THE MECHANICAL HARVEST OF CORN IN RATE OF PLANTING EXPERIMENTS

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by

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TABLE OF CONTENTS

INTRODUCTION

In recent years many farmers have been planting corn thicker in an attempt to increase the yield. Rate of planting experiments in many states have shown that corn yields can be materially increased with stands up to 16,000 or more plants per acre where fertility and moisture conditions are favorable. Ears are smaller and, in some cases, there may be more lodging when stands are increased.

Most experimental results in rate of planting experiments have been obtained from plots harvested by hand in which all the corn was saved and included in the total yield. Since the mechanical corn picker normally leaves some corn in the field, it appeared desirable to determine if the farmer who harvests his corn mechanically, is likely to obtain results similar to those obtained from hand picked plots.

The smaller ears produced at higher rates of planting raises the question, does the mechanical corn picker get these smaller ears? Increased lodging raises the question, does the corn picker harvest these lodged stalks?

The purpose of this study was to determine the effectiveness of mechanical harvest of corn planted at various plant populations per acre.

REVIEW OF LITERATURE

Several states have investigated the effect of plant population on corn yields. Since the results depend so much on the variety of corn, fertility level, moisture conditions, temperature, and other factors, only a few studies are reviewed here.

Rounds, Rossman, Zurakowski and Down (4) conducted rate, method, and date of planting experiments that were hand harvested from 1947 to 1950 in Michigan. Similar tests have given similar results from 1951 to 1953. The ability of a hybrid to give a bigger response to increased planting rate was found to be a varietal characteristic that was not dependent on the maturity or yielding ability of the hybrid. In 1947, 1948, 1949, and 1950, yields were significantly higher as the planting rate was increased. They found that the ear weight decreased as the rate of planting increased, but the loss in ear weight was more than offset by the larger number of ears per acre. In these tests, rate of planting had no consistent effect on stalk lodging. Response to nitrogen side dressing increased as the rate of planting increased on Conover loam that was planted to corn for the third successive year. Nitrogen side dressing had no effect on lodging. Weather was generally favorable for good corn production.

Huber (3) had also found previously that thin stands of corn produce larger ears but lower yields than thicker plantings in Pennsylvania.

In contrast to the Michigan results, Bryan, Eckhardt, and Sprague (2) found that closer spacings of corn plants consistently had more

lodged plants than wider spacings in Iowa.

Relatively little research has been done on mechanical harvest of corn at different plant populations per acre. Smith, Lyness, and Keisselbach (5) conducted a picker test in Nebraska in 1948. They used three rates of planting for their drilled plots and for their check planted plots. For the drilled experiments spacings of 10, 14, and 21 inches between plants were used. For those experiments check planted 2, 3, and 4 plants were planted per hill. Their results showed that there were few consistent differences between rates of planting. They found that when the grain of ear corn reached an essentially air-dry condition in the fall the picker did not shell as much as it did later in the season even though the kernel moisture remained about the same. They reported that the mechanical corn picker operated most efficiently at a kernel moisture content of 20 to 24 percent. Where harvest was delayed losses due to ear dropping, stalk breaking, and shelling by the picker increased after the grain reached 17 to 20 percent moisture.

METHODS AND MATERIALS

Three hybrids and four rates of planting were included in the experiment at five locations. The hybrids were Michigan 350 (90-day relative maturity,) Michigan 480 (105 day,) and Michigan 570 (110 day.) The four rates of planting varied depending on the location. Six experiments were planted; two in Ingham County, and one each in Saginaw, Kent, Kalamazoo, and Monroe counties.

All plots were planted by hand using excess seed and later thinned to the desired stand. The plots varied in size and shape depending on location. Split plot designs with either two or four replications were used. Details for each location are given in Table 1.

In the two experiments conducted on the Michigan State College farm in Ingham County, two of the four replications were side dressed with forty pounds of nitrogen (120 pounds ammonium nitrate) per acre.

Counts for stand, stalk lodging, and root lodging were made just prior to harvest. Stalk lodging refers to the plants broken below the ear. Root lodging refers to the plants leaning at an angle of thirty degrees or more from the vertical. Each experiment was harvested by the cooperator with his corn picker, adjusted by him for picking his corn crop. After harvest the corn from each plot was weighed, and the poorly husked ears and the "clean" ears (those with no husks left on the ears) were counted to determine "cleanness" of picking. All plots were gleaned for ears that the picker missed, and the gleanings were weighed. Two quadrant determinations were made per plot to estimate the amount of

Table 1. Agronomic information for rate of planting experiments conducted at six locations, 1954.

Location	Exp. no.	Cooperator	Plot size and shape	Row width	No. of reps	Soil type	Date planted	Date harvested	Previous crop	Fertilizer	Type of picker
Ingham County	102	M.S.C. East Lansing	1 row 60' 1/242 acre	36"	4	Conover	May 10 and 11	Oct 7	Alfalfa	250 lb. 12-12-12	John Deere one row
Ingham County	106	M.S.C. East Lansing	1 row 60' 1/242 acre	36"	4	Conover	May 18	Oct 18	Red clover	250 lb 12-12-12	John Deere one row
Saginaw County	103	Walter Reinbold, Reese	1 row 60' 1/242 acre	36"	4	Brookston	May 14	Oct 25	Alfalfa	Manure	Oliver one row
Kent County	105	Albert Porritt, Alto	1 row 64' 1/206 acre	40"	2	Fox	May 19	Oct 21	Mammoth clover	225 lb. 4-16-16 manure	International, two row mounted
Kalamazoo County	107	Harry Sweitzer and Lyle Decker, Schoolcraft	1 row 63' 1/218 acre	38"	2	Warsaw	May 17	Oct 22	Wheat and clover	80 lb. 5-20-20	New Idea one row
Monroe County	104	Edward Brodbeck, Ottawa Lake	2 rows 25' 1/299 acre	42"	4	Brookston	May 15	Nov 6	'52 - clover '53 - wheat	400 lb 6-9-18, 250 lb. in row	John Deere two row

Table 1 - continued

Location	Exp. no.	pH	Phosphorus lbs/acre	Potash lbs/acre
Ingham County	102	6.4	67	125
Ingham County	106	7.4	77	104
Saginaw County	103	6.9	106	132
Kent County	105		No soil test	
Kalamazoo County	107	6.3	175	365
Monroe County	104	6.4	40	152

shelled corn left in the field by the picker.

A moisture sample consisting of a one-inch section of cob and grain from ten ears of each plot was taken, weighed in the field, dried in an oven, and weighed again. Moisture percentages reported are those for the ear moisture.

Analyses of variance were made for yield of corn obtained from the picker, gleaned ear corn per acre, and bushels of gleaned shelled corn per acre. All yields are reported as bushels of shelled corn at 15.5 percent moisture per acre.

EXPERIMENTAL RESULTS

Ingham County, Experiment 102

Experiment 102 was conducted on the Michigan State College farm in Ingham County near East Lansing. Two of the four replications were side dressed with 40 pounds of nitrogen the latter part of June. Average yields, bushels per acre of shelled corn at 15.5 percent moisture, harvested with the picker are presented in Table 2. Analysis of variance in Table 3 shows that rate of planting and nitrogen side dressing significantly affected the yield. There were no significant differences due to hybrids.

Yields at the three higher plant populations (approximately 14,700, 19,500 and 22,700) were significantly higher than yields at the lower population (approximately 10,000 plants.) However, there were no significant differences in yield among these three higher populations. The best yields were obtained with about 19,500 plants per acre and side dressed.

There were no significant differences in gleaned ear corn among hybrids, rates, fertilizer, or any of the interactions in Table 4. On the average, the picker left about 5.5 bushels of ears per acre. The average gleanings were 4.5, 3.7, 6.9, and 7.2 bushels per acre for populations of 10,063, 14,742, 19,521, and 22,748 plants per acre respectively. When expressed as percentages of the total yield, the gleanings of ear corn averaged 4.5, 3.3, 5.0, and 5.7 percent for the four plant populations. The picker was effectively harvesting the smaller ears of

Table 2. Average results for three hybrids at four plant populations, with and without nitrogen side dressing, Ingham County, Experiment 102, 1954.

