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ELMER R. KIEHL, *Director*

Rate-of-Planting Studies with Prolific and Single-Ear Corn Hybrids

M. S. ZUBER, C. O. GROGAN, AND O. V. SINGLETON



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Rate-of-Planting Studies with Prolific and Single-Ear Corn Hybrids

M. S. ZUBER¹, C. O. GROGAN¹, AND O. V. SINGLETON²

INTRODUCTION

Missouri farmers have shown renewed interest in modified rates of planting corn during the past 10 years. Their new interest stems from: (1) increased use of fertilizer, (2) occasional drouths, (3) availability of prolific hybrids, (4) differential response of hybrids to varying plant populations, (5) increased use of irrigation, and (6) corn yield contests.

Many rate-of-planting tests have been conducted but the early tests with open-pollinated varieties following light fertilizer applications may not apply to recent cultural methods using hybrids and heavy fertilization.

This study investigated the response of single-ear and prolific hybrids as well as hybrids of different maturities to various plant populations. Prolific hybrids planted at a low rate may adjust better to variable environments than non-prolific hybrids by producing a single-ear per plant under adverse conditions and more than one ear when conditions are more favorable. Single-ear hybrids adjust only by changes in the size of the ear. It is necessary to plant at high rates to obtain maximum yields with single-ear hybrids on soils of high fertility and near optimum growing conditions. Missouri weather conditions vary so much from season to season and from location to location that high rates of planting may give excellent yields one year but very low ones the next. Since farmers cannot predict the type of growing season, they do not know whether to plant single-ear hybrids at a low, medium, or high rate.

METHODS

Types of Hybrids Tested:

Eleven hybrids of various maturities were selected for this study. Five represented prolific types (Dixie 33, Dixie 22, Dixie 29, AES 904W, and Tenn 501) and six were single-ear types (Mo 804, US 523W, Mo 4048W, Mo 4047W, US 13, and Kan 1639).

Field Design:

Each rate of planting was replicated three times and planted in individual blocks at each of the three locations. Each block was surrounded with a border row planted at the same rate as the block. The plots were two rows wide by

¹Research agronomists, Crops Research Division Agricultural Research Service, U. S. Department of Agriculture and research associates, Department of Field Crops, University of Missouri.

²Instructor, Department of Field Crops, University of Missouri.

five hills long. Each plot was planted by hand at twice the rate desired and later thinned to give a rate of 8,000, 12,000 or 16,000 plants per acre.

Agronomic Data:

Yield:

The corn from each plot was harvested and weighed. Yield was determined on the basis of shelled corn with a moisture content of 15.5 percent. Hybrids which varied from 15.5 percent were adjusted in yield accordingly. Adjustments were also made for missing hills but not for other variations in stand.

Moisture:

The grain moisture of each entry was determined by removing two rows of kernels from each of ten randomly selected ears from all replications. The grain from each sample was thoroughly mixed and the moisture content of a 100-gram sample was determined with a Steinlite moisture meter.

Lodging:

A plant was classified as "root lodged" if it leaned from the base more than 30 degrees from the vertical, and "stalk lodged" if it was broken below the ear. If a plant was both root and stalk lodged, it was counted in both categories. The percent was based on total plants.

Dropped Ears:

The total number of ears dropped by each hybrid was recorded at harvest. This number was divided by the total number of ears and multiplied by 100 to give the percent of dropped ears.

Ear Height Grade:

The ear height is the approximate number of feet from the base of the plant to the point of attachment of the upper ear. The grade was determined by the average of all replications.

Ears per Plant:

The total number of ears of all replications of each hybrid was divided by the total number of plants to determine the ears per plant.

Ear Weight:

The total ear weight of each hybrid was divided by the total number of ears to get the average weight per ear in pounds.

Location of Tests:

The test plots were planted at 3 locations: (1) Huntsdale (Boone County) in central Missouri, (2) Pierce City (Lawrence County) in southwest Missouri, and (3) Sikeston (New Madrid County) in southeast Missouri. The soil at each of these locations was fertilized to produce 100 bushels of corn per acre.

RESULTS

Tables 1 to 3 give results from three locations and table 4 summarizes results for all locations. Table 5 gives a summary of comparative performance records for the 5 prolific and 6 single-ear hybrids.

TABLE 1-THREE-YEAR (1955-56-57) PERFORMANCE RECORDS OF PROLIFIC AND SINGLE-EAR HYBRIDS PLANTED AT RATES OF 8,000, 12,000 AND 16,000 PLANTS PER ACRE; TESTED NEAR HUNTSDALE

Rate per Acre and Hybrid	Acre Yield bu.	Moisture In Grain %	Lodged Plants		Dropped Ears %	Ear Height Grade	Avg. Ears per Plant	Avg.
			Root %	Stalk %				wt. per Ear lb.
8,000 plants								
Dixie 33*	102.1	17.0	7.5	23.0	1.1	5.2	1.7	0.56
Dixie 22*	92.0	17.5	0.5	21.0	0.0	5.2	1.5	0.55
Dixie 29*	93.6	17.1	0.0	18.1	1.8	4.9	1.7	0.51
AES 904W*	96.3	16.2	0.6	10.2	0.0	4.6	1.9	0.46
Mo 804	85.2	15.8	1.1	7.6	0.6	5.1	1.2	0.66
US 523W	87.1	15.1	0.0	13.1	1.1	4.2	1.2	0.66
Mo 4048W	87.9	15.0	0.0	22.1	1.1	4.6	1.2	0.67
Mo 4047W	84.7	16.0	2.8	5.6	0.6	4.0	1.1	0.70
US 13	80.0	13.6	0.6	23.1	0.6	4.8	1.1	0.57
Kan 1639	79.6	14.4	2.2	7.3	0.6	4.0	1.1	0.67
Tenn 501*	87.0	16.1	3.3	27.7	0.0	4.3	1.6	0.48
Mean	88.7	15.8	1.7	16.2	0.7	4.6	1.4	0.59
12,000 plants:								
Mo 804	94.5	15.5	5.5	20.5	0.0	5.1	1.6	0.57
US 523W	101.2	15.5	0.0	20.8	0.7	4.7	1.0	0.58
Mo 4048W	85.6	13.4	0.2	24.4	1.9	4.9	1.0	0.52
Mo 4047W	99.5	16.2	1.1	12.8	0.0	4.4	1.0	0.59
US 13	95.4	14.5	0.0	29.7	1.5	4.8	1.0	0.55
Kan 1639	94.2	14.2	0.0	9.9	0.9	4.1	1.0	0.56
Tenn 501*	94.4	15.7	1.5	22.2	1.1	4.3	1.2	0.47
Dixie 33*	100.7	17.0	7.7	26.3	0.7	5.3	1.2	0.51
Dixie 22*	101.3	18.5	0.0	25.3	0.8	5.3	1.2	0.51
Dixie 29*	109.0	17.3	0.0	14.6	3.0	5.1	1.3	0.51
AES 904W*	108.3	16.0	0.0	10.3	0.8	4.8	1.4	0.45
Mean	98.6	15.8	1.5	19.7	1.0	4.8	1.2	0.53
16,000 Plants:								
US 13	90.8	14.8	1.1	40.5	2.1	4.6	1.0	0.43
Kan 1639	81.7	14.5	1.8	18.6	0.9	4.1	1.0	0.39
Tenn 501*	94.7	16.3	3.7	27.1	0.9	4.4	1.0	0.43
Dixie 33*	105.1	16.8	4.3	34.2	0.9	5.7	1.0	0.46
Dixie 22*	89.9	18.8	2.8	45.3	0.7	5.2	1.0	0.44
Dixie 29*	95.2	18.2	0.6	24.8	1.5	5.2	1.0	0.43
AES 904W*	102.8	16.4	0.0	19.8	0.9	5.0	1.1	0.43
Mo 804	91.2	15.5	2.3	37.6	0.0	4.9	1.0	0.44
US 523W	85.9	15.1	0.0	31.8	1.5	4.7	0.9	0.42
Mo 4048W	92.3	16.0	1.7	34.9	2.4	4.5	1.0	0.44
Mo 4047W	98.0	16.2	8.0	20.1	0.3	4.1	1.0	0.44
Mean	93.4	16.2	2.4	30.3	1.1	4.8	1.0	0.43
Grand Mean	93.6	15.9	1.9	22.1	0.9	4.7	1.2	0.52

