Michigan State University
Agricultural Experiment Station

In Cooperation with the

Michigan Potato Industry Commission

2008

Michigan Potato Research Report
Volume 40

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MICHIGAN POTATOES
MICHIGAN POTATO INDUSTRY COMMISSION

Michigan Potato Industry Commission

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March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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2008 MICHIGAN POTATO RESEARCH REPORT

C. M. Long, Coordinator

INTRODUCTION AND ACKNOWLEDGMENTS

The 2008 Potato Research Report contains reports of the many potato research projects conducted by MSU potato researchers at several locations. The 2008 report is the 40th volume, which has been prepared annually since 1969. This volume includes research projects funded by the Potato Special Federal Grant, the Michigan Potato Industry Commission (MPIC), GREEEN and numerous other sources. The principal source of funding for each project has been noted at the beginning of each report.

We wish to acknowledge the excellent cooperation of the Michigan potato industry and the MPIC for their continued support of the MSU potato research program. We also want to acknowledge the significant impact that the funds from the Potato Special Federal Grant have had on the scope and magnitude of potato related research in Michigan.

Many other contributions to MSU potato research have been made in the form of fertilizers, pesticides, seed, supplies and monetary grants. We also recognize the tremendous cooperation of individual producers who participate in the numerous on-farm projects. It is this dedicated support and cooperation that makes for a productive research program for the betterment of the Michigan potato industry.

We further acknowledge the professionalism of the MPIC Research Committee. The Michigan potato industry should be proud of the dedication of this committee and the keen interest they take in determining the needs and direction of Michigan's potato research.

Special thanks go to Bruce Sackett for the management of the MSU Montcalm Research Farm (MRF) and the many details which are a part of its operation. We also want to recognize Barb Smith and Esther Haviland at MPIC and Greg Steere for helping with the details of this final draft.

WEATHER

The overall 6-month average maximum temperature during the 2008 growing season was one degree lower than the 6-month average maximum temperature for the 2007 season and was one degree higher than the 15-year average (Table 1). There was one recorded temperature reading of 90 °F or above in 2008; this date was September 2nd. There were no recorded daytime temperatures above 90 °F or night time temperatures above 70 °F in the month of August. There were three days at the end of April that the air temperature was below 32 °F, April 28 - 30. There were three daytime low days, below 50 °F, during harvest in mid-October, October 22, 24 and 25. There were twelve night time lows below 32 °F in October; they occurred October 3 – 4; 17 & 18; 21 – 23; and 27 – 30. The average maximum temperatures for June, and July 2008 were one degree below the 15-year average. and the August 2008 average was one degree above the 15-year average (Table 1).

Rainfall for April through September was 17.36 inches, which was two and one-half inches below the 15-year average. (Table 2). Rainfall recorded during the month of September was the highest recorded for that month since the year 2000. Irrigation at MRF was applied 12 times from June 26 to September 3, averaging 0.74 inches for each application. The total amount of irrigation water applied during this time period was 8.90 inches.

Table 1. The 15-year summary of average maximum and minimum temperatures (°F) during the growing season at the Montcalm Research Farm.

Year	April		May		June		July		August		September		6-Month Average	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1994	57	34	66	43	78	55	79	60	75	55	73	51	71	50
1995	51	31	66	45	81	57	82	60	82	65	70	45	72	51
1996	50	31	64	44	75	57	76	55	80	59	70	51	69	50
1997	54	31	59	39	79	56	80	57	73	55	69	50	69	48
1998	60	37	75	51	77	56	82	58	81	60	76	52	75	52
1999	59	37	71	48	77	55	84	62	76	56	73	48	73	51
2000	56	34	70	49	75	57	77	56	79	57	70	49	71	50
2001	61	37	70	49	78	57	83	58	72	70	69	48	72	53
2002	56	36	63	42	79	58	85	62	81	58	77	52	73	51
2003	56	33	64	44	77	52	81	58	82	58	72	48	72	49
2004	62	37	67	46	74	54	79	57	76	53	78	49	73	49
2005	62	36	65	41	82	60	82	58	81	58	77	51	75	51
2006	62	36	61	46	78	54	83	61	80	58	68	48	72	51
2007	53	33	73	47	82	54	81	56	80	58	76	50	74	50
2008	**61**	**37**	**67**	**40**	**77**	**56**	**80**	**28**	**80**	**54**	**73**	**50**	**73**	**49**
15-Year Average	57	35	67	45	78	56	81	56	79	58	73	49	72	50

Table 2. The 15-year summary of precipitation (inches per month) recorded during the growing season at the Montcalm Research Farm.

Year	April	May	June	July	August	September	Total
1994	3.84	2.63	6.04	5.16	8.05	1.18	26.90
1995	3.65	1.87	2.30	5.25	4.59	1.38	19.04
1996	2.46	3.99	6.28	3.39	3.69	2.96	22.77
1997	2.02	3.13	3.54	2.80	2.71	1.46	15.66
1998	2.40	2.21	1.82	0.40	2.22	3.05	12.10
1999	5.49	5.07	5.82	4.29	5.46	4.03	30.16
2000	3.18	6.46	4.50	3.79	5.28	5.25	28.46
2001	3.28	6.74	2.90	2.49	5.71	4.43	25.55
2002	2.88	4.16	3.28	3.62	7.12	1.59	22.65
2003	0.70	3.44	1.85	2.60	2.60	2.06	13.25
2004	1.79	8.18	3.13	1.72	1.99	0.32	17.13
2005	0.69	1.39	3.57	3.65	1.85	3.90	15.05
2006	2.73	4.45	2.18	5.55	2.25	3.15	20.31
2007	2.64	1.60	1.58	2.43	2.34	1.18	11.77
2008	**1.59**	**1.69**	**2.95**	**3.07**	**3.03**	**5.03**	**17.36**
15-Year Average	2.62	3.80	3.45	3.35	3.93	2.73	19.88

GROWING DEGREE DAYS

Tables 3 and 4 summarize the cumulative growing degree days (GDD) for 2008. Growing degree days base 50 for May through September, 2008 are in (Table 3) and growing degree days base 40 for May through October, 2008 are in (Table 4). The total GDD base 50 for 2008 was 2152 (Table 3), which is lower than the 10-year average. The total GDD base 40 for 2008 was 3834 (Table 4).

Table 3. Growing Degree Days* - Base 50°F.

	Cumulative Monthly Totals				
Year	May	June	July	August	September
1999	317	865	1573	2070	2401
2000	313	780	1301	1851	2256
2001	317	808	1441	2079	2379
2002	319	903	1646	2214	2613
2003	330	762	1302	1922	2256
2004	245	662	1200	1639	2060
2005	195	826	1449	2035	2458
2006	283	765	1444	2016	2271
2007	358	926	1494	2084	2495
2008	**205**	**700**	**1298**	**1816**	**2152**
10-Year Average	288	800	1415	1973	2334

Table 4. Growing Degree Days* - Base 40°F.

	Cumulative Monthly Totals					
Year	May	June	July	August	September	October
2006	532	1310	2298	3180	3707	3923
2007	639	1503	2379	3277	3966	4443
2008	**447**	**1240**	**2147**	**2973**	**3596**	**3834**
2009						
2010						
2011						
2012						
2013						
2014						
2015						
10-Year Average	539	1351	2275	3143	3756	4067

*1999-2008 data from the weather station at MSU Montcalm Research Farm (Michigan Automated Weather Network System Entrican, MI.)

PREVIOUS CROPS, SOIL TESTS AND FERTILIZERS

The general potato research area utilized in 2008 was rented from Steve Comden, directly to the West of the Montcalm Research Farm. This acreage was planted to a field corn crop in the Spring of 2007 and harvested Fall 2007 with crop residue disked into the soil. In the spring of 2008, the recommended rate of potash was applied and disked into the remaining corn residue. The ground was deep chiseled, disked and direct planted to potatoes. The area was not fumigated prior to potato planting. Potato early die was not an issue in 2008.

The soil test analysis for the general crop area was as follows:

	lbs/A			
pH	P_2O_5	K_2O	Ca	Mg
6.2	308 (154 ppm)	186 (88 ppm)	894 (447 ppm)	118 (59 ppm)

The fertilizers used in the general plot area are as follows. (Variances in fertilizers used for specific research projects are included in the individual project reports.)

Application	Analysis	Rate	Nutrients ($N-P_20_5-K_20$)
Broadcast at plow down	0-0-60	300 lbs/A	0-0-180
At planting	19-17-0	20 gpa	42-37-0
	10-34-0	12 gpa	13-45-0
At emergence	46-0-0	150 lbs/A	69-0-0
1st Early side dress	46-0-0	150 lbs/A	69-0-0
2nd Late side dress (late varieties)	46-0-0	100 lbs/A	46-0-0

Magnesium and Sulfur were applied July 5, 16 and 25 in the form of Magnesium Sulfate (with an analysis of 9.8% Mg and 12.9% S) for a total application of 20 lb/A. The composite nutrient value resulted in 2 lbs actual Mg and 2.6 lbs of S being applied per acre on the potato production area.

HERBICIDES AND PEST CONTROL

Hilling was done in late May, followed by a pre-emergence application of Linex at 1.5 qts/A and Dual at 1.33 pints/A. A post-emergence application of Sencor at 1/3 lb/A and Matrix at 1 oz/A was made in mid-July.

Platinum was applied at planting at a rate of 8 fl oz/A.

Fungicides used were: Bravo Zn; Tanos; Previcur and Echo Zn, over 11 applications.

Potato vines were desiccated with Rely in late August at a rate of 2 pints/A.

2008 POTATO BREEDING AND GENETICS RESEARCH REPORT

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INTRODUCTION

At Michigan State University, we are dedicated to developing improved potato varieties for the chip-processing and tablestock markets. The program is one of four integrated breeding programs in the North Central region supported through the Potato Special Grant. At MSU, we conduct a multi-disciplinary program for potato breeding and variety development that integrates traditional and biotechnological approaches. In Michigan, it requires that we primarily develop high yielding round white potatoes with excellent chip-processing from the field and/or storage. In addition, there is a need for table varieties (russet, red, yellow, and round white). We conduct variety trials of advanced selections and field experiments at MSU research locations (Montcalm Research Farm, Lake City Experiment Station, Muck Soils Research Farm, and MSU Soils Farm), we ship seed to other states and Canadian provinces for variety trials, and we cooperate with Chris Long on grower trials throughout Michigan. Through conventional crosses in the greenhouse, we develop new genetic combinations in the breeding program, and also screen and identify exotic germplasm that will enhance the varietal breeding efforts. With each cycle of crossing and selection we are seeing directed improvement towards improved varieties (e.g. combining chip-processing, scab resistance, and late blight resistance). In addition, our program has been utilizing genetic engineering as a tool to introduce new genes to improve varieties and advanced germplasm for traits such as solids, insect resistance, disease resistance and nutritional enhancement. We feel that these in-house capacities (both conventional and biotechnological) put us in a unique position to respond to and focus on the most promising directions for variety development and effectively integrate the breeding of improved chip-processing and tablestock potatoes. The addition of the SolCAP translational genomics project, funded through the USDA, will enhance our abilities to identify important traits and then breed them into elite germplasm.

The breeding goals at MSU are based upon current and future needs of the Michigan potato industry. Traits of importance include yield potential, disease resistance (scab, late blight, early die, and PVY), insect (Colorado potato beetle) resistance, chipping (out-of-the-field, storage, and extended cold storage) and cooking quality, bruise resistance, storability, along with shape, internal quality, and appearance. We are also developing potato tuber moth resistant lines as a component of our international research project. If these goals can be met, we will be able to reduce the grower's reliance on chemical inputs such as insecticides, fungicides and sprout inhibitors, and improve overall agronomic performance with new potato varieties.

Over the years, key infrastructure changes have been established for the breeding program to make sound assessments of the breeding selections moving through the program. These include the establishment and expansion of the scab nursery, the development of the Muck Soils Research Farm for late blight testing, the incorporation of no-choice caged studies for Colorado potato beetle assessment, the Michigan Potato Industry Commission (MPIC)-funded construction of the B.F. (Burt) Cargill Demonstration Storage adjacent to the Montcalm Research Farm, new land at the Lake City Experiment Station along with a well for irrigation and expanded land at the Montcalm Research Farm.

PROCEDURE

I. Varietal Development

Each year, during the winter months, 500-1000 crosses are made using about 150 of the most promising cultivars and advanced breeding lines. The parents are chosen on the basis of yield potential, tuber shape and appearance, chip quality, specific gravity, disease and insect resistance, adaptation, maturity, lack of internal and external defects, etc. The seeds collected from these crosses are then used as the breeding base for the program. We also obtain seedling tubers or crosses from other breeding programs in the US to include other germplasm with desirable traits. The seedlings are grown annually for visual evaluation (size, shape, set, internal defects) at the Montcalm and Lake City Research Farms as part of the first year selection process of this germplasm each fall. Each selection is then evaluated post harvest for specific gravity and chip processing. These selections each represent a potential variety. This system of generating new seedlings is the initial step in an 8-12 year process to develop new varieties. This step is followed by evaluation and selection at the 8-hill, 20-hill and 30-hill stages. The best selections out of the four-year process are then advanced for testing in replicated trials (Preliminary, Adaptation, Dates-of-Harvest, Grower-cooperator trials, North Central Regional Trials, USPB/Snack Food Association Trials, and other out-of-state trials) over time and locations. ***The agronomic evaluation of the advanced breeding lines in the replicated trials is in the annual Potato Variety Evaluation Report.***

There is a need to find a russet table potato that will be profitable and produce quality russets for the eastern market. Currently, the three most desirable potatoes for production and type in Michigan are GoldRush, Russet Norkotah and Silverton Russet. The latter two potatoes suffer as symptomless carriers of PVY. Norkotah also has a weak vine and susceptibility to potato early die. We need a PVY resistant or PVY expressing Silverton Russet potato. We are continuing to make more russet crosses and selections in the breeding program to support this new russet market.

Evaluation of Advanced Selections for Extended Storage

With the Demonstration Storage facility adjacent to the Montcalm Research Farm, we are positioned to evaluate advanced selections from the breeding program for chip-processing over the whole extended storage season (October-June). Tuber samples of our elite chip-processing selections are placed in the demonstration storage facility in October and are sampled monthly to determine their ability to chip-process from colder (42-48°F) and/or 50°F storage. In addition, Chris Long evaluates the more advanced selections in the

10 cwt. box bins and manages the 500 cwt. storage bins which may have MSU-developed lines.

II. Germplasm Enhancement

To supplement the genetic base of the varietal breeding program, we have a "diploid" (2x = 24 chromosomes) breeding program in an effort to simplify the genetic system in potato (which normally has 4x = 48 chromosomes) and exploit more efficient selection of desirable traits. This added approach to breeding represents a large source of valuable germplasm, which can broaden the genetic base of the cultivated potato. The diploid breeding program germplasm base at MSU is a synthesis of seven species: *S. tuberosum* (adaptation, tuber appearance), *S. raphanifolium* (cold chipping), *S. phureja* (cold-chipping, specific gravity, PVY resistance, self-compatability), *S. tarijense* and *S. berthaultii* (tuber appearance, insect resistance, late blight resistance, verticillium wilt resistance), *S. microdontum* (late blight resistance) and *S. chacoense* (specific gravity, low sugars, dormancy and leptine-based insect resistance). In general, diploid breeding utilizes haploids (half the chromosomes) from potato varieties, and diploid wild and cultivated tuber-bearing relatives of the potato. Even though these potatoes have only half the chromosomes of the varieties in the U.S., we can cross these potatoes to transfer the desirable genes by conventional crossing methods via 2n pollen.

III. Integration of Genetic Engineering with Potato Breeding

Through transgenic approaches we have the opportunity to introduce new genes into our cultivated germplasm that otherwise would not be exploited. It has been used in potato as a tool to improve commercially acceptable cultivars for specific traits. Our laboratory has now 16 years experience in *Agrobacterium*-mediated transformation to introduce genes into important potato cultivars and advanced breeding lines. We are presently using genes in vector constructs that confer resistance to Colorado potato beetle and potato tuber moth (*Bt-cry3A, Bt-cry1Ia1* and avidin), late blight resistance via the *RB* gene (from the wild potato species *S. bulbocastanum*), drought resistance (*CBF1*), PVY, and vitamin E. Furthermore, we are investing our efforts in developing new vector constructs that use alternative selectable markers and give us the freedom to operate from an intellectual property rights perspective. In addition, we are exploring transformation techniques that eliminate the need for a selectable marker (antibiotic resistance) from the production of transgenic plants.

RESULTS AND DISCUSSION

I. Varietal Development

Breeding

The MSU potato breeding and genetics program is actively producing new germplasm and advanced seedlings that are improved for cold chipping, and resistance to scab, late blight, and Colorado potato beetle. For the 2008 field season, progeny from over 500 crosses were planted and evaluated. Of those, the majority were crosses to select for round whites (chip-processing and tablestock), with the remainder to select for yellow flesh, long/russet types, red-skin, and novelty market classes During the 2008 harvest, over 1000 selections were made from the 40,000 seedlings produced. All potential chip-processing selections will be tested in January and April 2009 directly out of 45°F (7.2°C) and 50°F (10°C) storages. Atlantic, Pike (50°F chipper) and Snowden (45°F chipper) are chip-processed as check cultivars. Selections have been identified at each stage of the selection cycle that have desirable agronomic characteristics and chip-processing potential. At the 8-hill and 20-hill evaluation state, about 400 and 120 selections were made, respectively. Selection in the early generation stages has been enhanced by the incorporation of the Colorado potato beetle, scab and late blight evaluations of the early generation material.

Chip-Processing

Over 70% of the single hill selections have a chip-processing parent in their pedigree. Based upon the pedigrees of the parents we have identified for breeding cold-chipping potato varieties, there is a diverse genetic base. We have at least eight cultivated sources of cold-chipping. Examination of pedigrees shows up to three different cold-chipping germplasm sources have been combined in these selections. Our promising chip-processing lines are MSJ147-1, MSH228-6 (moderate scab resistance), MSJ126-9Y (scab resistant), MSK061-4 (scab resistance), MSK409-1 (scab resistant), MSL007-B (scab resistance), MSM246-B, MSN191-2Y, MSL292-A, MSR061-1 (scab and PVY resistant) and MSQ070-1 (scab and late blight resistant). Other new promising lines include MSQ089-1 (scab resistant), MSP459-5 (scab and late blight resistant), MSP516-A (scab and late blight resistant), MSN170-A (scab resistant) MSR036-5 (scab and late blight resistant), MSR102-3 (scab and late blight resistant), MSR127-2 (scab resistant) and MSQ279-1 (scab resistant).

Tablestock

Efforts have been made to identify lines with good appearance, low internal defects, good cooking quality, high marketable yield and resistance to scab, late blight and PVY. Our current tablestock development goals now are to continue to improve the frequency of scab resistant lines, incorporate resistance to late blight along with marketable maturity and excellent tuber quality, and select more russet and yellow-fleshed lines. We have also been spinning off some pigmented skin and tuber flesh lines that may fit some specialty markets. From our breeding efforts we have identified mostly round white lines, but we also have a number of yellow-fleshed and red-skinned lines, as well as some purple skin selections that carry many of the characteristics mentioned above. We are also selecting for a dual-purpose russet, round white, red-skin, and improved Yukon Gold-type yellow-fleshed potatoes. Some of the tablestock lines were tested in on-farm trials in 2008, while others were tested under replicated conditions at the Montcalm Research Farm. Promising tablestock lines include MSI005-20Y, MSN105-1, MSM182-1 and MSL268-D and MSM171-A. We have a number of tablestock selections with late blight resistance (MSM171-A, MSM182-1, and MSL268-D). MSL211-3 has late blight and scab resistance. MSA8254-2BRUS is a russet table selection that has scab resistance, while MSL794-BRUS has late blight resistance. We are using these russets as parents in the breeding program to combine the late blight and scab resistance. Some newer lines with promise include the high yielding round white line, MSQ176-5 (late blight resistant), MSQ279-1 (scab resistant) and MSN230-6RY (scab and late blight resistant). MSM288-2Y is a bright yellow flesh selection similar in type to Yukon Gold. Some new pigmented lines are MSS582-1 (purple splash) and Michigan Red and Purple Splash. MSQ558-2RR and MSR226-1RR are red fleshed chippers and MSQ432-2PP is a purple-fleshed chipper. MSL228-1 (purple splash) is being licensed to Garden's Alive for their home garden catalog.

Early harvest breeding material screen

In 2008, we initiated an early harvest observation trial of our breeding lines to learn about the potential to replace Atlantic as an early harvest variety. We harvested the plots at 92 days and observed the yield, tuber size and tuber shape/ appearance. In addition, we measured specific gravity and made chips. From this trial of 180 lines, we were able to identify some promising early breeding lines for the out-of-the-field chipping and tablestock use. **Table 1** (*next page*) summarizes these results. Some of these lines are also characterized to have some scab resistance and late blight resistance along with the desirable chipping traits. We will continue to test many of these lines and other selections in 2009. We also identified some desirable early tablestock lines among this material tested.

Disease and Insect Resistance Breeding

Scab: Disease screening for scab has been an on-going process since 1988. Results from the 2008 MSU scab nursery indicate that 65 of 188 lines evaluated had a scab rating of 1.4 or less (better than or equivalent to Pike). The limitation of breeding for scab resistance is the reliance on the scab nursery. We found a moderate correlation between the field screening and greenhouse screening for scab. In addition to the replicated trial, we have been conducting early generation selection for scab resistance among our breeding material. In 2008, 109 of 287 early generation selections showed strong scab resistance (rating of 1.0 or better). These data were incorporated into the early generation selection evaluation process at Lake City. We are seeing that this expanded effort is leading to more scab resistant lines advancing through the breeding program. We hope that the nutrient film technology (NFT) hydroponic tuberization system will help us more reliably screen for scab resistance. The NFT study is supported through Project GREEEN.

Late Blight: With support from GREEEN, the Muck Soils Research Farm, Bath, Michigan has become an excellent North American site for late blight testing because of the humid microclimate and isolation from major commercial potato production. As a result, late blight infection has been consistently achieved each year making breeding efforts to select late blight resistant germplasm very efficient. In 2008, 44 of 138 advanced breeding lines were classified as late blight resistant. Of the early generation material tested, 79 of 166 lines were late blight resistant.

Late blight tuber tests were conducted with Willie Kirk. Twelve lines with foliar late blight resistance were tested against six *P. infestans* isolates (US1, 6, 8, 10, 11 and 14). Four of the isolates (US 8, 10, 11 and 14 were aggressive enough to cause tuber infection). Of the LB lines tested, 10 had less tuber infection than Snowden. MSL268-D (a progeny of Jacqueline Lee) had a low level of tuber infection, while MSN230-6RY, MSN105-1, MSJ461-1 and MSL211-3 had intermediate infection levels. We will continue to screen lines in the program to characterize tuber resistance to late blight.

Colorado potato beetle: With support from GREEEN, we also introduced an early generation Colorado potato beetle screen at the Montcalm Research Farm. In 2008, 21 of 105 breeding lines were at least moderately resistant to Colorado potato beetle at the Montcalm Research Farm Beetle Nursery. The beetle pressure was extremely high leading to complete defoliation in all susceptible check lines. Percent defoliation was visually estimated during the beetle infestation in June and July. This resistant material

Table 1

2008 EARLY TRIAL - Montcalm Research Farm, 10-hill plots
May 8 - August 8, 2008 (92 days)

Line	Market Category[1]	Maturity[2] 8/5/2008	SPGR	Chip[3] OTF	Pedigree Female	Pedigree Male
Atlantic	**C**	**3.5**	**1.084**	**1.0**	**Wauseon**	**Lenape**
FL1879	**C**	**4.0**	**1.085**	**1.0**	-	-
Snowden	**C**	**4.0**	**1.089**	**1.0**	**Lenape**	**Wischip**
Beacon Chipper	C	4.5	1.084	1.5	-	-
Boulder	C	4.5	1.083	1.5	MS702-80	NY88
C095051-7W	C	3.5	1.078	1.0	-	-
FL2053	C	4.0	1.096	1.0	-	-
MegaChip ScabMR	C	3.5	1.098	1.5	-	-
MSL292-A	C	4.0	1.086	1.0	Snowden	MSH098-2
MSQ130-4 LBR - ScabMR	C	3.5	1.080	1.0	Boulder	MSJ456-4Y
MSR297-A ScabMR	C/T	2.5	1.071	1.0	MSG004-3	MSJ461-1
MSS026-2Y ScabMR	C	4.0	1.094	**1.0!**	SJ-Y7	MSJ126-9Y
MSS042-1Y ScabR	C	3.0	1.083	1.0	MN-C182	MSL159-AY
MSS048-1 ScabMR	C	3.0	1.081	1.0	MN-C385	MSG227-2
MSS097-3 LBR - ScabMR	C	4.0	1.074	1.0	MSI037-4	MSL211-3
MSS145-4 LBR - ScabMR	C	4.0	1.076	**1.0!**	MSL766-1	MSJ126-9Y
MSS258-1 ScabR	C/T	3.0	1.066	**1.0!**	MSH098-2	MSH228-6
MSS297-3 ScabR	C	4.5	1.081	**1.0!**	MSJ147-1	MSM066-4
MSS306-4Y ScabR	C	2.5	1.081	**1.0!**	MSK116-B	MSM066-4
MSS350-5Y ScabMR	C	4.0	1.080	1.0	MN-S23-1	MSJ126-9Y
NY139	C	4.0	1.086	1.0	-	-
W4013-1	C	3.0	1.090	1.0	-	-
Red Norland	**T**	**2.5**	**1.065**	**1.5**	**ND626**	**Redkote**
Onaway	**T**	**2.5**	**1.064**	**3.0**	**USDA X96-56**	**Katahdin**
MSM288-2Y ScabMR	T	3.5	1.075	1.5	MSG145-1	MSA097-1Y
MSQ131-A	T	3.0	1.068	1.5	Boulder	MSJ461-1
MSQ176-5 LBR - ScabMR	T	4.0	1.073	2.0	MSI152-A	MSJ461-1
MSR218-AR ScabMR	T	4.0	1.069	1.5	NDTX4271-5R	MSK101-2
MSR219-2R ScabR	T	3.0	1.065	2.5	NDTX4271-5R	Stirling
MSR219-AR ScabMR	T	5.0	1.062	2.5	NDTX4271-5R	Stirling
MSS070-1 ScabR	T	4.5	1.072	3.0	MN-E65	MSL211-3
MSS206-2 LBR - ScabR	T	4.0	1.063	2.5	Beacon Chipper	MSJ461-1
MSS442-2 LBR - ScabMR	T	3.0	1.076	1.5	MSI152-A	Pike
MSS483-1 LBR - ScabMR	T	4.0	1.069	2.0	MSM171-A	MSJ461-1
MSS544-1R ScabMR	T	3.0	1.067	2.5	CO93037-6R	MNR-8RR
MSS547-2R	T	1.5	1.057	2.5	Dakota Rose	NDTX4304-1R
Michigan Purple	S	4.0	1.071	2.5	W870	Maris Piper
MSL228-1SPL	S	4.0	1.076	2.5	MSH361-1	Picasso
MSR216-AP LBR	S	3.0	1.073	2.0	NDC5281-2R	MSJ317-1
MSR226-ARR ScabR	S/C	3.0	1.071	1.0	PoorpG1-4	Durango Red
MSR241-4RY	S	3.0	1.077	2.0	PoorpG9-3	MN96013-RY
MSS517-2P ScabMR	S	1.5	1.063	-	Michigan Purple	W2275-3R
MSS582-1SPL ScabMR	S	4.0	1.072	2.5	MSL228-1	MSL211-3

ScabR Line(s) demonstrated resistance (R) or moderate resistance (MR) to Common Scab at the MSU Scab Disease Nursery.
LBR Line(s) demonstrated foliar resistance to Late Blight in inoculated field trials at the MSU Muck Soils Research Farm.
[1]Market Category: C: Chip-processing; T: Tablestock; S: Specialty.
[2]Maturity Rating: August 5, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).
[3]Chip Score: Snack Food Association Scale (Out of the field); Ratings: 1-5; 1: Excellent, 5: Poor.

was selected for further advancement in the breeding program and also for use in the next round of crossing to develop beetle resistant cultivars. Some of these lines are beginning to enter the preliminary trials in the breeding program and are being used as parents for further breeding. Concurrently, a field cage (no-choice) experiment was conducted to evaluate 3 avidin transgenic lines. In 2008, beetle behavior and defoliation was evaluated in lines that expressed differing levels of avidin. The data may suggest that avidin reduced the number of adults emerging from pupation, but we did not see significant defoliation differences between avidin and non-avidin plants.

It is a great challenge to achieve host plant resistance to insects in a commercially acceptable line. We have some promising advanced selections with partial resistance to Colorado potato beetle. In addition, we have *Bt-cry3A* transgenic lines that could be commercialized if the processors renewed their acceptance and regulatory environment was modified to reduce costs. I am on a national committee to help build infrastructure to so that transgenic specialty crops like potato can be deregulated in a more efficient and less costly manner. ***However, the national potato industry needs to be supportive of this technology before we can move forward. This acceptance of transgenic potatoes by the industry will take a lot of work, but we need to get past this stage.***

Russet Table Varieties for Michigan: 2008 Assessment

The dynamics of the potato industry in Michigan have been changing in the recent years. A reason for this change is Michigan's position to major markets in the central and eastern US. With rising fuel costs, Michigan growers can capture table market share with a freight advantage over western potatoes. Key to capturing this market is having russet varieties that suit Michigan's climate and soils and also serves the consumers taste and quality needs. Current russet varieties may not provide the quality and production levels to compete profitably in these markets. The three most desirable potatoes for production and type in Michigan are Russet Norkotah, GoldRush and Silverton Russet. Two of these potatoes suffer as symptomless carriers of PVY. Russet Norkotah also has a weak vine and susceptibility to potato early die. We need a PVY resistant or PVY expressing Silverton Russet potato. GoldRush has proven not to perform well in Michigan's southern tier of counties. New russet varieties with adaptability to Michigan could lead to greater market penetration and further diversify the markets for the Michigan potato industry.

In response to this need, our first strategy was a series of field studies in 2008 to evaluate advanced russet lines from other US potato breeding programs. Chris Long organized the Russet trials conducted at three locations: Walther Farms (Southern location), Montcalm Research Farm (Central location) and Elmaple Farm (Northern location). The Russet Selection Trial at the Montcalm Research Farm was incorporated with the MSU breeding program's Russet Variety Trial. In addition to these locations, some russet lines were tested at R & E Farms, T.J.J. Farms, Crawford Farms, Sandyland Farms and Lennard Ag Co. Agronomic data were collected at each site and tuber samples were brought back to campus for specific gravity measurements and for visual evaluation of type and skin appearance. The russet lines tested were selected from Michigan (1), Wisconsin (8), Colorado (7), Idaho (6), and Texas (3). Control varieties were GoldRush, Russet Norkotah, Russet Burbank, CORN#3, CORN#8 and Silverton Russet.

Walther Farms was planted April 17th, vine killed August 15 and harvested September 17th. GDDbase40 was 3018 from planting to vine kill. Elmaple Farm was planted May 9th, vine killed September 17th and harvested October 6th. The GDDbase40 for Elmaple was 3029. Montcalm Research Farm was planted May 8 and harvested September 17, 2008, about 2 weeks after vine killing.

The overall value of the russet lines was based upon a combination of traits: russet skin appearance, tuber type, size distribution, yield, and scab reaction. Of the 25 russet lines tested, 9 were rated to be worthwhile for testing again in 2009 in replicated plots or on larger scale trials.

The russet selection trial at Walther Farms (Southern Location) revealed two varieties of interest. They are **CO99053-3** from Colorado and **A95109-1 (recently named Classic Russet)** from Idaho. The **CO99053-3** had a 543 cwt./A US#1 Yield. This was 88% of the total yield. This variety had a low incidence of hollow heart. The variety has a full season maturity. This same variety performed very well at Elmaple Farms near Kalkaska for our Northern location. At Elmaple Farms, **CO99053-3** had a 503 cwt./A US#1 yield which was 85% of the total yield. The maturity for **CO99053-3** was mid to late season. Other varieties of interest are **A0008-1TE** which was the top yielding variety at our Southern location with a 545 cwt/A US#1 yield. But, hollow heart was observed and it did not have the best shape. Also, at Walther Farms the **A95109-1** variety performed very well with a 531 cwt/A US#1 yield. This variety had no internal defects noted and 91% marketable yield recorded, while also having scab resistance. A95109-1 was also the highest yielding line at Montcalm Research. The last variety of mention is **AOTX95265-4** at the Elmaple Farm (Northern Location). This variety had a 595 cwt/A US#1 yield and a 707 cwt./A total yield. These varieties will be tested again in the future.

In 2009, we will acquire a truck load of A95109-1 seed and divide this load between Walther Farms (Southwestern), Lennard Ag. Co. (Southeastern), Crawford Farms (Central), Sandyland Farms (Central) and R & E Farms (Northern). This grower collaboration allows us to birth a new variety into our commercial industry with buy in from us at MSU and our commercial industry. We are able to continue testing and evaluating this variety on a larger scale trial that provides more detailed observations on a variety's true agronomic performance.

Other promising lines for 2009 are:
Canela Russet – better performance than Russet Norkotah and strong dormancy,
A98289-1 – has earliness and scab resistance,
CO95172-3RUS – has scab resistance and good internal quality,
CO99100-1 – has scab resistance and earliness, but need to watch the hollow heart.

The second strategy we are employing to identify new russet for Michigan is to bring in tuber families of select russet crosses for selection in Michigan. These were grown and selected at Lake City in 2008. At this time, Dr. Susie Thompson at NDSU has already agreed to share progenies of russet crosses.

The third strategy is to make selected crosses that have a high probability of selecting Norkotah types. We will grow out large progenies (1000 per cross) to further increase the probability of finding desirable selections. We will use Silverton, Russet Norkotah, MSE192-8RUS, A95109-1RUS, etc. as parents. In year three of selection, we will test for PVY reaction so that symptomless PVY-expressing lines are not advanced further.

The fourth strategy is to use genetic engineering to express a PVY resistance gene in Russet Norkotah and Silverton Russet.

Sugar Profile Analysis of Early Generation Selections for Extended Storage: Chip-processing Results From the MPIC Demonstration Commercial Storage (October 2007 - June 2008)

The MSU Potato Breeding Program has been conducting chip-processing evaluations each year on potato lines from the MSU breeding program and from other states. For 9 years we have been conducting a long-term storage study to evaluate advanced breeding lines with chip-processing potential in the Dr. B. F. (Burt) Cargill Potato Demonstration Storage facility directly adjacent to the MSU Montcalm Research Farm to identify extended storage chippers. We evaluated advanced selections from the MSU, Wisconsin and North Dakota breeding programs for chip-processing over the whole extended storage season (October-June). Tuber samples of our elite chip-processing selections were placed in the demonstration storage facility in October and were sampled 6 times to determine their ability to chip-process from storage.

In October 2007, tuber samples from 12 MSU lines, 1 North Dakota line, and four Wisconsin lines from the Montcalm Research Farm and Lake City Experiment Station trials were placed in the bins. The first samples were chip-processed in November and then seven more times until June 2008. Samples were evaluated for chip-processing color, defects and glucose and sucrose were measured.

Table 2 summarizes the chip-processing color and scab rating of 11 lines and three check varieties (FL1879, Pike and Snowden) over the 7-month storage season. From November to April all lines chip-processed acceptably. The storage temperature ranged from 56.4°F (13.6°C) in November to a low of 49.8°F (9.9°C) in February. The lines that chip exceptionally well were MSJ126-9Y, MSJ147-1, MSL292-A and MSN191-2Y. MSQ070-1 was fast-tracked for sugar profile analysis and also had a good storage profile, with a constant 1.0 SFA chip score and 0.0% undesirable color in the chips (chip color and sugar profile analysis were conducted by Techmark, Inc.). MSK061-4 had early sprouting and soft tubers by the final May 14 evaluation date.

Snowden and Kalkaska (MSJ036-A) were off-color by the last date. In some cases, stem end discoloration (SED) or hollow heart was observed in a few chips, but no patterns emerged. Based upon the data, many of these lines have potential to be further tested in storage tests. MSQ070-1, MSH228-6, MSJ126-9Y, MSJ316-A, MSK061-4, MSK409-1 and MSP516-A offer scab resistance along with the chip-processing. MSQ070-1 also has late blight resistance.

Table 2. 2007-2008 Chip Scores from Chip-processing Lines in the Demonstration Storage
SFA Chip Scores for seven months storage at the MPIC Demonstration Storage

	Date / Bin Temperature								
Line	11/12/07 56.4 °F	12/18/07 50.4 °F	1/22/08 49.8 °F	2/18/08 49.8 °F	3/18/08 50.0 °F	4/16/08 50.0 °F	5/14/08 52.4 °F	6/11/08 56.8 °F	*2007 Scab*
FL1879	**1.0**	**1.5**	**1.5**	**1.5**	**1.0**	**1.0**	**1.0**	**2.0**	***2.0***
MSH228-6	1.0!	1.0	1.5	1.0	1.0	1.0	1.0	1.0	*1.5*
Kalkaska (MSJ036-A)	1.5	2.0	1.5	1.5	1.0	1.0	2.0	1.5	*0.8*
MSJ126-9Y	1.0!	1.5	1.5	1.0	1.0	1.0	1.0	1.5	*1.3*
MSJ147-1	1.0!	1.5	1.5	1.0	1.0	1.0!	1.0	1.0	*1.0*
MSJ316-A	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	*1.9*
MSK061-4	1.0	2.0	1.5	1.5	1.0	2.0	1.0	2.0	*1.0*
MSK409-1	1.0	1.5	1.5	1.0	1.5	1.0	1.5	1.5	*0.8*
MSL292-A	1.0	1.5	1.5	1.0	1.0	1.0	1.5	1.0	*2.3*
MSM246-B	1.0	2.0	1.5	1.0	1.5	1.0	1.0	1.5	*2.3*
MSN191-2Y	1.0!	1.5	1.5	1.5	1.0	1.0	1.5	1.0	*1.5*
MSP516-A	1.0	1.5	1.5	1.0	1.5	1.5	1.5	1.5	*1.0*
Pike	**1.0**	**1.0**	**1.5**	**1.0**	**1.0**	**1.5**	**1.5**	**1.0**	***1.4***
Snowden	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**2.5**	**3.0**	***2.6***
MSQ070-1 *	**1.0**	**1.0**	**1.0**	**1.0**	**-**	**-**	**-**	**-**	***1.0***

SFA Chip Score 1-5 scale: 1=excellent; 5=poor (>= 2.5 is considered unacceptable).
Scab Rating: 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.
MSQ070-1 was Fast-tracked; chip color and sugar profile analysis was conducted by Techmark, Inc.

Variety Release

We released MSJ036-A as Kalkaska in 2008. We are continuing to promote the seed production and testing of Beacon Chipper, a 2005 release. In addition, we are also continuing to promote Michigan Purple, Jacqueline Lee for the tablestock specialty markets. Boulder is being commercially grown in Quebec. Commercial seed production has been initiated for MSN105-1, a round white potato for the tablestock market. Lastly, commercial seed of MSH228-6, MSJ147-1, and MSJ126-9Y are being produced and we will continue to seek commercial testing of these lines. MSQ070-1 is also being fast-tracked for the chip-processing market. It has both scab and late blight resistance. We also have a focused ribavirin-based virus eradication system to generate virus-free tissue culture lines for the industry. About 30 lines are in ribaviran treatment at this time to remove PVS and PVY. This year, about 40 new MSU breeding lines are being put into tissue culture.

MSU Variety releases:

Kalkaska (MSJ036-A)

Parentage: B1254-1 X S440
Developers: Michigan State University and the Michigan Agricultural Experiment Station.

Plant Variety Protection: submitted

Strengths: MSJ036-A is a high yielding, round white potato with an attractive round appearance with shallow eyes.MSJ036-A has a strong vine and a full season maturity. This variety has resistance to *Streptomyces scabies* (common scab) stronger than Pike. MSJ036-A also has chip-processing storage characteristics and better tolerance to blackspot bruise than Snowden.

Weaknesses: Sugar levels have to be watched at harvest during cold temperatures.

Incentives for production: High yield and good tuber type combined with scab resistance.

Missaukee (MSJ461-1)

Parentage: Tollocan X NY88
Developers: Michigan State University and the Michigan Agricultural Experiment Station, Michigan Potato Industry Commission
Plant Variety Protection: Plant Variety Protection is being considered for this variety.

Strengths: MSJ461-1 is a round white chip-processing variety with an attractive round shape and bright skin. The primary strength of this variety is its strong foliar resistance to late blight (*Phytophthora infestans*) combined with chip-processing quality. MSJ461-1 can also be marketed as tablestock because of its good culinary quality. The tubers will chip process out-of-the-field and from 10°C (50°F) storage. MSJ461-1 performed well in Michigan on-farm trials and regional testing. Under irrigated conditions, the yield is similar to Snowden. MSJ461-1 is being considered for release, although no name has yet been chosen for this line.

Weaknesses: The specific gravity of MSJ461-1 is lower than Snowden in Michigan.

Incentives for production: High yield with uniform tuber size combined with strong foliar resistance to late blight, GN resistance and tolerance to verticillium wilt. Can be used for both chip-processing and table use.

MSJ147-1

Parentage: NorValley X S440
Developers: Michigan State University and the Michigan Agricultural Experiment Station
Plant Variety Protection: Will be considered.

Strengths: MSJ147-1 is a round white chip-processing potato that has a bright skin, white flesh and round shape. In addition, it has been determined to store at temperatures below 50°F and maintain low reducing sugar levels into May or June.

Weaknesses: Small vine, slow to emerge.

Incentives for production: MSJ147-1 produces many A-size tubers that are low in defects, however we are seeing some HH in the large tubers this storage season. Potatoes maintain low reducing sugar content for chip-processing out of the field and from storage.

II. Germplasm Enhancement

In 2008, only a few diploid populations were evaluated as single hills. From this breeding cycle, we plan to screen the selections for chip-processing from storage. In addition, selections were made from progeny that was obtained from the USDA/ARS at the University of Wisconsin. These families represent material from South American potato species and other countries around the world that are potential sources of resistance to Colorado potato beetle, late blight, potato early die, and ability to cold-chip process. We have used lines with Verticillium wilt resistance, PVY resistance, and cold chip-processing. We are monitoring the introgression of this germplasm through marker assisted selection. Through GREEEN funding, we were able to initiate a breeding effort to introgress leptine-based insect resistance. From previous research we determined that the leptine-based resistance is effective against Colorado potato beetle. We will continue conducting extensive field screening for resistance to Colorado potato beetle at the Montcalm Research Farm and in cages at the Michigan State University Horticulture Farm. We made crosses with late blight resistant diploid lines derived from *Solanum microdontum* to our tetraploid lines. This *S. microdontum*-based resistance is unique and very effective against the US-8 late blight strains. These progeny are being grown in the greenhouse and now we have used DNA marker analysis to identify which lines have the late blight resistance. We have conducted lab-based detached leaf bioassays and have identified resistant lines. At the Muck Farm we were able to identify some LB resistant hybrids.

III. Integration of Genetic Engineering with Potato Breeding

Segregation of Transgenes and Selectable Markers in Tetraploid Potato Crosses

The insertion of transgenes into cultivated potato offers the opportunity to introduce novel genes/traits into the cultivated germplasm. If a transgenic event is commercialized in the US, the progeny generated from the transgenic lines are also approved for growing. Thus, transgenic lines can be valuable parents in a breeding program. We have generated transgenic lines and made crosses to examine segregation of transgenes and the *nptII* selectable marker. In one set of crosses we examined the segregation of the *Bt-cry1Ia1* gene and the *nptII* gene. We also tested a subset of the progeny for potato tuber moth resistance. We learned that the Bt gene is inherited in a simple genetic manner and all the progeny that carried the Bt gene were resistant. Of 26 lines evaluated in agronomic trials over the past two years, we have selected 3 lines that will continue to be tested for their commercial potential.

In another set of crosses, we examined the segregation of the *RB* gene and the *nptII* genes. In some of these crosses the *RB* gene was co-integrated with the *nptII* gene in the transgenic line. In another transgenic line, the *RB* gene was independently integrated from the *nptII* gene so that *RB* and *nptII* would segregate independently in the progeny. Segregation data showed that we were able to select progeny that carried the *RB* gene, but not the *nptII* gene. Hence the progeny do not have the antibiotic resistance gene. Separating out the *nptII* gene makes transgenic potatoes have greater public perception. In addition, we have been able to combine the *RB* gene for late blight resistance with conventionally bred resistance genes. We tested a sample of these progeny at the Muck Farm in 2008. The late blight resistance was expressed in all *RB* positive lines and in some lines the high level of late blight resistance may have been attributed to combined conventional and transgene resistance. This is an exciting area of study that we will continue to pursue over the next few years. We may also have our own late blight resistant R-gene to use if our cloning research is successful (GREEEN funded).

Commercialization of Potato Tuberworm Resistant Potatoes in South Africa

The potato tuberworm (*Phthorimaea operculella* Zeller) is a primary pest problem facing potato farmers in developing countries. Currently, the primary means to control the potato tuberworm and avoid major crop losses is the use of chemical pesticides. Michigan State University (MSU), funded by the U.S. Agency for International Development (USAID), initiated biotechnology research on the development of potato tuberworm resistant varieties in 1992. A *Bacillus thuringiensis* (Bt)-*cry1Ia1* gene, was successfully introduced into several potato varieties and shown to be highly resistant to potato tuberworm in the Spunta-G2 line (both tuber and foliage). This Bt potato will be one of the first public sector developed products to reach farmers in developing countries and will serve as a model for the public sector deployment of insect resistant transgenic crops. The commercialization project includes six components: Product Development, Regulatory File Development, Obtaining Freedom to Operate and Establishing Licensing Relationships, Marketing and Technology Delivery, Documentation of Socio-Economic Benefits, and Public Communication. This technology would also have benefits in controlling PTM in the US and reducing the need for insectcide-based protection. In 2007, we focused on collecting the regulatory data that has to be submitted to the review agency. In 2008, we submitted the regulatory file to the South African authorities and we are waiting for their approval to release Spunta G2. This is a major milestone and we look forward to the final approval process.

Potato Translation Initiation Factor 4E (eIF4E) over-expression to obtain resistance to PVY in susceptible potato varieties

USDA/ARS funded project:
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Summary of the Problem

Numerous potato viruses are prevalent worldwide and can cause substantial economic losses. In the US four potato viruses PVY, PVX, PLRV and PVS are most frequently identified, but PVY and its various associated strains is the most common and economically most harmful (Valkonen 2007). These potato viruses are transmitted to the next seed generation through tubers. The use of disease-free tissue culture stocks in combination with state seed certification programs has historically been a source of clean seed to the commercial farmers, but in recent years, the level of PVY in potato certified seed lots has reached problem levels (Whitworth et al. 2005). The extensive spread of various strains of PVY have become very common in seed production due to the amount of PVY symptom-less expression varieties being grown combined with the high numbers of non-persistent PVY vectoring aphids present in potato growing regions. It is difficult to produce seed clean of PVY when the inoculum is so widely distributed throughout seed production regions.

The variety, Russet Norkotah and its line selections, make it the second most common variety in the US (NASS 2007). This variety along with Shepody and Silverton Russet are described as being symptom-less carriers of PVY. One solution to this problem is to replace these varieties with new and improved ones. Ideally these varieties would have extreme resistance to all PVY strains, but some advanced breeding lines such as A95109-1 that show great promise still have the weakness of PVY susceptibility. Resistance to PVY common and necrotic (NTN, N:O) strains is critical as the necrotic strains are present in the industry and can cause tuber defects. Michigan State University and other breeding programs are currently using the *Ry* gene to introduce extreme resistance to PVY into advanced breeding germplasm through conventional breeding combined with marker-assisted selection techniques (Gebhardt et al. 2006). It will take a significant number of years to identify, release and commercialize a new variety that will compete with the market impact of Russet Norkotah.

The conventional breeding strategy must be employed; however current technology exists to introduce PVY resistance directly into Russet Norkotah and other PVY susceptible varieties using pathogen-derived resistance (e.g. viral coat protein).

NatureMark had released in the late 1990s transgenic lines of Russet Burbank that were resistant to PVY (Kaniewski and Thomas, 2003). It is well known that these and other transgenic potato lines were removed from the market in 2001 when the quick serve restaurant industry was attacked by the anti-biotech activists through media tactics to create concern among the public regarding the food and environmental safety of these potatoes (Simon 2003).

Transgenic technology has continued to advance since the 1990s and Simplot scientists have recently developed a new method to introduce native genes into potato without any additional genes or DNA sequences (Rommens *et al.*, 2004). With this technology they can create transgenic potato lines that contain only potato genes rather than genes obtained from other organisms. The public perception of this technology is much more accepting of this transformation technique that employs only the crop's genes rather than genes from other organisms such are viruses, bacteria, etc. (K. Swords pers. comm.).

Research Objectives and Research Plan

The new transgenic approach can be applied to the PVY problem in the potato industry. ***Our overall objective* is to conduct studies that will lead to transgenic Russet Norkotah, Silverton Russet, and A95109-1 lines that have PVY resistance conferred by a native resistance gene from potato.** Through gene mapping studies Valkonen's group was able to map the extreme resistance to PVY to Chr. 11 (Hamalainen et al. 1997). A genetic marker has been identified that co-segregates with the extreme resistance to PVY (Ry_{adg}) (Kasai et al. 2000). Valkonen's group has also made an effort to clone this PVY resistance gene (a LRR-NBS R-gene), but the over-expressed gene they cloned did not confer resistance and they theorized that another non-cloned R-gene in the hotspot on Chr. 11 may be the actual R-gene that confers resistance. In pepper a PVY resistance gene maps to Chr. 3 and provides natural resistance to PVY that is different than the R-gene resistance on Chr. 11. Ruffel et al. (2005) was able to demonstrate that the *pot-1* gene in tomato (*Solanum lycoperisicum*) is an orthologue to the *pvr2* gene in pepper. In transient expression assays, they were able to show that the eIF4E gene (referred to as *pot-1*) accounted for the resistance to PVY in tomato. **Using a comparative genomics approach, we have been able to clone the translation initiation factor 4E (eIF4E) gene from potato that may be the orthologue to the recessive PVY resistance conferred by the *pvr2* locus in pepper (*Capsicum annum*).** Our eIF4E gene, cloned from potato using the tomato *pot-1* primers has an identical sequence length and a 96% sequence homology match to the tomato orthologue that confers PVY resistance in tomato. We hypothesize that the eIF4E gene we cloned is the orthologue of the *pot-1* and *pvr2* PVY resistance genes in tomato and pepper, respectively.

Progress Report (since June 2008)

One of the objectives of this research is to test the tomato *pot-1* (*eIF4E*) gene as a source of PVY resistance in potato. RT-PCR and cDNA amplification using gene specific primers allowed amplification of a tomato gene from *L. hirsutum* accession PI247087. The sequence of the cloned gene was identical to the Genbank sequence identified as *pot-1*(AY723736). This sequence was subsequently cloned into the *Agrobacterium* binary vector pSPUD4 which contains a Cauliflower mosaic virus 35S promoter (CaMV 35S) which should express the *pot-1* gene constitutively in plants. A previously cloned potato gene with over 96% sequence identity to the tomato *pot-1* gene but lacking the signature amino acid changes in key regions known to be associated with PVY resistance in pepper and tomato was sub-cloned into a pSPUD4 binary vector as well and will be used in transformations as a control.

Transformation experiments are now in progress using the PVY susceptible line E149-5Y, Silverton Russet and A95109-1. Several putative transgenic plants have been isolated and are in culture. As they grow and root, molecular characterization will be conducted. Additional transformations are in progress to generate more transgenic plants.

For the second objective, about 40 Solanum accessions from *S. chacoense*, *S. phureja*, *S. andigena, S. microdontum* have been obtained. A seed sample has been planted from each accession for subsequent DNA isolation and *pot-1* (*eIF4E*) amplication and sequencing.

Tissue culture plants (25 each) of 10 putative PVY resistant potato lines were sent to J. Whitworth for greenhouse PVY evaluation this fall.

MICHIGAN POTATOES
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March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

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Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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2008 POTATO VARIETY EVALUATIONS

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INTRODUCTION

Each year, the MSU potato breeding and genetics team conducts a series of variety trials to assess advanced potato selections from the Michigan State University and other potato breeding programs at the Montcalm Research Farm (Entrican). In 2008, we tested 227 varieties and breeding lines in the replicated variety trials. The variety evaluation also includes disease testing in the scab nursery (MSU Soils Farm, E. Lansing) and foliar and tuber late blight evaluation (Muck Soils Research Farm, Bath). The objectives of the evaluations are to identify superior varieties for fresh or processing markets. The varieties were compared in groups according to market class, tuber type, skin color, and to the advancement in selection. Each season, total and marketable yields, specific gravity, tuber appearance, incidence of external and internal defects, chip color (from the field, 45°F (7.2°C) and 50°F (10°C) storage), as well as susceptibilities to common scab, late blight (foliar and tuber), and blackspot bruising are determined.

PROCEDURE

Ten field experiments were conducted at the Montcalm Research Farm in Entrican, MI. They were planted as randomized complete block designs with two to four replications. The plots were 23 feet (7 m) long and spacing between plants was 10 inches (25.4 cm). *This spacing is a change from the previous 20 years of using 12 inch spacing.* Inter-row spacing was 34 inches (86.4 cm). Supplemental irrigation was applied as needed. The field experiments were conducted on a sandy loam soil that was in corn the previous year and in potatoes 4 years previously.

The most advanced selections in the breeding program were harvested at two dates to evaluate early and late harvest potential (Date-of-Harvest trial: Early and Late). The advanced selections were tested in the Advanced trial, representing selections at a stage between the Round White and the Date of Harvest trials. The other field trials were the Round White, Russet, Adaptation (chip-processors and tablestock), and Preliminary (chip-processors and tablestock) and Transgenic. *Note: We added an early harvest observation trial (92 days), to screen newer lines from the breeding program for early performance potential as out of the field chip-processing and tablestock varieties. The* *early trial is discussed in the breeding report.* In each of these trials, the yield was graded into four size classes, incidence of external and internal defects in > 3.25 in.(8.25 cm) diameter (or 10 oz. (283.5 g) for Russet types) potatoes were recorded. Samples were taken for specific gravity, chipping, disease tests and bruising tests. Chip quality was assessed on 25-tuber composite samples, taking two slices from each tuber. Chips were fried at 365°F (185°C). The chip color was measured visually with the SFA 1-5 color chart. Tuber samples were also stored at 45°F (7.2°C) and 50°F (10°C) for chip-processing out of storage in January and March. Advanced selections are also placed in the MPIC B.F. Burt Cargill Commercial Demonstration Storage in Entrican, MI for monthly sampling. The scab nursery at the MSU Soils Farm and the late blight trial at the Muck Soils Research Farm are used for scab and foliar late blight assessment of lines in the agronomic trials. Maturity ratings (1 early - 5 late) were taken for all variety trial plots in late August to differentiate early and late maturing lines.

RESULTS

A. Date of Harvest Trial Varieties:

Chip-processors and Tablestock (Tables 1: Early harvest, and 2: Late harvest)

There were 12 entries that were compared at two harvest dates (96 and 140 days). Atlantic, Snowden, Pike and FL1879 were used as check varieties. The plot yields were average to slightly below average in the early harvest (96 days), and specific gravity values were typical to an average year. On average, there was a 127 cwt/a increase in yield for the second harvest date (140 days). The results are summarized in **Tables 1: Early harvest and 2: Late harvest**. Hollow heart was the most prevalent internal defect in the early harvest this year, although only to a limited degree. FL1879 and MSM171-A showed the highest incidence of hollow heart in the late harvest. Interestingly, the hollow heart standard Atlantic, had less incidence of hollow heart (3%) compared to average years. In the early harvest trial, the best yielding lines were Atlantic, FL1879, MSN105-1, and MSL268-D. MSN105-1 is a round-white tablestock line with bright skin, excellent type, moderate scab resistance, moderate foliar late resistance, and an early maturity. MSL268-D is also a round-to-slightly oval white tablestock line with moderate scab resistance, strong foliar late resistance, and PVY resistance. The highest yielder for the late harvest was FL1879, followed by Atlantic, Snowden, MSN105-1, MSL268-D, and MSN170-A. MSN170-A is a chip-processing line that also offers scab resistance and average specific gravity. MSP459-5 has excellent chip quality (with storage potential), good specific gravity, and moderate scab and late blight resistance. The out-of-the-field chip scores for 2008 were all in the acceptable range with scores of 1.5. MSN170-A and MSP459-5 are being increased for on-farm testing.

B. Advanced Trial (Table 3)

A summary of the 18 entries evaluated Advanced trial results is given in **Table 3**. Overall, the yields for the Advanced trial (140 days) were above average. The highest yielding lines were tightly clustered (and not significantly different) between MegaChip (436 cwt/a), Kalkaska, Beacon Chipper, FL1879, MSI005-20Y, and MSQ176-5 (408 cwt/a). The next highest yielding group was MSK061-4 followed by Snowden, MSQ070-1, and FL2053. Hollow heart and vascular discoloration were the predominant internal defects, with FL1879 and Snowden having the highest levels of hollow heart (18 and 15%, respectively). Specific gravity was average to above average with seven lines having specific gravities higher than Snowden (1.088): MSN191-2Y (1.097), FL2053, MSQ070-1, MegaChip, MSJ147-1, MSK409-1, MSK061-4 (1.088). All entries in the trial had excellent chip-processing quality out of the field, with an SFA score of 1.0. Most of the MSU breeding lines have moderate to strong scab resistance. Kalkaska and Beacon Chipper continue to be consistently high yielding lines with good specific gravity, chip quality, and scab resistance. MSQ176-5 is a round-white tablestock line with excellent tuber type, strong foliar late blight resistance, and moderate scab resistance. Two promising chip-processing lines are MSQ070-1 (chip quality, high specific gravity, scab and late blight resistance) and MSR061-1 (chip quality, good specific gravity, scab and PVY resistance, and moderate late blight resistance). There is enough seed to begin on-farm testing of MSQ070-1 and MSQ176-5 in 2009.

Variety and Advanced Breeding Line Characteristics

Beacon Chipper – a chip processing line that has high yield potential and moderate scab tolerance along with excellent chip-processing quality. Beacon Chipper was named and released in 2005. Yield performance in the USPB/SFA was also high.

MSH228-6 – a chip-processing line with moderate scab resistance. It has a good type and has performed well in on-farm trials.

Kalkaska (MSJ036-A) – an MSU chip-processing selection with high yield potential. It also has a high specific gravity and scab resistance. The tuber type of MSJ036-A is round and attractive.

MSJ126-9Y – an earlier season chip-processing line with excellent chip quality and long-term storage potential. This line also has scab resistance and an attractive type.

MSJ147-1 – a full season storage chipper that also has some early sizing. It has excellent chip-processing quality and a high solids content. It has performed well in on-farm trials and has demonstrated an excellent long-term storage chipping profile.

MSK061-4 – an attractive round-white chip-processing line with good scab resistance. This line produces clean chips with good specific gravity and average yield, with low blackspot bruising, but has a short dormancy.

MSK409-1 – a round-white chip-processing line with good scab resistance. This earlier maturing line has average yield and slightly lower specific gravity.

MSL268-D – is also a round-to-slightly oval white tablestock line with moderate scab resistance, strong foliar late resistance, and PVY resistance. This line has an average yield with mid-early maturity.

MSM171-A – a round-white tablestock line with moderate scab resistance and strong foliar late blight resistance. This line also has an moderately early maturity with a 'Superior' type tuber appearance.

MSM246-B – a round-white chip-processing line with good specific gravity and excellent chip quality that has demonstrated potential for good long-term chip quality.

MSN105-1 – an attractive round-white tablestock line with moderate foliar late blight resistance, moderate scab resistance, and an early maturity.

MSN170-A – a new round-white chip-processing line with good scab resistance, average specific gravity, and good type. This line produces clean chips with good specific gravity and an early maturity, and has storage potential.

MSN191-2Y – an MSU chip-processing selection with a very uniform round type. This newer line produces excellent chips with a high specific gravity and low incidence of internal defects.

MSP459-5 – another new MSU chip-processing selection with scab resistance, average specific gravity, and a good, round type. This line has excellent chip quality with a low incidence of internal defects and storage potential.

The variety release of Kalkaska (MSJ036-A) is currently underway. We have submitted the PVP application to the USDA and the variety release description to the American Journal of Potato Research. Kalkaska is a high yielding, round white potato with an attractive round appearance with shallow eyes. Kalkaska has a strong vine and a full season maturity. This variety has resistance to *Streptomyces scabies* Thaxter (common scab of potato) similar to Pike. Kalkaska also has industry approved chip-processing storage characteristics (light color and low incidence of defects) and it also has better tolerance to blackspot bruise than Snowden. Specific gravity in Michigan averages 1.083, ranging from 1.075 to 1.096. Kalkaska also has a higher marketable yield than Pike and does not express heat necrosis in the tubers. The name Kalkaska was chosen to acknowledge a town located in the Michigan seed growing region.

In December 2004, 2005, 2007, and 2008, the MPIC sponsored a booth at the Great Lakes Fruit, Vegetable, and Farm Market Expo to market Liberator, Michigan Purple and Jacqueline to the farm market/roadside stand market segment. There continues to be a strong interest in specialty potato varieties and a growing demand for new, unique potato varieties. We also showcased some of the newer up-and-coming selections from the breeding program to get a sense of the interest from growers who stopped by the booth. The description of two of these varieties that fit the specialty potato market can be found below.

Michigan Purple - a tablestock selection with an attractive purple skin. This selection has high yield potential and the tubers have a low incidence of internal defects. The vine maturity is mid-season to mid-early. A thin skin makes this variety a challenge market on a large scale without making adjustments in harvest, washing and grading process. We regard this as a variety that can compete in the red market. Michigan Purple has great potential in the roadside stand and farm markets.

Jacqueline Lee – an oval/oblong tablestock selection with a high tuber set of tubers with a bright skinned, smooth and attractive appearance that is typical of many European cultivars. The tubers have very low incidence of internal defects and good baking quality. It is our best tasting potato! The strength of this selection is also its strong foliar resistance to the US8 genotype of late blight. Vine maturity is similar to Snowden. There is interest in California to market this variety. Jacqueline Lee has great potential in the roadside stand and farm markets.

C. North Central Regional Trial Entries (Tables 4, 5, and 7)

The North Central Trial is conducted in a wide range of environments (11 regional locations) to provide adaptability data for the release of new varieties from Michigan, Minnesota, North Dakota, Wisconsin, and Canada. The funding situation in 2007 negatively affected the number of entries for these trials, and continued in 2008. Fifteen breeding lines from three universities and seven control varieties were tested in Michigan in 2008. The clones were incorporated in the Round White (8 entries), Russet (3 entries), or Adaptation Tablestock (4 entries) trials according to market class. The results are presented in **Tables 4, 5, and 7**. These lines are designated with the superscript$^{\mathbf{NCR}}$ in the tables. The MSU lines MSJ316-A, MSJ461-1, MSM171-A, and MSI005-20Y were the Michigan representatives included in the 2008 North Central Trial. MSJ316-A has a uniform type with scab resistance and good chip quality. MSJ461-1 has a good, round type and chip-processing quality combined with strong foliar late blight resistance. MSM171-A a round-white tablestock line with moderate scab resistance, strong foliar late blight resistance, and an early maturity. MSI005-20Y is a yellow-fleshed line with high yield potential and an attractive round appearance.

D. Round White Trial (Table 4)

The 11 lines in the Round White Trial were all round-white chip-processing or tablestock entries from the North Central Regional Trial. The trial was harvested 127 days after planting. The top yielding lines were MSM171-A, Atlantic, and MSI005-20Y. The specific gravities were average to above average in comparison to a typical year in Michigan (1.089 for Atlantic, 1.091 for Snowden). Hollow heart and vascular discoloration were the predominant internal defects. Lower than typical years, the greatest hollow heart was seen in Atlantic (15%) and Snowden (13%). Vascular discoloration was above average as noted in Snowden (38%). The entries from North Dakota and Wisconsin (ND8307C-3, ND8304-2, W2310-3, W2133-1) were the lowest yielding lines, with the highest percentage of B-size tubers, although W2310-3 did have the highest specific gravity (1.092) in the trial.

E. Russet Trial (Table 5)

The number of entries in the russet trial this year reflects the strong interest in the state for russet varieties. In 2008, 33 lines evaluated after 133 days. The results are summarized in **Table 5**. Russet Burbank and Russet Norkotah were the reference varieties used in the trial. Scab resistance was prevalent among the lines tested, although many of the new breeding lines being evaluated were scab susceptible (10 lines had a scab rating $\geq$ 2.0). Hollow heart and vascular discoloration were the most prevalent internal defects. The highest hollow heart level was observed in MSA8254-2BRUS (40%), AC99375-1RUS (40%), and AOND95292-3RUS (35%). The lines with the highest vascular discoloration were A95109-1 (58%), W2253-5RUS (43%), and W8206-1RUS (40%). Specific gravity measurements were average with Russet Burbank and Russet Norkotah having 1.081 and 1.068 readings, respectively. The yield of the overall trial was above average for most lines in 2008. Off type and cull tubers were found in nearly all lines tested, with the greatest pickouts from Russet Burbank (31%). Vine maturity varied among lines but it did not correlate with yield. The highest yielding entry was A95109-1 with 469 cwt/a US#1 yield, followed by MSA8254-2BRUS. MSA8254-2BRUS is an MSU selection from the USDA/ARS Aberdeen, ID program. Working with Chris Long and the On-Farm Russet Trial results, the following are russet lines that were selected that show potential for Michigan: A95109-1, CO99053-3RUS, AOTX95265-4Ru, CO95172-3Rus, CORN#8, A0008-1TE, CO99100-1RUS, and A98289-1 (control varities were Freedom Russet, Silverton Russet, Goldrush, Canela Russet, and Russet Norkotah). A95109-1 has recently been released as Classic Russet.

F. Red-Skinned Varieties are included in Adaptation Tablestock Trial (Table 7)

Eleven red and purple lines were incorporated into the Adaptation Tablestock trial in 2008 (136 days). Six of the 11 were North Central Regional Trial entries: AND00272-1R, ATND98459-1RY, ND7132-1R, W5767-1R, Red Pontiac, and Red Norland. The results for the red-skinned lines are reported below.

G. Adaptation Trial (Tables 6 and 7)

The Adaptation Trial was divided into chip-processing and tablestock trials. The majority of the lines evaluated in the Adaptation Trial were tested in the Preliminary Trial the previous year. Three reference cultivars (Atlantic, Snowden and Pike), and 21 advanced breeding lines are reported in the chip-processing trial. The trial was harvested after 136 days and the results are summarized in **Table 6**. The out-of-the-field chip-processing scores were slightly darker (on average by 0.5 points) in this trial, but this demonstrated the chip quality of two MSU lines, MSP368-1 and MSR160-2Y. Specific gravity values were average to above average for the Montcalm Research Farm (Atlantic was 1.091 and Snowden was 1.088). Boulder was the highest yielding line (111 cwt/a greater than Atlantic). Multiple new breeding lines combine scab resistance and chip-processing: MSN148-A, MSP292-7, MSQ089-1, MSQ289-5, MSR041-3, and MSR169-8Y. MSR036-5 also combines late blight resistance, scab resistance, and chip-processing: MSR160-2Y also has resistance to late blight and PVY, and moderate scab resistance.

In the tablestock trial, Red Pontiac, Red Norland, Onaway, and Yukon Gold were the check varieties and 20 advanced breeding lines are summarized in the table. The trial was harvested after 136 days and the results are summarized in **Table 7**. In general, the yield was good in this trial and internal defects were low. Five of the 20 lines have late blight resistance (including Jacqueline Lee) and six lines have moderate to strong scab resistance. Seven of the 20 lines also had early maturity. MSN251-1Y, ND7132-1R, Red Pontiac, and MSQ461-2PP were the highest yielding lines. Promising lines with attractive type for the tablestock market and strong foliar late blight resistance include MSM182-1, MSN251-1Y, MSQ086-3, MSQ134-5, and Jacqueline Lee. MSM182-1 also has PVY resistance. It is exciting to see lines with combined traits for type, scab, late blight, and PVY resistance, and earlier maturity classes in more advanced selections in the breeding program.

H. Preliminary Trial (Tables 8 and 9)

The Preliminary trial is the first replicated trial for evaluating new advanced selections from the MSU potato breeding program. The division of the trials was based upon pedigree assessment for chip-processing and tablestock utilization. The chip-processing Preliminary Trial had 21 advanced selections and three check varieties (Atlantic, Snowden, and Pike). The chip-processing trial that is summarized in **Table 8** was harvested after 126 days. Most lines chip-processed well from the field. Specific gravity values and yields were average to above average for the trial. The highest yielding line was FL1879, followed closely by MSQ029-1, Atlantic, MSS303-02, MSS428-2, and MSQ089-1. Ten of the lines (48%) were also classified to be resistant or moderately resistant to scab ($\leq$ 1.5 in 2008). Six lines have demonstrated late blight resistance. Some of these lines combine chip quality with scab and late blight resistance/moderate resistance (MSQ035-3, MSQ130-4, MSR102-3, and MSS165-2Y).

Table 9 summarizes the 24 tablestock lines evaluated in the Preliminary Trial (Onaway was used the check variety). This tablestock trial was harvested and evaluated after 126 days. Eleven of the 24 lines were late blight resistant (46%), and eight were scab resistant or moderately resistant. MSS582-1SPL, MSS176-1, MSS737-1Y, MSS476-05SPL, and MSQ131-A were the highest yielding lines. MSS176-1 and MSQ131-A are round-white lines with strong late blight resistance and marketable maturities. MSS737-1Y is a yellow flesh line with moderate scab resistance and late blight resistance, and MSS411-3Y is another yellow with scab and late blight resistance. A few of the lines in this trial were considered for their unique color attributes for the specialty potato market: MSS582-1SPL, MSS476-05SPL, MSN111-4PP. The purple and red flesh-pigmented lines MSR226-1RR (Preliminary Chip Trial) and MSN11-4PP have also chipped out of the field.

I. Transgenic Trial (Table 10)

A field trial was conducted to continue to evaluate transgenic potato lines for agronomic performance. The results are summarized in **Table 10.** The trial this year (119 days) was used to evaluate a variety of different transgenic material. The trial is organized by parental clone and the trait of interest. The lines RB Spunta, SPA69.13, and E69.6 have the *RB* gene cloned from *S. bulbocastanum* which confers resistance to late blight. We have been using the RB Spunta line as a parent for transferring the 'native' late blight resistance gene to other varietal breeding material in the program. Four other lines express the *Bt-cry3A* gene which controls Colorado potato beetle (NO8.8, NO8.28 from Norwis; YG8.8 and YG8.12 from Yukon Gold; Atlantic Newleaf and Russet Burbank Newleaf were the control varieties). The majority of the lines were selections from two crosses to combine late blight resistance with the *Bt-cry1Ia1* gene (from SpuntaG2) for resistance to potato tuberworm (*Phthorimaea operculella*). There were six selections from the MSR605 family (SpuntaG2 x MSJ461-1) and two from the MSR606 family (SpuntaG2 x Jacqueline Lee). These selections had a range of performance for yield, specific gravity, and maturity. Three of the most promising lines are being put into tissue culture and going through virus eradication. An enhanced *Bt-cry1*, also for lepidopteran control, was evaluated in SP15.5 and SP15.8. Avidin-expressing lines have potential insecticidal activity against multiple insert orders, including Coleoptera (Colorado potato beetle) and Lepidoptera (potato tuberworm). The avidin lines were E75.7, E75.26, ND75.3, and ND75.6. The ND75.3 and ND75.6 combine avidin with natural host plant resistance for Colorado potato beetle. The ONAGP.1 and ONAGP.2 lines are transformed with the ADP-glucose pyrophosphorylase gene (AGPase) for increased starch content to increase specific gravity. To address the nutritional improvement of potatoes, two different proteins in the Vitamin E (α-tocopherol) pathway were expressed in SPHPPD.13, SPHPPD.15, and SPHPT.3.