Hybrid	Rate of planting	Total yield bushels per acre	Picker yield bushels per acre	Gleaned ear corn bushels per acre	Percent gleaned ear corn	Gleaned shelled corn bushels p/acre	Percent gleaned shelled corn	Ave. ear wt. picker yield	Ave. ear wt. gl. corn	Percent moisture in ears	Percent stalk lodging	Percent root lodging	Percent erect plants	Percent "clean" ears	Percent "dirty" ears
Mich. 350 (1)	9,680	93.6	86.2	6.4	6.8	1.0	1.1	.72	.57	22.0	16.2	.0	83.8	62.2	37.8
Mich. 350 (1)	10,043*	102.2	98.3	3.0	2.9	.9	.9	.89	.50	27.1	8.4	1.2	90.4	60.8	39.2
Mich. 350 (2)	14,762	86.6	79.7	5.6	6.5	1.3	1.5	.37	.43	23.6	30.3	.8	68.9	62.8	37.2
Mich. 350 (2)	14,399*	127.3	118.6	3.0	2.4	5.7	4.5	.73	.40	26.1	15.9	9.2	74.9	66.9	33.1
Mich. 350 (3)	19,602	129.4	120.2	7.3	5.6	1.9	1.5	.55	.45	22.2	32.7	1.2	66.1	58.1	41.9
Mich. 350 (3)	19,481*	140.3	124.1	4.0	2.9	12.2	8.7	.54	.41	25.1	36.0	3.7	60.3	62.8	37.2
Mich. 350 (4)	21,417	92.5	85.6	3.3	3.6	3.6	3.9	.35	.37	26.5	38.4	1.1	60.5	68.6	31.4
Mich. 350 (4)	22,627*	139.3	118.7	15.2	10.9	5.4	3.9	.53	.40	30.0	46.5	.5	53.0	73.3	26.7
Mich. 480 (1)	10,164	105.0	99.4	4.4	4.2	1.2	1.1	.77	.60	29.0	11.9	.0	88.1	34.1	65.9
Mich. 480 (1)	10,285*	95.6	92.1	2.9	3.0	.6	.6	.68	.66	29.0	8.2	.0	91.8	63.4	36.6
Mich. 480 (2)	15,004	125.4	122.1	1.5	1.2	1.8	1.4	.63	.50	27.6	20.9	.0	79.1	64.7	35.3
Mich. 480 (2)	15,609*	148.5	141.2	5.1	3.4	2.2	1.5	.81	.70	31.2	14.7	2.3	83.0	45.9	54.1
Mich. 480 (3)	19,723	142.1	134.2	6.7	4.7	1.2	.8	.67	.50	29.0	31.9	.6	67.5	61.6	38.4
Mich. 480 (3)	20,207*	136.7	127.6	5.1	3.7	4.0	2.9	.60	.70	30.6	29.9	2.3	67.8	59.4	40.6
Mich. 480 (4)	23,716	125.5	111.9	11.6	9.2	2.0	1.6	.50	.34	29.3	52.0	.0	48.0	65.9	34.1
Mich. 480 (4)	23,716*	150.1	139.3	4.5	3.0	6.3	4.2	.52	.37	27.1	26.2	9.5	64.3	68.3	31.7
Mich. 570 (1)	10,043	95.7	87.6	7.2	7.5	.9	.9	.65	.55	29.7	8.4	3.6	88.0	59.2	40.8
Mich. 570 (1)	10,164*	109.5	105.3	2.8	2.6	1.4	1.3	.75	.50	31.7	14.2	3.5	82.3	71.0	29.0
Mich. 570 (2)	13,673	92.0	86.4	2.2	2.4	3.4	3.7	.56	.50	31.2	18.5	.0	81.5	67.8	32.2
Mich. 570 (2)	15,004*	126.3	119.8	4.9	3.9	1.6	1.3	.69	.70	33.3	16.1	6.4	77.5	55.6	44.4
Mich. 570 (3)	18,876	120.4	108.9	8.4	7.0	3.1	2.6	.55	.37	31.2	32.6	3.2	64.2	70.2	29.8
Mich. 570 (3)	19,239*	154.5	140.3	9.4	6.1	4.8	3.1	.68	.46	30.3	26.4	3.7	69.9	80.0	20.0
Mich. 570 (4)	22,506	107.4	100.7	3.6	3.4	3.1	2.9	.46	.35	31.5	50.0	6.9	43.1	71.8	28.2
Mich. 570 (4)	22,506*	136.9	127.5	5.0	3.7	4.4	3.2	.54	.58	32.5	39.7	6.9	53.4	76.4	23.6
Grand ave.	16,597	109.6	101.9	5.7	5.2	2.0	1.9	.56	.46	28.1	28.7	1.5	69.8	62.3	37.7
Grand ave.	16,940*	130.6	121.1	5.4	4.0	4.1	3.0	.66	.53	29.5	23.5	4.1	72.4	65.3	34.7
Average (1)	9,962	98.1	91.1	6.0	6.2	1.0	1.0	.71	.57	26.9	12.2	1.2	86.6	51.8	48.2
Average (1)	10,164*	102.5	98.6	2.9	2.8	1.0	.9	.77	.55	29.3	10.3	1.6	88.1	65.1	34.9
Total ave. (1)	10,063	100.3	94.9	4.4	4.5	1.0	1.0	.74	.56	28.1	11.3	1.4	87.3	58.4	41.6
Average (2)	14,480	101.4	96.1	3.1	3.4	2.2	2.2	.52	.48	27.5	23.2	.3	76.5	65.1	34.9
Average (2)	15,004*	134.0	126.5	4.3	3.2	3.2	2.4	.74	.60	30.2	15.6	6.0	78.4	56.1	43.9
Total ave. (2)	14,742	117.7	111.3	3.7	3.3	2.7	2.3	.63	.54	28.9	19.4	3.1	77.5	60.6	39.4
Average (3)	19,400	130.7	121.1	7.5	5.8	2.1	1.6	.59	.44	27.5	32.4	1.7	65.9	63.3	36.7
Average (3)	19,642*	143.9	130.7	6.2	4.2	7.0	4.9	.61	.52	28.7	30.8	3.2	66.0	67.4	32.6
Total ave. (3)	19,521	137.3	125.9	6.9	5.0	4.5	3.3	.60	.48	28.1	31.6	2.5	65.9	65.4	34.6
Average (4)	22,546	108.5	99.4	6.2	5.4	2.9	2.8	.44	.35	29.1	46.8	2.7	50.5	68.7	31.3
Average (4)	22,950*	142.1	128.5	8.2	5.9	5.4	3.8	.53	.45	29.9	37.5	5.6	56.9	72.8	27.2
Total ave. (4)	22,748	125.3	114.0	7.2	5.7	4.1	3.3	.49	.40	29.5	42.2	4.2	53.6	70.7	29.3
350 ave.	16,365	100.6	92.9	5.7	5.6	2.0	2.0	.50	.46	23.6	29.4	.8	69.8	62.9	37.1
350 ave.	16,638*	127.3	114.9	6.3	4.8	6.1	4.5	.67	.43	27.1	26.7	3.7	69.6	66.0	34.0
Total ave.	16,502	114.0	103.9	6.0	5.2	4.1	3.3	.59	.45	25.4	28.1	2.2	69.7	64.4	35.6
480 ave.	17,152	124.6	116.9	6.1	4.8	1.6	1.2	.64	.49	28.7	29.2	.2	70.6	56.5	43.5
480 ave.	17,454*	132.8	125.1	4.4	3.3	3.3	2.3	.65	.61	29.5	19.8	3.5	76.7	59.3	40.7
Total ave.	17,303	128.7	120.9	5.3	4.1	2.5	1.8	.65	.55	29.1	24.5	1.9	73.6	57.9	42.1
570 ave.	16,275	103.9	95.9	5.4	5.1	2.6	2.5	.56	.44	30.9	27.4	3.4	69.2	67.3	32.7
570 ave.	16,728*	131.8	123.2	5.5	4.1	3.1	2.2	.67	.56	32.0	24.1	5.1	70.8	70.7	29.3
Total ave.	16,502	117.8	109.6	5.6	4.6	2.6	2.4	.62	.50	31.5	25.7	4.3	70.0	69.0	31.0

* Side dressed with 40 lbs. nitrogen.

Table 3. Average picker yield per acre and analysis of variance, Ingham County, Experiment 102, 1954.

Rate of planting	No nitrogen side dressing				Side dressed with nitrogen				Grand average/2
	Hybrid			Average	Hybrid			Average	
	350	480	570		350	480	570		
10,063	86.2	99.4	87.6	91.1	98.3	92.1	105.3	98.6	94.9
14,742	79.7	122.1	86.4	96.1	118.6	141.2	119.8	126.5	111.3
19,521	120.2	134.2	108.9	121.1	124.1	127.6	140.3	130.7	125.9
22,748	85.6	111.9	100.7	99.4	118.7	139.3	127.5	128.5	114.0
Ave.	92.9	116.9	95.9		114.9	125.1	123.2		
	Grand ave. 101.9/1				Grand ave. 121.1/1				

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	29,373.0		
Hybrids	2	2,410.4	1,205.2	2.29
Rate of planting	3	5,874.9	1,958.3	3.73*
Fertilizer	1	4,398.7	4,398.7	8.38**
Hybrids x rates	6	1,417.4	236.2	
Hybrids x fertilizer	3	797.1	398.6	
Rates x fertilizer	3	1,355.9	452.0	
Rates x fert. x hyb.	6	534.9	89.2	
Error	24	12,583.7	524.3	

/1 LSD for fertilizer = 13.6 bu.
/2 LSD for rate of planting = 19.2 bu.

Table 4. Average bushels of ear corn per acre left in the field by the picker and analysis of variance, Ingham County, Experiment 102, 1954.

Rate of planting	No nitrogen side dressing				Side dressed with nitrogen				Grand average
	Hybrid			Average	Hybrid			Average	
	350	480	570		350	480	570		
10,063	6.4	4.4	7.2	6.0	3.0	2.9	2.8	2.9	4.5
14,742	5.5	.8	2.1	2.8	3.0	4.9	4.8	4.3	3.6
19,521	7.2	6.6	8.4	7.4	3.9	5.0	9.3	6.1	6.8
22,748	4.5	11.6	3.5	6.5	15.0	4.5	4.9	8.1	7.3

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	997.0		
Hybrids	2	8.4	4.2	
Rate of planting	3	117.5	39.2	1.75
Fertilizer	1	1.4	1.4	
Hybrids x rates	6	92.2	15.4	
Hybrids x fertilizer	2	8.1	4.0	
Rates x fertilizer	3	46.1	15.4	
Rates x fert. x hyb.	6	184.4	30.7	1.37
Error	24	538.9	22.5	

the higher populations as well as the larger ears of the lower populations.

Gleanings of shelled corn left in the field by the picker were significantly larger at the higher plant populations and when side dressed with nitrogen, Table 5. Average bushels of shelled corn on the ground were 1.0, 2.7, 4.1, and 4.2 for the four populations respectively. The increase in bushels of shelled corn gleanings was largely a result of higher yields from the higher populations and nitrogen side dressing. When expressed as percentage of total yield, the shelled corn gleanings were 1.0, 2.3, 3.3, and 3.3 percent for the four plant populations. The differences among the three higher populations were not significant.

Differences in amount of shelled corn gleanings among the three hybrids were not significant. The early maturing hybrid, Michigan 350, did not have any higher shelled corn gleanings than the later maturing hybrids, Michigan 480 and 570.

Ear weight decreased as the planting rate increased. Average ear weight was .74, .63, .60, and .49 pounds for the four populations. Average ear weight tended to be higher when the corn was side dressed. The average weight of gleaned ears left by the picker tended to be smaller than the average ear weight harvested by the picker.

