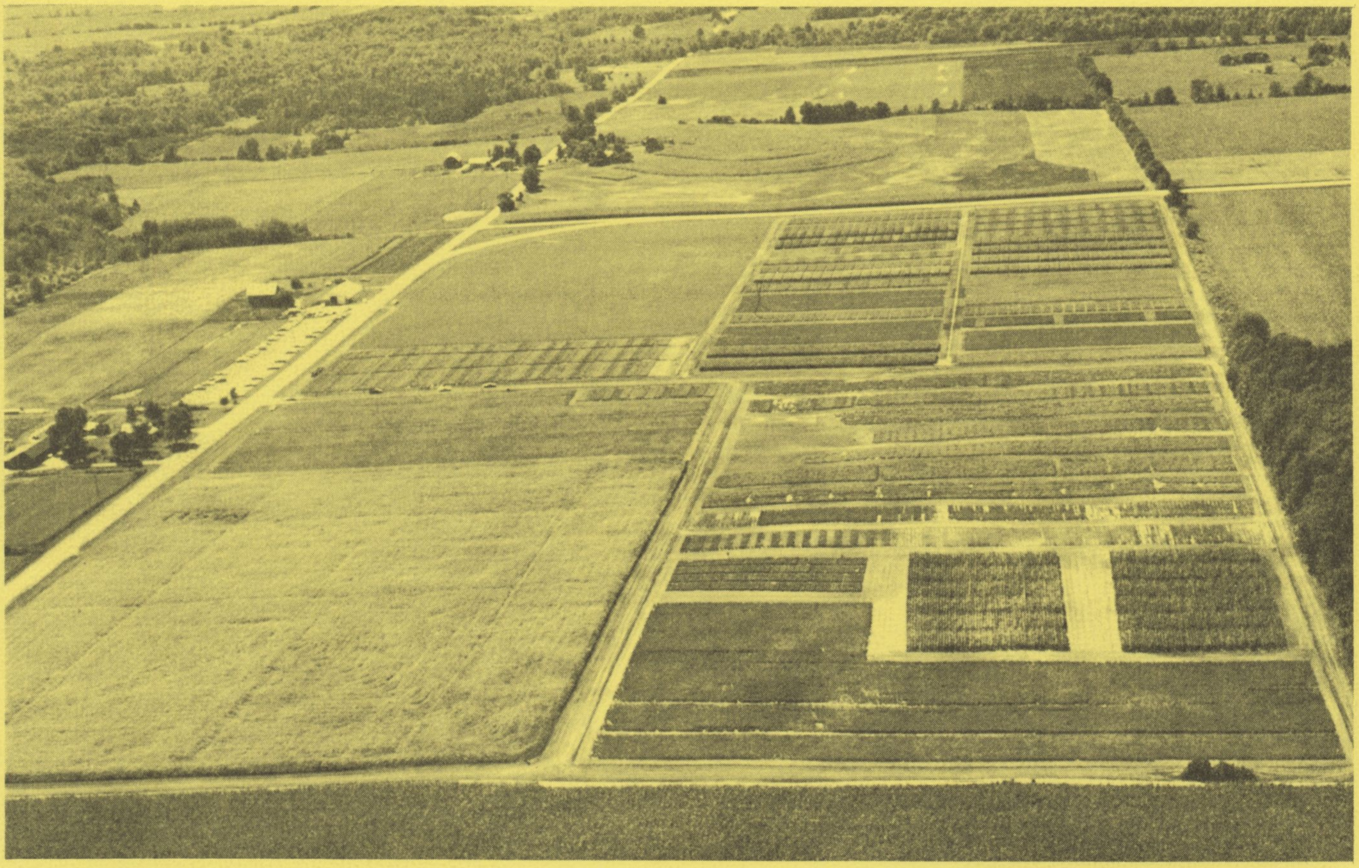
R.W. Chase File

1978 Research Report



MONTCALM EXPERIMENT STATION

Michigan State University
Agricultural Experiment Station

ACKNOWLEDGMENTS

Research personnel working at the Montcalm Branch Experiment Station have received much assistance in various ways. A special thanks is due each of these individuals, private companies and government agencies who have made this research possible. Many valuable contributions in the way of fertilizers, chemicals, seed, equipment, technical assistance, personal services, and monetary grants were received and are hereby gratefully acknowledged.

Special recognition is given to Mr. Theron Comden for his devoted cooperation and assistance in many of the day-to-day operations and personal services.

Special acknowledgement is made to the Michigan Potato Industry Commission and the Michigan Agricultural Experiment Station for the construction of a new 40' x 80' pole building for the storage of equipment and supplies. The building is located south of the field site and will greatly facilitate the storage and maintainance of the equipment. The building will have a room for holding seed potatoes and fertilizer in the spring and for holding research samples in the fall, but is not designed for long term potato storage. Provision has also been made for an office where research plot records can be maintained. Sincere appreciation is hereby acknowledged to the industry for this addition to the MSU research program.

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MONTCALM BRANCH EXPERIMENT STATION RESEARCH REPORT

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INTRODUCTION

The Montcalm Branch Experiment Station was established in 1966 with the first experiments initiated in 1967. This report marks the completion of twelve years of studies. The 40-acre facility is leased from Mr. Theron Comden and is located in west-central Michigan, one mile west of Entrican. The farm is used primarily for research on potatoes and is located in the heart of a major potato producing area.

This report is designed to coordinate all of the research obtained at this facility during 1978. Much of the data herein reported represents projects in various stages of progress; so results and interpretations may not be final. RESULTS PRESENTED HERE SHOULD BE TREATED AS A PROGRESS REPORT ONLY as data from repeated trials are necessary before definite conclusions and recommendations can be made.

WEATHER

Tables 1 and 2 summarize the eleven year temperature and rainfall data. April was considerably cooler than 1977 and the eleven year average. However, temperatures throughout the growing season were near normal. There was a very hot and humid period in late May which seriously hurt plantings of some growers; however most plot plantings were completed before this critical period. There were only two days in July, three in August and four in September when the daily maximum temperature exceeded 90°F.

Rainfall patterns were erratic, and through July rainfall was nearly 3.5 inches less than the eleven year average. On August 19 a 3.70 inch rain was recorded which represented over 60% of the total received during August. Harvest weather during September was excellent which facilitated timely harvests.

Irrigation applications of slightly less than one inch each were made fifteen times (June 5, 24, 28, July 6, 10, 13, 17, 20, 24, 28, August 2, 4, 7, 11, 14).

SOIL TESTS

Soil test results for the general plot area were:

Pounds per Acre

pH	P	K	Ca	Mg
7.0	395	227	960	230

Table 1. The 11-year summary of average maximum and minimum temperatures during the growing season at the Montcalm Branch Experiment Station.

Year	April		May		June		July		August		September		6-month average	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1968	61	37	62	41	74	53	80	55	81	58	74	50	73	50
1969	56	35	67	43	70	50	80	59	82	56	73	49	74	49
1970	54	35	65	47	72	55	80	60	80	57	70	51	73	45
1971	53	31	65	39	81	56	82	55	80	53	73	54	76	48
1972	47	30	70	47	72	50	79	57	76	57	69	49	73	48
1973	54	36	63	42	77	58	79	60	80	60	73	48	74	51
1974	57	36	62	41	73	52	81	57	77	56	68	45	70	48
1975	48	28	73	48	75	56	80	57	79	58	65	44	70	49
1976	58	35	63	41	79	57	81	58	80	53	70	46	71	48
1977	62	37	80	47	76	50	85	61	77	52	70	53	75	50
1978	50	31	67	45	78	50	81	56	82	57	75	52	72	49
11-year average	55	34	67	44	75	53	81	58	79	56	71	49		

Table 2. The 11-year summary of precipitation (inches per month) recorded during the growing season at the Montcalm Station.

Year	April	May	June	July	August	September	Total
1968	2.84	4.90	3.74	1.23	1.31	3.30	17.32
1969	3.33	3.65	6.18	2.63	1.79	0.58	18.16
1970	2.42	4.09	4.62	3.67	6.54	7.18	28.52
1971	1.59	0.93	1.50	1.22	2.67	4.00	11.91
1972	1.35	1.96	2.51	3.83	7.28	2.60	19.53
1973	3.25	3.91	4.34	2.36	3.94	1.33	19.13
1974	4.07	4.83	4.69	2.39	6.18	1.81	23.97
1975	1.81	2.05	4.98	2.71	11.25	3.07	25.87
1976	3.27	4.03	4.22	1.50	1.44	1.40	15.86
1977	1.65	0.46	1.66	2.39	2.61	8.62	17.39
1978	2.34	1.35	2.55	1.89	5.90	2.77	16.80
11-year average	2.54	2.92	3.73	2.35	4.63	3.33	19.50

FERTILIZERS USED

Except for the specific fertility studies where the fertilizers are specified in the report, the following fertilizers were used on the potato plot area:

Plow down	- 0-0-60	- 200 lbs/A
Banded at planting	- 20-10-10	- 500 lbs/A
Sidedressed at hilling	- 46-0-0	- 300 lbs/A

Rye and triticales covercrop plowed down.

HERBICIDES

Preplant incorporated EPTC (Eptem) at 3 lbs/A followed by delayed preemergence of metribuzin (Sencor) at 1/2 lb/A.

DISEASE & INSECT CONTROL

Systemic insecticide Temik was applied at 3 lbs/A.

Foliar fungicide and insecticide sprays were as follows:

July 5	Thiodan
July 15	Thiodan + Bravo
July 22	Monitor + Bravo
July 28	Thiodan + Bravo
August 5	Thiodan + Bravo
August 12	Monitor + Bravo
August 21	Cygon + Bravo
August 28	Thiodan + Bravo

Top killed prior to harvest with Dinoseb (Dow General) two quart/A plus crop oil concentrate (Herbimax) at one quart/A.

INFLUENCE OF SELECTED PRODUCTION MANAGEMENT INPUTS ON NUTRITION AND YIELD OF SUPERIOR POTATOES

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Department of Crop and Soil Sciences

This project was a study conducted as part of a larger project, to look at insects, nematodes, fertilizer, nitrogen, and storage characteristics and their interactions. Only the yield and nutritional aspect is reported here. Information on other aspects will be reported by Drs. G. Bird, R. Chase, and B. Cargill.

There were two experiments conducted in 1978. The first was to evaluate two pesticides (Temik and Vorlex) at three nitrogen rates (75, 150, and 300 lbs N/A). In addition a control was established to be compared with Temik and Vorlex. The control as well as the entire experiment received several foliar insecticide applications to control insects. The experimental design was a randomized complete block with nine treatments and five replications. The data for this experiment are presented in Tables 1-5.

The second experiment was also a randomized complete block design, but with 10 treatments (control, Temik, Vorlex, Furadan, and Dacamox) compared at two nitrogen rates (75 and 150 lbs/A).

In both experiments 75 lbs N/A was supplied at planting and the remainder was sidedress at hilling to obtain the 150 and 300 lb rates. Vorlex was chiseled beneath the row prior to planting at a rate of 10 gallons per acre. All of the other soil applied pesticides were applied at 3 lbs active ingredient per acre with the fertilizer placed in two bands two inches to either side of the seed piece and two inches below. Both experiments were planted on May 22, using B size seed pieces of the Superior variety.

Influence of Treatment of Yield

Table 1 shows the yield and size distribution of potatoes as affected by the treatments for the first experiment. Total yield was maximized with 300 lbs of N and Temik or Vorlex. Fertilizer N beyond 75 lbs increased yields in the control plots less than 30 cwt, but where Temik and Vorlex were used, yields were increased 40 and 70 cwt by 150 and 300 lbs of N, respectively. Temik and Vorlex significantly increased the yield of large size tubers (over 3 1/4 inches diameter) at the 300 lbs N rate. A size yield was increased by Temik and Vorlex at all nitrogen levels. B size tuber yield was greater with Temik at the 75 and 150 lb N rates.

In Table 5 similar results are reported for Temik and Vorlex with Vorlex generally giving the best yield. Dacamox and Furadan gave yields slightly lower than Temik or Vorlex but better than the control. The 150 lb N rate increased yields an average of 14 cwt/A. Dacamox significantly increased large size tubers and reduced yield of B size tubers.

Soil Test Results

Soil samples were taken to help with the interpretation of yield and elemental analysis of potato petioles. The data are presented in Tables 2 and 6. Only Calcium was significantly different in the first experiment. The differences were not consistent at each N rates, but higher Calcium values were generally observed where Temik and Vorlex were used. This could have some bearing on the lower Manganese (Mn) levels in petioles (Tables 3-4 and 7-8) with Temik and Vorlex in the first experiment, however, there was no significant correlation between soil Ca and plant Mn when the simple correlation coeffecient was determined (r = .01).

Influence of Treatments on Elemental Composition of Potato Petioles

Nitrogen fertilizer had no significant effect on any of the elements studied in the first sampling of the first experiment (Table 3), however, the N, P, K, and Mn contents in the petioles were affected by the pesticide treatments. Temik caused slightly lower N and P contents, while Vorlex increased the same elements over the control. Potassium values were generally higher for both Temik and Vorlex, while Mn decreased greatly. Vorlex reduced the Mn content to nearly half the control. The same result was observed in last years studies.

In the second sampling of the first experiment (Table 4), the N content of potato petioles was directly related to rate of N fertilizer. A slight increase in P and a decrease in Ca was observed with the 150 and 300 lb N rates. Manganese was again reduced by the two soil applied pesticides particularly Vorlex.

For experiment 2 (Table 7) Mn was significantly reduced in the first sampling by Vorlex only. For the second sampling in this experiment (Table 8) N, Mn, and Zn were significantly increased by 150 lbs of N compared to 75. Petioles from Vorlex treated plots had the lowest Mn levels, while Furadan tended to increase the Mn level giving slightly higher values than the control. Dacamox had a small but insignificant affect on Mn.

Summary

This experiment has demonstrated the importance of Temik and Vorlex in getting maximum effecient use of N fertilizer and uptake of other nutrients. These two materials have consistently shown a reduction in the Manganese content of potato petioles. At present we are still unable to explain the cause and effect of this relationship. It would be interesting to note if other management practices which affect Manganese availability and/or uptake also are yield related.

Table 1. Effect of Nitrogen and pesticide treatments on size and yield of Superior potatoes.

Treatments		Size Distribution			
		B	A	Large	
Nitrogen	Pesticide	<2"	2-3 1/4"	>3 1/4"	Total
- lb/A -		--------cwt/A--------			
	Control	9.5	243	4.8	258
75	Temik	12.3	286	4.7	303
	Vorlex	11.8	300	5.0	317
	Control	7.8	267	8.2	283
150	Temik	10.6	324	11.5	346
	Vorlex	8.1	343	5.0	356
	Control	9.0	255	6.5	270
300	Temik	9.5	341	25.5	377
	Vorlex	7.2	340	23.5	370
	LSD(.05)	(2.5)	(26)	(12.4)	(30)

Table 2. Soil test values observed in the experimental plots sampled July 7, 1978.

Treatments		Soil Test				
Nitrogen	Pesticide	PH	P	K	Ca	Mg
- lb/A -			lb/A			
	Control	6.8	431	312	939	245
75	Temik	6.9	459	309	1024	256
	Vorlex	6.9	432	303	1088	256
	Control	6.8	425	343	1194	281
150	Temik	6.7	434	333	1002	251
	Vorlex	6.8	422	334	1045	242
	Control	6.7	392	323	917	242
300	Temik	6.8	434	335	1088	272
	Vorlex	6.9	431	327	1024	265
	LSD(.05)	(NS)	(NS)	(NS)	(NS)	(NS)

Table 3. Effect of nitrogen and pesticide treatments on elemental composition of potato petioles sampled July 7, 1978.

Treatments		Elements						
Nitrogen	Pesticide	N	P	K	Ca	Mg	Mn	Zn
- lb/A -		---	---	---	%	---	- PPM -	
75	Control	2.70	.25	8.28	.67	.53	87	28
	Temik	2.46	.22	8.78	.69	.55	66	25
	Vorlex	2.68	.28	8.60	.68	.56	45	33
150	Control	2.78	.23	8.24	.60	.48	83	30
	Temik	2.54	.20	8.75	.66	.53	74	25
	Vorlex	2.83	.28	8.58	.67	.59	46	31
300	Control	2.74	.23	8.35	.70	.55	91	34
	Temik	2.69	.22	8.48	.72	.61	75	29
	Vorlex	2.86	.26	8.18	.65	.62	49	29
	LSD(.05)	(.23)	(.01)	(.32)	(NS)	(NS)	(24)	(NS)

Table 4. Effect of Nitrogen and pesticide treatments on elemental composition of potato petioles sampled August 4, 1978.