J. Potato Scab Evaluation (Table 11)

Each year, a replicated field trial at the MSU Soils Farm (E. Lansing, MI) is conducted to assess resistance to common scab. We are using a scale of a 0-5 ranking based upon a combined score for scab coverage and lesion severity. Usually examining one year's data does not indicate which varieties are resistant but it should begin to identify ones that can be classified as susceptible to scab. Our goal is to evaluate important advanced selections and varieties in the study at least three years to obtain a valid estimate of the level of resistance in each line. **Table 11** categorizes many of the varieties and advanced selections tested in 2008 at the MSU Soils Farm Scab Nursery over a three-year period. The varieties and breeding lines are placed into six arbitrary categories based upon scab infection level and lesion severity. A rating of 0 indicates zero infection. A score of 1.0 indicates a trace amount of infection. A moderate resistance (1.2 – 1.8) correlates with <10% infection. Scores of 4.0 or greater are found on lines with >50% infection and severe pitted lesions.

The check varieties Russet Burbank, Russet Norkotah, Red Norland, NorValley, Yukon Gold, Red Pontiac, Pike, Atlantic and Snowden can be used as references (bolded in **Table 11**). In general, most russet lines were scab resistant. This year's results continue indicate that we have been able to breed numerous lines for the chip-processing and tablestock markets with resistance to scab. A total of 65 lines, of the 188 tested, had a scab rating of 1.4 (better than or equivalent to Pike) or lower in 2008. Most notable scab resistant MSU lines are MSA8254-2BRUS, MSH228-6, MSJ036-A, MSJ126-9Y, MSK061-4, MSK409-1, MSM171-A, MSM288-2Y, MSN073-2, MSN170-A, MSN238-A, and MSP516-A; as well as some earlier generation lines MSQ070-1, MSQ089-1, MSQ289-5, MSQ440-2, MSR036-5, MSR061-1, MSR102-3, and MSR161-2. The greater number of MSU lines in the resistant and moderately resistant categories indicates we are making progress in breeding more scab resistant lines for the chip-processing and tablestock markets. There are also an increasing number of scab resistant lines that also have late blight resistance and PVY resistance. We also continue to conduct early generation scab screening on selections in the breeding program beginning after one year. Of the 278 early generation selections that were evaluated, 109 were resistant (scab rating of ≤ 1.0). Scab results from the disease nursery are also found in the Trial Summaries (**Tables 2-10**).

K. Late Blight Trial (Table 12)

In 2008, the late blight trial was conducted at the Muck Soils Research Farm, Bath, MI. This year, 138 entries were planted for evaluation in replicated plots. The field was planted on June 5 and inoculated July 30 with a combination of isolates (see **Table 12**). Fourty-four of the 138 lines were highly resistant to late blight. The late blight resistance of the MSU lines is derived from Tollocan (a Mexican variety), B0718-3 (USDA clone), AWN96518-2 (USDA clone), Stirling (Scottish variety), Torridon (Scottish variety), NY121 (Cornell University clone), Jacqueline Lee (MSU variety), and the wild potato species *S. microdontum* and *S. berthaultii*. These resistant progeny indicate that we can continue to breed for resistance using this group of resistant clones. We find these late blight resistant lines valuable because many of them also have marketable maturity and some are more tolerant to scab as compared to the first generation of late blight resistant lines. Also, some of these lines have chip-processing quality. In addition to the replicated late blight variety trials, we continue to do larger scale evaluations in the block tests, early generation screening, and evaluation of transgenic lines and breeding lines with wild germplasm pedigrees. Out of the 166 lines with late blight resistant parents selected for the early generation evaluation, 79 were resistant to moderately resistant (data not shown). The MSU Muck Soils Research Farm continues to be an excellent site for evaluating foliar late blight resistance in inoculated field trials. Tuber late blight resistance is currently being evaluated on many of the selections with foliar late blight resistance.

L. Blackspot Bruise Susceptibility (Table 13)

Evaluations of advanced seedlings and new varieties for their susceptibility to blackspot bruising are also important in the variety evaluation program. Based upon the results collected over the past years, the non-bruised check sample has been removed from our bruise assessment. A composite bruise sample of each line in the trials consisted of 25 tubers (a composite of 4 replications) from each line, collected at the time of grading. The 25 tuber sample was held in 50°F (10°C) storage overnight and then was placed in a hexagon plywood drum and tumbled 10 times to provide a simulated bruise. The samples were peeled in an abrasive peeler in October and individual tubers were assessed for the number of blackspot bruises on each potato. These data are shown in **Table 13**. The bruise data are represented in two ways: percentage of bruise free potatoes and average number of bruises per tuber. A high percentage of bruise-free potatoes is the desired goal; however, the numbers of blackspot bruises per potato is also important. Cultivars which show blackspot incidence greater than Atlantic are approaching the bruise-susceptible rating. In addition, the data is grouped by trial, since the bruise levels can vary between trials. Conducting the simulated bruise on 50°F (10°C) tubers has helped to standardize the bruise testing. We are observing less variation between trials since we standardized the handling of the bruise sample.

In 2008, the bruise levels were comparable to previous years. The most bruise resistant MSU breeding lines this year from the advanced trials were MSM246-B, MSL268-D, MSN105-1, MSJ126-9Y, MSR061-1, MSK061-4, MSJ316-A, MSM171-A, MSP292-7, MSM037-3, MSL292-A, MSM288-2Y, MSQ086-3, and MSL228-1SPL. The most susceptible lines from the advanced trials were Atlantic, Snowden, MegaChip, W2133-1, MSN148-A, and MSQ070-1. Of the earlier generation breeding lines (Preliminary Trial), the most bruise resistant were MSQ130-4, MSQ029-1, MSS199-2, MSQ035-3, and MSQ131-A. The most bruise resistant russet entries were Russet Norkotah, W2253-5RUS, CO98067-7RUS, and CO99053-4RUS; the most susceptible were A00727-1, AC99375-1RUS, W2683-2RUS, and Canela Russet. The most bruise resistant entries in the US Potato Board/Snack Food Association Trial were NY138, CO95051-7W, and CO96141-4W. NY139, Snowden, and W2324-1were the most bruise susceptible in this trial.

Table 1

MICHIGAN STATE UNIVERSITY
POTATO BREEDING and GENETICS

DATE OF HARVEST TRIAL: EARLY HARVEST
MONTCALM RESEARCH FARM
May 8 to August 11, 2008 (96 days)

	CWT/A		PERCENT OF TOTAL[1]						CHIP	PERCENT (%) TUBER QUALITY[3]				3-YR AVG US#1
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	SCORE[2]	HH	VD	IBS	BC	CWT/A
Atlantic	**258**	**290**	**89**	**10**	**89**	**0**	**1**	**1.089**	**1.0**	**5**	**0**	**0**	**0**	**258**
FL1879	247	257	96	3	91	5	1	1.072	1.0	0	0	0	0	300
MSN105-1[LBMR]	241	279	86	12	86	0	2	1.076	1.0	0	0	0	0	240
MSL268-D[LBR-PVYR]	232	284	82	16	80	1	3	1.073	1.0	5	0	0	0	-
MSM070-1	213	241	89	9	85	4	2	1.070	1.0	3	0	0	0	-
MSM171-A[LBR]	191	203	94	3	73	21	3	1.059	1.0	8	0	0	3	261
Snowden	**189**	**229**	**83**	**17**	**82**	**1**	**0**	**1.079**	**1.0**	**0**	**0**	**0**	**0**	**229**
MSN170-A	188	210	89	9	89	0	1	1.079	1.0	0	0	0	0	-
Pike	**159**	**183**	**87**	**13**	**86**	**1**	**0**	**1.079**	**1.0**	**0**	**0**	**0**	**0**	**174**
MSM170-2	158	223	71	29	70	1	0	1.068	1.0	0	0	0	0	-
MSP459-5	153	200	76	23	76	0	1	1.081	1.0	0	0	0	0	-
MSM246-B	126	139	91	8	90	1	1	1.078	1.0	3	0	0	0	-
MEAN	196	228						1.075						* Two-Year Average
$LSD_{0.05}$	43	44						0.003						

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.

[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.

[2]CHIP SCORE: Snack Food Association Scale (Out of the field); Ratings: 1-5; 1: Excellent, 5: Poor.

[3]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 40 Oversize and/or A-size tubers cut.

Table 2

DATE OF HARVEST TRIAL: LATE HARVEST
MONTCALM RESEARCH FARM
May 8 to September 24, 2008 (140 days)

	CWT/A		PERCENT OF TOTAL[1]						CHIP	PERCENT (%) TUBER QUALITY[3]						3-YR AVG US#1
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	SCORE[2]	HH	VD	IBS	BC	SCAB[4]	MAT[5]	CWT/A
FL1879	425	445	96	3	70	26	1	1.080	1.5	23	18	0	0	2.5	3.0	378
Atlantic	**368**	**422**	**87**	**11**	**84**	**3**	**2**	**1.094**	**1.5**	**3**	**0**	**0**	**0**	**2.4**	**2.8**	**320**
Snowden	**359**	**414**	**87**	**11**	**83**	**3**	**3**	**1.088**	**1.5**	**0**	**43**	**0**	**0**	**2.6**	**4.0**	**325**
MSN105-1[LBMR]	348	431	81	15	74	7	4	1.082	1.5	0	10	0	0	1.9	2.8	293
MSL268-D[LBR,PVYR]	347	437	79	16	75	4	5	1.078	1.5	3	10	0	0	1.1	3.0	-
MSN170-A	323	366	88	10	86	2	1	1.083	1.5	3	0	0	0	1.0	2.3	-
MSM171-A[LBR]	308	343	90	4	53	37	6	1.062	-	28	5	0	0	1.7	2.5	299
Pike	**265**	**314**	**84**	**15**	**82**	**2**	**0**	**1.088**	**1.5**	**0**	**15**	**0**	**0**	**1.4**	**3.3**	**230**
MSP459-5[LBMR]	256	348	74	24	73	0	2	1.084	1.5	0	5	0	0	1.5	2.3	-
MSM246-B	236	262	90	9	79	11	1	1.085	1.5	3	10	0	0	2.5	3.3	-
MEAN	323	378						1.082							* Two-Year Average	
$LSD_{0.05}$	52	53						0.004						0.9	0.7	

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.

[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.

[2]CHIP SCORE: Snack Food Association Scale (Out of the field); Ratings: 1-5; 1: Excellent, 5: Poor.

[3]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 40 Oversize and/or A-size tubers cut.

[4]SCAB DISEASE RATING: MSU Scab Nursery; 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.

[5]MATURITY RATING: August 28, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).

ADVANCED TRIAL
MONTCALM RESEARCH FARM
May 8 to September 24, 2008 (140 days)

	CWT/A		PERCENT OF TOTAL[1]						CHIP	PERCENT (%) TUBER QUALITY[3]						3-YR AVG US#1
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	SCORE[2]	HH	VD	IBS	BC	SCAB[4]	MAT[5]	CWT/A
MegaChip	436	469	93	5	80	13	2	1.095	1.0	0	40	0	0	1.5	3.8	-
Kalkaska	433	489	89	11	82	6	1	1.084	1.0	8	8	0	3	1.1	3.3	375*
Beacon Chipper	426	445	96	4	74	22	0	1.085	1.0	0	7	0	0	1.0	2.8	347
FL1879	415	434	96	3	71	25	1	1.082	1.0	18	15	3	0	2.5	2.8	-
MSI005-20Y	411	455	90	8	83	7	1	1.079	1.0	0	10	3	0	2.2	3.3	-
MSQ176-5[LBR]	408	434	94	5	62	32	1	1.070	1.0	8	10	0	0	2.0	3.0	-
MSK061-4	364	405	90	7	78	12	3	1.088	1.0	0	60	3	0	1.0	3.5	266
Snowden	**360**	**415**	**87**	**13**	**83**	**3**	**1**	**1.088**	**1.0**	**15**	**33**	**0**	**3**	**2.6**	**3.8**	-
MSQ070-1[LBR]	344	411	84	16	82	2	0	1.095	1.0	0	13	20	0	1.0	4.3	-
FL2053	331	400	83	8	81	2	9	1.096	1.0	3	5	0	0	2.0	2.5	304
MSR061-1[LBMR,PVYR]	299	388	77	23	77	0	0	1.087	1.0	0	18	0	0	1.3	3.0	-
MSJ126-9Y	279	318	88	12	82	6	0	1.078	1.0	3	18	0	0	1.1	2.8	261
MSJ147-1	271	342	79	21	79	0	0	1.092	1.0	0	3	0	0	1.4	3.8	214
MSH228-6	267	295	91	9	87	4	1	1.085	1.0	8	18	0	0	1.0	3.8	272
MSN191-2Y	265	318	83	16	82	2	0	1.097	1.0	0	3	0	0	2.5	2.8	253*
MSK409-1	262	318	82	9	72	11	9	1.089	1.0	0	33	3	0	1.0	3.0	222
Pike	**255**	**305**	**84**	**16**	**82**	**2**	**0**	**1.087**	**1.0**	**0**	**30**	**0**	**0**	**1.4**	**3.5**	-
MSN238-A	230	335	69	31	67	2	0	1.084	1.0	0	18	0	0	2.1	3.3	-
MEAN	336	387						1.087							* Two-Year Average	
$LSD_{0.05}$	70	67						0.004						0.9	0.8	

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.

[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.

[2]CHIP SCORE: Snack Food Association Scale (Out of the field); Ratings: 1-5; 1: Excellent, 5: Poor.

[3]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 40 Oversize and/or A-size tubers cut.

[4]SCAB DISEASE RATING: MSU Scab Nursery; 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.

[5]MATURITY RATING: August 28, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).

Table 4

ROUND WHITE TRIAL (North Central Regional Entries)
MONTCALM RESEARCH FARM
May 8 to September 11, 2008 (127 days)

	CWT/A		PERCENT OF TOTAL[1]							PERCENT (%) TUBER QUALITY[3]						3-YR AVG US#1
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	CHIP SCORE[2]	HH	VD	IBS	BC	SCAB[4]	MAT[5]	CWT/A
MSM171-A[LBR]	336	362	93	6	78	15	1	1.067	-	0	8	0	0	1.7	2.0	-
Atlantic	**324**	**369**	**88**	**8**	**76**	**11**	**4**	**1.089**	**1.5**	**15**	**5**	**0**	**0**	**2.4**	**2.8**	**312**
MSI005-20Y	307	368	83	15	80	3	1	1.080	-	0	3	0	0	2.2	2.8	325
Snowden	**297**	**351**	**85**	**13**	**76**	**8**	**2**	**1.091**	**1.0**	**13**	**38**	**0**	**0**	**2.6**	**4.5**	**350**
Norvalley	**290**	**355**	**82**	**16**	**77**	**5**	**2**	**1.077**	**1.0**	**0**	**5**	**0**	**0**	**-**	**2.0**	**299**
MSJ461-1[LBR]	282	375	75	25	74	1	0	1.079	1.0	0	0	0	0	2.1	4.0	-
MSJ316-A	277	321	86	13	83	3	0	1.083	1.5	3	0	0	0	1.6	4.5	296
W2310-3	234	275	85	14	84	1	1	1.092	1.0	0	0	0	0	1.9	2.8	236
ND8307C-3	222	303	73	27	72	2	0	1.087	1.5	0	0	0	0	1.4	4.3	-
W2133-1	179	268	67	30	65	2	3	1.087	1.0	0	3	0	0	2.1	2.3	278
ND8304-2	121	187	65	35	65	0	0	1.073	1.0	0	3	0	0	3.6	1.5	-
MEAN	261	321						1.082								
$LSD_{0.05}$	82	82						0.003						0.9	0.8	

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.
All the lines in the Round White Trial in 2008 were North Central Regional Trial entries.
[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.
[2]CHIP SCORE: Snack Food Association Scale (Out of the field); Ratings: 1-5; 1: Excellent, 5: Poor.
[3]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 40 Oversize and/or A-size tubers cut.
[4]SCAB DISEASE RATING: MSU Scab Nursery; 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.
[5]MATURITY RATING: August 28, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).

Table 5

MICHIGAN STATE UNIVERSITY
POTATO BREEDING and GENETICS

RUSSET TRIAL (+NCR ENTRIES) 2008
MONTCALM RESEARCH FARM
May 8 to September 17, 2008 (133 days)

	CWT/A		PERCENT OF TOTAL[1]						PERCENT (%) TUBER QUALITY[2]						3-YR AVG US#1
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	HH	VD	IBS	BC	SCAB[3]	MAT[4]	CWT/A
A95109-1	469	508	92	5	65	27	2	1.079	13	58	0	0	1.0	3.8	329
MSA8254-2BRUS	442	522	85	10	62	23	5	1.079	40	3	0	0	1.0	4.0	-
W5716-1RUS	385	471	82	14	70	11	4	1.082	3	5	0	0	1.3	4.0	351*
Silverton Russet	382	412	93	7	68	25	1	1.073	0	3	0	0	0.8	3.3	-
AC99375-1RUS	369	523	70	18	61	9	11	1.092	40	13	3	0	1.0	4.0	-
CO99053-3RUS	351	408	86	9	53	34	5	1.080	25	8	0	0	1.5	3.5	-
W2683-2RUS[NCR]	344	464	74	19	66	8	7	1.079	20	0	0	0	0.8	4.0	294
W7012-1RUS	330	422	78	16	64	14	6	1.082	3	15	0	0	1.0	3.3	-
W5716-1RUS[NCR]	320	405	79	13	60	19	8	1.084	10	10	5	0	1.3	3.3	-
CO95172-3RUS	310	398	78	20	73	5	2	1.086	0	5	0	0	1.3	3.5	-
AOND95292-3RUS[NCR]	309	394	78	17	71	7	4	1.082	35	10	0	0	2.6	3.5	-
W3328-1RUS	304	398	76	17	66	10	7	1.074	0	8	0	0	1.2	3.0	-
Canela Russet	284	344	82	16	67	15	2	1.087	8	13	0	0	1.4	2.3	261
W3666-2RUS	277	375	74	23	64	10	3	1.076	0	25	0	0	1.3	2.5	-
CORN #3	268	361	74	24	71	3	2	1.076	15	10	0	0	2.0	3.0	278
W2253-5RUS	265	305	87	9	73	14	5	1.071	8	43	0	0	1.8	3.8	-
W8206-1RUS	258	315	82	13	62	20	5	1.079	0	40	0	0	1.5	3.3	-
CO99100-1RUS	254	310	82	13	72	10	5	1.072	0	15	0	0	1.3	1.3	-
CORN #8	226	304	74	23	67	7	3	1.073	13	13	0	0	2.1	2.0	203
CO99053-4RUS	225	326	69	24	64	5	7	1.073	0	10	0	0	1.4	2.3	-
AOTX95265-2ARu	212	303	70	28	61	9	2	1.072	15	8	0	0	2.3	2.2	-
A00727-1	210	322	65	33	62	3	2	1.082	0	13	0	0	2.4	2.8	-
AOTX95265-4Ru	206	325	63	30	57	6	6	1.070	10	10	0	0	2.3	2.0	-
AOTX95265-3Ru	201	323	62	30	55	8	8	1.070	18	10	0	0	2.0	2.3	-
AC96052-1RUS	192	294	65	35	65	0	0	1.080	0	13	0	0	1.3	3.3	-
A0008-1TE	191	293	65	30	63	2	5	1.073	0	13	0	0	-	1.0	-
Russet Burbank[NCR]	**190**	**351**	**54**	**15**	**48**	**6**	**31**	**1.081**	**15**	**3**	**0**	**0**	**1.3**	**3.0**	**209**
CO98067-7RUS	189	303	63	32	59	4	6	1.065	0	25	0	0	1.8	1.8	-
W6234-4RUS	186	286	65	28	54	11	7	1.079	5	13	0	0	2.5	2.8	-
Russet Norkotah[NCR]	**167**	**273**	**61**	**36**	**59**	**2**	**3**	**1.068**	**3**	**10**	**0**	**0**	**-**	**1.0**	**162**
CO98368-2RUS	163	282	58	37	55	3	5	1.076	0	3	0	0	2.0	1.0	-
A98298-1	141	231	61	30	57	4	9	1.068	0	28	0	0	1.0	2.0	-
W6968-2RUS	136	210	65	34	57	7	2	1.074	0	5	0	0	2.8	1.8	-
MEAN	265	356						1.077						* Two-Year Average	
$LSD_{0.05}$	64	67						0.004					0.9	0.7	

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.

[NCR] North Central Regional Entry

[1]SIZE: B: < 4 oz.; A: 4-10 oz.; OV: > 10 oz.; PO: Pickouts.

[2]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 40 Oversize and/or A-size tubers cut.

[3]SCAB DISEASE RATING: MSU Scab Nursery; 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.

[4]MATURITY RATING: August 28, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).

Table 6

ADAPTATION TRIAL, CHIP-PROCESSING LINES
MONTCALM RESEARCH FARM
May 8 to September 19, 2008 (136 days)

	CWT/A		PERCENT OF TOTAL[1]						CHIP	PERCENT (%) TUBER QUALITY[3]					
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	SCORE[2]	HH	VD	IBS	BC	SCAB[4]	MAT[5]
Boulder	467	476	98	2	38	60	0	1.080	2.0	5	0	0	0	1.6	3.5
MSQ432-2PP	464	490	95	4	68	27	2	1.075	2.5	0	0	0	0	1.5	3.5
MSQ089-1	441	503	88	12	81	6	1	1.080	1.5	0	3	3	0	1.4	3.8
MSM037-3	427	461	92	7	87	6	1	1.076	1.5	3	8	0	0	1.8	3.0
FL1879	381	401	95	4	77	18	1	1.080	1.5	10	3	0	0	2.5	2.8
NY139	364	395	92	8	89	3	0	1.086	1.5	0	3	0	0	1.5	2.8
Atlantic	**356**	**402**	**88**	**10**	**81**	**8**	**1**	**1.091**	**1.5**	**5**	**0**	**0**	**0**	**2.4**	**3.0**
Snowden	**343**	**377**	**91**	**9**	**84**	**7**	**0**	**1.088**	**1.5**	**3**	**35**	**0**	**0**	**2.6**	**3.5**
MSQ279-1	334	362	92	5	62	30	2	1.074	2.0	8	3	0	0	1.5	3.8
MSR036-5[LBR]	334	373	90	10	77	13	0	1.086	2.0	8	10	0	0	1.5	4.5
MSP368-1	333	361	92	8	80	12	0	1.091	1.0	0	3	5	0	-	3.3
MSN148-A	306	344	89	11	82	7	0	1.095	1.5	3	5	0	0	1.4	3.3
W2717-5	296	345	86	11	79	7	3	1.092	1.5	5	23	5	8	2.4	2.5
MSL292-A	291	339	86	14	83	3	1	1.084	1.5	0	0	0	0	2.8	2.8
Pike	**256**	**298**	**86**	**14**	**85**	**1**	**0**	**1.086**	**1.5**	**0**	**5**	**0**	**0**	**1.4**	**3.5**
CO95051-7W	255	293	87	12	87	0	1	1.090	1.5	0	3	0	0	1.3	4.0
MSQ289-5	242	275	88	8	79	9	4	1.091	1.5	0	5	0	0	1.0	2.5
MSQ558-2RR	223	314	71	29	71	0	0	1.076	1.5	0	0	0	0	1.6	1.0
MSQ492-2[LBR]	221	274	81	19	76	5	1	1.078	1.5	0	0	25	0	2.2	4.5
W4013-1	211	277	76	22	74	3	2	1.086	1.5	0	0	0	0	2.6	2.3
MSP292-7	197	261	76	24	75	1	0	1.087	1.5	0	0	0	0	1.3	2.0
MSR041-3	194	287	68	32	68	0	0	1.079	1.5	0	0	3	0	1.0	2.3
MSR160-2Y[LBR,PVYR]	171	360	48	52	47	0	0	1.094	1.0	0	5	0	0	1.8	2.8
MSR169-8Y	163	210	78	22	73	4	1	1.084	1.5	0	0	0	0	1.0	3.8
MEAN	303	353						1.085							
$LSD_{0.05}$	75	77						0.004						0.9	0.8

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.

[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.

[2]CHIP SCORE: Snack Food Association Scale (Out of the field); Ratings: 1-5; 1: Excellent, 5: Poor.

[3]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 40 Oversize and/or A-size tubers cut.

[4]SCAB DISEASE RATING: MSU Scab Nursery; 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.

[5]MATURITY RATING: August 28, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).

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Table 7

ADAPTATION TRIAL, TABLESTOCK LINES (+NCR ENTRIES)
MONTCALM RESEARCH FARM
May 8 to September 19, 2008 (136 days)

	CWT/A		PERCENT OF TOTAL[1]						PERCENT (%) TUBER QUALITY[2]					
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	HH	VD	IBS	BC	SCAB[3]	MAT[4]
MSN251-1Y[LBR]	470	529	89	11	80	9	1	1.086	48	0	3	0	1.8	3.7
ND7132-1R[NCR]	427	456	94	5	82	12	1	1.070	3	3	0	0	2.0	2.8
Red Pontiac[NCR]	**427**	**470**	**91**	**5**	**70**	**21**	**4**	**1.066**	**13**	**0**	**0**	**0**	**-**	**3.5**
MSQ461-2PP	414	428	97	3	91	6	0	1.084	0	0	0	3	1.5	3.0
MSL228-1SPL	381	409	93	4	82	11	3	1.084	0	8	0	0	1.6	2.8
AND00272-1R[NCR]	372	443	84	15	82	1	1	1.069	0	3	0	0	1.4	3.0
Eva[PVYR]	367	402	91	7	82	9	2	1.075	3	5	0	0	2.4	3.3
Reba	367	379	97	3	81	16	0	1.075	3	0	0	3	2.0	2.8
MSM182-1[LBR,PVYR]	364	410	89	11	84	5	0	1.075	5	10	3	0	2.1	3.0
W5767-1R[NCR]	362	392	92	6	72	20	2	1.077	8	0	3	3	1.7	3.0
MSQ086-3[LBR]	353	388	91	9	87	4	0	1.083	0	5	0	0	1.5	3.5
MSM288-2Y	339	415	82	15	79	3	3	1.077	0	0	0	0	2.9	2.8
MSR157-1Y	338	368	92	8	86	6	1	1.082	10	8	0	0	1.5	2.8
Red Norland[NCR]	**338**	**377**	**90**	**9**	**85**	**4**	**2**	**1.062**	**3**	**0**	**0**	**0**	**1.0**	**1.5**
ATND98459-1RY[NCR]	317	421	75	24	75	0	1	1.074	0	0	0	0	2.8	2.3
Onaway	**304**	**343**	**89**	**8**	**80**	**9**	**3**	**1.068**	**0**	**13**	**0**	**0**	**1.8**	**1.8**
Michigan Purple	304	340	89	6	69	20	5	1.072	0	0	0	0	1.8	1.3
MSQ134-5[LBR]	298	355	84	16	82	2	0	1.079	0	0	0	0	1.9	3.8
Jacqueline Lee[LBR]	293	504	58	41	57	1	1	1.087	0	8	0	0	3.3	2.3
CO98012-5R	270	390	69	30	69	0	0	1.071	0	0	0	0	2.1	2.5
Yukon Gold	**255**	**282**	**90**	**6**	**81**	**9**	**4**	**1.073**	**5**	**3**	**5**	**0**	**3.0**	**1.0**
Rio Colorado	233	322	72	27	72	0	1	1.069	0	0	0	0	2.8	1.3
MSQ425-4Y	228	296	77	23	76	0	0	1.072	0	0	0	0	1.9	1.5
MSN215-2P	174	239	73	25	71	2	2	1.075	0	0	0	0	1.0	1.0
MEAN	333	390						1.075						
$LSD_{0.05}$	69	69						0.004					0.9	0.9

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.

[NCR] North Central Regional Entry

[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.

[2]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 40 Oversize and/or A-size tubers cut.

[3]SCAB DISEASE RATING: MSU Scab Nursery; 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.

[4]MATURITY RATING: August 28, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).

Table 8

PRELIMINARY TRIAL, CHIP-PROCESSING LINES
MONTCALM RESEARCH FARM
May 8 to September 10, 2008 (126 days)

	CWT/A		PERCENT OF TOTAL[1]							PERCENT (%) TUBER QUALITY[3]					
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	CHIP SCORE[2]	HH	VD	IBS	BC	SCAB[4]	MAT[5]
FL1879	393	408	96	3	72	24	1	1.084	1.0	25	20	0	0	2.5	2.5
MSQ029-1[LBR]	363	393	92	7	77	16	1	1.087	1.5/2.0	40	0	0	0	2.0	5.0
Atlantic	**359**	**396**	**91**	**7**	**83**	**8**	**2**	**1.097**	**1.5**	**0**	**5**	**0**	**0**	**2.4**	**3.0**
MSS303-02	344	387	89	10	87	2	1	1.095	1.0	0	10	20	0	1.5	4.0
MSS428-2	329	373	88	11	81	7	1	1.085	1.0	20	15	0	0	1.7	3.0
MSQ089-1	305	358	85	11	74	11	4	1.076	1.5	0	0	0	0	1.9	3.0
Snowden	**300**	**342**	**88**	**10**	**83**	**5**	**3**	**1.090**	**1.0**	**0**	**20**	**0**	**0**	**2.6**	**3.0**
MSR161-2	299	334	90	9	87	3	2	1.090	1.0	0	0	0	0	1.0	3.0
MSS514-1PP	282	340	83	16	78	5	1	1.063	2.5	0	0	0	0	0.8	3.0
MSS026-2Y	277	305	91	9	76	14	1	1.098	1.0	0	5	5	0	2.2	3.0
MSS165-2Y[LBR]	266	356	75	24	74	1	1	1.089	1.0!	0	0	0	0	1.3	3.0
MSS927-1	266	308	86	12	79	7	2	1.080	1.0	0	0	0	0	2.0	2.0
MSR058-2	263	345	76	22	74	3	2	1.084	1.5	0	5	0	0	1.3	4.0
MSQ035-3[LBR]	263	307	86	13	82	3	1	1.078	1.0	5	0	0	0	1.5	4.0
MSR102-3[LBR]	252	285	89	10	73	16	1	1.089	1.5	5	0	0	0	1.1	5.0
MSS306-4Y	235	281	83	12	76	7	5	1.081	1.0	0	0	0	0	1.5	1.5
MSS108-1[LBR]	223	268	83	16	62	21	1	1.072	-	0	5	20	0	3.0	3.0
MSQ130-4[LBR]	210	236	89	11	80	8	0	1.079	1.0	0	0	0	0	1.5	3.0
MSS199-2	207	248	83	16	82	1	0	1.080	1.0	0	0	0	0	1.3	2.0
MSM060-3	204	273	75	24	75	0	1	1.099	1.5	0	10	0	0	1.5	2.0
MSR128-4Y	184	242	76	21	75	1	3	1.091	1.0	0	0	0	0	2.0	4.5
MSR226-1RR	181	279	65	32	64	1	3	1.073	1.0!	0	0	0	0	2.0	1.0
Pike	**181**	**212**	**85**	**15**	**83**	**2**	**0**	**1.087**	**1.0**	**0**	**0**	**0**	**0**	**1.4**	**2.5**
MSS915-1	114	233	49	51	49	0	0	1.072	1.5	0	0	0	0	2.5	2.0
MEAN	263	313						1.084							
$LSD_{0.05}$	62	58						0.008						0.9	1.0

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.

[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.

[2]CHIP SCORE: Snack Food Association Scale (Out of the field); Ratings: 1-5; 1: Excellent, 5: Poor.

[3]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 20 Oversize and/or A-size tubers cut.

[4]SCAB DISEASE RATING: MSU Scab Nursery; 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.

[5]MATURITY RATING: August 28, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).

Table 9

PRELIMINARY TRIAL, TABLESTOCK LINES
MONTCALM RESEARCH FARM
May 8 to September 10, 2008 (126 days)

	CWT/A		PERCENT OF TOTAL[1]						CHIP	PERCENT (%) TUBER QUALITY[3]					
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	SCORE[2]	HH	VD	IBS	BC	SCAB[4]	MAT[5]
MSS582-1SPL	387	414	94	3	61	33	3	1.072	-	5	0	0	0	2.4	4.0
MSS176-1[LBR]	377	390	97	2	72	24	1	1.085	2.0	25	0	20	0	1.0	4.0
MSS737-1Y[LBR]	344	400	86	10	78	8	4	1.078	1.5	0	0	0	0	1.7	3.5
MSS476-05SPL	313	345	91	8	87	4	1	1.076	1.5	0	0	0	0	2.0	3.0
MSQ131-A[LBR]	295	301	98	2	61	38	0	1.069	1.0	0	0	0	0	2.0	3.5
MSS483-1[LBR]	294	337	87	13	81	6	0	1.072	2.0	0	0	0	0	2.4	3.5
MSS097-3[LBR]	292	315	93	7	67	26	0	1.073	1.0	0	5	0	0	2.3	2.5
Onaway	**265**	**302**	**88**	**9**	**78**	**10**	**3**	**1.068**	**3.5**	**0**	**0**	**0**	**0**	**1.8**	**2.5**
Reba	262	274	96	4	85	11	0	1.077	1.0	0	0	0	0	2.0	2.5
MSS206-2[LBR]	250	270	92	2	72	20	5	1.071	2.0	0	10	0	0	1.8	4.0
MSS526-1	242	266	91	7	80	11	2	1.065	3.5	0	5	0	0	1.8	1.5
MSS737-5Y	234	259	90	9	81	10	1	1.070	1.5	0	0	0	0	2.0	3.0
MSR297-A	230	255	90	10	87	3	0	1.072	1.0	0	0	0	0	1.8	2.5
MSR176-4P	211	255	83	15	83	0	2	1.079	-	5	5	5	0	1.3	1.5
MSS917-3[LBR]	197	259	76	24	74	2	0	1.089	1.0	0	10	0	0	2.2	3.0
MSS411-3Y[LBR]	194	292	66	34	66	0	0	1.088	1.5	0	0	0	0	1.0	3.5
MSR159-02[LBR]	194	226	86	13	76	10	1	1.085	1.5	5	0	0	0	1.5	4.0
MSN111-4PP	194	253	77	22	76	1	2	1.073	1.0	0	0	0	0	2.9	3.0
MSS544-1R	173	259	67	33	67	0	0	1.067	-	0	0	0	0	1.0	1.0
MSS442-2[LBR]	167	191	87	9	81	6	4	1.072	1.5	0	0	5	0	3.0	1.5
MSS164-6[LBR]	154	209	74	25	74	0	1	1.086	2.5	0	0	0	0	1.0	2.5
MSR218-AR	154	203	76	12	68	8	12	1.064	1.5	0	0	0	0	1.0	1.0
MSR219-2R	133	149	89	11	65	25	0	1.058	-	0	5	0	0	2.3	1.0
ND7994-1RUS	115	202	57	35	57	0	8	1.078	-	0	0	0	0	0.3	2.5
MSR241-4RY	100	184	54	45	54	0	1	1.073	-	0	0	0	0	2.3	1.0
MEAN	231	272						1.074							
$LSD_{0.05}$	111	116						0.006						0.9	1.4

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.
[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.
[2]CHIP SCORE: Snack Food Association Scale (Out of the field); Ratings: 1-5; 1: Excellent, 5: Poor.
[3]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 20 Oversize and/or A-size tubers cut.
[4]SCAB DISEASE RATING: MSU Scab Nursery; 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.
[5]MATURITY RATING: August 28, 2008; Ratings 1-5; 1: Early (vines completely dead); 5: Late (vigorous vine, some flowering).

TRANSGENIC TRIAL
MONTCALM RESEARCH FARM
May 8 to September 3, 2008 (119 days)

	CWT/A		PERCENT OF TOTAL[1]						PERCENT (%) TUBER QUALITY[2]				Parental	
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	HH	VD	IBS	BC	Clone	Trait
E69.6	183	271	68	32	66	2	1	1.070	0	0	0	0	MSE149-5Y	RB-Late Blight
E75.26	155	234	66	34	66	0	0	1.076	0	0	0	0	MSE149-5Y	Avidin
E75.7	153	238	64	35	64	0	1	1.066	0	0	0	0	MSE149-5Y	Avidin
ND75.6	251	282	89	9	81	7	3	1.091	0	0	0	0	ND5873-15	Avidin
ND75.3	209	248	84	11	74	11	5	1.084	0	10	10	0	ND5873-15	Avidin
Norwis	**355**	**378**	**94**	**4**	**84**	**10**	**2**	**1.071**	**0**	**25**	**0**	**5**	**Norwis**	**N/A**
NO8.28	293	315	93	7	88	5	0	1.067	0	0	0	0	Norwis	Bt-cry3A
NO8.8	285	308	93	7	89	3	0	1.072	0	5	0	0	Norwis	Bt-cry3A
ONAGP.2	173	231	75	24	75	0	2	1.068	0	0	0	0	Onaway	AGPase
ONAGP.1	114	169	67	21	67	0	11	1.068	0	10	0	0	Onaway	AGPase
ATL Newleaf	197	234	84	16	82	2	0	1.087	0	0	0	0	Atlantic	Bt-cry3A
RB Newleaf	55	149	37	39	33	3	25	1.076	10	10	0	0	Russet Burbank	Bt-cry3A
Spunta	**338**	**410**	**83**	**6**	**62**	**21**	**11**	**1.060**	**5**	**3**	**0**	**5**	**Spunta**	**N/A**
SpuntaG2	327	373	88	6	72	16	6	1.062	5	23	3	5	Spunta	Bt-cry1Ia1
SP15.5	335	406	82	8	75	7	9	1.065	0	15	0	0	Spunta	Bt-cry1
SP15.8	250	322	78	13	66	12	10	1.063	15	5	0	0	Spunta	Bt-cry1
RB Spunta CSPAG.13	328	391	84	9	70	14	7	1.063	10	10	0	0	Spunta	RB-Late Blight
SPA69.13	262	316	83	13	71	12	4	1.065	0	10	0	0	Spunta	RB-Late Blight
SPHPPD.15	290	365	79	11	72	7	10	1.064	0	15	0	10	Spunta	Vit. E
SPHPPD.13	282	365	77	10	69	8	13	1.062	0	15	10	0	Spunta	Vit. E
SPHPT.3	280	352	79	12	72	8	8	1.060	0	5	0	0	Spunta	Vit. E
Yukon Gold	**218**	**242**	**90**	**5**	**75**	**15**	**5**	**1.068**	**5**	**5**	**0**	**0**	**Yukon Gold**	**N/A**
YG8.8	216	246	88	12	85	2	0	1.078	5	15	0	0	Yukon Gold	Bt-cry3A
YG8.12	186	226	82	17	81	1	0	1.077	0	10	0	0	Yukon Gold	Bt-cry3A
R605-8[LBR]	311	351	89	10	79	9	2	1.068	3	0	0	0		Bt-cry1Ia1
R605-17[LBR]	243	310	78	15	75	3	6	1.077	0	3	3	0		Bt-cry1Ia1
R606-7	242	323	75	19	72	3	6	1.072	0	8	0	0		Bt-cry1Ia1
R605-7[LBR]	235	260	90	10	80	10	0	1.072	5	0	33	0		Bt-cry1Ia1
R605-10	233	280	83	17	81	2	0	1.078	0	0	0	0		Bt-cry1Ia1
R605-2	217	305	71	15	70	1	14	1.063	0	0	0	3		Bt-cry1Ia1
R606-2[LBR]	201	263	76	23	74	3	1	1.063	3	0	0	3		Bt-cry1Ia1
R605-5	149	243	61	37	61	0	1	1.070	0	3	0	0		Bt-cry1Ia1

[1]SIZE: B: < 2 in.; A: 2-3.25 in.; OV: > 3.25 in.; PO: Pickouts.

[2]QUALITY: HH: Hollow Heart; BC: Brown Center; VD: Vascular Discoloration; IBS: Internal Brown Spot. Percent of 40 Oversize and/or A-size tubers cut.

Table 11

MICHIGAN STATE UNIVERSITY
POTATO BREEDING and GENETICS

2006-2008 SCAB DISEASE TRIAL SUMMARY
SCAB NURSERY, EAST LANSING, MI

LINE	*3-YR* AVG.	2008 RATING	2008 WORST	2008 N	2007 RATING	2007 WORST	2007 N	2006 RATING	2006 WORST	2006 N
Sorted by ascending 2008 Rating;										
MSA8254-2BRUS	***0.2***	0.0	0.0	3	0.5	1	4	0.0	0	4
MSS037-2	-	0.0	0.0	1	-	-	-	-	-	-
ND7994-1	-	0.3	1.0	3	-	-	-	-	-	-
W2683-2RUS[NCR]	***0.5***	0.8	1.0	8	0.5	1	8	0.3	1	4
MSS514-1PP	-	0.8	1.0	4	-	-	-	-	-	-
Silverton Russet	-	0.8	1.0	4	-	-	-	-	-	-
A95109-1	***1.1***	1.0	2.0	4	0.7	1	3	1.7	3	3
MSQ070-1[LBR]	***0.9****	1.0	1.0	4	0.8	1	4	-	-	-
W2609-1R	***0.9****	1.0	1.0	4	0.8	1	4	-	-	-
MSK061-4	***1.1***	1.0	1.0	4	1.0	1	4	1.3	2	3
MSQ289-5	***0.8***	1.0	1.5	4	1.0	1	4	0.5	1	4
MSR161-2	***1.0****	1.0	1.0	4	1.0	1	3	-	-	-
MSN170-A	***1.1****	1.0	1.0	4	1.3	2	4	-	-	-
MSH228-6	***1.3***	1.0	1.0	3	1.5	2	4	1.4	2	4
Red Norland[NCR]	***1.2***	**1.0**	**1.0**	**2**	**1.5**	**3**	**4**	**1.0**	**2**	**4**
Beacon Chipper	***1.5***	1.0	1.0	1	1.8	2	4	1.8	2	4
A98298-1	-	1.0	1.0	4	-	-	-	-	-	-
AC99375-1RUS	-	1.0	1.0	1	-	-	-	-	-	-
MSN215-2P	-	1.0	1.0	4	-	-	-	-	-	-
MSR041-3	-	1.0	1.0	4	-	-	-	-	-	-
MSR169-8Y	-	1.0	1.0	2	-	-	-	-	-	-
MSR218-AR	-	1.0	1.0	1	-	-	-	-	-	-
MSR226-ARR	-	1.0	1.0	2	-	-	-	-	-	-
MSS070-1	-	1.0	1.0	1	-	-	-	-	-	-
MSS113-1	-	1.0	1.0	1	-	-	-	-	-	-
MSS163-5	-	1.0	1.0	1	-	-	-	-	-	-
MSS164-6[LBR]	-	1.0	1.0	1	-	-	-	-	-	-
MSS176-1[LBR]	-	1.0	1.0	1	-	-	-	-	-	-
MSS377-10	-	1.0	1.0	1	-	-	-	-	-	-
MSS411-3Y[LBR]	-	1.0	1.0	1	-	-	-	-	-	-
MSS434-2	-	1.0	1.0	1	-	-	-	-	-	-
MSS544-1R	-	1.0	1.0	4	-	-	-	-	-	-
W3160-5LBRUS	-	1.0	1.0	4	-	-	-	-	-	-
W7012-1RUS	-	1.0	1.0	3	-	-	-	-	-	-
MSR102-3[LBR]	***0.8****	1.1	1.5	4	0.5	1	2	-	-	-
Kalkaska (MSJ036-A)	***1.0***	1.1	1.5	4	0.8	1	4	1.2	2	3
MSJ126-9Y	***1.3***	1.1	1.5	4	1.3	2	4	1.5	2	4
MSL268-D[LBR,PVYR]	***1.6***	1.1	1.5	4	1.5	2	4	2.3	3	4
W3952-3RUS	-	1.1	1.5	4	-	-	-	-	-	-
W3328-1RUS	***1.2***	1.2	1.5	3	1.0	2	4	1.5	2	4
MSQ440-2	***1.3***	1.3	2.0	4	1.0	1	4	1.8	2	4
MSR061-1[LBMR,PVYR]	***1.1****	1.3	2.0	4	1.0	1	4	-	-	-

MICHIGAN POTATOES
MICHIGAN POTATO INDUSTRY COMMISSION

Michigan Potato Industry Commission

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March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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QUESTIONS

If you have any further questions, comments or concerns, please contact the Michigan Potato Industry Commission directly.

Michigan Potato Industry Commission
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Suite # 7
DeWitt, MI 48820

(517) 669-8377

2006-2008 SCAB DISEASE TRIAL SUMMARY
SCAB NURSERY, EAST LANSING, MI

	*3-YR**	2008	2008	2008	2007	2007	2007	2006	2006	2006
LINE	*AVG.*	RATING	WORST	N	RATING	WORST	N	RATING	WORST	N
Sorted by ascending 2008 Rating;										
MSR127-2	***1.1****	1.3	1.5	4	1.0	1	3	-	-	-
Russet Burbank[NCR]	***1.5***	**1.3**	**2.0**	**4**	**1.0**	**1**	**4**	**2.3**	**2**	**4**
W5716-1RUS	***1.1****	1.3	2.0	12	1.0	2	4	-	-	-
CO95051-7W	***1.4***	1.3	1.5	4	1.5	2	4	1.4	2	4
CO95172-3RUS	-	1.3	2.0	4	-	-	-	-	-	-
CO99100-1RUS	-	1.3	3.0	4	-	-	-	-	-	-
FL1922	-	1.3	2.0	4	-	-	-	-	-	-
MSN109-6RR	-	1.3	2.0	4	-	-	-	-	-	-
MSR058-1	-	1.3	1.5	4	-	-	-	-	-	-
MSR176-4P	-	1.3	2.0	4	-	-	-	-	-	-
MSS145-4	-	1.3	1.5	2	-	-	-	-	-	-
MSS165-2Y[LBR]	-	1.3	2.0	4	-	-	-	-	-	-
MSS199-2	-	1.3	2.0	4	-	-	-	-	-	-
MSP292-7	***1.3***	1.3	1.5	5	1.0	1	4	1.7	2	3
AC96052-1RUS	-	1.3	2.0	3	-	-	-	-	-	-
W3666-2RUS	-	1.3	2.0	3	-	-	-	-	-	-
Canela Russet	***0.8****	1.4	2.0	4	0.3	1	4	-	-	-
MSJ147-1	***1.4***	1.4	2.0	4	1.0	1	4	1.8	2	4
AND00272-1R	-	1.4	2.5	4	-	-	-	-	-	-
CO99053-4RUS	-	1.4	2.0	4	-	-	-	-	-	-
MSN148-A	-	1.4	2.0	4	-	-	-	-	-	-
ND8307C-3	-	1.4	2.0	4	-	-	-	-	-	-
Pike	***1.4***	**1.4**	**2.0**	**15**	**1.4**	**2**	**8**	**1.4**	**2**	**7**
MSP459-5[LBMR]	***1.5***	1.5	2.0	4	1.0	1	4	2.0	2	4
MSR036-5[LBR]	***1.3****	1.5	2.0	3	1.0	1	3	-	-	-
MSQ461-2PP	***1.4****	1.5	2.0	4	1.3	2	4	-	-	-
MSR157-1Y	***1.4****	1.5	2.0	4	1.3	2	4	-	-	-
MSQ432-2PP	***1.4****	1.5	2.0	2	1.3	2	3	-	-	-
MSQ035-3[LBR]	***2.0***	1.5	2.0	3	1.5	2	2	3.0	3	2
MSQ130-4[LBR]	***1.5****	1.5	2.0	4	1.5	2	4	-	-	-
NY139	***1.5****	1.5	2.0	4	1.5	2	4	-	-	-
MSM060-3	***1.7***	1.5	2.0	4	1.8	2	4	1.8	2	3
MSQ279-1	***1.6****	1.5	2.0	4	1.8	3	4	-	-	-
MSQ086-3[LBR]	***1.5***	1.5	2.0	4	2.0	2	4	1.0	1	4
CO99053-3RUS	-	1.5	3.0	4	-	-	-	-	-	-
Megachip	-	1.5	2.0	4	-	-	-	-	-	-
MSR159-02[LBR]	-	1.5	2.0	3	-	-	-	-	-	-
MSS297-3	-	1.5	1.5	1	-	-	-	-	-	-
MSS303-02	-	1.5	1.5	1	-	-	-	-	-	-
MSS306-4Y	-	1.5	2.0	2	-	-	-	-	-	-
MSS419-8	-	1.5	2.0	2	-	-	-	-	-	-
W8206-1RUS	-	1.5	2.0	3	-	-	-	-	-	-
Boulder	***1.7***	1.6	2.0	4	1.8	2	4	1.6	2	4
MSJ316-A	***1.7***	1.6	2.0	8	1.9	3	8	1.6	2	4

2006-2008 SCAB DISEASE TRIAL SUMMARY
SCAB NURSERY, EAST LANSING, MI

LINE	*3-YR* AVG.*	2008 RATING	2008 WORST	2008 N	2007 RATING	2007 WORST	2007 N	2006 RATING	2006 WORST	2006 N
Sorted by ascending 2008 Rating;										
MSQ558-2RR	***1.8****	1.6	2.0	4	2.0	3	4	-	-	-
MSL228-1	-	1.6	2.0	4	-	-	-	-	-	-
MSS428-2	-	1.7	2.0	3	-	-	-	-	-	-
MSS737-1Y[LBR]	-	1.7	2.0	3	-	-	-	-	-	-
W5767-1R	-	1.7	2.0	3	-	-	-	-	-	-
MSM171-A[LBR]	***1.4***	1.7	2.5	8	1.3	2	4	1.3	2	4
Michigan Purple	***2.3***	1.8	2.5	4	2.3	3	4	2.8	3	4
CO98067-7RUS	-	1.8	3.0	4	-	-	-	-	-	-
MSM037-3	-	1.8	2.0	4	-	-	-	-	-	-
MSN251-1Y[LBR]	-	1.8	2.0	4	-	-	-	-	-	-
MSS206-2[LBR]	-	1.8	2.0	4	-	-	-	-	-	-
MSS526-1	-	1.8	3.0	4	-	-	-	-	-	-
Onaway	-	**1.8**	**2.0**	**7**	-	-	-	-	-	-
MSR160-2Y[LBR,PVYR]	***1.5****	1.8	2.5	3	1.3	2	4	-	-	-
MSR297-A	-	1.8	2.0	3	-	-	-	-	-	-
W2253-5RUS	-	1.8	2.5	6	-	-	-	-	-	-
MSQ089-1	***1.4****	1.9	2.0	7	1.0	1	3	-	-	-
MSQ134-5[LBR]	***1.7****	1.9	2.5	4	1.5	2	4	-	-	-
MSN105-1[LBMR]	***1.8***	1.9	2.5	4	2.0	3	4	1.5	2	2
W2310-3	***1.9***	1.9	3.0	8	2.0	3	4	1.8	3	4
MSQ425-4Y	***2.4****	1.9	2.0	4	3.0	3	1	-	-	-
MSK409-1	***1.3***	2.0	4.0	3	0.8	1	4	1.0	1	4
MSR128-4Y	***1.5****	2.0	2.5	4	1.0	1	3	-	-	-
MSN190-2	***1.6***	2.0	2.0	4	1.3	2	4	1.6	2	4
MSQ029-1[LBR]	***1.8***	2.0	2.0	4	1.3	2	3	2.0	2	1
CORN#3	***1.8****	2.0	2.0	4	1.5	2	4	-	-	-
MSM070-1	***1.8****	2.0	3.0	4	1.5	2	4	-	-	-
FL2053	***2.1***	2.0	2.5	4	1.8	2	4	2.5	3	4
Reba	***1.9****	2.0	2.5	8	1.8	2	4	-	-	-
MSQ176-5[LBR]	***2.2***	2.0	2.0	3	2.0	2	4	2.5	3	2
AOTX95265-3Ru	-	2.0	3.0	4	-	-	-	-	-	-
CO98368-2RUS	-	2.0	2.5	3	-	-	-	-	-	-
MSQ131-A[LBR]	-	2.0	2.0	4	-	-	-	-	-	-
MSR226-1RR	-	2.0	2.0	3	-	-	-	-	-	-
MSS042-1Y	-	2.0	2.0	1	-	-	-	-	-	-
MSS048-1	-	2.0	3.0	2	-	-	-	-	-	-
MSS258-1	-	2.0	2.0	1	-	-	-	-	-	-
MSS476-05SPL	-	2.0	3.0	4	-	-	-	-	-	-
MSS487-2	-	2.0	2.0	1	-	-	-	-	-	-
MSS547-2R	-	2.0	2.0	1	-	-	-	-	-	-
MSS737-5Y	-	2.0	2.0	2	-	-	-	-	-	-
MSS927-1	-	2.0	2.0	4	-	-	-	-	-	-
ND7132-1	-	2.0	3.0	2	-	-	-	-	-	-
MSJ461-1[LBR]	***1.9***	2.1	3.0	8	1.8	3	4	1.8	2	4

2006-2008 SCAB DISEASE TRIAL SUMMARY
SCAB NURSERY, EAST LANSING, MI

LINE	*3-YR* AVG.*	2008 RATING	2008 WORST	2008 N	2007 RATING	2007 WORST	2007 N	2006 RATING	2006 WORST	2006 N
Sorted by ascending 2008 Rating;										
W2133-1[NCR]	***1.9***	2.1	3.0	8	1.8	2	4	2.0	2	4
MSR041-5	***1.6****	2.1	2.5	4	1.0	1	2	-	-	-
MSN238-A	***1.6***	2.1	2.5	4	1.3	2	4	1.5	2	4
MSM182-1[LBR,PVYR]	***2.3***	2.1	2.5	4	2.0	3	4	2.7	3	3
CORN#8	***2.2****	2.1	3.0	4	2.3	3	4	-	-	-
CO98012-5R	-	2.1	3.0	4	-	-	-	-	-	-
MSQ492-2[LBR]	***1.8***	2.2	3.0	3	1.3	2	4	1.8	2	3
MSI005-20Y[NCR]	***2.2***	2.2	3.0	9	2.0	2	4	2.5	3	4
MSS026-2Y	-	2.2	2.5	3	-	-	-	-	-	-
MSS917-3[LBR]	-	2.2	2.5	3	-	-	-	-	-	-
AOTX95265-2ARu	-	2.3	2.5	4	-	-	-	-	-	-
AOTX95265-4Ru	-	2.3	3.0	4	-	-	-	-	-	-
MSR219-2R	-	2.3	3.0	4	-	-	-	-	-	-
MSR241-4RY	-	2.3	3.0	4	-	-	-	-	-	-
MSS203-1	-	2.3	2.5	2	-	-	-	-	-	-
MSR705-2	-	2.3	3.0	3	-	-	-	-	-	-
MSS097-3[LBR]	-	2.3	3.0	3	-	-	-	-	-	-
MSS582-1SPL	***2.2****	2.4	3.0	4	2.0	3	5	-	-	-
Atlantic	***2.5***	**2.4**	**3.0**	**12**	**2.4**	**3**	**16**	**2.8**	**3**	**16**
A00727-1	-	2.4	3.0	4	-	-	-	-	-	-
MSN032-A	-	2.4	3.0	4	-	-	-	-	-	-
MSS483-1[LBR]	-	2.4	3.0	4	-	-	-	-	-	-
W2717-5	-	2.4	3.0	4	-	-	-	-	-	-
Eva[PVYR]	-	2.4	3.0	10	-	-	-	-	-	-
FL1879	***2.4***	2.5	3.0	11	2.0	2	4	2.6	3	4
MSN191-2Y	***2.2***	2.5	3.0	4	1.5	2	4	2.5	3	4
MSM246-B	***2.4***	2.5	3.0	3	2.3	3	4	2.4	4	4
MSN135-A	-	2.5	3.0	4	-	-	-	-	-	-
MSS022-1	-	2.5	3.0	2	-	-	-	-	-	-
MSS350-5Y	-	2.5	2.5	1	-	-	-	-	-	-
MSS718-1	-	2.5	3.0	2	-	-	-	-	-	-
MSS913-1	-	2.5	3.5	2	-	-	-	-	-	-
W6234-4RUS	-	2.5	3.0	2	-	-	-	-	-	-
Snowden[NCR]	***2.7***	**2.6**	**3.0**	**16**	**2.6**	**3**	**18**	**2.8**	**3**	**16**
AOND95292-3RUS	-	2.6	3.0	4	-	-	-	-	-	-
MSN200-2	-	2.6	3.0	4	-	-	-	-	-	-
W3186-2	-	2.6	3.0	4	-	-	-	-	-	-
W4013-1	-	2.6	3.5	4	-	-	-	-	-	-
Rio Colorado	***2.1****	2.8	3.0	4	1.5	2	4	-	-	-
ATND98459-1RY	***2.4****	2.8	3.0	4	2.0	2	4	-	-	-
MSL292-A	***2.5***	2.8	3.0	4	2.3	3	4	2.5	3	4
MSS934-4	-	2.8	3.0	2	-	-	-	-	-	-
W6968-2RUS	-	2.8	4.0	4	-	-	-	-	-	-
MSM288-2Y	***2.1****	2.9	3.0	4	1.3	2	4	-	-	-

2006-2008 SCAB DISEASE TRIAL SUMMARY
SCAB NURSERY, EAST LANSING, MI

	*3-YR**	2008	2008	2008	2007	2007	2007	2006	2006	2006
LINE	*AVG.*	RATING	WORST	N	RATING	WORST	N	RATING	WORST	N
Sorted by ascending 2008 Rating;										
MSN111-4PP	-	2.9	3.5	4	-	-	-	-	-	-
W3743-5RUS	-	2.9	3.5	4	-	-	-	-	-	-
Yukon Gold	***2.9****	**3.0**	**3.0**	**1**	**2.8**	**3**	**4**	**-**	**-**	**-**
MSL082-A	-	3.0	4.0	4	-	-	-	-	-	-
MSM170-2	-	3.0	3.0	4	-	-	-	-	-	-
MSP335-1	-	3.0	3.0	4	-	-	-	-	-	-
MSR216-AP	-	3.0	3.0	1	-	-	-	-	-	-
MSS025-2	-	3.0	3.0	1	-	-	-	-	-	-
MSS108-1[LBR]	-	3.0	3.0	1	-	-	-	-	-	-
MSS442-2[LBR]	-	3.0	3.0	2	-	-	-	-	-	-
MSS517-2P	-	3.0	3.0	1	-	-	-	-	-	-
Jacqueline Lee[LBR]	***2.8****	3.3	4.0	4	2.3	3	4	-	-	-
MSS110-05	-	3.4	4.0	4	-	-	-	-	-	-
ND8304-2	***3.1****	3.6	5.0	4	2.5	3	4	-	-	-
Russet Norkotah[NCR]	***2.1****	**-**	**-**	**-**	**2.0**	**3**	**4**	**2.2**	**3**	**3**

SCAB DISEASE RATING: MSU Scab Nursery plot rating of 0-5; 0: No Infection; 1: Low Infection <5%, no pitted leisions; 3: Intermediate >20%, some pitted leisions (Susceptible, as commonly seen on Atlantic); 5: Highly Susceptible, >75% coverage and severe pitted leisions.

	2008	2007	2006
$LSD_{0.05}$ =	**0.9**	**0.9**	**0.9**

[LBR] Line(s) demonstrated foliar resistance to Late Blight (*Phytopthora infestans*) in inoculated field trials at the MSU Muck Soils Research Farm.

[NCR] North Central Regional Entry

N = Number of replications.

2008 LATE BLIGHT VARIETY TRIAL
MUCK SOILS RESEARCH FARM

LINE	RAUDPC[1] MEAN	Female	Male	LINE	RAUDPC[1] MEAN
Sorted by ascending RAUDPC value:					
Foliar Resistance Category (select lines):				***Foliar Susceptibility Category (select lines)[2]:***	
MSQ176-5	0.0	MSI152-A	MSJ461-1	**RussetBurbank**	**16.9**
Jacqueline Lee	**0.0**	**Tollocan**	**Chaleur**	**PremierRusset**	**17.2**
MSR102-3	0.0	W1773-7	MSJ461-1	**SilvertonRusset**	**17.3**
MSQ131-A	0.2	Boulder	MSJ461-1	CO95051-7W	19.1
MSL082-A	0.2	MSE221-1	J. Lee	MSQ089-1	19.3
MSQ134-5	0.2	MSG004-3	MSJ461-1	AC96052-1RUS	19.6
MSQ492-2	0.3	Pike	MSJ461-1	**Pike**	**20.2**
MSQ029-1	0.4	B0766-3	NY121	W2324-1	20.4
MSR159-02	0.4	MSL766-1	MSJ126-9Y	MSS917-3	20.7
W6360-1RUS	0.4			W5716-1RUS	20.7
MSL268-D	0.5	NY103	J. Lee	W2133-1	20.8
MSQ035-3	0.6	MSG227-2	MSJ461-1	ND7994-1RUS	20.9
MSQ070-1	0.6	MSK061-4	MSJ461-1	MSR297-A	21.0
AWN86514-2	0.6			W2310-3	21.4
B2424-82	0.7			MSL228-1SPL	21.5
AF2376-5	0.7			MSN191-2Y	21.5
MSQ086-3	0.9	Onaway	MSJ461-1	MSM246-B	21.7
B0718-3	1.2			MSM288-2Y	22.0
MSR041-5	1.3	Liberator (A091-1)	MSJ461-1	AOTX95265-2ARUS	22.3
A97066-42LB	1.4			**Atlantic**	**22.3**
MSM182-1	1.5	Stirling	NY121	NY139	23.0
MSJ461-1	**2.0**	**Tollocan**	**NY88**	**Snowden**	**23.3**
B2460-23	3.1			ND98459-1RY	23.8
AOND95249-1RUS	3.8			A0008-1TE	25.4
W5015-5	4.3			MSR219-2R	25.9
MSN251-1Y	4.7	Torridon	MSG227-2	CO96141-4W	25.9
MSR061-1	4.9	W1201	NY121	CO99053-4RUS	26.6
MSN105-1	5.0	MSG141-3	J. Lee	Michigan Purple	26.7
AF2574-1	5.6			RioColorado	27.2
B2430-4	5.9			MSS544-1R	28.3
B0692-4	6.0			FL2053	28.4
OR03029-2	7.5			CO99100-1RUS	28.7
W3160-5LBrus	7.6			W2609-1R	29.7
B2432-33	7.9			CO98368-2RUS	31.0
MSM171-A	8.3	Stirling	MSE221-1	**Onaway**	**44.4**
$LSD_{0.05}$	8.0				

[1] Ratings indicate the average plot RAUDPC (Relative Area Under the Disease Progress Curve).

[2] 138 potato varieties and advanced breeding lines were tested in all. For brevity purposes, only selected varieties and breeding lines are listed.

Phytopthora infestans isolates US-1 (Pi 95-3); US-6 (Pi 95-2); US-8 (Pi 02-007, Pi 06-01, Pi 06-02); US-10 (Pi Banam); US-11 (Pi 96-1); US-14 (Pi 98-1, Pi 99-2) were inoculated on 7/30/08.

Planted as a randomized complete block design consisting of 3 replications of 4 hill plots on 6/5/2008.