There was an increase in the amount of stalk lodging with an increase in the rate of planting. There was little difference between Michigan 350, 480, and 570 in the amount of stalk lodging. There was consistently less stalk lodging for all hybrids and rates of planting when side dressed with nitrogen. For the entire experiment, there was an average of 26.1 percent stalk breakage below the ear. The average

Table 5. Average bushels of shelled corn per acre on ground and analysis of variance, Ingham County, Experiment 102, 1954.

Rate of planting	No nitrogen side dressing				Side dressed with nitrogen				Grand average/2
	Hybrid			Average	Hybrid			Average	
	350	480	570		350	480	570		
10,063	1.1	1.2	.9	1.0	.8	.5	1.4	.9	1.0
14,742	1.3	1.9	3.1	2.1	5.7	2.1	1.6	3.2	2.6
19,521	1.9	1.1	3.2	2.0	11.2	4.0	3.5	6.2	4.1
22,748	3.6	2.0	3.2	2.9	5.4	6.1	4.3	5.3	4.1
Average	2.0	1.6	2.6		5.8	3.2	2.7		
	Grand ave.		2.0/1		Grand ave.		3.9/1		

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	410.6		
Hybrids	2	20.5	10.2	
Rate of planting	3	81.2	27.1	4.40*
Fertilizer	1	42.3	42.3	6.87*
Hybrids x rates	6	21.3	3.5	
Hybrids x fertilizer	2	27.8	13.9	
Rates x fertilizer	3	31.4	10.5	
Rates x fert. x hyb.	6	38.5	6.4	
Error	24	147.7	6.2	

/1 LSD for fertilizer = 1.5 bu.
/2 LSD for rate of planting = 2.1 bu.

of gleaned ears was only 4.6 percent indicating that the picker harvested most of the ears on the broken stalks.

The amount of root lodging was small, averaging 2.8 percent for the experiment. There was no consistent increase in the amount of root lodging with increases in rate of planting.

There appeared to be a slight increase in the percent of "clean" ears harvested as the rate of planting increased. The smaller ears from the thicker plantings were being picked as free of husk as the larger ears from the thinner plantings.

Ingham County, Experiment 106

Experiment 106 was also conducted on the Michigan State College farm in a different field about a quarter of a mile west of Experiment 102. Corn in two of the four replications was side dressed with nitrogen. The results for this experiment are presented in Table 6. Differences between hybrids were highly significant, Table 7. Michigan 480 and 570 yielded more than Michigan 350. Yields were significantly lower when side dressed. There was a trend toward higher yields at the 19,500 population but the effect of rate of planting in this experiment was not statistically significant.

The soil in this field was lighter in texture than the field for Experiment 102. It was planted eight days later and the plants showed considerable "firing" late in the growing season, much more than Experiment 102.

Average bushels of ear corn gleaned per acre were 3.31, 4.35, 6.50, and 8.96 for populations of 10,023, 14,742, 19,542, and 24,160 plants per acre, Table 8. There was a significant trend toward more bushels of gleaned ear corn at the higher plant populations. In percentage of the total yield, the gleaned ear corn averages were 3.7, 3.9, 6.3, and 9.1 percent for the four populations respectively. Rate of planting did not significantly affect picker yields, Table 7. In contrast to Experiment 102 where there was no difference in gleaned ear corn, Experiment 106 did show an increase in gleaned ear corn at the higher planting rates where ear size was smaller. Rate of planting significantly increased picker yields in Experiment 102 while there were no significant differences in picker yields for Experiment 106. Average ear weight tended to

Table 6. Average results for three hybrids at four plant populations, with and without nitrogen side dressing, Ingham County, Experiment 106, 1954.

Hybrid	Rate of planting	Total yield bushels per acre	Picker yield bushels per acre	Gleaned ear corn bushels per acre	Percent gleaned ear corn	Gleaned shelled corn bushels p/acre	Percent gleaned shelled corn	Ave. ear wt. picker yield	Ave. ear wt. gl. corn	Percent moisture in ears	Percent stalk lodging	Percent root lodging	Percent erect plants	Percent "clean" ears	Percent "dirty" ears
Mich. 350 (1)	9,922	81.8	77.4	3.9	4.7	.5	.6	.62	.60	21.2	6.0	1.2	92.8	66.3	33.7
Mich. 350 (1)	10,043*	78.1	74.8	2.8	3.6	.5	.6	.58	.60	21.7	10.8	.0	89.2	62.5	37.5
Mich. 350 (2)	14,278	82.4	73.7	7.1	8.6	1.6	1.9	.43	.37	20.8	19.4	4.2	76.4	65.7	34.3
Mich. 350 (2)	14,762*	83.7	78.3	4.3	5.1	1.1	1.3	.44	.36	19.8	33.6	.8	65.6	62.9	37.1
Mich. 350 (3)	19,239	99.5	88.6	6.4	6.4	4.5	4.5	.42	.43	22.3	25.7	1.2	73.1	55.4	44.6
Mich. 350 (3)	19,481*	81.9	76.7	3.5	4.3	1.7	2.1	.38	.28	21.4	37.8	1.2	61.0	71.4	28.6
Mich. 350 (4)	23,595	84.4	64.3	10.4	12.3	9.7	11.5	.33	.31	22.8	48.7	3.5	47.8	68.0	32.0
Mich. 350 (4)	24,200*	86.7	74.6	8.5	9.8	3.6	4.2	.35	.33	22.8	43.0	1.0	56.0	62.5	37.5
Mich. 480 (1)	10,164	104.3	102.3	.6	.6	1.4	1.3	.73	.40	25.0	.0	.0	100.0	44.5	55.5
Mich. 480 (1)	9,801*	86.3	82.0	3.7	4.3	.6	.7	.73	.63	30.8	4.9	.0	95.1	41.3	58.7
Mich. 480 (2)	14,883	111.2	105.2	4.3	3.9	1.7	1.5	.60	.47	24.4	11.3	.0	88.7	49.5	50.5
Mich. 480 (2)	14,883*	87.1	81.1	3.8	4.4	2.2	2.5	.50	.32	23.6	30.0	.8	69.2	62.2	37.8
Mich. 480 (3)	19,602	128.1	115.6	11.3	8.8	1.2	.9	.54	.44	25.1	17.9	1.2	80.9	53.9	46.1
Mich. 480 (3)	19,118*	94.1	82.0	9.9	10.5	2.2	2.3	.49	.41	26.7	42.4	.6	57.0	63.4	36.6
Mich. 480 (4)	24,563	102.0	89.4	10.6	10.4	2.0	2.0	.39	.34	23.6	41.3	1.9	56.8	64.8	35.2
Mich. 480 (4)	24,926*	102.5	87.3	8.5	8.3	6.7	6.5	.39	.31	25.4	48.5	1.4	50.1	57.6	42.4
Mich. 570 (1)	10,043	107.1	103.8	3.0	2.8	.3	.3	.71	1.00	26.1	3.6	.0	96.4	53.4	46.6
Mich. 570 (1)	10,164*	95.0	88.7	5.9	6.2	.4	.4	.70	.50	27.7	11.9	7.1	81.0	52.4	47.6
Mich. 570 (2)	14,883	127.6	122.0	3.7	2.9	1.9	1.5	.65	.48	25.5	8.9	.0	91.1	63.7	36.3
Mich. 570 (2)	14,762*	94.7	87.3	4.2	4.4	3.2	3.4	.52	.39	26.0	25.4	7.3	67.3	71.2	28.8
Mich. 570 (3)	19,965	148.1	144.2	2.9	2.0	1.0	.7	.66	.48	28.4	17.5	3.0	79.5	52.3	47.7
Mich. 570 (3)	19,844*	98.8	90.4	5.9	6.0	2.5	2.5	.49	.33	27.5	35.3	3.0	61.7	72.8	27.2
Mich. 570 (4)	23,353	107.7	92.8	7.0	6.5	7.9	7.3	.45	.40	28.4	38.8	3.6	57.6	68.4	31.6
Mich. 570 (4)	24,321*	124.1	111.0	9.1	7.3	4.0	3.2	.48	.41	28.5	35.8	2.9	61.3	66.8	33.2
Grand ave.	17,040	107.0	98.3	5.9	5.8	2.8	2.8	.54	.48	24.5	19.9	1.7	78.4	58.8	41.2
Grand ave.	17,192*	92.7	84.5	5.8	6.2	2.4	2.5	.50	.41	25.2	30.0	2.2	67.8	62.3	37.7
Average (1)	10,043	97.7	94.5	2.5	2.7	.7	.7	.69	.67	24.1	3.2	.4	96.4	54.7	45.3
Average (1)	10,003*	86.4	81.8	4.1	4.7	.5	.6	.67	.58	26.7	9.2	2.4	88.4	52.1	47.9
Total ave. (1)	10,023	92.1	88.2	3.3	3.7	.6	.7	.68	.63	25.4	6.2	1.4	92.4	53.4	46.6
Average (2)	14,682	107.0	100.3	5.0	5.1	1.7	1.6	.56	.44	23.6	13.2	1.4	85.4	59.6	40.4
Average (2)	14,802*	88.5	82.2	4.1	4.6	2.2	2.4	.49	.36	23.1	29.7	3.0	67.3	65.5	34.5
Total ave. (2)	14,742	97.8	91.2	4.6	3.9	2.0	2.0	.53	.40	23.4	21.5	2.2	76.3	62.5	37.5
Average (3)	19,602	125.2	116.1	6.9	5.7	2.2	2.0	.54	.45	25.3	20.4	1.8	77.8	53.9	46.1
Average (3)	19,481*	91.5	83.0	6.4	6.9	2.1	2.3	.45	.34	25.2	38.5	1.6	59.9	69.2	30.8
Total ave. (3)	19,542	108.4	99.5	6.7	6.3	2.2	2.2	.50	.40	25.3	29.5	1.7	68.8	61.5	38.5
Average (4)	23,837	98.0	82.2	9.3	9.7	6.5	6.9	.39	.35	24.9	42.9	3.0	54.1	67.1	32.9
Average (4)	24,482*	104.5	91.0	8.7	8.5	4.8	4.6	.41	.35	25.6	42.4	1.8	55.8	62.2	37.8
Total ave. (4)	24,160	101.3	86.6	9.0	9.1	5.7	5.8	.40	.35	25.3	42.6	2.4	55.0	64.7	35.3
350 ave.	16,759	87.1	76.0	7.0	8.0	4.1	4.6	.45	.43	21.8	25.0	2.5	72.5	63.8	36.2
350 ave.	17,122*	82.6	76.1	4.8	5.7	1.7	2.1	.44	.39	21.4	31.2	.8	68.0	64.9	35.1
Total ave.	16,941	84.9	76.1	5.9	6.9	2.9	3.4	.45	.41	21.6	28.1	1.7	70.2	64.3	35.7
460 ave.	17,303	111.4	103.1	6.7	5.9	1.6	1.4	.57	.41	24.5	17.6	.8	81.6	53.3	46.7
480 ave.	17,182*	92.5	83.1	6.5	6.9	2.9	3.0	.52	.42	26.6	31.5	.7	67.8	56.1	43.9
Total ave.	17,243	102.0	93.1	6.6	6.4	2.3	2.2	.55	.42	25.6	24.5	.8	74.7	54.6	45.4
570 ave.	17,061	122.7	115.7	4.2	3.6	2.8	2.5	.62	.59	27.1	17.2	1.7	81.1	59.5	40.5
570 ave.	17,273*	103.2	94.4	6.3	6.0	2.5	2.4	.55	.41	27.4	27.1	5.1	67.8	65.8	34.2
Total ave.	17,167	113.0	105.0	5.3	4.8	2.7	2.5	.59	.50	27.3	22.2	3.4	74.4	62.6	37.4