Treatments		Elements						
Nitrogen	Pesticide	N	P	K	Ca	Mg	Mn	Zn
- lb/A -		%					- PPM -	
	Control	1.28	.10	7.65	1.54	1.31	251	11
75	Temik	1.10	.10	7.42	1.67	1.29	171	11
	Vorlex	1.28	.11	7.89	1.48	1.26	129	19
	Control	1.53	.11	7.63	1.42	1.43	246	14
150	Temik	1.51	.11	7.31	1.36	1.38	207	13
	Vorlex	1.51	.11	6.92	1.30	1.41	143	13
	Control	1.60	.11	7.21	1.36	1.36	306	17
300	Temik	1.63	.11	6.87	1.41	1.44	180	14
	Vorlex	1.70	.12	7.03	1.32	1.47	181	15
	LSD(.05)	(.08)	(.01)	(NS)	(.17)	(NS)	(92)	(NS)

Table 5. Effect of Nitrogen and pesticide treatments on size and yield of Superior potatoes.

Treatments		Size Distribution			
		B	A	Large	
Nitrogen	Pesticide	<2"	2-3 1/4"	>3 1/4"	Total
- lb/A -		----------cwt/A----------			
75	Control	12.0	276	12.6	301
	Temik	11.8	330	12.0	353
	Vorlex	12.8	351	7.2	371
	Furadan	12.8	301	8.7	322
	Dacamox	9.5	313	15.4	337
150	Control	9.8	295	9.6	314
	Temik	12.4	349	15.2	377
	Vorlex	12.0	357	10.9	380
	Furadan	10.6	315	9.3	335
	Dacamox	9.0	315	25.7	350
	LSD(.05)	(2.5)	(28)	(6.7)	(29)

Table 6. Soil test values observed in the experimental plots sampled July 7, 1978.

Treatment		Soil Test				
Nitrogen	Pesticide	PH	P	K	Ca	Mg
- lb/A -				lb/A		
75	Control	6.5	448	349	1024	242
	Temik	6.5	462	368	1003	238
	Vorlex	6.6	437	326	1003	245
	Furadan	6.6	425	324	981	226
	Decamox	6.5	475	363	1130	264
150	Control	6.6	450	322	1045	245
	Temik	6.6	407	326	875	226
	Vorlex	6.7	435	308	1003	240
	Furadan	6.3	440	337	832	204
	Decamox	6.3	437	309	811	206
	LSD(.05)	(NS)	(NS)	(NS)	(NS)	(NS)

Table 7. Effect of Nitrogen and pesticide treatments on elemental composition of potato petioles sampled, taken July 7, 1978.

Treatments		Elements						
Nitrogen	Pesticide	N	P	K	Ca	Mg	Mn	Pn
		%					PPM	
	Control	2.69	.24	8.47	.57	.49	74	28
	Temik	2.65	.22	8.50	.60	.52	55	27
75	Vorlex	2.55	.26	8.58	.55	.51	38	27
	Furadan	2.73	.22	8.62	.61	.51	78	28
	Dacamox	2.72	.25	8.56	.56	.50	59	28
	Control	2.79	.22	8.44	.61	.52	78	28
	Temik	2.69	.20	8.60	.56	.49	57	25
150	Vorlex	2.87	.27	8.23	.58	.55	35	30
	Furadan	2.70	.21	8.58	.52	.45	88	30
	Dacamox	2.65	.23	8.56	.58	.50	74	28
	LSD(.05)	(NS)	(NS)	(NS)	(NS)	(NS)	(28)	(NS)

Table 8. Effect of Nitrogen and pesticide treatments on elemental composition of potato petioles sampled August 4, 1978.

Treatments		Elements						
Nitrogen	Pesticide	N	P	K	Ca	Mg	Mn	Zn
		%					PPM	
75	Control	1.32	.10	7.98	1.45	1.27	197	11
	Temik	1.19	.10	8.09	1.37	1.15	136	12
	Vorlex	1.28	.10	7.76	1.28	1.21	103	13
	Furadan	1.31	.10	7.75	1.55	1.33	237	12
	Dacamox	1.25	.10	7.83	1.33	1.13	163	11
150	Control	1.51	.10	7.17	1.27	1.38	231	14
	Temik	1.45	.10	7.07	1.25	1.48	155	13
	Vorlex	1.49	.11	7.18	1.29	1.56	133	14
	Furadan	1.52	.10	7.66	1.31	1.26	316	15
	Dacamox	1.52	.11	7.29	1.20	1.36	230	16
	LSD(.05)	(.14)	(.09)	(NS)	(.16)	(NS)	(90)	(2)

THE INFLUENCE OF SELECTED PRODUCTION MANAGEMENT INPUTS ON THE YIELD, QUALITY AND STORABILITY OF POTATOES

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Department of Entomology

The objective of this study was to examine varying nitrogen levels and their interaction with selected insect and nematode control programs and to monitor growth and development and yield. Seedpieces (cv Superior) were planted on May 22-23, 1978 for all experiments at the Montcalm Potato Research Farm in Entrican, Michigan. Each plot consisted of four rows 50 ft. (15.24m) in length and 34 in. (.86m) apart, with 8 to 12 in. (20.5-30.5cm) spacings between plants. Plant growth and development was monitored at two week intervals throughout the season. This was accomplished by randomly selecting two plants from the outside rows of each plot and then returning them to the laboratory for analysis. In the laboratory, root weight, foliage weight and tuber weight and number were recorded at each sampling date. Soil and root populations of nematodes were estimated from samples taken at these times. Soil samples (centrifugation-flotation technique) for nematode analysis were taken by core sampling the two outside rows of each plot. Root samples (shaker technique) were derived from plants returned to the laboratory for plant growth analysis. At harvest, the center two rows of each plot were harvested, graded and weighed. During the season plants were maintained under normal commercial irrigation and insect and disease control practices. A complete random block- two factorial design was used to analyze the data, with each treatment replicated five times.

Experiment I

Seedpieces were planted in plots treated with three levels of Nitrogen (75, 150, 300 lb/acre) and two nematicides (Temik 15G 3.0 a.i./acre, Vorlex 10 gal/acre). Temik 15G was applied in the seed piece furrow at planting and Vorlex was injected to a 6-8 in. (15-20 cm) soil depth on May 3, 1978. All plots received a uniform application of 75 lbs/acre NPK (15-15-15) at planting. The plots to receive an added nitrogen treatment were sidedressed at an application rate of 100 lb/acre on June 13, 1978 and either 75 lb/acre and 125 lb/acre on June 22, 1978.

Nitrogen application rate and nematicide treatment contributed significantly to final yield. Irregardless of the pesticide used, yields were higher with the higher nitrogen application rate (Table 1). The total yield from plots treated with nematicides were significantly higher (P = 0.05) than that of the controls. Total yield of plots with nitrogen rates above 150 lb/acre were significantly (P = 0.05) different from the controls and the 75 lb/acre nitrogen plots but were not significantly different from the 300 lb/acre plots. Highest total yields were observed in the 300 lb/acre nitrogen plots with Temik 15G and Vorlex. Yields of A grade potatoes showed similar results to that of total yield (Table 1). Temik 15G and Vorlex, with nitrogen application rates above 150 lb/acre, significantly (P = 0.05) increased the yield of A grade potatoes. Both Temik 15G and Vorlex at the 75 lb/acre nitrogen rate significantly (P = 0.05) increased the B grade potato yield (Table 1) compared to the Vorlex treatments at the 300 and 150 lb/acre nitrogen rates. Temik 15G at the 300 lb/acre nitrogen rate resulted in the highest yield of Jumbo grade potatoes (Table 1). This was significantly (P = 0.05) greater than any treatment at the 75 lb/acre nitrogen rate. There were no significant differences in soil population densities of Pratylenchus penetrans among plots until the June 8, 1978 sample (Table 2).

From June 8,1978, Temik 15G significantly reduced soil population densities of P. penetrans at all nitrogen rates. Based on P. penetrans recovered from root tissue in this test, Temik 15G resulted in the best nematode control. There were no significant (P=0.05) differences in tuber or root growth and development season long (Table 4 and Table 5 respectively). From June 25,1978 foliage weight were higher in all nematicide treatments (Table 6).

Experiment II

Seedpieces were planted in plots treated with two levels of Nitrogen(75-150 lb/acre) and four nematicide treatments (Temik 15G 3.0 a.i./acre, Vorlex 10 gal/acre, Furadan 10G 3 lb a.i./acre, Dacamox 10G 3 lb a.i./acre). All nematicides were applied in the seed piece furrow at planting, except Vorlex 10 gal/acre which was injected to a 6-8inch(15-20cm) soil depth on May 3,1978. All plots received a uniform application of 75 lb/acre NPK (15-15-15) at planting and half the plots were sidedressed with an additional 75 lb/acre NPK June 22,1978.

Nitrogen application rate and nematicide treatment contributed significantly (P=0.05) to the total yield (Table 7). Both Temik 15G and Vorlex 10 gal/acre, at each nitrogen rate, significantly(P=0.05) increased total yield above the controls. With each nematicide used in this test, higher yields occurred at the greater nitrogen rate. Yield of A grade potatoes were similar to the total yield results. Vorlex 10 gal/acre at both nitrogen rates was significantly(P=0.05) greater than the controls. Dacamox 10G at the higher nitrogen rate significantly(P=0.05) increased Jumbo grade yield over all other plots. There were no significant(P=0.05) differences in B grade yield, although Dacamox 10G at both nitrogen rates resulted in the lowest yield. There were no significant(P=0.05) differences in soil population densities of Pratylenchus penetrans from the initial sample of May 22,1978 to the fourth of July 12, 1978(Table 8). At both nitrogen rates, Temik 15G resulted in a significant(P=0.05) decrease in soil population densities of P. penetrans from all other plots. This continued until harvest. Significant(P=0.05) differences in root population density of P. penetrans between plots were apparent season long(Table 9). Temik 15 G at the 75lb/acre nitrogen rate significantly(P=0.05) decreased root population density season long over all plots. Results of root samples taken from July 12, 1978 to harvest showed that Temik 15G at both nitrogen rates resulted in the best nematode control. Furadan 10G appeared to decrease root and soil population densities of P. penetrans but was only significantly(P=0.05) different from a control on August 1, 1978. Statistical analysis of plant growth and development data showed few significant(P=0.05) differences in root weight throughout the season (Table 10). Furadan 10G at the higher nitrogen rate significantly(P=0.05) increased root weight during the sample of June 25,1978. This may have, by increasing root weight early, contributed to the higher soil and root population densities observed in these plots. It appears that Dacamox 10G at both nitrogen rates, delays the growth and development of the foliage and tubers(Table 11 and 12 respectively). This resulted in lower foliage and tuber weights during early season and significantly(P=0.05) higher plant and tuber weights during the final sample. This may be due in part to the nematicidal and/or plant growth characteristics of this material.

TABLE 1 Influence of selected management inputs on the yield and grade of potatoes (cv Superior)

TREATMENT	A Grade	B Grade	Jumbo Grade	Total
	YIELD (CTW/ACRE)			
75N[2] Check	237.6a[1]	9.4ab	4.8a	254.8a
75N Temik 15G 3 lb a.i./acre	296.5bc	12.1b	4.6a	299.3bc
75N Vorlex 10 gal/acre	282.5c	11.7b	4.9a	311.9c
150N Check	263.4ab	7.7a	8.1ab	276.5abc
150N Temik 15G 3 lb a.i./acre	319.7d	10.5ab	11.4ab	340.9d
150N Vorlex 10 gal/acre	339.1d	8.0a	10.8ab	356.0d
300N Check	251.6ab	8.9ab	6.5a	267.9ab
300N Temik 15G 3 lb a.i./acre	337.5d	9.4ab	25.2b	371.5d
300N Vorlex 10 gal/acre	335.5d	7.1a	23.2ab	365.7d

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

TABLE 2 Influence of selected management inputs on population density of P. penetrans on potatoes (cv Superior)

	P. penetrans per 10 cm^3 soil					
TREATMENT	5/27/78	6/08/78	6/25/78	7/12/78	8/01/78	8/21/78
75N[2] Check	1.0a[1]	1.0a	1.0a	2.0a	4.0d	2.0abc
75N Temik 15G 3 lb a.i./acre	0.0a	0.0a	0.0a	0.0a	0.0a	1.0ab
75N Vorlex 10 gal/acre	1.0a	0.0a	1.0a	2.0a	1.0ab	2.0ab
150N Check	2.0a	1.0a	0.0a	3.0a	2.0bc	7.0c
150N Temik 15G 3 lb a.i./acre	1.0a	0.0a	0.0a	0.0a	0.0a	0.0a
150N Vorlex 10 gal/acre	2.0a	0.0a	0.0a	0.0a	1.0ab	1.0ab
300N Check	2.0a	1.0a	1.0a	2.0a	3.0cd	4.0bc
300N Temik 15G 3 lb a.i./acre	2.0a	0.0a	0.0a	1.0a	0.0a	0.0a
300N Vorlex 10 gal/acre	1.0a	0.0a	0.0a	0.0a	1.0ab	3.0abc

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newman-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

TABLE 3 Influence of selected management inputs on population density of P. penetrans on potatoes(cv Superior)

TREATMENT	P. penetrans per .1g root tissue 6/25/78	7/12/78	8/01/78	8/21/78
75N[2] Check	7.0c[1]	9.0ab	10.0cd	3.0bc
75N Temik 15G 3 lb a.i./acre	0.0a	0.0a	0.0a	1.0abc
75N Vorlex 10 gal/acre	1.0a	1.0a	2.0ab	3.0abc
150N Check	6.0bc	7.0b	16.0d	3.0abc
150N Temik 15G 3 lb a.i./acre	1.0a	0.0a	0.0a	1.0ab
150N Vorlex 10 gal/acre	2.0ab	2.0a	4.0bc	2.0abc
300N Check	6.0bc	10.0b	10.0cd	4.0c
300N Temik 15G 3 lb a.i./acre	2.0a	0.0a	5.0ab	0.0a
300N Vorlex 10 gal/acre	1.0a	1.0a	4.0bc	1.0abc

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

TABLE 4 Influence of selected management inputs on tuber weight of potatoes(cv Superior)

TREATMENT	TUBER WEIGHT/PLANT (GRAMS) 6/25/78	7/12/78	8/01/78	8/21/78
75N[2] Check	12.5a[1]	237.5a	758.4a	984.3a
75N Temik 15G 3 lb a.i./acre	17.7a	307.4a	773.5a	880.3a
75N Vorlex 10 gal/acre	17.0a	358.7a	753.0a	1147.7a
150N Check	8.0a	286.1a	596.0a	1103.4a
150N Temik 15G 3 lb a.i./acre	14.4a	236.1a	837.5a	1071.5a
150N Vorlex 10 gal/acre	22.3a	331.9a	673.4a	963.3a
300N Check	11.0a	215.8a	692.8a	858.4a
300N Temik 15G 3 lb a.i./acre	14.2a	284.4a	808.6a	980.0a
300N Vorlex 10 gal/acre	26.4a	364.9a	762.2a	1132.0a

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

TABLE 5 Influence of selected management inputs on root weight of potatoes (cv Superior)

TREATMENT			ROOT WEIGHT (GRAMS)			
		6/08/78	6/25/78	7/12/78	8/01/78	8/21/78
75N[2]	Check	4.932a[1]	7.771a	9.819a	9.595a	4.400a
75N	Temik 15G 3 lb a.i./acre	4.306a	7.812a	10.089a	8.040a	4.773a
75N	Vorlex 10 gal/acre	4.522a	8.459a	9.059a	6.949a	5.393a
150N	Check	4.920a	7.440a	8.886a	8.035a	5.720a
150N	Temik 15G 3 lb a.i./acre	4.070a	8.595a	8.138a	7.426a	6.452a
150N	Vorlex 10 gal/acre	3.916a	9.415a	7.972a	8.356a	4.580a
300N	Check	5.058a	8.475a	10.380a	8.047a	7.174a
300N	Temik 15G 3 lb a.i./acre	3.530a	10.552a	10.553a	7.435a	5.321a
300N	Vorlex 10 gal/acre	5.040a	10.626a	7.871a	7.969a	6.733a

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

TABLE 6 Influence of selected management inputs on foliage weight of potatoes (cv Superior)