Table 13

MICHIGAN STATE UNIVERSITY
POTATO BREEDING and GENETICS

2008 BLACKSPOT BRUISE SUSCEPTIBILITY TEST
SIMULATED BRUISE SAMPLES*

ENTRY	NUMBER OF SPOTS PER TUBER 0	1	2	3	4	5+	PERCENT (%) BRUISE FREE	AVERAGE SPOTS/TUBER
DATE OF HARVEST: LATE HARVEST								
MSM246-B	18	5	2				72	0.4
MSL268-D	17	4	4				68	0.5
MSN105-1	16	6	3				64	0.5
MSM070-1	15	7	2	1			60	0.6
MSN170-A	16	4	3	1	1		64	0.7
MSM171-A	13	8	1	2	1		52	0.8
Pike	**11**	**8**	**4**	**2**			**44**	**0.9**
MSP459-5	7	9	5	3	1		28	1.3
FL1879	7	6	7	3	1	1	28	1.5
Atlantic	**6**	**7**	**4**	**4**	**2**	**2**	**24**	**1.8**
Snowden	**5**	**5**	**7**	**4**	**2**	**2**	**20**	**2.0**
ADVANCED TRIAL								
MSJ126-9Y	21	4					84	0.2
MSR061-1	16	8	1				64	0.4
MSK061-4	16	5	4				64	0.5
Pike	**15**	**7**	**1**	**1**	**1**		**60**	**0.6**
MSQ176-5	13	8	4				52	0.6
MSI005-20Y	11	12	1	1			44	0.7
MSJ147-1	13	8	3	0	1		52	0.7
MSN238-A	11	8	5	0	0	1	44	0.9
MSH228-6	10	9	3	3			40	1.0
MSN191-2Y	12	8	1	1	2	1	48	1.0
MSJ036-A	8	10	3	4			32	1.1
FL1879	7	10	5	2		1	28	1.2
MSK409-1	8	7	6	2	1	1	32	1.4
Beacon Chipper	9	5	6	3	1	1	36	1.4
MegaChip	5	7	9	3	1		20	1.5
MSQ070-1	5	8	5	2	5		20	1.8
Snowden	**4**	**4**	**7**	**8**	**2**		**16**	**2.0**
ROUND-WHITE TRIAL (+North Central Regional Entries)								
ND8304-2	21	2	1	1			84	0.3
MSJ316-A	19	4	2				76	0.3
ND8307C-3	17	5	3				68	0.4
MSM171-A	13	9	3				52	0.6

2008 BLACKSPOT BRUISE SUSCEPTIBILITY TEST
SIMULATED BRUISE SAMPLES*

ENTRY	NUMBER OF SPOTS PER TUBER 0	1	2	3	4	5+	PERCENT (%) BRUISE FREE	AVERAGE SPOTS/TUBER
Norvalley	**11**	**9**	**2**	**3**			**44**	**0.9**
MSJ461-1	9	10	4	2			36	1.0
Atlantic	**8**	**4**	**8**	**4**	**1**		**32**	**1.4**
W2310-3	6	7	7	4	1		24	1.5
MSI005-20Y	2	9	3	4	1		11	1.6
Snowden	**6**	**3**	**9**	**4**	**2**	**1**	**24**	**1.8**
W2133-1	1	4	10	7	2	1	4	2.3
RUSSET TRIAL								
Russet Norkotah[NCR]	**23**	**2**					**92**	**0.1**
W2253-5RUS	23	2					92	0.1
CO98067-7RUS	22	3					88	0.1
CO99053-4RUS	22	3					88	0.1
CO98368-2RUS	20	5					80	0.2
A0008-1TE	19	6					76	0.2
AOTX95265-4Ru	20	4	1				80	0.2
W7012-1RUS	19	6					76	0.2
AOTX95265-2ARu	19	5	1				76	0.3
AOTX95265-3Ru	18	7					72	0.3
CO99100-1RUS	19	5	1				76	0.3
CORN #8	15	9	1				60	0.4
CO99053-3RUS	13	10	2				52	0.6
A95109-1	14	8	2	0	1		56	0.6
CORN #3	14	6	4	1			56	0.7
AOND95292-3RUS[NCR]	10	10	5				40	0.8
W3666-2RUS	12	7	5	0	1		48	0.8
W6234-4RUS	15	4	2	3	1		60	0.8
Silverton Russet	13	5	4	2	1		52	0.9
A98298-1	15	5	1	1	0	3	60	1.0
W3328-1RUS	9	7	8	1			36	1.0
CO95172-3RUS	10	5	6	3	1		40	1.2
Russet Burbank[NCR]	**9**	**9**	**2**	**4**	**0**	**1**	**36**	**1.2**
W6968-2RUS	6	10	6	2	0	1	24	1.3
AC96052-1RUS	7	7	8	2	0	1	28	1.4
A8254-2BRUS	5	7	10	3			20	1.4
W5716-1RUS[NCR]	4	8	9	3	1		16	1.6
W8206-1RUS	8	4	6	4	2	1	32	1.6
W5716-1RUS	4	8	7	4	1	1	16	1.7

2008 BLACKSPOT BRUISE SUSCEPTIBILITY TEST
SIMULATED BRUISE SAMPLES*

ENTRY	NUMBER OF SPOTS PER TUBER 0	1	2	3	4	5+	PERCENT (%) BRUISE FREE	AVERAGE SPOTS/TUBER
Canela Russet	4	9	5	3	3	1	16	1.8
W2683-2RUS[NCR]	3	8	8	3	3		12	1.8
AC99375-1RUS	4	7	5	7	2		16	1.8
A00727-1	4	5	10	3	0	3	16	2.0
ADAPTATION TRIAL, CHIP-PROCESSING LINES								
MSP292-7	25	0					100	0.0
MSM037-3	24	1					96	0.0
MSQ432-2PP	21	4					84	0.2
MSL292-A	20	5					80	0.2
Pike	**19**	**5**	**1**				**76**	**0.3**
MSQ089-1	20	2	3				80	0.3
MSR169-8Y	17	7	1				68	0.4
MSQ492-2	16	8	1				64	0.4
FL1879	16	7	2				64	0.4
MSQ289-5	17	7	0	0	1		68	0.4
MSR041-3	14	9	2				56	0.5
MSQ279-1	16	5	3	1			64	0.6
Boulder	16	4	4	1			64	0.6
MSQ558-2RR	13	7	3	2			52	0.8
CO95051-7W	13	5	6	1			52	0.8
NY139	12	9	1	3			48	0.8
Atlantic	**12**	**6**	**4**	**3**			**48**	**0.9**
MSR160-2Y	10	10	2	3			40	0.9
W2717-5	15	5	2	0	1	2	60	0.9
W4013-1	7	7	9	2			28	1.2
Snowden	**8**	**8**	**2**	**6**	**1**		**32**	**1.4**
MSR036-5	8	7	5	2	3		32	1.4
MSP368-1	7	6	6	5	1		28	1.5
MSN148-A	6	2	8	5	3	1	24	2.0
ADAPTATION TRIAL, TABLESTOCK LINES								
AND00272-1R[NCR]	23	2					92	0.1
Red Norland[NCR]	23	2					92	0.1
Yukon Gold	**22**	**3**					**88**	**0.1**
MSM288-2Y	21	4					84	0.2
MSQ086-3	20	4	1				80	0.2
MSL228-1SPL	19	5	0	1			76	0.3

2008 BLACKSPOT BRUISE SUSCEPTIBILITY TEST
SIMULATED BRUISE SAMPLES*

	NUMBER OF SPOTS PER TUBER						PERCENT (%) BRUISE	AVERAGE
ENTRY	0	1	2	3	4	5+	FREE	SPOTS/TUBER
Red Pontiac[NCR]	18	6	1				72	0.3
Rio Colorado	18	5	2				72	0.4
CO98012-5R	17	5	3				68	0.4
MSN215-2P	16	7	2				64	0.4
Eva	16	6	3				64	0.5
MI Purple	14	10	0	1			56	0.5
Reba	15	7	3				60	0.5
ATND98459-1RY[NCR]	15	5	2	0	1		65	0.6
MSQ461-2PP	14	8	2	1			56	0.6
Onaway	**14**	**6**	**3**	**2**			**56**	**0.7**
MSM182-1	12	8	2	2	1		48	0.9
MSQ134-5	13	4	5	3			52	0.9
MSQ425-4Y	9	10	4	1	1		36	1.0
ND7132-1R[NCR]	12	4	3	5	1		48	1.2
MSR157-1Y	14	1	5	3	1	1	56	1.2
Jacqueline Lee	8	6	6	5			32	1.3
W5767-1R[NCR]	7	6	6	3	1	2	28	1.6
MSN251-1Y	4	4	7	4	4	2	16	2.2
PRELIMINARY TRIAL, CHIP-PROCESSING LINES								
MSQ130-4	21	4					84	0.2
MSQ029-1	20	4	1				80	0.2
MSS199-2	20	3	2				80	0.3
MSQ035-3	19	3	3				76	0.4
Pike	**16**	**7**	**2**				**64**	**0.4**
MSS306-4Y	16	5	4				64	0.5
MSQ089-1	15	5	4	1			60	0.6
MSR128-4Y	12	10	3				48	0.6
MSS915-1	16	4	3	2			64	0.6
MSS927-1	12	10	2	1			48	0.7
MSR102-3	11	7	6	1			44	0.9
MSS514-1PP	9	11	4	1			36	0.9
MSS303-02	8	10	3	4			32	1.1
MSM060-3	7	9	7	2			28	1.2
MSS108-1	9	7	5	4			36	1.2
MSS165-2Y	8	6	7	4			32	1.3
FL1879	8	5	7	4	1		32	1.4
MSR161-2	5	6	7	5	1	1	20	1.8

2008 BLACKSPOT BRUISE SUSCEPTIBILITY TEST
SIMULATED BRUISE SAMPLES*

ENTRY	NUMBER OF SPOTS PER TUBER 0	1	2	3	4	5+	PERCENT (%) BRUISE FREE	AVERAGE SPOTS/TUBER
MSS428-2	3	10	6	3	2	1	12	1.8
MSR226-1RR	2	11	3	6	3		8	1.9
MSR058-2	3	6	6	7	2	1	12	2.1
Atlantic	**2**	**2**	**7**	**5**	**8**	**1**	**8**	**2.7**
MSS026-2Y	2	5	4	4	6	4	8	2.8
Snowden	**1**	**5**	**5**	**3**	**10**	**1**	**4**	**2.8**
PRELIMINARY TRIAL, TABLESTOCK LINES								
MSQ131-A	23	2					92	0.1
MSS526-1	18	4	3				72	0.4
MSS582-1SPL	17	7	0	1			68	0.4
MSR297-A	17	4	4				68	0.5
MSS206-2	15	8	2				60	0.5
MSR159-02	15	8	1	1			60	0.5
MSS576-05SPL	15	7	3				60	0.5
MSN111-4PP	14	7	4				56	0.6
MSS544-1R	14	7	4				56	0.6
MSR219-2R	13	8	3	1			52	0.7
MSS442-2	12	10	2	1			48	0.7
Onaway	**10**	**10**	**3**				**43**	**0.7**
Reba	12	8	4	1			48	0.8
MSS483-1	13	5	6	1			52	0.8
MSR218-AR	8	14	2	1			32	0.8
MSS917-3	12	7	4	2			48	0.8
MSS097-3	9	12	2	1	1		36	0.9
MSR241-4RY	8	8	9				32	1.0
MSS164-6	11	8	3	1	1	1	44	1.0
MSS737-1	7	11	3	2	2		28	1.2
MSR176-4P	7	6	7	5			28	1.4
MSS411-3Y	4	7	7	6	1		16	1.7
MSS176-1	6	4	9	2	3	1	24	1.8
TRANSGENIC TRIAL								
ATL Newleaf	11	9	4	1			44	0.8
E69.6	20	2	2	1			80	0.4
E75.26	11	8	4	1	1		44	0.9
E75.7	22	3					88	0.1
ND75.3	9	5	4	5	1	1	36	1.5
ND75.6	4	9	6	2	2	2	16	1.8

2008 BLACKSPOT BRUISE SUSCEPTIBILITY TEST
SIMULATED BRUISE SAMPLES*

	NUMBER OF SPOTS PER TUBER						PERCENT (%) BRUISE FREE	AVERAGE SPOTS/TUBER
ENTRY	0	1	2	3	4	5+		
NO8.28	20	4	1				80	0.2
NO8.8	19	4	1	1			76	0.4
Norwis	10	10	3	1	1		40	0.9
ONAGP.1	6	1	7	8	3		24	2.0
ONAGP.2	0	6	8	7	3	2	0	2.5
R605-10	15	4	4	1	1		60	0.8
R605-2	22	3					88	0.1
R605-5	16	7	1	1			64	0.5
R605-7	19	5	1				76	0.3
R605-8	22	2	0	1			88	0.2
R606-2	16	5	4				64	0.5
R606-7	18	5	2				72	0.4
RB Spunta CSPAG.13	13	11	1				52	0.5
SPA69.13	20	4	1				80	0.2
SP15.5	20	5					80	0.2
SP15.8	23	2					92	0.1
SPHPPD.13	20	4	1				80	0.2
SPHPPD.15	22	2	0	1			88	0.2
SPHPT.3	25	0					100	0.0
Spunta	16	8	1				64	0.4
SpuntaG2	18	7					72	0.3
Yukon Gold	22	2	1				88	0.2
YG8.12	23	2					92	0.1
YG8.8	20	4	1				80	0.2
USPB/SFA TRIAL CHECK SAMPLES (Not bruised)								
CO96141-4W	25	0					100	0.0
NY138	24	1					96	0.0
ND7519-1	23	2					92	0.1
CO95051-7W	22	2	1				88	0.2
AF2291-10	21	3	1				84	0.2
CO97043-14W	21	3	1				84	0.2
W2717-5	19	4	1	1			76	0.4
CO97065-7W	19	3	2	1			76	0.4
MSJ147-1	17	4	3	1			68	0.5
W2310-1	16	5	3	1			64	0.6
Kalkaska (MSJ036-A)	15	6	4				60	0.6
Beacon Chipper	16	4	3	1	1		64	0.7
Atlantic	**12**	**9**	**4**				**48**	**0.7**

2008 BLACKSPOT BRUISE SUSCEPTIBILITY TEST
SIMULATED BRUISE SAMPLES*

ENTRY	NUMBER OF SPOTS PER TUBER 0	1	2	3	4	5+	PERCENT (%) BRUISE FREE	AVERAGE SPOTS/TUBER
Snowden	**13**	**7**	**4**	**1**			**52**	**0.7**
NY139	12	9	2	2			48	0.8
W2324-1	12	4	6	3			48	1.0
USPB/SFA TRIAL BRUISE SAMPLES								
NY138	24	1					96	0.0
CO95051-7W	21	3	1				84	0.2
CO96141-4W	20	4	1				80	0.2
CO97043-14W	17	5	3				68	0.4
ND7519-1	13	10	2				52	0.6
Atlantic	**13**	**7**	**4**	**0**	**0**	**1**	**52**	**0.8**
AF2291-10	13	7	1	3	1		52	0.9
W2717-5	12	7	2	4			48	0.9
CO97065-7W	14	2	3	4	1	1	56	1.2
MSJ147-1	9	6	7	1	2		36	1.2
Kalkaska (MSJ036-A)	9	8	4	2	1	1	36	1.2
W2310-1	8	7	2	3	4	1	32	1.6
Beacon Chipper	8	4	4	6	2	1	32	1.7
W2324-1	7	3	6	4	4	1	28	1.9
Snowden	**4**	**6**	**4**	**7**	**1**	**3**	**16**	**2.2**
NY139	3	3	4	7	3	5	12	2.8

* Twenty or twenty-five A-size tuber samples were collected at harvest, held at 50 F at least 12 hours, and placed in a six-side plywood drum and rotated ten times to produce simulated bruising. Samples were abrasive-peeled and scored 10/30/08. The table is presented in ascending order of average number of spots per tuber.

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2008 On-Farm Potato Variety Trials

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Introduction

On-farm potato variety trials were conducted with 14 growers in 2008 at a total of 21 locations. Nine of the locations evaluated processing entries and eleven evaluated fresh market entries. The processing cooperators were Crooks Farms, Inc. (Montcalm), Walther Farms, Inc. (St. Joseph), Lennard Ag. Co. (Monroe), County Line Potato Farms, Inc. (Allegan), Main Farms (Montcalm), Michigan State University, Montcalm Research Farm (Montcalm) and Krummrey and Sons (Ingham). The United States Potato Board/Snack Food Association (USPB / SFA) chip trial was at Sandyland Farms, LLC (Montcalm). Fresh market trial cooperators were Crawford Farms, Inc. (Montcalm), DuRussel's Potato Farms, Inc. (Washtenaw), Elmaple Farms (Kalkaska), R & E Farms (Presque Isle), Horkey Bros. (Monroe), TJJ VanDamme Farms (Delta), Lennard Ag. Co. (St. Joseph), Sandyland Farms, LLC. (Montcalm), Krummrey and Sons (Ingham) and Walther Farms, Inc. (St. Joseph and Sanilac).

Procedure

There were five types of processing trials conducted this year. The first type contained 15 entries which were compared with the check varieties Snowden, Pike and FL1879. This trial type was conducted at Main Farms, Lennard Ag. Co. and County Line Farms. Varieties in these trials were planted in 100' strip plots. Seed spacing was grower dependent, but in general ranged from 9.5 to 11 inches. The second type of processing trial, referred to as a "Select" trial, contained eight lines which were compared to the variety in the field. In these trials, each variety was planted in a 15' row plot. Seed spacing and row width were 10" and 34", respectively. These trials were conducted on Crooks Farms, Inc. The third processing trial format was conducted at Krummrey and Sons in Ingham County. Four varieties were commercially planted in single row plots 500 to 1000 feet long. One 23' yield dig was performed in each block at harvest. These varieties were planted at 8" spacings. The fourth type was a four replication processing variety trial conducted at Walther Farms, Inc. (St.Joseph) in which 11 test varieties were compared to the check varieties Snowden, FL1867, FL1879 and FL1833. The plots were 15' by 34" and the seed was planted at 10" in-row spacing. The fifth type was the Box Bin trial at the Montcalm Research Farm in Montcalm County, MI. This trial contained nine varieties compared against the check variety Snowden. All ten varieties were planted in 34" wide rows, 600' long with 10" in-row seed spacing. A single 23' yield check was taken to evaluate each clone.

The USPB / SFA trial was the 6th chip processing trial type. For procedural details on this trial, reference the 2008 annual report published by the United States Potato Board.

Within the fresh market trials, there were 67 entries evaluated. There were 8 to 28 lines planted at each of the following locations: Delta, Ingham, Kalkaska, Monroe, Montcalm, Presque Isle, St. Joseph, Sanilac and Washtenaw counties. The varieties in each trial ranged from mostly round white varieties to mostly russet varieties. These varieties were generally planted in 100' strip plots. A single 23' yield check was taken to evaluate each clone in these strip trials. Seed spacing varied from 8 to 12 inches depending upon grower production practices and variety. At Walther Farms, Inc (St. Joseph and Sanilac), replicated trials were evaluated. The plots were 15' long by 34" wide and seed spacing was 10" (Sanilac) and 12" (St. Joseph). Four replications were evaluated per trial. The last freshpack trial type was the Russet Select Trial. The select russet trials were planted at three locations (Elmaple Farm, Montcalm Research Farm and Walther Farms, St. Joseph). Each russet variety was planted in one three row plot, that was thirty feet long with 34" wide row and 11-12" in-row spacing. A yield determination was made on 23 feet of the center row. Each select trial varied in the number of varieties tested.

Results

A. Processing Variety Trial Results

A description of the processing varieties, their pedigree and scab ratings are listed in Table 1. The overall averages of the eight locations from Allegan, Ingham, Monroe, Montcalm and St. Joseph counties are shown in Table 2.

Processing Variety Highlights

W2324-1; this clone was developed at the University of Wisconsin and has excellent yield potential. In 2008, W2324-1 was the top yielding variety in those trials in which it appeared. It averaged over 600 cwt/A US#1 (Table 2). This variety was susceptible to common scab and had slight hollow heart in the oversize tubers (Table 2). In the 2008 USPB/SFA trial, this clone yielded 555 cwt/A US#1 (Table 3). The size profile was larger, on average, and the specific gravity was at or slightly above average. The tuber type was marginal and internal defects were higher than desired with nine of thirty tubers exhibiting hollow heart.

MSL292-A; is a Michigan State University developed variety. In 2008, MSL292-A had an above average yield at 436 cwt/A US#1 (Table 2). This variety had 94% marketable yield and a slightly below average specific gravity at 1.078. Raw internal tuber quality was good. A trace of pitted scab was noted. MSL292-A exhibited excellent chip quality out of the field and from storage in 2008 and early 2009.

NY139; this is a Cornell, New York developed clone. This variety continues to exhibit a strong yield and good size profile. In 2008, NY139 yielded 418 cwt/A US#1 over seven locations with a 92% marketable yield average (Table 2). The specific gravity of this clone was at the trial average of 1.082. A trace of hollow heart was noted in 90 tubers. Also, a slight amount of vascular discoloration was noted in each trial location. NY139 performed very well in the 2008 USPB/SFA trial. This clone yielded 521 cwt/A US#1 with a 96% marketable yield. The specific gravity was five points above the trial average at 1.082. Raw tuber internal quality was excellent. Vine maturity for this variety appears to be medium-late to late.

Kalkaska (MSJ036-A); this Michigan State University developed clone had an average yield of uniform round tubers (Table 2) and excellent resistance to common scab. Kalkaska has a three year average yield of 337 cwt/A US#1 with a slightly below average specific gravity (Table 2). Vine vigor was excellent with some resistance to early die noted. This variety exhibited a short term storage profile and can be stored until January. Kalkaska yielded 465 cwt/A US#1 in the 2008 USPB/SFA trial with a slightly above average specific gravity at 1.078. Internal raw tuber quality and tuber type were excellent.

B. <u>USPB / SFA Chip Trial Results</u>

The Michigan location of the USPB / SFA chip trial was on Sandyland Farms, LLC in Montcalm County in 2008. Table 3 shows the yield, size distribution and specific gravity of the entries when compared with Atlantic and Snowden. Table 4 shows the at harvest raw tuber quality results. Table 5 shows the out of the field chip quality evaluations from samples processed and scored by Herr Foods, Inc., Nottingham, PA and Table 6 provides the blackspot bruise susceptibility of each entry. Table 7 provides a pre-harvest panel for each of the 16 varieties in the trial. This table compares tuber specific gravity, percent glucose and sucrose ratings taken on August 20th, 2008 for each variety.

<u>USPB / SFA Chip Trial Highlights</u>

The varieties in the 2008 trial that displayed the greatest potential for commercialization were NY138, NY139 and Kalkaska (MSJ036-A). Yield potential and specific gravity were excellent for NY139 (Table 3). This clone appears to have a full season maturity and good chip quality. NY139 was the most susceptible variety to black spot bruise of the clones tested (Table 6). NY138 had an excellent yield, size profile and tuber type but the specific gravity was eleven points below average at 1.066 (Table 3). This is not acceptable for commercial chip processing. Kalkaska had a strong US#1 yield with an average specific gravity (Table 3). This variety posted the lowest out of the field chip quality of the varieties tested (Table 5). The pre-harvest panel data shows the vine immaturity of Kalkaska on August 20th, 2008 (Table 7). This was also the day of vine kill for the trial. Table 5 shows some of the other varieties that did not have the best yield performance, but had good chip quality, such as ND7519-1.

C. <u>Fresh Market and Variety Trial Results</u>

A description of the freshpack varieties, their pedigree and scab ratings are listed in Table 8. Table 9 shows the overall average of eleven locations: Delta, Ingham, Kalkaska, Monroe, Montcalm (2), Presque Isle, St. Joseph, Sanilac and Washtenaw counties.

Fresh Market Variety Highlights

One round white, one red skin and three russet lines are worthy of mention from the 2008 variety trials. They are MSM182-1 (the round white), CO98012-5R (the red variety) and the russets, CO99053-3Rus, CO99053-4Rus and Classic Russet (A95109-1).

MSM182-1; this is a new selection for the Michigan State University potato breeding program. This variety has strong PVY and foliar late blight resistance. In the 2008 freshpack variety trials this clone had a 430cwt/A US#1 yield with a 1.078 specific gravity. There were two hollow heart in 50 cut tubers and a trace of vascular discoloration observed. The skin type of this variety is bright and the tubers are very uniform in shape.

CO98012-5R; is a Colorado State selection with excellent red skin color and uniform round tuber type (Table 9). The yield of this clone is below average for the trial and slightly below the other red varieties tested, but its skin type and uniformity are notable. The variety had a very attractive smooth skin with a round tuber appearance. Internal quality was good and specific gravity averaged 1.076. The variety appears to have moderate common scab tolerance.

CO99053-3Rus; this russet variety is a Colorado State selection with excellent yield potential. In 2008, it yielded 523 cwt/A US#1 with 14 percent oversize. The average specific gravity for this variety was 1.086 which is ten points higher than the trial average (Table 9). The clone had 3 hollow heart in thirty cut tubers. The vine maturity appeared to be late. The tubers exhibited a uniform, medium russet skin. This russet may possibly be a dual purpose russet selection.

CO99053-4Rus; is another Colorado State selection with uniform tuber type and a medium russet skin. This variety had a 457 cwt/A US#1 yield with 12 percent oversize (Table 9). The specific gravity of this clone is much better suited for the table market at 1.073. The hollow heart is higher than desired at seven hollow in twenty cut tubers. CO99053-4Rus appears to have a medium early vine maturity and needs to be evaluated further as an early russet selection.

Classic Russet (A95109-1); was the most promising russet variety in 2008. This clone is a USDA Aberdeen, ID release. It was named in early 2009 as Classic Russet. Over the 8 trial locations where it was tested, A95109-1 yielded 455 cwt/A US#1 with 38 percent oversize. In-row spacing for this variety should be decreased to 9-10 inches. The average specific gravity for Classic Russet was 1.077 with 10 of 120 cut tubers exhibiting hollow heart. Vine maturity was medium-late with nice, uniform blocky tuber type. This variety exhibited strong common scab resistance.

2008 MSU Processing Potato Variety Trials

Entry	Pedigree	2008 Scab Rating*	Characteristics
Beacon Chipper (UEC)	Unknown	1.0	High yield, mid-season maturity, some heat stress, good internal quality, scab tolerance, medium low specific gravity
Kalkaska (MSJ036-A)	A7961-1 X Zarevo	1.1	Medium – high yield, mid-season maturity, nice round uniform tuber type, warm harvest recommended, medium high specific gravity
Pike (NYE55-35)	Allegany X Atlantic	1.4	Average yield, early to mid-season maturity, small size tuber profile, early storage check variety, some internal defects, medium specific gravity
Snowden (W855)	B5141-6 X Wischip	2.6	High yield, late maturity, late season storage check variety, reconditions well in storage, medium to high specific gravity
CO95051-7W	AC88456-6W X BC0894-2W	1.3	Low – average yield, medium to late maturity, high percent of US#1 tubers, low internal defects, medium specific gravity
FL1833	Atlantic X FL1207	-	High yield, medium-late maturity, medium specific gravity, light yellow flesh, warm harvest required, stores late into May or June, small set of large tubers. Susceptible to common scab, hollow heart and stem end discoloration. Thin skinned.
FL1867	FL162 x Atlantic	-	High yield, early maturity, medium-high specific gravity
FL1879	Snowden X FL1207	2.5	High yield, late maturity, large tuber type, late season storage, medium specific gravity, check variety
FL2053	FL1922 X FL1831	2.0	Average yield, mid-season maturity, round to oblong tuber type, good bruise tolerance, fresh or early season storage, highly susceptible to growth crack, medium-high specific gravity
MSH228-6	MSC127-3 OP	1.0	Average yield, mid-season maturity, blocky flat tuber type, shallow eyes, medium specific gravity
MSJ126-9Y	Penta OP	1.1	Medium – high yield, cold chipper from 45º F, uniform A-size tubers, attractive appearance, good internal quality, long term storage potential, low - medium specific gravity

*Scab rating based on 0-5 scale; 0 = most resistant and 5 = most susceptible.

Table 1 continued

Entry	Pedigree	2008 Scab Rating*	Characteristics
MSJ147-1	Norvalley X S440	1.4	Average yield, mid to late season maturity, good internal quality, very good chip quality late in storage, medium specific gravity
MSK061-4	MSC148-A X Dakota Pearl	1.0	Average yield, mid-season maturity, good chip quality, breaks dormancy easily, sprouts easily, medium specific gravity
MSK409-1	MSC148-A X Liberator	2.0	Medium to high yield, early to mid-season maturity, storage chipper, flat oval tuber type, medium specific gravity
MSL292-A	Snowden X MSH098-2	2.8	Above average yield, scab susceptible, early maturity, late blight susceptible, medium-high specific gravity
MSM246-B	MSE274-A X NY115	2.5	Medium specific gravity, scab susceptible, cold chipper
MSN191-2Y	MSI234-6Y X MSH098-2	2.5	Below average yield, early to mid-season maturity, small round uniform tuber type, medium – high specific gravity
NY 139 (Y28-9)	NY120 X NY115	1.5	High yield, mid-late season maturity, medium specific gravity
W2324-1	Snowden X S438	2.5	Very high yield, late maturity, uniform tuber type, strong vine vigor, medium to high specific gravity
W2717-5	S440 x ND2828-15	2.4	Round tuber type, medium yield, medium maturity, medium specific gravity, moderate scab susceptibility
W4013-1	W2504-9 X Norvalley	2.6	Light brown skin color, small size, medium maturity, round to oblong, scab susceptible, low/medium specific gravity

*Scab rating based on 0-5 scale; 0 = most resistant and 5 = most susceptible

Table 2

2008 Processing Potato Variety Trial
Overall Average - Eight Locations
Allegan, Ingham, Monroe, Montcalm, St. Joseph Counties

NUMBER OF		CWT/A		PERCENT OF TOTAL[1]						CHIP	TUBER QUALITY[2]				TOTAL		3-YR AVG US#1
LOCATIONS	LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	SCORE[3]	HH	VD	IBS	BC	CUT	COMMENTS	CWT/A
2	W2324-1 (10")	699	737	95	5	82	13	0	1.091	1.5	0	6	0	0	20	large, rough, not uniform type, sl pitted scab	586**
2	W2324-1 (7.5")	661	734	90	9	86	4	1	1.088	1.3	2	3	0	0	20	large, not uniform type, sl pitted scab	661*
2	FL1833	485	524	93	7	90	3	0	1.077	1.0	0	0	0	0	40	tr gc	485*
4	FL1879	469	486	96	3	84	12	1	1.076	1.5	2	6	0	0	60	large, blocky type, tr surface scab, tr rot, sl greening	435
3	Pike	441	465	95	5	85	10	0	1.081	1.2	3	1	8	0	30		344
5	MSL292-A	436	460	94	6	90	4	0	1.078	1.1	0	4	0	0	70	round blocky type, tr pitted scab, netted skin	436*
1	FL1867	427	449	95	5	95	0	0	1.080	N/A	0	0	0	0	30		427*
7	NY139	418	452	92	7	86	6	1	1.082	1.4	1	13	0	0	90	large, blocky type	418*
5	Snowden	403	441	92	7	89	3	1	1.079	1.3	0	14	1	0	70	heavy netting	396
6	Kalkaska	400	459	87	13	85	2	0	1.078	1.4	1	7	0	0	80	uniform round type	337
5	MSM246-B	378	401	95	4	81	14	1	1.079	1.5	0	6	0	4	70	pitted scab, blocky round type	378*

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Table 2 continued

NUMBER OF LOCATIONS	LINE	CWT/A US#1	CWT/A TOTAL	PERCENT OF TOTAL[1] US#1	Bs	As	OV	PO	SP GR	CHIP SCORE[3]	TUBER QUALITY[2] HH	VD	IBS	BC	TOTAL CUT	COMMENTS	3-YR AVG US#1 CWT/A
7	MSJ126-9Y	370	416	88	12	85	3	0	1.071	1.5	0	11	0	0	90	uniform round type, nice yellow flesh, tr netting	359**
1	Beacon Chipper	360	394	92	7	78	14	1	1.085	N/A	0	3	0	0	10	misshapen in pickouts	375
5	MSN191-2Y	359	392	91	9	90	1	0	1.084	2.0	0	0	0	1	70	buff, heavily netted skin, blocky to oval type	304**
7	MSK409-1	358	407	88	10	75	13	2	1.082	1.5	3	12	0	2	90	oval to round type, misshapen pickouts, tr gc	352**
6	CO95051-7W	325	374	86	14	86	0	0	1.084	1.2	0	5	0	3	80	small , uniform round type, sl rot	289**
5	MSH228-6	316	339	93	7	87	6	0	1.078	1.3	0	2	0	0	60	tr surface scab, very deep set, flat blocky type	363
4	MSJ147-1	316	384	83	16	80	3	1	1.084	1.0	0	3	0	0	60	small size, sl rotten	287
2	W2717-5	267	370	73	27	73	0	0	1.088	1.3	0	3	0	0	20		267*
2	W4013-1	195	325	53	45	53	0	2	1.085	1.0	1	0	0	0	20		195*
	MEAN	404	451	88					1.082								

tr = trace, sl = slight, N/A = not applicable

SED = stem end defect, gc = growth crack

[1]SIZE

Bs: < 1 7/8" or 2"

As: 1 7/8" - 3.25" or 2" - 4"

OV: > 3.25" or 4"

PO: Pickouts

[2]TUBER QUALITY (number of tubers per total cut)

HH: Hollow Heart

VD: Vascular Discoloration

IBS: Internal Brown Spot

BC: Brown Center

[3]CHIP COLOR SCORE - Snack Food Association Scale

(Out of the field)

Ratings: 1 - 5

1: Excellent

5: Poor

*One-Year Average

* *Two-Year Average

Table 3. Yield ,Size Distribution*, Specific Gravity									
	Yield (cwt/A)		**Percent Size Distribution**						
Entry	**US#1**	**TOTAL**	**US#1**	**Small**	**Mid-Size**	**Large**	**Culls**		**Specific Gravity**
Snowden	**569**	**598**	**95**	**4**	**85**	**10**	**1**		**1.081**
W2324-1	555	604	92	5	77	14	3		1.078
NY139	521	542	96	3	88	8	1		1.082
NY138	504	525	96	4	79	17	1		1.066
Kalkaska	465	512	91	9	90	1	0		1.078
Atlantic	**414**	**443**	**93**	**5**	**80**	**13**	**1**		**1.077**
CO96141-4W	410	449	91	5	86	5	4		1.061
W2310-3	401	432	93	6	91	2	2		1.080
AF2291-10	394	414	95	3	79	17	2		1.078
CO97043-14W	379	402	94	6	86	8	0		1.068
CO97065-7W	363	408	89	10	89	0	1		1.079
ND7519-1	350	381	92	7	90	2	1		1.079
Beacon Chipper	320	333	96	4	79	17	0		1.072
W2717-5	318	354	90	9	88	2	2		1.085
MSJ147-1	254	336	76	24	76	0	1		1.089
CO95051-7W	177	210	84	16	83	1	0		1.072
MEAN	400	434	91	7	84	7	1		1.077

*small <1 7/8"; mid-size 1 7/8"-3 1/4"; large >3 1/4"

Table 4. At Harvest Tuber Quality. Sandyland Farms, Howard City, Michigan.					
	Internal Defects[1]				
Entry	**HH**	**VD**	**IBS**	**BC**	**Total Cut**
Snowden	**1**	**1**	**0**	**0**	**30**
W2324-1	9	0	0	0	30
NY139	0	0	0	0	30
NY138	1	0	0	0	30
Kalkaska	0	2	0	4	30
Atlantic	**4**	**0**	**0**	**0**	**30**
CO96141-4W	0	1	0	1	30
W2310-3	0	0	0	0	30
AF2291-10	4	0	0	0	30
CO97043-14W	0	2	0	0	30
CO97065-7W	0	1	0	1	30
ND7519-1	0	2	1	0	30
Beacon Chipper	2	0	0	1	30
W2717-5	4	2	0	0	30
MSJ147-1	0	0	0	0	30
CO95051-7W	0	1	0	0	30

[1]Internal Defects. HH = hollow heart, VD = vascular discoloration, IBS = internal brown spot, BC = brown center.

MICHIGAN POTATOES
MICHIGAN POTATO INDUSTRY COMMISSION

Michigan Potato Industry Commission

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March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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HELP

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QUESTIONS

If you have any further questions, comments or concerns, please contact the Michigan Potato Industry Commission directly.

Michigan Potato Industry Commission
13109 Schavey Rd.
Suite # 7
DeWitt, MI 48820

(517) 669-8377

Table 5. 2008 Post-Harvest Chip Quality[1].						
	Agtron	SFA[2]	Specific	Percent Chip Defects[3]		
Entry	Color	Color	Gravity	Internal	External	Total
Snowden	**61.3**	**2**	**1.071**	**15.8**	**10.0**	**25.8**
W2324-1	60.7	3	1.075	16.7	6.6	23.3
NY139	62.2	3	1.073	29.4	2.3	31.7
NY138	69.0	1	1.069	6.5	1.4	7.9
Kalkaska	60.5	4	1.075	46.4	1.5	47.9
Atlantic	**64.9**	**3**	**1.074**	**30.4**	**4.2**	**34.6**
CO96141-4W	66.7	2	1.055	18.1	4.9	23.0
W2310-3	62.7	2	1.078	10.7	1.8	12.5
AF2291-10	64.4	1	1.075	17.6	10.4	28.0
CO97043-14W	65.2	2	1.068	4.4	9.0	13.4
CO97065-7W	64.4	3	1.081	16.2	4.7	20.9
ND7519-1	64.0	1	1.073	2.9	1.5	4.4
Beacon Chipper	64.7	3	1.076	13.5	11.3	24.8
W2717-5	63.1	2	1.084	10.5	6.5	17.0
MSJ147-1	62.4	2	1.084	9.0	1.5	10.5
CO95051-7W	63.4	3	1.073	15.9	4.0	19.9

[1] Samples collected at harvest October 1st and processed by Herr Foods Inc., Nottingham, PA on October 6, 2008 (5 days).

Chip defects are included in Agtron and SFA samples.

[2] SFA Color: 1 = lightest, 5 = darkest

[3] Percent Chip Defects are a percentage by weight of the total sample; comprised of undesirable color, greening, internal defects and external defects.

Table 6. Black spot Bruise Test																				
	A. Check Samples[1]									B. Simulated Bruise Samples[2]									
								Percent	Average									Percent	Average
	# of Bruises Per Tuber						Total	Bruise	Bruises Per	# of Bruises Per Tuber						Total	Bruise	Bruises Per
Entry	0	1	2	3	4	5	Tubers	Free	Tuber	0	1	2	3	4	5	Tubers	Free	Tuber
Snowden	**13**	**7**	**4**	**1**			**25**	**52**	**0.7**	**4**	**6**	**4**	**7**	**1**	**3**	**25**	**16**	**2.2**
W2324-1	12	4	6	3			25	48	1.0	7	3	6	4	4	1	25	28	1.9
NY139	12	9	2	2			25	48	0.8	3	3	4	7	3	5	25	12	2.8
NY138	24	1					25	96	0.0	24	1					25	96	0.0
Kalkaska	15	6	4				25	60	0.6	9	8	4	2	1	1	25	36	1.2
Atlantic	**12**	**9**	**4**				**25**	**48**	**0.7**	**13**	**7**	**4**	**0**	**0**	**1**	**25**	**52**	**0.8**
CO96141-4W	25						25	100	0.0	20	4	1				25	80	0.2
W2310-3	16	5	3	1			25	64	0.6	8	7	2	3	4	1	25	32	1.6
AF2291-10	21	3	1				25	84	0.2	13	7	1	3	1		25	52	0.9
CO97043-14W	21	3	1				25	84	0.2	17	5	3				25	68	0.4
CO97065-7W	19	3	2	1			25	76	0.4	14	2	3	4	1	1	25	56	1.2
ND7519-1	23	2					25	92	0.1	13	10	2				25	52	0.6
Beacon Chipper	16	4	3	1	1		25	64	0.7	8	4	4	6	2	1	25	32	1.7
W2717-5	19	4	1	1			25	76	0.4	12	7	2	4			25	48	0.9
MSJ147-1	17	4	3	1			25	68	0.5	9	6	7	1	2		25	36	1.2
CO95051-7W	22	2	1				25	88	0.2	21	3	1				25	84	0.2

[1]Tuber samples collected at harvest and held at room temperature for later abrasive peeling and scoring.

[2]Tuber samples collected at harvest, held at 50ºF for at least 12 hours, then placed in a 6 sided plywood drum and rotated 10 times to produce simulated bruising. They were then held at room temperature for later abrasive peeling and scoring.

Table 7. Pre-Harvest Panels, 08/20/08

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Number of Hills	Number of Stems	Average[5] Tuber Weight
Snowden	**1.081**	**0.002**	**0.398**	**70**	**90**	**4**	**11**	**12.04**
W2324-1	1.070	0.007	0.475	100	100	3	12	8.00
NY139	1.082	0.002	0.462	90	100	5	14	10.71
NY138	1.070	0.002	0.409	70	90	4	7	13.34
Kalkaska	1.067	0.003	1.103	75	100	3	9	5.64
Atlantic	**1.077**	**0.001**	**0.424**	**80**	**100**	**3**	**12**	**9.73**
CO96141-4W	1.061	0.000	0.198	30	90	4	12	9.22
W2310-3	1.071	0.005	0.241	80	100	4	20	6.43
AF2291-10	1.068	0.012	0.716	90	100	4	15	7.62
CO97043-14W	1.068	0.001	0.219	50	90	4	12	9.77
CO97065-7W	1.069	0.005	0.385	70	80	4	16	7.33
ND7519-1	1.080	0.001	0.673	90	100	4	17	8.12
Beacon Chipper	Not available							
W2717-5	1.082	0.006	0.968	75	100	3	16	7.84
MSJ147-1	1.069	0.002	0.421	90	100	5	16	5.18
CO95051-7W	1.072	0.001	0.344	30	95	5	16	3.89

[1] Percent Glucose is the percent of glucose by weight in a given amount of fresh tuber tissue.

[2] Sucrose Rating is the percent of sucrose by weight in a given amount of fresh tuber tissue X10.

[3] The Canopy Rating is a percent rating of green foliage (0 is all brown dead foliage, 100 is green vigorus foliage).

[4] The Canopy Uniformity is a percentage of how uniform the foliage health is at the date of observation.

[5] The Average Tuber Weight is the total tuber weight collected divided by the number of tubers reported in ounces.

Table 8

2008 MSU Tablestock Potato Variety Trials

Entry	Pedigree	2008 Scab Rating	Characteristics
Alegria	Divina x 3.169 010-86	-	Round to oval, yellow skin, medium yellow flesh
Arogos	143-27 (ex Solanum vernei) x Cara	-	Late maturity, very high yields in hot climates, buff skin, cream flesh, long oval white tubers, usually out yielding the variety Spunta, It has good PCN resistance both to Ro1 and (partially) Ps1/2, 3, PVY susceptible
Canela Russet (AC92009-4Rus)	A83043-12 x A8784-3	0.3	Average yield, oblong blocky russet, good storability, above average specific gravity
Chieftain (Iowa 57410)	La1354 x La1027-18	1.5	High yield, slightly oval – large tuber size, red waxy skin type, low internal defects
Corn #3	Russet Norkotah Line Selection	1.5	High yield, large tuber size, mid-season maturity, tubers are white flesh, long to slightly oblong, medium to heavy russetted skin, eyes are shallow, numerous and well distributed tuber set, medium specific gravity
Corn #8	Russet Norkotah Line Selection	2.3	Average yield, early to mid-season maturity, tubers are white flesh, long to slightly oblong, medium to heavy russetted skin, eyes are shallow, numerous and well distributed tuber set, medium specific gravity
Crispin	AMIGO x DHS 70-699-39	-	Oval to oblong, smooth white skin with light tan net, light yellow flesh, medium maturity, some tolerance to late blight, good storability
Dakota Crisp	Yankee Chipper x Norchip	-	Medium maturity, low sugar in storage
Dakota Diamond (ND5822C-7)	ND4103-2 x Dakota Pearl		High yield, medium to late maturity, high specific gravity
Dakota Jewel (ND3196-1R)	ND2223-8R x ND649-4R	1.0	Average yield, early tuber maturity, smooth round tubers, nice red color out of the field, white flesh, shallow apical eyes, stores well, low specific gravity, some brown center noted.
Dark Red Norland	Redkote x ND626	1.5	Smooth to round medium oblong, deep red almost burgundy skin, white flesh. Early to very early maturity for tablestock, medium to late maturity for processing, medium yield, low to very low specific gravity, resistant to leaf roll, net necrosis, growth cracks, hollow heart, early blight, scab, PVA, PVY, rhizoctonia. Susceptible to greening, water damage, silver scurf and late blight, stores well – short dormancy, color tends to fade in storage. Typically requires one week after vine kill for strong skin set

*Scab rating based on 0-5 scale; 0 = most resistant and 5 = most susceptible.

Table 8 continued

Entry	Pedigree	2008 Scab Rating	Characteristics
Eva (NY103)	Stuben x OP	3.0	Mid-season maturity, above average yield, round to oval appearance, resistant to PVX and PVY
Freedom Russet (W1836-3Rus)	ND 14-1 Rus X W 1005-Rus	0.0	High yield, long blocky tubers, medium-late vine maturity, highly resistant to verticillium wilt, resistant to most common scab
Gala	2.6 720-86 x 'Leyla'	-	Early Maturity, round to oval, uniform shape, yellow to dark yellow flesh, high PVY resistance, high yielding
Goldrush (ND1538-1Rus)	ND450-3Rus x Lemhi Russet	0.3	Long to oval tubers, heavy russet, check variety
Harmony	Nadine x Stamina	2.5	White skinned smooth oval tubers and waxy cream flesh. A good cropper. tolerant of common scab
Katahdin (USDA 42667)	USDA 40568 x USDA 24642	1.0	Mid-season maturity, high yielding check variety
Mazama (NDO2686-6R)	1196-2R x Redsen	1.0	Early maturity, low specific gravity, medium to large round smooth tuber, white flesh, medium yield, bright red skin does not fade in storage, less susceptible to PVY than Dark Red Norland and Red LaSoda, high percentage of small, high-value tubers, susceptible to most fungal diseases and corky ringspot
Modoc (NDO4300-1R)	1196-2R x 2225-1R	-	Round to oval, uniform purplish-red bright skin does not fade in storage, low specific gravity, early maturity, susceptible to most fungal diseases and late blight, total yields slightly lower than those of Dark Red Norland and Red LaSoda but with a more desirable size profile, with higher yields of small, high-value tubers
Molli	I-79.318/286 x I-76.20/5	-	Very early maturity, large oval tuber size, round yellow flesh, good storability, resistance to potato wart, PVY & PVA, susceptible to leaf roll virus, late blight, rhizoctonia and blackleg.
Onaway	USDA X96-56 x Katahdin	1.0	High yield, early maturity, round tuber type, low specific gravity, smooth skin, white flesh, eyes medium – deep, few internal defects, check variety
Puren	FA 3541-1 x PENOBSCOT	-	-
Reba (NY 87)	Monona x Allegany	1.8	High yield, bright tubers, low incidence of internal defects, mid to late season maturity, medium – low specific gravity

*Scab rating based on 0-5 scale; 0 = most resistant and 5 = most susceptible.

Table 8 continued

Entry	Pedigree	2008 Scab Rating	Characteristics
Rio Colorado (NDC5281-2R)	ND3196-1R x ND2224-5R	1.5	Medium to high yield, medium maturity, medium tuber size, nice red color, round to oval shape, medium to low specific gravity
Rio Rojo (NDTX4304-1R)	ND1562-4R x NDTX9-1098-11R	-	Round-oval Red. Early to medium maturity. Medium vine size. Dormancy is similar to Red LaSoda but longer than Dark Red Norland. High yield, nice exterior, hollow heart resistant, good color, very nice interior, attractive bright red color, can store well, can oversize, seems to set high in bed, feathering, can skin and exhibit variability in tuber color, feathering, deep nose, heat sprouts, and growth cracks
Romanze	Hansa x Desiree	-	Mid-season maturity, high yield, oval red skin, yellow flesh, high resistance to late blight, PVA, PVY and powdery scab, low resistance to leaf roll virus, medium specific gravity
Russet Norkotah (ND534-4Rus)	ND9526-4Rus X ND9687-5Rus	2.0	Average yield, mid-season maturity, long to oval tubers, heavy russet skin, check variety, low specific gravity
Sierra Gold (TX1523-1Ru/Y)	Krantz x Delta Gold	3.0	Medium size specialty cultivar with deep-yellow flesh color and an attractive russet skin, early maturity, scab susceptible,
Silverton Russet (AC83064-6)	A76147-2 x A 7875-5	0.0	High yield, oblong to long blocky tuber type, medium russet skin, masks PVY, medium specific gravity, possible Sencor & linuron susceptibility
Snowbird (RZ-95-6643)	Nikita x Innovator	-	Round, yellow skinned tuber with white flesh, Round tubers with bright white skin and white flesh. Large in size with a low incidence of internal defects. Tubers size early. Diseases Good resistance to common scab and late blight, but still needs a regular spray control plan. First results are showing good virus resistance. Medium specific gravity
Superior	B96-56 x M59.44	-	Medium yielding variety, self fertile, short dormancy period, stores well, medium specific gravity
Valor	Cara x *Ex Solanum Vernei*	-	Oval to round; large; smooth to netted light yellow skin; High yielding variety. Tubers are uniform with an attractive appearance; will set deep in the soil. Good resistance to bruising and damage. Good tolerance to drought and heat stress. Medium dormancy period. Good storability. Low to medium specific gravity, highly resistant to golden nematode, moderate resistance to leaf roll, powdery scab, common scab, blackleg and late blight, susceptible to PVY

*Scab rating based on 0-5 scale; 0 = most resistant and 5 = most susceptible.

Table 8 continued

Entry	Pedigree	2008 Scab Rating	Characteristics
Yukon Gold	Norgleam x W5279-4	2.8	Oval, slightly flattened; finely flaked yellowish white skin; shallow pink eyes; light yellow flesh.... Medium to high yielding variety of attractive appearance. Large tubers are slightly susceptible to hollow heart. Excellent storability; long dormancy period. High specific gravity, highly resistant to PVA, moderate resistance to leaf roll, susceptible to common scab & PVY
A0008-1TE	Blazer R X A95109-1	-	Medium yield, very nice long blocky type, white flesh, medium russet skin, early maturity, dual purpose, medium – low/medium specific gravity
A00727-1	PA95A11-14 X A92030-5	-	Very high early yields, light to medium russet, low incidence or internal and external defects, moderate resistance to corky ringspot
Classic Russet (A95109-1Rus)	Blazer Russet X Summit Russet	0.7	Below average yield, early maturity, attractive appearance, fresh market use, low - medium specific gravity
A98289-1	A9396-1 X Premier Russet	-	Yields similar to Russet Norkotah, but higher US No.1, heavily russeted, bright eyes
AC96052-1Rus	A81386-1 x A9014-2	-	Medium maturity, good fry potential, oblong to long, heavy russeting, low yield, small tuber size, medium specific gravity
AC99375-1Rus	AWN86514-2 x A89384-10	-	High yield, medium maturity, high specific gravity, oblong, dual purpose russet, large vine, blackspot resistant, late blight resistance
AOTX95265-2ARus	A89216-9 x A86102-6	-	High yield, medium – late maturity, large vine size, oversize are rough, susceptible to Rhizoctonia, blocky type
AOTX95265-3Rus	A89216-9 x A86102-6	-	Medium maturity, medium vine size, blocky, flat, pointed type
AOTX95265-4Rus	A89216-9 x A86102-6	-	High yield, mid-late maturity, oblong to long russetted tubers, generally nice appearance
ATTX961014-1R/Y	A90601-2RDY x Mazama	-	Medium red skin, yellow flesh, medium sized tapered, blocky tuber type, medium specific gravity, low internal defects
CO95086-8Rus	CO87009-4Rus x Silverton Russet	0.0	Good market yield, medium maturity, resistant to black spot bruise, little internal defects, good size profile, medium yield potential, dual purpose russet, medium specific gravity, good processing from storage
CO95172-3Rus	Russet Nugget x AC88165-3Rus	-	Medium maturity, high yield potential, few external defects, resistant to hollow heart, good appearance, excellent internals, medium to high specific gravity.

*Scab rating based on 0-5 scale; 0 = most resistant and 5 = most susceptible.

Table 8 continued

Entry	Pedigree	2008 Scab Rating	Characteristics
CO98012-5R	A79543—4R x AC91844-2	-	Good appearance, small size, low specific gravity, possible Sencor & linuron susceptibility
CO98067-7Rus	Silverton Russet x TC1675-1	-	High yield, medium maturity, medium sized vine, medium specific gravity, long russet, dual purpose, blackspot resistant
CO98368-2Rus	Russet Nugget x Bannock Russet	-	Medium high yield, medium early maturity, medium sized vine, medium specific gravity, oblong russet, dual purpose, blackspot resistant
CO99053-3Rus	AC91014-2 x Silverton Russet	-	High yield, medium late maturity, large vine, medium specific gravity, long russet, dual purpose, blackspot resistant
CO99053-4Rus	AC91014-2 x Silverton Russet	-	Medium yield, early maturity, medium sized vine, medium specific gravity, long russet, dual purpose, blackspot resistant
CO99100-1Rus	AC93047-1 x Silverton Russet	-	Medium high yield, very early-early maturity, small-medium sized vine, medium specific gravity, oblong russet, dual purpose, blackspot resistant
MSI005-20Y	MSA097-1Y X Penta	2.0	High yielding, early to mid-season maturity, low internal defects, strong yellow flesh color
MSL268-D	NY103 X Jacqueline Lee	1.5	Medium yield, late blight resistance, round to oval tuber type
MSM171-A	Stirling X MSE221-1	1.3	High yield, late maturity, smooth shape, large round tuber type, superior skin type, late blight resistant, low specific gravity
MSM182-1	Stirling x NY121	1.8	PVY & late blight resistance, low specific gravity
MSN105-1	MSG141-3 X Jacqueline Lee	2.0	Average yield, early maturity, large heavy set tuber type, bright skin, medium specific gravity, moderate late blight resistance
MSN215-2P	Michigan Purple x Norland	1.0	Heavy purple skin, smooth shape
ND4659-5R	NorDonna x ND2842-3R	0.5	Medium yield, bright red skin, round to oblong and smooth with white flesh, medium maturity, medium specific gravity, low incidence of powdery scab and silver scurf
ND5002-3R	ND3504-3R x NorDonna	0.3	Medium yield, medium late maturity, bright red skin, very white flesh, round to oblong, block tuber, low internal defects, low specific gravity, scab tolerant, susceptible to PVY and silver scurf, sensitivity to metribuzin applications
W2253-5Rus	-	-	Low specific gravity
W3328-1Rus	W1099Rus x AC88064-6Ru3	1.0	High yield, medium to late maturity, oblong to long blocky tuber type, dark brown heavy russet skin, medium low specific gravity

*Scab rating based on 0-5 scale; 0 = most resistant and 5 = most susceptible.

Table 8 continued

Entry	Pedigree	2008 Scab Rating	Characteristics
W3666-2Rus	A8390-3Rus x W1151Rus	-	Medium yield, medium to high specific gravity, high percentage of US No. 1
W5716-1Rus	-	1.0	High yield, medium specific gravity
W6234-1Rus	-	-	-
W6968-2Rus	-	-	-
W7012-1Rus	-	-	-
W8206-1Rus	-	-	-

*Scab rating based on 0-5 scale; 0 = most resistant and 5 = most susceptible.

Table 9

2008 Freshpack Potato Variety Trial
Overall Averages - Eleven Locations
Delta, Ingham, Kalkaska, Monroe, Montcalm, Presque Isle, St. Joseph, Sanilac & Washtenaw Counties

NUMBER OF		CWT/A		PERCENT OF TOTAL[1]						TUBER QUALITY[2]				TOTAL	VINE		3-YR AVG US#1
LOCATIONS	LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	HH	VD	IBS	BC	CUT	MAT[3]	COMMENTS	CWT/A
1	AOTX95265-4Rus	595	707	84	15	77	7	1	1.079	0	2	0	0	10	1.5	misshapen in pickouts, dark russet, alligator hide, tr surface scab	485*
2	CO99053-3Rus	523	605	86	11	72	14	3	1.086	3	3	0	0	20	4.3	misshapen, pear shape, medium russeting, 1 alligator hide	523*
5	Corn#3	459	541	84	10	53	31	6	1.077	36	6	0	0	80	4.3	knobs, misshapen, high percent of oversize, tr pitted scab	456**
2	CO99053-4Rus	457	582	79	21	67	12	0	1.073	7	2	1	0	20	2.5		457*
8	Classic Russet (A95109-1)	455	512	89	5	51	38	6	1.077	10	16	0	1	120	3.8	large percent of OV, nice uniform blocky tuber type, misshapen in pickouts	330
2	Superior	454	536	84	14	79	5	2	1.076	0	2	0	1	20	4.0	misshapen pickouts, tr pitted scab, tr rot	454*
1	A98289-1Rus	454	571	80	17	61	19	3	1.070	0	0	0	0	10	3.0	misshapen	454*
2	GoldRush	447	582	76	14	59	17	10	1.073	4	4	0	0	60	2.3	dark heavy russet, misshapen pickouts	331**
2	A0008-1TERus	437	549	79	13	57	22	8	1.074	12	0	0	0	20	2.5	misshapen pickouts, gc, dark russet, 1 alligator hide, sticky stolon	437*
2	W3666-2Rus	432	545	79	17	61	18	4	1.078	2	1	0	0	20	3.0	heavy russet skin,	432*
5	MSM182-1	430	487	88	9	84	4	3	1.078	2	4	1	0	50	3.5	uniform round type, high percentage of As	430*
1	W6968-2Rus	413	522	80	14	56	24	6	1.066	4	0	0	0	10	4.0	tr. gc, tr. pitted scab, knobs & misshapen pickouts, greening	413*
2	AC99375-1Rus	400	554	71	25	66	5	4	1.098	7	0	0	0	20	4.5	gc, misshapen, buff russet, not uniform type	400*
1	Dakota Diamond	400	445	90	10	72	18	0	1.066	2	0	0	0	10	0.0	sticky stolon, uniform round, buff skin, tr pitted scab	400*
2	MSI005-20Y	395	443	87	11	80	7	2	1.069	0	2	0	0	50	4.0	tr gc, round to oval, netted skin, tr pitted scab	468

Table 9 continued

NUMBER OF LOCATIONS	LINE	CWT/A US#1	CWT/A TOTAL	PERCENT OF TOTAL[1] US#1	Bs	As	OV	PO	SP GR	TUBER QUALITY[2] HH	VD	IBS	BC	TOTAL CUT	VINE MAT[3]	COMMENTS	3-YR AVG US#1 CWT/A
6	Reba	391	414	94	5	78	16	1	1.077	5	2	0	0	60	2.7	nice uniform type, large	413
2	W2253-5Rus	389	445	88	10	69	19	2	1.076	2	0	0	0	20	3.5	misshapen and severe alligator hide	389*
7	Silverton Russet	385	450	85	14	68	17	1	1.073	13	3	0	1	100	3.7	pythium in a few tubers, some pear shape and alligator hide	343**
1	Snowbird	376	420	90	10	90	0	0	N/A	0	0	0	0	40	4.0	uniform size and shape	376*
1	W8206-1Rus	376	513	73	11	46	27	16	1.080	0	0	0	0	10	4.0	gc in pickouts	376*
2	Kathadin	375	408	92	7	82	10	1	1.069	1	3	0	1	20	2.0	tr pitted & surface scab, sl buff skin	409
2	CO98368-2Rus	374	524	71	25	68	3	4	1.075	0	2	0	0	20	2.0	misshapen, thin tuber	374*
1	Chieftain	371	403	92	8	91	1	0	N/A	1	0	0	0	30	3.0	tr gc	394**
6	CO95172-3Rus	366	459	79	14	64	15	7	1.081	0	3	0	0	90	4.2	gc, knobs, points, dark russet, heavy netting, alligator hide	290**
2	CO99100-1Rus	363	442	82	17	70	12	1	1.073	5	0	0	0	20	2.0	misshapen, buff, light russet	363*
1	Dakota Crisp	362	412	88	9	65	23	3	1.071	6	0	0	2	10	0.0	pink eye, gc and misshapen in pickouts	362*
2	A00727-1Rus	359	503	71	24	61	10	5	1.081	0	0	0	0	20	2.5	nice light netting, curved tuber, light russet, many oval tubers	359*
8	Freeedom Russet	357	440	80	13	66	14	7	1.078	13	3	3	0	110	4.3	eyebrows, round type, misshapen in pickouts,	386**
2	Onaway	356	416	84	13	73	11	3	1.064	0	4	0	0	20	N/A		388
1	ATTX961014-1RY	353	405	87	13	86	1	0	N/A	0	0	0	0	30	3.0	nice yellow flesh	353*
6	W5716-1Rus	353	452	79	17	67	12	4	1.083	2	5	0	0	90	3.2	pitted scab,	353*
1	Yukon Gold	350	378	93	6	83	10	1	N/A	5	1	0	0	40	5.0	gc and misshapen in pickouts	350*
1	AOTX95265-3Rus	349	506	69	24	58	11	7	1.078	0	2	1	0	10	1.0	dark russet, alligator hide, misshapen in pickouts, tr surface scab	349*

Table 9 continued

NUMBER OF LOCATIONS	LINE	CWT/A US#1	CWT/A TOTAL	PERCENT OF TOTAL[1] US#1	Bs	As	OV	PO	SP GR	TUBER QUALITY[2] HH	VD	IBS	BC	TOTAL CUT	VINE MAT[3]	COMMENTS	3-YR AVG US#1 CWT/A
6	Russet Norkotah	346	464	74	20	58	16	6	1.070	7	7	1	1	90	2.2	tr scab, gc in pickouts, misshapen	262
7	Canela Russet	343	402	84	12	54	30	4	1.083	8	10	0	0	100	4.3	misshapen in pickouts, skinning, sl pear shape, tr alligator hide	339**
7	Corn#8	342	433	78	16	56	22	6	1.072	9	7	0	0	100	3.0	misshapen, tr scab, high percent of oversize	341**
5	MSL268-D	341	400	82	15	77	5	3	1.086	1	11	0	0	50	4.0	misshapen and knobs in pickouts, alligator hide, heavy netting	361**
1	Dark Red Norland	340	374	91	9	90	1	0	N/A	2	0	0	0	40	3.0		340*
2	CO95086-8Rus	340	427	78	20	65	13	2	1.086	7	5	0	0	50	4.0	dark russet, heavy netting	297
1	Harmony	337	393	85	12	83	2	3	N/A	6	0	0	0	40	4.0	gc, significant soft rot	337*
6	W3328-1Rus	335	448	75	17	57	18	8	1.075	15	8	0	0	90	4.0	alligator hide, gc	328
1	Arogos	329	348	94	5	92	2	1	N/A	0	0	0	0	30	5.0	tr misshapen in pickouts	329*
1	W6234-1Rus	328	416	79	15	55	24	6	1.075	3	0	0	0	10	3.0	light netting	328*
5	Rio Colorado	313	368	84	13	82	2	3	1.071	0	5	0	0	80	2.8	gc in pickouts, uniform size and shape, tr pitted scab	365**
1	Rio Rojo	308	338	91	8	81	10	1	N/A	0	3	0	0	40	3.0		308*
1	Gala	306	371	82	18	82	0	0	N/A	0	0	0	0	40	3.0	tr pear shape, scab tolerant, bright, small size	306*
1	Dakota Jewel	301	342	88	8	86	2	4	N/A	7	0	0	0	40	4.0	misshapen in pickouts, gc in pickouts	264**
6	MSN105-1	299	366	81	18	78	3	1	1.083	0	2	1	0	90	3.3	misshapen in pickouts, small, bright,	328
1	Sierra Gold	298	330	91	9	87	4	0	N/A	0	0	0	1	40	3.0		298*
1	AOTX95265-2ARus	293	451	65	33	62	3	2	1.083	0	2	0	0	10	1.0	misshapen, tr. alligator hide	293*

Table 9 continued

NUMBER OF LOCATIONS	LINE	CWT/A US#1	CWT/A TOTAL	PERCENT OF TOTAL[1] US#1	Bs	As	OV	PO	SP GR	TUBER QUALITY[2] HH	VD	IBS	BC	TOTAL CUT	VINE MAT[3]	COMMENTS	3-YR AVG US#1 CWT/A
7	MSM171-A	287	319	90	6	62	28	4	1.068	13	3	2	2	100	3.3	knobs & misshapen in pickouts, gc, tr surface & pitted scab	344
2	Mazama	280	375	68	29	54	14	3	1.077	0	0	0	0	50	3.0		280*
1	Crispin	279	330	85	15	85	0	0	N/A	0	0	0	0	30	4.0	nice yellow flesh	279*
5	CO98012-5R	279	349	72	26	65	7	2	1.076	1	4	0	0	70	3.3	gc, nice type, small, tr scab	279*
1	W7012-1Rus	278	533	52	26	39	13	22	1.081	0	0	0	0	10	3.0	gc	278*
8	AC96052-1Rus	272	385	71	28	64	7	1	1.082	2	8	0	0	110	3.7	gc , dark russeting, small size, misshapen	215**
3	Eva	270	302	90	10	84	6	0	1.069	2	1	0	0	60	4.0	tr pink rot, tr lenticel rot, tr pitted scab	270*
2	CO98067-7Rus	262	422	63	32	60	3	5	1.067	1	2	0	0	20	1.5	curved tubers, misshapen	262*
2	Molli	262	311	83	12	81	2	5	1.061	1	2	0	0	50	3.5	gc and misshapen in pickout, tr pitted scab, small netting	262*
1	Puren	247	284	87	11	87	0	2	N/A	0	0	0	0	40	4.0	tr knobs in pickouts	247*
1	Valor	246	278	88	11	86	2	1	N/A	0	0	0	0	40	5.0	misshapen in pickouts	246*
1	ND4659-5R	224	266	84	15	84	0	1	N/A	0	0	0	0	40	5.0	small size	224*
1	Modoc	223	259	86	13	85	1	1	N/A	0	0	0	0	40	5.0	gc, misshapen in pickouts	223*
1	Alegria	215	293	73	19	73	0	8	N/A	0	0	0	0	30	4.0	knobs in pickouts, tr gc	215*
1	Romanza	183	237	77	22	77	0	1	N/A	0	0	0	0	40	5.0		183*
1	ND5002-3R	120	147	82	16	82	0	2	N/A	0	0	0	0	40	5.0		120*
1	MSN215-2P	85	109	77	20	75	2	3	N/A	0	0	0	0	40	3.0	significant gc and misshapen in pickouts	182**
	MEAN	341	418	82					1.076							tr = trace, sl = slight, N/A = not applicable	
																SED = stem end defect, gc = growth crack	

[1]SIZE

Bs: < 1 7/8" or < 4 oz.

As: 1 7/8" - 3.25" or 4 - 10 oz.

OV: > 3.25" or > 10 oz.

PO: Pickouts

[2]TUBER QUALITY (number of tubers per total cut)

HH: Hollow Heart

VD: Vascular Discoloration

IBS: Internal Brown Spot

BC: Brown Center

[3]MATURITY RATING

Date Taken: N/A

Ratings: 1 - 5

1: Early (vines completely dead)

5: Late (vigorous vine, some flowering)

*One-Year Average

* *Two-Year Average

Funding: 1,4-Sight Group

Effect of 1,4-Seed® as an Effective Sprout Suppressant Product on FL1922 Seed Potatoes in Michigan

Chris Long

Introduction:

This is a brief summary of the 2008 field trial conducted at the Michigan State University Montcalm Research Farm in conjunction with Sackett Ranch, Montcalm Co., MI. In this trial, 1,4-Seed® was applied to whole seed of the chip processing varieties FL1922. The objective was to slow dormancy break, giving the grower greater flexibility in planting timing and control of seed quality. The 1,4-Seed® was applied 30 days prior to the optimum planting date of this variety (May 27th). A second planting date was included as a "worst case scenario" (June 10th). The seed used in the second planting date was treated with 1,4-Seed® (April 28th), the same day as the first planting date. This experiment began in early March 2008 with the collection of the tuber samples prior to sprout development and concluded in late September 2008 after harvest. Five, 130 pound tuber samples were collected on March 11th 2008. One sample was returned to the commercial seed pile as the pile sample or control. Two additional samples were placed, one each, in two untreated sample barrels and two more samples, one each, in two treatment barrels. The treatment barrels were exposed to 1,4-Seed® Dimethylnatheline (DMN) at a rate of 1 ml of DMN per 100 lbs. of potatoes. A treatment protocol from the 1,4 Group was followed to properly treat the seed potatoes. One week after the treatment was applied the DMN residue was measured and found to be adequate to induce a dormancy response. The bag samples remained inside the barrels and the barrels were returned to 44.4 ºF storage until the time of seed cutting. The whole seed tubers required for the first planting were removed from cold storage 7 days before planting (May 20th). The seed tubers were allowed to warm to room temperature and then were cut for planting into 2.5 oz. seed pieces and allowed to suberize before planting on May 27th. This protocol was repeated before the June 10th planting as well. All treatments were replicated three times in three row, 40' long plots. Rows were on 34" centers with 9.5" in row spacing between seed pieces. Harvest data was taken from 23' of the center row of each plot. Stand count and average number of stems per plant was assessed for each 40' plot on both planting dates. A sprout index and sprout index by sprout length was assessed for the June 10th planting only.

Results:

Three results were found to be statistically significant when SAS was used to establish an analysis of variance (ANOVA) for this study. 1. The planting date influenced "B" size tuber number. 2. When the planting date was not used as a factor, treatment did influence

"B" size tuber number. 3. Treatment influenced the number of stems per plant. All other results, as well as the global ANOVA, were not significant.

Observational results are as follows: The DMN treatment for the first planting date appeared to reduce US#1 and total yield (Table 1). Tuber specific gravity was not altered on either planting date as a result of the treatment. The observed number of "B" size tubers was much higher in the treated sample than in the untreated or pile sample. There also appeared to be a slight reduction in the number of "A" size tubers in the treated sample compared to the untreated or pile sample. The observed effect of the treatment in the second planting date does not show much effect on the US#1 or Total yield, but the numbers of "B" size tubers was elevated and the number of "A" size tubers were reduced (Table 2). The sprout length data presented in Figure 1 shows that the DMN treatment reduced the overall length of the sprouts. A much higher percentage of elongated sprouts were present when no treatment was applied. Figure 2 shows a sprout index for the second planting date. The treated tubers appeared to have a lower level of sprouting than the pile or the untreated samples based on this index. Figure 3 shows the tubers treated with 1,4-Seed® produced on average 1 -1.5 more stems per plant.

Discussion:

The objective of this study was to control sprouting of potato seed during warm Spring planting conditions. The Spring of 2008 was very mild and made it difficult to strongly test this hypothesis. The product did appear to slow or prevent dormancy break which would give a grower greater control of seed quality prior to planting. An observed concern was the reduction in overall yield when this product was applied to potato seed (Table 1). But, consideration must be given to the observation of increased stem number and subsequent increase in tuber number (Tables 1-2). The 1,4-Seed® treatment appeared to slow sprout development in all treated samples when compared to the untreated and pile treatments. The treated tubers sprouted much more uniformly, in length of sprout, as well as, the number of eyes sprouted per tuber. This product seamed to foster slower more uniform sprout and eye development. This effect appeared to increase the number of stems each seed piece produced. In this study, no adjustment was made to accommodate for the production of more stems per hill. It is well known that an increase in stem number will result in an increase in tuber set. This study did not investigate whether seed treated with 1,4-Seed® should be spaced out further (in-row spacing increased) to accommodate for this increase in tuber set. With treated seed being spaced out further, it is possible that a greater US#1 and total yield per acre will be realized when compared to non treated seed. Also, this product could be used to enhance tuber set under the hill of a poor setting variety. In addition, less seed would be required to plant per acre. These ideas were not investigated in this study.