* Side dressed with 40 lbs. nitrogen.

Table 7

Rate of planting
[illegible]
[illegible]
[illegible]
[illegible]
Ave. [illegible]

Source of variation
Total
Hybrids
Rate of pl[illegible]
Fertilizer
Hybrids x r[illegible]
Hybrids x f[illegible]
Rates x fer[illegible]
Rates x fer[illegible]
Error

[illegible] LSD for [illegible]
[illegible] LSD for [illegible]

Table 7. Average picker yield per acre and analysis of variance, Ingham County, Experiment 106, 1954.

Rate of planting	No nitrogen side dressing				Side dressed with nitrogen				Grand average
	Hybrid			Average	Hybrid			Average	
	350	480	570		350	480	570		
10,023	77.4	102.3	108.8	96.2	74.8	82.0	88.7	81.8	89.0
14,742	73.7	105.2	122.0	100.3	78.3	81.1	87.3	82.2	91.3
19,542	88.6	115.6	144.2	116.1	76.7	82.0	90.4	83.0	99.6
24,160	64.3	89.4	92.8	82.2	74.6	87.3	111.0	91.0	86.6
Ave./2	76.0	103.1	117.0		76.1	83.1	94.4		
	Grand average 98.7/1				Grand average 84.5/1				

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	25,903.0		
Hybrids	2	7,052.1	3,526.1	8.3**
Rate of planting	3	1,150.6	383.5	
Fertilizer	1	2,414.0	2,414.0	5.7**
Hybrids x rates	6	215.3	35.9	
Hybrids x fertilizer	2	1,237.0	618.5	1.4
Rates x fertilizer	3	2,703.9	901.3	2.1
Rates x fert. x hyb.	6	889.2	148.2	
Error	24	10,240.9	426.7	

/1 LSD for fertilizer = 12.2 bu.
/2 LSD for hybrids = 15.0 bu.

Table 8. Average bushels of ear corn per acre left in field by picker and analysis of variance, Ingham County, Experiment 106, 1954.

Rate of planting	No nitrogen side dressing				Side dressed with nitrogen				Grand average/1
	Hybrid			Average	Hybrid			Average	
	350	480	570		350	480	570		
10,023	3.9	4.5	3.0	3.8	2.9	3.5	6.0	4.1	4.0
14,742	7.1	4.4	3.7	5.1	4.1	3.3	4.1	2.8	4.0
19,542	6.2	11.3	2.8	6.8	3.4	9.9	6.0	6.4	6.6
24,160	10.4	10.5	7.1	9.3	8.4	8.6	8.9	8.6	9.0
Ave.	6.9	7.7	4.2		4.7	6.3	6.2		
	Grand ave.			6.3	Grand ave.			5.7	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	701.6		
Hybrids	2	14.3	7.1	
Rate of planting	3	224.1	74.7	6.09**
Fertilizer	1	.3	.3	
Hybrids x rates	6	109.2	18.2	1.48
Hybrids x fertilizer	2	37.4	18.7	1.53
Rates x fertilizer	3	13.7	4.6	
Rates x fert. x hyb.	6	8.3	1.4	
Error	24	294.3	12.3	

/1 LSD for rate of planting = 2.9 bu.

be slightly lower in Experiment 106.

Average bushels per acre of gleaned shelled corn were .6, 2.0, 2.2, and 5.7 for the four planting rates, Table 9. Shelled corn gleanings were significantly higher for the 24,160 plant rate than for the other three populations. In percentage of total yield, the losses were .7, 2.0, 2.2, and 5.8 percent respectively. As in Experiment 102, the thicker plantings tended to have slightly more shelled corn gleanings than the thinner planting.

In most cases, the average weight per gleaned ear was smaller than the average ear weight for harvested ears.

The percentage of stalk lodging increased with the higher rates of planting and tended to be higher where plots were side dressed. The average stalk lodging for the entire experiment was 25.0 percent. The amount of root lodging was small, averaging only 2.0 percent, and was not affected consistently by any of the treatments. As in Experiment 102, picker losses did not appear to be affected to any appreciable extent by the amount of stalk lodging or root lodging.

The average percentages of "clean" picked ears for the three higher planting rates were higher than the average for the lower rate, as in Experiment 102, showing that ears from thicker stands were picked as "clean" or cleaner than those from thinner stands.

For both experiments, the variety differences were small and inconsistent for such characteristics as gleaned ears, gleaned shelled corn, and "cleanness" of picking showing that the early maturing hybrid was harvested as effectively and cleanly as the later maturing hybrids.

Both experiments were picked by the same operator with the same

Table 9. Average bushels of shelled corn per acre on ground and analysis of variance, Ingham County, Experiment 106, 1954.

Rate of planting	No nitrogen side dressing				Side dressed with nitrogen				Grand average/1
	Hybrid			Average	Hybrid			Average	
	350	480	570		350	480	570		
10,023	.5	1.4	.3	.7	.6	.6	.4	.5	.6
14,742	1.6	1.8	3.2	2.2	1.2	2.2	3.2	2.2	2.2
19,542	4.5	1.2	1.0	2.2	1.7	2.2	2.6	2.2	2.2
24,160	9.7	2.0	7.9	6.5	3.7	6.8	4.0	4.8	5.7
Ave.	4.1	1.6	3.1		1.8	3.0	2.6		
	Grand ave.			2.9	Grand ave.			2.4	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	471.7		
Hybrids	2	4.1	2.0	
Rate of planting	3	163.8	54.6	6.67**
Fertilizer	1	3.4	3.4	
Hybrids x rates	6	19.9	3.3	
Hybrids x fertilizer	2	27.1	13.6	1.66
Rates x fertilizer	3	6.2	3.1	
Rates x fert. x hyb.	6	51.1	8.5	1.04
Error	24	196.3	8.2	

/1 LSD for rate of planting = 2.4 bu.

John Deere one-row picker. Experiment 106 was planted eight days later and harvested eleven days later than Experiment 102. The quality of harvest in terms of gleaned corn and "cleanness" of picking were very similar in both experiments.

Saginaw County, Experiment 103

Experiment 103, Table 10, was conducted in Saginaw County near Reese on the farm of Walter Reinbold. There was no nitrogen side dressing on this experiment. There were significant differences in picker yields among the three hybrids, but there were no significant differences due to rates of planting.

Corn yields at this location were reduced because of dry weather conditions. The average yield for the experiment was 76.7 bushels per acre from the picker. Yields have averaged well over 100 bushels per acre in experiments conducted on this farm during the previous six years when rainfall was more adequate. Similar rate of planting experiments on this farm during the previous five years showed marked increases in corn yields as stand was increased up to about 20,000 plants per acre. While there was no increase in yield at the thicker stands, it is very significant that there was no decrease in yield with the thicker planting. If moisture had been more plentiful, it is very likely that yields would have increased at the higher plant populations.

The operator and the picker did a very good job of harvesting at this location. The average gleaned ear corn was only 1.2 bushels or 1.5 percent of the total yield. Average gleaned shelled corn was 3.5 bushels or 4.4 percent of the total, and ears were picked 92.4 percent clean.

Gleaned ear corn was not affected significantly by any of the treatments, Table 12. There was significantly more gleaned shelled corn with 22,683 plants per acre than with the other three populations. Differences in gleaned shelled corn with 10,446, 14,366, and 18,093 plants per acre were not significant.

Table 10. Average results for three hybrids at four plant populations, Saginaw County, Experiment 103, 1954.