TREATMENT			FOLIAGE WEIGHT (GRAMS)			
		6/08/78	6/25/78	7/12/78	8/01/78	8/21/78
75N[2]	Check	37.13a[1]	264.561a	430.30a	511.615ab	57.088a
75N	Temik 15G 3 lb a.i./acre	32.12a	293.418a	624.814a	557.877ab	170.005ab
75N	Vorlex 10 gal/acre	30.12a	397.888ab	647.367a	600.907ab	149.042ab
150N	Check	33.94a	259.862a	497.587a	569.527ab	112.638ab
150N	Temik 15G 3 lb a.i./acre	33.86a	307.017ab	588.190a	557.931ab	314.218c
150N	Vorlex 10 gal/acre	30.39a	392.134ab	583.923a	783.019b	156.036ab
300N	Check	34.62a	256.022a	469.901a	446.155a	101.647ab
300N	Temik 15G 3 lb a.i./acre	30.16a	367.218ab	565.215a	640.830a	242.938bc
300N	Vorlex 10 gal/acre	41.59a	435.979b	675.947a	723.642a	246.928bc

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

Table 7 Influence of selected production management inputs on the yield and grade of potatoes (cv Superior)

TREATMENT	A Grade	B Grade	Jumbo Grade	Total
		YIELD (CTW/ACRE)		
75N[2] Check	272.8a[1]	11.8a	12.4a	297.1a
75N Temik 15G 3 lb a.i./acre	325.7bcd	11.7a	11.8a	349.2cde
75N Vorlex 10 gal/acre	346.6cd	12.6a	7.1a	366.3de
75N Furadan 10G 3 lb a.i./acre	297.3ab	12.6a	8.6a	318.5abc
75N Dacamox 10G 3 lb a.i./acre	309.1abc	9.4a	15.2a	333.7abcd
150N Check	289.9ab	9.4a	8.6a	307.9ab
150N Temik 15G 3 lb a.i./acre	344.9cd	12.3a	15.1a	372.1de
150N Vorlex 10 gal/acre	352.4c	11.8a	10.8a	375.0e
150N Furadan 10G 3 lb a.i./acre	307.6abc	10.1a	8.9a	326.6abc
150N Dacamox 10G 3 lb a.i./acre	311.7abc	8.9a	25.4b	346.0bcde

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

Table 8 Influence of selected management inputs on population density of P. penetrans on potatoes (cv Superior)

TREATMENT		P. penetrans per 10 cm^3 soil					
		5/22/78	6/08/78	6/25/78	7/12/78	8/01/78	8/21/78
75N[2]	Check	1.0a[1]	4.0a	4.0a	3.0a	5.0b	8.0b
75N	Temik 15G 3 lb a.i./acre	0.0a	0.0a	0.0a	0.0a	0.0a	0.0a
75N	Vorlex 10 gal/acre	1.0a	0.0a	1.0a	2.0a	1.0b	4.0b
75N	Furadan 10G 3 lb a.i./acre	1.0a	0.0a	4.0a	1.0a	4.0b	8.0b
75N	Dacamox 10G 3 lb a.i./acre	1.0a	1.0a	5.0a	1.0a	1.0b	5.0b
150N	Check	2.0a	1.0a	6.0a	3.0b	6.0b	9.0b
150N	Temik 15G 3 lb a.i./acre	1.0a	0.0a	0.0a	0.0a	0.0a	0.0a
150N	Vorlex 10 gal/acre	3.0a	0.0a	4.0a	3.0a	3.0a	4.0a
150N	Furadan 10G 3 lb a.i./acre	1.0a	1.0a	2.0a	3.0a	4.0a	5.0a
150N	Dacamox 10G 3 lb a.i./acre	1.0a	1.0a	1.0a	1.0a	2.0a	5.0a

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

TABLE 9 Influence of selected management inputs on population density of P. penetrans on potato(cv Superior)

TREATMENT	P. penetrans per .1g root tissue 6/08/78	6/25/78	7/12/78	8/01/78	8/21/78
75N[2] Check	44.0b[1]	4.0b	10.0bc	37.0c	6.0ab
75N Temik 15G 3 lb a.i./acre	2.0a	0.0a	0.0a	0.0a	0.0a
75N Vorlex 10 gal/acre	20.0ab	6.0c	8.0bc	10.0b	3.0ab
75N Furadan 10G 3 lb a.i./acre	13.0ab	2.0bc	5.0bc	23.0bc	18.0ab
75N Dacamox 10G 3 lb a.i./acre	20.0ab	1.0bc	7.0bc	6.0b	6.0ab
150N Check	16.0ab	4.0c	18.0c	39.0c	15.0b
150N Temik 15G 3 lb a.i./acre	3.0ab	2.0ab	0.0a	0.0a	0.0a
150N Vorlex 10 gal/acre	14.0ab	3.0bc	6.0bc	11.0b	8.0ab
150N Furadan 10G 3 lb a.i./acre	23.0ab	6.0c	12.0bc	12.0b	6.0ab
150N Dacamox 10G 3 lb a.i./acre	9.0ab	1.0bc	3.0b	7.0b	14.0b

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

TABLE 10 Influence of selected management inputs on the root weight of potatoes(cv Superior)

TREATMENT	6/08/78	6/25/78	7/12/78	8/01/78	8/21/78
	ROOT WEIGHT (GRAMS)				
75N[2] Check	3.104a[1]	8.876ab	10.068a	11.196a	5.328a
75N Temik 15G 3 lb a.i./acre	3.939a	9.706ab	11.768a	10.486a	5.156a
75N Vorlex 10 gal/acre	3.454a	9.018ab	11.266a	8.308a	4.722a
75N Furadan 10G 3 lb a.i./acre	4.454a	9.446ab	10.266a	10.524a	5.252a
75N Dacamox 10G 3 lb a.i./acre	3.830a	8.716ab	10.408a	10.304a	4.520a
150N Check	3.784a	8.842ab	9.460a	10.002a	5.292a
150N Temik 15G 3 lb a.i./acre	3.454a	9.696ab	10.892a	9.262a	4.412a
150N Vorlex 10 gal/acre	4.110a	10.220ab	12.266a	9.244a	4.942a
150N Furadan 10G 3 lb a.i./acre	3.988a	11.228b	13.672a	10.604a	5.032a
150N Dacamox 10G 3 lb a.i./acre	3.004a	6.602a	9.866a	9.930a	6.830a

[1] Column fcllowed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

Table 11 Influence of selected management inputs on the foliage weight of potatoes(cv Superior)

TREATMENT	6/08/78	6/25/78	7/12/78	8/01/78	8/21/78
	FOLIAGE WEIGHT (GRAMS)				
75N[2] Check	27.2a[1]	290.3ab	609.7a	475.3a	55.7a
75N Temik 15G 3 lb a.i./acre	29.6a	334.1ab	744.0a	562.3a	88.4a
75N Vorlex 10 gal/acre	28.8a	388.6b	669.6a	495.0a	72.2a
75N Furadan 10G 3 lb a.i./acre	31.8a	299.2ab	612.9a	501.7a	50.5a
75N Dacamox 10G 3 lb a.i./acre	27.5a	249.2a	593.3a	582.9a	133.0a
150N Check	30.2a	286.3ab	592.4a	509.7a	90.4a
150N Temik 15G 3 lb a.i./acre	34.8a	406.2b	742.9a	535.2a	135.0a
150N Vorlex 10 gal/acre	30.5a	383.0b	788.7a	587.6a	111.2a
150N Furadan 10G 3 lb a.i./acre	31.7a	357.3ab	671.4a	591.2a	116.8a
150N Dacamox 10G 3 lb a.i./acre	24.2a	230.8a	602.7a	607.9a	211.4b

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newmans-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

TABLE 12 Influence of selected management inputs on the tuber weight of potatoes (cv Superior)

TREATMENT		TUBER WEIGHT/PLANT (GRAMS)			
		6/25/78	7/12/78	8/01/78	8/21/78
75N[2]	Check	9.0a[1]	310.7a	757.7a	871.0a
75N	Temik 15G 3 lb a.i./acre	14.9ab	364.7a	832.3a	923.4a
75N	Vorlex 10 gal/acre	29.1b	370.5a	810.6a	1071.2a
75N	Furadan 10G 3 lb a.i./acre	17.3ab	329.7a	733.5a	906.0a
75N	Dacamox 10G 3 lb a.i./acre	8.9a	281.8a	726.4a	822.8a
150N	Check	16.5ab	266.4a	817.2a	871.8a
150N	Temik 15G 3 lb a.i./acre	24.8ab	385.7a	775.0a	1121.8a
150N	Vorlex 10 gal/acre	20.1ab	419.4a	843.4a	1088.8a
150N	Furadan 10G 3 lb a.i./acre	20.6ab	355.1a	847.6a	819.4a
150N	Dacamox 10G 3 lb a.i./acre	7.3a	266.0a	781.0a	1113.0a

[1] Column followed by the same letter are not significantly different (P = 0.05) according to the Student-Newman-Keuls Multiple Range Test.

[2] 75N = 75 lb. nitrogen per acre

INFLUENCE OF PRESTORAGE CHEMICAL TREATMENTS ON OUT-OF-STORAGE POTATO QUALITY

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In 1977 different field production treatments were used on one Range of Superior potatoes at the Montcalm Potato Experiment Station. This potato plot was part of the MSU Integrated Potato Project. The potatoes were planted May 10 and harvested August 23, 1977.

There were twelve (12) different field treatments and four (4) replications of each treatment; the production treatments involved different levels of nitrogen and other chemicals (details of these treatments are shown in the footnote of the following table in this report).

These 1977 Superior potatoes were harvested using the MSU Potato Plot Harvester. The four replications of each treatment were combined into composite bagged samples (approximately 15 kilo each).

Some potato lots were post harvest chemically treated with Mertec, Chlorine, and P 293 (a sprout inhibitor); other lots remained untreated as checks.

These various lots (bags) of potatoes were stored in cubicles at MSU. They were suberized at 15.6° C and 95% RH for 10 days; and stored at 12.8° C and 95% RH. After six (6) months these potatoes were evaluated for market quality by H. S. Potter and B. F. Cargill; each tuber was examined individually. A potato was rated "good" if it was a marketable potato with no visual evidence of degradation.

The results are shown in the following table. This is one year data and a similar treatment on Superior potatoes will be conducted for three consecutive years (1977, 78 & 79). The 1978 Superior potatoes are in storage and will be reported in the next years Montcalm Station Report.

Publications

Influence of Prestorage Chemical Treatments on Out-of-Storage Potato Quality (1978). Cargill, B.F., Potter, H.S., Cash, J.N. and Hack, D.W. Microfiche 78-4056. American Society of Agricultural Engineers, St. Joseph, Michigan 49085

Table 6.

Quality evaluation of Superior potatoes (1977) produced under 12 different field production treatments[1], mechanically harvested with minimal bruising (1X bruise level), stored at 12.8 °C (55 °F) and 95% RH after suberization at 15.6 °C (60 °F) for ten days and evaluated after six months storage.

Production & Chemical Treatments	QUALITY EVALUATION[2] (%)			
	Good	Fusarium Dry Rot	Sprouts	Sprout Rating
1X-Unwashed (No chemicals)				
1	98.5	1.5	100	2.0
2	95.8	4.2	100	4.0
3	93.5	6.5	100	3.5
4	89.1	10.9	100	2.5
5	89.0	11.0	100	3.5
6	87.4	12.6	100	3.0
7	89.9	10.1	100	3.5
8	84.3	15.7	100	3.5
9	87.3	12.7	100	3.5
10	100.0	0.0	100	4.0
11	88.8	11.2	100	4.0
12	91.6	8.4	100	3.5
Average no chem.	91.3	8.7	100	3.4
1X-Unwashed w/chemicals)[3]				
1	98.2	1.8	100	2.0
2	94.0	6.0	100	2.5
3	95.1	4.9	100	2.0
4	96.2	3.8	100	2.0
5	98.0	2.0	100	2.0
6	98.5	1.5	100	2.5
7	94.6	5.4	100	2.0
8	95.6	4.6	100	2.5
9	97.1	2.9	100	2.0
10	98.9	1.1	100	2.5
11	98.0	2.0	100	2.0
12	98.2	1.8	100	2.5
Average w/chem.	96.9	2.1	100	2.2

[1, 2, 3] Footnotes on next page.

Table 6 Cont.

[1] Twelve different treatments replicated four times produced the Superior potatoes for this test to determine if production practices influenced storability of Superior potatoes. The 12 treatments applied by the Dept. of Crop & Soil Science, MSU were as follows:

1. 50 lbs. N, Check (foliar insecticides as needed)
2. 50 lbs. N, DiSyston 15G (3.0 lb. a.i./A plus foliar insecticides as needed)[4]
3. 50 lbs. N. Temik 15G (3.0 lb. a.i./A plus foliar as needed)
4. 50 lbs. N, Vorlex (12 gal/A plus DiSyston, plus foliar as needed)
5. 150 lbs. N, Check (foliar insecticides as needed)
6. 150 lbs. DiSyston 15G (3.0 lb. a.i./A plus foliar insecticides as needed)
7. 150 lbs. N, Temik 15G (3.0 lb. a.i./A plus foliar as needed)
8. 150 lbs. N. Vorlex (12 gal/A plus DiSyston plus foliar as needed)
9. 300 lbs. N, Check (foliar insecticides as needed)
10. 300 lbs. N. DiSyston 15G (3.0 lb. a.i./A plus foliar insecticides as needed)
11. 300 lbs. N, Temik (3.0 lb. a.i./A plus foliar as needed)
12. 300 lbs. N, Vorlex (12 gal/A plus DiSyston, plus foliar as needed)

These potatoes were planted May 10 at the MSU/Montcalm Potato Research Station and harvested August 23, 1977. Vorlex was applied April 18, 1977.

[2] Quality evaluations are as follows: The term "good" refers to potatoes that were individually inspected and no visible infection; a potato was classified as having a sprout if the sprout could be observed above the surface; and a sprout rating from 0.0-4.0 was given. The rating approximated the average length in inches of the sprouts in the sample - any sprout over 10 cm (4"), was classified as a "4".

[3] The chemicals applied were Mertect (1500 ppm) and chlorine (sodium hypochlorite) (200 ppm) and P-293 at 1% solution. The resulting solution was applied at the rate of 4.2 ℓ/1000 kg (1 gallon per ton) of potatoes.

[4] In the 12 treatments, the abbreviation, a.i., refers to "active ingredients".

VARIETY ADAPTATION AND EVALUATION

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*This research is financially supported by the Michigan Potato Industry Commission. This industry support has permitted the expansion of variety development work in Michigan.

A. Dates of Harvest (Montcalm Research Farm)

To determine economical yields of potatoes for early, mid season and late harvest 29 cultivars were planted, May 4, in randomized and replicated trials in three blocks for harvest on August 8, August 21 and September 30. All cultivars were planted in the block for the August 31 harvest. Those reported to be earlier were omitted from the September 20 harvest and the later developing cultivars were omitted from the block to be harvested August 8. Yields are reported as cwt/A US#1, Table 1. Specific gravity data was obtained within a few days of harvest and chip data was recorded on the August 8 and 31 harvests. More complete data will be obtained later on chips, cooking-color, texture and flavor after storage.

Several cultivars appear well adapted to the Michigan environment as yields and quality were excellent.

Denali, which has been in trials since 1974 as AK-37-19 produced exceptionally high yields and high solids on both August 8 and August 31. It makes good potato chips and its table quality is excellent.

Atlantic, a variety from the USDA potato breeding program at Beltsville, is comparable to Denali in yield, slightly lower in total solids, but much higher than most varieties. It makes excellent potato chips. This variety has found favor in Florida and on the Eastern Seaboard. As well as a variety for Michigan there is a potential market for seed. Like all new varieties, the demand will be dependent upon its performance. Because of instances of hollow-heart and internal necrosis, smaller acreages are recommended in the initial years to determine if these defects will be a problem in specific locations.

Michibonne is a release from Michigan State and tested as M.S. 709. This variety consistently has produced high yields of smooth attractive tubers for the fresh market. It has a tendency to oversize but even very large tubers are seldom hollow. It is satisfactory for chip processing at harvest but does not recondition.

Michimac is a release from Michigan State and tested as M.S. 711-8. This variety produces exceptionally high yields of smooth attractive tubers with good cooking qualities for the fresh market. Hollow heart is rarely a problem in oversize tubers.

Belchip, a release from the U.S.D.A. breeding program at Beltsville was introduced this year. As the name implies it is recommended for chip processing. Yields have been good with higher than average total solids.

In initial trials chip quality is excellent. Chipping quality from storage will be determined this winter.