Table 1

2008 1,4-Seed® Study, May 27th Planting
Montcalm Research Farm, Montcalm County, MI

Harvest 11-Sep-08 107 Days

DD, Base 40[3] 2653

	CWT/A		PERCENT OF TOTAL[1]						TUBER COUNT				AVG. STEM	TUBER QUALITY[2]				TOTAL	
LINE	US#1	TOTAL	US#1	Bs	As	OV	PO	SP GR	Bs	As	OV	PO	NUMBER	HH	VD	IBS	BC	CUT	COMMENTS
Pile, Rep 1	533	606	88	12	88	0	0	1.071	98	298	0	0	4	0	3	0	0	10	
Pile, Rep 2	363	448	81	16	81	0	3	1.070	101	211	0	6	3	0	2	0	0	10	
Pile, Rep 3	378	450	84	15	84	0	1	1.077	89	234	0	3	3	0	1	1	0	10	
MEAN	**425**	**501**	**84**	**15**	**84**	**0**	**1**	**1.073**	**96**	**248**	**0**	**3**	**3**						
Untreated Barrel, Rep 1	400	464	86	13	85	1	1	1.073	80	216	1	2	3	0	0	0	0	10	misshapen pickouts
Untreated Barrel, Rep 2	439	510	86	13	86	0	1	1.073	93	248	0	2	3	0	3	0	0	10	gc
Untreated Barrel, Rep 3	460	524	88	12	88	0	0	1.073	88	262	0	0	3	0	1	0	0	10	
MEAN	**433**	**499**	**87**	**13**	**86**	**0**	**1**	**1.073**	**87**	**242**	**0**	**1**	**3**						
Treated Barrel, Rep 1	370	506	73	26	72	1	1	1.071	194	237	1	3	5	0	1	0	0	10	
Treated Barrel, Rep 2	394	489	80	17	79	1	2	1.075	113	224	1	6	4	0	0	0	0	10	gc
Treated Barrel, Rep 3	330	422	78	18	78	0	4	1.075	107	242	0	5	4	0	0	0	0	10	gc
MEAN	**364**	**472**	**78**	**20**	**77**	**1**	**2**	**1.074**	**138**	**234**	**1**	**5**	**4**						

tr = trace, sl = slight, N/A = not applicable
SED = stem end defect, gc = growth crack

[1]SIZE
Bs: < 1 7/8"
As: 1 7/8" - 3.25"
OV: > 3.25"
PO: Pickouts

[2]TUBER QUALITY (number of tubers per total cut)
HH: Hollow Heart
VD: Vascular Discoloration
IBS: Internal Brown Spot
BC: Brown Center

Planted: 27-May-08
Vines Killed: 1-Sep-08
Days from Planting to Vine Kill: 97
Seed Spacing : 9.5"
No Fumigation

[3]MAWN STATION: Entrican

Table 2

2008 1,4-Seed® Study, June 10th Planting
Montcalm Research Farm, Montcalm County, MI

Harvest 23-Sep-08 105 Days

DD, Base 40[3] 2318

LINE	CWT/A US#1	CWT/A TOTAL	PERCENT OF TOTAL[1] US#1	Bs	As	OV	PO	SP GR	TUBER COUNT Bs	As	OV	PO	AVG. STEM Number	TUBER QUALITY[2] HH	VD	IBS	BC	TOTAL CUT	COMMENTS
Pile, Rep 1	382	446	86	14	86	0	0	1.079	88	221	0	0	3	0	0	0	0	10	pear shape
Pile, Rep 2	311	397	78	19	78	0	3	1.079	105	209	0	6	3	0	2	0	0	10	pear shape
Pile, Rep 3	341	412	83	17	83	0	0	1.076	96	212	0	1	3	0	0	0	0	10	pointed, pear shape
MEAN	**345**	**418**	**82**	**17**	**82**	**0**	**1**	**1.078**	**96**	**214**	**0**	**2**	**3**						
Untreated Barrel, Rep 1	317	413	77	22	77	0	1	1.085	123	195	0	1	4	0	0	0	0	10	
Untreated Barrel, Rep 2	352	427	82	17	82	0	1	1.078	102	222	0	1	4	0	0	0	0	10	pear shape
Untreated Barrel, Rep 3	322	408	79	20	79	0	1	1.073	119	208	0	2	3	0	3	0	0	10	
MEAN	**330**	**416**	**79**	**20**	**79**	**0**	**1**	**1.078**	**115**	**208**	**0**	**1**	**4**						
Treated Barrel, Rep 1	375	456	82	18	82	0	0	1.080	110	135	0	1	4	0	0	0	0	10	pointed, pear shape
Treated Barrel, Rep 2	318	444	71	28	71	0	1	1.075	181	239	0	2	5	0	0	0	0	10	
Treated Barrel, Rep 3	320	432	74	26	74	0	0	1.077	152	128	0	1	5	0	0	0	0	10	gc in pickouts
MEAN	**337**	**444**	**76**	**24**	**76**	**0**	**0**	**1.077**	**148**	**167**	**0**	**1**	**5**						

tr = trace, sl = slight, N/A = not applicable
SED = stem end defect, gc = growth crack

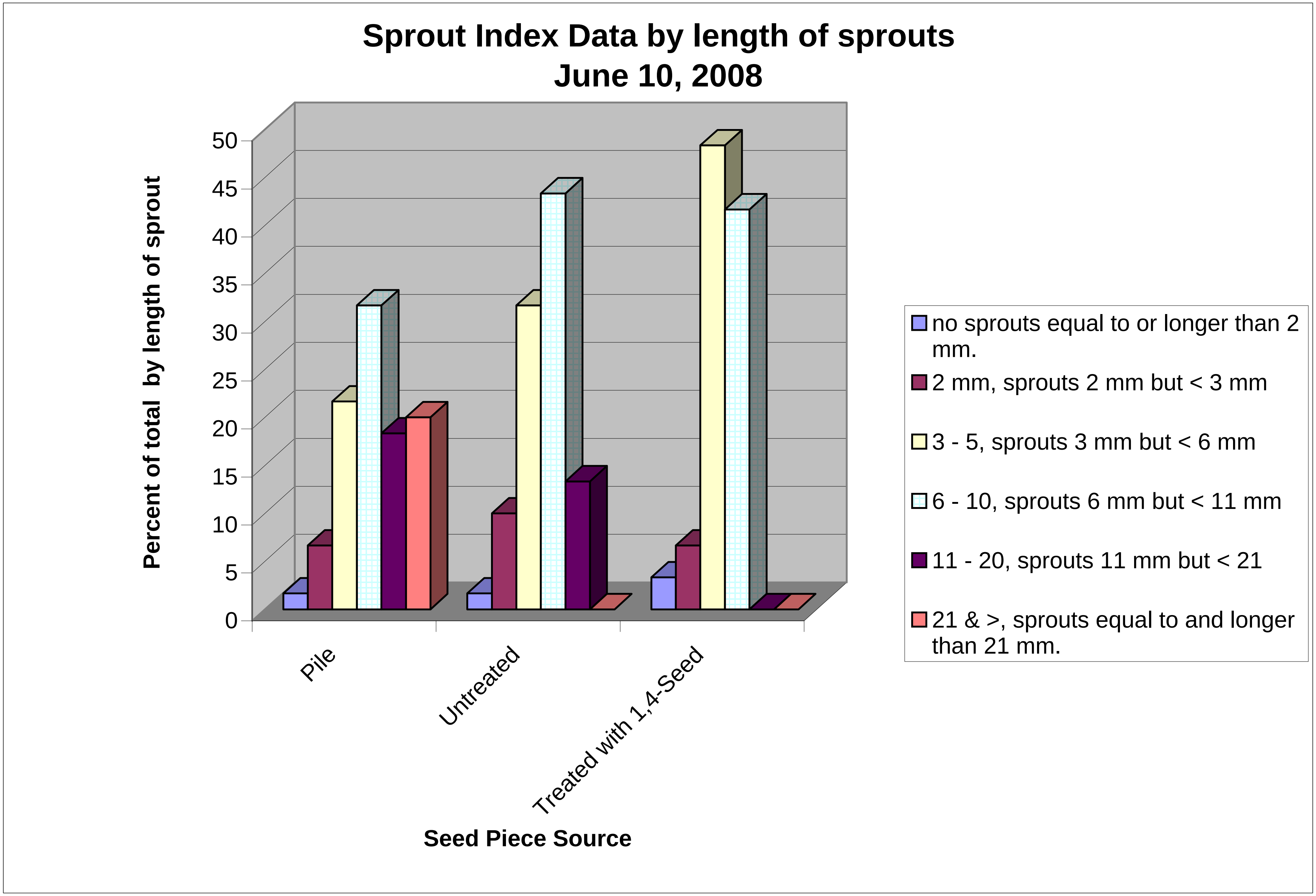
[1]SIZE
Bs: < 1 7/8"
As: 1 7/8" - 3.25"
OV: > 3.25"
PO: Pickouts

[2]TUBER QUALITY (number of tubers per total cut)
HH: Hollow Heart
VD: Vascular Discoloration
IBS: Internal Brown Spot
BC: Brown Center

Planted: 27-May-08
Vines Killed: 1-Sep-08
Days from Planting to Vine Kill: 83
Seed Spacing : 9.5"
No Fumigation

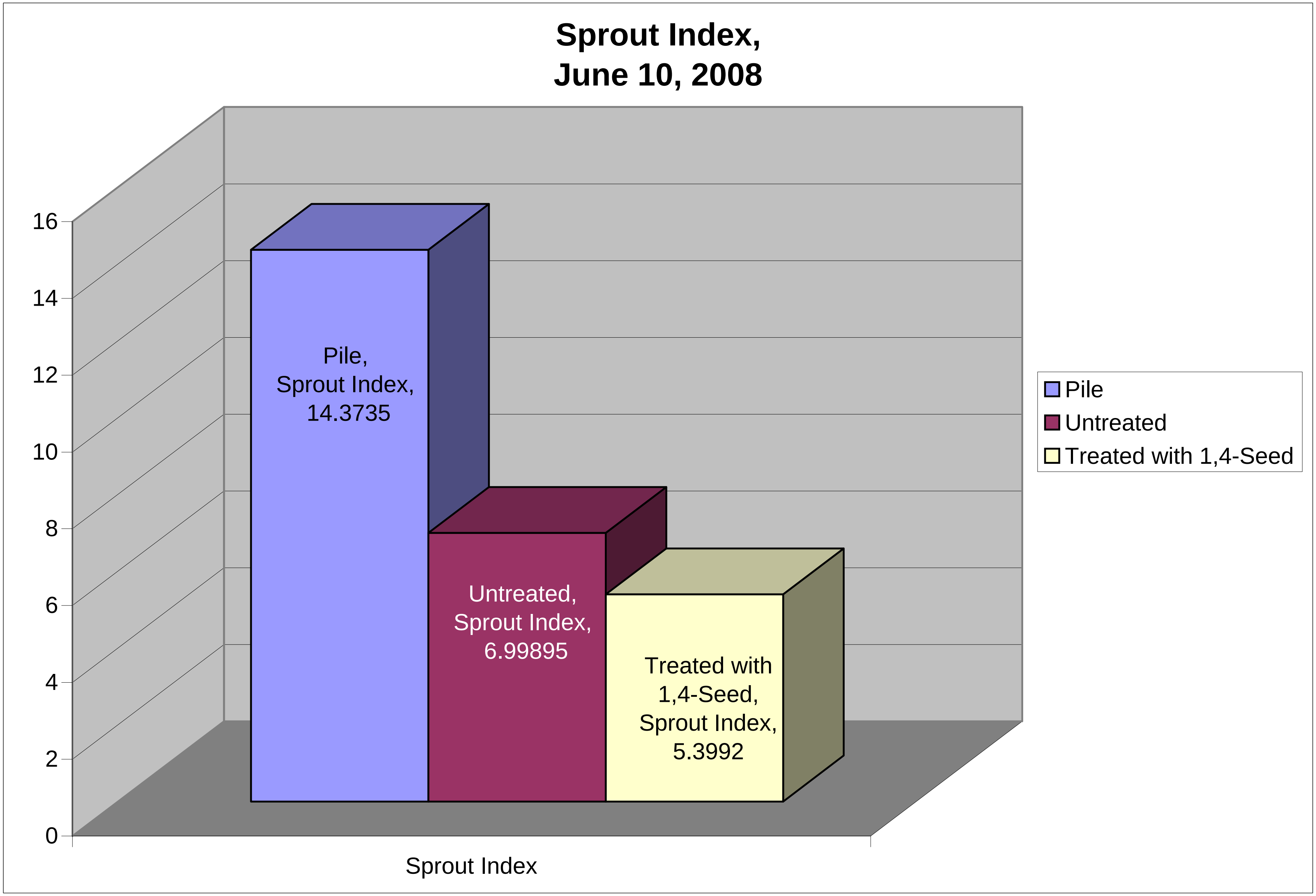
[3]MAWN STATION: Entrican

Figure 1



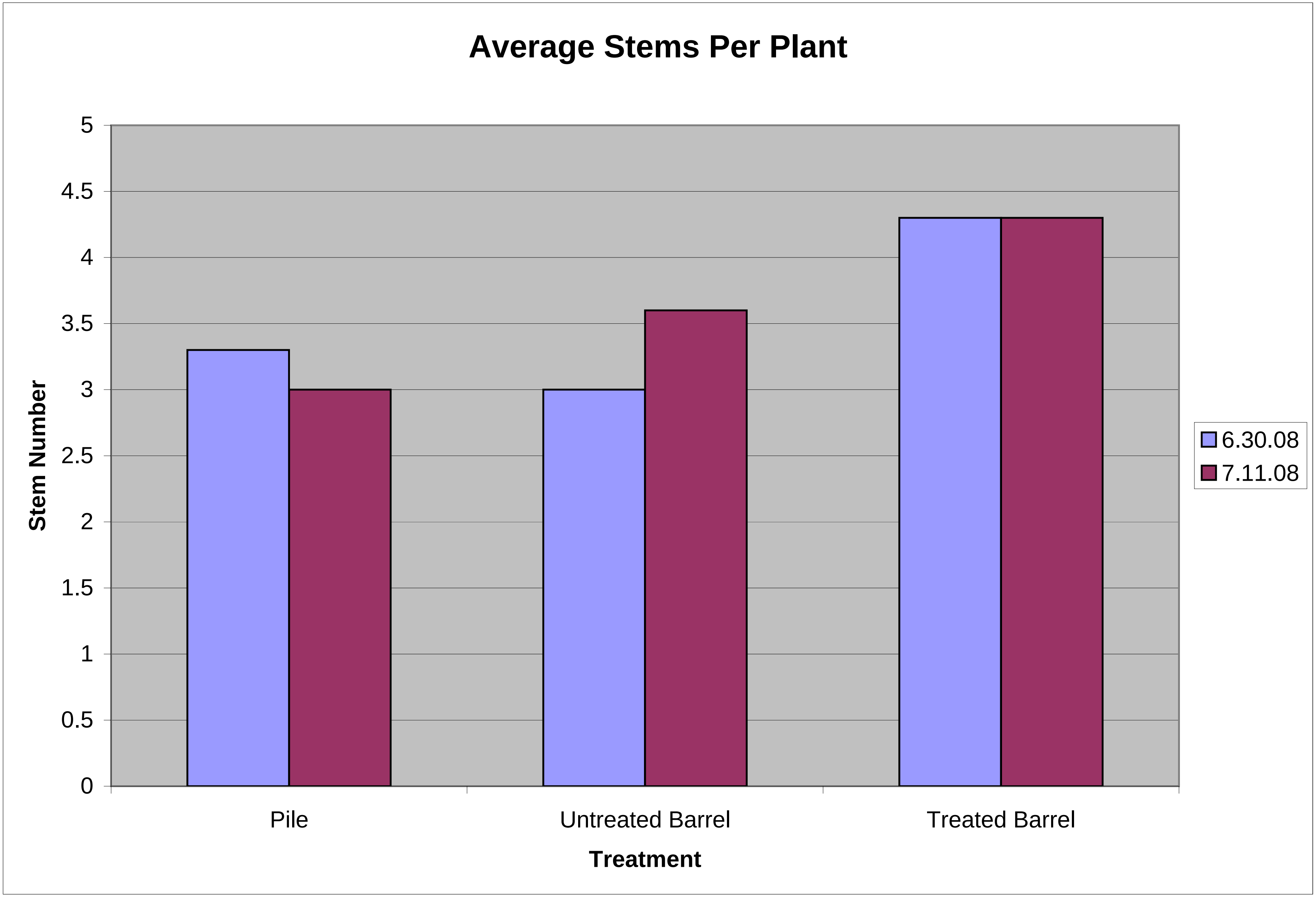
Sprout Index Data by length of sprouts
June 10, 2008
Percent of total by length of sprout
0
5
10
15
20
25
30
35
40
45
50
Pile
Untreated
Treated with 1,4-Seed
Seed Piece Source
no sprouts equal to or longer than 2 mm.
2 mm, sprouts 2 mm but < 3 mm
3 - 5, sprouts 3 mm but < 6 mm
6 - 10, sprouts 6 mm but < 11 mm
11 - 20, sprouts 11 mm but < 21
21 & >, sprouts equal to and longer than 21 mm.

Figure 2



Sprout Index,
June 10, 2008
16
14
12
10
8
6
4
2
0
Pile,
Sprout Index,
14.3735
Untreated,
Sprout Index,
6.99895
Treated with
1,4-Seed,
Sprout Index,
5.3992
Sprout Index
Pile
Untreated
Treated with 1,4-Seed

Figure 3


Average Stems Per Plant
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Stem Number
Pile
Untreated Barrel
Treated Barrel
Treatment
6.30.08
7.11.08

Funding: Northwest Agricultural Products, Wilbur Ellis

An Evaluation of Two Starter Fertilizers, Steric P® vs. 10-34-0 On Chieftain and Snowden Potato Varieties

Chris Long and Greg Steere

Introduction:

This is a summary of a field trial conducted at the Montcalm Research Farm, Entrican, Montcalm County, MI. In this trial the product Steric P® was applied to two common Michigan potato varieties, Chieftain, a red skin tablestock variety, and Snowden, a round white chip processing variety to compare its effects to a standard industry starter fertilizer.

Steric P® is a phosphate formulation, along with several other additives, which contains "a patented process for increasing . . . phosphate uptake" (from the manufacturer's website, http://www.nap-hem.com/LABELS_PDF/R_S/273_Steric_P_Label.pdf). The purpose of this study was to determine if this alternate form of phosphate had beneficial effects on the yield and quality of these two potato varieties.

Procedure:

Potassium was pre-plant applied as potash at a rate of 300 lb/A to the entire trial plot area for an actual Potassium application of 180 lbs.

Two trial plots consisting of four rows each were made for both Chieftain and Snowden. The plots were one hundred fifty feet in length, thirty-four inch rows. Chieftain was planted with an in-row spacing of nine inches and Snowden with a twelve inch in-row spacing.

An industry standard starter fertilizer of thirty-two gallons/A from a combination of twenty gallons 19-17-0 (actual nutrient value of forty-four pounds nitrogen and thirty-nine pounds phosphorus) and twelve gallons 10-34-0 (actual nutrient value of fifteen pounds nitrogen and forty-nine pounds phosphorus) was drip tube applied to either side of the furrow to one trial plot of each of the Chieftain and Snowden varieties.

The remaining test plots of each variety received an application of Steric P® in a similar manner to 10-34-0, at an equivalent nitrogen and phosphate rate/A to the industry standard at plant application.

All trial plots received identical post-planting nutrient, herbicide, fungicide and insecticide applications during the growing season. The total nitrogen application for the season was 239 lb/A.

Vines were killed 118 days after planting for both varieties; it should be noted that natural desiccation had occurred in all Chieftain trial plots approximately two weeks prior to vine kill. Four twenty-three foot sections were harvested from the center two rows of each treatment and variety. Chieftains were harvested September 11, 2008. Snowdens were harvested September 23, 2008. The at harvest data presented in Tables 1 and 2 illustrate the effect of the starter fertilizers on each variety.

Observations:

Chieftain (Table 1)

Yield

The total and US #1 yields averaged slightly lower for the Steric P® applications (twenty and thirty pounds respectively CWT/A) than the 10-34-0 applications. Both the Steric P® and 10-34-0 applications averaged above ninety percent US#1 in size for the total yield (Steric P® = 92%, 10-34-0 = 95%). On average, Steric P® yielded three percent more "B" size tubers than 10-34-0 and three percent less oversize tubers than the 10-34-0 application. There was no difference in the percentage of pickout tubers between the applications.

Quality

Specific gravity did not vary significantly between the two different applications.

Incidence of internal defect (e.g. hollow heart, vascular discoloration, etc.,) did not vary significantly between the applications.

A June 30, 2008 field observation showed an earlier emergence and stronger vine vigor in the plots with 10-34-0. (Table 1)

Snowden (Table 2)

Yield

A significant yield difference was observed between starter fertilizers for Snowden. The total yield (CWT/A) was ninety-four pounds less and US #1 yield (CWT/A) was eighty-four pounds less for the Steric P® than the 10-34-0 application. There were virtually no differences in tuber size distribution between starter fertilizer treatments on Snowden (see Table 2 – percent of total).

Quality

Overall, specific gravity for this chipping variety did not vary significantly (.004) between the two different fertilizer applications.

The two starter fertilizers did not appear to have a differing effect on the internal tuber quality of Chieftain. However, twenty percent of the Snowden tubers evaluated that were treated with Steric P® had hollow heart. Only ten percent of the 10-34-0 treated Snowden tubers exhibited hollow heart. Fifty-three percent of the Steric P® tubers examined showed vascular discoloration. Vascular discoloration was observed in fifty-eight percent

MICHIGAN POTATOES
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Michigan Potato Industry Commission

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www.mipotato.com   email: info@mipotato.com

March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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HELP

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The latest versions of Adobe's Acrobat Reader for both Windows and Macintosh computers are on this disc in the "Acrobat" folder.

QUESTIONS

If you have any further questions, comments or concerns, please contact the Michigan Potato Industry Commission directly.

Michigan Potato Industry Commission
13109 Schavey Rd.
Suite # 7
DeWitt, MI 48820

(517) 669-8377

of the 10-34-0 potatoes. The high level of vascular discoloration was observed across treatments.

A June 30, 2008 field observation showed a slightly earlier emergence and stronger vine vigor in the plots where 10-34-0 was applied. (Table 2)

Discussion:

The purpose of this study was to determine if this Steric P® form of phosphate had beneficial effects on the yield and quality of these two potato varieties.

In general, the 10-34-0 application produced a higher US#1 and total yield (CWT/A) than the Steric P® product.

It appeared that the Steric P® treatment on the Snowden variety increased the amount of hollow heart.

Table 1

2008 Steric P® Study, Chieftain, MRF

Harvest 11-Sep-08 121 Days

DD, Base 40[5] 3005

LINE	CWT/A US#1	CWT/A TOTAL	PERCENT OF TOTAL[1] US#1	Bs	As	OV	PO	SP GR	CHIP SCORE[3]	TUBER QUALITY[2] HH	VD	IBS	BC	TOTAL CUT	VINE VIGOR[4]	COMMENTS
Steric P® Rep 1	330	348	94	6	84	10	0	1.066		0	2	1	0	10	3.0	
Steric P® Rep 2	311	332	94	5	86	8	1	1.066		0	4	0	0	10	3.0	
Steric P® Rep 3	273	304	89	7	76	13	4	1.064		0	2	0	0	10	3.0	
Steric P® Rep 4	328	346	92	6	82	10	2	1.067		0	2	0	0	10	3.0	1 black leg
Steric P® Average	**311**	**333**	**92**	**6**	**82**	**10**	**2**	**1.066**								
10-34-0 Rep 1	283	300	95	3	81	14	2	1.061		0	4	0	0	10	4.0	
10-34-0 Rep 2	410	423	97	2	82	15	1	1.066		0	0	0	0	10	4.0	
10-34-0 Rep 3	361	377	95	3	81	14	2	1.067		0	1	0	0	10	4.0	
10-34-0 Rep 4	316	337	94	5	86	8	1	1.064		0	2	0	0	10	4.0	
10-34-0 Average	**343**	**359**	**95**	**3**	**82**	**13**	**2**	**1.064**								tr = trace, sl = slight, NA = not applicable SED = stem end defect, gc = growth crack

[1]SIZE	[2]TUBER QUALITY (number of tubers per total cut)	[3]CHIP COLOR SCORE - Snack Food Association Scale	[4]Vine Vigor Rating	Planted:	13-May-08
Bs: < 1 7/8"	HH: Hollow Heart	(Out of the field)	Date taken: 06/30/08	Vines Killed:	8-Sep-08
As: 1 7/8" - 3.25"	VD: Vascular Discoloration	Ratings: 1 - 5	Ratings 1-5	Days from Planting to Vine Kill	118
OV: > 3.25"	IBS: Internal Brown Spot	1: Excellent	1: Slow Emergence	Seed Spacing :	9"
PO: Pickouts	BC: Brown Center	5: Poor	5: Early emergence (vigorous vine, some flowering)	No Fumigation	

[5]MAWN STATION: Entrican

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Table 2

2008 Steric P® Study, Snowden, MRF

Harvest 23-Sep-08 133 Days

DD, Base 40[5] 3005

LINE	CWT/A US#1	CWT/A TOTAL	PERCENT OF TOTAL[1] US#1	Bs	As	OV	PO	SP GR	CHIP SCORE[3]	TUBER QUALITY[2] HH	VD	IBS	BC	TOTAL CUT	VINE VIGOR[4]	COMMENTS
Steric P® Rep 1	411	431	95	5	87	8	0	1.092		2	4	0	0	10	3.0	tr pitted scab, misshapen in pickouts
Steric P® Rep 2	367	409	90	5	88	2	5	1.084		2	4	0	0	10	3.0	pitted scab
Steric P® Rep 3	401	426	94	5	81	13	1	1.085		2	8	0	0	10	3.0	misshapen in pickouts, pitted scab
Steric P® Rep 4	355	375	93	5	85	8	2	1.086		2	5	0	0	10	3.0	
Steric P® Average	**384**	**410**	**93**	**5**	**85**	**8**	**2**	**1.086**								
10-34-0 Rep 1	437	474	93	6	87	6	1	1.091		0	6	0	0	10	3.5	tr pitted scab
10-34-0 Rep 2	414	459	91	5	75	16	4	1.087		2	7	0	0	10	3.5	growth crack
10-34-0 Rep 3	581	614	94	5	89	5	1	1.093		2	6	0	0	10	3.5	tr pitted scab
10-34-0 Rep 4	439	468	93	5	84	9	2	1.090		0	4	0	0	10	3.5	misshapen in pickouts, pitted scab
10-34-0 Average	**468**	**504**	**93**	**5**	**84**	**9**	**2**	**1.090**								tr = trace, sl = slight, NA = not applicable

SED = stem end defect, gc = growth crack

[1]SIZE
Bs: < 1 7/8"
As: 1 7/8" - 3.25"
OV: > 3.25"
PO: Pickouts

[2]TUBER QUALITY (number of tubers per total cut)
HH: Hollow Heart
VD: Vascular Discoloration
IBS: Internal Brown Spot
BC: Brown Center

[3]CHIP COLOR SCORE - Snack Food Association Scale
(Out of the field)
Ratings: 1 - 5
1: Excellent
5: Poor

[4] Vine Vigor Rating
Date Taken: 06/30/08
Ratings 1-5
1: Slow Emergence
5: Early emergence (vigorous vine, some flowering)

Planted:	13-May-08
Vines Killed:	8-Sep-08
Days from Planting to Vine Kill	118
Seed Spacing :	12"
No Fumigation	

[5]MAWN STATION: Entrican

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Funding: Absorbent Technologies

An Evaluation of Zeba Farm® and Zeba LF® on the Snowden Potato Variety

Chris Long and Greg Steere

Introduction:

This is a summary of a field trial conducted at the Montcalm Research Farm, Entrican, Montcalm County, MI. In this trial, two Absorbent Technologies products were compared against an untreated control. Snowden, a round, white, chip processing variety was the test variety. The purpose of this study was to determine the effect of the products on overall yield, size profile, tuber count and internal tuber quality for the Snowden variety.

"Zeba is a remarkable, patented soil amendment that helps improve quality and yield for all types of plants, using less water while increasing the efficiency of other crop inputs. This new technology builds on basic cornstarch to create a 'hydrogel' that holds and releases water – over and over again, similar to a sponge below the soil – for use by plants and food crops on an as-needed basis" (taken from the website http://www.zeba.com/company/20319_sustain%20_brochure.pdf).

The two Absorbent Technologies products used were: Zeba Farm®, a granular in-furrow product and Zeba LF®, a powdered form, "specifically formulated to mix with certain liquid fertilizers" (see above).

Procedure:

Four replications of Zeba Farm®, Zeba LF® and untreated control were made in the trial. Each replication included three side-by-side, twenty-five foot rows. The two outside rows served as guard rows with twenty-three feet of the center row of each replication to be harvested.

Furrows were mechanically opened and starter fertilizer applied. Twenty-seven seed pieces were hand planted at an eleven inch in-row spacing (thirty-four inches between rows) for all rows.

Before mechanical row closure the Zeba® products were applied at a rate of seven pounds/A according to manufacturer's specifications. Because of the small amount of product needed and the small medium of the product, both Zeba Farm® and Zeba LF® were applied in the furrow by hand. It should be noted that Zeba LF® is intended by the manufacturer to be applied with liquid fertilizer in-furrow.

All trial plots received identical post-planting nutrient, herbicide, fungicide and insecticide applications during the growing season. The total nitrogen application for the season was 239 lb/A.

The test plot received 17.36” of rainfall from April to September and a total of 8.90” of irrigation water for the same period.

Vine kill was done 104 days after planting for all test plots. Twenty-three foot sections from the center row of each replication were harvested from each plot. Table 1 illustrates the general harvest summary of this field trial.

Observations:

Yield

A slight yield difference was observed between the two Zeba® applications and the untreated replications. Zeba Farm® was the highest producer. Zeba LF® yielded slightly less total and US#1 yield per CWT/A than Zeba Farm®. The overall average of the untreated replications were thirty-six pounds less per CWT/A for the total yield and thirty-six pounds less per CWT/A, US#1 yield, compared to Zeba Farm®.

All replications averaged well over 90% for the percent of US#1 tubers against the total yield. The only variation in the size pattern between replications was in Zeba Farm® where 87% of the US#1’s were “A” sized, and 7% were “Oversize” (Table 1).

For the purpose of this study, overall tuber count by tuber size was kept along with the weight data. There were no significant differences between any of the replications regarding number of tubers per size category. On average there were slightly more “A” and “B” tubers in the Zeba® products. On average, the Zeba Farm® treatment yielded a slightly higher number of oversize tubers.

Quality

Overall, specific gravity for this chipping variety varied negligibly between Zeba® treatments and the untreated replications.

Internal qualities between the products and the untreated tubers remained the same. Hollow heart was greatest in Zeba Farm® at 10% followed by untreated Snowden at 5% and Zeba LF® 2.5%. In the Zeba Farm® and the untreated Snowden there was a moderate difference with Zeba LF® in the incidence of vascular discoloration (Table 1).

Discussion:

The purpose of this study was to determine the effect of the products on overall yield, size profile, tuber count and internal tuber quality for the Snowden variety.

The Zeba Farm® product demonstrated an increase in US#1 and total yield (CWT/A). The results were not as significant for the Zeba LF® product. Overall, the tuber count averages revealed that the Zeba® products increased tuber numbers, with Zeba LF®, taking the lead in the "A" size category.

Future areas of testing might include different water application scenarios with only precipitation, typical irrigation, and modified irrigation (limited water applied) during the growing season.

Table 1

2008 Zeba® Study
Montcalm Research Farm, Montcalm County, MI

Harvest 23-Sep-08 133 Days

DD, Base 40[3] 2662

LINE	CWT/A US#1	CWT/A TOTAL	PERCENT OF TOTAL[1] US#1	Bs	As	OV	PO	SP GR	TUBER COUNT Bs	As	OV	PO	TUBER QUALITY[2] HH	VD	IBS	BC	TOTAL CUT	COMMENTS
Untreated, Rep 1	382	400	95	5	89	6	0	1.083	3	172	5	0	2	5	0	0	10	sl pitted scab
Untreated, Rep 2	358	375	96	4	92	4	0	1.085	33	162	3	0	0	4	0	0	10	
Untreated, Rep 3	331	358	92	8	92	0	0	1.087	46	163	0	0	0	3	0	0	10	tr pitted scab
Untreated, Rep 4	332	353	94	6	90	4	0	1.079	32	162	3	0	0	7	0	0	10	
MEAN	**351**	**371**	**94**	**6**	**91**	**3**	**0**	**1.084**	**29**	**165**	**3**	**0**						
Zeba Farm®, Rep 1	393	408	96	4	85	11	0	1.089	30	167	9	0	2	5	0	0	10	
Zeba Farm®, Rep 2	398	419	95	5	91	4	0	1.087	36	176	3	0	1	4	0	0	10	
Zeba Farm®, Rep 3	400	434	92	7	86	7	0	1.086	51	177	5	1	1	4	0	0	10	
Zeba Farm®, Rep 4	358	366	98	2	88	10	0	1.083	17	165	7	0	0	8	0	0	10	
MEAN	**387**	**407**	**95**	**5**	**87**	**7**	**0**	**1.086**	**34**	**171**	**6**	**0**						
Zeba LF®, Rep 1	414	442	94	6	92	2	0	1.085	49	213	2	0	0	3	0	0	10	
Zeba LF®, Rep 2	350	364	96	4	93	4	0	1.086	18	172	3	0	0	4	0	0	10	
Zeba LF®, Rep 3	368	379	97	3	94	3	0	1.086	20	177	2	0	1	3	0	0	10	tr pitted scab
Zeba LF®, Rep 4	358	383	94	6	91	3	1	1.083	37	152	2	1	0	3	0	0	10	
MEAN	**372**	**392**	**96**	**5**	**92**	**3**	**0**	**1.085**	**31**	**179**	**2**	**0**						

tr = trace, sl = slight, N/A = not applicable

SED = stem end defect, gc = growth crack

[1]SIZE
Bs: < 1 7/8"
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IBS: Internal Brown Spot
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Planted: 13-May-08
Vines Killed: 25-Aug-08
Days from Planting to Vine Kill: 104
Seed Spacing : 11"
No Fumigation

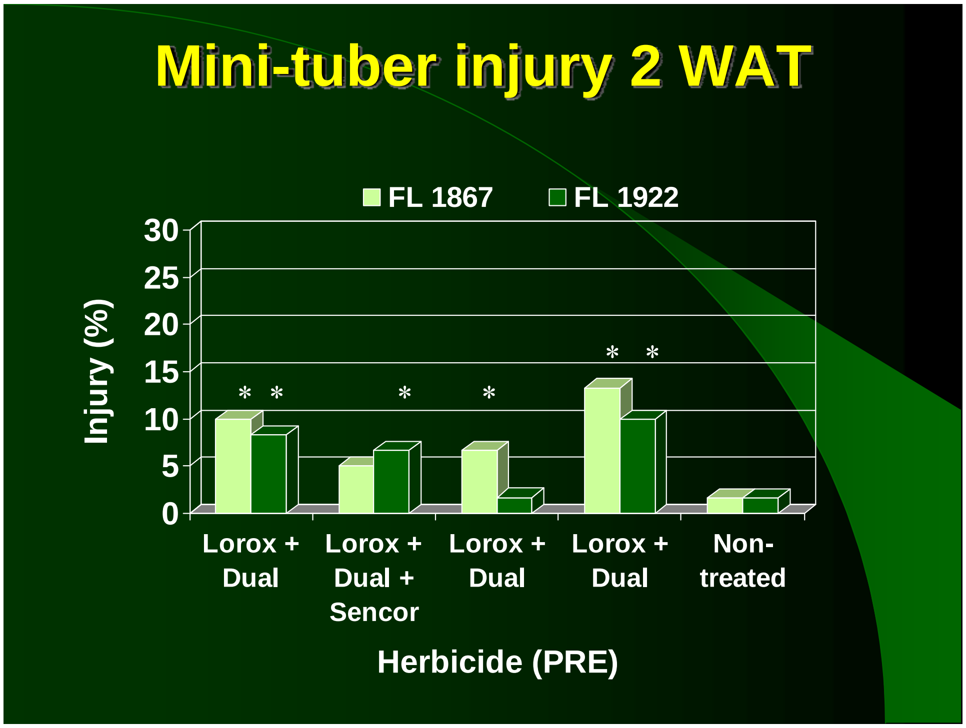
[3]MAWN STATION: Entrican

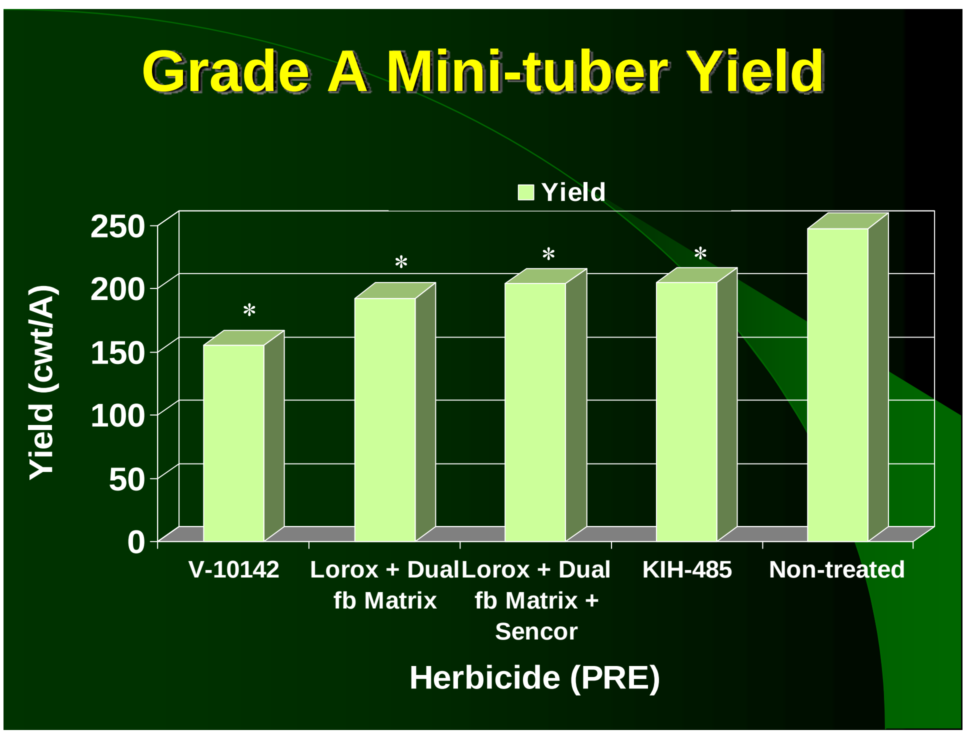
Funded by MPIC

Tolerance of Potato Mini-tubers to PRE and POST Herbicide Applications.

Calvin F. Glaspie, Wesley J. Everman, Chris Long and Andrew J. Chomas, Department of Crop and Soil Sciences Michigan State University, East Lansing MI 48824.

Demand for disease free potato seed in Michigan is high due to a large economic return upon planting disease and virus free seed potatoes. Using aseptically grown plants produced from issue culture, potato mini-tubers can be planted as a clean seed source. However, many generally accepted cultural practices for managing mini-tubers are adopted from cut seed piece, including weed management programs. Field trials were conducted at the near Lakeview, MI in 2008 to evaluate the effect of labeled herbicide programs on three cultivars of potato mini-tubers. Potato cultivars Atlantic, Frito Lay (FL) 1867 and FL 1922 were planted in 34-inch rows, 2.5 inches deep at 8 inch spacing and hilled at planting. Fifteen herbicide treatments were arranged in a strip plot design with four replications. Treatments included, *S*-metolachlor at 1.27 lb ai/A, pendimethalin at 0.71 lb ai/A, metribuzin at 0.5 lb ai/A, linuron at 0.5 lb ai/A, rimsulfuron at .023 lb ai/A, dimethenamid at 0.66 lb ai/A, imazosulfuron at 0.4 lb ai/A, linuron at 0.5 lb ai/A plus *S*-metolachlor at 1.27 lb ai/A, linuron at 0.5 lb ai/A plus *S*-metolachlor at 1.27 lb ai/A plus metribuzin at 0.09 lb ai/A, metribuzin at 0.09 lb ai/A plus *S*-metolachlor at 1.27 lb ai/A plus pendimethalin at 0.24 lb ai/A, metribuzin at 0.09 lb ai/A plus *S*-metolachlor at 1.27 lb ai/A plus pendimethalin at 0.24 lb ai/A plus glyphosate at 0.77 lb ai/A plus ammonium sulfate at 3.4 lb/A, linuron at 0.5 lb ai/A plus *S*-metolachlor at 1.27 lb ai/A followed by rimsulfuron at 0.016 lb ai/A plus non-ionic surfactant at 0.05 gal/A, linuron at 0.5 lb ai/A plus *S*-metolachlor at 1.27 lb ai/A followed by rimsulfuron at 0.016 lb ai/A plus metribuzin at 0.25 lb ai/A plus non-ionic surfactant at 0.05 gal/A, KIH-485 at 1.26 lb ai/A and a non-treated control. Production practices were similar to those used in commercial seed production in Michigan, with plots maintained weed free by hand. Visual injury was rated throughout the season on a 0-100% scale and yield data was collected at the end of the season for tuber count and tuber defects. Visual ratings showed differences in cultivar response to treatments with greater injury observed in FL1867 and FL1922. Treatments displaying visual injury in both cultivars contained *S*-metolachlor, metribuzin and linuron alone or in combination. Treatments that caused yield reductions in all cultivars were V-10142 and treatments containing POST applications of rimsulfuron. Several herbicide treatments appear to have sufficient crop safety to be used in mini-tuber production including pendimethalin, metribuzin, and rimsulfuron. Treatments of imazosulfuron and KIH-485 can reduce seed potato yields. Treatment combinations with *S*-metolachlor showed early season injury and yield reductions, however two treatments containing *S*-metolachlor + linuron yielded significantly the same as the hand weed-free.





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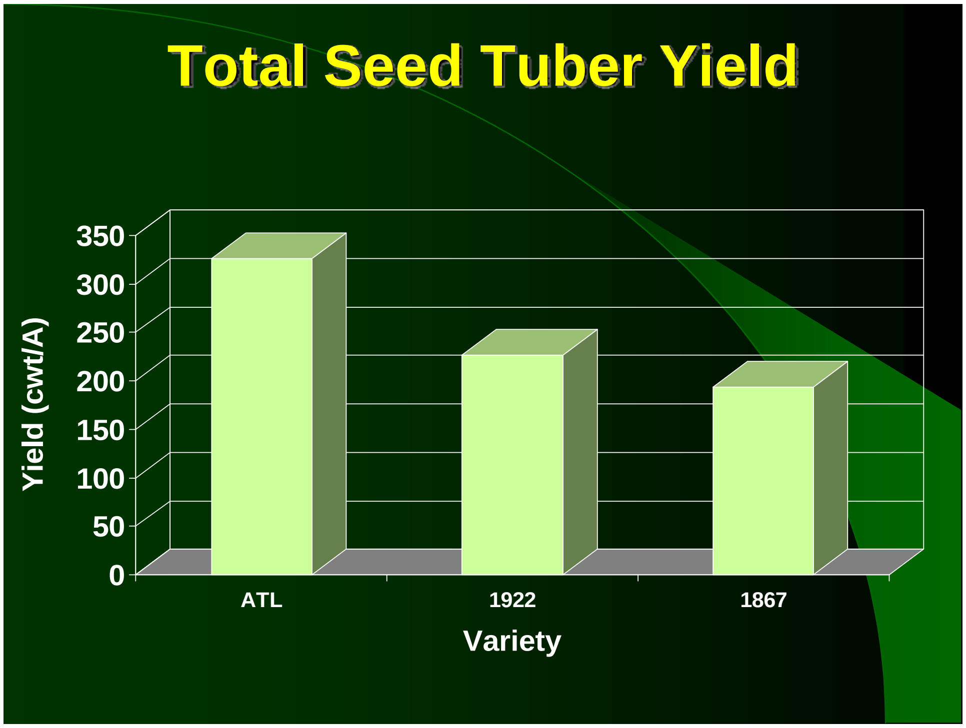


TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS

Calvin Glaspie, Wesley Everman, Chris Long, and Andrew Chomas

Michigan State University

Introduction

Demand for disease-free seed potato in Michigan is high due to a large yield return upon planting disease and virus-free seed. Using aseptically grown plants through tissue culture methods, potato mini-tubers can be generated as a clean seed source. However, many cultural practices for raising potato from mini-tubers are adopted from traditional seed piece production practices, including weed management programs. The use of these practices has resulted in an observed increased incidence of injury following PRE herbicide applications.

Objective

To determine the effect of current herbicide programs in potato cropping systems and how they affect mini-tuber seed production and quality.

Materials and Methods

- Plots were arranged in an RCBD
- Three potato cultivars were used
  - Atlantic (ATL), FL1867 and FL1922
- Planted in 34 in rows, 2.5 in deep at an 8 in spacing
- Plot size = 20 ft X 8.5 ft
- Each plot contained a row of each mini-tuber cultivar
- Herbicides (Table 1)
  - PRE treatments applied 2 weeks after planting (WAP)
  - POST treatments applied 6 WAP
- Plots were maintained hand weed-free
- Visual injury was rated during the season on a 0-100% scale
- 10 ft of the 20 ft row was harvested and graded
- Data is reported in hundred weight (cwt) per acre
- Statistical analysis was conducted using ANOVA procedures in SAS software

Table 1. Herbicide Treatment List

Trt	Herbicide and Rate	Trt	Herbicide and Rate
1	*S*-metolachlor at 1.27 lb ai/A	9	*S*-metolachlor + linuron + metribuzin at 0.09 lb ai/A
2	pendimethalin at 0.71 lb ai/A	10	*S*-metolachlor + metribuzin 0.09 lb ai/A + pendimethalin at 0.24 lb ai/A
3	metribuzin at 0.5 lb ai/A	11	*S*-metolachlor + metribuzin 0.09 lb ai/A + pendimethalin at 0.24 lb ai/A + glyphosate at 0.75 lb ae/A + AMS
4	linuron at 0.5 lb ai/A	12	*S*-metolachlor + linuron fb rimsulfuron at 0.016 lb ai/A + NIS
5	rimsulfuron at .023 lb ai/A	13	*S*-metolachlor + linuron fb rimsulfuron at 0.016 lb ai/A + metribuzin at 0.25 lb ai/A + NIS
6	dimethenamid at 0.66 lb ai/A	14	KIH-485 at 1.26 lb ai/A
7	imazosulfuron at 0.4 lb ai/A	15	Hand weed-free
8	*S*-metolachlor + linuron		

Figure 1. Mini-tuber discoloration 2 weeks after treatment

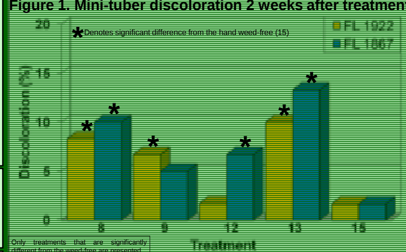


Figure 2. Yield of A-grade tubers as affected by treatment across cultivars

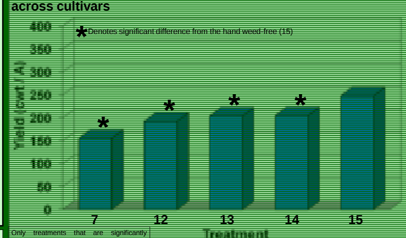
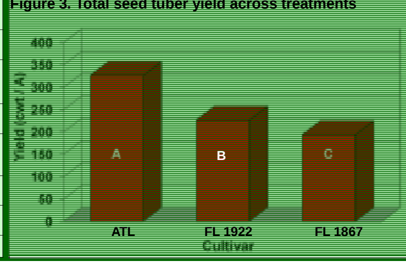


Figure 3. Total seed tuber yield across treatments



Results and Discussion

- FL 1922 and FL 1867 showed early season discoloration where *S*-metolachlor was applied (Figure 1), with injury becoming transient by 5 WAP
- No stunting or discoloration was observed in ATL (data not shown)
- Treatments containing imazosulfuron reduced A-grade yields by 38%
- A-sized tuber yield for *S*-metolachlor + linuron and *S*-metolachlor + linuron + metribuzin treatments did not differ significantly from the hand weed-free (Figure 2)
- Treatments KIH-485 and *S*-metolachlor + linuron fb rimsulfuron alone or in combination with metribuzin reduced A-grade sized tuber yields by 17-22%
- Atlantic yielded higher than the other cultivars, largely due to its higher proportion of oversized tubers (data not shown).
- Total yield variations observed were attributed mainly to cultivar differences (Figure 3).

Conclusions

Several herbicide treatments appear to have sufficient crop safety to be used in mini-tuber production including pendimethalin, metribuzin, and rimsulfuron.

Treatments of imazosulfuron and KIH-485 can reduce seed potato yields.

Treatment combinations with *S*-metolachlor showed early season injury and yield reductions, however two treatments containing *S*-metolachlor + linuron yielded significantly the same as the hand weed-free.

Future research

- Replicate the study a second year
- Conduct the study at an additional location
- Evaluate additional treatments
- Plant seed tubers obtained from this study to determine effects of growth on the subsequent crop

Acknowledgements

The authors would like thank the Michigan Potato Industry Commission for their support of this research. We would also like to thank Sklarczyk Farms for supplying the mini-tubers used in the study. Lastly we would like to thank the staff at the Montcalm research farm for helping maintain the study.

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Date Planted: 5/12/08
Variety: Atl,87,22
Population: 9.5 in space
Soil Type: Loamy Sand
Plot Size: 10 **X** 20 **FT**

Row Spacing: 34 IN
No. of Reps: 4
% OM: 1.6
pH: 5
Design: RANDOMIZED COMPLETE BLOCK

Tillage: Spring disk X3
Spring Chisel X 1
Cultivate X 1
Fertilizer: 12 gal 10-34-0 and 20 gal 19-17-0 on (5/12/08)
150 lbs 46-0-0 (6-17-08)
150 lbs 46-0-0 (6-27-08)

Crop	**Code**	**Common Name**
1.	SOLTU	POTATO

Application Description

	A	**B**
Application Timing:	PRE	POST
Date Treated:	5/28/08	6/24/08
Time Treated:	10:33 AM	9:30 AM
% Cloud Cover:	10	10
Air Temp., Unit:	59 F	80 F
% Relative Humidity:	41	72
Wind Speed/Unit/Dir:	0 mph	0 mph
Soil Temp., Unit:	58 F	68 F
Soil/Leaf Surface M:	4 5	4 5
Soil Moist (1=w 5=d):	4	4

Crop Stage at Each Application

	A	**B**
Crop Name:	SOLTU	SOLTU
Height (In.):		4-8(6)

Application Equipment

Appl	**Sprayer Type**	**Speed MPH**	**Nozzle Type**	**Nozzle Size**	**Nozzle Height**	**Nozzle Spacing**	**Boom Width**	**GPA**	**Carrier**	**PSI**
A	BKPK	3.5	FF	8003	18	20	60	20	H20	30
B	BKPK	3.5	FF	8003	18	20	60	20	H20	30

MSU Weed Science Research Program

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code							SOLTU					
Crop Code							18867	1867	1867	1922	1922	1922
Rating Data Type							Inj-Stunt	Inj-Emer	Inj-Color	Inj-Stunt	Inj-Emer	Inj-Color
Rating Unit							percent	percent	percent	percent	percent	percent
Rating Date							6/5/08	6/5/08	6/5/08	6/5/08	6/5/08	6/5/08
Trt-Eval Interval							8 DA-A	8 DA-A	8 DA-A	8 DA-A	8 DA-A	8 DA-A
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	1	2	3	4	5	6
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE	11.3	92.5	16.3	11.3	92.5	18.8
2	Prowl H2O	3.8	L	1.5	pt/a	PRE	5.0	91.3	1.3	8.8	93.8	6.3
3	Sencor	75	DF	0.67	lb/a	PRE	6.3	97.5	2.5	13.8	93.8	2.5
4	Lorox	50	DF	1	lb/a	PRE	5.0	98.8	5.0	8.8	86.3	1.3
5	Matrix	25	WG	1.5	oz/a	PRE	1.3	98.8	1.3	7.5	90.0	0.0
6	Outlook	6	L	14	fl oz/a	PRE	13.8	93.8	11.3	25.0	86.3	7.5
7	V-10142	75	WG	8.5	oz/a	PRE	4.4	91.3	1.3	7.5	85.0	1.3
8	Lorox	50	DF	1	lb/a	PRE	15.0	91.3	12.5	6.3	100.0	6.3
8	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Lorox	50	DF	1	lb/a	PRE	12.8	94.6	6.3	17.5	86.3	8.8
9	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Sencor	75	DF	0.125	lb/a	PRE						
10	Sencor	75	DF	0.125	lb/a	PRE	10.0	95.0	7.5	8.8	90.0	2.5
10	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
10	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Sencor	75	DF	0.125	lb/a	PRE	19.4	94.6	13.0	13.8	86.3	8.8
11	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
11	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Roundup WeatherMax	4.5	L	22	fl oz/a	PRE						
11	Ammonium Sulfate	100	DF	17	lb/100 gal	PRE						
12	Lorox	50	DF	1	lb/a	PRE	4.4	94.6	4.7	7.5	92.5	5.0
12	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
12	Matrix	25	WG	1	oz/a	POST						
12	Activator 90		L	0.25	% v/v	POST						
13	Lorox	50	DF	1	lb/a	PRE	8.8	93.8	6.3	6.3	93.8	7.5
13	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
13	Matrix	25	WG	1	oz/a	POST						
13	Sencor	75	DF	0.33	lb/a	POST						
13	Activator 90		L	0.25	% v/v	POST						
14	KIH-485	85	WG	2.37	oz ai/a	PRE	12.5	92.5	7.5	7.5	90.0	1.3
15	Non-Treated						5.0	92.5	5.0	3.8	93.8	6.3
LSD (P=.05)							9.64	9.64	5.03	11.60	12.03	9.56
Standard Deviation							6.74	6.75	3.52	8.11	8.42	6.69
CV							75.04	7.16	51.98	79.17	9.29	119.86

MSU Weed Science Research Program

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code												
Crop Code							ATL	ATL	ATL	1867	1867	1867
Rating Data Type							Inj-Stunt	Inj-Emer	Inj-Color	Inj-Stunt	Inj-Emer	Inj-Color
Rating Unit							percent	percent	percent	percent	percent	percent
Rating Date							6/10/08	6/10/08	6/10/08	6/10/08	6/10/08	6/10/08
Trt-Eval Interval							13 DA-A	13 DA-A	13 DA-A	13 DA-A	13 DA-A	13 DA-A
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	7	8	9	10	11	12
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE	0.0	100.0	0.0	2.5	100.0	1.3
2	Prowl H2O	3.8	L	1.5	pt/a	PRE	1.3	98.8	0.0	3.8	100.0	1.3
3	Sencor	75	DF	0.67	lb/a	PRE	0.0	100.0	0.0	0.0	100.0	0.0
4	Lorox	50	DF	1	lb/a	PRE	0.0	100.0	0.0	1.3	100.0	1.3
5	Matrix	25	WG	1.5	oz/a	PRE	1.3	100.0	0.0	0.0	100.0	1.3
6	Outlook	6	L	14	fl oz/a	PRE	1.3	98.8	0.0	3.8	100.0	2.5
7	V-10142	75	WG	8.5	oz/a	PRE	0.0	97.5	0.0	0.0	100.0	0.0
8	Lorox	50	DF	1	lb/a	PRE	0.0	100.0	0.0	13.8	100.0	10.0
8	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Lorox	50	DF	1	lb/a	PRE	1.3	98.8	0.0	7.7	100.0	4.6
9	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Sencor	75	DF	0.125	lb/a	PRE						
10	Sencor	75	DF	0.125	lb/a	PRE	0.0	100.0	0.0	1.3	100.0	1.3
10	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
10	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Sencor	75	DF	0.125	lb/a	PRE	0.0	99.0	0.1	6.0	100.0	4.6
11	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
11	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Roundup WeatherMax	4.5	L	22	fl oz/a	PRE						
11	Ammonium Sulfate	100	DF	17	lb/100 gal	PRE						
12	Lorox	50	DF	1	lb/a	PRE	0.0	92.5	1.3	2.7	100.0	6.2
12	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
12	Matrix	25	WG	1	oz/a	POST						
12	Activator 90		L	0.25	% v/v	POST						
13	Lorox	50	DF	1	lb/a	PRE	0.0	100.0	0.0	7.5	100.0	11.3
13	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
13	Matrix	25	WG	1	oz/a	POST						
13	Sencor	75	DF	0.33	lb/a	POST						
13	Activator 90		L	0.25	% v/v	POST						
14	KIH-485	85	WG	2.37	oz ai/a	PRE	0.0	100.0	0.0	2.5	100.0	0.0
15	Non-Treated						0.0	100.0	0.0	1.3	100.0	3.8
LSD (P=.05)							1.89	5.66	0.93	8.23	0.09	5.69
Standard Deviation							1.32	3.96	0.65	5.76	0.06	3.98
CV							396.63	4.0	729.85	160.6	0.06	121.43

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code												
Crop Code							1922	1922	1922	ATL	ATL	1867
Rating Data Type							Inj-Stunt	Inj-Emer	Inj-Color	Inj-Stunt	Inj-Color	Inj-Stunt
Rating Unit							percent	percent	percent	percent	percent	percent
Rating Date							6/10/08	6/10/08	6/10/08	6/18/08	6/18/08	6/18/08
Trt-Eval Interval							13 DA-A	13 DA-A	13 DA-A	21 DA-A	21 DA-A	21 DA-A
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	13	14	15	16	17	18
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE	3.8	100.0	3.8	0.0	0.0	1.3
2	Prowl H2O	3.8	L	1.5	pt/a	PRE	5.0	100.0	3.8	0.0	0.0	0.0
3	Sencor	75	DF	0.67	lb/a	PRE	0.0	100.0	0.0	0.0	0.0	0.0
4	Lorox	50	DF	1	lb/a	PRE	2.5	100.0	2.5	0.0	0.0	0.0
5	Matrix	25	WG	1.5	oz/a	PRE	1.3	100.0	1.3	0.0	0.0	2.5
6	Outlook	6	L	14	fl oz/a	PRE	1.3	100.0	2.5	0.0	0.0	0.0
7	V-10142	75	WG	8.5	oz/a	PRE	0.0	100.0	0.0	0.0	1.3	0.0
8	Lorox	50	DF	1	lb/a	PRE	1.3	100.0	6.3	0.0	0.0	6.3
8	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Lorox	50	DF	1	lb/a	PRE	1.3	100.0	5.0	0.0	0.0	3.1
9	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Sencor	75	DF	0.125	lb/a	PRE						
10	Sencor	75	DF	0.125	lb/a	PRE	0.0	100.0	2.5	0.0	0.0	0.0
10	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
10	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Sencor	75	DF	0.125	lb/a	PRE	1.3	100.0	3.8	0.0	0.0	0.0
11	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
11	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Roundup WeatherMax	4.5	L	22	fl oz/a	PRE						
11	Ammonium Sulfate	100	DF	17	lb/100 gal	PRE						
12	Lorox	50	DF	1	lb/a	PRE	1.3	100.0	6.3	0.0	0.8	0.0
12	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
12	Matrix	25	WG	1	oz/a	POST						
12	Activator 90		L	0.25	% v/v	POST						
13	Lorox	50	DF	1	lb/a	PRE	5.0	100.0	11.3	0.0	0.0	2.5
13	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
13	Matrix	25	WG	1	oz/a	POST						
13	Sencor	75	DF	0.33	lb/a	POST						
13	Activator 90		L	0.25	% v/v	POST						
14	KIH-485	85	WG	2.37	oz ai/a	PRE	1.3	100.0	2.5	0.0	0.0	0.0
15	Non-Treated						0.0	100.0	1.3	0.0	0.0	0.0
LSD (P=.05)							5.00	0.00	7.40	0.00	1.10	3.60
Standard Deviation							3.50	0.00	5.18	0.00	0.77	2.52
CV							210.1	0.0	147.87	0.0	577.39	242.08

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Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code											
Crop Code						1867	1922	1922	ATL	ATL	1867
Rating Data Type						Inj-Color	Inj-Stunt	Inj-Color	Inj-Stunt	Inj-Color	Inj-Stunt
Rating Unit						percent	percent	percent	percent	percent	percent
Rating Date						6/18/08	6/18/08	6/18/08	6/24/08	6/24/08	6/24/08
Trt-Eval Interval						21 DA-A	21 DA-A	21 DA-A	27 DA-A	27 DA-A	27 DA-A
Trt No. Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	19	20	21	22	23	24
1 Dual II Magnum	7.64	L	1.33	pt/a	PRE	1.3	0.0	1.3	0.0	0.0	0.0
2 Prowl H2O	3.8	L	1.5	pt/a	PRE	0.0	0.0	1.3	0.0	0.0	0.0
3 Sencor	75	DF	0.67	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
4 Lorox	50	DF	1	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
5 Matrix	25	WG	1.5	oz/a	PRE	3.0	0.0	0.0	0.0	0.0	0.0
6 Outlook	6	L	14	fl oz/a	PRE	0.0	1.3	0.0	0.0	0.0	0.0
7 V-10142	75	WG	8.5	oz/a	PRE	2.3	0.0	0.0	0.0	0.0	0.0
8 Lorox	50	DF	1	lb/a	PRE	0.8	0.0	0.0	0.0	0.0	2.5
8 Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9 Lorox	50	DF	1	lb/a	PRE	0.0	1.3	0.0	0.0	0.0	5.0
9 Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9 Sencor	75	DF	0.125	lb/a	PRE						
10 Sencor	75	DF	0.125	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
10 Dual II Magnum	7.64	L	1.33	pt/a	PRE						
10 Prowl H2O	3.8	L	0.5	pt/a	PRE						
11 Sencor	75	DF	0.125	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
11 Dual II Magnum	7.64	L	1.33	pt/a	PRE						
11 Prowl H2O	3.8	L	0.5	pt/a	PRE						
11 Roundup WeatherMax	4.5	L	22	fl oz/a	PRE						
11 Ammonium Sulfate	100	DF	17	lb/100 gal	PRE						
12 Lorox	50	DF	1	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
12 Dual II Magnum	7.64	L	1.33	pt/a	PRE						
12 Matrix	25	WG	1	oz/a	POST						
12 Activator 90		L	0.25	% v/v	POST						
13 Lorox	50	DF	1	lb/a	PRE	0.0	2.5	2.5	0.0	0.0	1.3
13 Dual II Magnum	7.64	L	1.33	pt/a	PRE						
13 Matrix	25	WG	1	oz/a	POST						
13 Sencor	75	DF	0.33	lb/a	POST						
13 Activator 90		L	0.25	% v/v	POST						
14 KIH-485	85	WG	2.37	oz ai/a	PRE	0.0	0.0	1.5	0.0	0.0	0.0
15 Non-Treated						0.0	0.0	0.0	0.0	0.0	0.0
LSD (P=.05)						2.19	2.30	2.26	0.00	0.00	2.06
Standard Deviation						1.53	1.61	1.58	0.00	0.00	1.44
CV						315.38	483.66	364.7	0.0	0.0	243.15

MSU Weed Science Research Program

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code												
Crop Code							1867	1922	1922	ATL	1867	1922
Rating Data Type							Inj-Color	Inj-Stunt	Inj-Color	Inj	injury	injury
Rating Unit							percent	percent	percent	percent	percent	percent
Rating Date							6/24/08	6/24/08	6/24/08	7/30/08	7/30/08	7/30/08
Trt-Eval Interval							27 DA-A	27 DA-A	27 DA-A	57 DA-A	57 DA-A	57 DA-A
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	25	26	27	28	29	30
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
2	Prowl H2O	3.8	L	1.5	pt/a	PRE	0.0	0.0	0.0	0.0	1.3	0.0
3	Sencor	75	DF	0.67	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
4	Lorox	50	DF	1	lb/a	PRE	0.0	0.0	0.0	0.0	1.3	0.0
5	Matrix	25	WG	1.5	oz/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
6	Outlook	6	L	14	fl oz/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
7	V-10142	75	WG	8.5	oz/a	PRE	0.0	0.0	0.0	0.0	1.6	0.0
8	Lorox	50	DF	1	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
8	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Lorox	50	DF	1	lb/a	PRE	0.0	3.8	0.0	0.0	0.0	0.0
9	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Sencor	75	DF	0.125	lb/a	PRE						
10	Sencor	75	DF	0.125	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
10	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
10	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Sencor	75	DF	0.125	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
11	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
11	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Roundup WeatherMax	4.5	L	22	fl oz/a	PRE						
11	Ammonium Sulfate	100	DF	17	lb/100 gal	PRE						
12	Lorox	50	DF	1	lb/a	PRE	0.0	0.0	0.0	0.0	0.9	0.0
12	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
12	Matrix	25	WG	1	oz/a	POST						
12	Activator 90		L	0.25	% v/v	POST						
13	Lorox	50	DF	1	lb/a	PRE	0.0	0.0	0.0	0.0	0.0	0.0
13	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
13	Matrix	25	WG	1	oz/a	POST						
13	Sencor	75	DF	0.33	lb/a	POST						
13	Activator 90		L	0.25	% v/v	POST						
14	KIH-485	85	WG	2.37	oz ai/a	PRE	0.0	0.0	0.0	0.0	0.8	0.0
15	Non-Treated						0.0	0.0	0.0	1.3	0.0	0.0
LSD (P=.05)							0.00	0.92	0.00	0.93	1.83	0.00
Standard Deviation							0.00	0.65	0.00	0.65	1.28	0.00
CV							0.0	258.2	0.0	783.99	335.26	0.0

MSU Weed Science Research Program

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code													
Crop Code								ATL	ATL	ATL	ATL	ATL	ATL
Rating Data Type								count	kg/plot	Count	Kg	Count	Kg
Rating Unit								A	A	B	B	Pick-out	Pick-out
Rating Date													
Trt-Eval Interval									HARVEST				
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg		31	32	33	34	35	36
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE		50.8	6.7763	4.8	0.1025	2.8	0.2075
2	Prowl H2O	3.8	L	1.5	pt/a	PRE		56.8	8.0188	4.0	0.0835	1.5	0.3100
3	Sencor	75	DF	0.67	lb/a	PRE		59.5	9.0013	4.5	0.0988	0.5	0.0875
4	Lorox	50	DF	1	lb/a	PRE		62.0	9.0213	3.5	0.0613	1.0	0.1150
5	Matrix	25	WG	1.5	oz/a	PRE		65.8	8.9113	3.3	0.0613	0.3	0.0500
6	Outlook	6	L	14	fl oz/a	PRE		66.5	9.3888	5.5	0.1138	0.5	0.1463
7	V-10142	75	WG	8.5	oz/a	PRE		50.0	6.8100	4.8	0.0963	0.5	0.0563
8	Lorox	50	DF	1	lb/a	PRE		58.8	9.2400	4.0	0.0813	0.3	0.0613
8	Dual II Magnum	7.64	L	1.33	pt/a	PRE							
9	Lorox	50	DF	1	lb/a	PRE		63.5	10.0913	6.3	0.1138	0.8	0.1513
9	Dual II Magnum	7.64	L	1.33	pt/a	PRE							
9	Sencor	75	DF	0.125	lb/a	PRE							
10	Sencor	75	DF	0.125	lb/a	PRE		53.8	7.9725	6.3	0.1313	1.5	0.3450
10	Dual II Magnum	7.64	L	1.33	pt/a	PRE							
10	Prowl H2O	3.8	L	0.5	pt/a	PRE							
11	Sencor	75	DF	0.125	lb/a	PRE		57.6	8.8302	2.8	0.0388	-0.1	-0.0132
11	Dual II Magnum	7.64	L	1.33	pt/a	PRE							
11	Roundup WeatherMax	4.5	L	22	fl oz/a	PRE							
11	Ammonium Sulfate	100	DF	17	lb/100 gal	PRE							
12	Lorox	50	DF	1	lb/a	PRE		56.8	8.2100	3.5	0.0688	0.3	0.0000
12	Dual II Magnum	7.64	L	1.33	pt/a	PRE							
12	Matrix	25	WG	1	oz/a	POST							
12	Activator 90		L	0.25	% v/v	POST							
13	Lorox	50	DF	1	lb/a	PRE		58.0	8.0200	4.8	0.0900	0.5	0.0700
13	Dual II Magnum	7.64	L	1.33	pt/a	PRE							
13	Matrix	25	WG	1	oz/a	POST							
13	Sencor	75	DF	0.33	lb/a	POST							
13	Activator 90		L	0.25	% v/v	POST							
14	KIH-485	85	WG	2.37	oz ai/a	PRE		58.5	7.6725	5.3	0.1013	0.8	0.1925
15	Non-Treated							56.5	8.2263	5.0	0.5800	0.5	0.0725
LSD (P=.05)								14.21	2.07016	4.89	0.41114	1.93	0.30793
Standard Deviation								9.94	1.44861	3.42	0.28770	1.35	0.21548
CV								17.06	17.22	75.38	236.81	178.12	174.54

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code Crop Code Rating Data Type Rating Unit Rating Date Trt-Eval Interval							ATL Count Oversize	ATL Kg Oversize	1867 Count A	1867 Kg A	1867 Count B	1867 Kg B
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	37	38	39	40	41	42
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE	2.8	0.58750	51.3	5.6075	4.8	0.1100
2	Prowl H2O	3.8	L	1.5	pt/a	PRE	4.5	1.56625	59.0	6.9050	7.8	0.1605
3	Sencor	75	DF	0.67	lb/a	PRE	5.8	1.86000	56.3	6.6788	4.3	0.1100
4	Lorox	50	DF	1	lb/a	PRE	3.3	1.04750	48.0	5.6763	3.5	0.0713
5	Matrix	25	WG	1.5	oz/a	PRE	3.0	0.99500	59.6	6.0081	8.7	0.2243
6	Outlook	6	L	14	fl oz/a	PRE	3.5	1.24250	55.5	5.5238	7.5	0.1600
7	V-10142	75	WG	8.5	oz/a	PRE	3.5	1.21625	38.0	2.6387	8.1	0.1672
8	Lorox	50	DF	1	lb/a	PRE	2.0	0.67375	46.5	6.0075	4.8	0.0875
8	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Lorox	50	DF	1	lb/a	PRE	4.5	1.23838	41.0	5.0363	5.5	0.1125
9	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
9	Sencor	75	DF	0.125	lb/a	PRE						
10	Sencor	75	DF	0.125	lb/a	PRE	3.5	1.20625	50.0	6.0438	4.5	0.2638
10	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
10	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Sencor	75	DF	0.125	lb/a	PRE	7.3	2.46385	55.4	6.1053	4.1	0.1006
11	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
11	Prowl H2O	3.8	L	0.5	pt/a	PRE						
11	Roundup WeatherMax	4.5	L	22	fl oz/a	PRE						
11	Ammonium Sulfate	100	DF	17	lb/100 gal	PRE						
12	Lorox	50	DF	1	lb/a	PRE	2.5	0.85875	38.4	3.3986	2.8	0.0589
12	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
12	Matrix	25	WG	1	oz/a	POST						
12	Activator 90		L	0.25	% v/v	POST						
13	Lorox	50	DF	1	lb/a	PRE	3.3	0.96375	47.8	4.8200	5.8	0.1425
13	Dual II Magnum	7.64	L	1.33	pt/a	PRE						
13	Matrix	25	WG	1	oz/a	POST						
13	Sencor	75	DF	0.33	lb/a	POST						
13	Activator 90		L	0.25	% v/v	POST						
14	KIH-485	85	WG	2.37	oz ai/a	PRE	3.8	1.27000	38.8	4.5625	5.3	0.1063
15	Non-Treated						2.8	0.86250	52.0	6.1650	3.0	0.0663
LSD (P=.05)							3.63	1.188389	13.92	2.43063	4.94	0.14644
Standard Deviation							2.54	0.831586	9.74	1.70086	3.46	0.10247
CV							68.41	69.1	19.81	31.43	64.69	79.17

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code											
Crop Code							1867	1867	1867	1867	1922
Rating Data Type							Count	Kg	Count	Kg	Count
Rating Unit							Pick-out	Pick-out	Oversize	Oversize	Grade A
Rating Date											
Trt-Eval Interval											
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	43	44	45	46	47
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE	0.0	0.0000	0.5	0.1663	43.8
2	Prowl H2O	3.8	L	1.5	pt/a	PRE	0.3	0.0038	0.0	0.0000	42.3
3	Sencor	75	DF	0.67	lb/a	PRE	0.0	0.0000	0.3	0.0825	46.3
4	Lorox	50	DF	1	lb/a	PRE	0.3	0.0225	1.3	0.4038	48.9
5	Matrix	25	WG	1.5	oz/a	PRE	0.0	0.0022	0.1	0.0308	48.8
6	Outlook	6	L	14	fl oz/a	PRE	0.0	0.0000	0.8	0.2225	37.8
7	V-10142	75	WG	8.5	oz/a	PRE	0.0	-0.0032	0.1	0.0197	37.8
8	Lorox	50	DF	1	lb/a	PRE	0.0	0.0000	0.5	0.1688	45.5
8	Dual II Magnum	7.64	L	1.33	pt/a	PRE					
9	Lorox	50	DF	1	lb/a	PRE	0.0	0.0000	0.5	0.1663	45.3
9	Dual II Magnum	7.64	L	1.33	pt/a	PRE					
9	Sencor	75	DF	0.125	lb/a	PRE					
10	Sencor	75	DF	0.125	lb/a	PRE	0.0	0.0000	0.8	0.2263	42.3
10	Dual II Magnum	7.64	L	1.33	pt/a	PRE					
10	Prowl H2O	3.8	L	0.5	pt/a	PRE					
11	Sencor	75	DF	0.125	lb/a	PRE	0.0	-0.0032	0.4	0.1013	41.5
11	Dual II Magnum	7.64	L	1.33	pt/a	PRE					
11	Prowl H2O	3.8	L	0.5	pt/a	PRE					
11	Roundup WeatherMax	4.5	L	22	fl oz/a	PRE					
11	Ammonium Sulfate	100	DF	17	lb/100 gal	PRE					
12	Lorox	50	DF	1	lb/a	PRE	0.0	-0.0032	0.1	0.0197	39.5
12	Dual II Magnum	7.64	L	1.33	pt/a	PRE					
12	Matrix	25	WG	1	oz/a	POST					
12	Activator 90		L	0.25	% v/v	POST					
13	Lorox	50	DF	1	lb/a	PRE	0.0	0.0000	0.0	0.0000	45.0
13	Dual II Magnum	7.64	L	1.33	pt/a	PRE					
13	Matrix	25	WG	1	oz/a	POST					
13	Sencor	75	DF	0.33	lb/a	POST					
13	Activator 90		L	0.25	% v/v	POST					
14	KIH-485	85	WG	2.37	oz ai/a	PRE	0.0	0.0000	0.0	0.0000	34.8
15	Non-Treated						0.5	0.0875	2.3	0.7000	43.5
LSD (P=.05)							0.35	0.04339	1.77	0.56244	11.75
Standard Deviation							0.25	0.03036	1.24	0.39357	8.22
CV							395.58	428.6	253.03	255.82	19.2

MSU Weed Science Research Program

TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code Crop Code Rating Data Type Rating Unit Rating Date Trt-Eval Interval							1922 Kg A	1922 Count B	1922 Kg B	1922 Count Pick-out	1922 Kg Pick-out	1922 Count Oversize
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	48	49	50	51	52	53
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE	6.29625050	6.5	0.1625	0.0	0.0000	0.0
2	Prowl H2O	3.8	L	1.5	pt/a	PRE	7.30500056	2.3	0.0538	0.0	0.0000	1.0
3	Sencor	75	DF	0.67	lb/a	PRE	7.44000128	2.3	0.0488	0.0	0.0000	0.5
4	Lorox	50	DF	1	lb/a	PRE	6.11934532	7.5	0.1779	1.3	0.1205	0.7
5	Matrix	25	WG	1.5	oz/a	PRE	6.81250068	4.3	0.1000	0.0	0.0000	0.3
6	Outlook	6	L	14	fl oz/a	PRE	4.87500049	2.5	0.0463	0.3	0.0550	1.3
7	V-10142	75	WG	8.5	oz/a	PRE	4.95875074	4.0	0.0738	0.0	0.0000	0.5
8 8	Lorox Dual II Magnum	50 7.64	DF L	1 1.33	lb/a pt/a	PRE PRE	6.50250118	4.0	0.0738	0.5	0.1275	1.3
9 9 9	Lorox Dual II Magnum Sencor	50 7.64 75	DF L DF	1 1.33 0.125	lb/a pt/a lb/a	PRE PRE PRE	7.19000078	3.0	0.0513	0.3	0.0350	1.5
10 10 10	Sencor Dual II Magnum Prowl H2O	75 7.64 3.8	DF L L	0.125 1.33 0.5	lb/a pt/a pt/a	PRE PRE PRE	6.58375091	5.5	0.1450	0.0	0.0000	1.5
11 11 11 11 11	Sencor Dual II Magnum Prowl H2O Roundup WeatherMax Ammonium Sulfate	75 7.64 3.8 4.5 100	DF L L L DF	0.125 1.33 0.5 22 17	lb/a pt/a pt/a fl oz/a lb/100 gal	PRE PRE PRE PRE PRE	6.12750067	4.5	0.1175	0.0	0.0000	1.0
12 12 12 12	Lorox Dual II Magnum Matrix Activator 90	50 7.64 25 	DF L WG L	1 1.33 1 0.25	lb/a pt/a oz/a % v/v	PRE PRE POST POST	4.94000055	2.3	0.0688	0.3	0.0425	0.5
13 13 13 13 13	Lorox Dual II Magnum Matrix Sencor Activator 90	50 7.64 25 75 	DF L WG DF L	1 1.33 1 0.33 0.25	lb/a pt/a oz/a lb/a % v/v	PRE PRE POST POST POST	5.69625053	4.5	0.0998	0.3	0.0538	0.8
14	KIH-485	85	WG	2.37	oz ai/a	PRE	4.97250034	3.0	0.0650	0.5	0.0588	0.3
15	Non-Treated						6.38750045	3.3	0.0575	0.0	0.0000	0.3
LSD (P=.05)							1.968304116	4.93	0.12280	0.90	0.11935	1.76
Standard Deviation							1.377339143	3.45	0.08593	0.63	0.08352	1.23
CV							22.41	87.42	96.09	284.84	254.08	165.02

MSU Weed Science Research Program
TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS, 2008

Trial ID: P0108 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code							
Crop Code							1922
Rating Data Type							Kg
Rating Unit							Oversize
Rating Date							
Trt-Eval Interval							
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	54
1	Dual II Magnum	7.64	L	1.33	pt/a	PRE	0.0000
2	Prowl H2O	3.8	L	1.5	pt/a	PRE	0.3950
3	Sencor	75	DF	0.67	lb/a	PRE	0.2425
4	Lorox	50	DF	1	lb/a	PRE	0.3727
5	Matrix	25	WG	1.5	oz/a	PRE	0.0963
6	Outlook	6	L	14	fl oz/a	PRE	0.5075
7	V-10142	75	WG	8.5	oz/a	PRE	0.1900
8	Lorox	50	DF	1	lb/a	PRE	0.4650
8	Dual II Magnum	7.64	L	1.33	pt/a	PRE	
9	Lorox	50	DF	1	lb/a	PRE	0.6313
9	Dual II Magnum	7.64	L	1.33	pt/a	PRE	
9	Sencor	75	DF	0.125	lb/a	PRE	
10	Sencor	75	DF	0.125	lb/a	PRE	0.6250
10	Dual II Magnum	7.64	L	1.33	pt/a	PRE	
10	Prowl H2O	3.8	L	0.5	pt/a	PRE	
11	Sencor	75	DF	0.125	lb/a	PRE	0.3975
11	Dual II Magnum	7.64	L	1.33	pt/a	PRE	
11	Prowl H2O	3.8	L	0.5	pt/a	PRE	
11	Roundup WeatherMax	4.5	L	22	fl oz/a	PRE	
12	Lorox	50	DF	1	lb/a	PRE	0.1950
12	Dual II Magnum	7.64	L	1.33	pt/a	PRE	
12	Matrix	25	WG	1	oz/a	POST	
12	Activator 90		L	0.25	% v/v	POST	
13	Lorox	50	DF	1	lb/a	PRE	0.3288
13	Dual II Magnum	7.64	L	1.33	pt/a	PRE	
13	Matrix	25	WG	1	oz/a	POST	
13	Sencor	75	DF	0.33	lb/a	POST	
13	Activator 90		L	0.25	% v/v	POST	
14	KIH-485	85	WG	2.37	oz ai/a	PRE	0.1075
15	Non-Treated						0.1150
LSD (P=.05)							0.73736
Standard Deviation							0.51597
CV							165.77

Michigan Potato Industry Commission

13109 Schavey Rd., Ste. 7   DeWitt, MI 48820   517.669.8377   Fax 517.669.8377
www.mipotato.com   email: info@mipotato.com

March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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HELP

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QUESTIONS

If you have any further questions, comments or concerns, please contact the Michigan Potato Industry Commission directly.