Hybrid	Rate of planting	Total yield bushels per acre	Picker yield bushels per acre	Gleaned ear corn bushels per acre	Percent gleaned ear corn	Gleaned shelled corn bushels p/acre	Percent gleaned shelled corn	Ave. ear wt. picker yield	Ave. ear wt. gl. corn	Percent moisture in ears	Percent stalk lodging	Percent root lodging	Percent erect plants	Percent "clean" ears	Percent "dirty" ears
Mich. 350 (1)	10,285	71.5	68.8	.9	1.3	1.8	2.5	.48	.55	18.2	5.8	.6	93.6	90.0	10.0
Mich. 350 (2)	13,866	74.9	70.0	1.6	2.1	3.3	4.4	.42	.29	20.0	17.9	.0	82.1	98.5	1.5
Mich. 350 (3)	17,182	76.5	70.7	3.0	3.9	2.8	3.7	.34	.30	19.3	29.5	.7	69.8	92.9	7.1
Mich. 350 (4)	21,780	68.7	61.1	.9	1.3	6.7	9.8	.28	.30	26.6	26.1	1.1	72.8	95.5	4.5
Mich. 480 (1)	11,011	76.5	74.5	.5	.7	1.5	2.0	.52	.70	24.7	1.1	.0	98.9	89.4	10.6
Mich. 480 (2)	15,246	83.9	80.1	.7	.8	3.1	3.7	.45	.30	23.8	9.9	.0	90.1	89.1	10.9
Mich. 480 (3)	18,271	83.8	78.7	1.6	1.9	3.5	4.2	.39	.40	24.2	15.8	.7	83.5	86.1	13.9
Mich. 480 (4)	22,554	78.7	72.4	1.5	1.9	4.8	6.1	.32	.24	22.8	20.9	2.7	76.4	93.5	6.5
Mich. 570 (1)	10,043	88.4	85.3	.4	.5	2.7	3.1	.64	.50	27.1	.6	.0	99.4	93.8	6.2
Mich. 570 (2)	13,987	86.2	83.6	.3	.3	2.3	2.7	.51	.40	27.6	5.2	2.2	92.6	93.3	6.7
Mich. 570 (3)	18,827	90.1	86.5	1.0	1.1	2.6	2.9	.41	.33	27.2	13.2	1.3	85.5	93.5	6.5
Mich. 570 (4)	23,716	98.1	89.1	1.7	1.7	7.3	7.4	.36	.23	28.0	15.8	2.3	81.9	94.3	5.7
Grand ave.	16,397	81.4	76.7	1.2	1.5	3.5	4.4	.43	.38	24.1	13.4	1.0	85.6	92.4	7.6
Average (1)	10,446	78.8	76.2	.6	.8	2.0	2.5	.55	.58	23.3	2.5	.2	97.3	91.1	8.9
Average (2)	14,366	81.7	77.9	.9	1.1	2.9	3.6	.46	.33	23.8	11.0	.7	88.3	93.6	6.4
Average (3)	18,093	83.5	78.6	1.9	2.3	3.0	3.6	.38	.34	23.6	19.5	.9	79.6	90.9	9.1
Average (4)	22,683	81.9	74.2	1.4	1.6	6.3	7.8	.32	.26	25.8	20.9	2.1	77.0	94.4	5.6
350 Ave.	15,778	73.0	67.7	1.6	2.2	3.7	5.1	.38	.36	21.0	19.8	.6	79.6	94.3	5.7
480 Ave.	16,771	80.7	76.4	1.1	1.3	3.2	4.0	.42	.41	23.9	11.9	.9	87.2	89.5	10.5
570 Ave.	16,643	90.7	86.1	.9	.9	3.7	4.0	.48	.37	27.5	8.7	1.5	89.8	93.7	6.3

Table 11. Average picker yield per acre and analysis of variance, Saginaw County, Experiment 103, 1954.

Rate of planting	Hybrid			Average
	350	480	570	
10,446	68.8	74.5	85.3	76.2
14,366	69.9	80.0	83.6	77.8
18,093	70.7	78.7	86.5	78.6
22,683	61.1	72.4	89.1	74.2
Ave./1	67.6	76.4	86.1	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	8,974.7		
Hybrids	2	2,734.7	1,367.4	17.1**
Rate of planting	3	140.0	46.7	
Replications	3	3,150.4	1,050.1	13.2**
Hybrids x rates	6	314.9	52.5	
Error	33	2,634.7	79.8	

/1 LSD for hybrids = 6.3 bu.

Table 12. Average bushels per acre of gleaned ear corn and analysis of variance, Saginaw County, Experiment 103, 1954.

Rate of planting	Hybrid			Average
	350	480	570	
10,446	.9	.5	.4	.6
14,366	1.7	.7	.3	.9
18,093	3.0	1.6	1.0	1.9
22,683	.9	1.5	1.7	1.4
Ave.	1.6	1.1	.9	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	119.8		
Hybrids	2	5.1	2.5	.96
Rate of planting	3	10.5	3.5	1.33
Replications	3	8.1	2.7	1.00
Hybrids x rates	6	9.3	1.6	.59
Error	33	86.9	2.6	

Table 13. Average bushels of shelled corn per acre on ground and analysis of variance, Saginaw County, Experiment 103, 1954.

Rate of planting	Hybrid			Average/1
	350	480	570	
10,446	1.8	5.8	2.6	3.4
14,366	3.2	3.1	2.5	2.9
18,093	2.9	3.5	2.5	3.0
22,683	6.7	4.8	7.3	6.3
Ave.	3.6	4.3	3.8	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	528.8		
Hybrids	2	3.9	2.0	
Rate of planting	3	91.7	30.6	3.07*
Replications	3	56.5	18.8	1.89
Hybrids x rates	6	47.7	7.9	
Error	33	329.0	10.0	

/1 LSD for rate of planting = 2.3 bu.

The picker harvested the small ears averaging only .32 pounds per ear as effectively as the larger ears. As in the previous experiments, the gleaned ears were slightly smaller in size than the harvested ears.

Stalk lodging increased as rate of planting increased. The experiment averaged 13.5 percent broken stalks. Root lodging percentages were very low and of no significance. Again, lodging did not seem to cause any appreciable loss of corn in harvest. Also, there was no evidence that thicker stands contributed to the percentage of "dirty" ears (those enclosed in husks) in harvest. Small ears were picked as "clean" as large ears.

Monroe County, Experiment 104

This experiment was conducted in Monroe County near Ottawa Lake on the farm of Edward Brodbeck. The results are presented in Table 14. The picker yield analysis, Table 15, shows that hybrids were the only significant factor affecting yield. Michigan 570 yielded more than the 480 or 350, while Michigan 480 yielded more than 350.

The average picker yield for this experiment was 69.8 bushels. Prolonged dry weather was a factor in failure to obtain significant increases in yield from the thicker plantings. Again, it is encouraging that the thicker stands did not lead to any decrease in yield. With adequate moisture, it is likely that yields would have increased at some of the higher populations.

The amount of gleaned ear corn was low, averaging 2.9 bushels or 3.5 percent of the total yield. Rates of planting and hybrids significantly affected the amount of gleaned ear corn. Bushels of gleaned ear corn per acre averaged .95, 3.08, 3.71, and 3.63 for populations of 11,463, 15,294, 18,844, and 21,264 plants per acre respectively. The three higher rates had more gleaned ear corn than the lower rate. The losses were 1.0, 3.1, 3.7, and 3.6 percent of the total yield for the four rates of planting respectively.

Analysis for shelled corn left in the field, Table 17, shows that there was no significance between the amount of gleaned shelled corn for any of the treatments. Shelled corn losses were high, averaging 8.8 bushels per acre or 10.9 percent of the total yield.

Size of harvested ears decreased with increases in rate of planting.

Table 14. Average results for three hybrids at four plant populations, Monroe County, Experiment 104, 1954.

Hybrid	Rate of planting	Total yield bushels per acre	Picker yield bushels per acre	Gleaned ear corn bushels per acre	Percent gleaned ear corn	Gleaned shelled corn bushels p/acre	Percent gleaned shelled corn	Ave. ear wt. picker yield	Ave. ear wt. gl. corn	Percent moisture in ears	Percent stalk lodging	Percent root lodging	Percent erect plants	Percent "clean" ears	Percent "dirty" ears
Mich. 350 (1)	10,648	70.3	60.0	1.5	2.1	8.8	12.5	.54	.53	16.2	5.1	3.4	91.5	61.0	39.0
Mich. 350 (2)	14,956	78.8	65.4	5.0	6.3	8.4	10.7	.48	.55	15.3	12.6	2.0	85.4	64.4	35.6
Mich. 350 (3)	18,102	77.5	64.6	2.5	3.2	10.4	13.4	.41	.40	15.5	16.7	1.7	81.6	58.9	41.1
Mich. 350 (4)	21,296	74.3	60.3	2.5	3.4	11.5	15.5	.39	.36	16.4	19.3	1.4	79.3	60.4	39.6
Mich. 480 (1)	12,536	82.1	76.1	.0	.0	6.0	7.3	.61	.00	18.9	2.4	1.0	96.6	54.8	45.2
Mich. 480 (2)	16,456	79.3	68.7	.9	1.1	9.7	12.2	.54	.47	21.8	11.7	.4	87.9	51.2	48.8
Mich. 480 (3)	19,602	88.4	76.6	1.7	1.9	10.1	11.4	.51	.42	19.6	13.0	.9	86.1	44.7	55.3
Mich. 480 (4)	21,127	73.1	58.4	3.8	5.2	10.9	14.9	.44	.39	26.7	17.2	.6	82.2	51.6	48.4
Mich. 570 (1)	11,205	86.2	79.8	1.4	1.6	5.0	5.8	.65	.70	21.6	3.8	4.3	91.9	65.6	34.4
Mich. 570 (2)	14,472	88.3	78.8	3.4	3.6	6.1	6.9	.58	.43	22.2	13.8	9.2	77.0	69.7	30.3
Mich. 570 (3)	18,828	89.6	75.5	6.9	7.8	7.2	8.0	.51	.42	22.6	16.4	7.1	76.5	67.5	32.5
Mich. 570 (4)	21,369	89.7	73.7	4.6	5.1	11.4	12.7	.48	.46	24.6	22.4	3.1	74.5	66.9	33.1
Grand ave.	16,716	81.5	69.8	2.9	3.5	8.8	10.9	.51	.43	20.1	12.9	2.8	84.3	59.7	40.3
Average (1)	11,463	79.6	72.0	1.0	1.2	6.6	8.5	.60	.36	18.9	3.8	2.9	93.3	60.5	39.5
Average (2)	15,294	82.2	71.0	3.1	3.8	8.1	9.9	.53	.48	19.8	12.7	3.9	83.4	61.8	38.2
Average (3)	18,844	85.1	72.2	3.7	4.3	9.2	10.9	.48	.41	19.3	15.4	3.2	81.4	57.0	43.0
Average (4)	21,264	79.0	64.1	3.6	4.6	11.3	14.4	.44	.40	22.6	19.6	1.7	78.7	59.6	40.4
350 Ave.	16,251	75.3	62.6	2.9	3.8	9.8	13.0	.46	.46	15.9	13.4	2.1	84.5	61.2	38.8
480 Ave.	17,430	80.8	70.0	1.6	2.1	9.2	11.5	.53	.32	21.8	11.1	.7	88.2	50.6	49.4
570 Ave.	16,469	88.5	77.0	4.1	4.6	7.4	8.4	.56	.50	22.8	14.1	5.9	80.2	67.4	32.6

Table 15. Average picker yields per acre and analysis of variance, Monroe County, Experiment 104, 1954.