BelRus is a release from the U.S.D.A. breeding program at Beltsville. This variety produced very smooth uniform russet skinned tubers. Contrary to reports from other areas, oversize was not a problem in Michigan. In fact the tuber set was high with too few tubers of 10 oz or over to interest processors. Additional testing especially in spacing trials will be necessary to evaluate the variety.

Croatan is a vigorous variety from North Carolina which produced high yields in the first year of testing. Chip quality was good at harvest. The high yield assures that it will be included in trials to determine its adaptation to the Michigan environment.

Several seedlings from the Michigan program offer a range of maturities for various markets. Seed of the new varieties and seedlings is limited but with the Michigan Potato Industry Commissions' support, all were increased on the Emmet County farm of Wayne Lennard and Sons. Samples have been submitted for the Florida test. Cultivars which show the greatest potential at this time are M.S. 2-152, M.S. 4-408 and M.S. 4-169. Small lots will be available to Premier Foundation Growers under the new regulations for introduction of new varieties.

B. Overstate Potato Variety Trials.

Overstate potato variety trials were conducted in several locations this year: Shoemaker Brothers in Allegan; Don and Jerry Meyers in Bay; Ardie Jenkins in Kalkaska; Frank Falkeis in Delta and Beaudoin Borthers in Houghton. In addition to the replicated trials at these locations, single row plantings of several varieties were conducted at the Bill Altman Farm in Presque Isle and Ardie Jenkins in Kalkaska. Harvests were made at all locations, however, the data obtained at Allegan County has been omitted because of the damage done by the heavy rains in June. Most of the field in which the plots were located was totally lost and the damage to the plot area was apparent at harvest as yields were well below normal.

Data from the Kalkaska location are not included because several plots were lost from the wheel tracks of the center pivot irrigation system.

Table 2 summarizes the yield data from three locations. Yields at all locations were very acceptable, however, one should consider the relative yield differences between varieties particularly when compared with standard varieties such as Norchip, Superior and Russet Burbank.

Varieties consistent in yield at all locations were Atlantic, Denali, Michibonne, Michimac and MS 4-169, all being above the average. Varieties consistent in producing high specific gravity were Atlantic, Denali, MS 3-69 and MS 4-169. Atlantic has continued to yield exceptionally well, however, the incidence of hollow heart and/or internal browning has been reported more frequently this year. We will need to continue to monitor this concern in hopes of identifying the cultural conditions which appear to influence this problem. The variety does have exceptionally good yield and dry matter potential and growers wishing to observe it in their program should perhaps do it on a modest basis at first.

Buckskin was evaluated for the first time in 1978. Its performance was eratic with poor stands resulting in the two Upper Peninsula locations. It had a high percentage of tubers over 3 1/4 inch. BelRus did not yield as well as anticipated. The tubers are smooth, quite blocky in shape and have a very dark russet. We shall continue to evaluate this variety. The Butte, a recent long russet variety released from Idaho, performed well at the two Upper Peninsula locations. In previous tests at the Montcalm Research Farm its yields has been comparable to Russet Burbank with a higher percentage of U.S. number 1's.Centenial Russet in previous trials has not yielded well although it had good general appearance. It has low dry matter and its place in the Michigan industry is questionable. The MS 4-169 and MS 4-198 cultivars performed exceptionally well and will be evaluated intensively in 1979. Michibonne and Michimac also performed exceptionally well and are worthy of trial lots by tablestock producers.

C. Variety Adaptability.

A second phase of the over state variety evaluations was the long-row plantings of several varieties in Kalkaska and Presque Isle Counties. Again, the Kalkaska data are omitted because of the plot damage by the irrigation system. The objectives of this project were to evaluate selected varieties under actual grower conditions. One hundred pound lots of each of eight varieties were machine cut and machine planted at the Altman Farm in Presque Isle County on May 22. Several follow up visits were made to observe stands and growth characteristics. Harvests were made on September 26 with the research plot harvester. Four yield checks were taken on each variety and these data are summarized in Table 3.

In terms of yield it should be noted that Superior, Oneida and Atlantic were all affected by sprayer wheel tracks during the growing season and this undoubtedly reduced the yield potential of these varieties. The stand of Michigami was poor, an observation made at several other locations. This variety will be withdrawn from release. The Ontario produced the greatest yield, however, a high percentage of tubers were poorly shaped because of second growth and heat sprout. The tubers did not size well as indicated by the percent over 3 1/4". In contrast, the Michibonne, Michimac and Snowchip had a high percentage of large tubers, particularly Michibonne. Closer spacings of 7-9 inches would be desirable for these varieties and would likely add significantly to their yield potential.

Rainfall during the growing season was well below normal and during June, July and August only 4.9 inches were recorded. Slightly over 6 inches fell during September, however, this did not overcome the stress from the earlier dry conditions.

Samples of these varieties are being stored at the Altman Farm and also at Michigan State University and periodic evaluations of aftercooking darkening will be made throughout the storage period. This technique provides an excellent opportunity to evaluate varieties under grower conditions and this scheme will be used for all overstate trials in 1979.

Table 1. The yields specific gravity and chip ratings of several cultivars at three dates of harvest (Montcalm Research Farm).

VARIETY	AUGUST 8				AUGUST 31			SEPT. 20	
	US#1 cwt/A	Specific Gravity	Chip Rating** at harvest	Chip Rating** 3 days later	US#1 cwt/A	Specific Gravity	Chip** Rating	US#1 cwt/A	Specific Gravity
EARLY AND MIDSEASON									
Denali	410	1.094	1	2	593	1.102	2		
Atlantic	435	1.092	1	1	533	1.099	1		
Michibonne	257	1.070	3	4	511	1.076	2		
MS 002-152	265	1.083	3	4	497	1.088	1		
MS 004-408	332	1.085	2	2	496	1.085	1		
MS 108-5	326	1.074	2	2	488	1.082	2		
MS 004-169	304	1.081	3	3	483	1.087	2		
MS 004-377	281	1.082	1	3	476	1.091	2		
Onaway	406	1.070	4	4	431	1.069	4		
Tobique	318	1.079	2	3	421	1.081	2		
Belchip	333	1.082	1	2	421	1.088	1		
Norchip	279	1.078	2	2	415	1.083	1		
Superior	265	1.073	2	2	320	1.075	2		
MS 002-171	322	1.076	1	1	306	1.078	1		
Jewel	250	1.078	2	2	302	1.084	1		
LATE									
Michimac					599	1.075	2	655	1.076
MS 305-19					591	1.088	2	612	1.089
Croatan					515	1.088	2	624	1.071
Butte					493	1.089	3	489	1.085
FL1227					429	1.083	1	454	1.080
Oneida					425	1.084	2	439	1.078
R. Burbank					417	1.094	3	458	1.089
FL 945					398	1.082	1	421	1.081
Buckskin					396	1.084	1	400	1.083
FL--2					388	1.085	1	404	1.080
FL-774					378	1.084	1	431	1.076
Katahdin					371	1.076	3	515	1.077
BelRus					300	1.080	2	262	1.076
Monona					293	1.072	1	304	1.070

** Samples were fried at harvest and again at 3 days following harvest. Ratings on the PC/SFA 1-5 scale, with 1 the lightest and 5 the darkest.

Table 2. The yield (cwt/A U.S. No. 1) and specific gravity of several varieties at 3 locations.

VARIETY	Meyers Bay (Aug. 28)				Falkeis Delta (Oct. 2)		Beaudoin Houghton (Oct. 3)	
	US#1 (cwt/A)	Specific Gravity	Chip Rating* at Harvest	Chip Rating* 3 Days After Harvest	US#1 cwt/A	Specific Gravity	US#1 cwt/A	Specific Gravity
Atlantic	510	1.098	1	3	560	1.081	477	1.092
Belchip	---	---	-	-	685	---	---	---
BelRus	---	---	-	-	388	1.071	270	1.087
Buckskin	330	1.084	2	3	310	1.070	356	1.088
Butte	---	---	-	-	523	1.081	532	1.089
Centennial Russet	---	---	-	-	510	1.063	417	1.075
Denali	429	1.094	2	3	552	1.086	392	1.096
FL-2	338	1.088	1	2	---	---	---	---
FL-774	390	1.086	1	2	---	---	---	---
FL-945	445	1.083	2	2	---	---	---	---
FL-1227	442	1.081	1	1	---	---	---	---
Michibonne	452	1.078	1	4	632	1.064	499	1.075
Michigami	374	1.073	4	4	563	1.060	334	1.076
Michimac	507	1.079	3	4	543	1.068	452	1.083
MS 002-171	411	1.083	1	2	446	1.070	470	1.080
MS 003-69	309	1.096	2	2	373	1.075	298	1.085
MS 004-169	429	1.093	2	3	677	1.075	551	1.087
MS 004-198	426	1.086	1	2	490	1.073	421	1.082
MS 108-5	447	1.078	1	3	558	1.072	412	1.084
MS 305-19	---	---	-	-	585	1.076	424	1.085
Norchip	---	---	-	-	460	1.078	---	---
Oneida	387	1.085	3	3	534	1.075	460	1.082
Russet Burbank	---	---	-	-	551	1.076	348	1.089
Superior	307	1.075	2	2	466	1.070	357	1.084
Median**	426				538		419	

*Samples were fried at harvest at 3 days following harvest. Ratings are on a 1-5 scale with 1 being the lightest and 5 the darkest.

**Mid-point at which half of the entries are greater in yield and half are smaller.

Table 3. The yield and quality of several varieties grown at the Altman Farm in Presque Isle County

Variety	Total* cwt/A	% over 3¼"	Specific Gravity	Remarks
Ontario	424	10%	1.065	- not well sized - considerable second growth & heat sprout - considerable feathering
Superior	229	6%	1.070	- small size
Snowchip	360	37%	1.065	- well sized - considerable feathering
Oneida	212	4%	1.080	- small size
Jewel	217	6%	1.083	- small size
Atlantic	279	17%	1.091	- uniform size - good appearance
Michibonne	331	61%	1.066	- considerable oversize; needs closer spacing - smooth appearance
Michigami	304	40%	1.065	- considerable oversize - smooth appearance
Michimac	335	30%	1.073	- some feathering and trace of scab - good appearance and shape

* U.S. No. 1 with a 2 inch minimum.

WEED CONTROL IN POTATOES

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Several combinations of herbicides and time of treatment were applied in Russet Burbank potatoes to control both broadleaved and grass weeds. The primary grass was barnyardgrass and the primary broadleaved weeds were pigweed and lambsquarter.

The most effective control of barnyardgrass was obtained from EPTAM at 4-6 lb/a applied preplant incorporated. An application of Sencor or Lexone or Lorox as a delayed preemergence (after weeds emerged and before potatoes emerged provided the most effective broadleaf control), The combinations of EPTAM and the second application of a chemical for broadleaved weeds provided 100% control. The same treatments that provided 100% weed control also gave the highest yields. The lower yields listed on the table are a reflection of poor or ineffective weed control.

The Lasso plus Sencor or Lexone should be used as separate treatments to allow for applying the Lasso at planting (preemergence) and the Sencor/Lexone as a delayed preemergence after weeds have emerged. Delaying the Lasso application will give less than effective grass control. Hoelon as a postemergence treatment offers possibility for barnyardgrass control.

Preplant Incorporated, Preemergence, and Postemergence Weed Control in Potatoes, Montcalm Co., Michigan, 1978.

Planted: May 9
Treated:
PPI: May 9
PRE: May 22
POST: June 13
Rated: June 21

Variety: Russet Burbank
Soil Type: loamy sand
Organic Matter: 2%

Weeds Present: Lambsquarter, Pigweed, Barnyardgrass.

Tmt. No.	Treatment	Rates lbs/A	Weed Control Ratings LQ	PW	BG	Injury	cwt/A Total Yield
	(PPI)						
1.	R-40244+Eptam	.5+4	8.8	9.3	8.8	0.0	
2.	" "	.75+4	3.7	4.0	4.3	0.3	
3.	Eptam+Sencor 4	4+.5	7.0	6.7	7.3	0.0	314
4.	" "	4+.75	7.7	8.0	9.0	0.0	370
5.	Eptam+Sencor 4	6+2	9.8	9.3	7.2	2.7	380
	(PPI) (DELAYED PRE)						
6.	Eptam+Sencor 4	4+.5	10	10	9.0	0.0	484
7.	Eptam+Lexone DF	4+.5	9.0	9.0	7.3	0.0	415
8.	" "	6+.5	10	10	9.0	0.0	412
9.	Eptam+Lorox	4+.5	10	10	10	0.0	437
	(PPI) (D.PRE) (POST)						
10.	Eptam+Lexone DF+Lexone	4+3/8+3/8	10	10	10	2.3	416
11.	Eptam+Lexone DF+Lexone	4+.5+.25	10	10	9.7	0.7	388
12.	Eptam+Sencor 4+Sencor	4+.5+.25	10	10	9.8	0.7	419
13.	Eptam+Lexone 4+Lexone	4+.5+.25	10	10	10	0.3	424

Preplant Incorporated, Preemergence, and Postemergence Weed Control in Potatoes, Montcalm Co., Michigan, 1978.

Continued.

Tmt. No.	Treatment	Rates lbs/A	Weed Control Ratings LQ	PW	BG	Injury	cwt/A Total Yield
	(PPI) (D. PRE)						
14.	Eptam+Lexone+Hoelon	4+.5+.75	10	10	9.8	0.0	464
15.	Lasso+Lexone DF	2.5+.5	9.7	9.7	8.3	0.0	422
	(PRE) (D. PRE)						
16.	Lasso+Lexone DF	2+.5	10	10	9.8	0.0	430
	(PRE) (POST)						
17.	Lexone DF+Lasso+Lexone DF	.5+2+3/8	10	10	10	1.3	406
18.	R-40244	.75	10	10	9.0	0.0	
19.	"	1	10	9.7	6.3	0.7	
20.	Lasso+Sencor 4	2+.5	7.7	9.7	9.3	0.0	414
21.	Lasso+Lexone DF	2+.5	9.8	10	9.7	0.0	420
	(PPI)						
22.	Lasso+Lexone DF	2.5+.5	7.0	7.3	6.3	0.0	282
	(D.PRE)(POST)						
23.	Lexone+Hoelon	.5+1	9.0	8.7	8.7	0.3	397
24.	Lexone+Hoelon	.5+2	9.7	8.7	8.7	0.0	410
	(D.PRE) (POST)						
25.	Sencor 4+Hoelon	.5+.75	9.3	9.2	9.0	0.0	423
26.	Sencor+Hoelon	.5+1	9.2	9.2	8.7	0.0	445
27.	Sencor+Hoelon	.5+.75	9.5	9.2	9.2	0.3	438
	(D. PRE)						
28.	Sencor 4+Lasso	.5+2	9.3	9.3	8.0	0.0	455
29.	Sencor 4+Lasso	.5+2.5	9.5	9.5	9.0	0.0	432
30.	No Treatment	---	0.0	0.0	0.0	0.0	123

INTERACTIONS BETWEEN COLORADO POTATO BEETLE DENSITY, TIMING OF DEFOLIATION, AND POTATO YIELD

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The study was divided into a large-scale field plot with a natural Colorado Potato Beetle infestation and a series of small caged plots where larval densities were controlled and adult feeding was not allowed.

The objective of the field plot was to examine the effects of time of defoliation on yield for early and late varieties of potatoes.

In the cage plots we wanted to assess the effects of different larval densities on yield.

Field Plot

The large-scale field plot was planted to two varieties of potatoes; Sebagos, a late variety, and Norchips, and early-maturing variety. Mean Colorado Potato Beetle density was approximately 5 to 7 larvae and/or adults per hill, much higher than normally found in commercial fields. Portions of the plot were treated with insecticides or left untreated, to manipulate the time of defoliation. For the late-maturing variety, defoliation through July had no significant effect on yield (Fig. 1). Feeding by the summer generation of adults during early August resulted in severe losses. This defoliation may have been more intense than the earlier larval feeding, even though population densities were approximately the same. The relative intensity of adult and larval defoliation needs to be further examined.

In contrast, the early-maturing variety never recovered from the early defoliation (Fig. 2). Even in the protected plots, the Norchips had matured and vines were dead by the end of August.

Cage Study

Eggs were introduced into the cages to provide larval densities of 0, 5, 12, or 25 larvae per hill during the first generation (early July) and again during the second generation (mid-August). There were 10 hills per cage and 5 cages for each density.