*Prolific hybrids

TABLE 2-THREE-YEAR (1955-56-57) PERFORMANCE RECORDS OF PROLIFIC AND SINGLE-EAR HYBRIDS PLANTED AT RATES OF 8,000, 12,000 AND 16,000 PLANTS PER ACRE; TESTED NEAR PIERCE CITY

Rate per Acre and Hybrid	Acre Yield bu.	Mois- ture In Grain %	Lodged Plants		Dropped Ears %	Ear Height Grade	Avg. Ears· per Plant	Avg. wt. per Ear lb.
			Root %	Stalk %				
8,000 Plants:								
Dixie 33*	91.6	17.0	0.6	6.2	0.6	4.4	1.6	0.56
Dixie 22*	71.9	19.5	0.0	9.2	0.0	4.6	1.3	0.51
Dixie 29*	83.2	17.9	0.0	7.6	0.6	3.9	1.7	0.46
AES 904W*	83.0	16.0	1.1	6.8	0.0	3.7	1.8	0.43
Mo 804	68.0	15.2	0.0	9.8	0.6	4.0	1.1	0.56
US 523W	79.7	15.6	0.0	18.0	0.0	3.3	1.2	0.59
Mo 4048W	76.2	15.3	1.2	12.8	0.0	3.6	1.1	0.64
Mo 4047W	73.2	16.2	1.2	9.3	0.0	3.5	1.0	0.65
US 13	68.6	12.8	0.6	9.4	0.6	3.6	1.0	0.60
Kan 1639	67.0	13.4	0.6	8.6	0.0	3.1	1.1	0.61
Tenn 501*	81.4	16.4	0.0	10.5	0.6	3.3	1.5	0.49
Mean	76.7	15.9	0.5	9.8	0.3	3.7	1.3	0.55
12,000 Plants:								
Mo 804	83.0	14.9	1.1	18.3	0.0	3.8	1.0	0.47
US 523W	95.5	14.8	0.4	18.3	0.0	3.6	1.1	0.56
Mo 4048W	85.2	14.7	0.0	16.4	0.8	4.0	1.0	0.53
Mo 4047W	89.4	15.9	2.3	10.3	0.0	3.8	1.0	0.54
US 13	82.1	12.7	0.0	11.1	0.0	3.4	1.0	0.50
Kan 1639	89.2	13.9	0.0	13.0	0.0	3.6	1.0	0.55
Tenn 501*	80.9	16.9	0.0	10.6	0.0	3.8	1.3	0.38
Dixie 33*	96.7	18.9	0.7	8.6	0.7	4.5	1.2	0.49
Dixie 22*	84.3	19.9	1.1	16.2	0.4	4.6	1.1	0.48
Dixie 29*	92.1	17.7	0.0	10.4	0.8	4.5	1.4	0.41
AES 904W*	104.1	16.7	0.4	11.8	0.0	4.1	1.4	0.45
Mean	89.3	16.1	0.6	13.2	0.3	4.0	1.1	0.52
16,000 Plants:								
US 13	78.5	12.7	0.0	12.8	0.0	3.4	1.0	0.38
Kan 1639	81.8	12.8	0.3	22.9	1.3	3.3	0.9	0.45
Tenn 501*	87.9	15.3	1.7	21.5	0.3	3.6	1.0	0.41
Dixie 33*	91.7	18.0	2.0	10.4	0.0	5.0	1.0	0.42
Dixie 22*	79.7	18.7	1.2	17.7	0.6	4.7	1.0	0.39
Dixie 29*	99.2	17.0	1.6	6.9	0.3	4.5	1.1	0.41
AES 904W*	90.7	17.6	1.4	12.5	0.0	3.8	1.1	0.41
Mo 804	77.0	14.0	0.0	23.1	0.0	3.7	0.9	0.40
US 523W	88.3	15.3	0.9	20.0	0.0	3.7	0.9	0.46
Mo 4048W	88.4	14.3	0.9	16.1	0.0	3.7	0.9	0.45
Mo 4047W	90.9	16.0	0.0	20.7	0.0	3.6	0.9	0.43
Mean	86.7	15.6	0.9	16.8	0.2	3.9	1.0	0.42
Grand Mean	84.2	15.9	0.7	13.3	0.3	3.9	1.1	0.50

*prolific hybrids

TABLE 3—THREE-YEAR (1955-56-57) PERFORMANCE RECORDS OF PROLIFIC AND SINGLE-EAR HYBRIDS PLANTED AT RATES OF 8,000, 12,000 AND 16,000 PLANTS PER ACRE; TESTED NEAR SIKESTON

Rate per acre and Hybrid	Acre Yield bu.	Mois- ture In Grain %	Lodged Plants		Dropped Ears %	Ear Height Grade	Avg. Ears per Plant	Avg. wt. per Ear lb.
			Root %	Stalk %				
8,000 Plants:								
Dixie 33*	92.7	15.4	0.0	4.0	1.7	4.6	1.8	0.46
Dixie 22*	87.4	16.6	1.1	1.1	0.6	4.5	1.8	0.43
Dixie 29*	82.9	15.8	1.1	3.3	0.6	3.8	1.7	0.42
AES 904W*	91.2	15.0	0.0	0.6	0.6	3.7	2.0	0.40
Mo 804	78.2	14.7	1.1	2.2	0.0	3.9	1.2	0.59
US 523W	85.2	14.6	0.6	2.2	1.1	3.7	1.2	0.62
Mo 4048W	83.5	14.6	0.0	3.3	0.0	3.7	1.2	0.60
Mo 4047W	80.4	14.5	3.3	2.2	0.0	3.5	1.1	0.61
US 13	75.7	13.7	0.6	0.6	0.0	3.6	1.1	0.58
Kan 1639	79.8	14.2	1.1	2.2	0.6	3.2	1.1	0.61
Tenn 501*	82.0	14.7	2.2	3.3	1.7	3.5	1.7	0.43
Mean	83.6	14.9	1.0	2.3	0.6	3.8	1.5	0.52
12,000 Plants:								
Mo 804	87.9	15.6	0.0	3.7	1.1	3.8	1.0	0.49
US 523W	99.6	15.1	0.0	4.5	0.0	3.5	1.0	0.58
Mo 4048W	93.7	14.8	1.1	3.6	0.0	3.6	1.0	0.56
Mo 4047W	90.9	15.7	1.1	2.6	0.7	3.6	1.0	0.53
US 13	85.2	12.9	0.0	3.4	0.4	3.7	1.0	0.47
Kan 1639	88.7	13.7	0.4	4.9	0.0	3.2	1.0	0.52
Tenn 501*	87.7	15.0	0.0	3.0	0.4	3.6	1.2	0.46
Dixie 33*	87.8	15.2	1.1	4.2	1.2	4.6	1.3	0.40
Dixie 22*	90.9	16.8	0.0	3.3	2.6	4.6	1.3	0.42
Dixie 29*	80.8	16.1	0.0	4.1	0.7	4.2	1.3	0.38
AES 904W*	93.8	15.1	0.0	2.6	0.4	3.8	1.4	0.38
Mean	89.7	15.1	0.3	3.6	0.7	3.8	1.1	0.47
16,000 Plants:								
US 13	82.5	13.7	0.0	6.2	1.1	3.4	1.0	0.38
Kan 1639	92.1	13.5	3.1	4.2	0.0	3.4	1.0	0.41
Tenn 501*	86.7	14.3	0.8	4.5	0.0	3.7	1.0	0.36
Dixie 33*	90.1	14.8	2.0	6.6	2.8	4.6	1.1	0.38
Dixie 22*	86.5	15.5	1.7	5.3	0.9	4.9	1.1	0.36
Dixie 29*	86.0	16.4	0.0	5.1	2.8	4.2	1.1	0.36
AES 904W*	97.4	15.1	1.1	3.4	0.0	3.9	1.2	0.35
Mo 804	95.7	14.3	0.0	6.1	0.3	3.8	1.0	0.42
US 523W	101.5	14.0	2.5	8.3	0.0	3.4	1.0	0.42
Mo 4048W	95.2	14.8	3.3	5.3	1.7	3.8	0.9	0.45
Mo 4047W	94.5	14.7	3.2	1.7	0.0	3.4	1.0	0.42
Mean	91.7	14.7	1.6	5.2	0.9	3.9	1.0	0.39
Grand Mean	88.3	14.9	1.0	3.7	0.7	3.8	1.2	0.46