Rate of planting	Hybrid			Average
	350	480	570	
11,463	60.0	76.1	79.8	72.0
15,294	65.4	68.7	78.8	71.0
18,844	64.6	76.6	75.5	72.2
21,264	60.3	58.4	73.7	64.1
Ave. /1	62.6	70.0	77.0	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	4,999.9		
Hybrids	2	1,650.7	825.4	12.6**
Rate of planting	3	528.6	176.2	2.7
Replications	3	128.0	42.7	
Hybrids x rates	6	535.5	89.3	1.4
Error	33	2,157.1	65.4	

/1 LSD for hybrids = 5.8 bu.

Table 16. Average bushels of gleaned ear corn per acre and analysis of variance, Monroe County, Experiment 104, 1954.

Rate of planting	Hybrid			Average/2
	350	480	570	
11,463	1.5	.0	1.4	1.0
15,294	5.0	.9	3.4	3.1
18,844	2.5	1.7	6.9	3.7
21,264	2.5	3.8	4.6	3.6
Ave./1	2.9	1.6	4.1	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	353.4		
Hybrids	2	49.3	24.7	5.13**
Rate of planting	3	60.4	20.1	4.19**
Replications	3	22.3	7.4	1.55
Hybrids x rates	6	62.5	10.4	2.17
Error	33	158.8	4.8	

/1 LSD for hybrids = 1.6 bu.
/2 LSD for rate of planting = 1.8 bu.

Table 17. Average bushels of shelled corn per acre on ground and analysis of variance, Monroe County, Experiment 104, 1954.

Rate of planting	Hybrid			Average
	350	480	570	
11,463	8.8	6.0	5.1	6.6
15,294	8.5	9.7	6.1	8.1
18,844	10.5	10.4	7.2	9.4
21,264	11.5	10.9	11.4	11.3
Ave.	9.8	9.3	7.5	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	47	908.9		
Hybrids	2	48.2	24.1	1.22
Rate of planting	3	138.2	46.1	2.32
Replications	3	34.9	11.6	.58
Hybrids x rates	6	33.9	5.7	.29
Error	33	653.8	19.8	

The size of gleaned ears was generally smaller than harvested ears. The amount of stalk lodging increased with increases in rates of planting. Stalk lodging averaged 12.9 percent for the experiment. While gleaned ear corn increased at the higher rates where there was more stalk lodging, it does not appear that the amount of stalk lodging was a serious factor in harvesting losses.

The amount of root lodging in most cases was rather low and was not a factor in harvest losses. There was no consistent increase in root lodging with increases in rate of planting.

There were no consistent differences in the percentages of "clean" picked ears. The thicker stands with smaller ears were picked as "clean" as the thinner stands with larger ears.

Kent County, Experiment 105

Two replications were planted in Kent County near Alto on the farm of Albert and Marvin Porritt. Dry weather was again a factor in cutting corn yields. Results of this experiment are given in Table 18.

Analysis of picker yields, Table 19, shows that yield was not significantly affected by any of the treatments.

Gleaned ear corn averaged 1.5, 2.3, 4.7, and 4.9 bushels per acre for the four populations, Table 20. In percentage of the total yield, the losses were 2.4, 3.6, 6.6, and 8.4 respectively. Gleaned ear corn increased as the plant population increased and as ear size decreased.

Gleaned shelled corn was again higher than gleaned ear corn, Table 21. Average gleanings of shelled corn were 3.7, 2.5, 7.4, and 6.3 bushels per acre for the four planting rates. These losses averaged 5.9, 4.0, 10.0, and 10.2 percent of the total yields respectively. Shelled corn losses were higher for the thicker stands.

Ear size decreased with the rate of planting and size of gleaned ears was smaller than that for harvested ears, showing that the picker was leaving the smaller ears.

Stalk lodging increased with rate of planting, averaging 26.5 percent for the experiment. Again, stalk lodging was not a major factor in picker losses since the percentage of gleaned ear corn was low in comparison to the percentage of stalk lodging.

There was more root lodging at the three thicker planting rates but the percentages were generally low. The amount of root lodging did not appear to be a factor in harvest losses.

Table 18. Average results for three hybrids at four plant populations, Kent County, Experiment 105, 1954.

Hybrid	Rate of planting	Total yield bushels per acre	Picker yield bushels per acre	Gleaned ear corn bushels per acre	Percent gleaned ear corn	Gleaned shelled corn bushels p/acre	Percent gleaned shelled corn	Ave. ear wt. picker yield	Ave. ear wt. gl. corn	Percent moisture in ears	Percent stalk lodging	Percent root lodging	Percent erect plants	Percent "clean" ears	Percent "dirty" ears
Mich. 350 (1)	10,285	61.4	56.3	3.3	5.4	1.8	2.9	.56	.45	25.2	17.6	.0	82.4	84.0	16.0
Mich. 350 (2)	15,246	60.2	55.1	3.0	5.0	2.1	3.5	.42	.37	18.3	25.3	1.6	73.1	85.4	14.6
Mich. 350 (3)	18,634	77.6	57.2	6.6	8.5	13.8	17.8	.44	.35	24.8	35.0	1.9	63.1	68.3	31.7
Mich. 350 (4)	22,627	66.2	55.1	5.2	7.9	5.9	8.9	.33	.26	23.0	38.0	3.6	58.4	80.8	19.2
Mich. 480 (1)	9,922	69.3	63.0	1.2	1.7	5.1	7.4	.63	.40	28.5	13.4	3.7	82.9	64.7	35.3
Mich. 480 (2)	15,488	65.0	59.8	2.5	3.8	2.7	4.2	.52	.38	27.0	19.5	8.6	71.9	73.7	26.3
Mich. 480 (3)	18,392	63.1	55.9	4.2	6.7	3.0	4.8	.40	.24	23.8	26.3	3.3	70.4	68.2	31.8
Mich. 480 (4)	23,958	48.3	38.9	5.3	11.0	4.1	8.5	.35	.30	26.9	49.5	1.0	49.5	75.3	24.7
Mich. 570 (1)	9,801	57.8	53.5	.0	.0	4.3	7.4	.49	.00	27.5	13.5	.0	86.5	82.2	17.8
Mich. 570 (2)	16,456	61.8	57.9	1.3	2.1	2.6	4.2	.50	.37	28.5	20.6	3.7	75.7	73.2	26.8
Mich. 570 (3)	19,723	72.9	64.2	3.3	4.5	5.4	7.4	.51	.31	32.0	22.7	12.2	65.1	81.1	18.9
Mich. 570 (4)	24,442	67.2	54.1	4.2	6.3	8.9	13.2	.48	.23	27.8	37.1	7.9	55.0	79.8	20.2
Grand ave.	17,081	64.2	55.9	3.3	5.2	5.0	7.5	.47	.31	26.9	26.5	4.0	69.5	76.5	23.5
Average (1)	10,003	62.8	57.6	1.5	2.4	3.7	5.9	.56	.28	27.1	14.8	1.3	83.9	77.0	23.0
Average (2)	15,730	62.4	57.6	2.3	3.6	2.5	4.0	.48	.37	24.6	21.8	4.6	73.6	77.4	22.6
Average (3)	18,916	71.2	59.1	4.7	6.6	7.4	10.0	.45	.30	26.9	28.0	5.8	66.2	72.5	27.5
Average (4)	23,676	60.6	49.4	4.9	8.4	6.3	10.2	.39	.26	25.9	41.5	4.2	54.3	78.6	21.4
350 Ave.	16,698	66.3	55.9	4.5	6.7	5.9	8.3	.44	.36	22.8	29.0	1.7	69.3	79.6	20.4
480 Ave.	16,940	61.4	54.4	3.3	5.8	3.7	6.2	.48	.33	26.6	27.1	4.2	68.7	70.5	29.5
570 Ave.	17,606	64.9	57.4	2.2	3.2	5.3	8.1	.50	.23	29.0	23.5	6.0	70.5	79.1	20.9

Table 19. Average picker yields per acre and analysis of variance, Kent County, Experiment 105, 1954.

Rate of planting	Hybrid			Average
	350	480	570	
10,003	56.3	63.1	53.5	57.6
15,730	55.1	59.8	58.0	57.9
18,916	57.2	55.9	64.2	59.1
23,676	55.1	38.9	54.1	49.4
Ave.	55.9	54.4	57.5	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	23	2,256.0		
Hybrids	2	37.0	18.5	.16
Rate of planting	3	351.7	117.2	1.00
Replications	1	78.5	78.5	.66
Hybrids x rates	6	493.7	82.3	.69
Error	11	1,295.1	117.7	

Table 20. Average bushels of gleaned ear corn per acre and analysis of variance, Kent County, Experiment 105, 1954.

Rate of planting	Hybrid			Average/1
	350	480	570	
10,003	3.4	1.2	.0	1.5
15,730	3.0	2.5	1.3	2.3
18,916	6.6	4.2	3.3	4.7
23,676	5.3	5.3	4.2	4.9
Ave.	4.6	3.7	2.2	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	23	137.9		
Hybrids	2	22.1	11.1	2.23
Rate of planting	3	52.6	17.5	3.54*
Replications	1	2.7	2.7	
Hybrids x rates	6	6.0	1.0	
Error	11	54.5	5.0	

/1 LSD for rate of planting = 2.81 bu.