Half of the plants from each cage were harvested after first generation larval feeding (July 11th) and foliage, stems, and tubers weighed. There are no significant differences in foliage, or tuber weight after 1st generation feeding. Plants were growing vigorously at this time and recovered rapidly from defoliation. The remaining 5 hills in each cage were harvested after 2nd generation larval feeding (August 29th). Tubers, stems, and foliage were again weighed. At this time, when the potatoes were nearly mature, there was a significant reduction in yield of tubers correlated with increased larval density (up to 30% loss - Fig. 3). However, there was no evidence of a threshold density, below which there was no loss in yield. The relationship seemed to be almost linear. Using this relationship, the cost of one spray would be justified at larval densities of 0.5 per hill or higher.

Foliage weight was reduced by 29% at the highest larval density. Stem weight was reduced by 22%.

Soil moisture seemed to have a considerable effect on the ability of the plant to recover from defoliation. One of the cages (not included in the final analysis) was on the edge of the plot and received inadequate irrigation. Plants in this cage were complete defoliated by 5 larvae per hill.

Conclusions

1. Time of defoliation, in relation to variety of potatoes (and presumably date of maturity), was critical in determining the effects on yield.

2. Adult feeding (during mid-August) caused severe defoliation.

3. Yield was reduced nearly linearly with respect to larval density.

4. Factors, such as reduced soil moisture, low soil fertility, or disease, that reduce plant vigor may greatly increase the impact of foliar feeding. The interactions between these factors and the impact of defoliation on potato yield need to be further investigated and should be carefully considered when making recommendations for control of defoliators of potatoes.

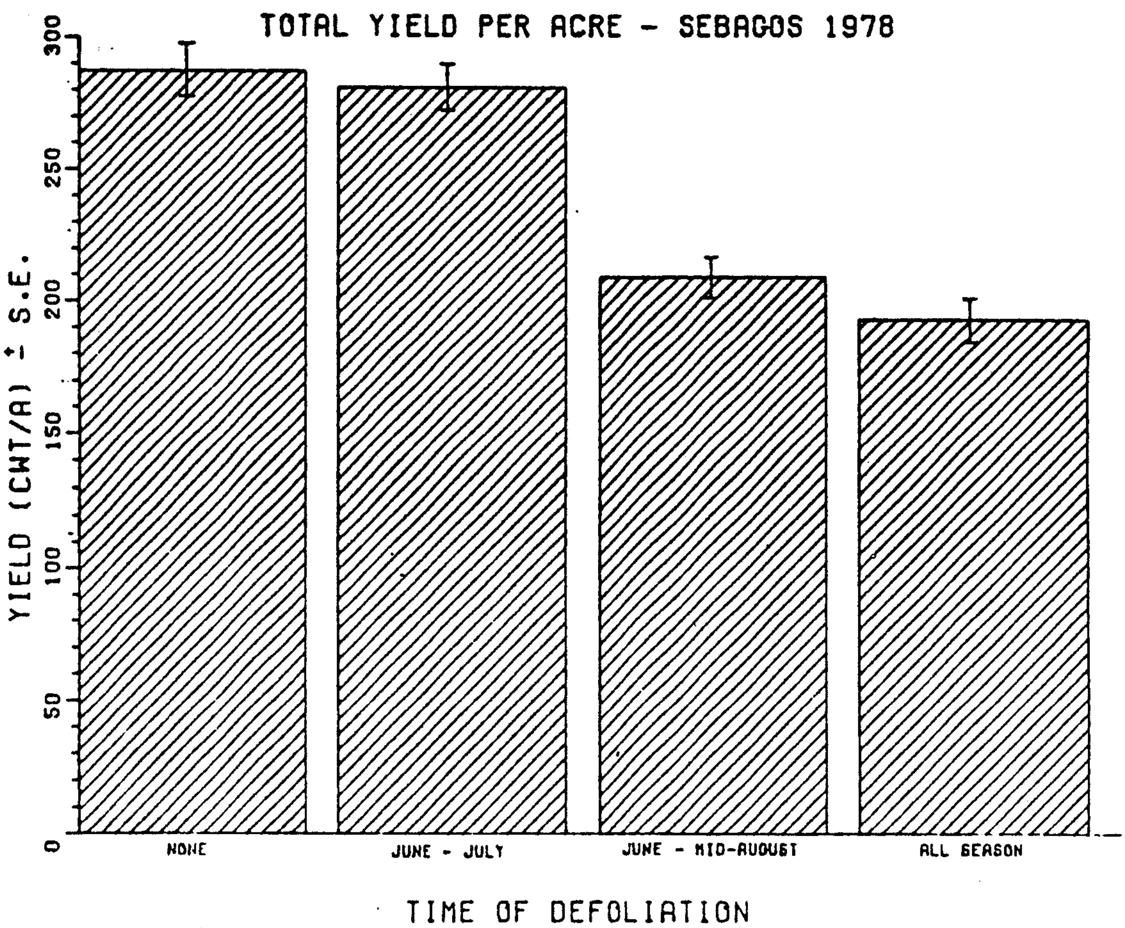

Fig. 1. Total yield of Sebagos subjected to defoliation by Colorado Potato Beetle adults and larvae for different lengths of time.

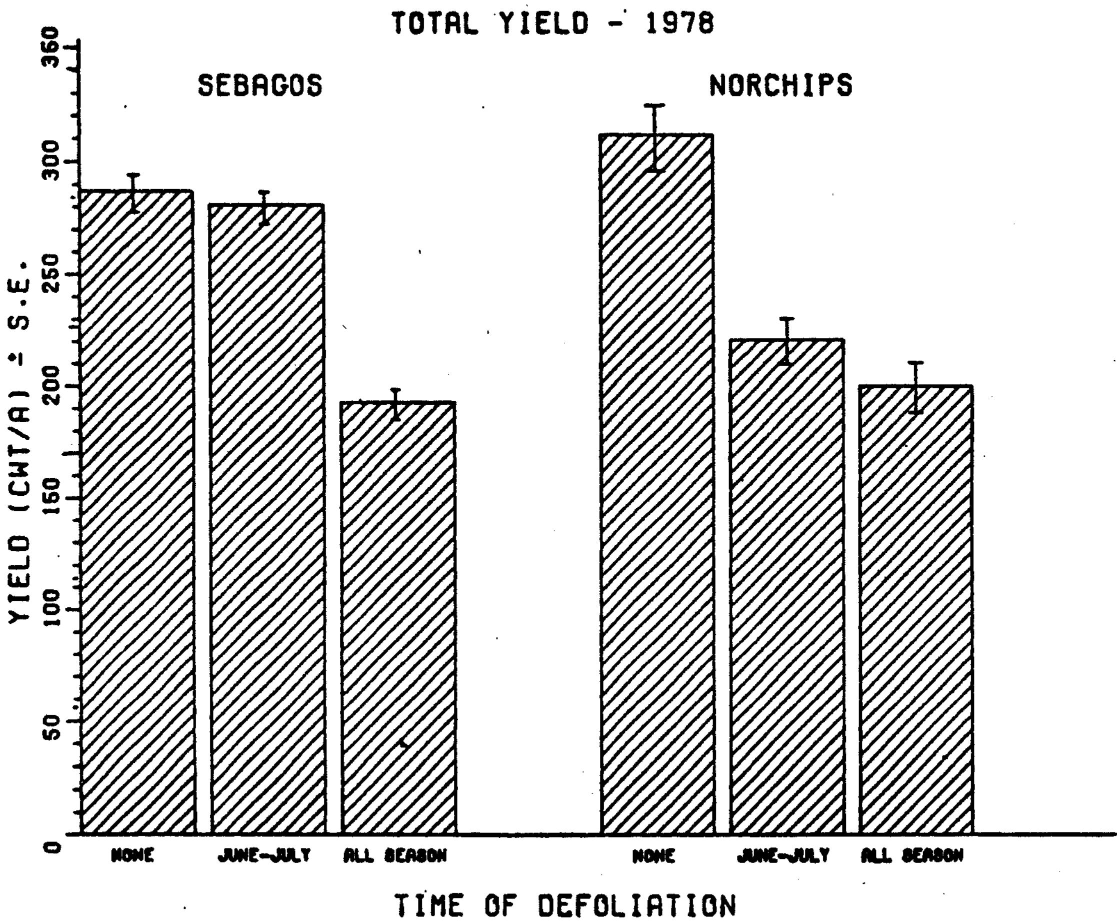

Fig. 2. Total yields of Sebagos and Norchips subjected to defoliation by Colorado Potato Beetle for different lengths of time.

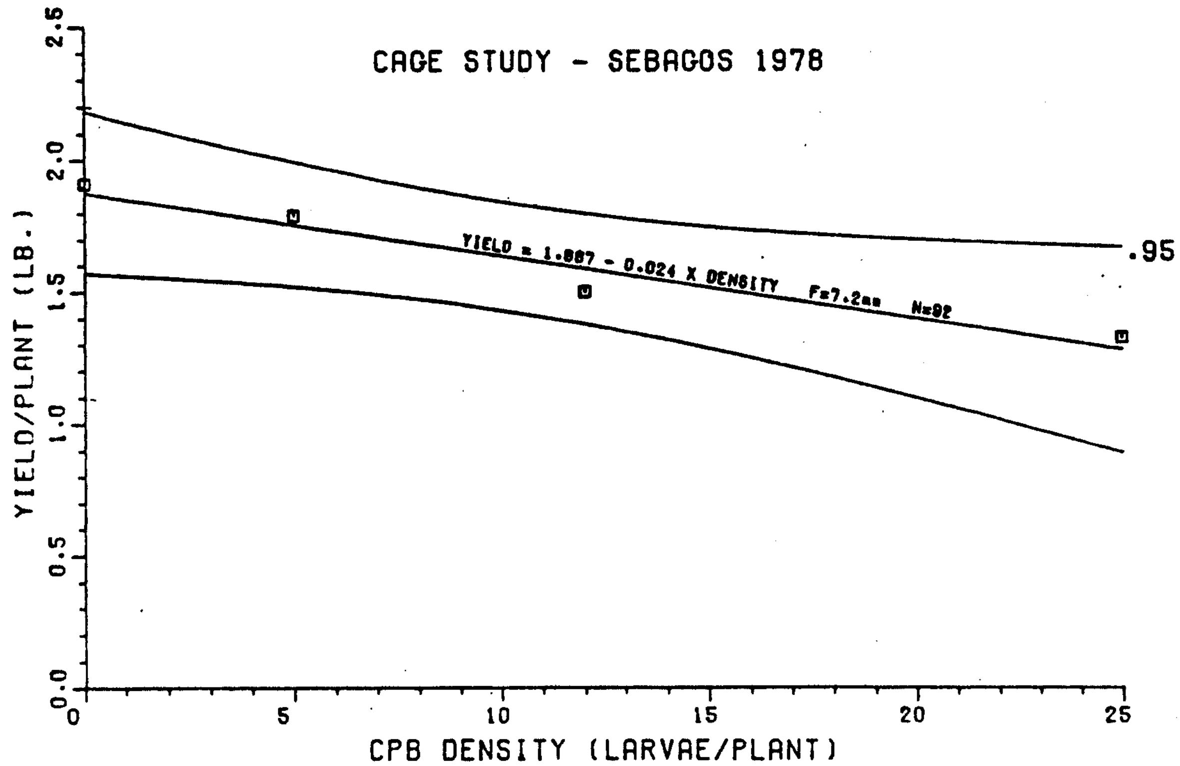

Fig. 3. Tuber yield per plant compared with density of Colorado Potato Beetle larvae. (1.9 lb/plant ≈ 370 cwt/a)

INFLUENCE OF EXPERIMENTAL NEMATICIDES IN CONTROL OF PRATYLENCHUS PENETRANS AND POTATO YIELDS

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Seven granular and two liquid nematicides were evaluated for control of Pratylenchus penetrans associated with Solanum tuberosum (cv 'Superior') production. A complete randomized block design was used with each treatment replicated 5 times. Seed pieces were planted May 23, 1978 (degree days at base 10C (DD_{10}) = 674) at the Montcalm Potato Research Farm in Entrican, Michigan. Each plot consisted of four rows 15.24 m in length and 0.86 m apart, with 20.5 - 30.5 cm spacing between plants. All nematicides were applied at planting, except NA055 which was applied May 3, 1978 (DD_{10} = 1035.5). Monitor was applied when necessary for insect control, and irrigation water as needed throughout the growing season. Soil samples for nematode analysis (centrifugation-flotation, 1.14 specific gravity sucrose) were taken immediately before planting, at late mid-season (DD_{10} = 4702, July 12, 1978) and at harvest on September 1, 1978 (DD_{10} = 1969). Root samples were processed for nematodes (shaker technique) at DD_{10} = 5902 and 1969. The center two rows of each plot were harvested, graded and weighed.

NA055 significantly ($P = 0.05$) increased total tuber yield and yield of Grade A tubers. DS16813 resulted in a significant increase in Grade B tubers, without decreasing total tuber yield or yield of Grade A tubers. There were no significant differences in soil population densities of P. penetrans among the plots at DD_{10} = 674, or among the treatments at DD_{10} = 1384. All treatments significantly reduced P. penetrans root and soil population densities at DD_{10} = 1969. The sum of the root and soil population densities indicated a significant population decrease with Vydate (DD_{10} = 1384) and for all treatments (DD_{10} = 1969).

Table 1. Effect of nematicides on *Pratylenchus penetrans* and potato yields.

Treatment, formulation and rate per acre	*Pratylenchus penetrans* per DD_{10}[1] No. per 100 cm^3 soil			No. per g root		No. per g root plus No. per 100 cm^3 soil		Tuber yield (ctw per acre)			
	674	1384	1969	1384	1969	1384	1969	A Grade	B Grade	Oversize Grade	Total
Check (non treated)	19.8a[2]	42.146a	54.20b	31.4a	38.0b	73.544b	92.2b	185.2a	5.5a	12.2a	202.9a
DS 16813 - 4 lb ai/acre	38.4a	31.036a	12.20a	15.6a	9.2a	47.034ab	21.4a	190.1a	6.3a	13.4a	209.8a
DS 16813 - 2 lb ai/acre	22.4a	8.816a	3.20a	15.2a	10.2a	22.014ab	13.4a	206.8a	6.6a	14.0a	227.4a
Vydate 10G - 2 lb ai/acre	20.6a	2.150a	2.80a	11.4a	5.6a	13.54a	8.4a	196.0a	9.9b	9.8a	215.7a
Mocap 10G - 2 lb ai/acre	11.2a	17.704a	4.40a	7.4a	6.0a	21.102ab	10.4a	201.2a	7.0a	11.5a	219.9a
Mocap 6EC - 2 lb ai/acre	16.8a	15.482a	5.40a	14.0a	9.8a	29.48ab	15.2a	194.2a	7.2a	13.9a	215.3a
RH 4553 5G 14 lb/acre	12.4a	26.592a	10.00a	14.0a	8.4a	40.59ab	18.4a	183.5a	5.6a	11.7a	200.8a
RH 7346 5G 14 lb/acre	20.2a	42.146a	8.60a	25.2a	5.2a	67.344ab	13.8a	191.1a	6.1a	16.3a	213.5a
RH 308 5G 14 lb/acre	12.0a	17.704a	12.20a	15.8a	14.8a	33.502ab	27.2a	180.5a	6.3a	9.6a	196.4a
NAO 5510 10 gal/acre	15.8a	15.882a	10.20a	8.4a	7.2a	23.88ab	17.4a	236.7b	5.1a	21.0a	262.8b

1) DD_{10} = degree day accumulation base 10 C.

2) Column means followed by the same letter are not significantly different (P = 0.05) according to the Student-Newman Keul Multiple Range Test.

POTATO INSECT CONTROL STUDIES

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A. Soil Insecticide Evaluation for White Grub Control

Wireworms and white grubs often cause extensive feeding damage to potato plants especially to the tubers. This damage usually results in the lowering of grade or rejection of the crop by the buyer. These insects are usually most severe when new fields, especially grassy areas, are brought into production. Past research programs have evaluated several insecticides for wireworm control some of which are labeled and are now being recommended for this use. There are no control programs available when white grubs are the principal problem.

Methods

A plot to evaluate 27 different treatments including different combinations of experimental and registered insecticides on soil insects was established at the Cranney Farm in Mecosta County. The plot was located in a field which had been out of production several years and grasses and weeds had become established. An early inspection of the area indicated white grubs were present.

The treatments were applied in six replications of 25 foot plots in a randomized design. The outside and every third row was left untreated so the insect damage in each treated row could be compared with an adjacent untreated row. This plot lay-out was elected to assume adequate evaluation of the data since past research indicated that soil insect populations are seldom evenly distributed over an area. Five foot alleys were left untreated between the replications.