*Prolific hybrids

TABLE 4-THREE-YEAR (1955-56-57) PERFORMANCE RECORDS OF PROLIFIC AND SINGLE-EAR HYBRIDS PLANTED AT RATES OF 8,000, 12,000 AND 16,000 PLANTS PER ACRE; TESTED NEAR HUNTSDALE, PIERCE CITY, AND SIKESTON

Rate per Acre and Hybrid	Acre Yield bu.	Mois- ture In Grain %	Lodged Plants		Dropped Ears %	Ear Height Grade	Avg. Ears per Plant	Avg. wt. per Ear lb.
			Root %	Stalk %				
8,000 Plants:								
Dixie 33*	95.5	16.5	2.7	11.0	1.5	4.8	1.7	0.53
Dixie 22*	83.8	17.8	0.5	10.5	0.2	4.7	1.5	0.50
Dixie 29*	86.5	16.9	0.4	9.7	1.0	4.2	1.7	0.46
AES 904W*	90.2	15.9	0.6	5.9	0.2	4.0	1.9	0.43
Mo 804	77.1	15.4	0.7	6.6	0.4	4.3	1.1	0.60
US 523W	84.0	15.1	0.0	11.1	0.7	3.7	1.2	0.62
Mo 4048W	82.5	14.9	0.6	12.7	0.4	3.9	1.2	0.64
Mo 4047W	78.5	15.8	2.4	5.7	0.2	3.7	1.1	0.65
US 13	74.7	13.3	0.6	11.0	0.4	4.0	1.1	0.58
Kan 1639	75.7	13.8	1.3	6.1	0.4	3.5	1.1	0.63
Tenn 501*	83.5	15.8	1.8	13.8	0.8	3.7	1.6	0.49
Mean	82.9	15.6	1.1	9.5	0.6	4.1	1.4	0.55
12,000 Plants:								
Mo 804	88.5	15.3	2.0	14.2	0.4	4.2	1.0	0.51
US 523W	98.8	15.2	0.1	14.5	0.3	3.6	1.0	0.57
Mo 4048W	88.1	15.0	1.1	14.8	0.9	4.2	1.0	0.54
Mo 4047W	93.3	15.9	1.5	8.6	0.2	3.9	1.0	0.55
US 13	87.6	13.4	0.0	14.7	0.9	4.0	1.0	0.51
Kan 1639	90.7	13.9	0.1	9.3	0.3	3.6	1.0	0.54
Tenn 501*	87.7	15.8	0.5	11.9	1.3	3.9	1.2	0.44
Dixie 33*	95.1	17.1	3.2	13.0	0.9	4.8	1.2	0.47
Dixie 22*	92.1	18.4	0.4	14.9	1.3	4.8	1.2	0.47
Dixie 29*	94.6	16.9	0.0	11.9	1.2	4.6	1.3	0.43
AES 904W*	102.0	15.9	0.1	8.2	0.4	4.2	1.4	0.43
Mean	92.6	15.7	0.8	12.4	0.7	4.2	1.1	0.51
16,000 Plants:								
US 13	83.9	13.7	0.4	19.8	1.0	3.8	1.0	0.40
Kan 1639	85.2	13.6	1.7	15.2	0.7	3.6	0.9	0.42
Tenn 501*	89.8	15.3	2.1	17.7	0.4	3.9	1.0	0.40
Dixie 33*	95.7	16.6	2.8	17.1	1.2	5.1	1.1	0.42
Dixie 22*	85.4	17.7	1.9	22.7	0.7	4.9	1.0	0.40
Dixie 29*	93.5	17.2	0.7	12.3	1.6	4.6	1.1	0.40
AES 904W*	98.1	16.4	0.9	11.9	0.3	4.2	1.1	0.40
Mo 804	87.9	14.6	0.8	22.3	0.1	4.1	1.0	0.42
US 523W	91.9	14.8	1.1	20.1	0.5	3.9	0.9	0.43
Mo 4048W	92.0	15.0	1.9	18.8	1.4	4.0	0.9	0.45
Mo 4047W	94.5	15.6	3.7	14.4	0.1	3.7	1.0	0.43
Mean	90.7	15.5	1.6	17.5	0.7	4.2	1.0	0.41
Grand Mean	88.7	15.6	1.2	13.1	0.7	4.2	1.2	0.49

*Prolific hybrid

TABLE 5-SUMMARY OF COMPARATIVE PERFORMANCE RECORDS FOR PROLIFIC AND SINGLE-EAR HYBRIDS PLANTED AT 8,000, 12,000, AND 16,000 PLANTS PER ACRE AT HUNTSDALE, PIERCE CITY, AND SIKESTON FOR THE 3-YEAR PERIOD 1955-57.

Rate per acre and Comparison	Actual	Acre Yield	Total	Avg.	Avg. Ear Weight
	Plant Population		Ears per Acre	Ears per Plant	
	No.	Bu.	No.	No.	Lb.
All rates:					
5 Prolific Hybrids	11,652	91.6	15,497	1.33	0.41
6 Single-Ear Hybrids	11,652	86.4	12,002	1.03	0.50
Avg. 11 Hybrids	11,652	89.0	13,633	1.17	0.46
8,000 plants:					
5 Prolific Hybrids	7,880	87.9	13,238	1.68	0.46
6 Single-Ear Hybrids	7,864	78.7	8,886	1.13	0.62
Avg. 11 Hybrids	7,872	82.9	10,863	1.38	0.54
12,000 plants:					
5 Prolific Hybrids	11,724	94.3	14,772	1.26	0.45
6 Single-Ear Hybrids	11,664	91.2	11,664	1.00	0.55
Avg. 11 Hybrids	11,700	92.8	13,104	1.12	0.50
16,000 plants:					
5 Prolific Hybrids	15,248	92.5	16,163	1.06	0.40
6 Single-Ear Hybrids	15,344	89.3	14,577	0.95	0.43
Avg. 11 Hybrids	15,296	90.9	15,296	1.00	0.42

ACRE YIELDS

The average yields for the 11 hybrids at the three locations were 82.9; 92.8; and 90.9 bushels, respectively, for the 8,000, 12,000, and 16,000 planting rates. The actual plant populations were 7,872; 11,700; and 15,292. Disregarding types of hybrids, these data indicate that under the growing conditions at these locations 11,700 plants per acre was the best rate out of the 3 tested.

A comparison of yields of the 5 prolific and the 6 single-ear hybrids showed an advantage for the prolific hybrids at all three rates of planting (Figure 1). This yield advantage, however, may be partly due to the later maturity of the prolific group. An important aspect of these comparisons is the small range in yields (88 to 94 bushels) for the prolific hybrids. By contrast, the single-ear group ranged from about 78.5 bushels at the 8,000 rate to 91 at the 16,000 rate.

Two of the 5 prolific hybrids, Dixie 33 and Tenn 501, and two of the 6 single-ear hybrids, Mo 4047W and Mo 4048W, gave their highest yields at the 16,000 planting rate. The remaining 7 hybrids manifested their highest yields at the 12,000 planting rate. (Figures 2 and 3).