Michigan Potato Industry Commission
13109 Schavey Rd.
Suite # 7
DeWitt, MI 48820

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Funded by AgChem Industry

Weed Control in Potato with Reflex.

Wesley J. Everman and Andrew J. Chomas. Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824.

Interest in alternative herbicides for weed control has lead several companies to investigate potato tolerance to herbicides labeled in other row crops. A study was conducted at Montcalm Research Farm (MRF) and on a cooperator's farm near Stockbridge, MI to investigate the tolerance of potatoes to fomesafen (Reflex). The studies consisted of 12 treatments arranged in a randomized complete block design with four replications at MRF and three at Stockbridge. The treatments consisted of Reflex at 1 pt/A, Reflex at 2 pt/A, Dual Magnum at 1 pt/A, Reflex at 1 pt plus Dual Magnum at 1 pt, Boundary at 1.5 pt/A, Boundary at 1.5 pt plus Reflex at 1 pt, Boundary at 1.5 pt plus Reflex at 0.5 pt, Dual Magnum at 1 pt plus Sencor at 4 oz/A, Dual Magnum at 1 pt plus Matrix at 1 oz/A, Prowl H2O at 1.6 pt/A plus Reflex at 1 pt, and Prowl H2O at 1.6 pt plus Reflex at 2 pt. A non-treated control plot was included for comparison. Treatments were put out just prior to cracking at MRF and just after planting at Stockbridge. Data are presented by location. Timing of application was a major factor in weed control at the two locations. Reflex has postemergence activity on many weed species; however, common lambsquarters control was minimal when Reflex was applied as a delayed preemergence application (at cracking). Overall weed control was excellent at Stockbridge, and common lambsquarters control was enhanced at MRF when Boundary was added in combination with Reflex. It will be important to include a herbicide that provides postemergence control of common lambsquarters if Reflex is used as a delayed preemergence application. Potato tolerance was excellent at both locations, with no injury observed at either location.

WEED CONTROL IN POTATO WITH REFLEX, 2008

Trial ID: P0208 Study Dir.: Potato Commission
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Date Planted:	5/12/08	**Row Spacing:**	34 IN
Variety:	Snowden	**No. of Reps:**	4
Population:	9.5 in space	**% OM:**	1.6
Soil Type:	Loamy Sand	**pH:**	5.6
Plot Size:	10 **X** 20 **FT**	**Design:**	RANDOMIZED COMPLETE BLOCK

Tillage: Spring disk X3
Spring Chisel X 1
Cultivate X 1
Fertilizer: 12 gal 10-34-0 and 20 gal 19-17-0 on (5/12/08)
150 lbs 46-0-0 (6-17-08)
150 lbs 46-0-0 (6-27-08)

Crop	**Code**	**Common Name**
1.	SOLTU	POTATO

Application Description

	A
Application Timing:	PRE
Date Treated:	5/28/08
Time Treated:	11:55 AM
% Cloud Cover:	10
Air Temp., Unit:	72 F
% Relative Humidity:	54
Wind Speed/Unit/Dir:	0 mph
Soil Temp., Unit:	55 F
Soil/Leaf Surface M:	4 5
Soil Moist (1=w 5=d):	4

Crop Stage at Each Application

	A
Crop Name:	SOLTU

Application Equipment

Appl	**Sprayer Type**	**Speed MPH**	**Nozzle Type**	**Nozzle Size**	**Nozzle Height**	**Nozzle Spacing**	**Boom Width**	**GPA**	**Carrier**	**PSI**
A	Cub	3.5	FF	8003	18"	20"	120"	20	H20	30

MSU Weed Science Research Program

WEED CONTROL IN POTATO WITH REFLEX, 2008

Trial ID: P0208 Study Dir.: Potato Commission
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code							cheal	amare	abuth		cheal
Crop Code						SOLTU				SOLTU	
Rating Data Type						injury	control	control	control	injury	control
Rating Unit						percent	percent	percent	percent	percent	percent
Rating Date						6/10/08	6/10/08	6/10/08	6/10/08	6/24/08	6/24/08
Trt-Eval Interval						13 DAPRE	13 DAPRE	13 DAPRE	13 DAPRE	27 DAPRE	27 DAPRE
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit / Grow Stg	1	2	3	4	5	6
1	Untreated					0	0	0	0	0	0
2	Reflex	2	L	1	pt/a PRE	11	38	100	98	0	28
3	Reflex	2	L	2	pt/a PRE	3	56	75	98	0	53
4	Dual Magnum	7.62	L	1	pt/a PRE	4	5	33	25	0	35
5	Reflex	2	L	1	pt/a PRE	15	91	100	95	0	82
5	Dual Magnum	7.62	L	1	pt/a PRE						
6	Boundary	6.5	EC	1.5	pt/a PRE	5	89	100	100	0	75
7	Boundary	6.5	EC	1.5	pt/a PRE	16	100	100	100	0	93
7	Reflex	2	L	1	pt/a PRE						
8	Boundary	6.5	EC	1.5	pt/a PRE	15	100	100	99	0	93
8	Reflex	2	L	0.5	pt/a PRE						
9	Dual Magnum	7.62	L	1	pt/a PRE	4	81	100	99	0	74
9	Sencor	75	DF	4	oz/a PRE						
10	Dual Magnum	7.62	L	1	pt/a PRE	11	94	100	96	0	83
10	Matrix	25	WG	1	oz/a PRE						
11	Prowl H2O	3.8	L	1.6	pt/a PRE	9	75	100	95	0	63
11	Reflex	2	L	1	pt/a PRE						
12	Prowl H2O	3.8	L	1.6	pt/a PRE	8	75	100	98	0	71
LSD (P=.05)						9.0	20.1	28.0	21.6	0.0	14.8
Standard Deviation						6.2	13.9	19.4	15.0	0.0	10.3
CV						74.83	20.81	23.14	17.92	0.0	16.51

MSU Weed Science Research Program

WEED CONTROL IN POTATO WITH REFLEX, 2008

Trial ID: P0208 Study Dir.: Potato Commission
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code							amare	abuth		cheal		
Crop Code									SOLTU		SOLTU	SOLTU
Rating Data Type							control	control	injury	control	yield	YIELD
Rating Unit							percent	percent	percent	percent	lbs/plot	CWT
Rating Date							6/24/08	6/24/08	7/22/08	7/22/08	9/18/08	9/18/08
Trt-Eval Interval							27 DAPRE	27 DAPRE	55 DAPRE	55 DAPRE	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	7	8	9	10	11	12
1	Untreated						0	0	0	0	2.3	17.3
2	Reflex	2	L	1	pt/a	PRE	83	79	0	3	5.8	44.2
3	Reflex	2	L	2	pt/a	PRE	100	86	0	5	8.1	61.9
4	Dual Magnum	7.62	L	1	pt/a	PRE	87	60	0	0	2.5	18.8
5	Reflex	2	L	1	pt/a	PRE	100	95	0	65	29.0	222.5
5	Dual Magnum	7.62	L	1	pt/a	PRE						
6	Boundary	6.5	EC	1.5	pt/a	PRE	100	100	0	53	21.0	161.4
7	Boundary	6.5	EC	1.5	pt/a	PRE	100	100	0	94	45.1	346.3
7	Reflex	2	L	1	pt/a	PRE						
8	Boundary	6.5	EC	1.5	pt/a	PRE	100	100	0	91	37.2	285.6
8	Reflex	2	L	0.5	pt/a	PRE						
9	Dual Magnum	7.62	L	1	pt/a	PRE	100	100	0	28	17.6	134.9
9	Sencor	75	DF	4	oz/a	PRE						
10	Dual Magnum	7.62	L	1	pt/a	PRE	100	100	0	41	21.9	168.0
10	Matrix	25	WG	1	oz/a	PRE						
11	Prowl H2O	3.8	L	1.6	pt/a	PRE	100	98	0	8	17.4	133.4
11	Reflex	2	L	1	pt/a	PRE						
12	Prowl H2O	3.8	L	1.6	pt/a	PRE	100	100	0	18	9.2	70.7
12	Reflex	2	L	2	pt/a	PRE						
LSD (P=.05)							12.6	27.4	0.0	20.5	11.45	88.05
Standard Deviation							8.7	19.0	0.0	14.2	7.93	60.98
CV							9.79	22.37	0.0	42.18	43.95	43.95

ARM Action Codes

TY1 = 7.687068*[11]

WEED CONTROL IN POTATO WITH REFLEX, KRUMMER, 2008

Trial ID: P0708 Study Dir.:
Conducted: Investigator: Wesley Everman

Date Planted:	5/26/08	**Row Spacing:**	34 IN
Variety:	Snowden	**No. of Reps:**	3
Population:		**% OM:**	
Soil Type:		**pH:**	
Plot Size:	10 **X** 20 **FT**	**Design:**	RANDOMIZED COMPLETE BLOCK

Crop	Code	Common Name
1.	SOLTU	POTATO

Application Description

	A
Application Timing:	PRE
Date Treated:	5/29/08
Time Treated:	2:10 PM
Air Temp., Unit:	85 F
% Relative Humidity:	20
Wind Speed/Unit/Dir:	3 mph SW
Soil Temp., Unit:	64 F
Soil/Leaf Surface M:	4 5
Soil Moist (1=w 5=d):	4

Crop Stage at Each Application

	A
Crop Name:	SOLTU

Application Equipment

Appl	Sprayer Type	Speed MPH	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	GPA	Carrier	PSI
A	BKPK	3.5	FF	8003	18"	20"	100"	20	H20	30

WEED CONTROL IN POTATO WITH REFLEX, KRUMMER, 2008

Trial ID: P0708 Study Dir.:
Conducted: Investigator: Wesley Everman

Weed Code							solsa		solsa	solsa		
Crop Code								SOLTU			SOLTU	SOLTU
Rating Data Type							control	injury	control	control	growthcrack	yield
Rating Unit							percent	percent	percent	percent	1-5	lbs/plot
Rating Date							6/13/08	6/30/08	6/30/08	7/29/08	9/5/08	9/5/08
Trt-Eval Interval							15 DAPRE	32 DAPRE	32 DAPRE	61 DAPRE	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	1	2	3	4	5	6
1	Untreated						0.0	0.0	0.0	0.0	0	52.43
2	Reflex	2	L	1	pt/a	PRE	56.7	0.0	86.7	16.7	0	51.10
3	Reflex	2	L	2	pt/a	PRE	93.3	0.0	100.0	90.0	1	45.37
4	Dual Magnum	7.62	L	1	pt/a	PRE	91.3	0.0	94.7	65.0	1	43.57
5	Reflex	2	L	1	pt/a	PRE	95.0	0.0	93.3	73.3	1	48.13
5	Dual Magnum	7.62	L	1	pt/a	PRE						
6	Boundary	6.5	EC	1.5	pt/a	PRE	71.7	0.0	95.0	75.0	1	45.27
7	Boundary	6.5	EC	1.5	pt/a	PRE	88.3	1.7	95.0	76.7	1	50.43
7	Reflex	2	L	1	pt/a	PRE						
8	Boundary	6.5	EC	1.5	pt/a	PRE	88.3	0.0	93.3	56.7	1	45.17
8	Reflex	2	L	0.5	pt/a	PRE						
9	Dual Magnum	7.62	L	1	pt/a	PRE	81.7	0.0	88.3	58.3	1	52.33
9	Sencor	75	DF	4	oz/a	PRE						
10	Dual Magnum	7.62	L	1	pt/a	PRE	70.0	0.0	80.0	41.7	0	50.83
10	Matrix	25	WG	1	oz/a	PRE						
LSD (P=.05)							16.04	1.57	11.35	48.40	1.3	10.952
Standard Deviation							9.35	0.91	6.61	28.21	0.8	6.357
CV							12.7	547.72	8.0	50.99	117.62	13.12

MSU Weed Science Research Program

WEED CONTROL IN POTATO WITH REFLEX, KRUMMER, 2008

Trial ID: P0708 Study Dir.:

Conducted: Investigator: Wesley Everman

Weed Code						
Crop Code						SOLTU
Rating Data Type						YIELD
Rating Unit						CWT
Rating Date						9/5/08
Trt-Eval Interval						HARVEST

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	7
1	Untreated						201.6
2	Reflex	2	L	1	pt/a	PRE	196.4
4	Dual Magnum	7.62	L	1	pt/a	PRE	167.5
5	Reflex	2	L	1	pt/a	PRE	185.0
5	Dual Magnum	7.62	L	1	pt/a	PRE	
6	Boundary	6.5	EC	1.5	pt/a	PRE	174.0
7	Boundary	6.5	EC	1.5	pt/a	PRE	193.9
7	Reflex	2	L	1	pt/a	PRE	
8	Boundary	6.5	EC	1.5	pt/a	PRE	173.6
8	Reflex	2	L	0.5	pt/a	PRE	
9	Dual Magnum	7.62	L	1	pt/a	PRE	201.2
9	Sencor	75	DF	4	oz/a	PRE	
10	Dual Magnum	7.62	L	1	pt/a	PRE	195.4
10	Matrix	25	WG	1	oz/a	PRE	
LSD (P=.05)							42.10
Standard Deviation							24.44
CV							13.12

ARM Action Codes

TY1 = 3.843982*[C6]

Funded by MAES

Weed Control and Potato Crop Tolerance with V10142.

Wesley J. Everman and Andrew J. Chomas. Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824.

A study was conducted at Montcalm Research Farm in 2008 to determine weed control and potato tolerance to an experimental compound, V10142. V10142 is being evaluated as a preemergence and postemergence weed control option in potato. The only weed at high enough densities and evenly distributed throughout the plot was common lambsquarters. Control improved as rate increased, and tolerance of potatoes to V10142 was very good. There was minimal injury early in the season with greater injury observed at the highest rate; however, injury dissipated and was not significant 21 days after application. Results are presented in the following table.

WEED CONTROL AND POTATO CROP TOLERANCE WITH V10142

Trial ID: P0408 Study Dir.:
Conducted: MONTCALM RSH STA. Investigator: Wesley Everman

Date Planted:	5/12/08	**Row Spacing:**	34 IN
Variety:	Snowden	**No. of Reps:**	4
Population:	9.5 in space	**% OM:**	1.1
Soil Type:	Loamy Sand	**pH:**	5.1
Plot Size:	10 **X** 25 **FT**	**Design:**	RANDOMIZED COMPLETE BLOCK

Tillage: Spring disk X3
Spring Chisel X 1
Cultivate X 1
Fertilizer: 12 gal 10-34-0 and 20 gal 19-17-0 on (5/12/08)
150 lbs 46-0-0 (6-17-08)
150 lbs 46-0-0 (6-27-08)

Crop	**Code**	**Common Name**
1.	SOLTU	POTATO

Application Description

	A	**B**
Application Timing:	PRE	POST
Date Treated:	5/28/08	6/18/08
Time Treated:	10:45 AM	2:40 PM
% Cloud Cover:	10	100
Air Temp., Unit:	60 F	67 F
% Relative Humidity:	41	64
Wind Speed/Unit/Dir:	0 mph	6 mph W
Soil Temp., Unit:	58 F	66 F
Soil/Leaf Surface M:	4 5	4 5
Soil Moist (1=w 5=d):	4	4

Crop Stage at Each Application

	A	**B**
Crop Name:	SOLTU	SOLTU
Height (In.):		12

Application Equipment

Appl	**Sprayer Type**	**Speed MPH**	**Nozzle Type**	**Nozzle Size**	**Nozzle Height**	**Nozzle Spacing**	**Boom Width**	**GPA**	**Carrier**	**PSI**
A	CUB	3.5	FF	8003	18"	20"	120"	20	H20	30
B	CUB	3.5	FF	8003	18"	20"	100"	20	H20	30

WEED CONTROL AND POTATO CROP TOLERANCE WITH V10142

Trial ID: P0408 Study Dir.:
Conducted: MONTCALM RSH STA. Investigator: Wesley Everman

Weed Code								cheal		cheal		cheal
Crop Code							SOLTU		SOLTU		SOLTU	
Rating Data Type							injury	control	injury	control	injury	control
Rating Unit							percent	percent	percent	percent	percent	percent
Rating Date							6/10/08	6/10/08	6/24/08	6/24/08	7/8/08	7/8/08
Trt-Eval Interval							13 DAPRE	13 DAPRE	27 DAPRE	27 DAPRE	20 DAPO	20 DA-B
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	1	2	3	4	5	6
1	V-10142	75	WG	6.4	oz/a	PRE	0	74	0	60	0	73
2	V-10142	75	WG	8.5	oz/a	PRE	1	61	0	80	0	83
3	V-10142	75	WG	10.67	oz/a	PRE	10	80	0	79	1	81
4	V-10142	75	WG	6.4	oz/a	PRE	9	69	0	75	1	87
4	V-10142	75	WG	6.4	oz/a	POST						
4	Activator 90		L	0.25	% v/v	POST						
5	V-10142	75	WG	8.5	oz/a	PRE	9	58	3	80	0	88
5	V-10142	75	WG	8.5	oz/a	POST						
5	Activator 90		L	0.25	% v/v	POST						
6	V-10142	75	WG	10.67	oz/a	PRE	1	76	1	83	0	88
6	V-10142	75	WG	8.5	oz/a	POST						
6	Activator 90		L	0.25	% v/v	POST						
7	Untreated						4	6	0	0	0	8
8	V-10142	75	WG	6.4	oz/a	PRE	6	89	3	85	1	93
8	Dual Magnum	7.62	L	1	pt/a	PRE						
8	V-10142	75	WG	8.5	oz/a	POST						
8	Activator 90		L	0.25	% v/v	POST						
9	Matrix	25	WG	1	oz/a	PRE	10	98	0	92	0	94
9	Dual Magnum	7.62	L	1	pt/a	PRE						
9	Matrix	25	WG	1	oz/a	POST						
9	Activator 90		L	0.25	% v/v	POST						
10	Dual Magnum	7.62	L	1	pt/a	PRE	3	100	0	95	0	95
10	Sencor	75	DF	4	oz/a	PRE						
10	V-10142	75	WG	8.5	oz/a	POST						
10	Activator 90		L	0.25	% v/v	POST						
11	Dual Magnum	7.62	L	1	pt/a	PRE	14	100	3	98	1	95
11	Sencor	75	DF	4	oz/a	PRE						
11	Matrix	25	WG	1	oz/a	POST						
11	Activator 90		L	0.25	% v/v	POST						
12	Chateau	51	WG	1.5	oz/a	PRE	91	95	29	85	3	85
13	Dual Magnum	7.62	L	1	pt/a	PRE	1	35	0	55	0	44
14	Dual Magnum	7.62	L	1	pt/a	PRE	9	100	6	96	3	91
14	Reflex	2	L	1	pt/a	PRE						
15	Boundary	6.5	EC	1.5	pt/a	PRE	8	100	0	97	0	94
16	Boundary	6.5	EC	1.5	pt/a	PRE	6	100	3	98	0	93
16	Reflex	2	L	0.5	pt/a	PRE						

WEED CONTROL AND POTATO CROP TOLERANCE WITH V10142

Trial ID: P0408 Study Dir.:
Conducted: MONTCALM RSH STA. Investigator: Wesley Everman

Weed Code							cheal		cheal		cheal
Crop Code						SOLTU		SOLTU		SOLTU	
Rating Data Type						injury	control	injury	control	injury	control
Rating Unit						percent	percent	percent	percent	percent	percent
Rating Date						6/10/08	6/10/08	6/24/08	6/24/08	7/8/08	7/8/08
Trt-Eval Interval						13 DAPRE	13 DAPRE	27 DAPRE	27 DAPRE	20 DAPO	20 DA-B
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg 1	2	3	4	5	6
LSD (P=.05)						10.7	27.3	9.9	12.6	2.6	12.0
Standard Deviation						7.5	19.1	7.0	8.8	1.9	8.4
CV						66.19	24.64	240.62	11.21	312.26	10.4

WEED CONTROL AND POTATO CROP TOLERANCE WITH V10142

Trial ID: P0408 Study Dir.:
Conducted: MONTCALM RSH STA. Investigator: Wesley Everman

Weed Code						
Crop Code						SOLTU
Rating Data Type						Yield
Rating Unit						lbs/plot
Rating Date						9/12/08
Trt-Eval Interval						HARVEST
Trt No.	**Treatment Name**	**Form Conc**	**Form Type**	**Rate**	**Rate Unit**	**Grow Stg**	**7**
1	V-10142	75	WG	6.4	oz/a	PRE	32
2	V-10142	75	WG	8.5	oz/a	PRE	39
3	V-10142	75	WG	10.67	oz/a	PRE	41
4	V-10142	75	WG	6.4	oz/a	PRE	47
4	V-10142	75	WG	6.4	oz/a	POST	
4	Activator 90		L	0.25	% v/v	POST	
5	V-10142	75	WG	8.5	oz/a	PRE	42
5	V-10142	75	WG	8.5	oz/a	POST	
5	Activator 90		L	0.25	% v/v	POST	
6	V-10142	75	WG	10.67	oz/a	PRE	41
6	V-10142	75	WG	8.5	oz/a	POST	
6	Activator 90		L	0.25	% v/v	POST	
7	Untreated						9
8	V-10142	75	WG	6.4	oz/a	PRE	50
8	Dual Magnum	7.62	L	1	pt/a	PRE	
8	V-10142	75	WG	8.5	oz/a	POST	
8	Activator 90		L	0.25	% v/v	POST	
9	Matrix	25	WG	1	oz/a	PRE	51
9	Dual Magnum	7.62	L	1	pt/a	PRE	
9	Matrix	25	WG	1	oz/a	POST	
9	Activator 90		L	0.25	% v/v	POST	
10	Dual Magnum	7.62	L	1	pt/a	PRE	50
10	Sencor	75	DF	4	oz/a	PRE	
10	V-10142	75	WG	8.5	oz/a	POST	
10	Activator 90		L	0.25	% v/v	POST	
11	Dual Magnum	7.62	L	1	pt/a	PRE	55
11	Sencor	75	DF	4	oz/a	PRE	
11	Matrix	25	WG	1	oz/a	POST	
11	Activator 90		L	0.25	% v/v	POST	
12	Chateau	51	WG	1.5	oz/a	PRE	37
13	Dual Magnum	7.62	L	1	pt/a	PRE	24
14	Dual Magnum	7.62	L	1	pt/a	PRE	44
14	Reflex	2	L	1	pt/a	PRE	
15	Boundary	6.5	EC	1.5	pt/a	PRE	59
16	Boundary	6.5	EC	1.5	pt/a	PRE	53
16	Reflex	2	L	0.5	pt/a	PRE	

WEED CONTROL AND POTATO CROP TOLERANCE WITH V10142

Trial ID: P0408 Study Dir.:
Conducted: MONTCALM RSH STA. Investigator: Wesley Everman

Weed Code						
Crop Code						SOLTU
Rating Data Type						Yield
Rating Unit						lbs/plot
Rating Date						9/12/08
Trt-Eval Interval						HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	7
LSD (P=.05)						8.8
Standard Deviation						6.1
CV						14.56

Funded by MAES

Herbicide Timing Effect on Weed Control in Potato.

Wesley J. Everman and Andrew J. Chomas. Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824.

Herbicide application timing is an important consideration in any cropping system, and is of special importance in potatoes which have limited postemergence herbicide options. Through interactions with industry personnel and growers, it seems the common timing of preemergence herbicide application is often as near to potato cracking as possible, often with applications coming after potatoes have emerged. In order to determine what effect the timing of herbicide applications has on weed control and yield herbicide products were applied to Snowden. Herbicide treatments consisted of Dual II Magnum (1 pt/A) plus Lorox (1 lb/A), Dual II Magnum (1 pt/A) plus Lorox (1 lb/A) plus Sencor (0.125 lb/A), Dual II Magnum (1 pt/A) plus Lorox (1 lb/A) followed by Matrix (1 oz/A) plus NIS (0.25% v/v), and Dual II Magnum (1 pt/A) plus Lorox (1 lb/A) followed by Matrix (1 oz/A) plus Sencor (0.33 lb/A) plus NIS (0.25% v/v). Application timings were at planting 10 DAP and 21 DAP. All herbicide treatments were compared with a non-treated control treatment. Each treatment was replicated four times. Irrigation and other potato crop management practices utilized closely mirror practices followed by producers. Weed control was evaluated, and plots were harvested and marketable yields determined. Weed control was similar when herbicides were applied at 10 and 21 DAP, regardless of herbicides used or presence of a postemergence application. Similarly, at planting preemergence treatments that were followed by a postemergence application showed no differences in control or yield when compared to later application timings. The results of this initial study indicate that timing may not be as critical as previously believed. A follow-up study is planned for 2009.

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Date Planted:	5/12/08	**Row Spacing:**	34 IN
Variety:	Snowden	**No. of Reps:**	4
Population:	9.5 in space	**% OM:**	1.1
Soil Type:	Loamy Sand	**pH:**	5.1
Plot Size:	10 **X** 25 **FT**	**Design:**	FACTORIAL

Tillage: Spring disk X3
Spring Chisel X 1
Cultivate X 1
Fertilizer: 12 gal 10-34-0 and 20 gal 19-17-0 on (5/12/08)
150 lbs 46-0-0 (6-17-08)
150 lbs 46-0-0 (6-27-08)

Crop and Weed Description

Weed	**Code**	**Common Name**	**Scientific Name**
1.	CHEAL	LAMBSQUARTERS, COMMON	CHENOPODIUM ALBUM L.
Crop	**Code**	**Common Name**	
1.	SOLTU	POTATO	

Application Description

	A	**B**	**C**	**D**
Application Timing:	PRE	10 DAP	21 DAP	POST
Date Treated:	5/13/08	5/22/08	6/2/08	6/18/08
Time Treated:	5:36 PM	12:48 PM	10:35 AM	2:00 PM
% Cloud Cover:	45	75	15	100
Air Temp., Unit:	69 F	65 F	74 F	67 F
Wind Speed/Unit/Dir:	12 mph SE	1 mph W	7 mph W	6 mph W
Soil Temp., Unit:	63 F	57 F	64 F	66 F
Soil/Leaf Surface M:	4 5	4 5	4 5	4 5
Soil Moist (1=w 5=d):	4	4	4	4

Crop Stage at Each Application

	A	**B**	**C**	**D**
Crop Name:	SOLTU	SOLTU	SOLTU	SOLTU
Height (In.):			Cracking	12

Weed Stage at Each Application

	A	**B**	**C**	**D**
Weed 1 Name:	CHEAL	CHEAL	CHEAL	CHEAL
Height (In.):		Cot	.5-1(.5)	

Weed Density (plants/sq. ft.)

	1	**2**	**3**
Date:	5/13/08	5/22/08	6/2/08
Weed Name:	CHEAL	CHEAL	CHEAL
Density:		4	30

Application Equipment

Appl	**Sprayer Type**	**Speed MPH**	**Nozzle Type**	**Nozzle Size**	**Nozzle Height**	**Nozzle Spacing**	**Boom Width**	**GPA**	**Carrier**	**PSI**
A	BKPK	3.5	FF	8003	18	20	100	20	H20	30
B	BKPK	3.5	FF	8003	18	20	100	20	H20	30
C	BKPK	3.5	FF	8003	18	20	100	20	H20	30
D	BKPK	3.5	FF	8003	18	20	100	20	H20	30

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Weed Code								CHEAL	DIGSN		CHEAL	DIGSN	
Crop Code							SOLTU			SOLTU			SOLTU
Rating Data Type							Inj	Control	Control	Inj	Control	Control	<1 7/8"
Rating Unit							Percent	Percent	Percent	Percent	Percent	Percent	kilogram
Rating Date							6/18/08	6/18/08	6/18/08	6/24/08	6/24/08	6/24/08	9/11/08
Trt-Eval Interval							36 DAP	36 DAP	36 DAP	42 DAP	42 DAP	42 DAP	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	1	2	3	4	5	6	7
1	Planting						0.0	100.0	100.0	0.0	89.3	100.0	40.3
1	Dual Magnum	7.62	L	1	pt/a	0 DAP							
1	Lorox	50	DF	1	lb/a	0 DAP							
2	Planting						0.0	100.0	100.0	0.0	80.0	97.7	39.0
2	Dual Magnum	7.62	L	1	pt/a	0 DAP							
2	Lorox	50	DF	1	lb/a	0 DAP							
2	Sencor	75	DF	0.125	lb/a	0 DAP							
3	Planting						0.0	100.0	100.0	0.0	100.0	100.0	37.3
3	Dual Magnum	7.62	L	1	pt/a	0 DAP							
3	Lorox	50	DF	1	lb/a	0 DAP							
3	Matrix	25	WG	1	oz/a	POST							
3	Activator 90		L	0.25	% v/v	POST							
4	Planting						0.0	100.0	100.0	0.0	100.0	100.0	39.7
4	Dual Magnum	7.62	L	1	pt/a	0 DAP							
4	Lorox	50	DF	1	lb/a	0 DAP							
4	Sencor	75	DF	0.33	lb/a	POST							
4	Matrix	25	WG	1	oz/a	POST							
4	Activator 90		L	0.25	% v/v	POST							
5	10 DAP						0.0	100.0	100.0	0.0	95.0	100.0	38.7
5	Dual Magnum	7.62	L	1	pt/a	10 DAP							
5	Lorox	50	DF	1	lb/a	10 DAP							
6	10 DAP						0.0	100.0	100.0	0.0	97.3	100.0	37.3
6	Dual Magnum	7.62	L	1	pt/a	10 DAP							
6	Lorox	50	DF	1	lb/a	10 DAP							
6	Sencor	75	DF	0.125	lb/a	10 DAP							
7	10 DAP						0.0	100.0	100.0	0.0	99.0	100.0	45.3
7	Dual Magnum	7.62	L	1	pt/a	10 DAP							
7	Lorox	50	DF	1	lb/a	10 DAP							
7	Matrix	25	WG	1	oz/a	POST							
7	Activator 90		L	0.25	% v/v	POST							
8	10 DAP						0.0	100.0	100.0	0.0	99.3	100.0	40.7
8	Dual Magnum	7.62	L	1	pt/a	10 DAP							
8	Lorox	50	DF	1	lb/a	10 DAP							
8	Sencor	75	DF	0.33	lb/a	POST							
8	Matrix	25	WG	1	oz/a	POST							
8	Activator 90		L	0.25	% v/v	POST							
9	21 DAP						0.0	100.0	100.0	0.0	100.0	100.0	31.7
9	Dual Magnum	7.62	L	1	pt/a	21 DAP							
9	Lorox	50	DF	1	lb/a	21 DAP							
10	21 DAP						0.0	100.0	100.0	0.0	100.0	100.0	27.3
10	Dual Magnum	7.62	L	1	pt/a	21 DAP							
10	Lorox	50	DF	1	lb/a	21 DAP							
10	Sencor	75	DF	0.125	lb/a	21 DAP							

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Weed Code							CHEAL	DIGSN		CHEAL	DIGSN	
Crop Code						SOLTU			SOLTU			SOLTU
Rating Data Type						Inj	Control	Control	Inj	Control	Control	<1 7/8"
Rating Unit						Percent	Percent	Percent	Percent	Percent	Percent	kilogram
Rating Date						6/18/08	6/18/08	6/18/08	6/24/08	6/24/08	6/24/08	9/11/08
Trt-Eval Interval						36 DAP	36 DAP	36 DAP	42 DAP	42 DAP	42 DAP	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit / Grow Stg	1	2	3	4	5	6	7
11	21 DAP					0.0	100.0	100.0	0.0	100.0	100.0	27.3
11	Dual Magnum	7.62	L	1	pt/a 21 DAP							
11	Lorox	50	DF	1	lb/a 21 DAP							
11	Matrix	25	WG	1	oz/a POST							
11	Activator 90		L	0.25	% v/v POST							
12	21 DAP					0.0	100.0	100.0	0.0	100.0	100.0	23.3
12	Dual Magnum	7.62	L	1	pt/a 21 DAP							
12	Lorox	50	DF	1	lb/a 21 DAP							
12	Sencor	75	DF	0.33	lb/a POST							
12	Matrix	25	WG	1	oz/a POST							
12	Activator 90		L	0.25	% v/v POST							
LSD (P=.05)						0.00	0.00	0.00	0.00	8.84	1.23	21.93
Standard Deviation						0.00	0.00	0.00	0.00	5.22	0.73	12.95
CV						0.0	0.0	0.0	0.0	5.4	0.73	36.3

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Weed Code

Rating Data Type							<1 7/8"	pickout	pickout	oversize	cnt/oversiz
Rating Unit							count	count	kilogram	count	kilogram
Rating Date							9/11/08	9/11/08	9/11/08	9/11/08	9/11/08
Trt-Eval Interval							HARVEST	HARVEST	HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	8	9	10	11	12
1	Planting						1.7100	0.0	0.0000	2.3	0.77000006
1	Dual Magnum	7.62	L	1	pt/a	0 DAP					
1	Lorox	50	DF	1	lb/a	0 DAP					
2	Planting						1.7567	0.3	0.0367	0.7	0.19166668
2	Dual Magnum	7.62	L	1	pt/a	0 DAP					
2	Lorox	50	DF	1	lb/a	0 DAP					
2	Sencor	75	DF	0.125	lb/a	0 DAP					
3	Planting						1.6683	1.3	0.2250	4.3	1.56666676
3	Dual Magnum	7.62	L	1	pt/a	0 DAP					
3	Lorox	50	DF	1	lb/a	0 DAP					
3	Matrix	25	WG	1	oz/a	POST					
3	Activator 90		L	0.25	% v/v	POST					
4	Planting						1.6817	0.3	0.0567	2.0	0.68166674
4	Dual Magnum	7.62	L	1	pt/a	0 DAP					
4	Lorox	50	DF	1	lb/a	0 DAP					
4	Sencor	75	DF	0.33	lb/a	POST					
4	Matrix	25	WG	1	oz/a	POST					
4	Activator 90		L	0.25	% v/v	POST					
5	10 DAP						1.3367	0.3	0.0867	1.3	0.46333338
5	Dual Magnum	7.62	L	1	pt/a	10 DAP					
5	Lorox	50	DF	1	lb/a	10 DAP					
6	10 DAP						1.7233	0.0	0.0000	1.0	0.32333339
6	Dual Magnum	7.62	L	1	pt/a	10 DAP					
6	Lorox	50	DF	1	lb/a	10 DAP					
6	Sencor	75	DF	0.125	lb/a	10 DAP					
7	10 DAP						2.0083	1.0	0.1233	2.7	0.87500009
7	Dual Magnum	7.62	L	1	pt/a	10 DAP					
7	Lorox	50	DF	1	lb/a	10 DAP					
7	Matrix	25	WG	1	oz/a	POST					
7	Activator 90		L	0.25	% v/v	POST					
8	10 DAP						1.8167	0.3	0.0400	1.3	0.48333340
8	Dual Magnum	7.62	L	1	pt/a	10 DAP					
8	Lorox	50	DF	1	lb/a	10 DAP					
8	Sencor	75	DF	0.33	lb/a	POST					
8	Matrix	25	WG	1	oz/a	POST					
8	Activator 90		L	0.25	% v/v	POST					
9	21 DAP						1.4117	0.0	0.0000	1.3	0.46833338
9	Dual Magnum	7.62	L	1	pt/a	21 DAP					
9	Lorox	50	DF	1	lb/a	21 DAP					
10	21 DAP						1.2617	0.3	0.0350	2.3	0.77500011
10	Dual Magnum	7.62	L	1	pt/a	21 DAP					
10	Lorox	50	DF	1	lb/a	21 DAP					
10	Sencor	75	DF	0.125	lb/a	21 DAP					

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Weed Code										
Crop Code						SOLTU	SOLTU	SOLTU	SOLTU	SOLTU
Rating Data Type						<1 7/8"	pickout	pickout	oversize	cnt/oversiz
Rating Unit						count	count	kilogram	count	kilogram
Trt-Eval Interval						HARVEST	HARVEST	HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg 8	9	10	11	12
11	21 DAP					1.2150	0.0	0.0000	2.3	0.93000010
11	Dual Magnum	7.62	L	1	pt/a	21 DAP				
11	Lorox	50	DF	1	lb/a	21 DAP				
11	Matrix	25	WG	1	oz/a	POST				
11	Activator 90		L	0.25	% v/v	POST				
12	21 DAP					1.1600	0.7	0.1067	0.7	0.24166670
12	Dual Magnum	7.62	L	1	pt/a	21 DAP				
12	Lorox	50	DF	1	lb/a	21 DAP				
12	Sencor	75	DF	0.33	lb/a	POST				
12	Matrix	25	WG	1	oz/a	POST				
12	Activator 90		L	0.25	% v/v	POST				
LSD (P=.05)						0.97487	1.68	0.26388	3.20	1.117083423
Standard Deviation						0.57568	0.99	0.15583	1.89	0.659663564
CV						36.84	254.86	263.37	101.57	101.88

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Weed Code											
Crop Code							SOLTU	SOLTU	SOLTU	SOLTU	SOLTU
Rating Data Type							Grade A	Grade A	dry	wet	SPEC. GRAV
Rating Unit							count	kilogram			
Rating Date							9/11/08	9/11/08	9/11/08	9/11/08	9/11/08
Trt-Eval Interval							HARVEST	HARVEST	HARVEST	HARVEST	HARVEST
No.	Name	Conc	Type	Rate	Unit	Stg	13	14	15	16	17
1	Planting						139.7	17.4500006	9.82333472	0.749166742	1.0826051
1	Dual Magnum	7.62	L	1	pt/a	0 DAP					
1	Lorox	50	DF	1	lb/a	0 DAP					
2	Planting						149.3	17.7316683	10.33833512	0.778833408	1.0814252
2	Dual Magnum	7.62	L	1	pt/a	0 DAP					
2	Lorox	50	DF	1	lb/a	0 DAP					
2	Sencor	75	DF	0.125	lb/a	0 DAP					
3	Planting						154.0	21.4066699	10.34333428	0.784833450	1.0819204
3	Dual Magnum	7.62	L	1	pt/a	0 DAP					
3	Lorox	50	DF	1	lb/a	0 DAP					
3	Matrix	25	WG	1	oz/a	POST					
3	Activator 90		L	0.25	% v/v	POST					
4	Planting						117.7	18.3783340	9.70833399	0.742333427	1.0828034
4	Dual Magnum	7.62	L	1	pt/a	0 DAP					
4	Lorox	50	DF	1	lb/a	0 DAP					
4	Sencor	75	DF	0.33	lb/a	POST					
4	Matrix	25	WG	1	oz/a	POST					
4	Activator 90		L	0.25	% v/v	POST					
5	10 DAP						143.7	19.0166702	10.01833444	0.779500086	1.0846870
5	Dual Magnum	7.62	L	1	pt/a	10 DAP					
5	Lorox	50	DF	1	lb/a	10 DAP					
6	10 DAP						147.7	18.3816680	9.27500150	0.689833412	1.0804344
6	Dual Magnum	7.62	L	1	pt/a	10 DAP					
6	Lorox	50	DF	1	lb/a	10 DAP					
6	Sencor	75	DF	0.125	lb/a	10 DAP					
7	10 DAP						140.7	18.7166690	9.04500098	0.595666707	1.0716321
7	Dual Magnum	7.62	L	1	pt/a	10 DAP					
7	Lorox	50	DF	1	lb/a	10 DAP					
7	Matrix	25	WG	1	oz/a	POST					
7	Activator 90		L	0.25	% v/v	POST					
8	10 DAP						146.3	17.7033347	9.03500075	0.698333393	1.0837252
8	Dual Magnum	7.62	L	1	pt/a	10 DAP					
8	Lorox	50	DF	1	lb/a	10 DAP					
8	Sencor	75	DF	0.33	lb/a	POST					
8	Matrix	25	WG	1	oz/a	POST					
8	Activator 90		L	0.25	% v/v	POST					
9	21 DAP						116.0	14.1483350	8.96500105	0.674500056	1.0807029
9	Dual Magnum	7.62	L	1	pt/a	21 DAP					
9	Lorox	50	DF	1	lb/a	21 DAP					
10	21 DAP						123.7	16.6166685	8.64666739	0.618666711	1.0766995
10	Dual Magnum	7.62	L	1	pt/a	21 DAP					
10	Lorox	50	DF	1	lb/a	21 DAP					
10	Sencor	75	DF	0.125	lb/a	21 DAP					

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Weed Code											
Crop Code							SOLTU	SOLTU	SOLTU	SOLTU	SOLTU
Rating Data Type							Grade A	Grade A	dry	wet	SPEC. GRAV
Rating Unit							count	kilogram			
Rating Date							9/11/08	9/11/08	9/11/08	9/11/08	9/11/08
Trt-Eval Interval							HARVEST	HARVEST	HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	13	14	15	16	17
11	21 DAP						148.0	18.0666694	9.46500110	0.675000079	1.0764905
11	Dual Magnum	7.62	L	1	pt/a	21 DAP					
11	Lorox	50	DF	1	lb/a	21 DAP					
11	Matrix	25	WG	1	oz/a	POST					
11	Activator 90		L	0.25	% v/v	POST					
12	21 DAP						110.3	14.0066685	8.65000144	0.634000067	1.0785915
12	Dual Magnum	7.62	L	1	pt/a	21 DAP					
12	Lorox	50	DF	1	lb/a	21 DAP					
12	Sencor	75	DF	0.33	lb/a	POST					
12	Matrix	25	WG	1	oz/a	POST					
12	Activator 90		L	0.25	% v/v	POST					
LSD (P=.05)							68.95	6.06328882	2.151214815	0.1767161963	0.00886222
Standard Deviation							40.71	3.58051217	1.270342119	0.1043550029	0.00523334
CV							29.85	20.3	13.45	14.87	0.48

MICHIGAN POTATOES
MICHIGAN POTATO INDUSTRY COMMISSION

Michigan Potato Industry Commission

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www.mipotato.com email: info@mipotato.com

March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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HELP

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QUESTIONS

If you have any further questions, comments or concerns, please contact the Michigan Potato Industry Commission directly.

Michigan Potato Industry Commission
13109 Schavey Rd.
Suite # 7
DeWitt, MI 48820

(517) 669-8377

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Weed Code										
Crop Code							HH	VD	IBS	BC
Rating Data Type										
Rating Unit										
Rating Date							9/11/08	9/11/08	9/11/08	9/11/08
Trt-Eval Interval							HARVEST	HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	18	19	20	21
1	Planting						0.0	5.7	0.0	0.0
1	Dual Magnum	7.62	L	1	pt/a	0 DAP				
1	Lorox	50	DF	1	lb/a	0 DAP				
2	Planting						0.3	3.3	0.0	0.0
2	Dual Magnum	7.62	L	1	pt/a	0 DAP				
2	Lorox	50	DF	1	lb/a	0 DAP				
2	Sencor	75	DF	0.125	lb/a	0 DAP				
3	Planting						3.3	4.7	0.0	0.0
3	Dual Magnum	7.62	L	1	pt/a	0 DAP				
3	Lorox	50	DF	1	lb/a	0 DAP				
3	Matrix	25	WG	1	oz/a	POST				
3	Activator 90		L	0.25	% v/v	POST				
4	Planting						0.3	5.3	0.0	0.0
4	Dual Magnum	7.62	L	1	pt/a	0 DAP				
4	Lorox	50	DF	1	lb/a	0 DAP				
4	Sencor	75	DF	0.33	lb/a	POST				
4	Matrix	25	WG	1	oz/a	POST				
4	Activator 90		L	0.25	% v/v	POST				
5	10 DAP						0.7	4.3	0.0	0.0
5	Dual Magnum	7.62	L	1	pt/a	10 DAP				
5	Lorox	50	DF	1	lb/a	10 DAP				
6	10 DAP						0.0	4.0	0.0	0.0
6	Dual Magnum	7.62	L	1	pt/a	10 DAP				
6	Lorox	50	DF	1	lb/a	10 DAP				
6	Sencor	75	DF	0.125	lb/a	10 DAP				
7	10 DAP						0.0	5.0	0.3	0.0
7	Dual Magnum	7.62	L	1	pt/a	10 DAP				
7	Lorox	50	DF	1	lb/a	10 DAP				
7	Matrix	25	WG	1	oz/a	POST				
7	Activator 90		L	0.25	% v/v	POST				
8	10 DAP						0.7	6.3	0.0	0.0
8	Dual Magnum	7.62	L	1	pt/a	10 DAP				
8	Lorox	50	DF	1	lb/a	10 DAP				
8	Sencor	75	DF	0.33	lb/a	POST				
8	Matrix	25	WG	1	oz/a	POST				
8	Activator 90		L	0.25	% v/v	POST				
9	21 DAP						0.3	8.3	0.7	0.0
9	Dual Magnum	7.62	L	1	pt/a	21 DAP				
9	Lorox	50	DF	1	lb/a	21 DAP				
10	21 DAP						0.3	6.0	0.0	0.0
10	Dual Magnum	7.62	L	1	pt/a	21 DAP				
10	Lorox	50	DF	1	lb/a	21 DAP				
10	Sencor	75	DF	0.125	lb/a	21 DAP				

Potato Timing Study, Montcalm, 2008

Trial ID: P1108 Study Dir.:
Conducted: Montcalm Investigator: Wesley Everman

Weed Code										
Crop Code							HH	VD	IBS	BC
Rating Data Type										
Rating Unit										
Rating Date							9/11/08	9/11/08	9/11/08	9/11/08
Trt-Eval Interval							HARVEST	HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	18	19	20	21
11	21 DAP						0.3	5.7	0.0	0.0
11	Dual Magnum	7.62	L	1	pt/a	21 DAP				
11	Lorox	50	DF	1	lb/a	21 DAP				
11	Matrix	25	WG	1	oz/a	POST				
11	Activator 90		L	0.25	% v/v	POST				
12	21 DAP						0.0	5.3	0.0	0.0
12	Dual Magnum	7.62	L	1	pt/a	21 DAP				
12	Lorox	50	DF	1	lb/a	21 DAP				
12	Sencor	75	DF	0.33	lb/a	POST				
12	Matrix	25	WG	1	oz/a	POST				
12	Activator 90		L	0.25	% v/v	POST				
LSD (P=.05)							1.20	2.52	0.39	0.00
Standard Deviation							0.71	1.49	0.23	0.00
CV							134.65	27.93	276.34	0.0

ARM Action Codes

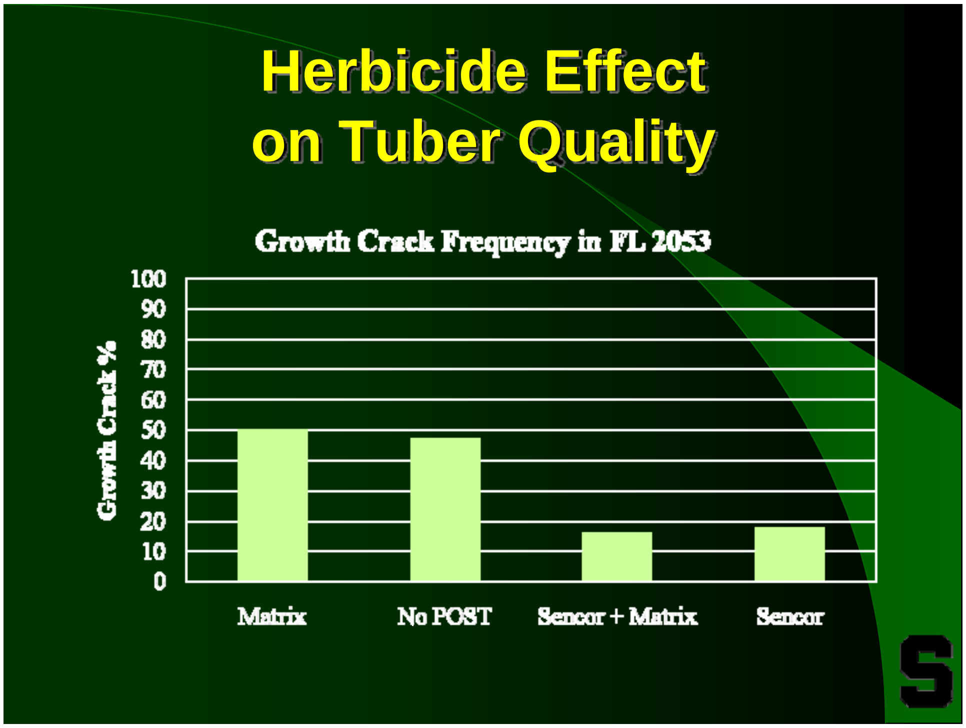
T1 = [C15]/([C15]-[C16])

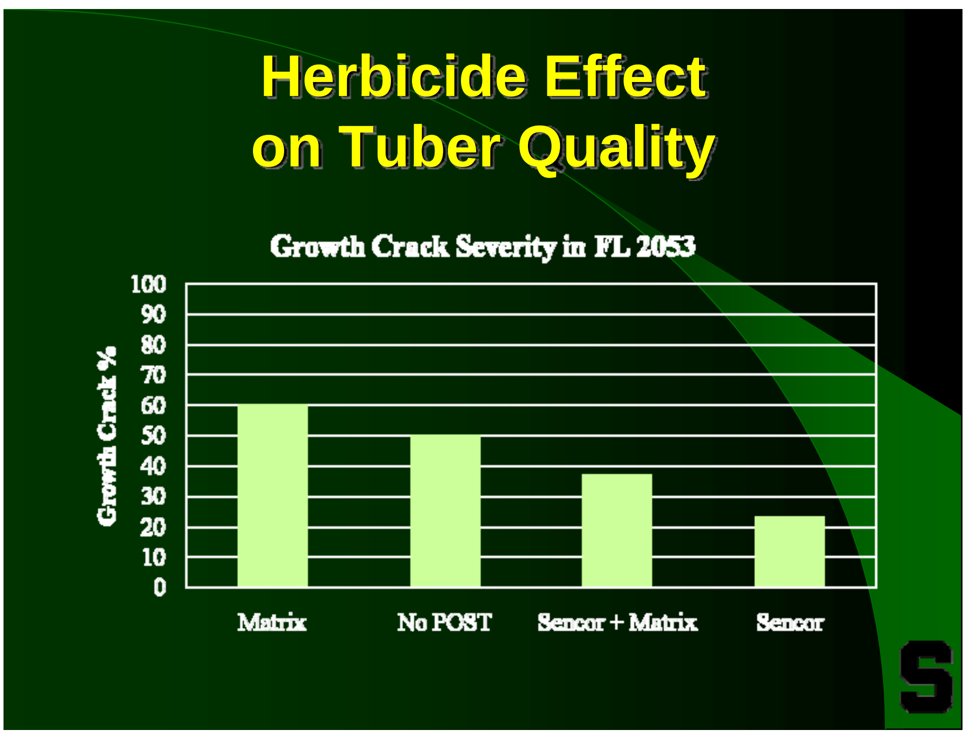
Funded by Industry

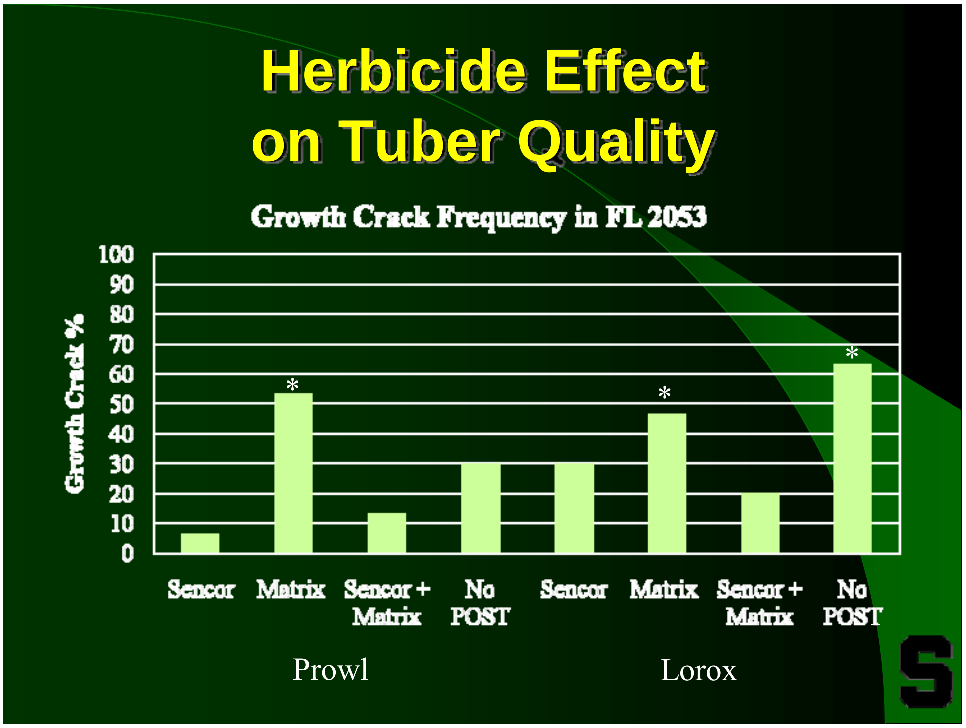
Herbicide Effect on Growth Cracks in FL2053 Potato.

Wesley J. Everman, Chris Long, and Andrew J. Chomas. Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824.

Herbicide growth cracks are a concern for potato producers, especially those growing the chipping variety FL2053. Due to concerns that herbicides may be contributing to the occurrence and severity of growth cracks in FL2053, a study was conducted near Three Rivers, MI in 2008 to investigate several herbicides applied to FL2053 both preemergence and postemergence. Preemergence herbicide treatments consisted of Dual Magnum at 1.33 pt/A plus Sencor at 0.33 lb/A plus Prowl H2O at 0.5 pt/A and ual Magnum at 1.33 pt/A plus Sencor at 0.33 lb/A plus Lorox at 1 pt/A. Postemergence herbicide options included Sencor at 0.33 lb/A plus NIS at 0.25%, Matrix at 1 oz/A plus NIS, Sencor at 0.33 lb plus Matrix at 1 oz plus NIS, or no POST herbicide. Treatments were applied in a factorial arrangement of PRE followed by POST herbicide options. Preemergence treatments were made after planting, and postemergence applications were made at canopy closure. Growth crack occurrence and severity were evaluated at harvest, after which tubers were graded. Initial results indicate there may be some effect of herbicides on growth crack occurrence and severity; however further studies are planned to provide definitive results.


Herbicide Effect
on Tuber Quality
Growth Crack Frequency in FL 2053
Growth Crack %
100
90
80
70
60
50
40
30
20
10
0
Matrix
No POST
Sencor + Matrix
Sencor


Herbicide Effect
on Tuber Quality
Growth Crack Severity in FL 2053
Growth Crack %
100
90
80
70
60
50
40
30
20
10
0
Matrix
No POST
Sencor + Matrix
Sencor


Herbicide Effect
on Tuber Quality
Growth Crack Frequency in FL 2053
Growth Crack %
100
90
80
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30
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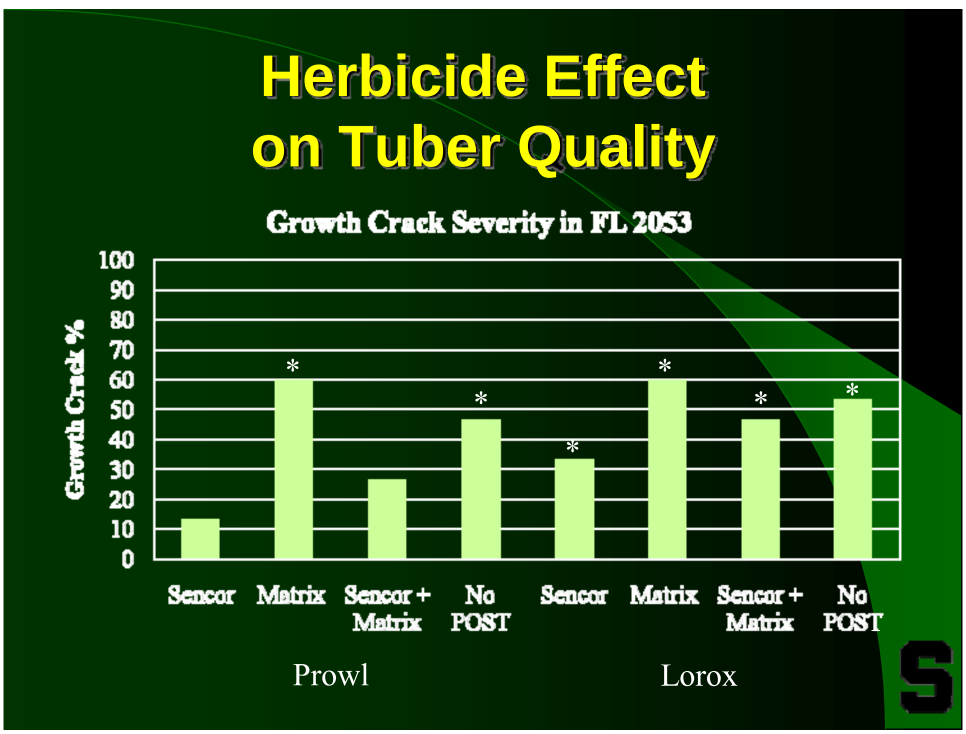
Sencor
Matrix
Sencor + Matrix
No POST
Sencor
Matrix
Sencor + Matrix
No POST
Prowl
Lorox


Herbicide Effect
on Tuber Quality
Growth Crack Severity in FL 2053
Growth Crack %
100
90
80
70
60
50
40
30
20
10
0
*
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*
*
Sencor
Matrix
Sencor + Matrix
No POST
Sencor
Matrix
Sencor + Matrix
No POST
Prowl
Lorox

Trial ID: P0608 Study Dir.: Andy Chomas
Conducted: Walther Fms Investigator: Wesley Everman

Date Planted: **Row Spacing:** IN
Variety: **No. of Reps:** 3
Population: 11 inch **% OM:**
Soil Type: **pH:**
Plot Size: 10 **X** 20 **FT** **Design:** FACTORIAL

Tillage: Fall Chisel, Spring Chisel
Fertilizer: 100# N at Planting, 130# N sidedress.

Crop	**Code**	**Common Name**
1.	SOLTU	POTATO

Application Description

	A	**B**
Application Timing:	PRE	POST
Date Treated:	4/30/08	6/19/08
Time Treated:	8:00 PM	9:00 AM
% Cloud Cover:	20	10
Air Temp., Unit:	56 F	70 F
% Relative Humidity:	52	53
Wind Speed/Unit/Dir:	0 mph SE	0 mph
Soil Temp., Unit:	15 c	17 c
Soil/Leaf Surface M:	5 5	4 3
Soil Moist (1=w 5=d):	5	4

Crop Stage at Each Application

	A	**B**
Crop Name:	SOLTU	SOLTU

Application Equipment

Appl	**Sprayer Type**	**Speed MPH**	**Nozzle Type**	**Nozzle Size**	**Nozzle Height**	**Nozzle Spacing**	**Boom Width**	**GPA**	**Carrier**	**PSI**
A	BKPK	3.5	FF	8003	20	20	100	20	H20	30
B	BKPK	3.5	FF	8003	18	20	100	20	H20	30

Comments: HH = Hollow Heart VD = Vascular Disease IBS Internal Brown Spot BC Bacterial Ring Rot

Water damage to plots 104, 108, 204,208,304 and 308

Trial ID: P0608 Study Dir.: Andy Chomas
Conducted: Walther Fms Investigator: Wesley Everman

Weed Code										
Crop Code						SOLTU	SOLTU	Grade B	Grade B	Pick-out	Pick-out
Rating Data Type						occurance	severity	count	weight/plot	weight/plot	weight/plot
Rating Unit						1-5	1-5	number	kilogram	count	kilogram
Rating Date						9/12/08	9/12/08	9/12/08	9/12/08	9/12/08	9/12/08
Trt-Eval Interval						HARVEST	HARVEST	HARVEST	HARVEST	HARVEST	HARVEST

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	1	2	3	4	5	6
1	Dual Magnum	7.62	EC	1.33	pt/a	PRE	0	1	12	0.617	2	0
1	Sencor	75	DF	0.33	lb/a	PRE						
1	Prowl H2O	3.8	L	0.5	pt/a	PRE						
1	Sencor	75	DF	0.33	lb/a	POST						
1	Activator 90		L	0.25	% v/v	POST						
2	Dual Magnum	7.62	EC	1.33	pt/a	PRE	3	3	12	0.672	7	2
2	Sencor	75	DF	0.33	lb/a	PRE						
2	Prowl H2O	3.8	L	0.5	pt/a	PRE						
2	Matrix	25	WG	1	oz/a	POST						
2	Activator 90		L	0.25	% v/v	POST						
3	Dual Magnum	7.62	EC	1.33	pt/a	PRE	1	1	7	0.319	1	0
3	Sencor	75	DF	0.33	lb/a	PRE						
3	Prowl H2O	3.8	L	0.5	pt/a	PRE						
3	Sencor	75	DF	0.33	lb/a	POST						
3	Matrix	25	WG	1	oz/a	POST						
3	Activator 90		L	0.25	% v/v	POST						
4	Dual Magnum	7.62	EC	1.33	pt/a	PRE	2	2	17	0.846	6	1
4	Sencor	75	DF	0.33	lb/a	PRE						
4	Prowl H2O	3.8	L	0.5	pt/a	PRE						
4	Non-Treated											
5	Dual Magnum	7.62	EC	1.33	pt/a	PRE	2	2	37	0.768	5	1
5	Sencor	75	DF	0.33	lb/a	PRE						
5	Lorox	50	DF	1	lb/a	PRE						
5	Sencor	75	DF	0.33	lb/a	POST						
5	Activator 90		L	0.25	% v/v	POST						
6	Dual Magnum	7.62	EC	1.33	pt/a	PRE	2	3	12	0.637	9	2
6	Sencor	75	DF	0.33	lb/a	PRE						
6	Lorox			1	pt/a	PRE						
6	Matrix	25	WG	1	oz/a	POST						
6	Activator 90		L	0.25	% v/v	POST						
7	Dual Magnum	7.62	EC	1.33	pt/a	PRE	1	2	9	0.513	4	1
7	Sencor	75	DF	0.33	lb/a	PRE						
7	Lorox	50	DF	1	lb/a	PRE						
7	Sencor	75	DF	0.33	lb/a	POST						
7	Matrix	25	WG	1	oz/a	POST						
7	Activator 90		L	0.25	% v/v	POST						
8	Dual Magnum	7.62	EC	1.33	pt/a	PRE	3	3	8	0.371	12	3
8	Sencor	75	DF	0.33	lb/a	PRE						
8	Lorox	50	DF	1	lb/a	PRE						
8	Non-Treated											
LSD (P=.05)							1.5	1.6	23.2	0.3669	6.1	1.9
Standard Deviation							0.9	0.9	13.3	0.2095	3.5	1.1
CV							51.83	41.83	92.85	35.34	60.16	75.96

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Trial ID:  P0608                Study Dir.: Andy Chomas
Conducted: Walther Fms        Investigator: Wesley Everman
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Weed Code Crop Code Rating Data Type Rating Unit Rating Date Trt-Eval Interval							Oversize weight/plot count 9/12/08 HARVEST	Oversize weight/plot kilogram 9/12/08 HARVEST	Grade A weight/plot count 9/12/08 HARVEST	Grade A weight/plot kilogram 9/12/08 HARVEST	Wet weight/plot kilogram 9/12/08 HARVEST	HH defect of ten 9/12/08 HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	7	8	9	10	11	12
1	Dual Magnum	7.62	EC	1.33	pt/a	PRE	7	2.416	51	8.954	0.799	0
1	Sencor	75	DF	0.33	lb/a	PRE						
1	Prowl H2O	3.8	L	0.5	pt/a	PRE						
1	Sencor	75	DF	0.33	lb/a	POST						
1	Activator 90		L	0.25	% v/v	POST						
2	Dual Magnum	7.62	EC	1.33	pt/a	PRE	9	3.266	56	9.376	0.768	0
2	Sencor	75	DF	0.33	lb/a	PRE						
2	Prowl H2O	3.8	L	0.5	pt/a	PRE						
2	Matrix	25	WG	1	oz/a	POST						
2	Activator 90		L	0.25	% v/v	POST						
3	Dual Magnum	7.62	EC	1.33	pt/a	PRE	6	2.436	35	6.621	0.523	0
3	Sencor	75	DF	0.33	lb/a	PRE						
3	Prowl H2O	3.8	L	0.5	pt/a	PRE						
3	Sencor	75	DF	0.33	lb/a	POST						
3	Matrix	25	WG	1	oz/a	POST						
3	Activator 90		L	0.25	% v/v	POST						
4	Dual Magnum	7.62	EC	1.33	pt/a	PRE	6	2.018	45	7.073	0.527	0
4	Sencor	75	DF	0.33	lb/a	PRE						
4	Prowl H2O	3.8	L	0.5	pt/a	PRE						
4	Non-Treated											
5	Dual Magnum	7.62	EC	1.33	pt/a	PRE	22	8.740	48	8.002	0.703	0
5	Sencor	75	DF	0.33	lb/a	PRE						
5	Lorox	50	DF	1	lb/a	PRE						
5	Sencor	75	DF	0.33	lb/a	POST						
5	Activator 90		L	0.25	% v/v	POST						
6	Dual Magnum	7.62	EC	1.33	pt/a	PRE	6	2.349	34	5.350	0.490	1
6	Sencor	75	DF	0.33	lb/a	PRE						
6	Lorox			1	pt/a	PRE						
6	Matrix	25	WG	1	oz/a	POST						
6	Activator 90		L	0.25	% v/v	POST						
7	Dual Magnum	7.62	EC	1.33	pt/a	PRE	14	5.307	46	8.263	0.659	0
7	Sencor	75	DF	0.33	lb/a	PRE						
7	Lorox	50	DF	1	lb/a	PRE						
7	Sencor	75	DF	0.33	lb/a	POST						
7	Matrix	25	WG	1	oz/a	POST						
7	Activator 90		L	0.25	% v/v	POST						
8	Dual Magnum	7.62	EC	1.33	pt/a	PRE	14	5.354	33	5.626	0.440	0
8	Sencor	75	DF	0.33	lb/a	PRE						
8	Lorox	50	DF	1	lb/a	PRE						
8	Non-Treated											
LSD (P=.05)							11.5	4.5800	25.3	4.2448	0.4454	0.8
Standard Deviation							6.5	2.6151	14.4	2.4237	0.2543	0.4
CV							62.54	65.61	33.2	32.72	41.43	261.86

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Trial ID:  P0608                  Study Dir.: Andy Chomas
Conducted: Walther Fms          Investigator: Wesley Everman
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							VD	IBS	BC
Weed Code									
Crop Code							VD	IBS	BC
Rating Data Type							defect	defect	defect
Rating Unit							of ten	of ten	of ten
Rating Date							9/12/08	9/12/08	9/12/08
Trt-Eval Interval							HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	13	14	15
1	Dual Magnum	7.62	EC	1.33	pt/a	PRE	0	0	0
1	Sencor	75	DF	0.33	lb/a	PRE			
1	Prowl H2O	3.8	L	0.5	pt/a	PRE			
1	Sencor	75	DF	0.33	lb/a	POST			
1	Activator 90		L	0.25	% v/v	POST			
2	Dual Magnum	7.62	EC	1.33	pt/a	PRE	0	0	1
2	Sencor	75	DF	0.33	lb/a	PRE			
2	Prowl H2O	3.8	L	0.5	pt/a	PRE			
2	Matrix	25	WG	1	oz/a	POST			
2	Activator 90		L	0.25	% v/v	POST			
3	Dual Magnum	7.62	EC	1.33	pt/a	PRE	0	1	0
3	Sencor	75	DF	0.33	lb/a	PRE			
3	Prowl H2O	3.8	L	0.5	pt/a	PRE			
3	Sencor	75	DF	0.33	lb/a	POST			
3	Matrix	25	WG	1	oz/a	POST			
3	Activator 90		L	0.25	% v/v	POST			
4	Dual Magnum	7.62	EC	1.33	pt/a	PRE	1	0	0
4	Sencor	75	DF	0.33	lb/a	PRE			
4	Prowl H2O	3.8	L	0.5	pt/a	PRE			
4	Non-Treated								
5	Dual Magnum	7.62	EC	1.33	pt/a	PRE	0	0	0
5	Sencor	75	DF	0.33	lb/a	PRE			
5	Lorox	50	DF	1	lb/a	PRE			
5	Sencor	75	DF	0.33	lb/a	POST			
5	Activator 90		L	0.25	% v/v	POST			
6	Dual Magnum	7.62	EC	1.33	pt/a	PRE	0	0	0
6	Sencor	75	DF	0.33	lb/a	PRE			
6	Lorox			1	pt/a	PRE			
6	Matrix	25	WG	1	oz/a	POST			
6	Activator 90		L	0.25	% v/v	POST			
7	Dual Magnum	7.62	EC	1.33	pt/a	PRE	0	0	0
7	Sencor	75	DF	0.33	lb/a	PRE			
7	Lorox	50	DF	1	lb/a	PRE			
7	Sencor	75	DF	0.33	lb/a	POST			
7	Matrix	25	WG	1	oz/a	POST			
7	Activator 90		L	0.25	% v/v	POST			
8	Dual Magnum	7.62	EC	1.33	pt/a	PRE	0	0	0
8	Sencor	75	DF	0.33	lb/a	PRE			
8	Lorox	50	DF	1	lb/a	PRE			
8	Non-Treated								
LSD (P=.05)							1.0	0.6	0.9
Standard Deviation							0.6	0.3	0.5
CV							267.05	207.02	242.84

Funding: MPIC

Host Plant Resistance and Reduced Rates and Frequencies of Fungicide Application to Control Potato Late Blight (2008).