The broadcast applications were distributed as granules or in water solutions over the soil surface and rototilled to a depth of 6 to 8 inches. The band treatments were applied in the seed furrow and then covered by hand. The preplant treatments were applied on May 21 and the band treatments applied in the seed furrow at the time of planting on May 22. They were covered immediately after. Russet burbank seed were used in the plot. The plots were fertilized and maintained by the grower similar to the rest of the field.

The alleys between the plots were opened up by hand prior to harvesting with the plot mechanical harvester. Vine killers had been applied to facilitate use of the equipment. The plots were harvested and on October 11 and placed in tagged bags. These were then taken to a storage shed and held until further analyzed. All of the tubers were graded by size and white grub and wireworm damage was evaluated. Each of the grades and damage classifications were weighed before discarding. Samples were saved from each treated plot for specific gravity determination or residue analysis. All of the tubers from the unlabeled treatments or damaged by insects were discarded and the rest were saved for further use. The results of the tuber evaluations are presented in Table 1.

Table 1. Yields and insect tuber damage data from soil insect research plot, Morley, Michigan
Planted: May 22; Harvested: October 1978

Material and Placement		Rate ai/A	Yield/A	Percent Tubers by Grade Size				Specific Gravity	Percent Tubers Damaged		
				B's	A's	10 oz	Off		Good	Grub	Wireworm
NC-6897 76W	Seed Treat	4 oz ai/ 100 lb	321 cwt	9%	72%	13%	6%	1.091	96.8%	3.1%	0.1%
Untreated	--	--	372						93.5	3.5	3.0
NC-6897 76W	Brdcst	4 lb	378	6	68	21	5	1.087	95.7	3.7	0.6
Untreated	--	--	353						94.0	3.6	2.4
NC-6897 76W	Brdcst	4 lb	398	8	66	19	7	1.089	98.1	1.3	0.6
+ Temik 15 G	Band	3 lb									
Untreated	--	--							94.8	3.5	1.7
NC-6897 76W	Brdcst	4 lb	396	5	72	17	6	1.089	97.8	1.9	0.3
+ Furadan 10 G	Band	3 lb	316								
Untreated	--	--							90.9	5.5	3.6
Mocap 6 EC	Brdcst	3 lb	371	7	70	17	6	1.087	97.7	2.1	0.2
Untreated	--	--	367						94.3	4.6	1.1
Mocap 6 EC	Brdcst	6 lb	386	9	75	12	4	1.088	96.8	3.2	0
Untreated	--	--	351						95.4	3.1	1.5
Mocap 6 EC	Brdcst	3 lb	382	7	67	19	7	1.090	96.3	3.1	0.6
+ Temik 15 G	Band	3 lb									
Untreated	--	--	341						95.8	3.2	1.0
Mocap 6 EC	Brdcst	3 lb	400	6	70	16	8	1.089	97.6	2.1	0.3
+ Furadan 10 G	Band	3 lb									
Untreated	--	--	372						93.0	5.1	1.9
Dyfonate 10 G	Brdcst	4 lb	414	7	75	13	5	1.087	99.6	0.2	0.2
Untreated	--	--	343						95.4	4.0	0.6
Dyfonate 10 G	Brdcst	4 lb	369	6	68	17	9	1.091	97.9	1.7	0.4
+ Temik 15 G	Band	3 lb									
Untreated	--	--	308						95.0	3.3	1.6
Dyfonate 4 E	Brdcst	4 lb	396	6	73	18	3	1.089	95.4	4.2	0.4
Untreated	--	--	370						91.7	6.6	1.6

Material and Placement		Rate ai/A	Yield/A	Percent Tubers by Grade Size				Specific Gravity	Percent Tubers Damaged		
				B's	A's	10 oz	Off		Good	Grub	Wireworm
Dyfonate 4 E	Brdcst	4 lb	300 cwt	7%	68%	18%	7%	1.089	97.9%	1.9%	0.2%
+ Temik 15 G	Band	3 lb									
Untreated	--	--	304						94.6	4.0	1.5
Dyfonate 4 E	Brdcst	4 lb	371	8	67	20	5	1.087	97.8	1.1	1.0
+ Furadan 10 G	Band	3 lb									
Untreated	--	--	362						92.6	4.9	2.5
Dasanit 15 G	Brdcst	5 lb	424	8	71	15	6	1.089	98.2	1.0	0.8
Untreated	--	--	345						93.0	5.3	1.7
Dasanit 15 G	Brdcst	5 lb	385	7	68	15	10	1.090	98.6	0.7	0.7
+ Temik 15 G	Band	3 lb									
Untreated	--	--	383						96.8	2.2	1.0
Dasanit 15 G	Brdcst	5 lb	444	7	67	18	8	1.088	97.4	2.3	0.3
+ Furadan 10 B	Band	3 lb									
Untreated	--	--	323						94.8	2.4	2.8
Dasanit 6 E	Brdcst	5 lb	416	6	71	19	4	1.088	98.1	1.3	0.6
Untreated	--	--	362						94.7	3.7	1.5
Dasanit 6 E	Brdcst	5 lb	403	6	69	18	7	1.088	98.8	1.1	0.1
+ Furadan 10 G	Band	3 lb									
Untreated	--	--	370						95.7	3.5	0.8
Diazinon 4 E	Brdcst	4 lb	361	7	72	17	4	1.086	97.4	1.7	0.9
Untreated	--	--	311						94.8	3.4	1.9
Diazinon 4 E	Brdcst	4 lb	369	6	66	20	8	1.089	95.9	3.5	0.7
+ Temik 15 G	Band	3 lb									
Untreated	--	--	404						94.0	5.0	1.0
Diazinon 4 E	Brdcst	4 lb	373	6	65	22	7	1.087	98.9	0.4	0.7
+ Furadan 10 G	Band	3 lb									
Untreated	--	--	358						94.1	3.2	2.7
Furadan 10 G	Brdcst	3 lb	380	7	70	21	2	1.086	96.0	2.6	1.3
Untreated	--	--	363						94.7	3.4	1.9

Material and Placement		Rate ai/A	Yield/A	Percent Tubers by Grade Size				Specific Gravity	Percent Tubers Damaged		
				B's	A's	10 oz	Off		Good	Grub	Wireworm
Furadan 10 G	Band	3 lb	396 cwt	6%	66%	21%	7%	1.087	98.2%	1.2%	0.6%
Untreated	--	--	383						96.7	2.9	0.5
Temik 15 G	Band	3 lb	389	8	69	19	4	1.090	94.8	4.4	0.8
Untreated	--	--	383						92.7	5.0	2.3
Untreated Control		--	351	7	70	18	5	1.089	94.4	3.9	1.7
Untreated		--	327						91.6	5.8	2.5
Untreated Control		--	373	7	76	15	2	1.088	95.4	3.0	1.5
Untreated		--	326						96.2	2.5	1.2
Untreated Control		--	382	7	73	15	5	1.087	91.6	4.1	4.3
Untreated		--	261						93.8	5.0	1.2

*Placement: Seed Treat = Seed treatment; Brdcst = Broadcast and incorporated; Band = In-row with seed. Rates based on 34 inch rows; liquids and wettable powders applied in water at 50 gal. per A.

Results

The populations of white grubs was not as severe as anticipated in the plot areas thus the tuber damage was much less than was expected. The damage as measured by percent by weight of tubers showing grub feeding scars varied from 2.4% to 6.6% in the untreated rows compared to 0.2% to 4.4% damage in the adjacent treated plots. The data have not been analyzed statistically however so the differences may not be statistically significant. This type of treatment evaluation exemplifies the problems associated with predicting and evaluating soil insect problems.

B. Foliar Insecticide Evaluation at Muck Experimental Farm

Several commercial and experimental materials were evaluated for the foliar insects associated with potato production in Michigan. Data on cutworm control were especially needed to complete requirements to extend label coverage of certain materials. Colorado potato beetle, potato leafhoppers and aphid populations developed in the plot and excellent data were obtained on insecticide performance on them (Tables 2-5). Yield data did not reflect these differences, however, (Table 6). Muck grown potatoes if provided good cultural practices can withstand high insect populations without substantially affecting the yield.

Table 2. Foliar Insect Control on Potatoes

Potato Leafhoppers (Insects/30 Sweeps)

Material[a]	July 12	July 24	August 7	August 16	August 29
Bendiocarb WP 1/2	12	54	79	12	44
Bendiocarb WP 1	15	21	20	2	60
Bendiocarb SC	25	18	25	6	39
Monitor	13	20	25	8	43
Lannate	12	19	42	7	60
GCP 6361	21	31	68	23	67
UC 51762	24	13	18	5	34
Furadan F	23	24	42	3	39
Pydrin	17	2	6	3	20
Sandoz 6538	12	36	53	16	49
Temik	4	13	35	21	51
Dacamox 2	--	9	15	10	45
Dacamox 3	2	7	18	6	19
Furadan G	8	13	32	18	44
Furadan G + F	10	39	43	6	39
Furadan G + Pir	3	52	36	17	57
Untreated	14	39	48	11	50
Untreated	13	70	66	25	39

[a]For rates of application and treatment dates refer to harvest data.

Table 3. Foliar Insect Control on Potatoes

Flea Beetles (Insects/30 Sweeps)

Material[a]	July 12	July 24	August 7	August 16	August 29
Bendiocarb WP 1/2	5	69	181	8	28
Bendiocarb WP 1	13	33	67	2	21
Bendiocarb SC	17	23	97	4	34
Monitor	10	71	181	6	15
Lannate	4	76	202	4	31
GCP 6361	21	87	253	8	18
UC 51762	18	12	76	0	18
Furadan F	9	31	165	1	15
Pydrin	17	6	161	2	22
Sandoz 6538	16	84	158	11	19
Temik	32	104	343	39	14
Dacamox 2	16	70	463	66	6
Dacamox 3	11	32	99	15	16
Furadan G	28	84	82	28	18
Furadan G + F	24	87	81	4	10
Furadan G + Pir	24	82	95	14	14
Untreated	33	52	91	22	11
Untreated	13	100	95	37	22

[a]For rates of application and treatment dates refer to harvest data.

Table 4. Foliar Insect Control on Potatoes

Colorado Potato Beetle (Insects/30 Sweeps)

Material[a]	July 12		July 24		Aug 7		Aug 16		Aug 29	
	Ad	Lv	Ad	Lv	Ad	Lv	Ad	Lv	Ad	Lv
Bendiocarb WP 1/2	0	207	0	2	66	2	2	0	0	15
Bendiocarb WP 1	1	203	0	2	79	0	2	0	1	5
Bendiocarb SC	0	188	1	0	61	2	1	0	0	6
Monitor	0	192	1	15	72	0	2	0	0	16
Lannate	1	207	0	40	69	3	24	7	1	5
GCP 6361	2	208	0	1	27	0	3	0	1	3
UC 51762	2	188	2	56	58	11	15	4	3	11
Furadan F	1	144	1	0	56	0	2	0	1	2
Pydrin	0	316	1	1	65	1	16	5	0	11
Sandoz 6538	0	238	1	0	52	0	1	1	0	2
Temik	0	1	0	2	24	1	12	5	0	21
Dacamox 2	1	11	1	6	27	2	7	1	0	27
Dacamox 3	0	1	1	1	9	2	3	3	1	12
Furadan G	0	4	1	42	16	35	12	6	2	5
Furadan G + F	0	9	1	80	33	25	1	0	0	1
Furadan G + Pir	2	2	2	38	37	23	15	8	2	9
Untreated	2	191	2	61	126	33	40	13	3	6
Untreated	1	134	0	21	66	9	24	7	1	4
Total	13	2444	15	368	943	149	182	60	16	161
%	1	99	4	96	86	14	75	25	9	91

[a]For rates of application and treatment dates refer to harvest data.

Table 5. Foliar Insect Control on Potatoes

Green Peach Aphids (Insects/30 Sweeps)

Material[a]	July		August			Aphids/15 leaves	
	12	24	7	16	29	Aug 7	Aug 23
Bendiocarb WP 1/2	3	137	422	175	5	65	11
Bendiocarb WP 1	5	174	322	288	6	111	190
Bendiocarb SC	13	184	912	495	79	211	257
Monitor	12	16	26	4	8	2	0
Lannate	7	22	67	10	7	11	5
GCP 6361	9	6	17	5	2	7	0
UC 51762	10	82	312	218	145	50	35
Furadan F	13	16	116	10	4	21	11
Pydrin	3	7	18	12	1	3	0
Sandoz 6538	7	6	132	247	7	42	139
Temik	2	10	26	27	4	11	0
Dacamox 2	5	15	88	60	5	6	1
Dacamox 3	4	10	156	164	3	26	22
Furadan G	19	101	413	153	8	106	2
Furadan G + F	5	194	543	35	112	62	28
Furadan G + Pir	27	252	332	18	10	160	2
Untreated	9	116	116	62	4	25	2
Untreated	7	134	133	35	6	40	2

[a]For rates of application and treatment dates refer to harvest data.

Table 6. Yields and Size of Tubers from Potato Foliar Plots
MSU Muck Exptl. Farm, Bath (Clinton Co.)

Variety: Sebago
Date Planted: May 17; Date Harvested: Oct. 9

Materials	Rate/A (Tox.)	Plcemnt[a]	Yield/Acre[b] Cwt	Yield/Acre[b] Bu	% Size Distribution Less Than 1-7/8"	% Size Distribution 1-7/8" and Over
Bendiocarb 76 WP	1/2 lb	Fol	275	458	10%	90%
Bendiocarb 76 WP	1 lb	Fol	296	493	12	88
Bendiocarb 50 S	1 lb	Fol	267	445	12	88
Monitor 4 WDL	3/4 lb	Fol	244	407	11	89
Lannate 1.8 L	0.9 lb	Fol	247	412	13	87
Gulf GCP 6361 2 EC	1 lb	Fol	313	522	8	92
Un. Carb. 51762 75 WP	0.9 lb	Fol	252	420	10	90
Furadan 4 F	1 lb	Fol	246	410	11	89
Pydrin 2.4 EC	0.1 lb	Fol	256	427	14	86
Sandoz 6538 2 EC	1/2 lb	Fol	247	412	12	88
Temik 15 G	3 lb	In-row	230	383	13	87
Dacamox 15 G	2 lb	In-row	267	445	11	89
Dacamox 15 G	3 lb	In-row	206	343	15	85
Furadan 10 G	3 lb	In-row	286	477	12	88
Furadan 10 G	3 lb	In-row				
+ Furadan 4 F	1 lb	Fol	268	447	13	87
Furadan 10 G	3 lb	In-row				
+ Pirimor 50 W	1/4 lb	Fol	264	440	17	83
Untreated	--	--	316	527	9	91
Untreated	--	--	263	438	11	89

[a]Type of foliar applications: CO_2 sprayer delivering 70 gal./A. applied on July 18, 24, Aug. 12 and 29. Granular treatments applied in row at time of planting.

[b]Plots consisted of three replications of paired 25 ft. rows.

EFFECT OF POTATO SEED PIECE TREATMENT ON STAND AND YIELD - 1978

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Department of Botany and Plant Pathology

Chemicals alone or in combination were compared as potato seed piece treatment for control of tuber dry rot and black leg (soft rot). Seed of the variety Sebago was cut and chemically treated immediately prior to planting on May 9, 1978. Chemicals were applied either by lightly dusting seed pieces or by dipping them for two minutes. Treatments were randomized and replicated four times in a single block planting. Plots consisted of a single row 50 feet long. The row width was 34 inches with seed spaced 12 inches apart within rows.

Seed was slow to sprout and the plant stand in general was poor. Stand count and yields varied widely within treatments. Differences between treatments were not found to be significant except where the seed was soaked in water before planting. The water alone tended to increase seed piece decay.

Treatment	% Stand	Yield CWT/A	
		US#1	B Grade
1. Clorox 5.25% (sodium hypochlorite) 1.9 w/water	74.2ab	280.4 b	6.5
2. Chlorine dioxide 50 ppm	79.5ab	285.0ab	7.1
3. Chlorine dioxide 100 ppm	80.1ab	287.5ab	4.5
4. CGA 14703 100 ppm	75.0ab	289.0ab	7.1
5. Terraclor Super X 5% dust	71.8 b	290.1ab	8.6
6. Terraclor Super X 10% dust	69.2 b	278.7 b	5.1
7. Terraclor 5% dust	80.5ab	291.4ab	6.3
8. Terraclor 10% dust	76.0ab	285.0ab	7.2
9. Topsin M 2 1/2% dust	80.6ab	303.5a	7.0
10. Topsin M + Dithane M-45 1% + 5% dust	83.6a	305.0a	6.8
11. Water	50.1 c	251.8 c	5.7
12. No Treatment	67.8 b	283.2 b	6.5
LSD .05	12.2	24.0	NS

Small letters indicate treatments that do not differ significantly at 5% level according to the LSD test.