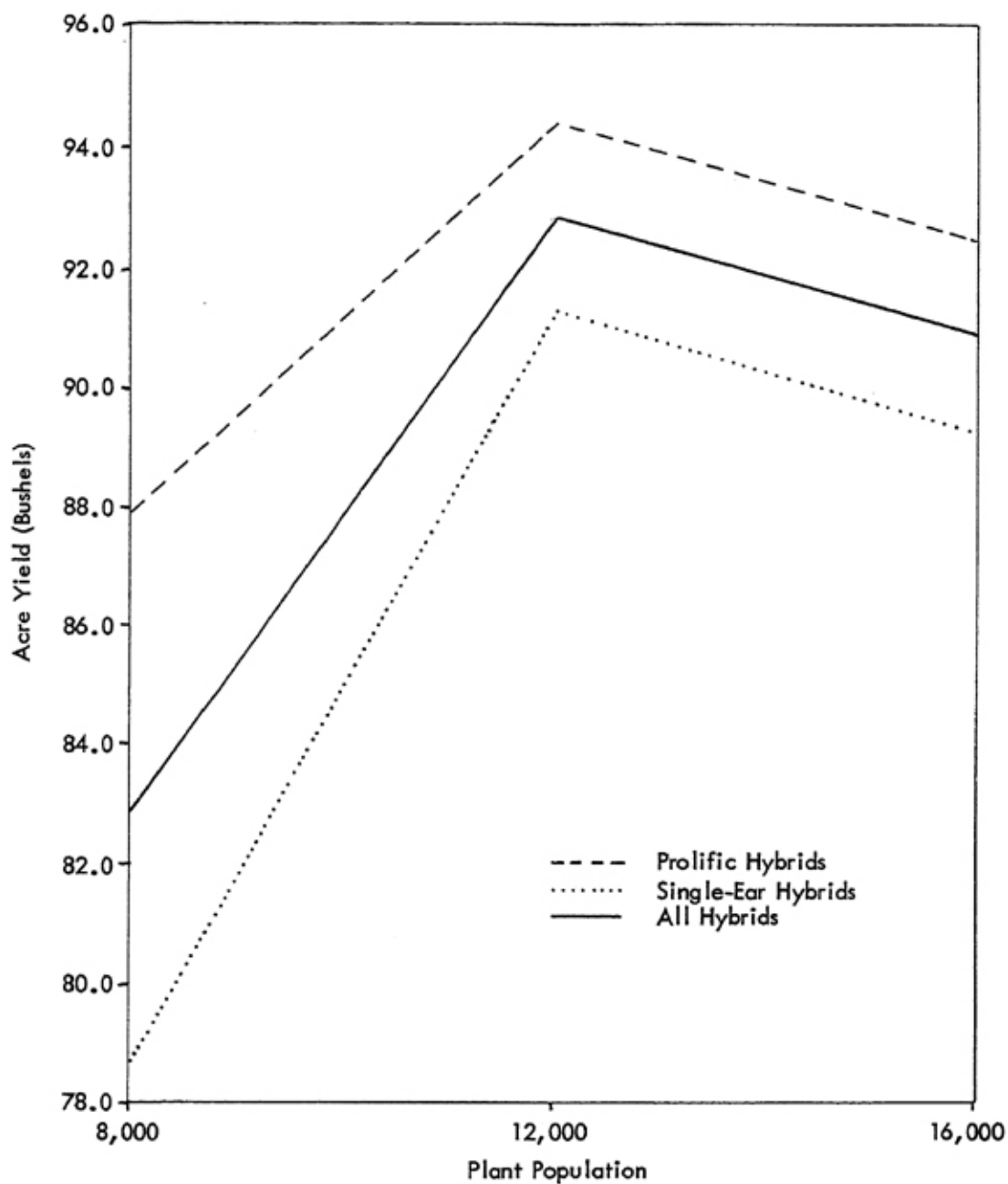


Figure 1. Summary of acre yield for 11 hybrids (5 prolific and 6 single-ear hybrids) planted at 3 rates of planting and tested at 3 locations during 1955, 1956, and 1957.

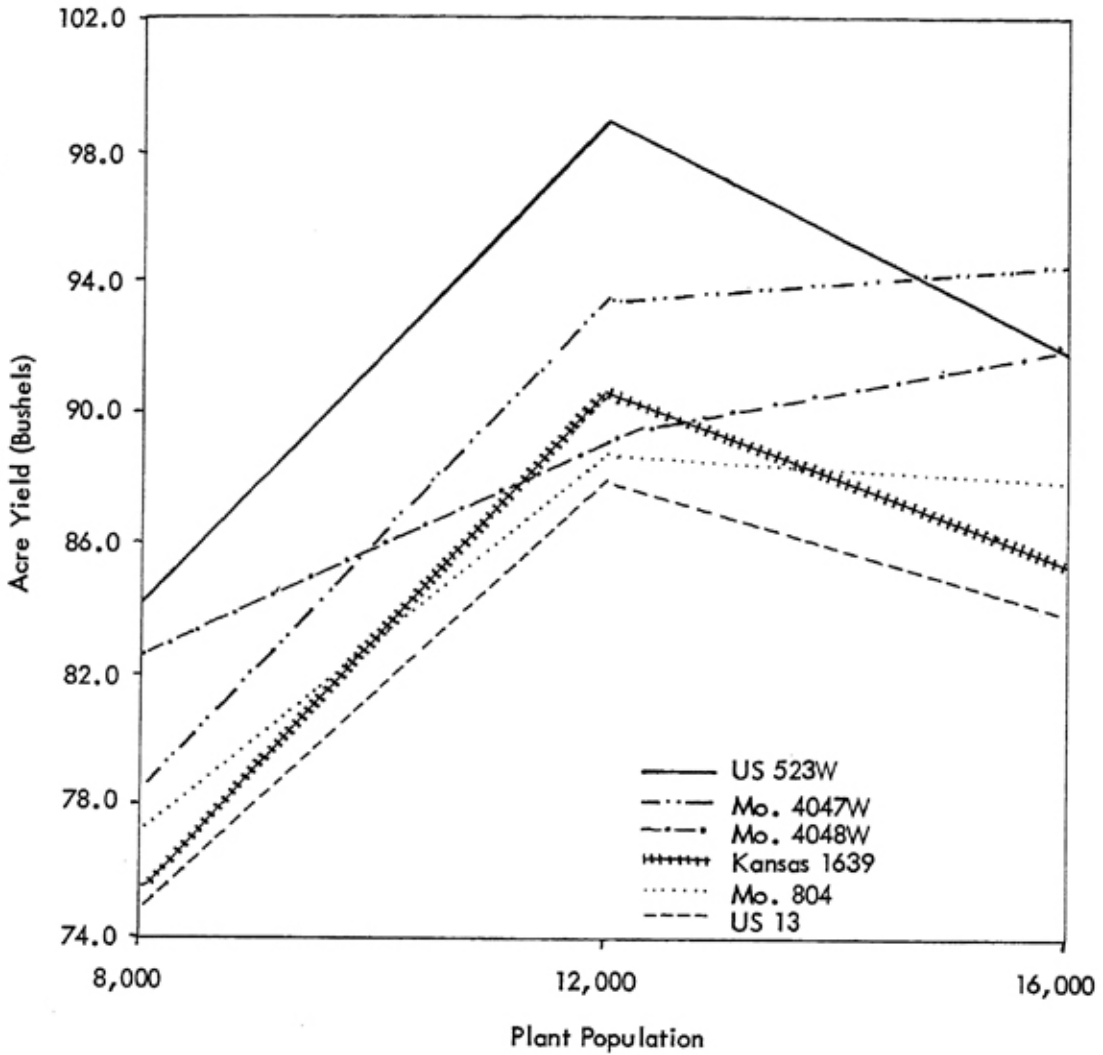


Figure 2. Summary of acre yield for each of 6 single-ear hybrids planted at 3 rates of planting and tested at 3 locations during 1955, 1956, and 1957.