W.W. Kirk[1], D.S. Douches[2] [1]Plant Pathology, [2]Crop and Soil Sciences, Michigan State University.

Late blight of potato caused by *Phytophthora infestans* (Mont de Bary), is a major threat to the production of high quality potatoes. Unchecked, *P. infestans* can rapidly defoliate plants in the field and can infect potato tubers when spores are washed into the soil. Potato late blight control strategies changed following the migration of mefenoxam/metalaxyl-resistant populations of *P. infestans* from Mexico to North America and necessitate cultural control methods and crop protection strategies that rely primarily on protectant foliar fungicide applications. There are several potential methods for reducing fungicide inputs in potato crop management. These include the use of fungicides with less active ingredient, reduced application rates, longer application intervals and a combination of any of these strategies. There are currently few late blight resistant potato cultivars that meet commercial standards in the United States. Typical fungicide application programs use a 5-7 day spray interval depending on environmental conditions and grower preference. The frequent fungicide spray intervals and rates currently used by growers to control late blight are expensive and more economical control measures are needed.

Therefore, the objective of this research was to determine if acceptable control of foliar late blight can be achieved by using increased fungicide spray intervals and reduced application rates of residual contact fungicides on potato germplasm with a range of susceptibility to late blight developed at the potato breeding program in Michigan.

MATERIALS AND METHODS

Potato Germplasm, agronomy and experimental design

Previous experiments from the MSU breeding program identified potato cultivars and advanced breeding lines (ABL) with different responses to foliar late blight. In this trial, ABL incorporating the RB gene for potato late blight resistance were included.

All experiments were conducted at the Michigan State University Muck Soils Research Station, Bath, MI (90% organic muck soil). Soils were plowed to 9" cm depth during Oct following harvest of preceding crops. Soils were prepared for planting with a mechanical cultivator in early May and fertilizer applied during final bed preparation on the day of planting. Cultivars/ABL were planted on 25 May, 2008 in two-row by 50 ft plots (34" row spacing). The experimental design for the fungicide application interval and reduced dose rate trials was a split plot randomized block design with four replications. Fertilizers were applied in accordance with results from soil testing carried out in the spring of each year and about 200 cwt N/A (total N) was applied in two equal doses at planting and hilling. Additional micronutrients were applied according to petiole sampling recommendations and in all years. Approximately 0.2, 0.3 and 0.2 cwt/A boron, manganese and magnesium, respectively were applied as chelated formulations. Cut and whole seed pieces (2.5-5.0 oz) of selected cultivars and ABL were used in all experiments.

When relative humidity (RH) dipped below 80% (measured with RH sensors mounted within the canopy, described below), a mist irrigation system (described below) was turned on to maintain RH at >95% within the plant canopy. Plots were irrigated as necessary to maintain canopy and soil moisture conditions conducive for development of foliar late blight with turbine rotary garden sprinklers (Gilmour Group, Somerset, PA, U.S.A.) at 112 gal H_2O A/hr and managed under standard potato agronomic practices. Weeds were controlled by hilling and with Dual 8E (2 pt/A on 28 Jun), Basagran (2 pt/A on 28 Jun and 25 Jul) and Poast (1.5 pt/A on 25 Jul). Insects were controlled with Admire 2F (20 fl oz/A at planting on 28 Jun), Sevin 80S (1.25 lb/A on 11 and 25 Jul), Thiodan 3EC (2.33 pt/A on 1 and 21 Aug) and Pounce 3.2EC (8 oz/A on 25 Jul).

Funding: MPIC

Residual Contact Fungicides

Bravo WS 6SC (active ingredient, chlorothalonil; Syngenta) was used for this experiment. Fungicides were applied with an ATV rear-mounted spray boom (R&D Sprayers, Opelousas, LA) 20 gal H_2O/A (80 psi pressure) with three XR11003VS nozzles per row positioned 12" apart and 18" above the canopy. In the fungicide application interval and reduced dose rates trial, chlrothalonil was applied at 7 and 14 day intervals at 0, 50 and 100% MRAR to the ABL and cultivars described in Figure 1. The first fungicide application occurred at 36 days after planting (DAP; 30 Jun, 2008) when potato plants were approximately 6" tall. Fungicides were applied until non-treated plots of susceptible controls reached about 100% diseased foliar area (10 Sep). The 7 and 14-day interval treatments received eight and four applications in 2008, respectively.

Pathogen Preparation and Inoculation.

Zoospore suspensions were made from *P. infestans* cultures of several isolates from different genetic backgrounds, including (US8 and US14 genotypes, insensitive to mefenoxam/metalaxyl, A2 mating types) grown on rye agar plates for 14 days in the dark at 15^oC. Sporangia were harvested from the rye agar plates by rinsing the mycelial/sporangial mat in cold (4^oC) sterile, distilled water and scraping the mycelial/sporangial mat from the agar surface with a rubber policeman. The mycelial/sporangial suspension was stirred with a magnetic stirrer for 1 hour. The suspension was strained through four layers of cheesecloth and the concentration of sporangia was adjusted to about 1 x 10^2 sporangia/fl oz using a hemacytometer. Sporangial cultures were incubated for 2-3 hours at 40^oF to stimulate zoospore release. All plots were inoculated simultaneously through an overhead sprinkler irrigation system, on 28 Jul, 2008; by injecting the zoospore suspension of *P. infestans* into the irrigation water feed pipeline at 20 psi CO_2 pressure and applied at a rate of about at 10^4 spores/fl oz over the whole trial area. The amount and rate of inoculum applied was estimated from prior calibration of the irrigation system (described above) and was intended to expose all potato foliage to inoculum of *P. infestans*.

Disease Evaluation and Data Analysis

As soon as late blight symptoms were detected (about 30 days after inoculation, DAI), each plant within each plot was visually rated at 7 day intervals for percent leaf and stem (foliar) area with late blight lesions on 28 Aug and 5 and 10 Sep [21 days after final application (DAFA), 42 DAI in 2008] when there was about 100% foliar infection in the untreated plots of susceptible varieties. The mean percent blighted foliar area per treatment was calculated. In the present study, any cultivar/ABL with foliar late blight severity measured as the Relative Area Under the Disease Progress Curve [RAUDPC] value that was not significantly higher than that of Torridon was classified as late blight resistant (R). Any cultivar/ABL with a RAUDPC value significantly higher than that of Snowden or with a RAUDPC value that was not statistically different from that of Atlantic was classified as late blight susceptible (S). Cultivars/ABLs were classified as moderately resistant (I) if the RAUDPC value was significantly higher than that of Torridon but significantly lower than that of Snowden. The cultivars/ABLs included in the trials from 2005 are shown in Table 1.

Fungicide treatments were classified into three groups within each cultivar; non-effective if the RAUDPC was not significantly different from the non-treated control (NE); partially effective if significantly less than the non-treated control and significantly greater than the 100% MRAR, 5-day frequency application (PE); and effective if the RAUDPC was not significantly different from 100% MRAR, 5-day frequency application (E).

Microclimate Measurement

Climatic variables were measured with a Campbell Weather Station equipped with air temperature and humidity sensors located within the potato canopy on site. Microclimate within the potato canopy was monitored beginning when 50% of the potato plants had emerged and ending

Funding: MPIC

when canopies of healthy plants reached 100% senescence. The Wallin Late Blight Prediction Model was developed in the Eastern United States under conditions similar to those in Michigan and was adapted to local conditions. Late blight disease severity values (DSV) were estimated from the Wallin Late Blight Prediction Model and accumulated from inoculation to final evaluation to estimate the conduciveness of the environment for late blight development.

RESULTS

Microclimate conditions

Late blight developed slowly during August due to high temperatures; non-treated susceptible controls reached about 100% diseased foliar area 42 DAI. Meteorological variables were measured with a Campbell weather station located at the farm, latitude 42.8269 and longitude -84.365deg. Maximum, minimum and average daily air temperature (^{o}F) were 81.2, 25.3 and 53.1 and 0-d with maximum temperature >90^{o}F (May); 91.9, 39.6 and 66.7 and 1-d with maximum temperature >90^{o}F (Jun); 89.9, 38.3 and 68.5 and 0-d with maximum temperature >90^{o}F (Jul); 87.9, 35.5 and 65.6 and 0-d with maximum temperature >90^{o}F (Aug); 91.7, 33.3 and 59.3 and 1-d with maximum temperature >90^{o}F (Sep). Maximum, minimum and average daily soil temperature (^{o}F) were 78.0, 41.4 and 58.1 (May); 81.6, 52.6 and 67.7 (Jun); 82.2, 55.8 and 71.1 (Jul); 85.7, 55.2 and 71.4 (Aug); 81.8, 51.6 and 65.3 (Sep). Maximum, minimum and average soil moisture (% of field capacity) 80.2, 74.0 and 76.6 (May); 91.1, 73.5 and 81.5 (Jun); 100.8, 77.0 and 83.2 (Jul); 97.0, 76.5 and 81.0 (Aug); 123.1 (flooding), 76.6 and 84.3 (Sep). Maximum, minimum and average daily soil temperature (^{o}F) were 78.0, 41.4 and 58.1 (May); 81.6, 52.6 and 67.7 (Jun); 82.2, 55.8 and 71.1 (Jul); 85.7, 55.2 and 71.4 (Aug); 81.8, 51.6 and 65.3 (Sep). Maximum, minimum and average relative humidity were 95.0, 16.0 and 62.8 (May); 95.6, 28.5 and 68.3 (Jun); 95.9, 29.1 and 69.4 (Jul); 96.3, 25.7 and 69.1 (Aug); 96.9, 28.8 and 73.7 (Sep). Precipitation was 1.08 in. (May), 3.59 in. (Jun), 3.69 in. (Jul), 1.56 in. (Aug) and 7.02 in. (Sep). The total number of late blight disease severity values (DSV) over the disease development period was 80 using 90% ambient %RH as bases for DSV accumulation. Plots were irrigated to supplement precipitation to about 0.1 in./A/4 day period with overhead sprinkle irrigation. This indicated that environmental conditions were conducive to late blight development (DSV > 18).

Using the RAUDPC metric for treatment comparisons the varieties were significantly different in susceptibility to *P. infestans* but susceptible varieties (Goldrush, E69.06 and RB Spunta) were not significantly different from each other and the resistant varieties developed no symptoms (Table 1). Comparing the fungicide treated RAUDPC responses to non-treated controls within each cultivar indicated that application of chlorothalonil at full rate of application at 7 or 14-day intervals resulted in ineffective control of late blight in Goldrush and E69.06 (Table 1). Application of chlorothalonil at100% rate of application at the 7-day interval resulted in effective control of late blight RB Spunta but other rate although numerically lower were not significantly different form the non-treated control (Table 1). Fungicide treatments did not significantly effect late blight development in either Misaukee, MSJ138 R6 A22 or MSM171-A.

DISCUSSION

The results of this study were inconsistent with previous studies and indicate that a combination of cultivar/ABL resistance and managed application of protective fungicides failed to significantly reduce foliar late blight to acceptable levels in most situations. When conditions were less conducive to late blight development (as in 2005), reduced amounts of chlorothalonil were either fully or partially effective at most application rates tested on all cultivars/ABL compared to the non-treated controls. However, in some cultivars/ABL, 50% of the MRAR of fungicide was sufficient to achieve acceptable control, whereas other cultivars/ABL required 100% MRAR to control late blight. On late blight susceptible cultivars, applications of chlorothalonil at 14-day intervals were ineffective for controlling late blight at the doses tested. However, in the resistant cultivars the fungicides did not reduce the RAUDPC in comparison with untreated plots of these cultivars and fungicides are not required for late blight control in these entries.

The opportunity to manage late blight by applying reduced rates of fungicides at increased spray intervals to cultivars less susceptible to late blight was partially demonstrated in this study. In addition, the efficacy of reduced rates and increased application intervals of fungicides against other potato pathogens such as early blight has not been established and may prove to be a major constraint in the adoption of managed fungicide applications. As new cultivars with enhanced late blight resistance are developed and released it will be important to provide growers with recommendations for the most effective and economical chemical control of late blight in these new cultivars. In the future, the type of information gathered in this study will be used to develop models, based on cultivar resistance and response to fungicide application, to advise and guide growers as to which fungicide, rate and frequency of application is required to provide protection against late blight. Climatic conditions within the canopy will also impact choice of fungicide and rate and frequency of application. Therefore, new cultivars will need to be carefully screened in the manner described in this study, over several seasons in order to develop accurate models for fungicide application.

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Table 1. Foliar late blight severity and mean RAUDPC (max = 100) in potato cultivars and ABL inoculated with *Phytophthora infestans* (US8, A2) and protected with reduced rates of chlorothalonil applied at 50 or 100% manufacturers recommended application rate. All comparisons were tested at p = 0.05

Cultivar/ ABL	Fungicide rate (pt/a)	Application frequency (days)	Foliar late blight (%) 30 DAI[z]		37 DAI		42 DAI		RAUDPC[y] (Max = 100) 0 – 42 DAI	
Goldrush	0.75	7	1.0	b[x]	9.3	bcd	25.0	bcd	2.9	bcd
		14	4.3	ab	16.3	abc	50.0	ab	6.4	a-d
	1.5	7	1.5	b	9.0	bcd	31.3	bcd	3.3	bcd
		14	2.0	b	11.3	a-d	43.8	abc	4.5	a-d
	0	0	4.5	ab	15.0	a-d	66.3	a	7.2	abc
E69.06	0.75	7	0.8	b	10.0	bcd	20.0	bcd	2.6	bcd
		14	2.0	b	11.5	a-d	21.8	bcd	3.4	bcd
	1.5	7	9.3	a	23.8	a	48.8	ab	9.6	a
		14	6.3	ab	21.3	ab	41.3	abc	7.6	abc
	0	0	4.8	ab	22.5	ab	70.0	a	8.4	ab
MSJ138 R6 A22	0.75	7	0.0	b	0.0	d	0.0	d	0.0	d
		14	0.0	b	0.0	d	0.0	d	0.0	d
	1.5	7	0.0	b	0.0	d	0.0	d	0.0	d
		14	0.0	b	0.0	d	0.0	d	0.0	d
	0	0	0.0	b	0.0	d	0.0	d	0.0	d
RB Spunta	0.75	7	0.3	b	2.8	cd	5.0	d	0.7	d
		14	1.3	b	5.0	cd	10.0	cd	1.7	cd
	1.5	7	0.8	b	5.0	cd	10.0	cd	1.5	cd
		14	0.8	b	5.3	cd	10.5	cd	1.5	cd
	0	0	5.3	ab	18.8	ab	52.5	ab	7.3	abc
MSM171-A	0.75	7	0.0	b	0.0	d	0.0	d	0.0	d
		14	0.0	b	0.0	d	0.0	d	0.0	d
	1.5	7	0.0	b	0.0	d	0.0	d	0.0	d
		14	0.0	b	0.0	d	0.0	d	0.0	d
	0	0	0.0	b	0.0	d	0.0	d	0.0	d
Misaukee	0.75	7	0.0	d	0.0	d	0.0	d	0.0	d
		14	0.0	d	0.0	d	0.0	d	0.0	d
	1.5	7	0.0	d	0.0	d	0.0	d	0.0	d
		14	0.0	d	0.0	d	0.0	d	0.0	d
	0	0	0.0	d	0.0	d	0.0	d	0.0	d
$LSD_{0.05}$			4.38		8.29		21.98		3.80	

[z] Days after inoculation with *Phytophthora infestans*, US8, A2.
[y] RAUDPC, relative area under the disease progress curve calculated from day of inoculation to last evaluation of late blight.
[x] Values followed by the same letter are not significantly different at $p = 0.05$ (Tukey Multiple Comparison).

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Seed treatments and seed plus foliar treatments for control of seed- and soil-borne Rhizoctonia, 2008.

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Potatoes with R*hizoctonia solani* (black scurf), 2- 5% tuber surface area infected, were selected for the trials. Potato seed was prepared for planting by cutting and treating with fungicidal seed treatments two days prior to planting. Seed were planted at the Michigan State University Muck Soils Experimental Station, Bath, MI on 4 Jun into two-row by 20-ft plots (ca. 10-in between plants to give a target population of 50 plants at 34-in row spacing) replicated four times in a randomized complete block design. The two-row beds were separated by a five-foot unplanted row. Dust formulations were measured and added to cut seed pieces in a Gustafson revolving drum seed treater and mixed for two minutes to ensure even spread of the fungicide. Fungicides applied as pre-planting potato seed liquid treatments were applied in water suspension at a rate of 0.2 pt/cwt onto the exposed seed tuber surfaces, with the entire seed surface being coated in the Gustafson seed treater. In-furrow at-planting applications were delivered at 8 pt H2O/A in a 7” band using a single XR11003VS nozzle at 30 p.s.i. Foliar applications were applied with a R&D spray boom delivering 25 gal/A (80 p.s.i.) and using three XR11003VS nozzles per row. Fertilizer was drilled into plots before planting, formulated according to results of soil tests. Additional nitrogen (final N 28 lb/A) was applied to the growing crop with irrigation 45 DAP (days after planting). Previcur Flex was applied at 0.7 pt/A on a seven-day interval, total of four applications, starting one day after inoculation of adjacent plots with *Phytophthora infestans*. Weeds were controlled by hilling and with Dual 8E at 2 pt/A 10 DAP, Basagran at 2 pt/A 20 and 40 DAP and Poast at 1.5 pt/A 58 DAP. Insects were controlled with Admire 2F at 1.25 pt/A at planting, Sevin 80S at 1.25 lb/A 31 and 55 DAP, Thiodan 3 EC at 2.33 pt/A 65 and 87 DAP and Pounce 3.2EC at 8 oz/A 48 DAP. Vines were killed with Reglone 2EC (1 pt/A on 20 Sep). Plots (20-ft row) were harvested on 16 Oct and individual treatments were weighed and graded. Four plants per plot were harvested 10-days after the final treatment application (13 Jul) and the percentage of stems and stolons with greater than 5% of the total surface area were counted. An index of below ground health was evaluated 35 DAP on a scale of 0 - 5 where 0 = no symptoms of stem canker, 1 = 1 – 5%, 2 = 6 – 10%, 3 = 11 – 20%, 4 = 21 – 50%, 5 = 50 – 100% of the surface of roots, stolons and stem affected by Rhizoctonia. Samples of 50 tubers per plot were harvested 14 days after desiccation and assessed for black scurf (*R. solani*) incidence (%) and severity 40 days after harvest. Severity of black scurf was measured as an index calculated by counting the number of tubers (n = 50) falling in class 0 = 0%; 1 = 1 - 5%; 2 = 6 -10%; 3 = 11 - 15; 4 >15% surface area of tuber covered with sclerotia. The number in each class is multiplied by the class number and summed. The sum is multiplied by a constant to express as a percentage. Indices of 0 - 25 represent 0 - 5%; 26 - 50 represent 6 - 10%; 51 - 75 represent 11 - 15% and 75 - 100 >15% surface area covered with sclerotia. Meteorological variables were measured with a Campbell weather station located at the farm, latitude 42.8269 and longitude -84.365deg. Maximum, minimum and average daily air temperature (^{o}F) were 81.2, 25.3 and 53.1 and 0-d with maximum temperature >90^{o}F (May); 91.9, 39.6 and 66.7 and 1-d with maximum temperature >90^{o}F (Jun); 89.9, 38.3 and 68.5 and 0-d with maximum temperature >90^{o}F (Jul); 87.9, 35.5 and 65.6 and 0-d with maximum temperature >90^{o}F (Aug); 91.7, 33.3 and 59.3 and 1-d with maximum temperature >90^{o}F (Sep). Maximum, minimum and average daily soil temperature (^{o}F) were 78.0, 41.4 and 58.1 (May); 81.6, 52.6 and 67.7 (Jun); 82.2, 55.8 and 71.1 (Jul); 85.7, 55.2 and 71.4 (Aug); 81.8, 51.6 and 65.3 (Sep). Maximum, minimum and average soil moisture (% of field capacity) 80.2, 74.0 and 76.6 (May); 91.1, 73.5 and 81.5 (Jun); 100.8, 77.0 and 83.2 (Jul); 97.0, 76.5 and 81.0 (Aug); 123.1 (flooding), 76.6 and 84.3 (Sep). Precipitation was 1.08 in. (May), 3.59 in. (Jun), 3.69 in. (Jul), 1.56 in. (Aug) and 7.02 in. (Sep). Plots were irrigated to supplement precipitation to about 0.1 in./A/4 day period with overhead sprinkle irrigation.

No treatment affected final plant stand. RAUEPC was significantly greater in treatments with RAUEPC values greater than 14.2 in comparison to the untreated control (RAUEPC = 9.4). Marketable yield and total ranged from 236 to 324 cwt/A (not-treated check = 255 cwt/A) and 265 to 354 cwt/A (untreated check = 239 cwt/A), respectively but no treatments were significantly different from the untreated check and Maxim FS (ST). No treatment affected the total number of stolons or stem number per plant. Treatments with less than 51.6% incidences of stems with >5% girdling due to Rhizoctonia stem canker were significantly different from the untreated control. No treatments had significantly less stolon canker incidence in comparison to Maxim FS the standard commercial treatment or the untreated control. Treatments with less than 42.5% incidence of tubers with black scurf were significantly lower than the untreated control. Treatments with less than 38.8% incidence of tubers with black scurf were not significantly different from Maxim FS the standard commercial treatment. Treatments with less than 19.1% severity index of tubers with black scurf were significantly lower than the untreated control (29.4%). Treatments with less than 15.3% severity index of tubers with black scurf were not significantly different from Maxim FS the standard commercial treatment (6.3%). Seed treatments and seed treatment plus fungicide applications of fungicides were not phytotoxic.

Funding: MPIC/Agrochemical Industry

Table 1. Effect of seed treatments and in-furrow applications of fungicides on emergence and yield

Treatment and rate/1000 row feet and rate/cwt potato seed[z]	Final plant stand (%)		RAUEPC[y]		Yield (cwt/A) US1		Total	
Maxim 4FS 0.16 fl oz/cwt (A)……	84.5	a	11.1	bcd	278	a	310	a
LEM 17 200EC 0.67 fl oz (B)….....	89.0	a	15.1	ab	257	a	286	a
LEM 17 200EC 1.15 fl oz (B)….....	90.5	a	16.6	a	324	a	354	a
LEM 17 200EC 1.6 fl oz (B)……..	91.5	a	14.2	abc	290	a	321	a
LEM 200SC 1.6 fl oz (B)…………	87.5	a	13.6	a-d	280	a	311	a
Quadris 2.08SC 0.4 fl oz (B)……..	87.0	a	14.6	ab	286	a	316	a
Evito 4FL 0.26 fl oz (B)………....	88.0	a	16.9	a	293	a	325	a
BUPOT-1 3.4SC 0.3 fl oz/cwt (A)..	85.5	a	13.2	a-d	317	a	351	a
BUPOT-1 3.4SC 0.5 fl oz/cwt (A)..	89.5	a	12.2	bcd	305	a	337	a
BUPOT-3 3.4SC 0.3 fl oz/cwt (A)..	91.0	a	15.2	ab	264	a	296	a
BUPOT-3 3.4SC 0.5 fl oz/cwt (A)..	85.5	a	10.4	cd	286	a	319	a
BUPOT-5 3.4SC 0.3 fl oz/cwt (A)..	85.0	a	11.3	bcd	254	a	288	a
BUPOT-5 3.4SC 0.5 fl oz/cwt (A)..	89.0	a	10.3	cd	236	a	265	a
BUPOT-7 3.4SC 0.3 fl oz/cwt (A)..	87.5	a	13.0	a-d	270	a	306	a
BUPOT-7 3.4SC 0.5 fl oz/cwt (A)..	88.0	a	13.5	a-d	275	a	307	a
WE1042-1 6DS 0.75 lb/cwt (A)…..	91.0	a	14.4	abc	252	a	284	a
WE1043-1 6DS 0.75 lb/cwt (A)…..	84.5	a	13.4	a-d	270	a	309	a
WE1043-1 6DS 0.75 lb/cwt (A)…..	89.5	a	12.8	a-d	275	a	305	a
Untreated Check………………....	68.0	a	9.4	d	255	a	288	a
$HSD_{0.05}$	14.18		4.26		59.6		61.0	

[z] Application type; rate per 1000 row ft for in-furrow applications; rate per cwt of potato seed-piece application prior to planting; liquid formulations for seed piece application at 0.2 pt/cwt; .

[y] RAUEPC = Relative area under the emergence progress curve measured from planting to 31 days after planting.

[x] Application dates: A= 4 Jun (liquid formulations for seed piece application at 0.2 pt/cwt; B= 4 Jun (in-furrow).

[w] Values followed by the same letter are not significantly different at p = 0.05 (Honest Significant Difference; Tukey Multiple Comparison).

Funding: MPIC/Agrochemical Industry

Table 2. Effect of seed treatments and in-furrow applications of fungicides on stem canker and tuber black scurf

Treatment and rate/1000 row feet and rate/cwt potato seed[z]	Stems (35 DAP) Num -ber	Stems (35 DAP) Percent infected[y]		Stolons (35 DAP) Num ber/ plant	Stolons (35 DAP) Girdling[x] > 5%		Root and lower stem canker index 35 DAP[w] (0 – 5)		Tuber black scurf Incidence (%)		Tuber black scurf Severity scale (0 - 100)	
Maxim 4FS 0.16 fl oz/cwt (A)……	3.8	31.7	d-g	8.4	6.5	a	1.7	a-e	20	f	6.3	d
LEM 17 200EC 0.67 fl oz (B)…....	3.6	29.5	d-g	7.3	4.5	a	1.3	c-e	35	b-f	12.8	cd
LEM 17 200EC 1.15 fl oz (B)…....	4.1	42.0	cde	7.1	12.4	a	1.5	b-e	42.5	bcd	16.3	bcd
LEM 17 200EC 1.6 fl oz (B)…….	3.8	34.3	def	7.8	9.9	a	1.3	cde	21.3	ef	7.2	d
LEM 200SC 1.6 fl oz (B)………..	3.9	21.0	fg	8.9	7.0	a	1.0	e	37.5	b-f	15.3	bcd
Quadris 2.08SC 0.4 fl oz (B)…….	4.3	16.7	g	9.4	7.6	a	1.1	de	33.8	b-f	12.8	cd
Evito 4FL 0.26 fl oz (B)………....	3.6	24.3	fg	7.7	7.8	a	1.0	e	26.3	def	12.2	cd
BUPOT-1 3.4SC 0.3 fl oz/cwt (A).	4.4	26.8	e-g	7.6	4.1	a	1.4	b-e	22.5	ef	8.8	cd
BUPOT-1 3.4SC 0.5 fl oz/cwt (A).	4.2	63.1	ab	7.1	19.8	a	2.1	ab	25	def	9.1	cd
BUPOT-3 3.4SC 0.3 fl oz/cwt (A).	3.9	51.6	bc	7.8	8.7	a	1.9	a-d	38.8	b-f	14.7	bcd
BUPOT-3 3.4SC 0.5 fl oz/cwt (A).	4.1	55.3	abc	6.9	7.5	a	1.7	a-e	26.3	def	10.0	cd
BUPOT-5 3.4SC 0.3 fl oz/cwt (A).	3.6	33.0	d-f	8.0	4.2	a	1.7	a-e	36.3	b-f	13.8	bcd
BUPOT-5 3.4SC 0.5 fl oz/cwt (A).	4.3	40.9	c-e	7.7	6.3	a	2.3	a	32.5	b-f	12.8	cd
BUPOT-7 3.4SC 0.3 fl oz/cwt (A).	4.2	44.0	cd	8.4	10.5	a	2.0	abc	28.8	c-f	8.8	cd
BUPOT-7 3.4SC 0.5 fl oz/cwt (A).	4.2	33.2	d-f	8.3	9.3	a	1.9	a-d	40	b-e	14.1	bcd
WE1042-1 6DS 0.75 lb/cwt (A)….	3.5	42.1	cde	8.1	8.9	a	1.9	a-d	51.3	ab	24.1	ab
WE1043-1 6DS 0.75 lb/cwt (A)….	3.8	41.4	cde	7.6	11.5	a	1.8	a-d	36.3	b-f	15.0	bcd
WE1043-1 6DS 0.75 lb/cwt (A)….	3.9	30.8	d-f	8.9	9.2	a	1.7	a-e	46.3	abc	19.1	abc
Untreated Check………………....	4.6	71.7	a	9.5	15.9	a	2.3	a	65.0	a	29.4	a
$HSD_{0.05}$	1.10	15.81		1.95	10.05		0.75		19.96		10.33	

[z] Application type; rate per 1000 row ft for in-furrow applications; rate per cwt of potato seed-piece application prior to planting; liquid formulations for seed piece application at 0.2 pt/cwt.

[y] Stems with greater than 5% of area with stem canker due to *Rhizoctonia solani*.

[x] Stolons with greater than 5% of area with stolon canker due to *Rhizoctonia solani*.

[w] An index of below ground health was evaluated 35 DAP on a scale of 0 - 5 where 0 = no symptoms of stem canker, 1 = 1 – 5%, 2 = 6 – 10%, 3 = 11 – 20%, 4 = 21 – 50%, 5 = 50 – 100% of the surface of roots, stolons and stem affected by Rhizoctonia.

[v] Application dates: A= 13 Jun (liquid formulations for seed piece application at 0.2 pt/cwt; B= 13 Jun (in-furrow); C= 29 Jun (banded over row).

[u] Values followed by the same letter are not significantly different at p = 0.05 (Honest Significant Difference; Tukey Multiple Comparison).

Funding: MPIC/Agrochemical Industry

Evaluation of fungicide programs for potato early blight and brown leaf spot control, 2008.

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Potatoes (cut seed, treated with Maxim FS at 0.16 fl oz/cwt) were planted at the Michigan State University Muck Soils Experimental Station, Bath, MI on 25 May into two-row by 25-ft plots (34-in row spacing), separated by a five-foot unplanted row and replicated four times in a randomized complete block design. Plots were irrigated as needed with sprinklers and were hilled immediately before sprays began. All fungicides in this trial were applied on a 7-day interval from 5 Jul to 29 Aug (9 applications) with an ATV rear-mounted R&D spray boom calibrated to deliver 25 gal/A (80 p.s.i.) using three XR11003VS nozzles per row. Weeds were controlled by hilling and with Dual 8E (2 pt/A on 25 May), Basagran (2 pt/A on 28 Jun and 11 Jul) and Poast (1.5 pt/A on 11 Jul). Insects were controlled with Admire 2F (20 fl oz/A at planting and on 28 Jun), Sevin 80S (1.25 lb/A on 11 and 25 Jul), Thiodan 3EC (2.33 pt/A on 1 and 21 Aug) and Pounce 3.2EC (8 oz/A on 11 Jul). Plots were rated visually for percentage foliar area affected by early blight and brown leaf spot on 15, 22, 29 Aug and 5 Sep [7 days after final application (DAFA)]. The relative area under the disease progress curve was calculated for each treatment from 5 Aug to 5 Sep, a period of 31 days. Vines were killed with Reglone 2EC (1 pt/A on 6 Sep). Plots (2 x 25-ft row) were harvested on 17 Sep and individual treatments were weighed and graded. Meteorological variables were measured with a Campbell weather station located at the farm, latitude 42.8269 and longitude -84.365deg. Maximum, minimum and average daily air temperature (^oF) were 88.0, 39.6 and 64.9 and 0-d with maximum temperature >90^oF (May); 91.3, 36.1 and 66.6 and 2-d with maximum temperature >90^oF (Jun); 95.2, 37.7 and 67.0 and 4-d with maximum temperature >90^oF (Jul); 93.4, 36.3 and 68.7 and 4-d with maximum temperature >90^oF (Aug); 90.0, 34.1 and 63.4 and 1-d with maximum temperature >90^oF (Sep). Maximum, minimum and average daily soil temperature (^oF) were 75.1, 53.1 and 65.8 (May); 82.1, 53.2 and 68.2 (Jun); 83.1, 53.7 and 65.3 (Jul); 80.5, 54.5 and 67.1 (Aug); 77.1, 51.3 and 66.4 (Sep). Maximum, minimum and average soil moisture (% of field capacity) were 79.0, 75.2 and 77.3 (May); 91.7, 77.2 and 81.3 (Jun); 82.1, 74.1 and 77.9 (Jul); 98.1, 75.4 and 80.7 (Aug); 76.2, 66.6 and 69.8 (Sep). Precipitation was 0.99 in. (May), 3.91 in. (Jun), 0.80 in. (Jul), 6.18 in. (Aug) and 1.09 in. (Sep). The total number of late blight disease severity values (DSV) over the disease development period was 62 using 90% ambient %RH as a base for DSV accumulation. Plots were irrigated to supplement precipitation to about 0.1 in./A/4 day period with overhead sprinkle irrigation.

Early blight and brown leaf spot (Alternaria complex) developed steadily in about equal proportions and untreated controls reached about 65% foliar infection by 5 Sep. Up to 5 Aug, fungicide programs with 0% Alternaria complex were significantly different from the untreated control. Alternaria developed to 8% by 22 Aug in the untreated control and programs with less than 1.5% Alternaria complex were significantly different to the untreated control but not from any other treatment. Alternaria developed to 20.0% in the untreated control by 29 Aug. Programs with 2.0 to 12.5%, 2.5 to 13.3% and 11.3 to 20.0% Alternaria complex were not significantly different. Alternaria developed to 63.8% in the untreated control by 5 Sep. All treatments had significantly less Alternaria complex in comparison to the untreated control. Programs with 7.3 to 27.5% and 11.3 to 32.5% Alternaria complex were not significantly different. less than 1.5% Alternaria complex were significantly different to the untreated control but not from any other treatment. up to 26 DAI were not significantly different from each other. All fungicide programs significantly reduced the average amount of Alternaria complex over the season (RAUDPC, 0 to 31 days after the first evaluation) compared to the untreated control. Application programs with RAUDPC values from 1.2 to 5.7 and 1.4 to 6.7 were not significantly different. There were no significant differences in marketable or total yield among treatments. Alternaria tuber blight was not observed after harvest. Phytotoxicity was not noted in any of the treatments. The Penncozeb plus Super Tin program was not within label guidelines and was included to determine if the addition of Penncozeb could ameliorate potential phytotoxic effects associated with Super Tin 80WDG.

Treatment and rate/A	Foliar early blight and brown leaf spot (%) 5 Aug	22 Aug	29 Aug	5 Sep 7 DAFA[z]	RAUDPC Max = 100[y] 0 - 40 DAI	Yield (cwt/A) US1	Total
Sonata 500SC 4.0 pt + Dithane RS 75DF 1.5 lb + Biotune 1EC 4.5 fl oz (A,C,E[x]); Headline 2.08EC 6 fl oz (B,D,F)………………………..	0.0b[w]	0.8ab	4.3b	12.5bcd	2.2b	240abc	361a
Headline 2.08EC 9.0 fl oz (A,E,H); Bravo ZN 6SC 1.5 pt (B,D,F,I); Endura 70WDG 2.5 oz (C,G)………………………...…	0.0b	0.3b	2.8b	8.8cd	1.4b	268a	384a
Penncozeb 75DF 2.0 lb (A,B,C,D,E); Penncozeb 75DF 2.0 lb + Super Tin 80WP 5 oz (F,G,H,I)…………………………	0.5ab	4.8ab	12.5ab	31.3bc	6.5ab	254abc	384a
BravoWS 6SC 1.5 pt (A,C,E,F,G,H,I) Evito 4FL 3.8 fl oz + 0.125% NIS (B,D)……..……...…	0.3ab	1.8ab	5.8b	20.0bcd	3.5b	223abc	333a
BravoWS 6SC 1.5 pt (A,C,E,F,G,H,I) Evito 4FL 1.9 fl oz + 0.125% NIS (B,D)……..………...	0.0b	2.0ab	5.8b	22.5bcd	3.7b	247abc	375a
Polyoxin D 2.5 WP 2.0 lb (A-I)…………….….……….	0.5ab	4.0ab	13.3ab	32.5b	6.7ab	236abc	367a
LEM 17 200EC 9.6 fl oz (A-I)………………………….	0.5ab	3.8ab	11.3ab	27.5bcd	5.7b	209abc	334a
LEM 17 200EC 16.8 fl oz (A-I)……………….………..	0.3ab	0.5b	5.0b	12.5bcd	2.4c	230abc	344a
LEM 17 200EC 24.0 fl oz (A-I)……………………...….	0.3ab	2.8ab	6.8b	20.0bcd	3.9b	238abc	358a
LEM 17 200SC 16.8 fl oz (A-I)………...……….……..….	0.3ab	0.5b	2.5b	11.3bcd	1.8b	210abc	349a
LEM 17 200SC 24.0 fl oz (A-I)……….…………......….	0.0b	0.5b	2.0	7.3d	1.2b	212abc	329a
Tanos 50 WDG 6.0 oz + Manzate 75DF 1.5 lb (A,C,E); Manzate 75DF 1.5 lb (G); Endura 2.5 oz (B,D,F,H)……	0.0b	0.5b	3.3b	8.8cd	1.6b	258ab	364a
Untreated..	1.5a	8.0a	20.0a	63.8a	12.1a	192c	327a
$HSD_{0.05}$	1.34	7.33	11.21	23.27	5.81	53.7	74.8

[z] Days after final application of fungicide.
[y] RAUDPC, relative area under the disease progress curve calculated from day of inoculation to last evaluation of late blight.
[x] Application dates: A= 5 Jul; B= 12 Jul; B= 19 Aug; D= 25 Aug; E= 1 Aug; F= 8 Aug; G= 15 Aug; H= 22 Aug; I = 29 Aug.
[w] Values followed by the same letter are not significantly different at $p = 0.05$ (Tukey Multiple Comparison).

Funding: MPIC and MSU GREEEN

Effect of different genotypes of *Phytophthora infestans* and temperature on tuber disease development.

William Kirk[1], Dave Douches[2], Pavani Tumbalam[1], Rob Schafer[1], Joe Coombs[2] and Devan Berry[2]. MSU; [1]Plant Pathology and [2]Crop and Soil Science.

Potato late blight (*Phytophthora infestans*) is a significant global constraint to potato production and due to conducive climatic conditions and growing practices the mid western states of the US are particularly vulnerable. The emergence and spread of new genotypes of *P. infestans* in North America have resulted in significant economic loss to the potato industry. The mid-west states produce about 10 million tons of potato from 150,000 planted hectares, which represents about 40% of total US production. Potato late blight affects the health of foliage and tubers limiting profitable potato production. Significant financial costs in terms of crop protection (up to $700/ha) and crop losses (up to $5,000/ha) are incurred when intervention measures to control potato late blight are unsuccessful.

The newer genotypes have rapidly displaced the US-1 clonal lineage which previously had global occurrence. In Michigan for example, the occurrence of diverse *P. infestans* genotypes (US-8, US-10, US-11 and US-14) has been documented in recent years. Rapid changes in the genetic diversity of the population of *P. infestans* are not predictable, but the sudden appearance and resultant predominance of the US-8 genotype, must pre-empt efforts in potato pathology and breeding to prepare for further genetic disturbance. Knowledge of competitive interactions among pathogen genotypes, fitness components and the role of resistant cultivars will enable us to develop a better understanding of the factors which govern strain selection and stability. The factors which affect frequency of occurrence of *P. infestans* genotypes and strain composition have not been adequately addressed. However, fungicide resistance clearly played an important role in genotype selection when phenylamide-resistant genotypes appeared globally in the 1990's. Other fitness components such as temperature tolerance have not been well evaluated but their importance has recently gained credibility. In previous field and growth chamber studies, late blight experiments were often inoculated with single or sequential pathogen genotypes, or epidemic development was monitored under field conditions prior to determination of fungal genotype composition. Therefore, this did not address the various host – pathogen genotype interactions. Furthermore, previous studies have not taken into account the susceptibility of potato tubers to different *P. infestans* genotypes. This is important as late blight is readily transmitted by seed-borne inoculum and consequently, immature stems and leaves may be exposed to late blight from infected seed pieces. Recent work has indicated that the new immigrant clones, especially US-8, are more aggressive in tubers and sprouts. Research at MSU has shown that most of the commonly grown potato cultivars with foliar resistance to late blight are susceptible to tuber late blight. However, several advanced breeding lines (ABL) in the MSU potato breeding program have recently been identified with tuber late blight resistance.

The US-8 genotype of *P. infestans* displaced the US-1 genotype within five years of its appearance in North America, and it is vital that the industry is prepared for the supplanting of the US-8 genotype by other equally aggressive and stable genotypes of the pathogen. The proposed project, using field and controlled environment studies on potato foliage and tubers, will document whether the competitive ability of diverse *P. infestans* genotypes, potato cultivars/ABL with variable levels of host resistance, or environmental factors are important criteria for *P. infestans* genotype composition, maintenance and stability. The overall objective of this project is to develop an understanding of the factors (e.g., pathogen temperature tolerance, fitness, and host resistance) which govern pathogen genotype selection and stability.

Funding: MPIC and MSU GREEEN

Materials and Methods

Culturing of Phytophthora infestans and tuber inoculations

Cultures of *P. infestans* [isolates *Pi*95-3 (US-1), *Pi*96-2 [US-1.7 (RFLP genotype], *Pi*02-007 (US-8), *Pi*Banam (US-10), *Pi*96-1 (US-11) and *Pi*98-1 (US-14)] were selected as the most aggressive isolates from the collection of Kirk (Michigan State University) and grown on rye agar Petri plates for 14 days in the dark at 18C. These isolates were acquired from field infections from 1995 to 2002 on foliage and tubers of potatoes of commonly grown in Michigan, USA. Pathogenicity was determined on foliage and tubers in tuber and detached leaf tests. Single isolates representative of the range of genotypes were selected for this study because only individual isolates of US-1, US-1.7 and US-11 were available (in the US these isolates are rare) and using multiple isolates would have unbalanced the experimental design.

A mixture of mycelium and sporangia of *P. infestans* grew on 200 plate cultures (9 cm diameter x 15 mm depth Petri plates) from each isolate. Each plate produced between 10^5 - 10^6 spores ml^{-1} from 50 ml of wash water. An estimate of the amount of mycelium from each plate was not attempted. A core of tuber tissue was removed from each test tuber using a 5 mm diameter sterile cork borer to a depth of 5 mm. A 5 mm core of mycelium plus sporangia was removed from the selected plate and placed in the wound. The tissue core was replaced in the wound and a smear of petroleum jelly placed over the wound. The non-inoculated control treatments were potato seed pieces from each cultivar/ABL that cored as described above and inoculated with a core of rye agar with no pathogen.

Tubers were inoculated as described and were then stored in the dark in net bags within ventilated plastic boxes. Each treatment was replicated four times. Boxes were arranged in a complete randomized design and stored in Environmental growth chambers in darkness at 10C and 90% RH. Disease development rates within tubers in relation to storage temperature were known from previous experiments and a single sampling date was selected 30 days after inoculation (DAI). After incubation (30 DAI), seed pieces were cut 25, 50 and 75% from and parallel to the inoculated surface of n = 32 inoculated seed pieces to assess tuber blight development in the tuber tissue. A digital image analysis technique was used to assess tuber tissue infection. The area selection cut-off threshold was set to 10 LIU, effectively allowing the software to exclude all parts of the image darker than 10 LIU, e.g. the black background. The average reflective intensity (ARI) of all the pixels within the image gave a measurement of severity of tuber tissue rot from each sample. The amount of late blight affected tissue per tuber was expressed as a single value (Mean ARI) calculated as the average ARI of the three sections, described above.

Statistical analyses

Tuber rot severity was expressed relative to the ARI of the non-inoculated treatments for each cultivar/ABL. The relative average reflective intensity of a treatment was calculated as follows:

$$\text{RARI (\%)} = \left[1 - \frac{MeanARI_{treatment}}{MeanARI_{control}}\right] * 100;$$

where RARI (%) has a minimum value of zero (no visible symptoms) and maximum value of 100 (tuber surface is completely black). Data were analysed by analysis of variance (least squares method) using the JMP program version 5.0.1 (SAS Institute Inc., SAS Campus Drive, Cary, North Carolina 27513, USA).

Results

The main effects indicated that some varieties were more resistant to *P. infestans* regardless of genotype or storage temperature. The varieties Kufri Jeevan and Stirling, were the most resistant followed by other MSU bred lines MSJ138K6-A22, MSL268-D, E69.3 and Misaukee (MSJ461-

MICHIGAN POTATOES
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March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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1) and MSE149-5Y, MSL603-319Y, Snowden, RB Spunta and MSL211-3 were the most susceptible lines. The most aggressive genotype of *P. infestans* was US-10, followed by US-8 and US-14 then US-11. US-1 and US-6 genotypes were not particularly aggressive on the lines tested. These results indicate that the lines Kufri Jeevan and Stirling, and MSU bred lines MSJ138K6-A22, MSL268-D, E69.3 and Misaukee (MSJ461-1) could contribute to tuber blight resistance breeding efforts in the future. These lines are partially resistant to US-8 genotype of *P. infestans* which is predominant in MI. The genotype was isolated from all three loci where epidemics established in MI in 2006.

All varieties were partially resistant to the US-1 genotype although some disease developed in certain varieties. Values close to zero (including negative values) indicate no establishment of *P. infestans* within the tubers. Although varieties with partial resistance to foliar and tuber phases of potato late blight are important in the overall management of the disease these results indicate that varietal resistance is not the only component of disease management, For this reason we are proposing that varieties (close to commercial release) with partial resistance to the US-8 genotype of *P. infestans* are further profiled in a variety x fungicide interaction this coming year.

Table 1. Main effects analyses of variety, genotype of *Phytophthora infestans* and temperature on tuber tissue darkening [Mean RARI (%)] in potato tubers.

Variety	Mean RARI (%)[a]		Genotype of *P. infestans*		
E149-5Y	20.7	a[b]	US-10	18.8	a
L603-319Y	14.1	b	US-8	15.2	b
Snowden	12.5	bc	US-14	8.9	c
RB Spunta	12.3	bc	US-11	8.6	c
MSL211-3	11.7	bcd	US-1.7	0.4	d
E69.6	11.0	cd	US-1	0.1	d
MSN105-1	10.3	cde			
N230-1RY	9.3	def			
Misaukee (MSJ461-1)	7.6	efg			
E69.3	7.0	fg			
MSL268-D	5.2	gh			
MSJ138K6A22	5.2	gh			
Kufri Jeevan	3.1	hi			
Stirling	0.9	i			

[a] Normalized tuber tissue darkening score expressed % RARI = [1- Mean ARI $_{treatment}$ / Mean ARI $_{control}$] *100; % RARI has a minimum value of zero (no darkening, but if the value is negative the tuber tissue was lighter than the control) and maximum value of 100 (cut tuber surface is completely blackened). The numbers are derived from the mean average reflective intensity of three surfaces cut latitudinally 25, 50 and 75% from the apex of n = 10 tubers per treatment combination.

[b] Values followed by the same letter are not significantly different at P = 0.05 for comparisons of mean RARI values within different *P. infestans* genotypes of cultivar/ABL combinations and temperature treatments (Tukey Multiple Comparison)

Table 2. Tuber tissue darkening [Mean RARI (%)] in different cultivars and advanced breeding lines (ABL) of potatoes after inoculation with different genotypes of *Phytophthora infestans*.

	Tuber tissue darkening caused by different genotypes of *P. infestans* [Mean RARI (%)[a]]											
Cultivars/ABL	US-1		US-1.7		US-8		US-10		US-11		US-14	
MSE149-5Y	.[b]		.		15.1	def[c]	26.3	a-d	.		.	
MSL603-319Y	2.2	a	1.5	abc	18.2	b-e	26.9	abc	15.0	ab	20.5	a
Snowden	-0.8	cde	-0.8	de	23.6	ab	20.4	cde	19.0	a	13.8	b
RB Spunta	-1.8	de	-1.2	b-e	21.4	bc	31.4	a	12.9	abc	11.2	bc
MSL211-3	1.3	ab	0.7	a-d	28.9	a	24.8	a-d	8.4	cd	6.2	c-g
E69.6	0.6	abc	1.4	a-e	19.7	bcd	22.9	b-e	13.6	abc	10.0	bcd
N105-1	0.0	bcd	0.9	a	17.5	cde	27.9	ab	1.8	e	13.9	b
N230-1RY	-0.4	b-e	3.0	b-e	11.6	f	19.5	de	12.6	abc	9.3	b-e
Misaukee	-0.6	b-e	-0.1	e	13.2	ef	19.4	de	6.2	b-e	13.7	b
E69.3	-1.9	e	-1.1	a-d	13.6	ef	16.8	e	13.0	abc	1.6	fg
MSL268-D	1.1	ab	1.5	e	14.4	def	8.6	f	2.2	de	3.3	efg
J138K6A22	-1.2	cde	-1.0	cde	14.8	def	9.9	f	0.5	e	8.1	b-f
Kufri Jeevan	2.3	a	-0.7	ab	-0.4	g	8.9	f	5.2	de	3.5	d-g
Stirling	0.7	abc	1.6	e	1.3	g	1.1	g	0.2	e	0.7	g

[a] Normalized tuber tissue darkening score expressed % RARI = [1- Mean ARI $_{treatment}$ / Mean ARI $_{control}$] *100; % RARI has a minimum value of zero (no darkening, but if the value is negative the tuber tissue was lighter than the control) and maximum value of 100 (cut tuber surface is completely blackened). The numbers are derived from the mean average reflective intensity of three surfaces cut latitudinal at 25, 50 and 75% from the apex of n = 10 tubers per treatment combination.

[b] Data from E149-5Y missing because of tuber shortage

[c]. Values followed by the same letter are not significantly different at P = 0.05 for comparisons of mean RARI values within different *P. infestans* genotypes of cultivar/ABL combinations and temperature treatments (Tukey Multiple Comparison).

Funding: MPIC/Agrochemical Industry

Evaluation of fungicide programs for potato late blight control: 2008.

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Potatoes (cut seed, treated with Maxim FS at 0.16 fl oz/cwt) were planted at the Michigan State University Muck Soils Experimental Station, Bath, MI on 25 May into two-row by 25-ft plots (34-in row spacing), separated by a five-foot unplanted row and replicated four times in a randomized complete block design. Plots were irrigated as needed with sprinklers and were hilled immediately before sprays began. All rows were inoculated (3.4 fl oz/25-ft row) with a zoospore suspension of *Phytophthora infestans* [US-8 biotype (insensitive to mefenoxam, A2 mating type)] at 10^4 spores/fl oz on 27 Jul. All fungicides in this trial were applied on a 7-day interval from 5 Jul to 22 Aug (8 applications) with an ATV rear-mounted R&D spray boom calibrated to deliver 25 gal/A (80 p.s.i.) using three XR11003VS nozzles per row. Weeds were controlled by hilling and with Dual 8E (2 pt/A on 25 May), Basagran (2 pt/A on 28 Jun and 11 Jul) and Poast (1.5 pt/A on 11 Jul). Insects were controlled with Admire 2F (20 fl oz/A at planting and on 28 Jun), Sevin 80S (1.25 lb/A on 11 and 25 Jul), Thiodan 3EC (2.33 pt/A on 1 and 21 Aug) and Pounce 3.2EC (8 oz/A on 11 Jul). Plots were rated visually for percentage foliar area affected by late blight on 30 Jul; 15, 22, 29 Aug and 5 Sep [14 days after final application (DAFA), 40 days after inoculation (DAI)] when there was about 100% foliar infection in the untreated plots. The relative area under the disease progress curve was calculated for each treatment from date of inoculation, 30 Jul to 5 Sep, a period of 36 days. Vines were killed with Reglone 2EC (1 pt/A on 6 Sep). Plots (2 x 25-ft row) were harvested on 17 Sep and individual treatments were weighed and graded. Samples of 50 tubers per plot were stored after harvest in the dark 50^{o}F and incidence of tuber late blight was evaluated after 40 days. Meteorological variables were measured with a Campbell weather station located at the farm, latitude 42.8269 and longitude -84.365deg. Maximum, minimum and average daily air temperature (^{o}F) were 81.2, 25.3 and 53.1 and 0-d with maximum temperature >90^{o}F (May); 91.9, 39.6 and 66.7 and 1-d with maximum temperature >90^{o}F (Jun); 89.9, 38.3 and 68.5 and 0-d with maximum temperature >90^{o}F (Jul); 87.9, 35.5 and 65.6 and 0-d with maximum temperature >90^{o}F (Aug); 91.7, 33.3 and 59.3 and 1-d with maximum temperature >90^{o}F (Sep). Maximum, minimum and average daily soil temperature (^{o}F) were 78.0, 41.4 and 58.1 (May); 81.6, 52.6 and 67.7 (Jun); 82.2, 55.8 and 71.1 (Jul); 85.7, 55.2 and 71.4 (Aug); 81.8, 51.6 and 65.3 (Sep). Maximum, minimum and average soil moisture (% of field capacity) 80.2, 74.0 and 76.6 (May); 91.1, 73.5 and 81.5 (Jun); 100.8, 77.0 and 83.2 (Jul); 97.0, 76.5 and 81.0 (Aug); 123.1 (flooding), 76.6 and 84.3 (Sep). Maximum, minimum and average daily soil temperature (^{o}F) were 78.0, 41.4 and 58.1 (May); 81.6, 52.6 and 67.7 (Jun); 82.2, 55.8 and 71.1 (Jul); 85.7, 55.2 and 71.4 (Aug); 81.8, 51.6 and 65.3 (Sep). Maximum, minimum and average relative humidity were 95.0, 16.0 and 62.8 (May); 95.6, 28.5 and 68.3 (Jun); 95.9, 29.1 and 69.4 (Jul); 96.3, 25.7 and 69.1 (Aug); 96.9, 28.8 and 73.7 (Sep). Precipitation was 1.08 in. (May), 3.59 in. (Jun), 3.69 in. (Jul), 1.56 in. (Aug) and 7.02 in. (Sep). The total number of late blight disease severity values (DSV) over the disease development period was 80 using 90% ambient %RH as bases for DSV accumulation. Plots were irrigated to supplement precipitation to about 0.1 in./A/4-day period with overhead sprinkle irrigation.

Late blight developed steadily after inoculation and untreated controls reached 100% foliar infection by 5 Sep. Up to 40 DAI, all fungicide programs reduced foliar late blight significantly compared to the untreated control and up to 26 DAI were not significantly different from each other. On 29 Aug 33 DAI, programs with 4.3 to 12.5%, 5.5 to 13.8% and 7.5 to 16.3% foliar late blight were not significantly different. On 5 Sep, 40 DAI, programs with 18.8 to 36.3%, 26.3 to 45.0%, 33.8 to 51.3% and 73.8% foliar late blight were not significantly different. All fungicide programs significantly reduced the average amount of foliar late blight over the season (RAUDPC, 0 to 40 DAI) compared to the untreated control. Application programs with RAUDPC values from 0.4 to 1.1, 3.7 to 4.1, 4.1 to 5.3 and 18.5 (untreated) were not significantly different. There were no significant differences in marketable or total yield among treatments. There were significant differences in the incidence of tuber late blight 53 days after harvest among treatments. The untreated check had 14.9% incidence of tuber blight but only treatments with less than 4.2% incidence had significantly less tuber blight than the untreated check. Treatments with greater than 23.8% incidence of tuber blight had significantly more tuber blight than the untreated check. Phytotoxicity was not noted in any of the treatments.

Treatment and rate/A	Foliar late blight (%) 5 Aug 9 DAI[z]	22 Aug 26 DAI	29 Aug 33 DAI	5 Sep 40 DAI 5 DAFA[y]	RAUDPC Max = 100[x] 0 - 40 DAI	Yield (cwt/A) US1	Total	Tuber blight (%)[w]
BravoWS 6SC 1.5 pt (A,B,C,D,E,F,G,H)……………..	0.0c	0.2b	3.0d	6.8c	0.8d	326	407	23.8a
Revus Top 4.17SC 5.5 fl oz + Induce SL 0.25 pt (A,B,D,G,E,H); BravoWS 6SC 1.5 pt (C,F)…………………………….	0.0c	0.4b	4.3d	7.5c	1.1d	296	347	14.6bc
Revus Top 4.17SC 7.0 fl oz + Induce SL 0.25 pt (A,B,D,G,E,H); BravoWS 6SC 1.5 pt (C,F)…………………………….	0.0c	0.1b	2.3d	6.3c	0.7d	323	397	4.0e
JE 874 2.1 SE 0.5 pt + Curzate 60DF 3.2 oz + Manzate 1.5 lb (A,C,G,E,I); BravoWS 6SC 1.5 pt (B,D,F,H)………………………	0.0c	0.5b	2.8d	11.8c	1.1d	329	403	15.3bc
Revus Opti 3.67SC 2.5 pt + Induce SL 0.25 pt (A,C,E,G,I); BravoWS 6SC 1.5 pt (B,D,F,H)………………………	0.0c	0.3b	2.5d	9.5c	1.0d	289	366	11.6cd
Penncozeb 75DF 1.0 lb (A); Penncozeb 75DF 2.0 lb (B,C,D); Penncozeb 75DF 2.0 lb + Super Tin 80WP 3.25 oz (E,F,G,H,I)…………………	0.0c	0.6b	11.3c	36.3b	3.8c	295	377	8.1cde
Penncozeb 75DF 2.0 lb (A,B,C,D,E,F,G,H)…………....	0.3bc	0.6b	10.0c	36.3b	3.7c	318	392	4.2de
TD 2368-01 4DF 3.0 lb (A,B,C,D,E,F,G,H)…………..	0.1c	0.8b	12.5c	38.8b	4.1bc	310	369	15.0bc
TD 2368-01 4DF 4.0 lb (A,B,C,D,E,F,G,H)…………..	0.5b	0.9b	18.8b	42.5b	5.3b	350	422	19.5ab
Bravo WS 6SC pt (A,B,C,E,G); Ranman 3.33 SC 0.17 pt + Manzate 75DF 2.0 lb + NIS 0.125 pt (D,F,H)…………………………………..	0.0c	0.1b	1.0d	4.8c	0.4d	308	371	13.5bc
Untreated...	1.2a	5.5a	82.5a	100a	18.5a	293	373	14.9bc
$HSD_{0.05}$	0.36	1.49	5.24	9.08	1.29	52.8	59.9	7.36

[z] Days after inoculation with *Phytophthora infestans*, US8, A2.
[y] Days after final application of fungicide.
[x] RAUDPC, relative area under the disease progress curve calculated from day of inoculation to last evaluation of late blight.
[w] Incidence of tuber late blight after storage at 50°F.
[v] Application dates: A= 30 Jun; B= 9 Jul; C= 16 Jul; D= 23 Jul; E= 30 Jul; F= 6 Aug; G= 13 Aug; H= 20 Aug; I = 27 Aug.
[u] Values followed by the same letter are not significantly different at $p = 0.05$ (Tukey Multiple Comparison).

Funding: MPIC/Agrochemical Industry

Evaluation of fungicide programs for Pythium leak control, 2008.

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Potatoes (cut seed, treated with Maxim FS at 0.16 fl oz/cwt) were planted at the Michigan State University Muck Soils Experimental Station, Bath, MI on 13 Jun into two-row by 25-ft plots (34-in row spacing), separated by a five-foot unplanted row and replicated four times in a randomized complete block design. Plots were irrigated as needed with sprinklers and were hilled immediately before sprays began. All rows were inoculated (3.4 fl oz/25-ft row) with an oospore suspension of *Pythium ultimum* (sensitive to mefenoxam) at 10^2-oospores/fl oz on 20 Jun [7 days after planting (DAP)]. In-furrow and foliar-banded applications were applied with an R&D spray boom delivering 8 gal/A (80 p.s.i.) and using one XR11003VS nozzle per row. Foliar applications were applied with an ATV rear-mounted R&D spray boom calibrated to deliver 25 gal/A (80 p.s.i.) using three XR11003VS nozzles per row. Bravo WS 6SC was applied on a 14-day interval from 27 Jul to 15 Sep (4 applications) to protect against foliar late blight. Weeds were controlled by hilling and with Dual 8E (2 pt/A on 25 May), Basagran (2 pt/A on 28 Jun and 11 Jul) and Poast (1.5 pt/A on 11 Jul). Insects were controlled with Admire 2F (20 fl oz/A at planting and on 28 Jun), Sevin 80S (1.25 lb/A on 11 and 25 Jul), Thiodan 3EC (2.33 pt/A on 1 and 21 Aug) and Pounce 3.2EC (8 oz/A on 11 Jul). Tuber number per plant was rated on 27 Jul and 27 Aug from samples of four plants per plot. Vines were killed with Reglone 2EC (1 pt/A on 21 Sep). Plots (2 x 25-ft row) were harvested on 10 Oct and individual treatments were weighed and graded and tuber number in size grades US-1 and b-grade determined. Samples of 50 tubers/plot were stored in the dark at 50oF and 95% RH for 60 days after harvest and the percentage of tubers with Pythium leak determined. Meteorological variables were measured with a Campbell weather station located at the farm, latitude 42.8269 and longitude -84.365deg. Maximum, minimum and average daily soil temperature (^{o}F) were 75.1, 53.1 and 65.8 (May); 82.1, 53.2 and 68.2 (Jun); 83.1, 53.7 and 65.3 (Jul); 80.5, 54.5 and 67.1 (Aug); 77.1, 51.3 and 66.4 (Sep). Maximum, minimum and average soil moisture (% of field capacity) were 79.0, 75.2 and 77.3 (May); 91.7, 77.2 and 81.3 (Jun); 82.1, 74.1 and 77.9 (Jul); 98.1, 75.4 and 80.7 (Aug); 76.2, 66.6 and 69.8 (Sep). Precipitation was 0.99 in. (May), 3.91 in. (Jun), 0.80 in. (Jul), 6.18 in. (Aug) and 1.09 in. (Sep). Plots were irrigated to supplement precipitation and enhance Pythium leak development to about 0.1 in./A/4 day period with overhead sprinkle irrigation.

No treatments had any effect on tuber number per plant measured pre-harvest. All treatments had significantly more US-1 grade tubers per plot at harvest in comparison with the untreated control except IR6141 69WG 0.21 lb/A applied during early senescence (timing D). Treatments with greater than 46.3 b-grade tubers per plot at harvest had significantly more tubers than the untreated control. All treatments had significantly greater US-1 grade yield in comparison with the untreated control. Pythium leak was evident in all plots at harvest but there was no difference in the percentage measured among any treatments. After about 60-days in storage, no treatments had significantly less incidence of tubers with Pythium leak than the untreated control although the incidence was low.

	Tuber number per plant		Tuber number/plot at harvest		Yield (cwt/A)		Pythium leak (% incidence)	
Treatment and rate/A or rate/1000 row ft	27 Jul	27 Aug	US-1	b-size	US-1	b-size	Harvest	Storage
Ridomil Gold 4EC 0.42 fl oz/1000 row ft (A)…	9.8	9.6	80.8 b	43.0abc	202 b	61abc	0.8	0.0
Ridomil Gold 4EC 0.42 fl oz 1000 row ft (A); Ridomil Gold 4EC 0.42 fl oz/A (B)…………….	10.9	9.6	109.3a	51.0a	290a	74a	0.7	1.0
Phostrol 6.69SC 0.66 fl oz/1000 row ft + Ultra Flourish 4SC 0.84 fl oz/1000 row ft (A)…	13.4	9.9	83.0 b	46.3ab	212 b	64ab	1.4	2.0
Ranman 400SC 0.42 fl oz 1000 row ft (A); Ranman 400SC 2.7 fl oz/A + Silwet SL 2.0 fl oz/A + Phostrol 6.69SC 8.0 pt/A (B); Phostrol 6.69SC 10.0 pt/A (C,D)………………	12.2	9.9	86.5 b	46.8ab	221 b	66ab	0.9	1.0
IR6141 69WG 0.21 lb/A (C,D)………………..	12.9	9.9	81.8 b	40.8abc	219 b	56a-d	0.9	2.0
IR6141 69WG 0.21 lb/A (C)…………………..	12.3	10.1	83.5 b	36.5 bcd	221 b	53 bcd	1.3	2.0
IR6141 69WG 0.21 lb/A (D)…………………..	13.4	10.3	75.3 bc	27.5 d	191 b	37 d	0.7	1.0
Untreated..	13.4	10.3	63.8 c	32.3 cd	154 c	44 cd	1.7	5.0
$LSD_{0.05}$	3.04	1.95	13.30	12.24	36.8	19.9	1.01	2.80

[z] Application dates: A= 13 Jun (in-furrow at planting); B= 29 Jun (95% emergence, banded application); C= 25 Jul; D= 8 Aug.
[y] Values followed by the same letter are not significantly different at p = 0.05 (Fishers protected LSD).

Potato Insect Biology and Management

Report to the Michigan Potato Industry Commission
15 January 2009

Adam M. Byrne, Walter L. Pett, Beth A. Bishop, and Edward J. Grafius

Outline.

I. Resistance of Colorado potato beetle populations to imidacloprid and thiamethoxam was evaluated for field populations from Michigan, as well as other locations in the Midwest and locations in the northeastern U.S.

II. Field insecticide evaluations of registered and experimental insecticides.

I. Resistance of Colorado potato beetle populations to imidacloprid and thiamethoxam.

Imidacloprid (Admire Pro®) and thiamethoxam (Platinum®, Actara®) continue to be the preferred and most reliable means of Colorado potato beetle control. Today, greater than 75% of the acres in the northeastern and midwestern United States are protected by these compounds (NASS 2006). Such consistent and heavy dependency on any compound sets the stage for resistance development. Further complicating the issue is the availability of generic imidacloprid formulations; these formulations drive down product cost, which will likely lead to even greater field exposure to this compound. All of these reasons strongly support the need to continue monitoring resistance development and to encourage growers to adopt strong resistance management strategies.

Our objectives were to continue gathering data on susceptibility to imidacloprid and thiamethoxam in Colorado potato beetle populations collected from commercial potato fields in Michigan and other regions of the United States. A second objective was to monitor the correlations between imidacloprid and thiamethoxam susceptibility. To accomplish these objectives, 39 Colorado potato beetle populations (21 Michigan populations, 15 populations collected in other states, and three laboratory populations) were bioassayed with imidacloprid and/or thiamethoxam.

<u>Methods</u>

During 2008, 21 Colorado potato beetle populations were collected from five Michigan counties (Huron, Isabella, Kalkaska, Mecosta, and Montcalm). Cooperators also provided one population from Delaware, three populations from Maine, Minnesota, and Virginia, and five populations from Wisconsin. Three laboratory strains were also tested (Table I.1).

Colorado potato beetle adults were either kept at room temperature (25±1° C) and fed foliage daily or, for longer term storage, kept in controlled environment chambers (11±1° C) and fed weekly. Beetles were treated with 1 µl of acetone/insecticide solution of known concentration applied to the ventral surface of the abdomen using a 50 µl Hamilton® microsyringe. Following treatment, beetles were placed in 100 mm diameter petri dishes lined with Whatman® No. 1 filter paper and provided with fresh potato foliage. They were kept at 25±1° C and the foliage and filter paper were checked daily and changed as needed.

A preliminary screen was conducted on most populations (for populations tested in previous years, screening was sometimes not necessary) to determine relative susceptibility to imidacloprid and thiamethoxam by testing 10 beetles each with one concentration of insecticide/acetone solution. Based on the results from these screens, a range of five concentrations was selected for each population to be assayed and each bioassay was replicated up to three times. In each replicate, 12-15 beetles were treated with each concentration (four to five beetles per dish and two to three dishes per concentration).

Beetle response was assessed 7 days post treatment. A beetle was classified as dead if its abdomen was shrunken, it did not move when its legs or tarsi were pinched, and its elytra were darkened. Beetles that had died due to *Beauvaria* sp. infection were excluded from analysis; these beetles were easily recognized by their pale petrified appearance or presence of white filamentous fungi. A beetle was classified as walking and healthy if it was able to grasp a pencil and walk forward normally. A beetle was classified as poisoned if its legs were extended and shaking, it was unable to right itself or grasp a pencil, and it was unable to walk forward normally at least one body length. Dead and poisoned beetle numbers were pooled for analysis. Data were analyzed using standard log-probit analysis (SAS® System v9.1.3, SAS Institute 2006).

<u>Results</u>

The imidacloprid LD_{50} value (dose lethal to 50% of the beetles) for the susceptible laboratory strain (New Jersey) was 0.034 µg/beetle, similar to values for previous years. The LD_{50} values from the field for imidacloprid ranged from 0.146 µg/beetle (overwintered adults from Montcalm Research Farm) to 2.383 µg/beetle (Sackett Potatoes, field 21) for Michigan populations (Figure I.1) and from 0.021 µg/beetle (Arlington, WI) to 5.495 µg/beetle (Delaware, DE) for out-of-state populations (Figure I.2A, Table I.2).

Significant levels of resistance to imidacloprid were again present in Michigan. Four fields from the Sackett Potatoes home farm were tested this year, all of which were greater than 10-fold resistant to imidacloprid. Between 10 and 20-fold is often where control problems begin to appear in the field. Most noteworthy were fields 21 and 34, they were 70 and 36-fold resistant, respectively, to imidacloprid compared to the susceptible strain.

In 2008, eight additional Sackett Potatoes sites away from their home farm showed greater than 20-fold resistance to imidacloprid. The proportion of Michigan samples showing greater than 10-fold resistance to imidacloprid was up from 67% in 2007 to 90% in 2008. All but two samples had significantly higher LD_{50} values than the susceptible New Jersey strain, the exceptions being from Kalkaska and overwintered adults from the Montcalm Research Farm.