EFFECT OF PRE-PLANT SOIL TREATMENTS
ON THE CONTROL OF POTATO SCAB - 1978

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Terraclor, a nitrate inhibitor (Terrazole) and combinations of both were applied as pre-plant soil treatments for control of scab on potatoes. Terraclor alone was broadcast and applied in the rows. Terrazole plus urea with and without the addition of Terraclor was applied only as a broadcast treatment.

The soil type was a fine sandy loam with a pH of 7.2. It was heavily inoculated with the scab organism in the fall of 1977. Irrigation was used only when necessary to maintain growth. Plots were mechanically weeded and were sprayed weekly for foliar disease and insect control.

Cut seed variety Sebago was planted May 12, 1978, in single row plots 25' long. The row width was 32" with seed pieces spaced 9" apart within rows. Treatments were arranged in a randomized block planting with three replications.

Terraclor alone and in combination with Terrazole plus urea was effective in reducing scab. Terrazole plus urea alone had no beneficial effect on disease incidence. In-row applications of Terraclor 2 EC resulted in the highest marketable yields.

	Yield cwt/A				
	Harvested		Marketable		% Marketable[1]
Treatment	U.S.#1	B Grade	U.S.#1	B Grade	Tubers
1. Terraclor 2 EC 12 1/2 gal/A - Broadcast	287.8	37.0	183.9a	23.6a	63.9 b
2. Terraclor 2 EC 18 3/4 gal/A - Broadcast	299.8a	53.7	206.3b	36.9 b	68.8 b
3. Terraclor 2 EC 5 gal/A - in row	307.8a	18.5	229.9a	13.8a	74.7a
4. Terraclor 2 EC 7 1/2 gal/A in row	308.2a	25.4	241.0a	19.9a	78.2a
5. Terraclor 75W 33 lb/A -broadcast	291.1a	62.4	212.2b	45.5b	72.9ab
6. Urea + Terrazole 100D + 100 lbN + 1/2 lb ai/A - Broadcast	277.9a	47.9	87.0d	15.0a	31.3 c
7. Urea + Terrazole 100D 100 N + 1 lb ai/A - Broadcast	282.8a	49.7	85.7d	15.1a	30.3 c
8. Urea + Terrazole 100D + Terraclor 2 EC 100/lb N + 1/2 lb ai + 12 1/2 gal/A - Broadcast	285.6a	34.8	179.1c	21.8a	62.7 b
9. Urea + Terrazole 100D + Terraclor 2 EC 100 lb N + 1 lb ai + 12 1/2 gal/A - Broadcast	294.0a	32.3	197.3b	21.7a	67.1 b
10. No treatment	254.5b	54.8	65.2e	14.0a	25.6 c

Small letters indicate Duncan's multiple range groupings of treatments that do not differ significantly at the 5% level.

[1]Potato tubers with less than 2% scab.

Note: Treatments 1 through 6 and 10 also received 100 lbs. of N in the form of urea.

FUNGIGATION TRIALS WITH BRAVO 6F FOR DISEASE CONTROL ON POTATOES

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Department of Botany and Plant Pathology

The fungicide Bravo 6F applied on potatoes at the recommended rate (1 1/2 oz/A) with a boom sprayer and through solid set irrigation was evaluated for control of early blight (Alternaria solani) and Botrytis blight (Botrytis cinerea). Trials were conducted on commercial plantings of Onaway and Sebago potatoes at the Ferris Christenson farm in Montcalm County. The experimental site was a 60 acre irrigated field with sandy loam soil and moderately undulating topography. The field was about equally divided between the two potato varieties.

Treatments were applied to adjacent blocks which varied in size from 25 acres for the boom sprayer to 5 acres for the irrigation method. Cultural practices including the use of irrigation and the application of herbicides and insecticides were uniform throughout the plantings.

The boom sprayer (J. Bean) used was trailer-mounted and covered 12 rows. Nozzles were the flat fan type (Spraying Systems #6502) spaced 12 inches apart and without drops.

The irrigation system had 4-foot risers laid out on 60-foot centers. The sprinkler heads (Buckner #8601) fitted with 7/16" orifices were operated at 75 psi.

The spray suspension, a 20 X concentration, was introduced into the irrigation system at 120 spi using a power sprayer and a fertilizer injector. Dye, red #46 (H. Kohnstam), was added initially to the spray suspension to determine the time required to apply the fungicide treatments. This varied between 20 and 25 minutes for 5 acres, depending on the topography of the area treated and other factors. The estimated volume of water applied by the irrigation method varied between 950-1200 gallons per acre as compared to 50 gallons per acre with the boom sprayer.

Fungicide treatments were started during the third week in June and continued on a 7-day schedule until the middle of September (12 applications).

Evaluation for disease incidence and yield were made in .04 acre plots arranged in replicated transects extending across the treated areas. Adequate unsprayed checks were provided for comparison.

Summary: In both trials, Bravo 6F was equally effective against early blight irrespective of method of application. It was also effective against Botrytis blight, but control was significantly better by the irrigation method than with the boom sprayer. Of the two methods, it is apparent that the irrigation system provided better distribution of the fungicide, particularly on the lower portions of the potato plants where Botrytis blight was most severe.

Sprayer wheel track damage was a significant factor affecting both disease incidence and yield. The effect on disease incidence was particularly noticeable with Botrytis blight in the Onaway trial and with early blight in the Sebago trial. The prorated loss in yield of US #1 potatoes from sprayer wheel damage for both trials averaged about 9%.

Table #1 - Variety Onaway

Method of Application	Disease Index[2,3]		Average Yield CWT/A[3]	
	Early Bl.	Botrytis Bl.	US #1	B Grade
Boom Sprayer (NWT)[1]	1.7 ab	2.9 b	312.6 a	59.6 a
Boom Sprayer (WT)[1]	2.2 b	3.7 c	251.5 b	49.4 a
Irrigation	1.5 a	1.8 a	303.0 a	38.4 a
No treatment	5.1 c	4.0 c	238.3 b	37.0 a

Table #2 - Variety Sebago

Method of Application	Disease Index[2,3]		Average Yield CWT/A[3]	
	Early Bl.	Botrytis Bl.	US #1	B Grade
Boom Sprayer (NWT)[1]	1.5 a	2.4 b	348.7 a	61.1 a
Boom Sprayer (WT)[1]	2.0 b	2.9 bc	288.6 c	54.8 a
Irrigation	1.6 a	.9 a	352.1 a	59.2 a
No treatment	4.8 c	3.5 c	309.4 b	50.5 a

[1]NWT = non-wheel track rows, WT = wheel-track rows.

[2]Disease Index: 0 = no disease; 10 = 100 % foliage infected.

[3]Small letters are Duncan multiple range groupings which do not differ significantly at the 5% level.

COLORED BEAN VARIETY AND STRAIN TEST

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These tests were seeded June 13 under somewhat non-uniform soil moisture conditions. Emergence was not complete until June 30. Row width was 20 inches, plots 3 rows wide, in 4 replications. The nursery received one irrigation at mid pod fill for Charlevoix which seemed to benefit the standard full-season varieties, but it apparently was too late to help the earlier-maturing entries. Primarily on account of seed quality and color, seven of the 29 entries were not harvested. For tabular purposes, the standard varieties and the experimentals are presented in two different tables. However, in fact, all entries were grown interspersed in a common field nursery, so their yields may be directly compared.

Test 8201-SV. Standard large colored beans.

Variety	Seed Type	Yield in lb/acre
Charlevoix	DRK	1818.3
Mecosta	LRK	1883.6
Manitou	LRK	1930.3
Sacremento	LRK	1357.2
Redkloud	LRK	1426.8
Montcalm	DRK	1915.1
Valley	Great Northern	1360.5
Yellow-Eye	Y.E.	1070.1
Swedish Brown	Sw. Br.	1187.6
Michicran	Cranberry	1457.2

$LDS_{.05}$ = 107 lbs.

Test 8201 - Exp.

Entry	Seed Type	Desirability	Yield in lbs/acre
70699	LRK	B	1185.4
5406	LRK	A	1783.5
70702	LRK	A	1178.8
70688	LRK	B	1682.4
5408	Large White	B	1425.7
70689	LRK	B	964.6
70700	LRK	A	1434.4
6854	LRK	C	1625.8
61144	Large White	A	2179.4
70710	DRK	A+	1327.8
70684	LRK	B	1676.9
6831	DRK	B	1262.6

$LSD_{.05}$ = 107 lbs.

Discussion of Tests 8201-SV and 8201-Exp:

The four full-season red kidney varieties were significantly the best yielders at this site, Charlevoix not quite up to the others. The early light reds, Sacremento and Redkloud, were clearly too early to yield well at this location and planting date.

In the test 8201-Exp. only early maturing lines were included, all with halo blight resistance. Seven lines were not harvested because a preliminary check of seed coloration at maturity indicated they would be unacceptable to processors. The 7 lines underscored in the table appear the most promising. They include 2 large white-seeded types, one dark red kidney, and 4 light reds. Since the first objective of this nursery was to identify a mid-early light red, we shall have to rely upon one of the lines 5406, 70688, 70700, and 6854 as potential replacement for the marginally late Mecosta. Of these, 5406 came closest in yield to Mecosta, although much earlier in maturity.

CONTROL OF THE ROOT-LESION NEMATODE (*Pratylenchus penetrans*) ASSOCIATED WITH NAVY BEAN (*Phaseolus vulgaris* L.) YIELDS-1978

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Seven nematicides were evaluated. Each treatment was replicated six times in a randomized block design on a sandy clay loam soil (s = 66.4, si = 11.08, c = 22.5) at the Michigan State University Montcalm Experimental Farm in Entrican. Each plot consisted of 4 rows 6.0m (20 ft) in length and 0.86m (34 inches) apart. Three fumigant nematicide treatments of Nemamort 8E were applied (in-row) 19 days before planting (DD_{10} = 309). The non-fumigant nematicides were applied (in-row) at the time of planting on June 21, 1978 (DD_{10} = 540). Soil samples were taken prior to the application of the soil fumigants, and at the time of planting. Soil and root samples were taken at 6 intervals from time of planting until harvest. The centrifugation-flotation and shaker techniques were used to determine *P. penetrans* population levels in soil and roots, respectively.

Nematode populations in the soil were not significantly different (P = 0.05) at the time of fumigation with Nemamort at 309 accumulated degree days at a base of 10 C (DD_{10} = 309). At the time of planting (DD_{10} = 540), however, nematode populations in plots fumigated with Nemamort were significantly lower (P = 0.05) than those in all other plots. Both soil and root populations fluctuated throughout the growing season in accordance with the life cycle of *P. penetrans*. The greatest population density of *P. penetrans* was recovered from roots at mid-season (DD_{10} = 1877). Three generations of *P. penetrans* occurred during the growing season. All chemical treatments significantly reduced population densities of *P. penetrans*. Yields of dry navy beans were increased over that of the control with Temik 15G at 0.75 lb ai/acre, Temik 15G at 1.50 lb ai/acre, and Vydate 10G at 3.0 ai/acre. There was no significant difference between yields from plots treated with Nemacur 15G and the control plot. All Nemamort treatment significantly reduced yields below that of the control. There was no significant difference among yields from the three Nemamort treatments. Nemamort at 36 lb ai/acre produced the lowest yield.

Table. 1. Effect of nematicides on populations of *Pratylenchus penetrans* and on yield of navy beans.

Treatment, formulation and rate per acre	Yield cwt/acre	*Pratylenchus penetrans* at DD_{10}* — No. per 100 cm^3/soil								No. per g root tissue					
		309	540	890	1349	1877	2167	2288	2340	890	1349	1877	2167	2288	2340
Check	19.2c	54a	57b	65b	24ab	46b	23b	49b	30b	79c	69b	105b	32b	67b	27c
Temik 15G 0.75 lb ai/acre	22.5d	52a	56b	7a	2a	13a	5a	5a	8a	3ab	0a	2a	1a	5a	6ab
Temik 15G 1.50 lb ai/acre	24.4d	59a	59b	14a	1a	4a	1a	11a	13a	3ab	1a	5a	0a	2a	2a
Vydate 10G 3 lb ai/acre	24.8d	51a	55b	12a	1a	7a	7a	14a	7a	3ab	4a	8a	1a	3a	2a
Nemamort 8E 18 lb/acre	16.8bc	65a	18a	17a	1a	13a	6a	7a	8a	10b	9a	16a	1a	4a	11ab
Nemamort 8E 24 lb/acre	14.5b	53a	11a	19a	2a	14a	1a	7a	8a	5ab	3a	17a	1a	11a	19bc
Nemamort 8E 36 lb/acre	10.0a	52a	7a	12a	5a	7a	5a	11a	13a	5ab	2a	20a	1a	5a	18bc
Nemacur 15G 5 lb ai/acre	16.9bc	46a	54b	9a	1a	11a	1a	4a	4a	1a	0a	6a	1a	4a	2a

*DD_{10} = accumulated degree days (base 10 C)

Column means followed by the same letters are not significantly different according to the Student-Newmans-Keuls Multiple Range Test (P = 0.05).

CONTROL OF THE ROOT-LESION NEMATODE (*Pratylenchus penetrans*) ON SOYBEANS (*Glycine max*), 1978

G. W. Bird and A. P. Elliott
Department of Entomology

Four nematicide treatments were evaluated, and each nematicide treatment was replicated five times in a randomized block design. The experiment was carried out on a sandy clay loam soil (s = 66.4, si = 22.4, c = 11.08) at the Michigan State University Montcalm Experimental Farm in Entrican. Each plot consisted of 4 rows 6.0m (50 ft) in length and 0.86m (34 inches) apart. All nematicides were applied (in-row) at the time of planting on June 6, 1978 (accumulated degree days at a base of 10 C, DD_{10} = 368). Soil samples were taken at the time of planting, and soil and root samples were taken at 5 intervals throughout the season. Soil and root samples were analyzed by the centrifugation-flotation and shaker techniques, respectively, and population densities of *P. penetrans* calculated.

There was no significant (P = 0.05) difference among the plots in the initial soil population densities of *P. penetrans* (DD_{10} = 368). All treatments significantly reduced both soil and root population densities of *P. penetrans*. Population densities fluctuated thoughout the growing season. The highest *P. penetrans* densities in the root tissue was found 58 days after planting (DD_{10} = 1349), while population densities in the soil were highest at the time of harvest (DD_{10} = 2360). Treatment with Temik 15G at 2.0 lb ai/acre and Nemacur 15G at 5.0 lb ai/acre resulted in significant increases in bean yields.

Table 1. Effect of nematicides on population densities of Pratylenchus penetrans and on soybean yields.

		Pratylenchus penetrans at DD_{10}[1]										
Treatment, formulation and rate per acre	Yield cwt/acre	No. per 100 cm^3/soil						No. per g root tissue				
		368	890	1349	1877	2167	2360	890	1349	1877	2167	2360
Check	13.9a	47a	31b	37b	18b	55b	80b	41b	113b	20b	79b	19b
Temik 15G 2.0 ai/acre	18.4b	50a	4a	5a	2a	9a	31a	2a	7a	2a	10a	2a
Mocap 10G 2.0 ai/acre	16.9ab	41a	6a	6a	1a	7a	28a	1a	14a	1a	11a	4a
Mocap 6E 2.0 ai/acre	16.4ab	43a	17ab	21b	1a	10a	36a	5a	3a	1a	22a	6a
Nemacur 15G 5.0 ai/acre	18.2b	45a	4a	5a	1a	14a	21a	2a	9a	1a	12a	1a

[1] DD_{10} = accumulated degree days (base 10 C)

Column means followed by the same letters are not significantly different according to the Student-Newman-Keuls Test (P = 0.05)

CORN HYBRIDS, PLANT POPULATION AND IRRIGATION

E. C. Rossman, B. Darling and K. Dysinger
Department of Crop and Soil Science

Performance data for 73 commercial corn hybrids evaluated in 1978 with irrigation and without irrigation are presented in Table 1. A total of 8 inches of supplemental water were applied during July and August. Bouyoucous soil moisture blocks were placed at 6, 12, 18 and 24-inch depths in both irrigated and unirrigated plot areas.