Table 21. Average bushels of gleaned shelled corn per acre and analysis of variance, Kent County, Experiment 105, 1954.

Rate of planting	Hybrid			Average/1
	350	480	570	
10,003	1.9	1.7	2.1	1.9
15,730	8.8	5.6	4.1	6.2
18,916	1.7	5.2	5.8	4.2
23,676	11.6	6.2	10.4	9.4
Ave.	6.0	4.7	5.6	5.4

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	23	402.7		
Hybrids	2	7.5	3.7	
Rate of planting	3	181.6	60.5	4.67*
Replications	1	4.5	4.5	
Hybrids x rates	6	66.7	11.1	
Error	11	142.5	13.0	

/1 LSD for rate of planting = 4.6 bu.

There were no consistent differences among rates of planting or hybrids in the percentages of clean ears harvested. The smaller ears of thick stands were picked as "clean" as larger ears of thinner stands.

Kalamazoo County, Experiment 107

This experiment was conducted on the farm of Harry Sweitzer and Lyle Decker near Schoolcraft. Results are given in Table 22.

Differences in picker yields among hybrids were significant while differences due to rate of planting were not significant. The average yield for 14,318 plants per acre was 88.1 bushels compared with 76.5 bushels for 9,801 plants per acre, but the difference was not statistically significant at the five percent level of confidence.

Gleaned ear corn and gleaned shelled corn were not affected significantly by either hybrids or rate of planting. Stalk lodging averaged 20.6 percent for the experiment and increased with the higher populations. Harvest losses were not affected to any extent by the percentage of stalk lodging. Root lodging percentages were low and of no major consequence. The low population, 9,801 plants per acre, was picked slightly "cleaner" than the three higher populations.

Table 22. Average results for three hybrids at four plant populations, Kalamazoo County, Experiment 107, 1954.

Hybrid	Rate of planting	Total yield bushels per acre	Picker yield bushels per acre	Gleaned ear corn bushels per acre	Percent gleaned ear corn	Gleaned shelled corn bushels p/acre	Percent gleaned shelled corn	Ave. ear wt. picker yield	Ave. ear wt. gl. corn	Percent moisture in ears	Percent stalk lodging	Percent root lodging	Percent erect plants	Percent "clean" ears	Percent "dirty" ears
Mich. 350 (1)	9,559	69.6	65.4	.9	1.3	3.3	4.7	.55	.60	17.6	10.1	1.3	88.6	88.5	11.5
Mich. 350 (2)	14,399	82.3	78.0	.3	.4	4.0	4.9	.45	.20	17.2	10.9	.0	89.1	72.6	27.4
Mich. 350 (3)	18,513	72.2	66.4	1.5	2.1	4.3	6.0	.33	.33	16.5	30.0	2.6	67.4	85.7	14.3
Mich. 350 (4)	22,264	80.4	70.8	4.9	6.1	4.7	5.8	.30	.30	15.3	43.4	1.6	55.0	79.2	20.8
Mich. 480 (1)	9,922	85.1	79.7	3.4	4.0	2.0	2.4	.58	.53	21.0	9.8	1.2	89.0	88.4	11.6
Mich. 480 (2)	14,278	93.9	89.9	1.7	1.8	2.3	2.5	.52	.55	20.3	5.9	.8	93.3	74.0	26.0
Mich. 480 (3)	18,239	93.6	88.7	1.3	1.4	3.6	3.8	.42	.30	20.6	27.8	1.3	70.9	72.2	27.8
Mich. 480 (4)	23,232	104.7	97.9	1.9	1.8	4.9	4.7	.38	.37	21.4	18.8	2.6	78.6	72.7	27.3
Mich. 570 (1)	9,922	86.9	84.5	.6	.7	1.8	2.1	.63	.80	21.1	7.3	3.7	89.0	80.4	19.6
Mich. 570 (2)	14,278	102.6	96.3	1.2	1.2	5.1	5.0	.57	.45	23.4	11.9	1.7	86.4	84.0	16.0
Mich. 570 (3)	17,545	103.5	93.6	4.8	4.6	5.1	4.9	.49	.36	22.9	33.1	2.8	64.1	77.9	22.1
Mich. 570 (4)	23,353	92.7	83.3	3.7	4.0	5.7	6.1	.38	.31	22.6	37.8	4.7	57.5	82.9	17.1
Grand ave.	16,375	89.0	82.9	2.2	2.5	3.9	4.4	.47	.43	20.0	20.6	2.0	77.4	79.9	20.1
Average (1)	9,801	80.5	76.5	1.6	2.0	2.4	3.1	.59	.64	19.9	9.1	2.1	88.8	85.8	14.2
Average (2)	14,318	93.0	88.1	1.1	1.1	3.8	4.1	.51	.40	20.3	9.6	.8	89.6	76.9	23.1
Average (3)	18,432	89.8	82.9	2.5	2.7	4.4	4.9	.41	.33	20.0	30.3	2.2	67.5	78.6	21.4
Average (4)	22,950	92.6	84.0	3.5	4.0	5.1	5.5	.35	.33	19.8	33.3	3.0	63.7	78.3	21.7
350 Ave.	16,184	76.2	70.2	1.9	2.5	4.1	5.4	.41	.36	16.7	23.6	1.4	75.0	81.5	18.5
480 Ave.	16,668	94.4	89.1	2.1	2.3	3.2	3.4	.48	.44	20.8	15.5	1.5	83.0	76.8	23.2
570 Ave.	16,275	96.4	89.4	2.6	2.6	4.4	4.5	.52	.48	22.5	22.5	3.2	74.3	81.3	18.7

Table 23. Average picker yields per acre and analysis of variance, Kalamazoo County, Experiment 107, 1954.

Rate of planting	Hybrid			Average
	350	480	570	
9,801	65.4	79.7	84.5	76.5
14,318	78.0	89.9	96.3	88.1
18,432	66.4	88.7	93.6	82.9
22,950	70.8	97.9	83.3	84.0
Ave./1	70.2	89.1	89.5	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	23	4,481.3		
Hybrids	2	1,947.5	973.8	8.3**
Rate of planting	3	410.7	136.9	1.2
Replications	1	456.8	456.8	3.9
Hybrids x rates	6	373.7	62.3	
Error	11	1,292.6	117.5	

/1 LSD for hybrids = 11.8 bu.

Table 24. Average bushels of gleaned ear corn per acre and analysis of variance, Kalamazoo County, Experiment 107, 1954.

Rate of planting	Hybrid			Average
	350	480	570	
9,801	.9	3.5	.6	1.7
14,318	.3	1.7	1.3	1.1
18,432	1.6	1.3	4.8	2.6
22,950	4.9	1.9	3.5	3.4
Ave.	1.9	2.1	2.6	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	23	103.2		
Hybrids	2	2.1	1.1	
Rate of planting	3	19.9	6.7	1.9
Replications	1	8.2	8.2	2.3
Hybrids x rates	6	34.3	5.7	1.6
Error	11	38.8	3.5	

Table 25. Average bushels of gleaned shelled corn per acre and analysis of variance, Kalamazoo County, Experiment 107, 1954.

Rate of planting	Hybrid			Average
	350	480	570	
9,801	3.2	1.9	1.8	2.3
14,318	4.0	2.2	5.0	3.7
18,432	4.3	3.6	5.1	4.3
22,950	4.8	4.9	5.6	5.1
Ave.	4.1	3.2	4.4	

Analysis of variance

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	23	82.0		
Hybrids	2	6.2	3.1	
Rate of planting	3	24.7	8.2	2.08
Replications	1	.3	.3	
Hybrids x rates	6	6.9	1.2	
Error	11	43.6	4.0	

DISCUSSION

In five out of the six experiments, there was no statistically significant increase or decrease in picker yields at the four plant populations (Table 26). Yields at the thicker stands were significantly higher in one experiment (Ingham County, Experiment 102). At some of the other locations, there were small but not statistically significant increases for thicker plantings. Dry weather during late July and most of August was a factor accounting for no significant yield increases with thicker populations in five of the six experiments. It is important to emphasize that, with the exception of the highest population, there were no significant decreases in yield. If moisture conditions had been more favorable, it appears likely, in view of previous experiments (4), that yields would have shown more of an increase with increase in plant populations.

Stalk lodging increased considerably as the population increased (Table 26). Observations indicated that most of the stalk breakage was a result of stalk rot diseases. Thinner and smaller stalks with possibly more disease infection contributed to the increased lodging.

The picker losses at the different plant populations are summarized in Table 27. In three out of the six experiments, there were no significant increases in gleaned ear corn as the planting rate was increased. In the other three experiments, the amount of gleaned ear corn did increase significantly at the thicker stands. In four out of the six experiments, the gleaned shelled corn increased significantly at the

Table 26. Average picker yield and average percent "stalk lodging" in six experiments.

County	Rate of planting				Statistical significance
	(1)*	(2)*	(3)*	(4)*	
Picker yield - bushels per acre					
Ingham 102	94.9	111.3	125.9	114.0	Significant
Ingham 106	88.2	91.2	99.5	86.6	Not significant
Saginaw 103	76.2	77.9	78.6	74.2	Not significant
Monroe 104	72.0	71.0	72.2	64.1	Not significant
Kent 105	57.6	57.6	59.1	49.4	Not significant
Kalamazoo 107	76.5	88.1	82.9	84.0	Not significant
Average	77.6	82.9	86.4	78.7	
Percent stalk lodging					
Ingham 102	11.3	19.4	31.6	42.2	
Ingham 106	6.2	21.5	29.5	42.6	
Saginaw 103	2.5	11.0	19.5	20.9	
Monroe 104	3.8	12.7	15.4	19.6	
Kent 105	14.8	21.8	28.0	41.5	
Kalamazoo 107	9.1	9.6	30.3	33.3	
Average	7.9	16.0	25.7	33.3	

* Average stands for the six experiments: (1) = 10,300, (2) = 14,865, (3) = 18,891, (4) = 22,913 plants per acre.