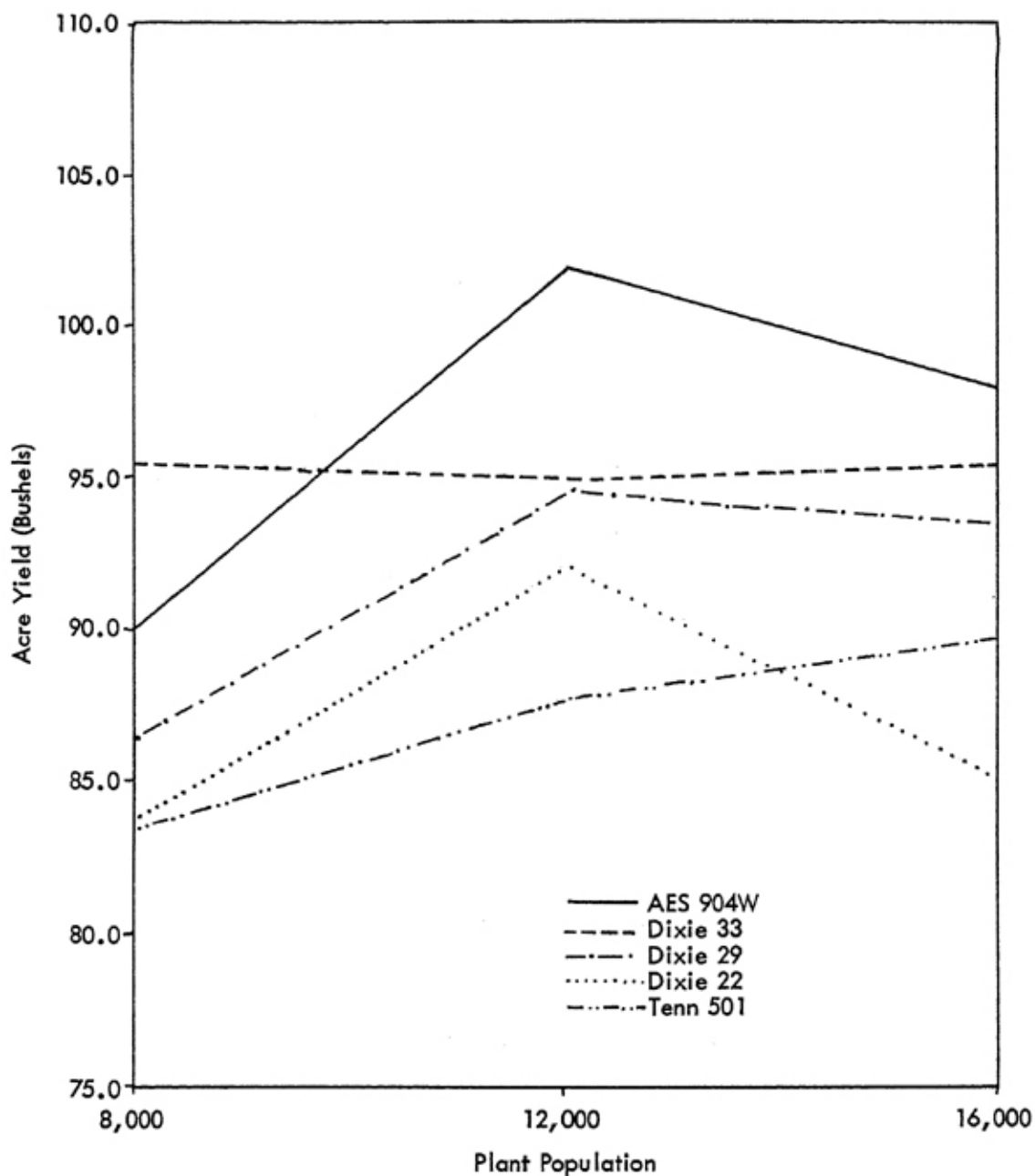


Figure 3. Summary of acre yield for each of 5 prolific hybrids planted at 3 rates of planting and tested at 3 locations for the three years; 1955, 1956, and 1957.

Dixie 33 gave a comparatively constant yield at each of the three rates of planting. Less than 1 bushel difference occurred in yield between any two rates of planting at the locations for the 3 years. Five bushels was the greatest range in yield between any two locations for any two rates of planting. This narrow range in yield of Dixie 33 over all years and all locations is striking and of considerable practical importance.

Table 6 gives an analysis of variance for plot yields. All interactions except hybrid x rate x year and hybrid x rate x location were significant. The hybrid x location interaction might be expected to be highly significant since the 11 hybrids represented a rather wide range in maturity and the southern locations were more favorable for later maturing types.

TABLE 6-ANALYSIS OF VARIANCE COMPUTED FOR YIELD; GRAIN MOISTURE, AND STALK LODGING FOR THE RATE-OF-PLANTING STUDY CONDUCTED AT HUNTSDALE, PIERCE CITY, AND SIKESTON FOR THE 3-YEAR PERIOD 1955-1957

Source of Variation	D/F	Yield per Plot lbs.	Mean Squares	
			Moisture (%)	Stalk Lodging (%)
Total	296			
Years	2	15513.04**	853.02**	3870.56**
Rates	2	2534.04**	0.56	1631.94**
Hybrids	10	574.08**	49.03	191.34**
Locations	2	2159.69**	33.81**	8619.50**
Year x Rate	4	391.51**	3.65**	349.90**
Year x Hybrid	20	133.91**	2.30**	55.25*
Year x Location	4	5247.78**	63.78**	2822.19**
Rate x Hybrid	20	82.92**	0.79	35.35
Rate x Location	4	160.79**	2.63**	305.17**
Hybrid x Location	20	123.37**	3.80**	176.64**
Year x Rate x Hybrid	40	31.03	0.94	35.26
Year x Rate x Location	8	108.56**	2.54**	352.45**
Rate x Location x Hybrid	40	38.19	0.72	26.63
Location x Year x Hybrid	40	63.13*	1.21*	66.07**
Error	80	25.35	0.56	22.72

* Significant at 5% Level

** Significant at 1% Level

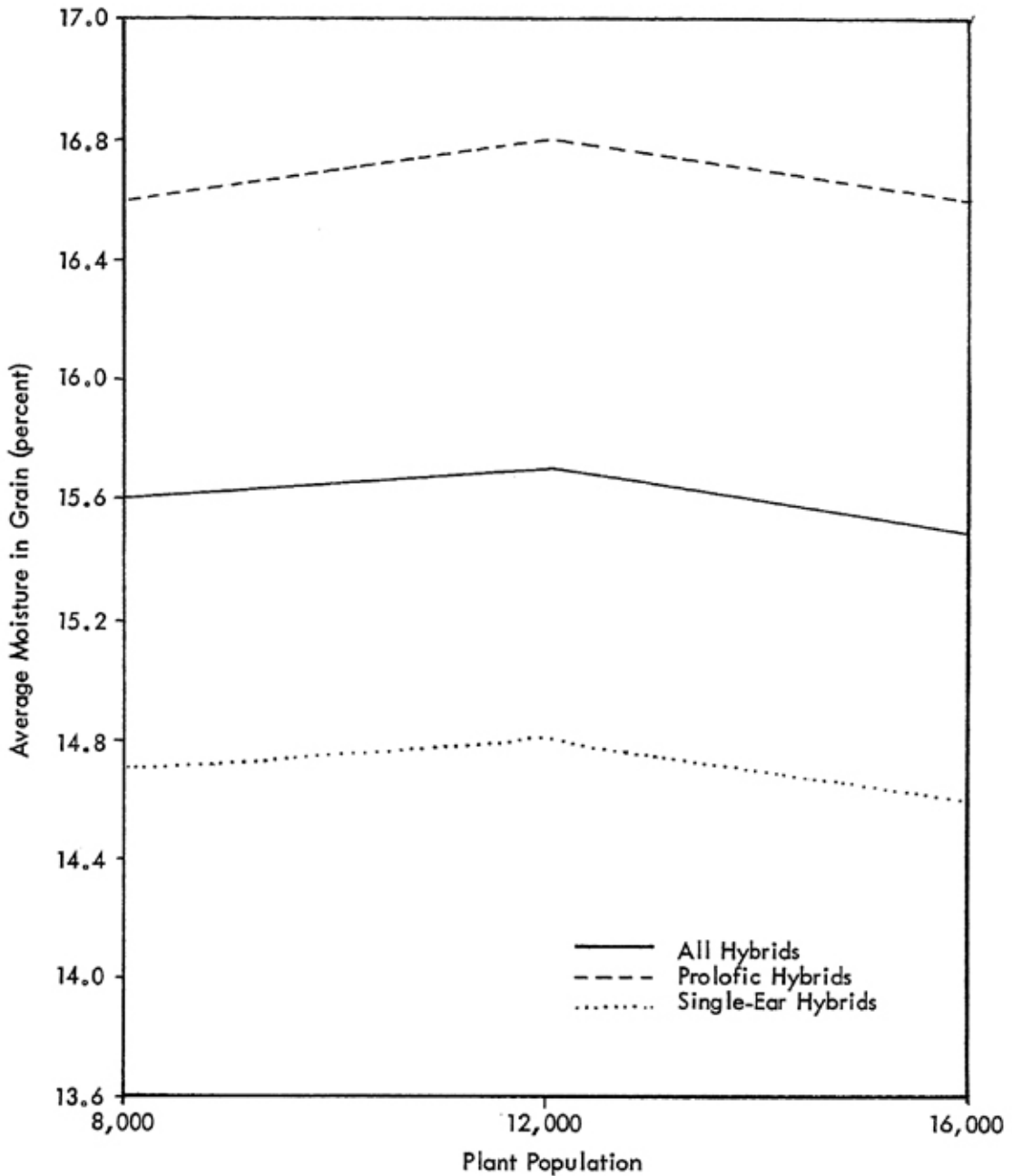


Figure 4. Average percent moisture in grain at harvest for 11 hybrids; (5 prolific and 6 single-ear hybrids) planted at 3 rates of planting and tested at 3 locations during 1955, 1956, and 1957.