Irrigated yields averaged 55.4 bushels more per acre than unirrigated -- 143.6 vs. 88.2, an increase of 63%. Hybrids ranged from 91.5 to 186.0 irrigated and 61.1 to 112.3 bushels per acre without irrigation. Hybrids significantly better than the average yield (arranged in order of increasing grain moisture content at harvest) are listed below. Twenty-one of the 23 hybrids were in the highest yielding group for both irrigated and unirrigated plots.

Irrigated	Not Irrigated
Michigan 3102 (2X)	Michigan 3102 (2X)
ADI 232 (2X)	ADI 232 (2X)
Stanton 10100 (2X)	Pioneer 3780 (2X)
Pioneer 3780 (2X)	Pioneer 3901 (2X)
Pioneer 3901 (2X)	Michigan 407-2X (2X)
Michigan 407-2X (2X)	Super Crost 1950 (2X)
Super Crost 1950 (2X)	Funk G-4408 (2X)
Funk G-4408 (2X)	Blaney B506 (2X)
Blaney B506 (2X)	Super Crost 2350 (2X)
Super Crost 2350 (2X)	Amcorn 7480 (2X)
Amcorn 7480 (2X)	Migro M-2018X (2X)
Migro M-2018X (2X)	Pride 4488 (2X)
Pride 4417 (2X)	Migro M-015 (2X)
Pride 4488 (2X)	Migro M-2022X (2X)
Migro M-2022X (2X)	Trojan TXS102 (2X)
Trojan TXS102 (2X)	Funk G-4323 (MSX)
Funk G-4444 (2X)	Funk G-4444 (2X)
Migro M-0301 (2X)	Migro M-0301 (2X)
Acco UC3002 (2X)	Acco UC3002 (2X)
ADI 315 (2X)	ADI 315 (2X)
Michigan 5912 (2X)	Michigan 5912 (2X)
Acco UC3301 (2X)	Acco UC3301 (2X)
ADI 197 (2X)	ADI 197 (2X)

The correlation of irrigated with unirrigated yields was highly significant, .933, indicating that the hybrids tended to respond alike in both situations. During the 11-year period, 1968-1978, the correlations have ranged between .7 and .9 except for 1976 when it was .490. All correlations have been highly significant.

Average, highest and lowest yields for corn hybrids irrigated and not irrigated for the 11-year period, 1968-1978, are given in Table 2. The average yielding hybrid has yielded 49 more bushels per acre when irrigated. The highest yielding hybrids have responded with 64 bushels added yield while the lowest yielding hybrids have given only 32 bushels added yield when irrigated. These results demonstrate the importance of choosing high yielding hybrids to maximize returns from irrigation with little, if any, additional cost.

Stalk lodging averaged 5.1% irrigated and 2.5% not irrigated, twice as much loding on the irrigated plots in 1978. In 1977, there was also more lodging on the irrigated plots, almost three times more stalk breakage when irrigated. In most of the previous years, there has been less lodging when irrigated. Generally, stressed weaker plants on unirrigated plots have been more susceptible to lodging except in 1977 and 1978.

Plant Population x Irrigation

Five adapted hybrids at four plant populations irrigated and not irrigated were grown in each of 11 years, 1968-1978, Table 3. Over the 11-year period, a population of 23,400 has given the highest average yield (171 bushels per acre) when irrigated while 19,200 has given the highest yield (110 bushels) without irrigation. The 23,300 population irrigated has given the highest yield in 10 of the 11 years. The 11-year average increase due to irrigation has been 73 bushels per acre at the 23,300 population.

Moisture content of grain at harvest has averaged .5-1.0% higher for the higher plant populations. Stalk lodging has increased with increased plant population.

Table 1

Zone 3

NORTH CENTRAL MICHIGAN
Montcalm County Trial - Irrigated vs. Not Irrigated
One, Two, Three Year Averages - 1978, 1977, 1976

Hybrid	% Moisture			Bushels per acre						% Stalk lodging					
	1978	2 yrs.	3 yrs.	1978		2 years		3 years		1978		2 years		3 years	
(Brand - Variety)				Irrig	Not Irrig	Irrig	Not Irrig	Irrig	Not Irrig	Irrig	Not Irrig	Irrig	Not Irrig	Irrig	Not Irrig
Michigan 280 (4X)	18.5	22	21	91.5	69.0	96	66	108	63	8.9	9.0	9	6	8	10
Acco UC1124 (2X)	18.9	--	--	112.5	71.7	---	---	---	---	10.4	9.0	--	--	--	--
Super Crost 1210 (2X)	19.0	--	--	86.1	62.1	---	---	---	---	4.4	2.4	--	--	--	--
Pioneer 3975A (Sp.)	19.1	--	--	138.4	84.8	---	---	---	---	1.5	0.8	--	--	--	--
Michigan 333-3X (3X)	19.2	22	21	133.1	88.5	121	78	129	78	3.8	3.0	3	2	3	2
Migro M-0101 (2X)	19.3	23	22	136.0	81.8	123	76	129	73	5.6	0.0	8	3	6	6
Michigan 3093 (3X)	19.4	23	22	123.9	87.2	119	75	129	76	4.2	3.6	3	3	3	5
Super Crost 1402 (2X)	19.8	--	--	91.8	61.1	---	---	---	---	6.0	2.4	--	--	--	--
Super Crost 1590 (2X)	19.8	--	--	109.5	68.8	---	---	---	---	2.2	0.8	--	--	--	--
ADI 195 (2X)	19.8	24	--	107.5	70.5	98	63	---	---	5.0	1.7	6	2	--	--
Pioneer 3965 (3X)	20.0	23	--	118.2	80.5	113	72	---	---	0.0	1.6	0	1	--	--
DeKalb XL12 (2X)	20.2	--	--	97.1	65.3	---	---	---	---	10.6	2.5	--	--	--	--
Pioneer 3958 (2X)	20.2	25	24	124.7	88.9	116	73	128	73	3.8	0.7	4	1	4	4
Stanton 1090 (2X)	20.6	--	--	103.5	66.3	---	---	---	---	13.5	4.6	--	--	--	--
Super Crost 31 (4X)	20.8	--	--	103.6	64.8	---	---	---	---	3.8	0.8	--	--	--	--
Customaize CFS-1000 (2X)	20.8	--	--	129.8	77.4	---	---	---	---	9.9	4.1	--	--	--	--
DeKalb XL15 (2X)	20.8	--	--	119.7	73.8	---	---	---	---	4.6	3.0	--	--	--	--
Garno S-84 (2X)	20.8	--	--	144.8	96.0	---	---	---	---	3.9	1.5	--	--	--	--
Pride 2206 (2X)	20.9	--	--	149.4	87.3	---	---	---	---	5.6	2.3	--	--	--	--
Super Crost S18 (2X)	21.0	25	--	141.3	83.7	125	74	---	---	3.7	2.3	3	1	--	--
Jacques JX52 (2X)	21.0	--	--	139.2	90.1	---	---	---	---	6.2	6.8	--	--	--	--
Super Crost 1692 (2X)	21.4	25	24	123.5	82.3	113	75	124	72	3.8	0.8	2	0	2	3
Blaney B302-WX (2X)	21.5	--	--	130.8	80.2	---	---	---	---	2.5	0.7	--	--	--	--
Garno S-90 (2X)	21.5	--	--	142.4	90.5	---	---	---	---	0.0	0.0	--	--	--	--
*+Michigan 3102 (2X)	21.5	25	24	180.5	102.0	153	86	155	83	2.6	3.3	3	2	3	4

Table 1 Continued

Acco UC1151 (2X)	21.6	--	--	151.8	84.0	---	---	---	---	8.1	2.2	--	--	--	--
Stanton 1095 (2X)	21.6	--	--	130.5	76.6	---	---	---	---	6.9	2.1	--	--	--	--
Amcorn 4010 (2X)	21.8	26	--	94.0	65.6	92	61	---	---	6.7	4.4	5	2	--	--
Michigan 3953 (3X)	21.8	25	--	141.5	84.1	135	77	---	---	4.2	3.5	4	3	--	--
*+ADI 232 (2X)	21.8	25	--	163.0	99.5	140	77	---	---	8.7	6.8	4	5	--	--
P-A-G SX189 (2X)	21.8	--	--	147.3	85.0	---	---	---	---	6.6	3.1	--	--	--	--
*Stanton 10100 (2X)	21.8	--	--	159.5	87.3	---	---	---	---	3.0	0.0	--	--	--	--
*+Pioneer 3780 (2X)	21.9	26	25	181.0	104.4	166	96	170	91	8.8	2.4	5	1	5	6
Blaney B606 (2X)	21.9	27	27	150.3	95.5	136	86	148	88	2.3	0.8	2	0	1	1
*+Pioneer 3901 (2X)	22.0	26	--	164.3	100.5	156	92	---	---	0.0	0.7	2	0	--	--
*+Michigan 407-2X (2X)	22.1	26	25	161.9	102.1	152	93	160	89	3.0	1.7	3	1	2	5
*+Super Crost 1950 (2X)	22.1	--	--	166.6	98.3	---	---	---	---	7.1	4.6	--	--	--	--
*+Funk G-4408 (2X)	22.1	27	--	186.0	109.4	161	98	---	---	2.2	2.3	2	1	--	--
Blaney B406 (2X)	22.3	--	--	131.7	78.0	---	---	---	---	0.8	0.0	--	--	--	--
*+Blaney B506 (2X)	22.3	26	--	160.9	102.3	147	86	---	---	2.9	0.8	6	2	--	--
*+Super Crost 2350 (2X)	22.3	26	25	185.3	107.6	149	91	153	86	4.7	1.5	5	1	4	4
Amcorn 4100 (2X)	22.5	26	25	145.5	88.5	132	81	141	79	4.4	0.8	5	4	6	7
Michigan 4122 (2X)	22.5	26	25	142.4	96.0	140	86	153	87	5.1	0.9	4	2	4	5
Funk G-4224 (MSX)	22.5	--	--	139.7	81.1	---	---	---	---	8.8	2.5	--	--	--	--
Acco UC2301 (2X)	22.5	27	26	153.7	89.4	138	78	146	78	4.8	6.9	4	5	3	10
*+Amcorn 7480 (2X)	22.7	27	--	165.4	101.7	148	90	---	---	1.6	0.0	1	0	--	--
*+Migro M-2018X (2X)	22.8	27	--	181.4	106.5	162	96	---	---	0.0	0.0	1	0	--	--
*Pride 4417 (2X)	23.0	--	--	159.9	87.4	---	---	---	---	3.9	1.6	--	--	--	--
Michigan 5443 (3X)	23.0	27	26	147.1	96.1	138	86	148	84	6.0	4.1	6	3	5	7
Funk G-4272 (3X)	23.0	26	--	147.6	87.5	132	75	---	---	7.8	5.8	7	4	--	--
Amcorn 7300 (2X)	23.1	28	26	125.9	80.6	129	79	143	81	8.0	5.6	4	4	3	11
Renk RK66 (2X)	23.1	28	--	150.9	87.0	139	80	---	---	1.6	0.8	2	0	--	--
*+Pride 4488 (2X)	23.1	--	--	161.1	99.3	---	---	---	---	1.5	2.8	--	--	--	--
Northrup King PX48 (2X)	23.2	27	--	154.7	89.8	149	89	---	---	7.5	2.3	7	2	--	--
Voris V2372 (2X)	23.2	27	--	154.9	96.6	149	89	---	---	6.1	4.5	5	2	--	--
Asgrow RX58 (2X)	23.4	27	27	149.0	86.6	147	84	155	81	4.5	8.0	5	4	5	8
Customaize CFS-115 (2X)	23.5	--	--	121.0	72.0	---	---	---	---	6.4	1.8	--	--	--	--
+Migro M-0105 (2X)	23.6	27	--	150.7	97.5	137	86	---	---	6.4	3.9	10	4	--	--
Pickseed XR44 (2X)	23.6	28	27	141.5	83.6	139	82	153	84	9.2	2.2	7	2	5	6
Super Crost S27 (2X)	23.6	28	27	152.6	94.5	141	88	154	87	3.1	2.3	2	2	2	8

Table 1 Continued

Pickseed 8858 (2X)	23.7	--	--	122.7	75.1	---	---	---	---	3.3	0.9	--	--	--	--
*+Migro M-2022X (2X)	23.7	28	--	169.4	101.4	152	90	---	---	5.0	0.7	4	0	--	--
*+Trojan TXS102 (2X)	24.0	--	--	168.3	100.9	---	---	---	---	4.5	5.8	--	--	--	--
Michigan 5802 (2X)	24.0	28	27	153.9	96.2	143	88	155	88	4.3	3.0	4	3	4	7
+Funk G-4323 (MSX)	24.8	--	--	155.1	100.4	---	---	---	---	1.5	0.8	--	--	--	--
*+Funk G-4444 (2X)	24.8	28	27	165.3	99.4	148	88	160	85	6.3	0.0	6	0	4	7
*+Migro M-0301 (2X)	24.9	29	29	164.2	112.3	153	94	160	92	8.1	2.2	5	2	5	4
*+Acco UC3002 (2X)	25.3	29	--	168.8	97.5	155	90	---	---	10.8	0.0	7	0	--	--
*+ADI 315 (2X)	25.4	--	--	180.0	104.6	---	---	---	---	2.3	0.0	--	--	--	--
*+Michigan 5912 (2X)	25.4	29	--	168.6	102.8	163	95	---	---	2.1	0.0	1	0	--	--
*+Acco UC3301 (2X)	25.7	30	29	168.9	101.8	155	91	161	87	8.0	2.8	5	3	4	8
Customaize CFS-WX120 (2X)	26.5	--	--	118.7	70.4	---	---	---	---	12.9	4.0	--	--	--	--
*+ADI 197 (2X)	29.1	--	--	177.6	98.3	---	---	---	---	0.7	0.0	--	--	--	--
Average	22.2	26	25	143.6	88.2	138	84	146	82	5.1	2.5	4	2	4	6
Range	18.5 to 29.1	22 to 30	21 to 29	91.5 to 186.0	61.1 to 112.3	92 to 166	61 to 98	108 to 170	63 to 92	0.0 to 13.5	0.0 to 9.0	0 to 10	0 to 6	1 to 8	1 to 11
Least significant difference	1.2	0.9	0.7	13.9	8.6	8	6	6	5						

*Significantly better than average yield, irrigated, 1978
+Significantly better than average yield, not irrigated, 1978

	1978	1977	1976
Planted	May 3	April 26	May 5
Harvested	November 9	October 28	October 29
Soil type	Montcalm sandy loam	Montcalm sandy loam	Montcalm sandy loam
Previous crop	Corn	Corn	Clover
Population	20,700	20,500	19,300
Rows	30"	30"	30"
Fertilizer	197-60-60	283-90-90	336-156-156
Irrigation	8 inches	13 inches	12 inches
Soil test: pH	6.7	6.7	6.7
P	362 (very high)	391 (very high)	403 (very high)
K	188 (medium)	174 (medium)	163 (medium)

Farm Cooperator: Theron Comden, Montcalm Experimental Farm, Lakeview

County Extension Director: James Crosby, Stanton

Table 2. Average, highest and lowest yields for corn hybrids irrigated and not irrigated for 11 years, 1968-1978.

Year	No. of hybrids tested	Average		Highest		Lowest	
		Irrigated	Not Irrigated	Irrigated	Not Irrigated	Irrigated	Not Irrigated
1978	73	144	88	186	112	92	61
1977	74	125	73	158	88	89	56
1976	80	156	72	183	93	120	49
1975	75	154	125	207	157	106	80
1974	76	112	103	134	122	65	58
1973	72	114	101	138	120	78	73
1972	72	157	137	206	179	99	91
1971	56	163	28	211	42	91	11
1970	64	144	103	194	128	95	70
1969	63	146	86	185	109	97	56
1968	56	136	96	182	123	92	65
Average		141	92	180	116	93	61

Table 3. Average yield at four plant populations irrigated and not irrigated for 11 years, 1968-1978.

Year	15,100		19,200		23,400		27,400	
	Irrigated	Not Irrigated	Irrigated	Not Irrigated	Irrigated	Not Irrigated	Irrigated	Not Irrigated
1978	146	92	164	110	175	100	165	94
1977	141	74	152	81	160	70	150	69
1976	153	72	174	84	181	81	161	68
1975	158	136	183	164	196	151	172	146
1974	118	100	130	111	135	98	120	94
1973	108	97	134	116	128	106	108	102
1972	152	132	187	159	191	149	161	144
1971	173	37	189	35	191	20	181	11
1970	122	91	144	112	158	93	151	85
1969	126	91	158	109	173	96	148	86
1968	144	114	169	130	193	107	178	89
Average	141	95	162	110	171	98	154	90