A population from Delaware again showed very high levels of resistance to imidacloprid, consistent with findings from previous years. The two populations tested from Maine were greater than 10-fold resistant, but much lower than in previous seasons, while the lone Virginia population tested was very susceptible. The Wisconsin populations submitted to us for testing did not show high levels of resistance this season. However, elevated levels of resistance persist in some areas of Wisconsin (pers. comm. Russell Groves, University of Wisconsin), but overall values were lower than those recorded in Michigan this year. A sample from Minnesota registered just over 18-fold resistance to imidacloprid; this is a site that appears to be undergoing some rapid change and warrants close scrutiny next season.

The thiamethoxam LD_{50} value for the susceptible laboratory strain (New Jersey) was 0.047 µg/beetle. The LD_{50} values for thiamethoxam ranged from 0.11 µg/beetle (overwintered adults from Montcalm Research Farm) to 0.356 µg/beetle (Sackett Potatoes field 34) for Michigan populations (Figure I.3) and from 0.031 µg/beetle (Painter, VA) to 0.649 µg/beetle (Delaware, DE) for out-of-state populations (Figure I.2.B, Table I.3).

As in 2007, no Michigan populations had greater than 10-fold resistance to thiamethoxam. However, all populations tested had LD_{50} values significantly higher than the susceptible New Jersey strain, up from 88% in 2007.

Susceptibility to imidacloprid (as measured by LD_{50}) in field-collected Colorado potato beetle populations was highly correlated with susceptibility to thiamethoxam (Figure I.4). This result was also found in previous years (e.g. Grafius et al. 2004, 2005; Byrne et al. 2006, 2007, 2008). This high correlation is a strong indicator that alternation between imidacloprid and thiamethoxam would not be an effective or wise management technique.

The Evans laboratory strain has been selected for imidacloprid resistance, while Hadley has been selected for resistance to thiamethoxam. Adults from each generation were selected with their corresponding compound, using doses causing 30-90% mortality. Survivors from selections were used to maintain the laboratory strains. Bioassays are conducted roughly every third generation, allowing us to follow resistance development under a high selection pressure scenario. The imidacloprid LD_{50} values for the Evans and Hadley strains were 19.861 and 26.308, respectively; these represent the highest resistance values we have ever recorded. The Hadley strain had a thiamethoxam LD_{50} value of 2.008, which is slightly higher than 40-fold resistant compared to the susceptible laboratory strain. Both these populations demonstrate the potential for future resistance problems if efforts aren't continually made to limit selection pressures.

Adults from the Hadley strain are currently being used in genetic studies to see if resistance to thiamethoxam is inherited as dominant or recessive factors and if a single gene or multiple genes are likely involved. Results of these studies will help us continue to develop recommendations for managing resistance.

Table I.1. Colorado potato beetle populations tested for susceptibility to imidacloprid and thiamethoxam in 2008.

Michigan populations
Andersen Brothers Farm *Field 44* Summer adults were collected on 17 July 2008 by Mark Otto, Agri-Business Consultants, Inc. from commercial potato field in Isabella County, MI. Source of beetles from volunteer potatoes in 2008 peas in fields AB 41 & 43. This same population was tested in 2007.
Border Summer adults were collected on 30 July 2008 by James W. Johnson, Syngenta Crop Protection, from a commercial potato field near Cass City, Huron County, MI.
Kalkaska Summer adults were collected on 24 July 2008 by Dennis Ioyt, Iott Seed Farms, Inc., from a commercial potato field in Excelcior Twp., Kalkaska County, MI.
Main Large larvae were collected on 30 July 2008 by James W. Johnson, Syngenta Crop Protection, from a commercial potato field near Cass City, Huron County, MI. Larvae were reared to adults and then bioassayed.
Montcalm Farm Overwintered adults were collected on 9 June 2008 and summer adults on 21 July 2008 from untreated potatoes at the Michigan State University Montcalm Potato Research Farm, Entrican, MI.
Northeast Main Summer adults were collected on 30 July 2008 by James W. Johnson, Syngenta Crop Protection, from a commercial potato field near Cass City, Huron County, MI.
Paul Main Farm Adults were collected by Mark Otto, Agri-Business Consultants, Inc. from commercial potato fields in Mecosta and Montcalm Counties.
Field B1 Summer adults were collected on 19 July 2008. Source of beetles from volunteers in 2008 seed corn in field PM KR-AN in Montcalm County. Population was tested in 2007 as KR GR.
Field C7 Summer adults were collected on 21 July 2008. Source of beetles was from volunteers in 2008 seed-corn in field PM C1 in Montcalm County. This is the first time we have been able to test beetles from this population.
Field H1 Summer adults were collected on 20 July 2008. Source of beetles was from volunteers in 2008 corn in field PM H26 in Montcalm County. First beetles tested from this population.
Field HB-YN Overwintered adults were collected on 6 June 2007. Collected from volunteers in 2008 sugar beets and corn in Montcalm County. Population was tested in 2007.
Field R11 Summer adults were collected on 21 June 2008. Source of beetles was volunteers in 2008 green beans in field PM R7 in Mecosta County. Population was tested in 2007.
Field RC5 Summer adults were collected on 19 July 2008. Source of beetles was volunteers in seed corn in PM D2 in Montcalm County. First time this population has been tested.

Table I.1. cont'd. Colorado potato beetle populations tested for susceptibility to imidacloprid and thiamethoxam in 2008.
Sackett Potatoes Adults were collected by Mark Otto, Agri-Business Consultants, Inc., and Michigan State University researchers from commercial potato fields in Mecosta and Montcalm Counties, MI.
Fields 12-14 Overwintered adults were collected on 5 June 2008 from trap rows along south edge of SP14 in Mecosta County. Population tested last year as SP15.
Field 21 Summer adults were collected on 21 July 2008. Source of beetles was from volunteers in seed corn in fields SP22 & 25 in Mecosta County. Population tested last year.
Field 34 Summer adults were collected on 21 July 2008. Source of beetles was from volunteers in 2008 seed corn in field SP43-48 in Mecosta County. Population tested last year.
Fields 41-42 Overwintered adults were collected on 5 June 2008 from trap rows in Mecosta County. Population tested last year.
Fields 54-55 Summer adults were collected on 4 August 2008. Source of beetles were from volunteers in this year's potato field in Mecosta County. Population was tested last year.
Field 76 Summer adults were collected on 21 July 2008. Source of beetles was from volunteers in corn in SP75 and 77 in Mecosta County.
Field 95 Summer adults were collected on 15 July 2008. Source of beetles was from volunteers in wheat in SP94 in Mecosta County. Population tested last year.
Field 102 Summer adults were collected on 29 July 2008. Source of beetles was from volunteers in SP103 peas in Mecosta County. Population tested last year.
Fields 167-169 Summer adults were collected on 15 July 2008. Source of beetles was volunteers in 2008 corn in SP166 in Montcalm County. First time this population has been tested.

Out-of-state populations
Arlington, Wisconsin Overwintered adults were collected on 6 June 2008 by Scott Chapman, University of Wisconsin, from potatoes at the Arlington Agricultural Experiment Station, Arlington, WI.
Aroostook, Maine Adults were collected on 7 July 2008 by Gary Sewell, University of Maine, from untreated potato research plots near Presque Isle, ME.
Becker, Minnesota Adults were collected on 24 June 2008 by David Ragsdale, University of Minnesota, from potatoes treated, at planting, with Admire Pro ® (8.0 oz/acre) at the Sand Plain Experiment Farm, near Becker, MN.
Bridgewater, Maine Adults were collected on 12 August 2008 by Jim Gerritsen, Wood Prairie Farm, from a potato field, treated with Entrust ® (1 oz/acre), near Bridgewater, ME.
Delaware, Delaware Adults were collected on 30 June 2008 by Joanne Whalen, University of Delaware, from a commercial potato field near Little Creek, DE, treated at planting with Gaucho ® and with foliar applications of Radiant and Spintor.
Fryeburg, Maine Adults were collected on 9 July 2008 by Megan Patterson, from a commercial potato field near Fryeburg, ME.

Table I.1. cont'd. Colorado potato beetle populations tested for susceptibility to imidacloprid and thiamethoxam in 2008.
Hammer, Minnesota Adults were collected on 24 June 2008 by David Ragsdale, University of Minnesota, from a commercial potato field in East Clear Lake Twp., Sherburne County, MN that was treated at planting with Admire Pro ® (8.3 oz/acre).
Hastings, Minnesota Summer adults were collected on 25 August 2008 by Jim Gill from a commercial potato field near Hastings, MN, treated with Admire ® (18 oz/acre) and Thimet ® at planting.
Horntown, Virginia Overwintered adults were collected on 19 May 2008 by Tom Kuhar, Virginia Polytechnic Institute and State University, from a potato field near Horntown, VA that was treated with Platinum ® and Regent ® at planting.
Lewallen, Wisconsin Overwintered adults were collected on 4 June 2008 by Scott Chapman, University of Wisconsin-Madison, from a potato field near Lewallen, WI.
New Church, Virginia Overwintered adults were collected on 19 May 2008 by Tom Kuhar, Virginia Polytechnic Institute and State University, from a potato field near New Church, VA that was treated with Platinum ® and Regent ® at planting.
Okray-Hammer, Wisconsin Overwintered adults were collected on 5 June 2008 by Scott Chapman, University of Wisconsin-Madison, from a potato field near Plover, WI.
Okray-Rt, Wisconsin Overwintered adults were collected on 5 June 2008 by Scott Chapman, University of Wisconsin-Madison, from a potato field near Plover., WI.
Painter, Virginia Overwintered adutls were collected on 20 May 2008 by Tom Kuhar, Virginia Polytechnic Institute and State University, from untreated potatoes at the Eastern Shore Agricultural Research & Extension Center in Painter, VA.
Powell West, Wisconsin Overwintered adults were collected on 4 June 2008 by by Scott Chapman, University of Wisconsin-Madison, from a potato field near Coloma., WI.

Laboratory strains
Evans Collected from Montcalm Co., MI in summer 1997. Adults from most generations have been selected with imidacloprid doses targeting 60-80% mortality.
Hadley Collected from Hadley, MA in July 2003. Adults from most generations have been selected with thiamethoxam doses targeting 60-80% mortality.
New Jersey Adults obtained from the Phillip Alampi Beneficial Insects Rearing Laboratory, New Jersey Department of Agriculture.
NY-Select Collected from Long Island, NY in 1997. Adults from most generations selected with imidacloprid doses targeting 60-80% mortality.

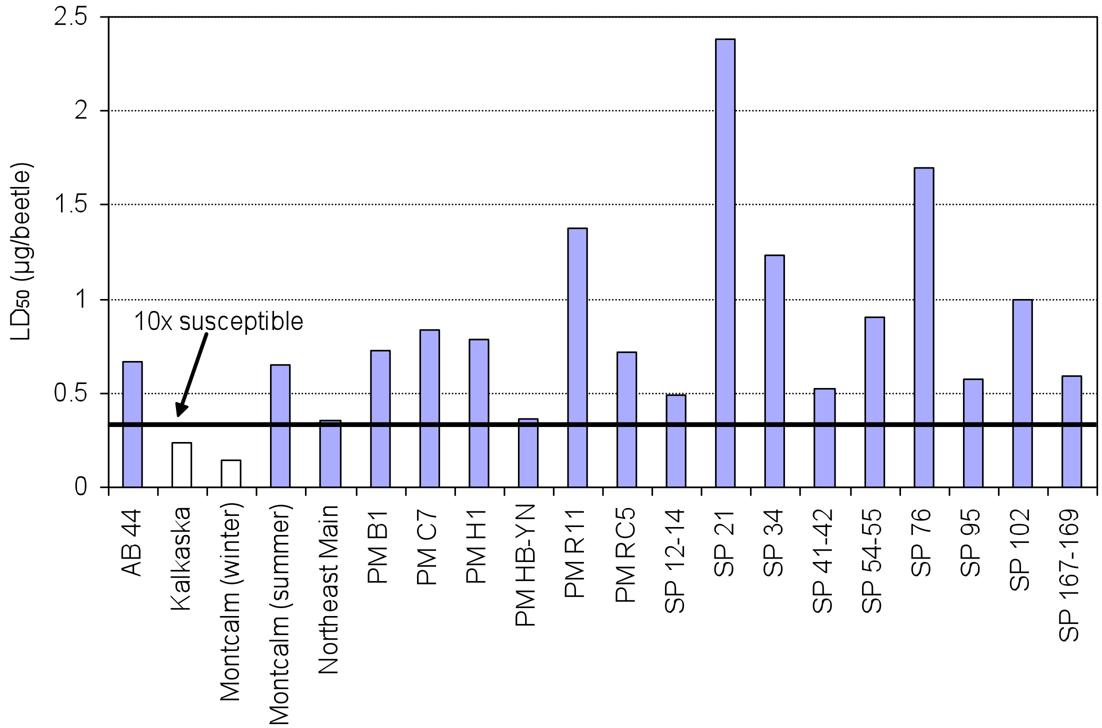
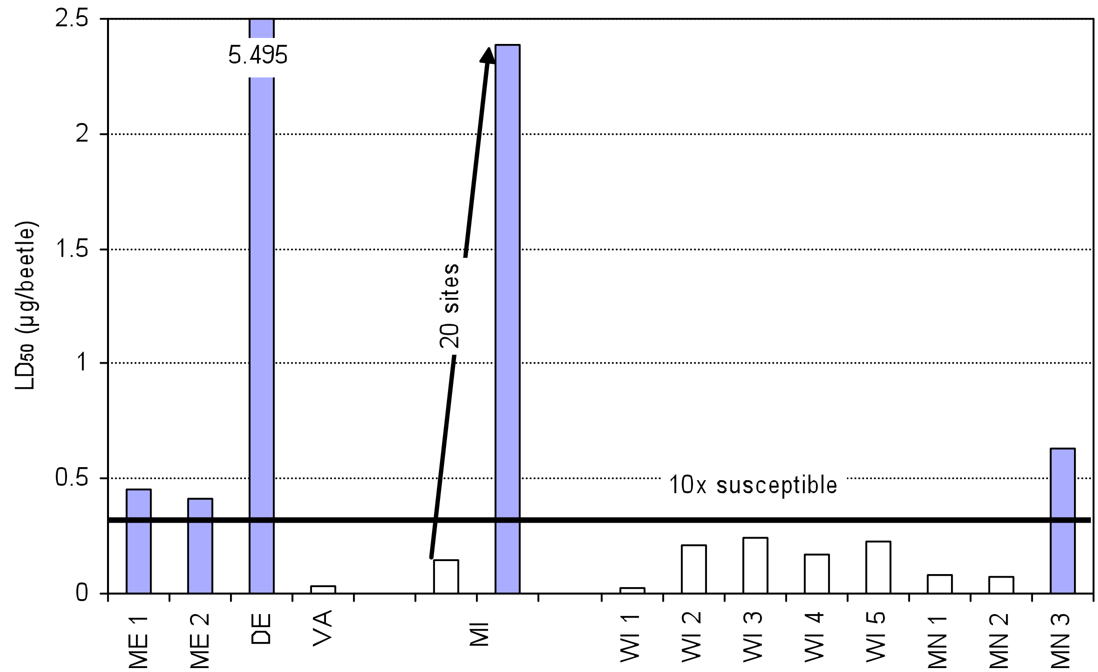


Figure I.1. Susceptibility of Michigan field populations of Colorado potato beetle to imidacloprid. Dark bars represent populations that had significantly greater LD_{50} values compared to the susceptible strain.

A. Imidacloprid



B. Thiamethoxam

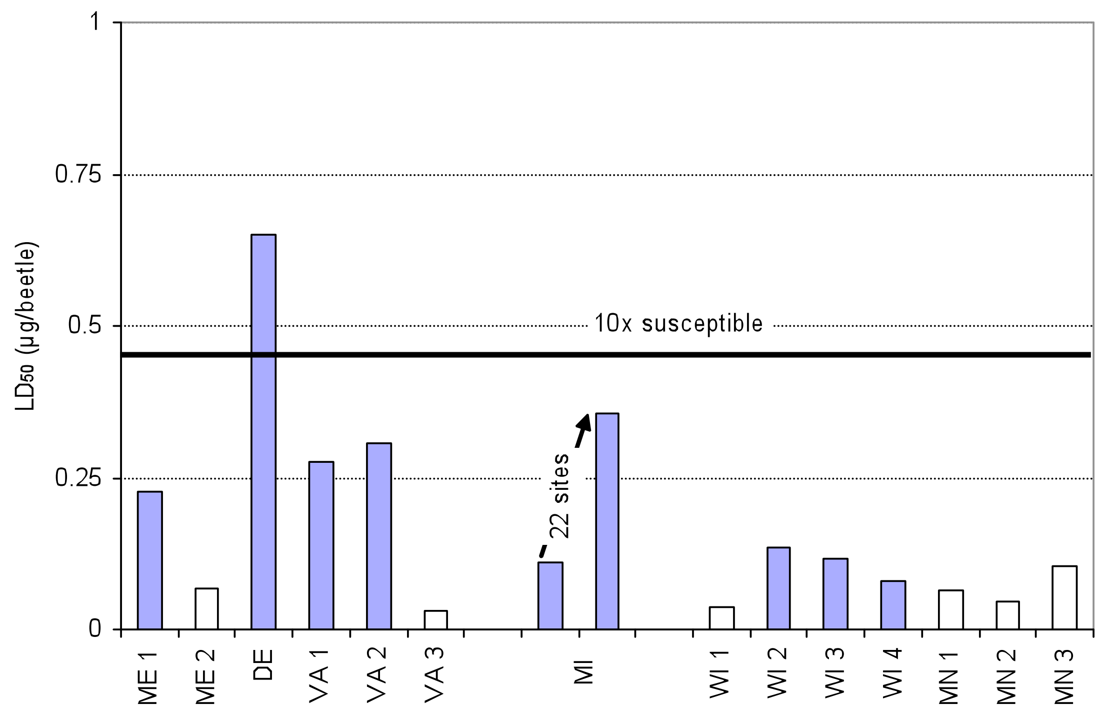


Figure I.2. Susceptibility of field populations of Colorado potato beetle to imidacloprid (A) and thiamethoxam (B). Michigan values represented as a range from lowest to highest value. Dark bars represent populations that had significantly greater LD_{50} values compared to the susceptible strain.

Table I.2. LD_{50} values (µg/beetle) and 95% fiducial limits for Colorado potato beetle populations treated with imidacloprid at 7 days after treatment.

	LD_{50}	95% fiducial limits
Michigan populations		
Anderson Brothers Field 44	0.670[2]	0.558-0.793
Kalkaska	0..234	0.110-0.344
Montcalm Farm (winter)	0.146	0.102-0.192
Montcalm Farm (summer)	0.647[2]	0.481-1.084
Northeast Main	0.355[2]	0.206-0.513
Paul Main Farm		
Field B1	0.728[2]	0.317-1.711
Field C7	0.840[2]	0.435-1.395
Field H1	0.782[2]	0.642-0.926
Field HB-YN	0.366[2]	0.301-0.426
Field R11	1.376[2]	1.048-1.937
Field RC5	0.719[2]	0.549-1.027
Sackett Potatoes		
Fields 12-14	0.490[2]	0.417-0.567
Field 21	2.383[2]	1.918-2.966
Field 34	1.235[2]	0.249-2.116
Fields 41-42	0.525[2]	0.431-0.618
Fields 54-55	0.903[2]	0.775-1.063
Field 76	1.694[2]	1.383-2.071
Field 95	0.573[2]	0.470-0.723
Field 102	0.999[2]	0.862-1.151
Fields 167-169	0.591[2]	0.488-0.716
out-of-state populations		
Arlington, WI	0.021	0.018-0.024
Aroostook, ME	0.059	*
Becker, MN	0.081	0.033-0.124
Bridgewater, ME	0.450[2]	0.350-0.601
Delaware, DE	5.495[2]	3.884-10.885
Fryeburg, ME	0.411[2]	0.302-0.621
Hammer, MN	0.075	0.057-0.096
Hastings, MN	0.631[2]	0.341-0.974
Lewallen, WI	0.209	0.154-0.265
Okray-Hammer, WI	0.243	0.174-0.381

Table I.2. cont'd. LD_{50} values (µg/beetle) and 95% fiducial limits for Colorado potato beetle populations treated with imidacloprid at 7 days after treatment.

	LD_{50}	95% fiducial limits
Okray-Rt, WI	0.172	0.131-0.223
Painter, VA	0.036	0.029-0.043
Powell West, WI	0.230	0.070-0.371
laboratory strains		
Evans	19.861[2]	16.767-29.575
Hadley	26.308	*
New Jersey	0.034	0.011-0.189

[1] significantly greater than LD_{50} value for susceptible New Jersey strain
[2] greater than 10 times the LD_{50} value for susceptible New Jersey strain

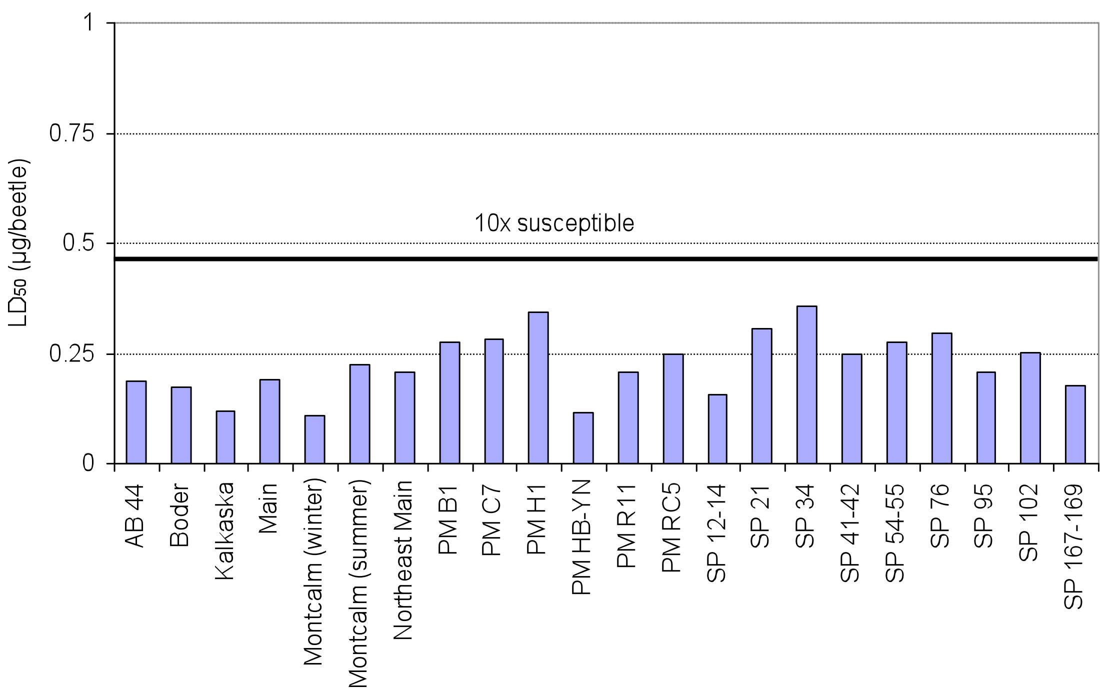


Figure I.3. Susceptibility of Michigan field populations of Colorado potato beetle to thiamethoxam. All populations showed significantly greater LD_{50} values compared to the susceptible strain.

Table I.3. LD_{50} values (µg/beetle) and 95% fiducial limits for Colorado potato beetle populations treated with thiamethoxam at 7 days after treatment.

	LD_{50}	95% fiducial limits
Michigan populations		
Anderson Brothers Field 44	0.187[1]	0.156-0.220
Border	0.174[1]	0.132-0.224
Kalkaska	0..120[1]	0.096-0.150
Main	0.191[1]	0.135-0.276
Montcalm Farm (winter)	0.110[1]	0.093-0.132
Montcalm Farm (summer)	0.225[1]	0.180-0.317
Northeast Main	0.205[1]	0.157-0.290
Paul Main Farm		
Field B1	0.275[1]	0.236-0.319
Field C7	0.281[1]	0.241-0.325
Field H1	0.343[2]	0.189-0.702
Field HB-YN	0.116[1]	0.097-0.140
Field R11	0.208[1]	0.164-0.252
Field RC5	0.247[1]	0.206-0.291
Sackett Potatoes		
Fields 12-14	0.156[1]	0.131-0.184
Field 21	0.305[1]	0.247-0.360
Field 34	0.356[1]	0.295-0.418
Fields 41-42	0.248[1]	0.144-0.887
Fields 54-55	0.274[1]	0.215-0.335
Field 76	0.297[1]	0.265-0.336
Field 95	0.208[1]	0.173-0.252
Field 102	0.253[1]	0.189-0.307
Fields 167-169	0.177[1]	0.139-0.246
out-of-state populations		
Arlington, WI	0.036	0.031-0.041
Aroostook, ME	0.042	*
Becker, MN	0.063	0.054-0.074
Bridgewater, ME	0.227[1]	0.134-0.484
Delaware, DE	0.649[2]	0.539-0.794
Fryeburg, ME	0.068	0.006-0.113
Hammer, MN	0.046	0.030-0.059
Hastings, MN	0.105	0.053-0.147

Table I.3. cont'd. LD_{50} values (µg/beetle) and 95% fiducial limits for Colorado potato beetle populations treated with thiamethoxam at 7 days after treatment.		
	LD_{50}	95% fiducial limits
Horntown, VA	0.276[1]	0.237-0.319
Lewallen, WI	0.135[1]	0.080-0.213
New Church, VA	0.308[1]	0.257-0.373
Okray-Hammer, WI	0.117[1]	0.084-0.167
Okray-Rt, WI	0.080[1]	0.056-0.102
Painter, VA	0.031	0.020-0.039
laboratory strains		
Hadley	2.008[2]	1.639-2.449
New Jersey	0.047	0.041-0.054

[1] significantly greater than LD_{50} value for susceptible New Jersey strain
[2] greater than 10 times the LD_{50} value for susceptible New Jersey strain

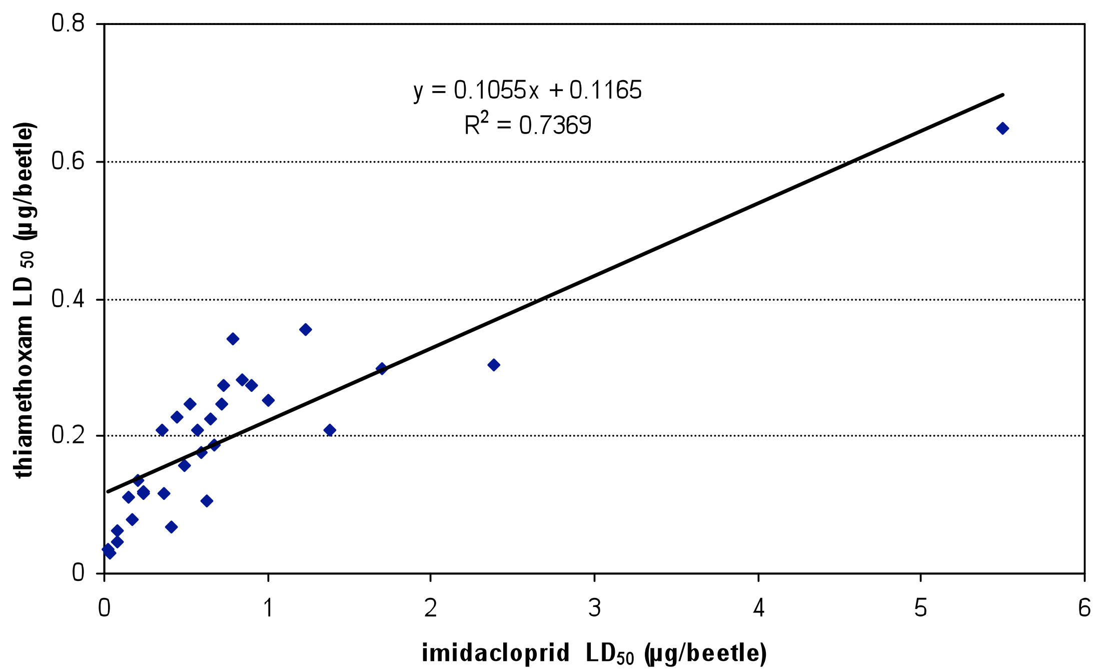


Figure I.4. Correlation between susceptibility to imidacloprid and thiamethoxam for all field populations tested in 2008 (n=31).

II. Field insecticide evaluations of registered and experimental insecticides.

Evaluation of registered and potential insecticides for control of Colorado potato beetle provides data on comparative effectiveness of products and data to support future product registrations and use recommendations.

Methods

Thirty-one insecticide treatments plus an untreated check (Table II.1) were tested at the Michigan State University Montcalm Research Farm, for control of CPB. 'Atlantic' seed pieces were planted 12 in. apart, with 34 in. row spacing on 15 May 2007. Treatments were replicated four times in a randomized complete block design. Plots were 35 ft long and three rows wide.

Admire Pro, Platinum, and V10170 treatments were applied in-furrow at planting using a single nozzle hand-held boom (30 gpa, 30 psi). Temik was a granular application in furrow at planting. Foliar treatments were first applied at greater than 50% egg hatch on 18 June. Subsequent first-generation sprays for most treatments were applied on 25 June, 2 July and 5 July, depending on treatment (footnote, Table II).

Post-spray counts of CPB adults, egg masses, small larvae (1st and 2nd instars), and large larvae (3rd and 4th instars) on five randomly selected plants from the middle row of each plot were made 5 to 6 days after each foliar application. On 22 September, the middle row of each plot was harvested mechanically and the total tuber weight was recorded. Data were analyzed using two-way ANOVA (treatment and block) and significant differences were determined with Fisher's Protected LSD test (p=0.05).

Results

The seasonal average number of large larvae was significantly lower in 28 of the 31 treated plots than in untreated plots (Table II). However, overall insect pressure was very high and only the Admire (high rate), Platinum, and Temik insecticide treatments kept large larvae below the economic threshold of 2 large larvae per plant compared to 16 large larvae per plant in the untreated plots. The seasonal average number of egg masses and small larvae, included many larvae that had recently hatched and were still on the egg mass, resulting in high variability in these results. All treatments, except for ARY50401, resulted in significantly higher yields than in the untreated plots (Table II).

Results show that a number of experimental insecticides may provide future control of Colorado potato beetle, but foliar applications are more difficult to effectively time than at planting applications with Admire and Platinum.

Table II.1. The seasonal average number of first generation Colorado potato beetle adults, egg masses, small larvae, large larvae per plant, and yield of harvested 'Atlantic' potatoes.

Treatment/ formulation	Adults	Egg Masses	Small Larvae	Large Larvae	Yield (lbs) /35 row ft.[8]
A15397 NIS (Voliam Xpress) 5.0 floz/A[3]	0.4 e-i	0.6 d-g	1.9 a-c	3.3 c-f	41.4 c-e
A15397 NIS (Voliam Xpress) 7.0 floz/A[6]	0.2 a-h	0.4 b-f	3.7 a-d	5.0 d-g	46.0 d,e
A15397 NIS (Voliam Xpress) 8.9 floz/A[5]	0.3 d-i	0.6 e-g	4.0 b-d	5.5 e-h	41.4 c-e
A15645 NIS (Voliam Flexi) 4 oz/A[6]	0.3 a-i	0.4 b-f	3.6 a-d	4.7 d-g	47.4 d,e
Actara 25 WG 5.5 oz/A[6]	0.2 a-g	0.3 a-d	2.2 a-c	3.2 b-e	54.0 e
Admire Pro 7.0 floz/A[1]	0.4 h.i	0.4 b-f	1.4 a,b	2.6 b-d	41.7 c-e
Admire Pro 8.7 floz/A[1]	0.4 e-i	0.2 a-c	0.5 a,b	1.4 a,b	50.6 e
Agrimek EC 8 floz/A[7]	0.2 a-g	0.4 b-e	5.5 c-e	6.6 f-h	42.0 c-e
Alverde + MSO 4.5 floz/A+.5%[6]	0.02 a	0.2 a-c	5.4 c-e	6.4 f-h	49.4 c-e
ARY5040+Provado 1.6FL + Battalion 2.0EC 2.0floz/A +2.0 floz/A+7.0 floz/A[2]	0.3 c-i	0.6 d-g	8.1 e,f	9.5 h-j	41.8 c-e
ARY50401 80 floz/A[2]	0.4 f-i	0.4 b-f	20.0 h	21.1 k	12.0 a,b
ARY50401+Battalion 2.0 EC 20.0 floz/A+7 floz/A[2]	0.1 a-e	0.5 b-g	8.7 e,f	10.0 h-j	31.8 c,d
ARY50401+Provado 1.6FL 20.0 floz/A +2.0 floz/A[2]	0.4 f-i	0.4 b-f	6.8 d,e	8.0 g-i	37.4 c-e
Assail 4.0 floz/A[5]	0.2 a-g	0.3 a-d	5.6 c-e	6.6 e-h	38.4 c-e
Belay 2.13 SCX 2.0 floz/A[6]	0.1 a-c	0.3 a-c	2.5 a-c	3.5 b-e	38.2 c-e
Belay 2.13 SC 3.0 floz/A[6]	0.1 a-e	0.2 a-c	2.3 a-c	3.2 c-f	36.4 c-e
Coragen SC 3.5 floz/A[7]	0.4 g-i	0.4 b-f	5.2 c-e	6.4 f-h	39.7 c-e
Coragen SC 5.0 floz/A[3]	0.3 b-i	0.5 c-g	3.2 a-d	4.5 d-g	43.6 c-e
Endigo (A13623C) 3.5 floz/A[5]	0.2 a-h	0.5 b-f	5.2 c-e	6.4 f-h	43.4 c-e

HGW86 10 OD + MSO 100 g/Ha+.5%[4]	0.2 a-g	0.3 a-d	2.4 a-d	3.4 c-f	47.0 d,e
HGW86 10 OD 100 g/Ha[4]	0.2 a-g	0.3 a-c	3.5 a-d	4.4 d-f	50.8 c-e
HGW86 10 OD 150 g/Ha[4]	0.1 a-d	0.4 b-e	3.4 a-d	4.5 d-g	43.0 c-e
HGW86 10 OD 50 g/Ha[4]	0.3 c-i	0.6 d-g	2.4 a-c	3.8 c-f	47.1 d,e
HGW86 10 SE 100 g/HA[4]	0.2 a-h	0.4 b-e	2.9 a-c	4.0 d-g	44.6 c-e
HGW86 20 SC 150 g/Ha[1]	0.3 c-i	0.3 a-d	2.8 a-c	3.8 c-f	36.7 c-e
HGW86 20 SC 200 g/Ha[1]	0.7 j	0.5 b-g	2.0 a-c	3.3 b-e	44.3 c-e
HGW86 20 SC 75 g/HA[1]	0.5 i.j	0.7 f,g	3.4 a-d	5.0 d-g	44.0 c-e
Lambda 3.2 oz/A[6]	0.3 b-i	0.9 g	3.8 a-d	5.6 e-h	39.2 c-e
Platinum 75 SG 2.7floz/A[1]	0.2 a-g	0.1 a	0.1 a	0.8 a	46.4 d,e
Temik 15G 20 lb/A[1]	0.05 a,b	0.2 a,b	0.9 a,b	1.8 a-c	41.1 c-e
Trigard WG 2.66 oz/A[2]	0.1 a-f	0.6 d-g	11.4 f,g	12.8 i-k	27.2 b,c
Untreated	0.3 c-i	0.5 c-g	14.9 g	16.2 j,k	7.9 a

Average numbers within a column followed by different letters are significantly different (P,0.05, Fisher's Protected LSD). Data transformed for analysis with log (x+1), presented in non-transformed units.
[1]Treatments applied in-furrow at planting May 15, 2008
[2]Treatments applied: 18 Jun, 25 Jun, 2 Jul, 9 Jul
[3]Treatments applied: 18 Jun, 25 Jun, 2 Jul
[4]Treatments applied: 18 Jun, 25 Jun, 9 Jul
[5]Treatments applied: 18 Jun, 2 Jul
[6]Treatments applied: 18 Jun, 9 Jul
[7]Treatments applied: 18 Jun, 2 Jul, 9 Jul
[8]Harvested 22 Sep

MICHIGAN POTATOES
MICHIGAN POTATO INDUSTRY COMMISSION

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March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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Excretion of ^{14}C-imidacloprid in Michigan Colorado potato beetles

(REPORT 2008)

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I. PROBLEM STATEMENT

The Colorado potato beetle (CPB), *Leptinotarsa decemlineata* (Say), is the principal insect pest of potatoes in North America and Europe (Weber and Ferro 1994), if this pest is not controlled it can cause the total defoliation of the crop and sever economic losses.. Imidacloprid, a neonicotinoid compound was registered for use on potatoes in 1995 and soon became the primary means to control Colorado potato beetles resistant to organophosphates, pyrethroids, and carbamates in Michigan and other areas in the US (Grafius 1997).

Despite excellent initial efficacy of imidacloprid in 1997, resistance to imidacloprid was detected in a CPB population collected from an imidacloprid treated commercial potato field in Long Island, NY (Zhao et al. 2000). In 1998 resistance of CPB to imidacloprid was widespread in Long Island (Mota-Sanchez et al. 2000), and more recently resistance has been detected in several other potato-growing regions in the northeast USA (Dively 2006, Alyokhin et al. 2007). In Michigan, resistance of CPB to imidacloprid and low levels of resistance to thiamethoxam were detected in 2004 and more resistance cases are appearing close to the original site of detection (Grafius 2006). Intense efforts for insecticide resistance management including crop rotation and trap crop have been implemented (Grafius 2006). Despite some resistance cases, many Colorado potato beetle populations are still susceptible to imidacloprid and other neonicotinoids. Taking a proactive approach at this point in time will help to preserve the efficiency of this class of chemicals. One of the key strategies to manage resistance is the determination of the mechanism of resistance of CPB to imidacloprid.
Our research approach was to use labeled ^{14}C-imidacloprid to study rates of excretion of this compound when applied orally in a Michigan CPB population, a susceptible population, and a population with a highest level of resistance from Long Island, NY.

II.SPECIFIC OBJECTIVES AND HYPOTHESES

Specific objectives:

1) Determine the rates of excretion of ^{14}C-imidacloprid in Michigan potato beetles treated with this compound.

Hypothesis:
The mechanism by which CPB from MI resistant populations eliminates imidacloprid differs from other resistant populations (i.e. from Long Island, NY) because of differences in the pattern of insecticide use and genetic background.

III. SPECIFIC METHODS AND PROCEDURES

The rate of excretion of imidacloprid in Michigan resistant and susceptible populations was identified and compared with populations form Long Island, NY and a susceptible strain.

Insects. Resistant populations of Colorado potato beetles to imidacloprid from Michigan sites where Dr. Edward Grafius reported resistance will be used. Those populations were compared with a highly resistant field population from Long Island, NY and a susceptible population reared in the laboratory (New Jersey).

Dosing. ^{14}C-Imidacloprid was applied via oral assays. A dose of ^{14}C-imidacloprid was used (3000 dpm/beetle, about 10 ng 14C-imidacloprid) in beetles of all populations. After application, beetles were transferred to a 20 ml glass scintillation vial. Up to four beetles were held in a vial. Five time intervals will be used for the (0.5, 2, 4, 24, 72, and 120 h). Three replications were performed per exposure time (four beetles per replication). At the end of each time interval, beetles were killed and homogenized in a tube with 10 ml of acetonitrile using a high speed mechanical homogenizer (VirTishear). Following homogenization, tubes were centrifuged for 5 min at 7000 rpm. The supernatant was decanted into a scintillation vial. An aliquot was taken from each extract to count the radioactivity. Radioactivity of each exposure time was measured in a liquid scintillation counter (LSC).

Excretion. To calculate the amount of excreted ^{14}C from imidacloprid, holding vials for each time period were rinsed with 3 ml of methanol. An aliquot of 400 µl of acetone was put in a scintillation vial with 15 ml of cocktail fluid and was counted. To get the total amount of ^{14}C excreted, the results of all fractions were combined.

IV. RESULTS AND DISCUSSION.

Pharmacokinetics

Internal fractions. One hour after treatment about 24% of the total dose of ^{14}C-imidacloprid was found inside insect body in all populations (Figure 1A). At 6 h after treatment lower 14C-imidacloprid was found in the resistant strain (20%), followed by the Michigan population (30%), and the susceptible strain (42%). Twenty four hours after treatment only 1% of the amount the internal extractable fraction of imidicloprid remained in resistant beetles, whereas the Michigan and susceptible populations were different from the resistant population, but similar to each other with 14% and 18% remaining, respectively. Seventy two hours after treatment the amount of 14C-imidacloprid in the insect body of the resistant strain remained stable at 1%. At 72 h the amount of 14C-imidacloprid in the Michigan and susceptible population were 6% and 2%, respectively.

Excretion. Excretion appeared to be faster in the susceptible strain from 30 min to 2 h than the Michigan population and the Long Island population (Fig 2A). At 2 h after treatment the percentage of excreted radioactivity were 30, 23, 26 % for the susceptible, Michigan and Long Island, NY population, respectively. This result could be caused by a high expression of initial intoxication symptoms in the susceptible strain including tremors and contractions in the insect body. However, at 6h after treatment and all the times after this hour the Long Island population had the biggest percentage of excreted radioactivity followed by the Michigan and susceptible population (Fig2). Excretion of ^{14}C-imidacloprid also was relatively fast, at the end of the experiment the percentage of 14C-imidacloprid that had been removed from the body of the susceptible, Michigan and Long Island population was 59, 62, and 77%, respectively.

The process of internalization and elimination of 14C-imidacloprid may explain the intoxication and recovery of beetles treated with imidacloprid (Mota-Sanchez 2003). Mota-Sanchez (2003) reported that beetles treated with imidacloprid showed symptoms 20 to 30 min after treatment. These symptoms included hyperexcitability, tremors, bending of the antenna and tarsi, vomiting, and defecation. When the beetles were knocked down, they became prostrate with feeble movement of the appendages. These early symptoms could be attributed to the initial penetration of the compound and distribution to the target sites. The agonist effect of imidacloprid on the nicotinic acetylcholine receptors triggered adverse physiological responses mentioned above. However, 3 to 10 d after treatment, some beetles recovered from the insecticide exposure. This situation may be due to the elimination and reduction in the internal radioactivity of most of the radiolabeled compound as it was found in Mota-Sanchez 2003. In this research we observed similar symptoms of intoxication and recovery in susceptible and resistant beetles. However, the susceptible beetles were affected longer time than the resistant ones.

V. CONCLUSION

Colorado potato beetles were treated via oral assays procedure that closely approaches the form in which beetles come in contact with imidacloprid in the potato field.
This is the first report that resistant beetles treated with imidacloprid excrete more compound than susceptible beetles. The Michigan population was intermediate in the rate of excretion and internal amount of 14C-imidacloprid in comparison with the

resistant and susceptible population. This condition is also correlated with resistance levels and underscores the importance of managing neonicotinoid resistance in CPB in Michigan potato beetles.

VI. AKNOWLEDGEMENTS

We deeply appreciate the kind support of the MPIC for this proposal and also the valuable help of Mark Otto and Adam Byrne and Ed Grafius to provide Michigan beetles. In addition, our collaborator, Dale Moyer from Cornell Experiment Station at Riverhead, Long Island, NY provided us with resistant beetles**.**

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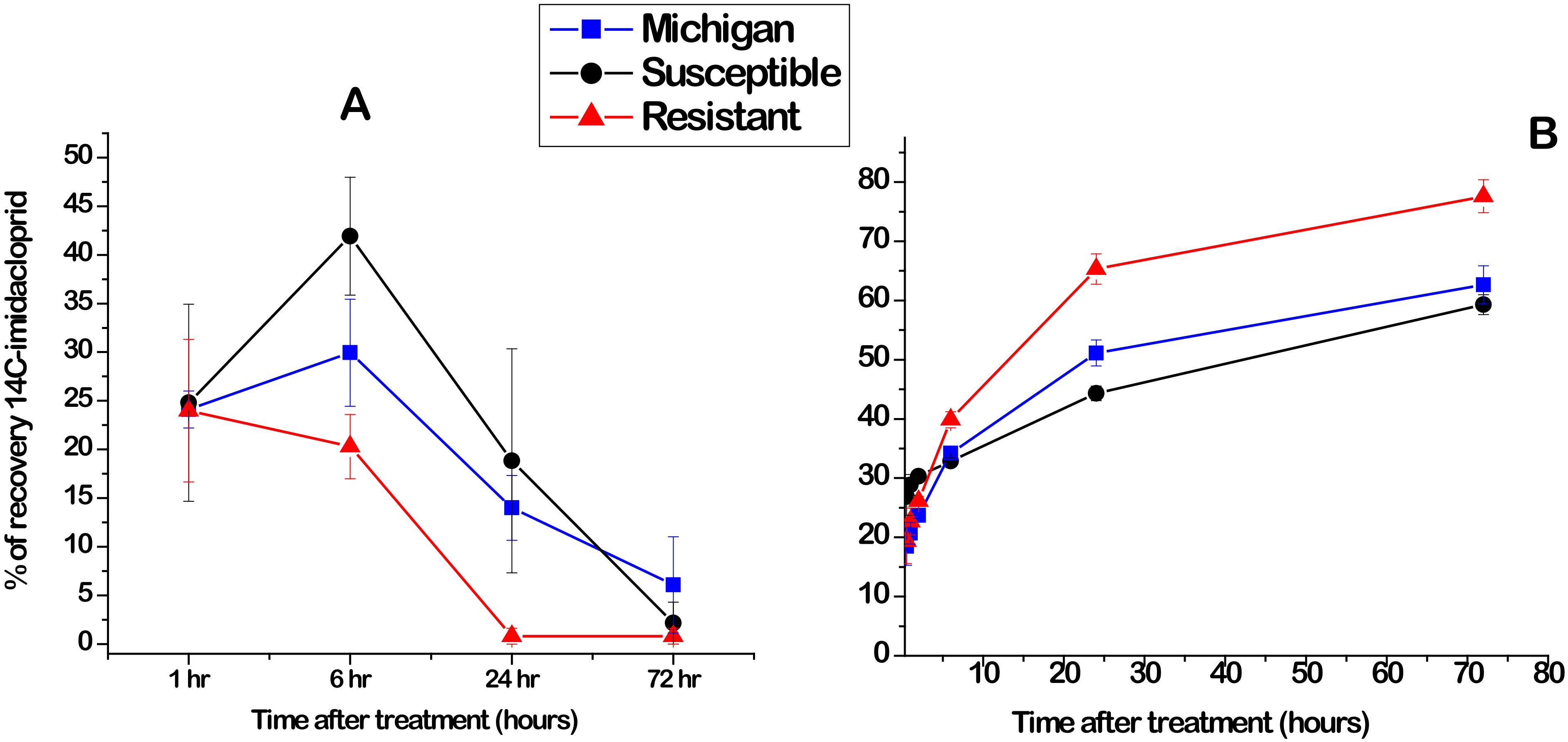


Figure 1. Pharmacokinetics of ^{14}C-imidacloprid (10 ng/beetle) in a susceptible, Michigan and Long Island, NY populations of CPB. 1A. Internal fraction. 1B. Excretion

Preliminary Studies on the Role of Stubby-Root Nematodes as Vectors of the Corky Ringspot Virus Disease of Potato in Michigan

George W Bird, Nematologist
Willie Kirk, Plant Pathologist
Michigan State University

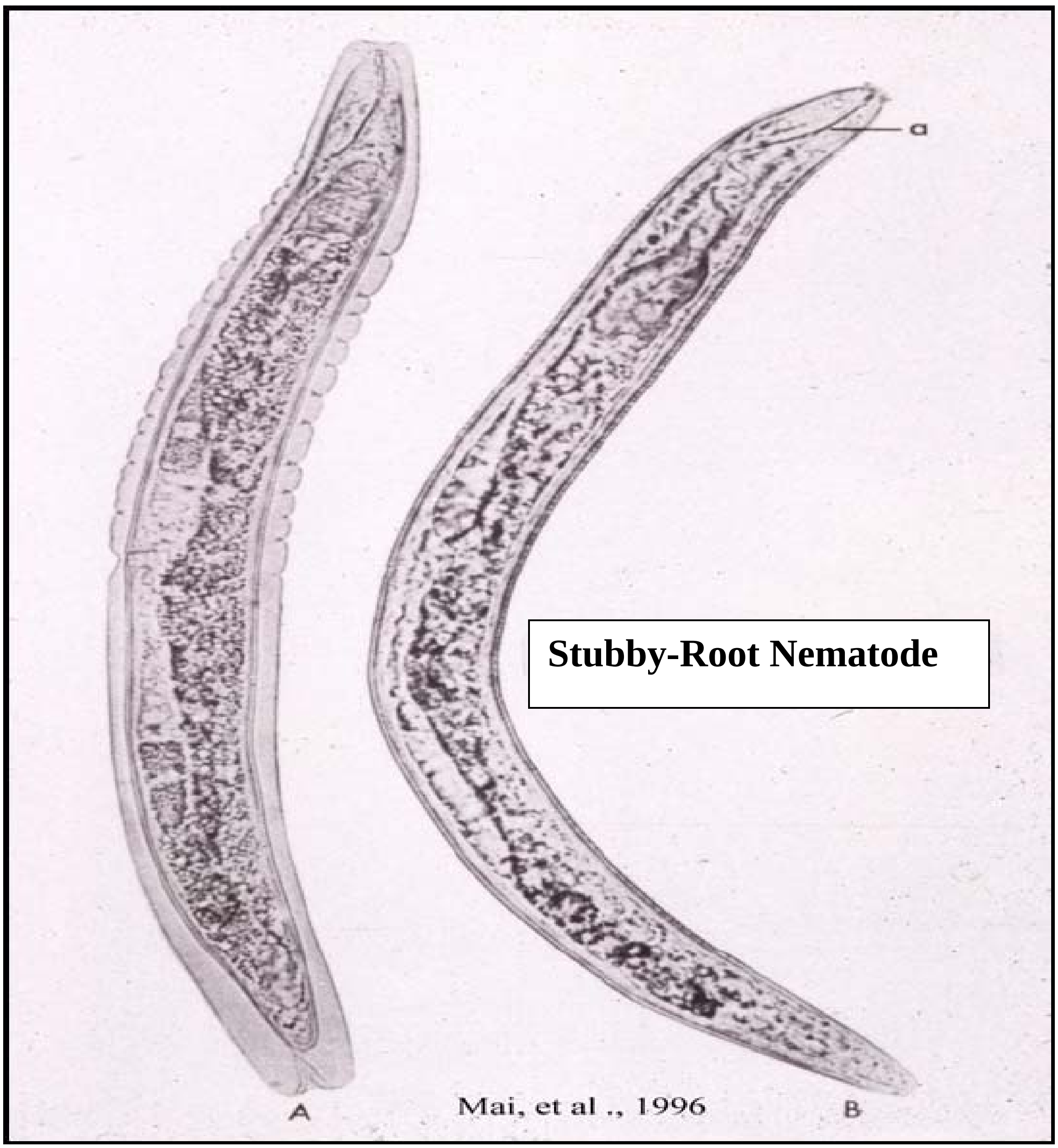
In potato production, plant parasitic nematodes cause infectious diseases, function as predisposition agents and vector viruses. During the past three decades, the root-lesion nematode has been the most important nematode impacting Michigan potato production. Recently, however, Corky Ringspot Virus Disease of Potato (CRDP) has been identified in a number of locations in Michigan (St. Joseph and Saginaw Counties). Documentation of the occurrence of CRDP was recorded in Plant Disease, Volume 92:485. A photograph of tuber symptoms from Michigan was used on the cover of Plant Disease Volume 92 Issue 3 (Figure 1). CRDP disease of potato has been known for many years in Florida, Wisconsin and Maine, and recently it has become a significant problem in the northwest.

Figure 1. Corky Ringspot Tuber Symptoms.

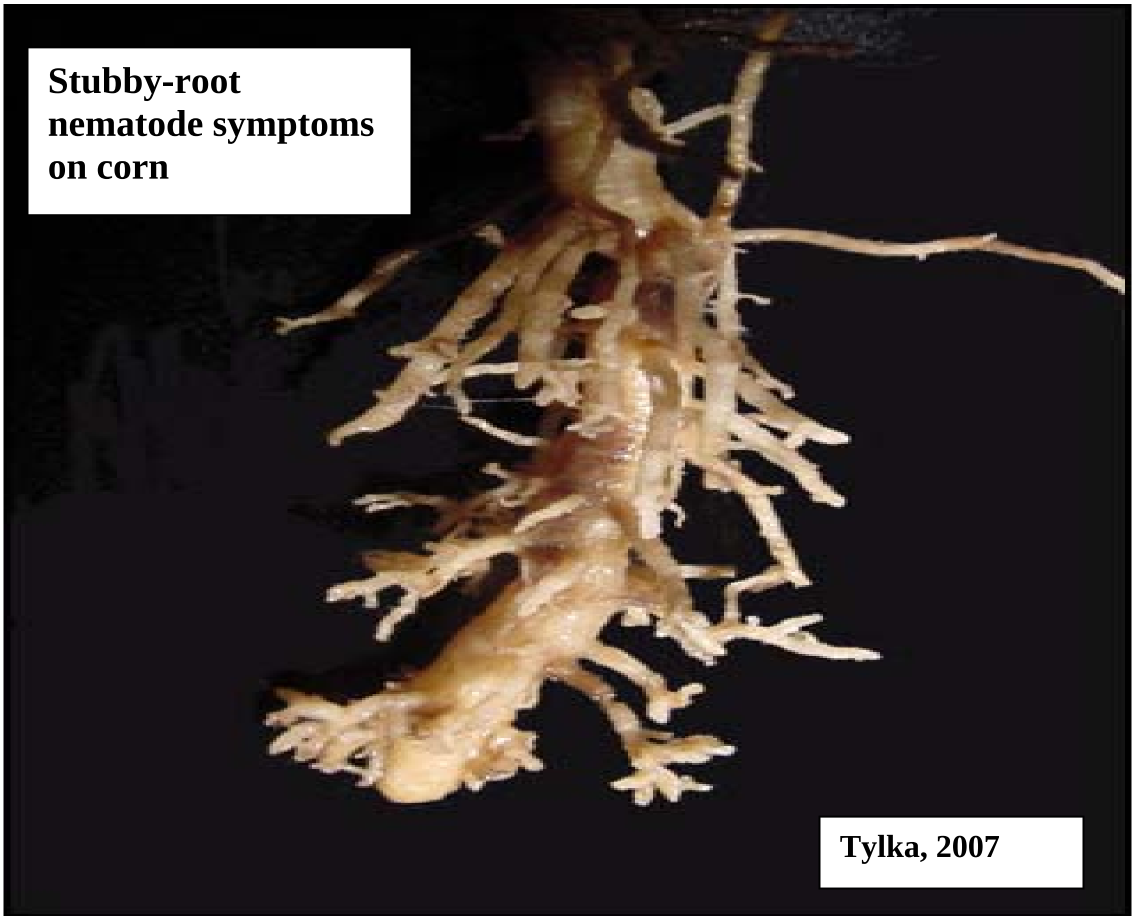
CRDP is caused by the Tobacco Rattle Virus (TRV) which is vectored by a number of species of stubby-root nematodes (Figure 2). These are classified in two genera, *Trichodorus* spp. and *Paratrichodorus* spp. Although infrequent and not usually in high population densities, the following eight species of stubby-root nematodes are known to exist in Michigan . Over the past 35 years, stubby-root nematodes have been detected in potato fields in Michigan.

Stubby-Root Nematodes of Michigan

-- *T. proximus, T. proximus, T. primitivus, and T. similis*
-- *P. minor, P. atlanticus, P. prorsus and P. pachydermus*



Corn and onions are excellent hosts for stubby-root nematodes. In addition, there are a number of crops and weeds that are hosts of TRV. These include both corn and wheat. Stubby-root symptoms on corn can be severe (Figure 3).



Very little is known about CRDP and its association with stubby-root nematodes in Michigan. The goal of a 2008 MPIC funded research project was to conduct preliminary investigations on the role and management of stubby-root nematodes in relation to the occurrence of CRDP under Michigan growing conditions. One of the objectives of this project was to determine if application of the nematicides Telone II , Vapam or Vydate can be used to decrease incidence of CRDP through control of stubby-root nematodes.

A 13.4 acre field in St. Joseph County, with a known history of CRDP was used for the 2008 research. A portion of the field (7.7 acres) was divided into 80 plots. Sixteen different nematicide treatments were used, with each being replicated four times (Table 1). Telone II, Vapam and Vydate were used individually and in combination. Because the Telone II was applied before the final design of the experiment, all Telone treatments were on the south side of the field (Table 2). At harvest, tuber symptoms of CRDP were recovered from tubers grown in eleven of the 80 plots (Table 3). CRDP was not limited to any one portion of the field, but appeared along a transect form the southwest corner to the northwest corner of the field. CRDP was associated with the non-treated control and nine of the 15 different types of nematicide applications, including the treatment with Telone II (18 gal/A), Vapam (37.5 gal/A) and Vydate (0.5 lb at planting plus three foliar post-plant applications). It can be concluded that in 2008, existing chemical control procedures were inadequate of prevention of CRDP (Table 4). In a more detailed post-harvest assessment of CRDP infection, % infection was found to range from 0 to 66%.

The research location was not a potato early-die site. Mean treatment yields ranged from a low of 397 cwt/acre to a high of 496 cwt/acre (Table 5). The lowest tuber yield was associated with the Telone II treatment at 18 gal/acre. The second lowest yield (425 cwt/acre) was associated with the non-treated control. The highest yield was associated with the Telone II plus at-plant Vydate treatment. It is essential that this research be repeated in 2009, with several minor modifications.

Table 1. 2008 Corky Ringsot Disease of Potato Control Treatments.

	Treatment
1	Non-Treated Control
2	Vydate 0.5 lb at-plant
3	Vydate 1.0 lb at-plant
4	Vydate 0.5 lb at-plant + 3-0.5 lb post
5	Telone II 18 gal pre-plant
6	Telone II 18 gal pre-plant + Vydate 0.5 lb at-plant
7	Telone II 18 gal pre-plant + Vydate 1.0 lb at-plant
8	Telone II 18 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post
9	Vapam 37.5 gal pre-plant
10	Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant
11	Vapam 37.5 gal pre-plant + Vydate 1.0 lb at-plant
12	Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post
13	Telone II 18 gal + Vapam 37.5 gal pre-plant
14	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant
15	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate1.0 lb at-plant
16	Telone 18 gal + Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post

Table 2. 2008 Corky Ringspot Research Plot Plan

14	6	2	10	2	Rep I	
13	5	1	9	1	Rep I	
16	8	4	12	4	Rep I	
15	7	3	11	3	Rep I	
13	5	9	1	1	Rep II	
16	8	`1	4	4	Rep II	
15	7	11	3	3	Rep II	
14	6	10	2	2	Rep II	North
7	15	3	11	3	Rep III	
5	13	1	9	1	Rep III	
8	16	4	12	4	Rep III	
6	14	2	10	2	Rep III	
16	8	12	4	4	Rep IV	
15	7	11	3	3	Rep IV	
14	6	10	2	2	Rep IV	
13	5	9	1	1	Rep IV	

Table 3. 2008 CRDP control experiment yields and tuber infection..

(lbs/A)	Treatment	(cwt/A)	(CRDP infection)
0	Non-Treated Control	**424**	**12.50%**
0.5	Vydate 0.5 lb at-plant	**459**	**12.50%**
1	Vydate 1.0 lb at-plant	**466**	**7.50%**
2	Vydate 0.5 lb at-plant + 3-0.5 lb post	**451**	**2.50%**
18	Telone II 18 gal pre-plant	**397**	**0.00%**
18.5	Telone II 18 gal pre-plant + Vydate 0.5 lb at-plant	**496**	**5.00%**
19	Telone II 18 gal pre-plant + Vydate 1.0 lb at-plant	**447**	**2.50%**
20	Telone II 18 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**469**	**0.00%**
37.5	Vapam 37.5 gal pre-plant	**460**	**2.50%**
38	Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant	**443**	**0.00%**
38.5	Vapam 37.5 gal pre-plant + Vydate 1.0 lb at-plant	**459**	**5.00%**
39.5	Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**481**	**0.00%**
55.5	Telone II 18 gal + Vapam 37.5 gal pre-plant	**478**	**2.50%**
56	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant	**478**	**0.00%**
56.5	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate1.0 lb at-plant	**456**	**0.00%**
57.5	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**463**	**2.50%**
28.6	Mean	**458**	**3.44%**

Table 4. 2008 CRDP research tuber yield and % infection sorted by sort % infection.

	Treatment	Yield (cwt/A)	CSDP (% infec.)
2	Vydate 0.5 lb at-plant	**459.105**	**12.50%**
1	Non-Treated Control	**424.78**	**12.50%**
3	Vydate 1.0 lb at-plant	**466.46**	**7.50%**
6	Telone II 18 gal pre-plant + Vydate 0.5 lb at-plant	**496.49**	**5.00%**
11	Vapam 37.5 gal pre-plant + Vydate 1.0 lb at-plant	**458.5225**	**5.00%**
13	Telone II 18 gal + Vapam 37.5 gal pre-plant	**477.9**	**2.50%**
16	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**463.085**	**2.50%**
9	Vapam 37.5 gal pre-plant	**460.01**	**2.50%**
4	Vydate 0.5 lb at-plant + 3-0.5 lb post	**451.2875**	**2.50%**
7	Telone II 18 gal pre-plant + Vydate 1.0 lb at-plant	**447.365**	**2.50%**
12	Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**481.175**	**0.00%**
14	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant	**478.145**	**0.00%**
8	Telone II 18 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**468.4975**	**0.00%**
15	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate1.0 lb at-plant	**455.875**	**0.00%**
10	Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant	**442.785**	**0.00%**
5	Telone II 18 gal pre-plant	**396.935**	**0.00%**

Table 5. 2008 CRDP research tuber yield and % infection sorted by sort tuber yield.

(lbs/A)	Treatment	(cwt/A)	(% infec.)
18.5	Telone II 18 gal pre-plant + Vydate 0.5 lb at-plant	**496.49**	**5.00%**
39.5	Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**481.175**	**0.00%**
56	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant	**478.145**	**0.00%**
55.5	Telone II 18 gal + Vapam 37.5 gal pre-plant	**477.9**	**2.50%**
20	Telone II 18 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**468.4975**	**0.00%**
1	Vydate 1.0 lb at-plant	**466.46**	**7.50%**
57.5	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant + 3 appl 0.5 lb post	**463.085**	**2.50%**
37.5	Vapam 37.5 gal pre-plant	**460.01**	**2.50%**
0.5	Vydate 0.5 lb at-plant	**459.105**	**12.50%**
38.5	Vapam 37.5 gal pre-plant + Vydate 1.0 lb at-plant	**458.5225**	**5.00%**
56.5	Telone II 18 gal + Vapam 37.5 gal pre-plant + Vydate1.0 lb at-plant	**455.875**	**0.00%**
2	Vydate 0.5 lb at-plant + 3-0.5 lb post	**451.2875**	**2.50%**
19	Telone II 18 gal pre-plant + Vydate 1.0 lb at-plant	**447.365**	**2.50%**
38	Vapam 37.5 gal pre-plant + Vydate 0.5 lb at-plant	**442.785**	**0.00%**
0	Non-Treated Control	**424.78**	**12.50%**
18	Telone II 18 gal pre-plant	**396.935**	**0.00%**

Funded by AgChem Industry

Vine Desiccation in Potato.

Wesley J. Everman, Chris Long, and Andrew J. Chomas. Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824.

A study was initiated in 2008 to investigate the effects of vine kill herbicides on storage quality. Vine kill herbicides act rapidly to desiccate foliage from potato plants prior to harvest. Four herbicides representing 3 classes of herbicides are currently labeled for use as vine kill in potato. We routinely investigate the effectiveness of potato vine kill products in the field; however the effects of vine kill products on tuber quality and storage have not been extensively investigated. There are many physiological effects of herbicides on plant growth and development, and investigating the effects of vine kill herbicides will help determine if storage life and tuber quality are compromised. We evaluated the effect of several available vine kill herbicides and one experimental compound under evaluation on tuber quality at harvest including grade and internal defects, and are determining the effect of vine kill herbicides on potato storage life and chipping quality. Herbicide products were applied on Snowden to test effectiveness of vine kill with herbicide treatments consisting of 1) Rely at 28.7 oz/A 2) Rely + AMS at 3 lb/A 3) Reglone at 1 pt/A followed by Reglone at 1 pt 4) BAS 800 at 0.5 oz/A 5) BAS 800 at 1 oz/A 6) BAS 800 at 2 oz/A 7) BAS 800 at 4 oz/A 8) Aim at 3.2 oz/A 9) Aim at 3.2 oz/A fb Aim at 3.2 oz/A. All herbicide treatments were compared with a non-treated control treatment. Vine kill was evaluated weekly after treatment until harvest. Plots were harvested after vine kill and marketable yield was determined. No yield effects were observed due to treatment, and all products resulted in excellent vine kill at the time of harvest. Tubers were then placed by treatment into storage in the new potato storage unit. Tuber samples were taken on a monthly basis to determine sugar levels, internal defects, and chip quality. Results of this research will determine if storage quality and life is affected by herbicide treatments for vine kill.

VINE DESICCATION IN POTATO, 2008

Trial ID: P0308 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Date Planted:	5/12/08	**Row Spacing:**	34 IN
Variety:	Snowden	**No. of Reps:**	4
Population:	9.5 in space	**% OM:**	1.6
Soil Type:	Loamy Sand	**pH:**	5
Plot Size:	10 **X** 30 **FT**	**Design:**	RANDOMIZED COMPLETE BLOCK

Tillage: Spring disk X3
Spring Chisel X 1
Cultivate X 1
Fertilizer: 12 gal 10-34-0 and 20 gal 19-17-0 on (5/12/08)
150 lbs 46-0-0 (6-17-08)
150 lbs 46-0-0 (6-27-08)

Application Description

	A	**B**
Application Timing:	SEN	YELL
Date Treated:	5/18/08	8/25/08
Time Treated:	5:43 PM	11:30 AM
% Cloud Cover:	10	50
Air Temp., Unit:	92 F	71 F
% Relative Humidity:	42.4	57
Wind Speed/Unit/Dir:	6 mph w	4 mph NW
Soil Temp., Unit:	24 c	20 c
Soil/Leaf Surface M:	5 5	5 5
Soil Moist (1=w 5=d):	4	4

Application Equipment

Appl	**Sprayer Type**	**Speed MPH**	**Nozzle Type**	**Nozzle Size**	**Nozzle Height**	**Nozzle Spacing**	**Boom Width**	**GPA**	**Carrier**	**PSI**
A	BKPK	3.5	FF	8003	18"*	30"	100"	20	H20	30
B	BKPK	3.5	FF	8003	18"*	20"	100"	20	H20	30

Comments: 18" from the average height of Potato Canopy.