MOISTURE IN GRAIN

Figure 4 shows the average percent of moisture in the grain at harvest for the 11 hybrids at 3 rates of planting. Although the differences were small, the grain from the highest rates of planting had less moisture than grain from the 2 lowest rates. This difference was small, however, being only 0.2 percent. The higher moisture percent in prolificals was due to later maturity.

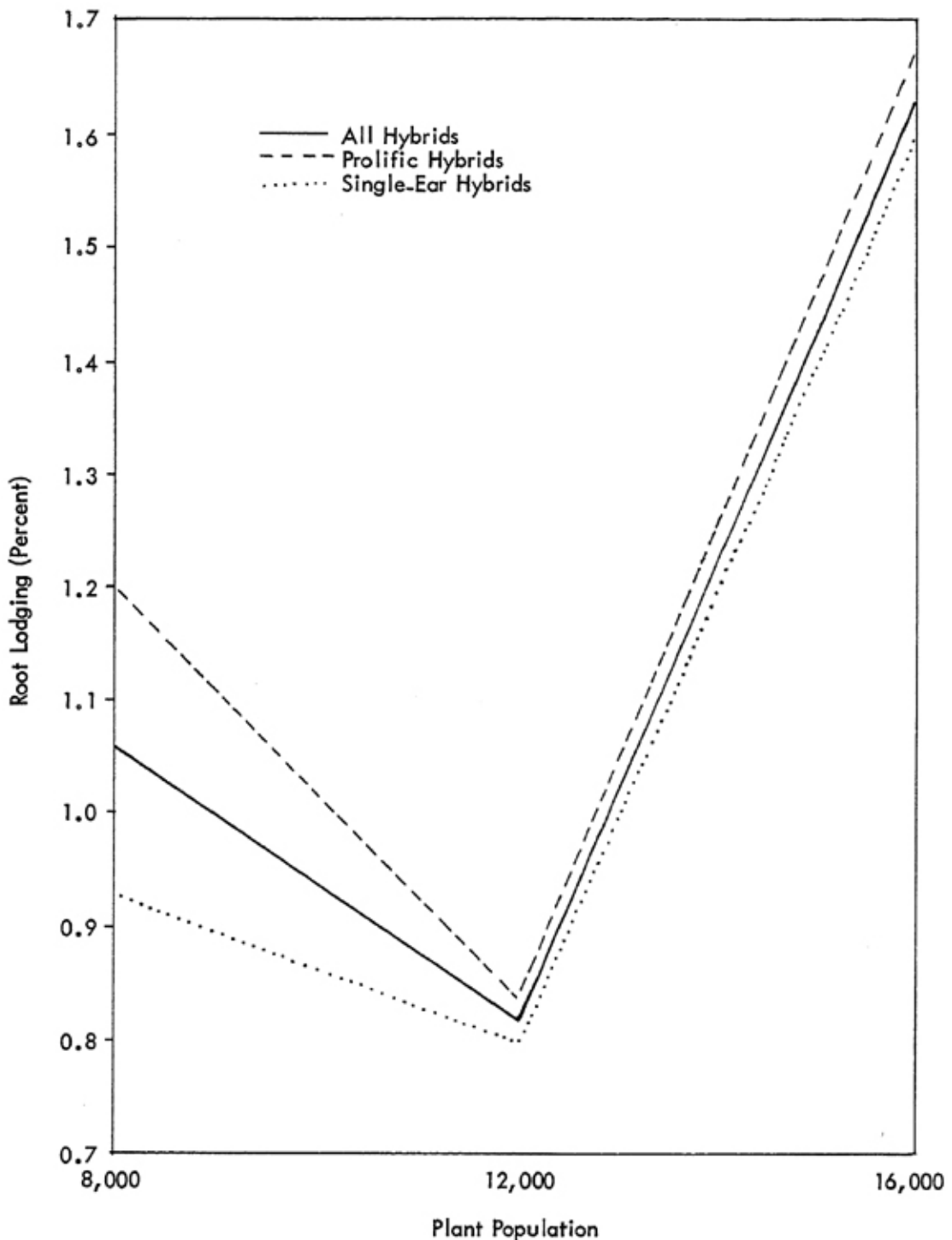


Figure 5. Average percent root lodging for 11 hybrids (5 prolific and 6 single-ear hybrids) planted at 3 rates of planting and tested at 3 locations during 1955, 1956, and 1957.

LODGING

The extent of root lodging in the different plant populations for the 3 years is shown in Figure 5. Though the percent of root lodging was low, it was relatively higher at the more dense plant population.

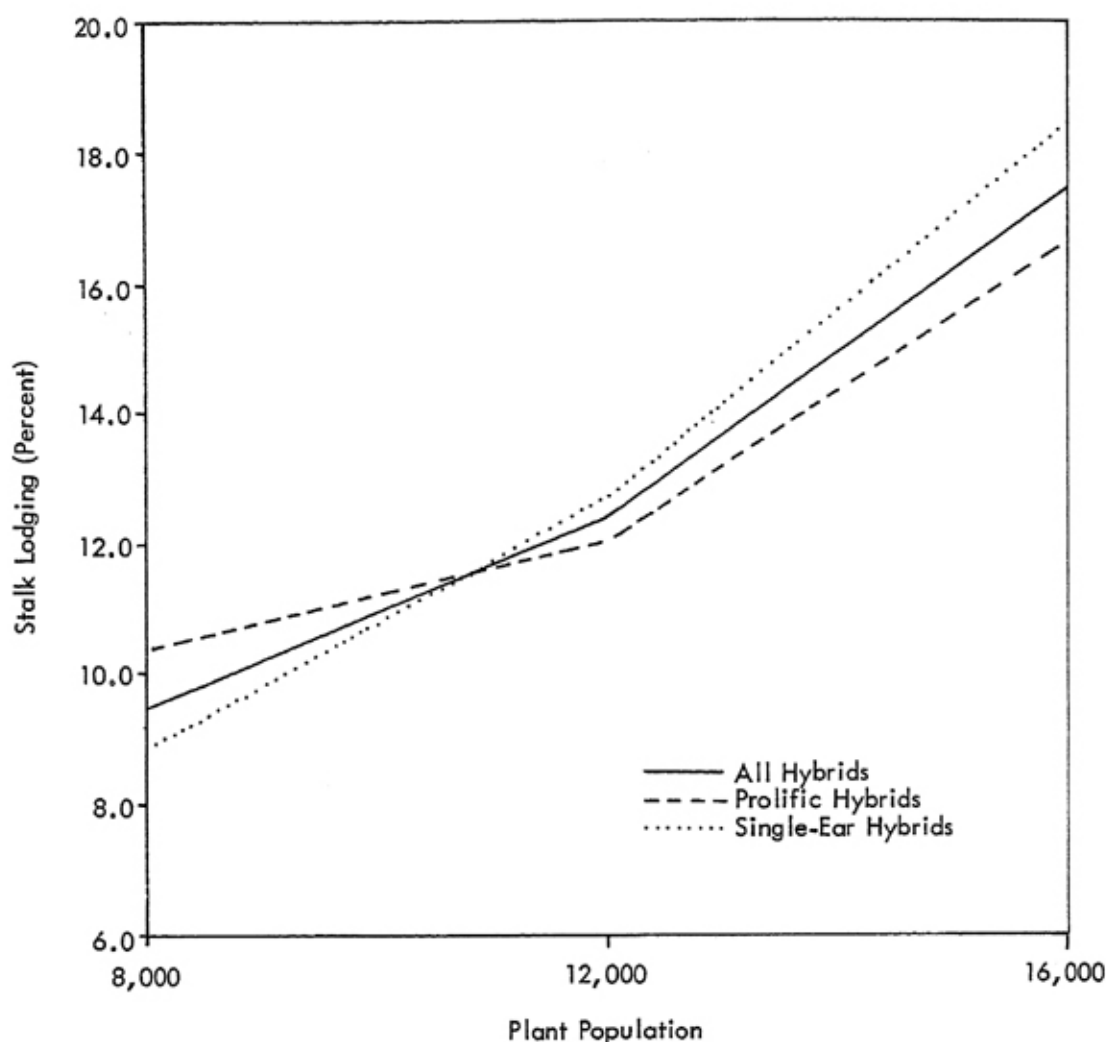


Figure 6. Average percent stalk lodging for 11 hybrids (5 prolific and 6 single-ear hybrids) planted at 3 rates of planting and tested at 3 locations during 1955, 1956, and 1957.