Table 27. Average bushels per acre and percent of total yield for gleaned ear corn and gleaned shelled corn in six experiments.

County		Rate of planting (1)*	(2)*	(3)*	(4)*	Statistical significance
Gleaned ear corn						
Ingham 102	Bushels	4.4	3.7	6.9	7.2	Not sig-
	Percent	4.5	3.3	5.0	5.7	nificant
Ingham 106	Bushels	3.3	4.6	6.7	9.0	Signifi-
	Percent	3.7	3.9	6.3	9.1	cant
Saginaw 103	Bushels	.6	.9	1.9	1.4	Not sig-
	Percent	.8	1.1	2.3	1.6	nificant
Monroe 104	Bushels	1.0	3.1	3.7	3.6	Signifi-
	Percent	1.2	3.8	4.3	4.6	cant
Kent 105	Bushels	1.5	2.3	4.7	4.9	Signifi-
	Percent	2.4	3.6	6.6	8.4	cant
Kalamazoo 107	Bushels	1.6	1.1	2.5	3.5	Not sig-
	Percent	2.0	1.1	2.7	4.0	nificant
Average	Bushels	2.1	2.6	4.4	4.9	
	Percent	2.4	2.6	4.5	5.6	
Gleaned shelled corn						
Ingham 102	Bushels	1.0	2.7	4.5	4.1	Signifi-
	Percent	1.0	2.3	3.3	3.3	cant
Ingham 106	Bushels	.6	2.0	2.2	5.7	Signifi-
	Percent	.7	2.0	2.2	5.8	cant
Saginaw 103	Bushels	2.0	2.9	3.0	6.3	Signifi-
	Percent	2.5	3.6	3.6	7.8	cant
Monroe 104	Bushels	6.6	8.1	9.2	11.3	Not sig-
	Percent	8.5	9.9	10.9	14.4	nificant
Kent 105	Bushels	3.7	2.5	7.4	6.3	Signifi-
	Percent	5.9	4.0	10.0	10.2	cant
Kalamazoo 107	Bushels	2.4	3.8	4.4	5.1	Not sig-
	Percent	3.1	4.1	4.9	5.5	nificant
Average	Bushels	2.7	3.7	5.1	6.5	
	Percent	3.6	4.3	5.8	7.8	
Total picker losses						
Average	Bushels	4.8	6.3	9.5	11.4	
Average	percent	6.0	6.9	10.3	13.4	

* Average stands for the six experiments: (1) = 10,300, (2) = 14,865, (3) = 18,891, (4) = 22,913 plants per acre.

thicker populations. The total picker losses (gleaned shelled corn plus gleaned ear corn) for all experiments were 4.8, 6.3, 9.5, and 11.4 bushels per acre for average stands of 10,300, 14,865, 18,891, and 22,913 plants per acre, respectively. In percentage of the total yield the losses were 6.0, 6.9, 10.3, and 13.4 percent, respectively.

Most of the increases in gleaned ear corn and gleaned shelled corn occurred at the two thicker stands, averaging 18,891 and 22,913 plants per acre, which are not generally recommended except for ideal conditions. On the basis of previous experiments, a stand of about 16,000 plants per acre is being recommended in Michigan for better than average corn land and a stand of about 12,000 plants for average or below average corn soils. There are many fields in Michigan with stands of 8,000 to 10,000 plants per acre. In the present experiments, there was very little increase in either gleaned ear corn or gleaned shelled corn as the stand was increased from an average of about 10,000 to an average of about 15,000 plants per acre. These results indicate that picker losses need not increase appreciably as the population is increased up to about 16,000 plants per acre. At higher populations, the picker losses may increase in some cases but not in all instances.

In these studies, all populations at each location were picked with the same adjustment of the picker. The farmer cooperator adjusted the picker for harvesting his own crop and no additional adjustments were made for the various populations. It is possible that picker losses could have been reduced at the high populations if the proper adjustments had been made.

Many farmers are concerned about the "cleanness" of mechanical

harvest in terms of the amount of ears harvested with husk attached. Table 28 summarizes the data on "cleanness" of harvest at the various plant populations. It appears obvious that rate of planting had no effect, in general, on the percentage of harvested ears with husks attached. The percentage of "clean" picked ears varied tremendously from location to location and apparently was affected by kind of picker, adjustment of picker, weather conditions, skill of the operator, and other factors.

As shown in Table 26, stalk lodging increased from an average of 7.9 percent at the low population to 33.3 percent at the high population. While there were increased picker losses with the high populations at some locations, the increases in picker losses were not proportionate to the increases in stalk lodging. Thus, it is apparent that the pickers were harvesting a high percentage of the ears on the broken plants.

Ear size at harvest ranged from an average of .65 pound at the low population to .41 for the high population. While the gleaned ear corn did increase in some cases at the higher populations, it appears that the smaller ears at the higher populations was not a serious handicap in effective mechanical harvest.

Under the conditions of these experiments, there did not appear to be any consistent differences in gleaned ear corn, gleaned shelled corn, or percent "clean" picked ears among the three different hybrids used in this study (Table 29). The three hybrids, Michigan 350, 480, and 570, ranged from early to full season in maturity (90, 105, and 110 days relative maturity, respectively).

Table 28. Average percent "clean" picked ears for six experiments.

County	Rate of planting			
	(1)*	(2)*	(3)*	(4)*
Ingham 102	58.4	60.6	65.4	70.7
Ingham 106	53.4	62.5	61.5	64.7
Saginaw 103	91.1	93.6	90.9	94.4
Monroe 104	60.5	61.8	57.0	59.6
Kent 105	23.0	22.6	27.5	21.4
Kalamazoo 107	85.8	76.9	78.6	78.3
Average	62.0	63.0	63.5	64.9

* Average stands for the six experiments: (1) = 10,300, (2) = 14,865, (3) = 18,891, (4) = 22,913 plants per acre.

Table 29. Average picker yield, gleaned ear corn, gleaned shelled corn, "clean" picked ears, and stalk breakage.

Hybrid	Rate of planting				Ave.
	(1)*	(2)*	(3)*	(4)*	
Picker yields - bushels per acre					
Michigan 350	69.8	74.0	77.3	69.8	72.7
Michigan 480	80.2	87.2	88.3	80.3	84.0
Michigan 570	82.7	87.4	93.6	86.0	87.4
Bushels gleaned ear corn per acre					
Michigan 350	2.5	3.3	4.1	5.4	3.8
Michigan 480	1.8	2.2	4.2	5.0	3.3
Michigan 570	2.0	2.3	4.9	4.4	3.4
Bushels gleaned shelled corn per acre					
Michigan 350	2.9	3.8	6.9	6.7	5.1
Michigan 480	2.8	3.6	4.1	5.6	4.0
Michigan 570	2.6	3.5	4.4	7.2	4.4
Percent "clean" picked ears					
Michigan 350	74.9	75.0	71.6	75.4	74.2
Michigan 480	64.8	66.5	65.1	70.2	66.7
Michigan 570	73.3	74.9	76.3	77.6	75.5
Percent stalk breakage					
Michigan 350	9.9	19.4	29.6	35.9	23.7
Michigan 480	6.6	14.3	24.0	31.7	19.2
Michigan 570	7.4	14.3	23.6	32.6	19.5

* Average stands for the six experiments : (1) = 10,300, (2) = 14,865, (3) = 18,891, (4) = 22,913 plants per acre.

ABSTRACT

Many rate of planting experiments have shown marked increases in corn yields with thicker planting. Most of these experiments were harvested by hand and all of the corn regardless of ear size was obtained. Since ear size generally decreases and lodging frequently increases as plant population increases, it becomes important to know if the mechanical corn picker is capable of recovering the higher potential yields with thicker stands.

Three corn hybrids ranging from 90 to 110-day in relative maturity, and four plant populations averaging 10,300, 14,865, 18,891, and 22,913 plants per acre were grown in six experiments in 1954 in five locations (Ingham, Saginaw, Monroe, Kent, and Kalamazoo counties.) In two experiments in Ingham County half of the plots were side dressed with 40 pounds of nitrogen per acre. At each location, the plots were picked by the farm cooperator with his corn picker adjusted for picking his crop. No separate adjustments of the picker were made for the different plant populations.

A dry season was largely responsible for no significant increases in yield with thicker populations in five of the six experiments. It is significant that there were no decreases in yields for the thicker plantings when compared with the lowest population. With more adequate rainfall, it is very likely that yields would have been increased at the higher populations in view of previous experiments on these same farms.

Gleaned ear corn increased as the plant population was increased in three out of six experiments. In the other three experiments, there was no significant increase. In four out of the six experiments, gleaned shelled corn increased as the plant population was increased. These increases in picker losses occurred largely with the high populations averaging 18,891 and 22,913 plants per acre. Total picker losses (gleaned ear corn and shelled corn) averaged 6.0, 6.9, 10.3, and 13.4 percent of the total yield for average populations of 10,300, 14,865, 18,891, and 22,913 plants per acre, respectively.

Within the recommended plant populations for Michigan (up to 16,000 plants per acre), there were no significant increases in either gleaned ear corn or gleaned shelled corn.

Stalk lodging increased as plant population was increased. However, picker losses did not increase proportionally to increases in stalk lodging indicating that the pickers were recovering a large portion of the ears on broken plants.

Ear size decreased as population increased. Again, the decrease in ear size was not reflected in a proportional increase in picker losses. Small ears were not a serious handicap to mechanical harvest.

"Cleanness" of mechanical harvest, as measured by the percent of ears with husks attached, was not affected by the rate of planting.

The three corn hybrids used in this study (Michigan 350, 480, and 570) showed no consistent variety differences for gleaned ear corn, gleaned shelled corn, or percent "clean" picked ears. The maturity of these hybrids range from early to full-season.

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THE MECHANICAL HARVEST OF CORN

IN

RATE OF PLANTING EXPERIMENTS

by

David J. Woods

AN ABSTRACT

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