VINE DESICCATION IN POTATO, 2008

Trial ID: P0308 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code												
Crop Code							SOLTU	SOLTU	SOLTU	SOLTU	SOLTU	SOLTU
Rating Data Type							control	control	control	control	control	<1 7/8"
Rating Unit							percent	percent	percent	percent	percent	kilogram
Rating Date							8/21/08	8/25/08	9/2/08	9/10/08	9/18/08	9/18/08
Trt-Eval Interval							3 DA-B	7 DA-B	15 DA-B	23 DA-B	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	1	2	3	4	5	6
1	Untreated						4	4	15	63	74	2.79
2	Rely 200	1.67	L	28.7	fl oz/a	SEN	18	79	96	93	100	2.59
3	Rely 200	1.67	L	28.7	fl oz/a	SEN	28	81	100	97	100	2.69
3	Ammonium Sulfate	100	DF	3	lb/100 gal	SEN						
4	Reglone	2	L	1	pt/a	SEN	75	81	100	99	100	2.72
4	Activator 90		L	0.25	% v/v	SEN						
4	Reglone	2	L	1	pt/a	YELL						
4	Activator 90		L	0.25	% v/v	YELL						
5	BAS 80004H	2.9	L	0.5	fl oz/a	SEN	44	65	80	81	80	2.64
5	Herbimax		L	1	% v/v	SEN						
5	Ammonium Sulfate	100	DF	2	% w/w	SEN						
6	BAS 80004H	2.9	L	1	fl oz/a	SEN	44	67	75	83	100	2.12
6	Herbimax		L	1	% v/v	SEN						
6	Ammonium Sulfate	100	DF	2	% w/w	SEN						
7	BAS 80004H	2.9	L	2	fl oz/a	SEN	53	68	93	93	100	2.51
7	Herbimax		L	1	% v/v	SEN						
7	Ammonium Sulfate	100	DF	2	% w/w	SEN						
8	BAS 80004H	2.9	L	4	fl oz/a	SEN	51	66	85	87	100	2.39
8	Herbimax		L	1	% v/v	SEN						
8	Ammonium Sulfate	100	DF	2	% w/w	SEN						
9	Aim	2	L	0.032	lb ai/a	SEN	29	48	66	84	100	2.27
9	MSO		L	1	% v/v	SEN						
10	Aim	2	L	0.025	lb ai/a	SEN	26	50	97	93	100	3.08
10	MSO		L	1	% v/v	SEN						
10	Aim	2	L	0.032	lb ai/a	YELL						
10	MSO		L	1	% v/v	YELL						
LSD (P=.05)							9.8	10.4	19.4	12.9	2.1	0.816
Standard Deviation							6.8	7.2	13.4	8.9	1.5	0.563
CV							18.26	11.85	16.62	10.2	1.52	21.82

VINE DESICCATION IN POTATO, 2008

Trial ID: P0308 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code											
Crop Code							SOLTU	SOLTU	SOLTU	SOLTU	SOLTU
Rating Data Type							<1 7/8"	pickout	pickout	oversize	cnt/oversiz
Rating Unit							count	kilogram	count	kilogram	number
Rating Date							9/18/08	9/18/08	9/18/08	9/18/08	9/18/08
Trt-Eval Interval							HARVEST	HARVEST	HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	7	8	9	10	11
1	Untreated						71	0.121	1	1.634	5
2	Rely 200	1.67	L	28.7	fl oz/a	SEN	62	0.031	0	0.779	3
3	Rely 200	1.67	L	28.7	fl oz/a	SEN	68	0.009	1	0.174	1
3	Ammonium Sulfate	100	DF	3	lb/100 gal	SEN					
4	Reglone	2	L	1	pt/a	SEN	62	-0.004	0	0.099	0
4	Activator 90		L	0.25	% v/v	SEN					
4	Reglone	2	L	1	pt/a	YELL					
4	Activator 90		L	0.25	% v/v	YELL					
5	BAS 80004H	2.9	L	0.5	fl oz/a	SEN	65	0.061	0	1.251	3
5	Herbimax		L	1	% v/v	SEN					
5	Ammonium Sulfate	100	DF	2	% w/w	SEN					
6	BAS 80004H	2.9	L	1	fl oz/a	SEN	51	0.000	0	0.738	2
6	Herbimax		L	1	% v/v	SEN					
6	Ammonium Sulfate	100	DF	2	% w/w	SEN					
7	BAS 80004H	2.9	L	2	fl oz/a	SEN	61	0.000	0	0.929	3
7	Herbimax		L	1	% v/v	SEN					
7	Ammonium Sulfate	100	DF	2	% w/w	SEN					
8	BAS 80004H	2.9	L	4	fl oz/a	SEN	45	0.034	0	1.510	5
8	Herbimax		L	1	% v/v	SEN					
8	Ammonium Sulfate	100	DF	2	% w/w	SEN					
9	Aim	2	L	0.032	lb ai/a	SEN	54	0.086	0	0.520	2
9	MSO		L	1	% v/v	SEN					
10	Aim	2	L	0.025	lb ai/a	SEN	71	0.000	0	1.114	3
10	MSO		L	1	% v/v	SEN					
10	Aim	2	L	0.032	lb ai/a	YELL					
10	MSO		L	1	% v/v	YELL					
LSD (P=.05)							20.6	0.1230	0.6	1.0429	3.1
Standard Deviation							14.2	0.0846	0.4	0.7187	2.1
CV							23.29	250.13	218.55	82.18	84.19

VINE DESICCATION IN POTATO, 2008

Trial ID: P0308 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code										
Crop Code						SOLTU	SOLTU	SOLTU	SOLTU	SOLTU
Rating Data Type						Grade A	Grade A	dry	wet	SPEC. GRAV
Rating Unit						kilogram	count			
Rating Date						9/18/08	9/18/08	9/18/08	9/18/08	9/18/08
Trt-Eval Interval						HARVEST	HARVEST	HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	12	13	14	15	16

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	12	13	14	15	16
1	Untreated						26.433	229	3.084	0.264	1.09
2	Rely 200	1.67	L	28.7	fl oz/a	SEN	24.560	217	2.228	0.222	1.11
3	Rely 200	1.67	L	28.7	fl oz/a	SEN	27.086	236	2.273	0.213	1.10
3	Ammonium Sulfate	100	DF	3	lb/100 gal	SEN					
4	Reglone	2	L	1	pt/a	SEN	25.356	209	2.070	0.459	1.41
4	Activator 90		L	0.25	% v/v	SEN					
4	Reglone	2	L	1	pt/a	YELL					
4	Activator 90		L	0.25	% v/v	YELL					
5	BAS 80004H	2.9	L	0.5	fl oz/a	SEN	24.063	188	2.668	0.239	1.10
5	Herbimax		L	1	% v/v	SEN					
5	Ammonium Sulfate	100	DF	2	% w/w	SEN					
6	BAS 80004H	2.9	L	1	fl oz/a	SEN	24.030	213	2.416	0.233	1.11
6	Herbimax		L	1	% v/v	SEN					
6	Ammonium Sulfate	100	DF	2	% w/w	SEN					
7	BAS 80004H	2.9	L	2	fl oz/a	SEN	25.276	224	2.445	0.251	1.11
7	Herbimax		L	1	% v/v	SEN					
7	Ammonium Sulfate	100	DF	2	% w/w	SEN					
8	BAS 80004H	2.9	L	4	fl oz/a	SEN	26.721	194	2.811	0.255	1.10
8	Herbimax		L	1	% v/v	SEN					
8	Ammonium Sulfate	100	DF	2	% w/w	SEN					
9	Aim	2	L	0.032	lb ai/a	SEN	24.546	200	2.496	0.234	1.10
9	MSO		L	1	% v/v	SEN					
10	Aim	2	L	0.025	lb ai/a	SEN	26.081	215	2.493	0.231	1.11
10	MSO		L	1	% v/v	SEN					
10	Aim	2	L	0.032	lb ai/a	YELL					
10	MSO		L	1	% v/v	YELL					
LSD (P=.05)							3.4129	45.0	0.5823	0.2225	0.246
Standard Deviation							2.3521	31.0	0.4013	0.1534	0.170
CV							9.25	14.58	16.06	58.95	14.94

VINE DESICCATION IN POTATO, 2008

Trial ID: P0308 Study Dir.:
Conducted: MONTCALM RSCH STA. Investigator: Wesley Everman

Weed Code										
Crop Code							SOLTU	SOLTU	SOLTU	SOLTU
Rating Data Type							HH	VD	IBS	STEM END
Rating Unit							0-10	0-10	0-10	0-10
Rating Date							9/18/08	9/18/08	9/18/08	9/18/08
Trt-Eval Interval							HARVEST	HARVEST	HARVEST	HARVEST
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Grow Stg	17	18	19	20
1	Untreated						2	4	0	0
2	Rely 200	1.67	L	28.7	fl oz/a	SEN	1	2	0	0
3	Rely 200	1.67	L	28.7	fl oz/a	SEN	1	1	0	0
3	Ammonium Sulfate	100	DF	3	lb/100 gal	SEN				
4	Reglone	2	L	1	pt/a	SEN	0	3	0	1
4	Activator 90		L	0.25	% v/v	SEN				
4	Reglone	2	L	1	pt/a	YELL				
4	Activator 90		L	0.25	% v/v	YELL				
5	BAS 80004H	2.9	L	0.5	fl oz/a	SEN	0	1	0	0
5	Herbimax		L	1	% v/v	SEN				
5	Ammonium Sulfate	100	DF	2	% w/w	SEN				
6	BAS 80004H	2.9	L	1	fl oz/a	SEN	1	0	1	0
6	Herbimax		L	1	% v/v	SEN				
6	Ammonium Sulfate	100	DF	2	% w/w	SEN				
7	BAS 80004H	2.9	L	2	fl oz/a	SEN	1	1	0	1
7	Herbimax		L	1	% v/v	SEN				
7	Ammonium Sulfate	100	DF	2	% w/w	SEN				
8	BAS 80004H	2.9	L	4	fl oz/a	SEN	1	2	0	1
8	Herbimax		L	1	% v/v	SEN				
8	Ammonium Sulfate	100	DF	2	% w/w	SEN				
9	Aim	2	L	0.032	lb ai/a	SEN	1	1	0	0
9	MSO		L	1	% v/v	SEN				
10	Aim	2	L	0.025	lb ai/a	SEN	2	1	0	0
10	MSO		L	1	% v/v	SEN				
10	Aim	2	L	0.032	lb ai/a	YELL				
10	MSO		L	1	% v/v	YELL				
LSD (P=.05)							1.5	2.2	0.7	1.1
Standard Deviation							1.0	1.5	0.5	0.8
CV							131.11	99.19	385.67	345.06

ARM Action Codes

T1 = [c14]/([c14]-[c15])

Funding: MPIC/Agrochemical Industry
USDA/ARS; IR-4 progrm

Evaluation and comparison of biofungicides and fungicides for the control of post harvest potato tuber diseases.

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Summary
Potatoes are susceptible to a variety of storage pathogens, including late blight (*Phytophthora infestans*), Fusarium dry rot (*Fusarium sambucinum*), Pythium leak (*Pythium ultimum*), tuber soft rot (*Pectobacterium* spp.), and silver scurf (*Helminthosporium solani*). Current recommendations for potato storage diseases include sanitation and exclusion as the primary controls for these pathogens in storage facilities. No fungicides are registered for direct application to tubers for control of these important pathogens and few compounds are available for potato tuber treatment in storage, including chlorine-based disinfectants such as, sodium hypochlorite, calcium hypochlorite and chlorine dioxide. In recent years several new biofungicides based on the biocontrol bacteria *Bacillus subtilis* (Serenade) and *B. pumilis* (Sonata) have been registered or are awaiting EPA approval for use on potato, and have shown promise in the control of seed and soil borne diseases such as late blight, black scurf and pink rot. Over the past three years these products have been evaluated for the control of of pathogens under post-harvest potato tuber storage conditions. Thus, studies were initiated to evaluate the efficacy of these biofungicides for the control of potato storage pathogens under post-harvest conditions. For a comparison, several commercial storage products Phostrol (sodium, potassium and ammonium phosphates), and Oxidate (hydrogen dioxide) and experimental treatment Quadris (azoxystrobin) and mixtures of azoxystrobin and fludioxinil (Maxim) at different rates ± thiabendazole (Mertect) and were evaluated for their effectiveness under storage conditions. Preliminary results show that in general conventional fungicide Quadris provided the most effective disease control. The biofungicides provided moderate control. However, in all cases results for the biofungicides were not significantly different from those for Quadris. In the case of *Pythium*, the biofungicides were as effective in controlling the disease as Quadris and results were not significantly different from the non-inoculated control.

Materials and Methods

Experiments were carried out in November 2007 with potato cultivars “FL1879”, “Goldrush” and “Chieftan”. The tests were carried out at three storage temperatures used in the potato industry; 10^{o}C (49^{o}F), chip processing; 7^{o}C (45^{o}F), table stock; and 4^{o}C (39^{o}F), table stock and seed. The cultivars used in the 10^{o}C test were cv. FL1879 a chip processing cultivar; cv. Goldrush at 7^{o}C a table-stock cultivar; cv. Chieftain at 4^{o}C a red skinned table-stock cultivar. Potatoes free from visible diseases [except cv. Chieftain that was uniformly infected with *H. solani* (*Hs*, silver scurf, 20% of surface area affected) at the time of application] were selected for the trials from tubers harvested in October 2006. Tubers were prepared for inoculation with *Phytophthora infestans* (*Pi*), *P. erythroseptica* (*Pe*), *Pythium ultimum* (*Py*), and *Fusarium sambucinum* (*Fs*) by grazing with a single light stroke with a wire brush, sufficient to abrade the skin of the tubers to a depth of 0.01 mm. Solutions (1 x 10^3/ml) of sporangia/zoosporangia of *Pi* (late blight), oospores/sporangia of *Pe* (pink rot), oospores of *Py* (Pythium leak), macroconidia of *Fs*

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(dry rot) and bacterial cells of *P. carotovora* (*Pc*, soft rot) were prepared from cultures of the pathogens previously isolated from potato tubers in Michigan. All pathogens were grown on PDA for 10 days prior to preparation of inoculum solutions. Two non-treated controls, either inoculated with one of the pathogens or non-inoculated were included in the trial for every treatment. Damaged tubers, (50/replicate/treatment; total 200 tubers/treatment) were sprayed with 10 ml of pathogen suspension, for a final dosage of about 0.25 ml per tuber. Tubers were stored for 2-d after inoculation at 20°C before treatment. Fungicides were applied as liquid treatments in a water suspension with a single R&D XR11003VS spray nozzle at a rate of 1L/ton at 50 psi onto the tuber surfaces, with an entire seed surface being coated. After inoculation, tubers were incubated in the dark in plastic boxes at 10°C, 7°C or 4°C (depending on cultivar and disease combination) for 120 to 127 days. Tubers were cut open and the number of tubers with symptoms or signs of the individual pathogens were counted to determine incidence of disease. Disease severity was assessed using a disease severity index. Disease severity classes were determined as class 0 = 0%; 1 = 1 - 10%; 2 = 11 - 20%; 3 = 21 - 50; 4 > 51 – 100% internal area of tuber tissue with disease. The disease severity index was then calculated as the number in each class multiplied by the class number and summed. The sum was then multiplied by a constant to express severity on a 0 – 100 scale. Data were analyzed using analysis of variance and the Tukey's LSD test in JMP (SAS Institute, NC).

Results and Conclusions

In the late blight studies (Table 1) all of the non-inoculated treatments had 0% incidence treatments. Tuber late blight did not develop in the 7°C experimental set. At 10°C no treatments except significantly reduced late blight incidence and severity in comparison to the non-treated inoculated control (Table 1).

In the Fusarium dry rot studies at 10°C and 7°C Fusarium dry rot developed. (Table 2) and all of the non-inoculated treatments had significantly less dry rot than their inoculated counterparts although some tubers were affected. At 10°C in FL1879, A15696 treatments at the two highest rates of application significantly reduced dry rot incidence in comparison to the non-treated inoculated control but no treatments significantly reduced the severity index (Table 2). At 7°C in Goldrush, A15696 treatments at the highest rate of application, the Quadris, Maxim, Mertect mixture, Maxim and Oxidate significantly reduced dry rot incidence and the severity index in comparison to the non-treated inoculated control (Table 2).

In the Pink rot studies at 10°C and 7°C Pink rot developed with greater levels of disease in the 7°C trial (cv. Goldrush); (Table 2). Most of the non-inoculated treatments had significantly less dry rot than their inoculated counterparts although some tubers were affected and at 10°C Maxim and Oxidate had significant effect on the incidence or severity of Pink rot. At 10°C in FL1879, no treatments significantly reduced pink rot incidence or severity in comparison to the non-treated inoculated control but very little pink rot developed in the non-treated inoculated control (Table 3). Phostrol had uncharacteristic high levels of incidence and severity and may have been applied twice causing a phytotoxic effect. At 7°C in Goldrush, high incidence and severity of pink rot

MICHIGAN POTATOES
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March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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HELP

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If you have any further questions, comments or concerns, please contact the Michigan Potato Industry Commission directly.

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was observed in the inoculated non-treated control. All treatments significantly reduced pink rot incidence and the severity index in comparison to the non-treated inoculated control (Table 2). Phostrol was particularly effective at this temperature and variety combination with zero disease incidence.

In the Pythium leak studies the disease only developed in 10^{o}C trial (cv. FL1879); (Table 4). Phostrol had uncharacteristic high levels of incidence and severity and may have been applied twice causing a phytotoxic effect. No Pythium developed in the non-treated inoculated control and most treatments had low incidence and severity of the disease (Table 4). Serenade at the lower rate had significantly greater Pythium incidence and severity than other treatments.

In the silver scurf studies the disease was only tested in the 4^{o}C trial (cv. Chieftain); (Table 5). Phostrol may have been applied twice causing a phytotoxic effect and had uncharacteristic high levels phytotoxicity and was excluded from the analysis. Only the Quadris, Maxim, Mertect mixture significantly reduced silver scurf index in comparison to the non-treated inoculated control (Table 5).

A limited number of treatments were included in the soft rot evaluations (Table 6) and in general fungicides were excluded. Soft rot developed at 10^{o}C and 7^{o}C and all of the non-inoculated treatments had significantly less soft rot than their inoculated counterparts where soft rot developed. At 10^{o}C in FL1879, all treatments significantly reduced soft rot incidence and the severity index in comparison to the non-treated inoculated control (Table 2). Phostrol had uncharacteristic high levels of incidence and severity and may have been applied twice causing a phytotoxic effect. At 7^{o}C in Goldrush, the same effects of the treatments were observed as those at 10^{o}C (Table 2).

Overall in this study, Serenade and Sonata provided limited control of potato storage diseases (except soft rot where excellent control was observed), while treatment with Oxidate and Quadris provided effective disease control.

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Table 1. Severity and incidence of tubers with potato late blight 127 days after treatment with fungicides/biofungicides at 10°C.

Treatments and rate of application per cwt of tubers	Inoculated (+ or -)	Tuber disease and storage temperature			
		Severity index[a] @ 10°C[b]		Incidence @ 10°C	
Maxim 230SC 0.00414 fl oz[c]		2.5	e[d]	12.5	e
	-	0.0	e	0.0	e
Oxidate 27SC 0.125 fl oz	+	7.5	d	31.3	d
	-	0.0	e	0.0	e
Phostrol 53.6 SC 1.28 fl oz	+	22.3	a	83.8	a
	-	0.0	e	0.0	e
Quadris 250 SC 0.0038 fl oz	+	12.5	bc	56.3	bc
	-	0.0	e	0.0	e
A15696 478 SC 0.002 fl oz	+	14.8	b	63.8	b
	-	0.0	e	0.0	e
A15696 478 SC 0.004 fl oz	+	11.5	bc	52.5	bc
	-	0.0	e	0.0	e
A15696 478 SC 0.0157 fl oz	+	2.3	e	11.3	e
	-	0.0	e	0.0	e
Quadris 250 SC 0.0038 fl oz Maxim 230 SC 0.00414 fl oz Mertect 491 SC 0.021 fl oz	+	2.5	e	12.5	e
	-	0.0	e	0.0	e
Serenade ASO 1.34 SC 0.32 fl oz	+	9.0	cd	45.0	cd
	-	0.0	e	0.0	e
Serenade ASO 1.34 SC 0.16 fl oz	+	9.8	cd	47.5	c
	-	0.0	e	0.0	e
Sonata 1.38 SC 0.32 fl oz	+	10.3	cd	47.5	c
	-	0.0	e	0.0	e
Untreated	+	12.0	bc	52.5	bc
	-	0.0	e	0.0	e
$LSD_{0.05}$		3.67		14.69	

[a] Severity classes were determined as class 0 = 0%; 1 = 1 - 10%; 2 = 11 - 20%; 3 = 21 - 50%; 4 > 51 – 100% internal area of tuber tissue with disease and incidence is percentage of tubers in class 1 - 4.
[b] Tubers in the 10°C test were cv. FL1879 a chip processing cultivar.
[c] Active ingredients and proportions; Maxim, fludioxinil 0.5%; Oxidate, hydrogen peroxide, 27.0%; Phostrol, phosphonic acid 53.6%; Quadris, azoxystrobin, 22.9%; A15696, fludioxinil 0.5% + azoxystrobin, 22.9%; Mertect, thiabendazole, 49.1%; Serenade, *Bacillus subtilis*, 1.34%; Sonata, *Bacillus pumulis*, 1.38%.
[d] Mean values of diseased tubers within a column followed by the same letter are not significantly different at $p = 0.05$ (Tukey test).

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Table 2. Severity and incidence of tubers with Fusarium dry rot 120 days after treatment with fungicides/biofungicides at two storage temperatures (10 and 7^{o}C).

Treatments and rate of application per cwt of tubers	Inoculated (+ or -)	Tuber disease and storage temperature Severity index[a] @ 10°C[b]		Incidence @ 10°C		Severity @ 7°C		Incidence @ 7°C	
Maxim 230SC 0.00414 fl oz[c]	+	20.5	cde[d]	80.0	cde	3.1	e	10.0	e
	-	1.0	g	1.3	h	0.0	e	0.0	e
Oxidate 27SC 0.125 fl oz	+	18.0	de	76.3	cde	9.4	d	31.3	d
	-	1.3	g	1.3	h	0.0	e	0.0	e
Phostrol 53.6 SC 1.28 fl oz	+	60.5	a	93.8	a	27.8	a	83.8	a
	-	0.0	g	0.0	h	0.0	e	0.0	e
Quadris 250 SC 0.0038 fl oz	+	17.3	de	80.0	cde	15.6	bc	56.3	bc
	-	0.0	g	0.0	h	0.0	e	0.0	e
A15696 478 SC 0.002 fl oz	+	26.8	c	80.0	cde	18.4	b	63.8	b
	-	0.0	g	0.0	h	0.0	e	0.0	e
A15696 478 SC 0.004 fl oz	+	19.0	cde	70.0	e	14.4	bc	52.5	bc
	-	0.0	g	0.0	h	0.0	e	0.0	e
A15696 478 SC 0.0157 fl oz	+	13.5	ef	57.5	f	2.8	e	11.3	e
	-	0.0	g	0.0	h	0.0	e	0.0	e
Quadris 250 SC 0.0038 fl oz Maxim 230 SC 0.00414 fl oz Mertect 491 SC 0.021 fl oz	+	18.8	de	78.8	cde	3.1	e	12.5	e
	-	6.0	fg	15.0	g	0.0	e	0.0	e
Serenade ASO 1.34 SC 0.32 fl oz	+	18.8	de	75.0	de	11.3	cd	45.0	cd
	-	0.0	g	0.0	h	0.0	e	0.0	e
Serenade ASO 1.34 SC 0.16 fl oz	+	23.0	cd	86.3	abc	12.2	cd	47.5	c
	-	0.0	g	0.0	h	0.0	e	0.0	e
Sonata 1.38 SC 0.32 fl oz	+	46.3	b	92.5	ab	12.8	cd	47.5	c
	-	0.0	g	0.0	h	0.0	e	0.0	e
Untreated	+	20.3	cde	82.5	bcd	15.0	bc	52.5	bc
	-	0.3	g	1.3	h	0.0	e	0.0	e
$LSD_{0.05}$		7.79		10.65		4.59		14.69	

[a] Severity classes were determined as class 0 = 0%; 1 = 1 - 10%; 2 = 11 - 20%; 3 = 21 - 50; 4 > 51 – 100% internal area of tuber tissue with disease and incidence is percentage of tubers in class 1 - 4.
[b] Tubers in the 10^{o}C test were cv. FL1879 a chip processing cultivar and at 7^{o}C were cv. Goldrush a table-stock cultivar.
[c] Active ingredients and proportions; Maxim, fludioxinil 0.5%; Oxidate, hydrogen peroxide, 27.0%; Phostrol, phosphonic acid 53.6%; Quadris, azoxystrobin, 22.9%; A15696, fludioxinil 0.5% + azoxystrobin, 22.9%; Mertect, thiabendazole, 49.1%; Serenade, *Bacillus subtilis*, 1.34%; Sonata, *Bacillus pumulis*, 1.38%.
[d] Mean values of diseased tubers within a column followed by the same letter are not significantly different at p = 0.05 (Tukey test

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Table 3. Severity and incidence of tubers with Pink Rot 120 days after treatment with fungicides/biofungicides at two storage temperatures (10 and 7°C) .

Treatments and rate of application per cwt of tubers	Inoculated (+ or -)	Tuber disease and storage temperature Severity index[a] @ 10°C[b]		Incidence @ 10°C		Severity @ 7°C		Incidence @ 7°C	
Maxim 230SC 0.00414 fl oz[c]	+	6.6	bcdef [d]	6.3	bc	6.3	bc	5.0	bc
	-	1.3	efg	1.3	cd	0.0	e	0.0	e
Oxidate 27SC 0.125 fl oz	+	6.3	bcdefg	5.0	bcd	7.8	b	6.3	b
	-	1.6	defg	1.3	cd	0.0	e	0.0	e
Phostrol 53.6 SC 1.28 fl oz	+	24.4	a	20.0	a	0.0	e	0.0	e
	-	0.0	g	0.0	d	0.0	e	0.0	e
Quadris 250 SC 0.0038 fl oz	+	0.0	g	0.0	d	1.6	de	1.3	de
	-	0.0	g	0.0	d	0.0	e	0.0	e
A15696 478 SC 0.002 fl oz	+	6.3	bcdefg	5.0	bcd	4.7	bcd	3.8	bcd
	-	0.0	g	0.0	d	0.0	e	0.0	e
A15696 478 SC 0.004 fl oz	+	10.9	b	8.8	b	7.8	b	6.3	b
	-	0.0	g	0.0	d	0.0	e	0.0	e
A15696 478 SC 0.0157 fl oz	+	3.1	cdefg	2.5	cd	0.0	e	0.0	e
	-	0.0	g	0.0	d	0.0	e	0.0	e
Quadris 250 SC 0.0038 fl oz Maxim 230 SC 0.00414 fl oz Mertect 491 SC 0.021 fl oz	+	7.8	bcd	6.3	bc	7.8	b	6.3	b
	-	7.5	bcde	15.0	a	0.0	e	0.0	e
Serenade ASO 1.34 SC 0.32 fl oz	+	5.9	bcdefg	5.0	bcd	3.1	cde	2.5	cde
	-	0.0	g	0.0	d	0.0	e	0.0	e
Serenade ASO 1.34 SC 0.16 fl oz	+	3.1	cdefg	2.5	cd	4.7	bcd	3.8	bcd
	-	0.0	g	0.0	d	0.0	e	0.0	e
Sonata 1.38 SC 0.32 fl oz	+	9.1	bc	8.8	b	1.6	de	1.3	de
	-	0.0	g	0.0	d	0.0	e	0.0	e
Untreated	+	1.9	defg	2.5	cd	23.4	a	18.8	a
	-	0.3	fg	1.3	cd	0.0	e	0.0	e
LSD $_{0.05}$		6.35		5.53	d	3.74		2.99	

[a] Severity classes were determined as class 0 = 0%; 1 = 1 - 10%; 2 = 11 - 20%; 3 = 21 - 50; 4 > 51 – 100% internal area of tuber tissue with disease and incidence is percentage of tubers in class 1 - 4.
[b] Tubers in the 10°C test were cv. FL1879 a chip processing cultivar and at 7°C were cv. Goldrush a table-stock cultivar.
[c] Active ingredients and proportions; Maxim, fludioxinil 0.5%; Oxidate, hydrogen peroxide, 27.0%; Phostrol, phosphonic acid 53.6%; Quadris, azoxystrobin, 22.9%; A15696, fludioxinil 0.5% + azoxystrobin, 22.9%; Mertect, thiabendazole, 49.1%; Serenade, *Bacillus subtilis*, 1.34%; Sonata, *Bacillus pumulis*, 1.38%.
[d] Mean values of diseased tubers within a column followed by the same letter are not significantly different at p = 0.05 (Tukey test).

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Table 4. Severity and incidence of tubers with Pythium leak 127 days after treatment with fungicides/biofungicides at 10°C.

Treatments and rate of application per cwt of tubers	Inoculated (+ or -)	Tuber disease and storage temperature: Severity index[a] @ 10°C[b]		Incidence @ 10°C	
Maxim 230SC 0.00414 fl oz[c]		0.6	b[d]	2.5	de
	-	1.3	b	1.25	e
Oxidate 27SC 0.125 fl oz	+	0.0	b	0	e
	-	1.6	b	1.25	e
Phostrol 53.6 SC 1.28 fl oz	+	49.1	a	65	b
	-	0.0	b	0	e
Quadris 250 SC 0.0038 fl oz	+	0.9	b	0	e
	-	0.0	b	0	e
A15696 478 SC 0.002 fl oz	+	0.0	b	0	e
	-	0.0	b	0	e
A15696 478 SC 0.004 fl oz	+	2.2	b	2.5	de
	-	0.0	b	0	e
A15696 478 SC 0.0157 fl oz	+	0.0	b	100	a
	-	0.0	b	0	e
Quadris 250 SC 0.0038 fl oz Maxim 230 SC 0.00414 fl oz Mertect 491 SC 0.021 fl oz	+	0.9	b	2.5	de
	-	7.5	b	15	cd
Serenade ASO 1.34 SC 0.32 fl oz	+	0.0	b	0	e
	-	0.0	b	0	e
Serenade ASO 1.34 SC 0.16 fl oz	+	10.3	b	17.5	c
	-	0.0	b	0	e
Sonata 1.38 SC 0.32 fl oz	+	0.0	b	0	e
	-	0.0	b	0	e
Untreated	+	0.0	b	0	e
	-	0.3	b	0	e
LSD $_{0.05}$		10.37		12.80	

[a] Severity classes were determined as class 0 = 0%; 1 = 1 - 10%; 2 = 11 - 20%; 3 = 21 - 50%; 4 > 51 – 100% internal area of tuber tissue with disease and incidence is percentage of tubers in class 1 - 4.
[b] Tubers in the 10°C test were cv. FL1879 a chip processing cultivar.
[c] Active ingredients and proportions; Maxim, fludioxinil 0.5%; Oxidate, hydrogen peroxide, 27.0%; Phostrol, phosphonic acid 53.6%; Quadris, azoxystrobin, 22.9%; A15696, fludioxinil 0.5% + azoxystrobin, 22.9%; Mertect, thiabendazole, 49.1%; Serenade, *Bacillus subtilis*, 1.34%; Sonata, *Bacillus pumulis*, 1.38%.
[d] Mean values of diseased tubers within a column followed by the same letter are not significantly different at $p = 0.05$ (Tukey test).

Funding: MPIC/Agrochemical Industry
USDA/ARS; IR-4 progrm

Table 5. Severity and incidence of tubers with silver scurf 127 days after treatment with fungicides/biofungicides at 4°C.

Treatments and rate of application per cwt of tubers	Tuber disease and storage temperature Severity index[a] @ 4°C[b]	
Maxim 230SC 0.00414 fl oz[c]	71.3	ab[d]
Oxidate 27SC 0.125 fl oz	69.8	ab
Quadris 250 SC 0.0038 fl oz	66.0	abc
A15696 478 SC 0.002 fl oz	62.5	bc
A15696 478 SC 0.004 fl oz	62.5	bc
A15696 478 SC 0.0157 fl oz	65.0	bc
Quadris 250 SC 0.0038 fl oz + Maxim 230 SC 0.00414 fl oz + Mertect 491 SC 0.021 fl oz	58.3	c
Serenade ASO 1.34 SC 0.32 fl oz	66.5	abc
Serenade ASO 1.34 SC 0.16 fl oz	77.3	ab
Sonata 1.38 SC 0.32 fl oz	74.0	a
Untreated	72.3	ab
LSD $_{0.05}$	11.89	

[a] Severity classes were determined as class 0 = 0%; 1 = 1 - 10%; 2 = 11 - 20%; 3 = 21 - 50; 4 > 51 – 100% internal area of tuber tissue with disease and incidence is percentage of tubers in class 1 - 4. Incidence was 100% for all treatments.
[b] Tubers in the 4°C test were cv. Red Norland a red skinned table stock cultivar.
[c] Active ingredients and proportions; Maxim, fludioxinil 0.5%; Oxidate, hydrogen peroxide, 27.0%; Quadris, azoxystrobin, 22.9%; A15696, fludioxinil 0.5% + azoxystrobin, 22.9%; Mertect, thiabendazole, 49.1%; Serenade, *Bacillus subtilis*, 1.34%; Sonata, *Bacillus pumulis*, 1.38%.
[d] Mean values of diseased tubers within a column followed by the same letter are not significantly different at $p = 0.05$ (Tukey test).

Table 6. Severity and incidence of tubers with Soft Rot (*Pectobacterium carotovorum*) 120 days after treatment with fungicides/biofungicides at two storage temperatures (10 and 7°C) .

Treatments and rate of application per cwt of tubers	Inoculated (+ or -)	Tuber disease and storage temperature Severity index[a] @ 10°C[b]		Incidence @ 10°C		Severity index @ 7°C		Incidence @ 7°C	
Oxidate 27SC 0.125 fl oz[c]	+	1.3	c[d]	1.3	c	2.5	d	2.5	d
	-	1.3	c	1.3	c	0.0	d	0.0	d
Phostrol 53.6 SC 1.28 fl oz	+	19.3	b	21.3	b	53.0	b	57.5	b
	-	0.0	c	0.0	c	69.3	a	81.3	a
Serenade ASO 1.34 SC 0.32 fl oz	+	1.0	c	2.5	c	0.0	d	0.0	d
	-	0.0	c	0.0	c	0.0	d	0.0	d
Serenade ASO 1.34 SC 0.16 fl oz	+	0.0	c	0.0	c	1.5	d	3.8	d
	-	0.0	c	0.0	c	0.0	d	0.0	d
Sonata 1.38 SC 0.32 fl oz	+	0.0	c	0.0	c	0.0	d	0.0	d
	-	0.0	c	0.0	c	0.0	d	0.0	d
Untreated	+	53.8	a	68.8	a	26.3	c	26.3	c
	-	0.3	c	1.3	c	0.0	d	0.0	d
LSD $_{0.05}$		4.15		7.81		7.59		8.30	

[a] Severity classes were determined as class 0 = 0%; 1 = 1 - 10%; 2 = 11 - 20%; 3 = 21 - 50; 4 > 51 – 100% internal area of tuber tissue with disease and incidence is percentage of tubers in class 1 - 4.
[b] Tubers in the 10°C test were cv. FL1879 a chip processing cultivar and at 7°C were cv. Goldrush a table-stock cultivar.
[c] Active ingredients and proportions; Oxidate, hydrogen peroxide, 27.0%; Phostrol, phosphonic acid 53.6%; Serenade, *Bacillus subtilis*, 1.34%; Sonata, *Bacillus pumulis*, 1.38%.
[d] Mean values of diseased tubers within a column followed by the same letter are not significantly different at $p = 0.05$ (Tukey test).

Funding: 1,4-Sight Group

Effect of 1,4-SIGHT® post-harvest potato dormancy treatment on sugars of stored chip stock in Michigan

Chris Long

Introduction:

This is a brief summary of the 2007-2008 storage trial conducted at Sackett Potatoes, Mecosta Co., MI. In this trial, 1,4-Sight was applied to three chip processing varieties and the tubers were evaluated for adverse sugar accumulation resulting from the Dimethylnaptheline (DMN) application. The experiments began in late September 2007 and concluded in mid April 2008.

Results:

Please see attached graphs of sugar concentration vs. pile temperature and a graph of chip color and color defects for each variety tested.

Discussion:

The variety FL1833 was tested as a long-term storage variety. DMN was applied to the treated samples on October 1st, 2008. Throughout the experiment, the sucrose concentrations in the pile, in the untreated and in the treated samples, tracked very closely to each other (Figure 1). Glucose levels in the treated samples were very similar to glucose levels in the pile and the untreated samples. Based on the chip color and color defects graph, it was difficult to say if there were any treatment effects (Figure 2). There was some variability, but it appeared in the pile samples more than in the treatment samples. CIPC was applied to all FL1833 samples approximately six weeks after the DMN application. The DMN does not appear to have caused the variability in the treated sample. The variability in the pile samples cannot be explained.

Pike was tested because it is a short term storage variety with excellent early chip quality. It is generally put into storage early when the tuber temperatures are high (70ºF). Pike may greatly benefit from a DMN application early in storage. Also, the DMN application does not require the added heat as in a CIPC application, thus preventing any possible storage loss due to additional elevated storage temperatures. CIPC is not typically applied until the tubers have suberized where as the DMN may be applied a week after tubers have been placed in storage. Sugar concentrations, in general, tracked in a similar and consistent pattern for both sucrose and glucose across treatments (Figure 3). Chip color was identical for all treatments with only some slight variation in sugar related defects. There is not a consistent enough pattern to suggest that the color defects observed in the Pike treatments were anything more than sample variability (Figure 4).

The FL1922 variety was chosen because of its excellent storability. Of the three varieties treated with DMN, this variety exhibited the least amount of variability in sugar concentration, as well as, chip color or color defects (Figures 5-6). The sucrose levels of the three treatments tracked very closely and the glucose levels were identical. This also held true for the chip color and color defects. The FL1922 exhibited no deviation from the control as related to chip color and color defects.

Overall:

For the three varieties tested, no negative effect of the DMN application was observed on tuber chip quality. In two cases, with the FL1833 and Pike varieties, there was some variation in chip color defects across treatments, but not in the SFA color scores. This variation in chip color defects is difficult to correlate to the DMN application because it occurs across all treatments and does not occur in a uniform pattern. There was some variability in sugar concentration observed for both FL1833 and Pike across all treatments. In general, this variation is typical of the sugar analysis process. No consistent trend was observed that would lead one to believe that DMN was involved in causing this variation. In the FL1922 variety, there was almost no variability observed in sugar concentration or chip color or color related defects. There was no negative effect of the DMN application on the sugar quality of the FL1922 variety in this study.

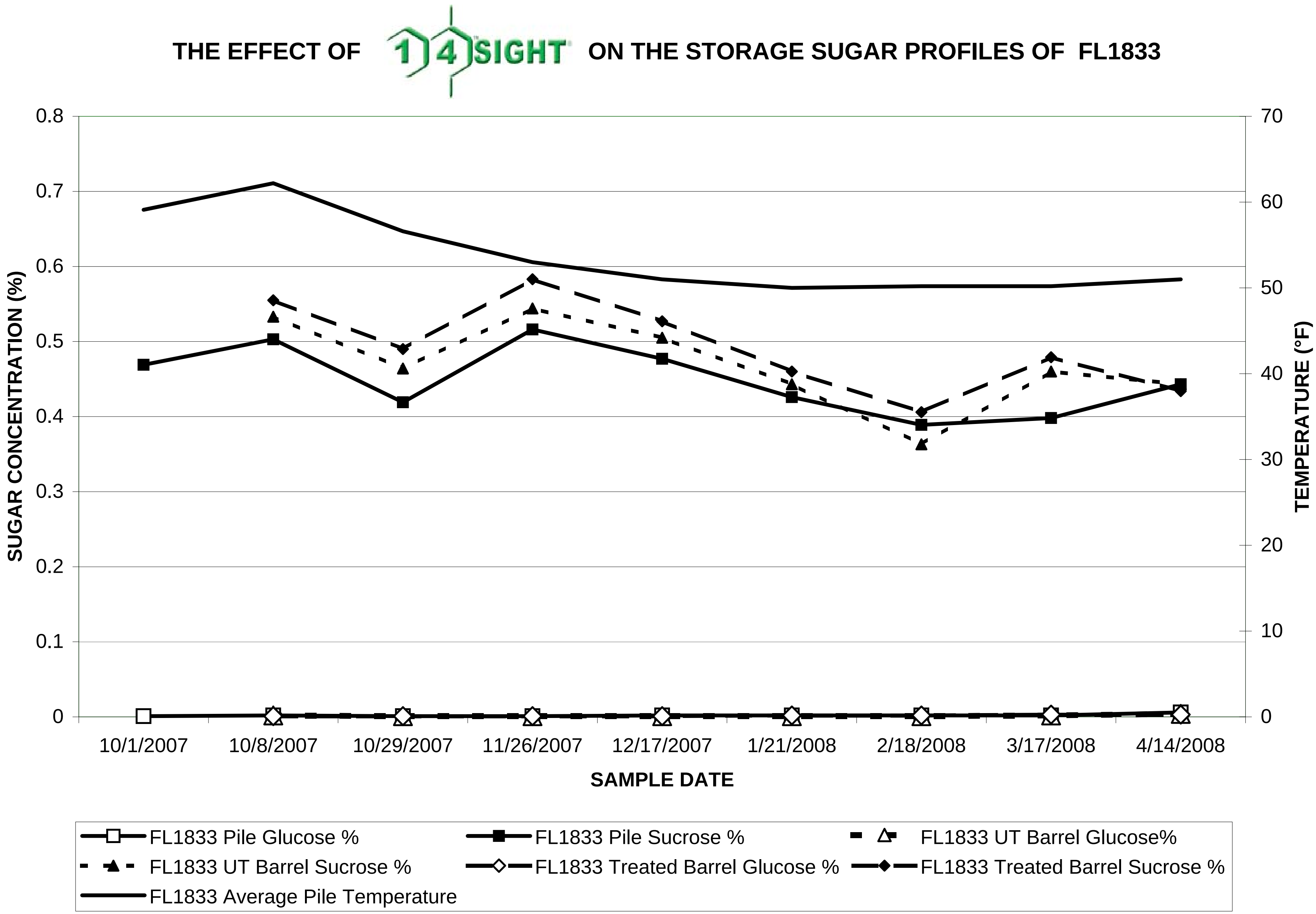
Dormancy Observations:

The dormancy enhancement of the DMN product was inconclusive in the variety Pike based on two observations made one month and three months after treatment. No dormancy break was noted in any of the FL1922 or the FL1833 treatments. All varieties exhibited a background level of eye development (peeping). Both FL1833 and FL1922 were treated with CIPC six weeks after the DMN application. DMN appears to have a short window of dormancy enhancement that can, in turn, be reduced by large volumes of fresh air exchange in the storage environment.

Weight Loss Observations:

Weight loss observations were not made in this study. The effect of a DMN application on tuber weight loss is of interest in order to reduce pressure bruising and tuber shrinkage and will be evaluated in future studies.

Figure 1



THE EFFECT OF 1-4SIGHT ON THE STORAGE SUGAR PROFILES OF FL1833
SUGAR CONCENTRATION (%)
TEMPERATURE (°F)
SAMPLE DATE
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
70
60
50
40
30
20
10
0
10/1/2007
10/8/2007
10/29/2007
11/26/2007
12/17/2007
1/21/2008
2/18/2008
3/17/2008
4/14/2008
FL1833 Pile Glucose %
FL1833 Pile Sucrose %
FL1833 UT Barrel Glucose%
FL1833 UT Barrel Sucrose %
FL1833 Treated Barrel Glucose %
FL1833 Treated Barrel Sucrose %
FL1833 Average Pile Temperature

Figure 2

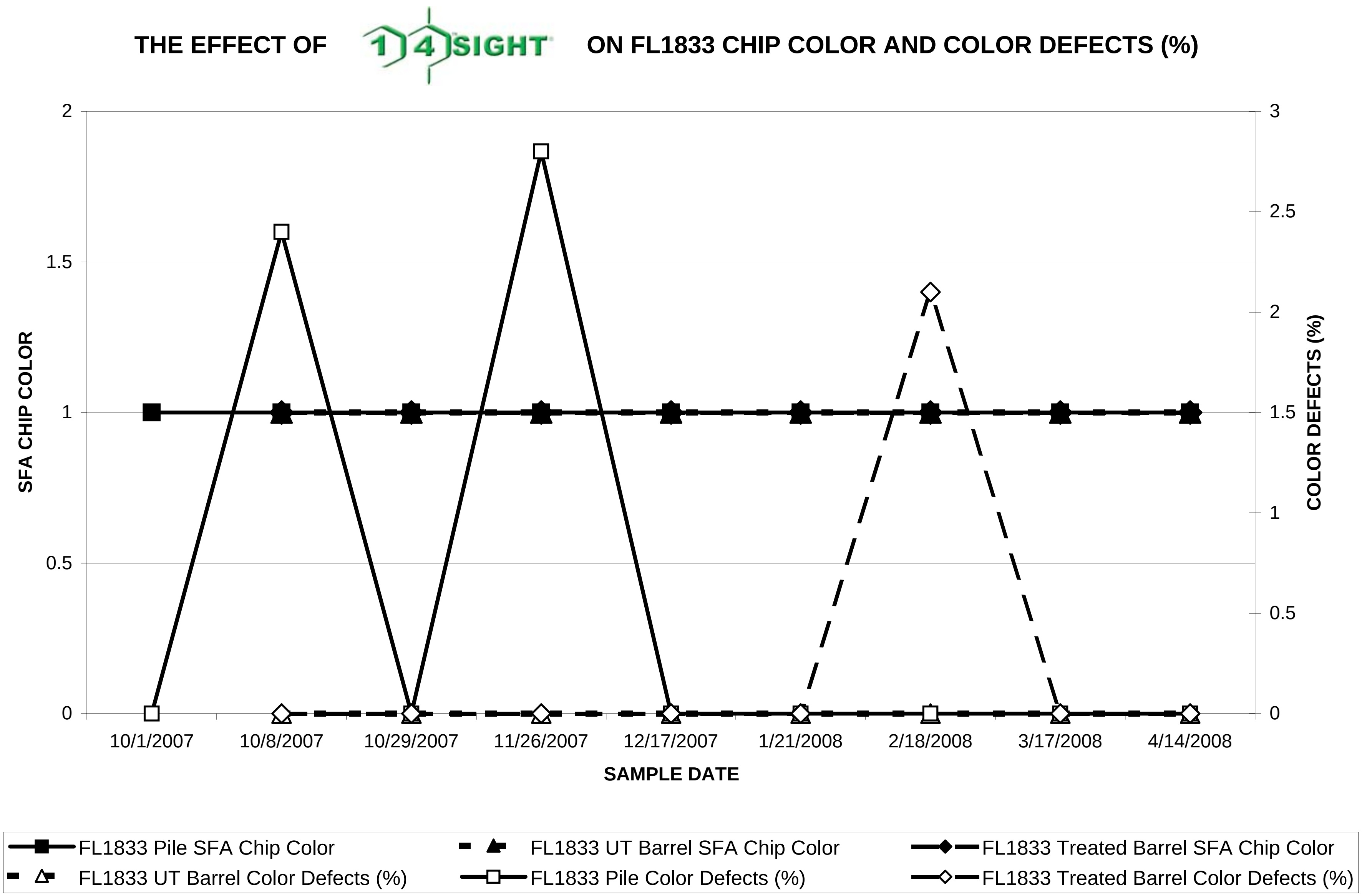


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Figure 3

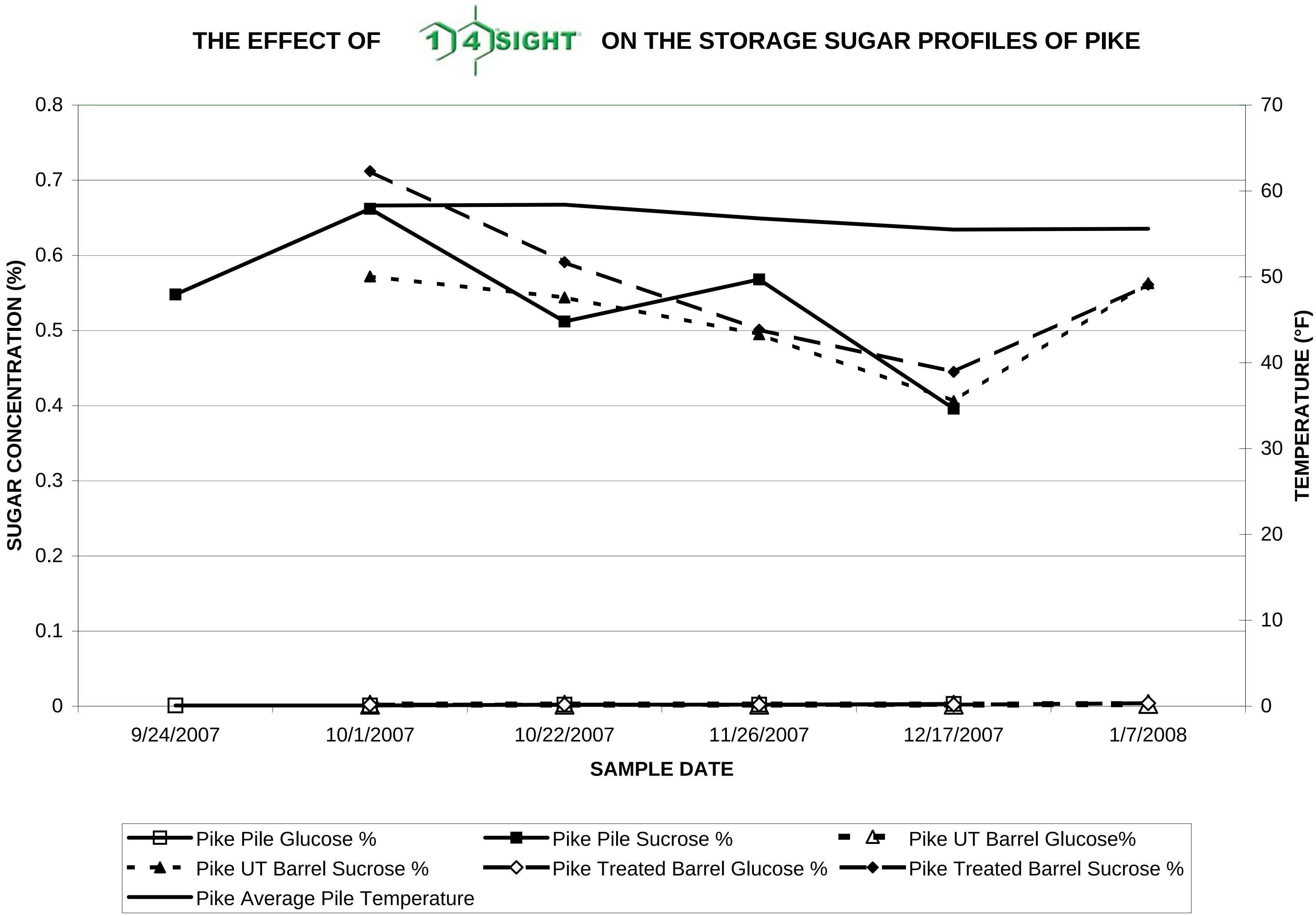

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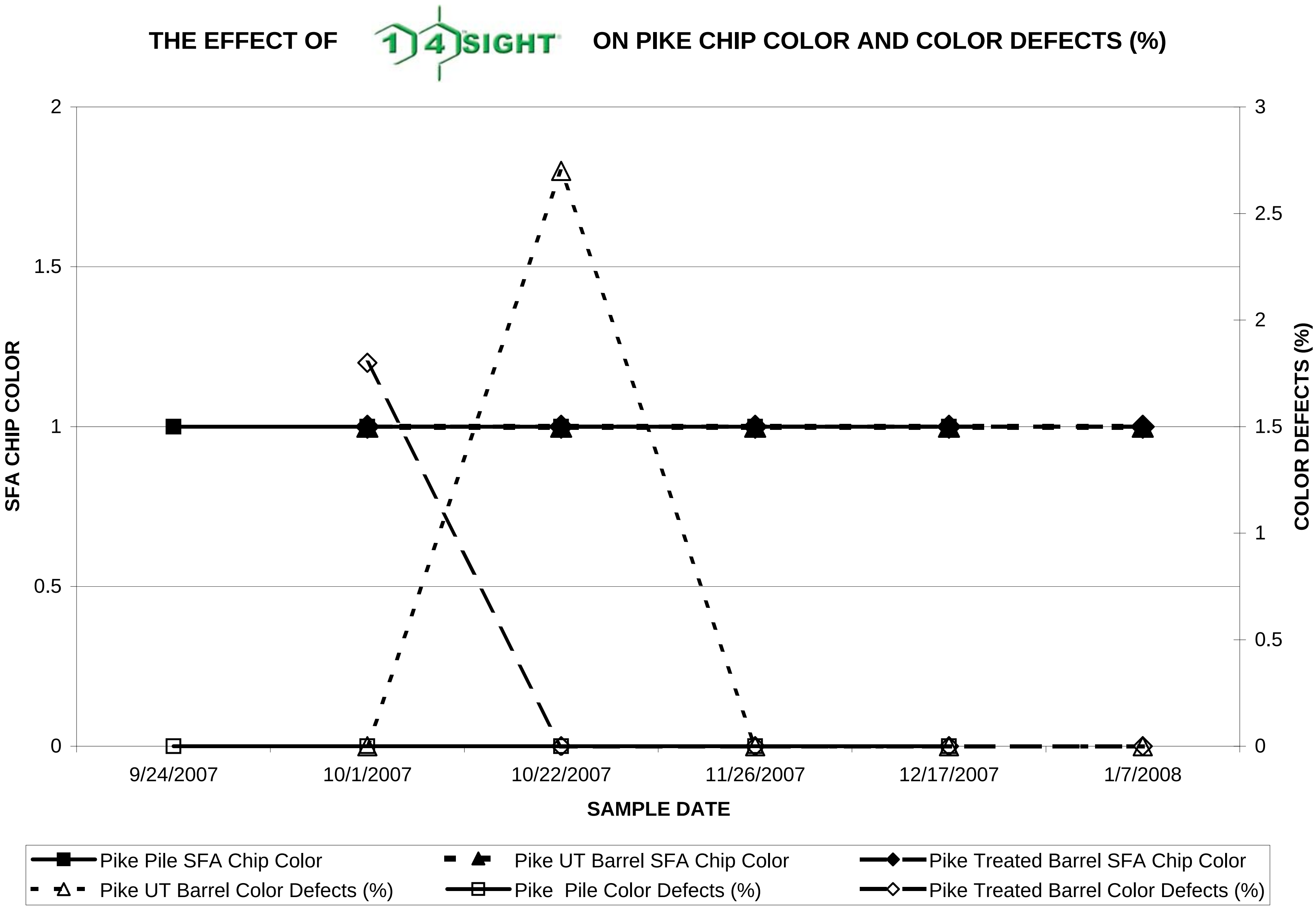
Figure 4



THE EFFECT OF 1-4SIGHT ON PIKE CHIP COLOR AND COLOR DEFECTS (%)
SFA CHIP COLOR
COLOR DEFECTS (%)
0
0.5
1
1.5
2
0
0.5
1
1.5
2
2.5
3
9/24/2007
10/1/2007
10/22/2007
11/26/2007
12/17/2007
1/7/2008
SAMPLE DATE
Pike Pile SFA Chip Color
Pike UT Barrel SFA Chip Color
Pike Treated Barrel SFA Chip Color
Pike UT Barrel Color Defects (%)
Pike Pile Color Defects (%)
Pike Treated Barrel Color Defects (%)

Figure 5

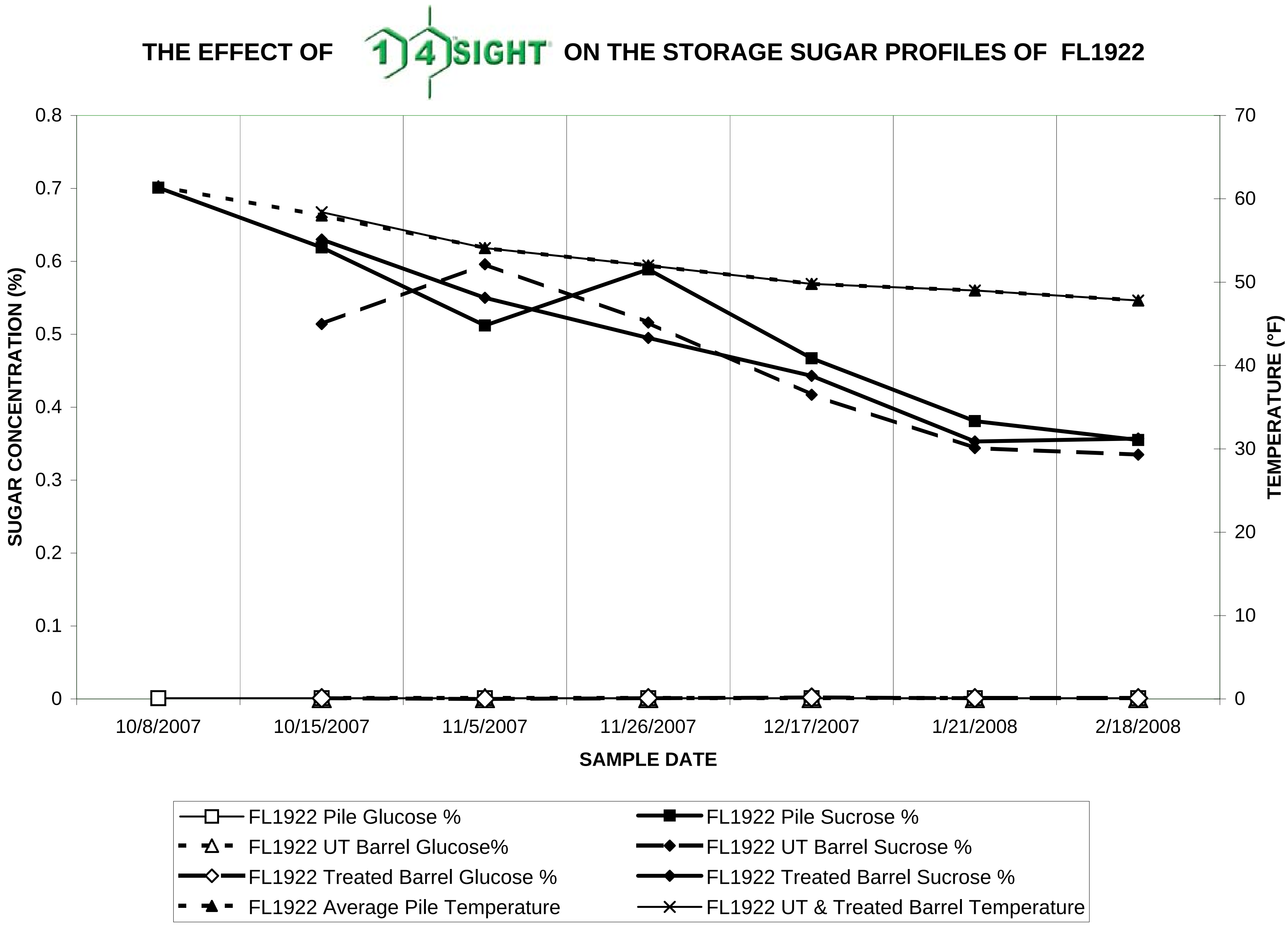


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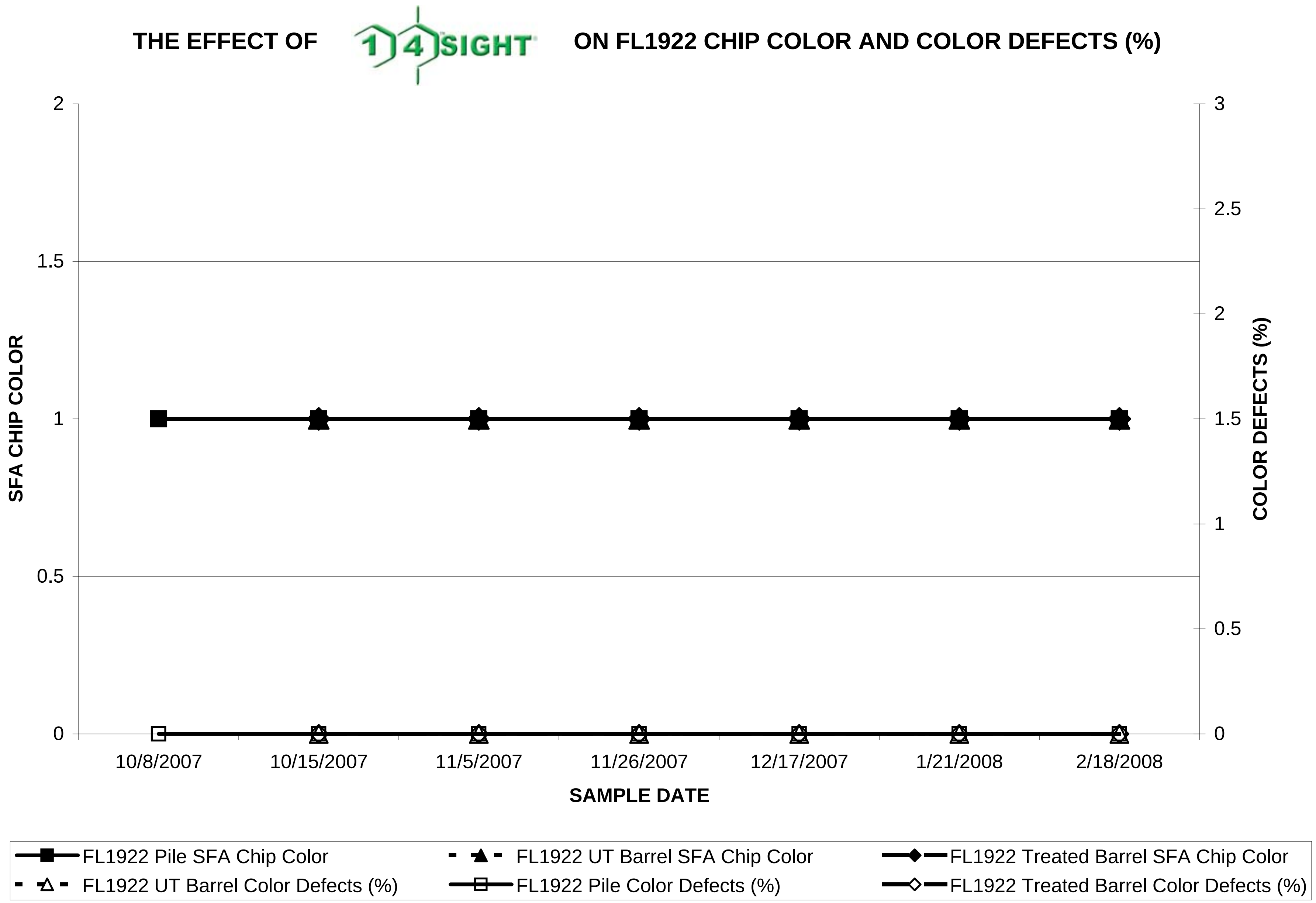
Figure 6



THE EFFECT OF 1-4SIGHT ON FL1922 CHIP COLOR AND COLOR DEFECTS (%)
SFA CHIP COLOR
COLOR DEFECTS (%)
SAMPLE DATE
2
1.5
1
0.5
0
3
2.5
2
1.5
1
0.5
0
10/8/2007
10/15/2007
11/5/2007
11/26/2007
12/17/2007
1/21/2008
2/18/2008
FL1922 Pile SFA Chip Color
FL1922 UT Barrel SFA Chip Color
FL1922 Treated Barrel SFA Chip Color
FL1922 UT Barrel Color Defects (%)
FL1922 Pile Color Defects (%)
FL1922 Treated Barrel Color Defects (%)

Funding: MPIC

Summary Report for the 2007-2008 Dr. B. F. (Burt) Cargill Potato Demonstration Storage

Brian Sackett, Chris Long, Bruce Sackett, Todd Forbush (Techmark, Inc.), Steve Crooks, Dennis Iott, Keith Tinsey, Tim Young, Jason Walther, Troy Sackett, Randy Styma and Ben Kudwa

Introduction

This is a summary report of the 2007-2008 Dr. B. F. (Burt) Cargill Potato Demonstration Storage Annual Report Volume 7. This report is designed to provide a short summary of the 2007-2008 storage committee activities. To obtain a copy of the full 2007-2008 Demonstration Storage Report please contact the Michigan Potato Industry Commission office (517-669-8377) or Chris Long at Michigan State University (517-355-0271 ext. #193). The full report will be provided to you free of charge.

Goals and Objectives

The 2007 growing season was warmer than average May through September. This resulted in average specific gravities and strong overall yields. The early part of the growing season was cool with a warm and dry summer. The harvest season was generally warm and dry resulting in a good storage season.

The goal of the MPIC Storage and Handling Committee for the 2007-2008 bulk bin storage season was two fold: 1) to develop more in-depth storage profiles on two commercially available varieties, MegaChip and Monticello, and 2) to begin bulk experimentation on three new chipping varieties, MSJ036-A (Kalkaska), CO95051-7W, and MSJ147-1.

MegaChip continued to show susceptibility to above average levels of external defects. These defects resulted in detrimental sugar accumulation which in turn resulted in defects in the finished chips. Because of this, our objective was to manage the accumulation of internal sugars around these external defects through the utilization of pile temperature and fresh air volume. Our second variety of interest was Monticello. Monticello continued to exhibit low reducing sugars which lends itself well to long term storability. Managing soft rot and wet break down of tubers in the storage has become a concern with this relatively thin skinned variety. Monticello will be managed for an April to June shipment to a processor, keeping in mind potential production and storability issues. The Kalkaska variety is thought to be a short term storage variety with strong common scab resistance and good agronomic quality. The CO95051-7W and the MSJ147-1 are potential long term storage varieties that could be shipped in May or June for commercial processing. Both varieties are average to below average agronomic performers with some slight tolerance to common scab. All bins were treated with CIPC on October 25th, 2007 and January 23rd, 2008.

Results for the 500 cwt. Bulk Bins:

MSJ036-A (Kalkaska) Bulk Bin 2. These potatoes were planted at Sackett Acres, Edmore, MI., on May 12th, were vine killed on August 30th and harvested on September 25th, 2007. The crop emerged more slowly than the variety Pike which was planted in the same field. During the growing season, the vine type of Kalkaska was more vigorous than that of Pike. Some vine rot was experienced in the Kalkaska variety due possibly to a close plant spacing (9.5") and a higher amount of fertilizer input than is required for this variety. The vine rot was most likely a cause of some sugar immaturity found in the tubers at harvest. The storage bin was filled September 26th, 2007 with a tuber pulp temperature of 68.0ºF. The sucrose rating at the time of bin filling was 0.845 and fluctuated from 0.710 to 0.729 from mid October to mid December 2007, respectively. In early January, 2008 the sucrose rating dropped to 0.583 and was 0.568 when evaluated again on January 15th, 2008. At this point, the decision was made to ship these potatoes to Herr Foods Inc., Nottingham, PA for processing. From late November 2007 until shipment in January 2008, the percent glucose remained steady at 0.003. Concern was expressed about the Kalkaska variety because its appearance was inconsistent in the test fry samples. The variety always had some level of chip defects during the storage evaluation. The load, when processed at Herr's, scored 12.3 percent external and 7.9 percent internal defects in the finished product with an AGTRON score of 61.7. The external defects appeared to be pitted scab. The variety was grown in a field with a high level of common scab. The internal defects were free sugars. The storage temperature of this bin in late October, 2007 was 58.2ºF and trended downward to 54.0ºF in mid-January when the bin was sold. Kalkaska showed many positive agronomic traits; yield, scab tolerance, vine vigor and good specific gravity. Given this variety's slower respiration rate, it was a challenge to precondition and store this variety with confidence. There was a great concern with the amount of internal and external defects present as to whether this bin would process acceptably. The bin did process acceptably, but there has been much reservation about the storability of this variety. Future plans for development will concentrate on in-field and storage management strategies to promote the further commercialization of this variety. Planting Kalkaska early in the growing season to allow for the production of a fully mature crop and adjusting plant in-row spacing to 10-10.5" may help in the reduction of vine rot. Also, timing of a fungicide application at bloom drop to prevent white mold or soft rot from forming in the plant canopy may be helpful.

<u>CO95051-7W Bulk Bin 3.</u> These potatoes were planted at Sackett Acres, Edmore, MI., on May 21st, vine killed September 6th and harvested on September 27th, 2007. The storage bin was filled September 28th, 2007 with a pulp temperature of 63.0ºF. The specific gravity of CO95051-7W prior to vine kill was 1.087. The sucrose rating at the time of bin filling was 0.548 and remained steady until early January when it declined to 0.464. The sucrose rating reached a low of 0.346 in early March at which point it began a slow rise to 0.555 in early May. At this point, the percent glucose began to move slightly upward to 0.003 in mid-May, up from 0.001 in late April. The sucrose and glucose levels continued to rise to a sucrose rating of 0.755 and 0.003 percent glucose on June 2nd when it was shipped to Utz Quality Foods, Inc., Hanover, PA. This variety was

stored at 48.0ºF from early February to late April. The ending bin temperature when shipped to Utz was 58.0ºF. CO95051-7W chip processed with 8% total defects (3% external, 5% internal). The external defects were mainly pressure bruise and the internal defects were sugar related. This variety had a specific gravity of 1.091 at Utz with an AGTRON score of 60.2. CO95051-7W appears to be an average to below average yielding variety with slight to moderate scab tolerance. The ability for this variety to process in early June out of storage is very exciting and we will continue to test the commercial potential of this variety in the future.

<u>MegaChip Bulk Bin 4.</u> This variety was grown at Crooks Farms, Stanton, MI. It was planted on May 1st, vine killed September 3rd and harvested May 28th, 2007. The pulp temperature at harvest was 58.0ºF. The specific gravity prior to vine kill was 1.086. The storage bin was filled on September 29th, 2007. The sucrose rating and percent glucose were 0.555 and 0.002, respectively. MegaChip exhibited a high level of internal color in the fry sample evaluated at harvest. The sucrose rating ranged from a high of 0.669 in late October to 0.333 in mid-January 2008 when it was shipped. Pulp temperature at the time of shipping was 56.4ºF. The percent glucose varied between 0.002 and 0.003 through the duration of its storage. At no point in our storage evaluation did the chip samples of MegaChip appear to have very high chip quality. The respiration rate of this variety makes it difficult to respire off free sugars. The agronomic characteristics of this variety are very strong. The variety has excellent yield, plant vigor, common scab tolerance and a high specific gravity. This variety does not, however, appear to be a very stable or reliable storage chip processing line because of its high specific gravity and low tuber respiration rate. It is difficult to metabolize off free sugars and achieve an acceptable chip product from this variety out of storage. This variety would best be suited for late out-of-field chip processing contracts. It may be effectively utilized in poor agronomically performing field conditions.

<u>Monticello Bulk Bin 5.</u> These potatoes were loaded into storage on September 29th, 2007 with a pulp temperature of 59.0ºF. The potatoes were grown at Sackett Potatoes, Mecosta, MI. They were planted May 5th, vine killed August 27th and harvested

September 28th, 2007. The specific gravity was 1.079 at the time of vine kill. The hope was to build on our production experience from last season and hold this bin for late chip processing. Tuber quality was good at the time of bin loading. The sucrose rating was 0.912 and the percent glucose at bin loading was 0.002. The sugar levels gradually declined from these levels to a low point in early March where a 0.415 sucrose rating and 0.002 percent glucose was recorded. From this point in time, the sugar levels gradually increased to a 0.596 sucrose rating and 0.003 percent glucose. At this point, some soft rot became evident and with the continual upward trend in sugar movement, the bin was shipped to Utz Quality Foods, Inc., Hanover, PA on April 23rd, 2008. The tuber storage temperature from mid-December to end of April ranged from 50.4ºF to 49.6ºF. The specific gravity recorded there was 1.078, similar to our at-harvest reading. Seven percent external defects were recorded, which consisted mostly of pressure bruise and pitted scab. Some slight internal defects were noted consisting of one percent of the sample taken. The internal chip defects consisted of sugar discoloration and internal sprouting. A 59.3 AGTRON score was recorded on this load. The chip processing quality of the variety was acceptable, but continued tuber rot issues related to the thin skin of Monticello prevented the variety from being stored late. It is unclear how to take advantage of the chip quality of this variety when the tuber storability is so difficult.

MSJ147-1 Bulk Bin 6. These tubers were grown at Sandyland Farms, Howard City, MI. The variety was planted May 25th, vine killed September 11th and harvested October 5th, 2007. It was loaded into storage the same day that it was harvested. The tuber pulp temperature at the time of bin loading was 60.0ºF. The specific gravity prior to vine kill was 1.080. The sucrose rating at the time of bin loading was 0.512 and the percent glucose was recorded at 0.001. These tubers appeared to be chemically mature at the time of harvest. Sucrose levels were somewhat variable from October to late April at which time the sucrose level rose to 0.819 in early June. Storage temperature from late November 2007 to mid-April 2008 was 50.0ºF. Percent glucose remained low most of the storage season with very few undesirable color related defects being recorded. In late April the pile temperature was raised to 52.0ºF to facilitate the respiration of latent sugars associated with internal defects appearing in test chip fry samples. The MSJ147-1 variety was chip processed at Utz Quality Foods, Inc., Hanover, PA on June 4th, 2008. Six percent external and thirteen percent internal defects were recorded after processing. The external defects consisted of pressure bruise and the internal defects were hollow heart and internal discoloration. Nineteen percent total chip defects were recorded in all, along with a 59.0 AGTRON score. MSJ147-1 may have processed with a reduced number of defects if it had been shipped a month earlier. The yield performance of this variety was average or below average. Hollow heart was evident in the oversize tubers and some common scab susceptibility was apparent. The late chip processing quality of this variety is good, but the production issues need to be addressed for this variety to have a commercial impact.

Promising Varieties In the Box Bin Trial:

Varieties that looked promising in the Box Bin trial (Bin 1) in 2007 were NY139, MSH228-6, MSJ126-9Y, and MSL007-B. These varieties will be considered for larger scale evaluations in the 2008-2009 storage season.

MICHIGAN POTATOES
MICHIGAN POTATO INDUSTRY COMMISSION

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March 16, 2009

To All Michigan Potato Growers & Shippers:

The Michigan Potato Industry Commission, Michigan State University's Agricultural Experiment Station and Cooperative Extension Service are pleased to provide you with a copy of the results from the 2008 potato research projects.

This report includes research projects funded by the Michigan Potato Industry Commission, the USDA Special Grant and special allocations by the Commission. Additionally, the Commission expresses appreciation to suppliers of products for research purposes and special grants to the Commission and researchers.

Providing research funding and direction to principal investigators at MSU is a function of the Michigan Potato Industry Commission's Research Committee.

Best wishes for a prosperous 2009 season.

The Michigan Potato Industry Commission

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QUESTIONS

If you have any further questions, comments or concerns, please contact the Michigan Potato Industry Commission directly.

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