The stalk lodging results are shown in Figure 6. Stalk lodging at the 16,000 rate was nearly double that for the 8,000 planting rate. Acre yield for the 8,000 rate was relatively low for most hybrids. Thus the smaller amount of stalk lodging at this rate did not offset the yield reduction due to other factors.

When both yield and stalk lodging are considered, the 12,000 rate appears to be the best rate tested. Table 6 shows a significant difference for most of the stalk lodging interactions. Since stalk lodging is usually excessive at high rates of planting, the use of a prolific hybrid planted at low planting rates appears attractive. These studies show that regardless of the type of hybrid, farmers should be discouraged from planting at any rate above 12,000 due to the increase of stalk lodging. With corn harvested by mechanical pickers, the loss in yield at this rate of planting might be as much as 10 to 15 bushels when yields are over 100 bushels per acre.

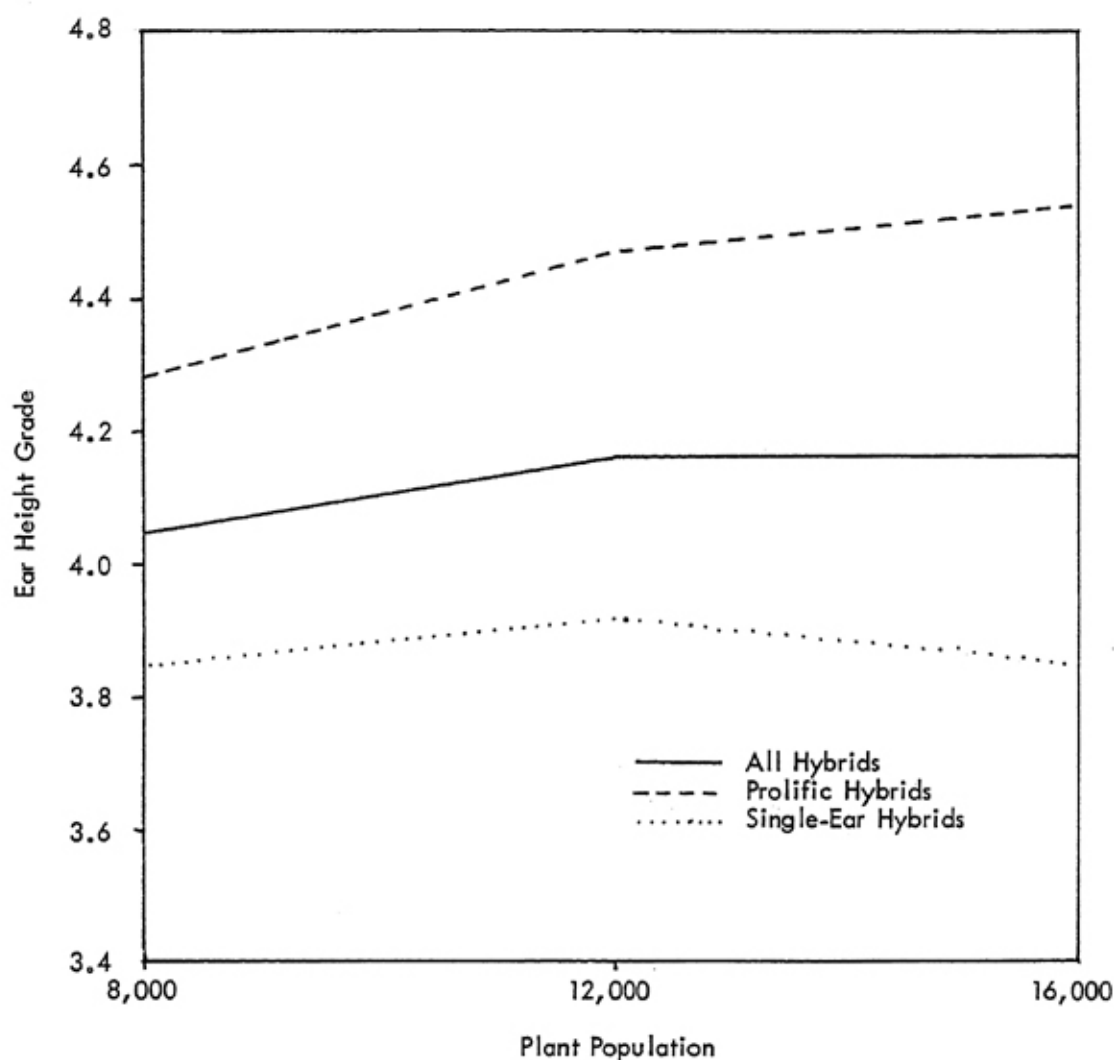


Figure 7. Average ear height grade for 11 hybrids (5 prolific and 6 single-ear hybrids) planted at 3 rates of planting and tested at 3 locations during 1955, 1956, and 1957.

EAR HEIGHT GRADE

The ear height grades of all prolific and the single-ear hybrids for the different planting rates are presented in Figure 7. The average ear height of the 5 prolific hybrids increased slightly from the 8,000 up to the 12,000 planting rate. This did not appear to be the case with the single-ear hybrids, which differed little at any of the three planting rates. Average height was slightly higher in the 12,000 population than in the other two.

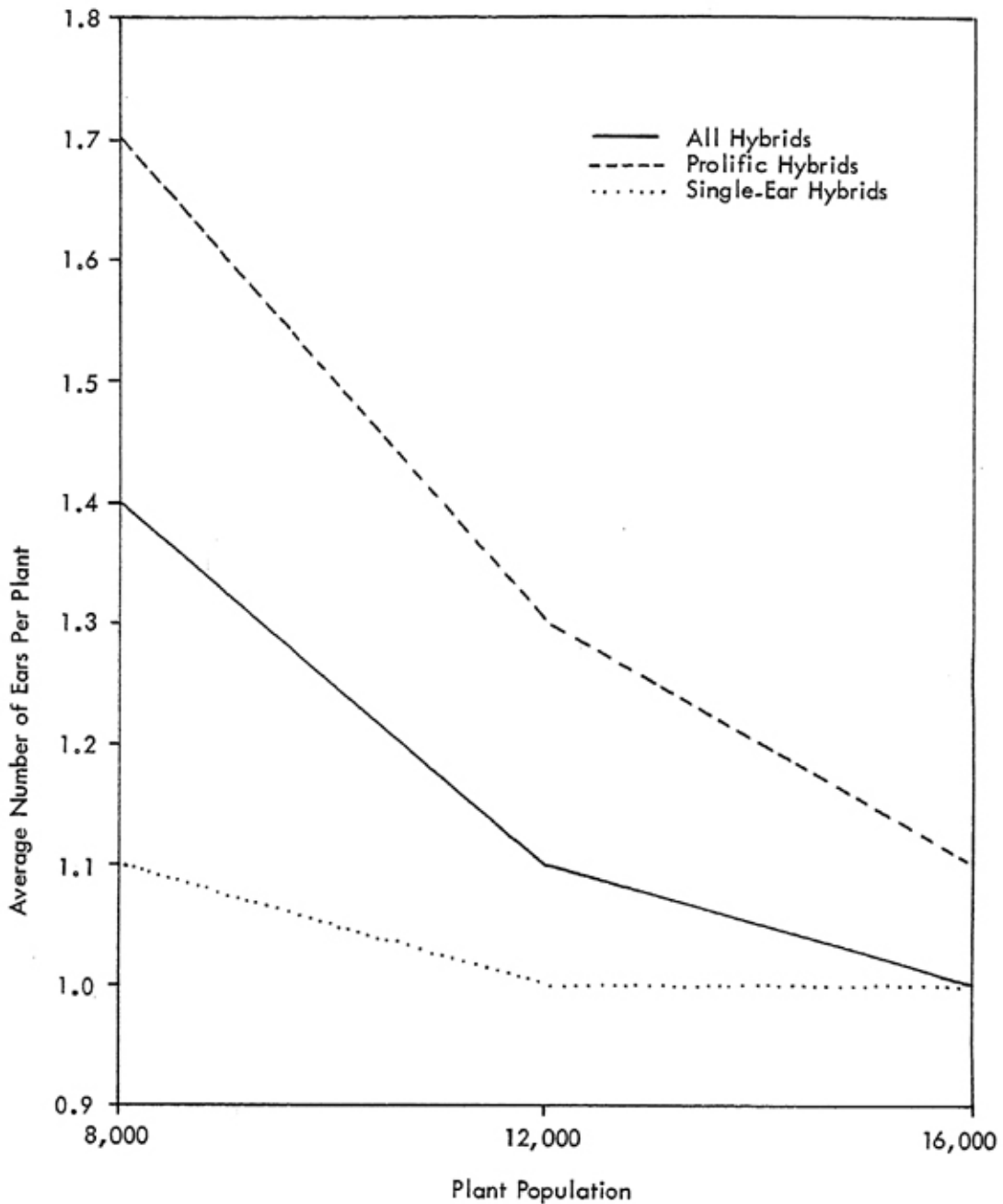


Figure 8. Average number of ears per plant for 11 hybrids (5 prolific and 6 single-ear hybrids) planted at 3 rates of planting and tested at 3 locations during 1955, 1956, and 1957.

NUMBER OF EARS PER PLANT

The average number of ears per plant for the prolific hybrids (Figure 8) decreased markedly from the 8,000 to the 16,000 rate. The single-ear hybrids had the same average at 16,000 and 12,000 planting rates. As the planting rate increased, the single-ear hybrids rapidly approached one ear per plant. Even though the average number of ears for the prolific hybrids consistently decreased, these hybrids still exhibited a prolific tendency at the 16,000 planting rate. If a 20,000 planting rate had been used, the prolific hybrids would probably have been reduced to a single ear per plant.

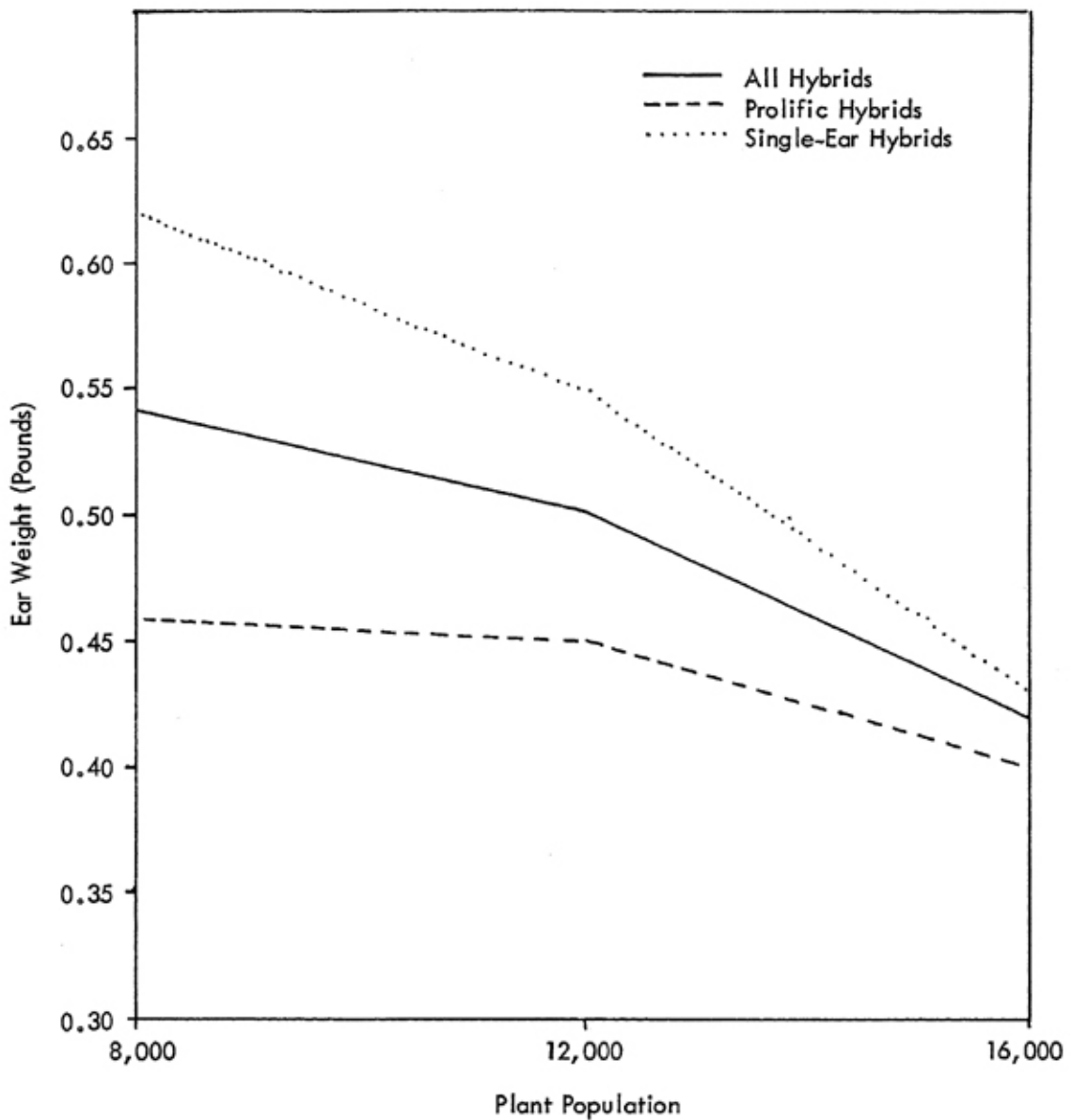


Figure 9. Average ear weight in pounds for 11 hybrids, (5 prolific and 6 single-ear hybrids,) planted at 3 rates of planting and tested at 3 locations during 1955, 1956, and 1957.

EAR WEIGHT

The average ear weight for the 11 hybrids ranged from 0.54 pound at 8,000 planting rate to 0.42 pound at 16,000 (Figure 9). A comparison of the 5 prolific and 6 single-ear hybrids shows the single-ear range of 0.62 to 0.43, whereas the prolific hybrids ranged from 0.46 to 0.40 pound. Ear weights of the single-ear hybrids decreased markedly from the 8,000 to the 16,000 planting rate, whereas those of the prolific hybrids decreased relatively little.

DISCUSSION

The narrow range in prolific hybrid yields between the 8,000 and the 16,000 planting rates, in spite of the various environments encountered during the 3-year period at the 3 locations, is a characteristic greatly desired in corn production. From an economic standpoint, farmers are interested in reducing the year-to-year fluctuations in yield. The use of a prolific hybrid would give a farmer the highest yield feasible at either a low or a high planting rate and presumably under a wider array of environmental conditions. It remains to be seen whether this behavior will occur under more adverse growing conditions than those experienced during this experiment. The yield response of some of the prolific hybrids at the various planting rates encourages further investigation, especially of earlier maturing prolific hybrids which were not available for this study.

SUMMARY

Conclusions derived from a rate-of-planting study for 3 years at 3 locations (Huntsdale, Pierce City, and Sikeston) were:

1. The most favorable rate of planting for both single-ear and prolific hybrids was 12,000 plants per acre.
2. Prolific hybrids appear to be more consistent in high yield performance regardless of planting rate.
3. Prolific hybrids Dixie 33 and Tenn 501 and single-ear hybrid Mo 4048W appeared to be better suited for either low or heavy planting rates, suggesting that it may be best to choose prolific hybrids for a rather wide range of planting rates.
4. In general, stalk lodging increased as planting rates increased.
5. In most hybrids, ear height increased slightly and the moisture in grain decreased slightly as planting rates were increased.
6. The average number of ears per plant decreased with increases in planting rates. Single-ear hybrids were strictly one-ear types at 12,000 and 16,000 populations, whereas prolific types tended to bear more than one ear per plant at those rates.
7. The average ear weight decreased with increased planting rates. The greatest range was shown in single-ear types.
8. Similar tests under more adverse conditions may be necessary to prove the superiority of prolific hybrids over the single-ear types in adjusting their growth habits to fit the growing season at low rates of planting.
9. The development of early maturing prolific-type hybrids appears to be desirable.