To the Graduate Council:

I am submitting herewith a thesis written by Charles Thomas Cunnyngham entitled "Evaluation of Selection for Ear Prolificacy in Corn (Zea mays L.) in Low and High Plant Populations." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Plant and Soil Science.

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EVALUATION OF SELECTION FOR EAR PROLIFICACY IN CORN (ZEA MAYS L.) IN LOW AND HIGH PLANT POPULATIONS

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Charles Thomas Cunnyngham

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ABSTRACT

Two populations of corn, a white endosperm and a yellow endosperm, were selected for prolificacy in a low plant population of 13,069 plants per acre and in a high plant population of 26,138 plants per acre. The lines developed from the two populations were sib-mated and testcrossed to single-ear inbreds in order to obtain seed for evaluation. The selections were evaluated as lines and in hybrids at Knoxville and Crossville, Tennessee, in both low and high plant populations.

A randomized complete block design was used for all evaluations which were replicated three times at both locations. Data were obtained on the number of ear shoots, total ears, and nubbin ears produced per plant. The weight of total ears and the weight of nubbin ears per plant were also obtained along with ear height data.

It was found that lines selected at a plant population of 26,138 plants per acre tended to have a greater degree of prolificacy than lines selected at a plant population of 13,069 plants per acre. The high density selection group averaged a greater degree of prolificacy along with having more individual selections significantly greater than the means of the evaluations. However, the increased prolificacy observed from the high density selections was due largely to an increased number of small ears.

The data obtained would suggest that selection for prolificacy was more effective in the yellow endosperm selections than in the white

endosperm selections. This may be due to the poorer comparative response of inbred T232 than T115 under the conditions of evaluation.

Ear weight per plant of the white endosperm selections was greater when selected in the high density while the opposite was true for the yellow endosperm selections. Individual white selections producing the greatest number of ear shoots also produced the most total ears and had the highest ear weight. Among the yellow endosperm selections, those producing the most ear shoots did not necessarily have the most number of ears.

Generally, selections that were superior when evaluated at the low plant population were also superior when evaluated at the high plant population.

Evaluation of the selections in crosses generally did not differentiate the low and high density selections.

Selections from the white endosperm population had a higher ear placement when selected in low density while the yellow endosperm selections had a higher ear placement when selected in high density.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION AND LITERATURE REVIEW	1
II.	MATERIALS AND METHODS	10
	Development of Lines	10
	Entries Included in the Experiments	11
	Testing Procedure	12
	Collection of Data	16
	Statistical Analysis	17
III.	RESULTS AND DISCUSSION	19
	Ear Shoots Produced	19
	White endosperm selections	19
	Yellow endosperm selections	26
	Ears Produced	32
	White endosperm selections	32
	Yellow endosperm selections	34
	Nubbin Ears Produced	37
	White endosperm selections	37
	Yellow endosperm selections	40
	Ear Weight per Plant	44
	White endosperm selections	44
	Yellow endosperm selections	47
	Nubbin Ear Weight per Plant	50
	White endosperm selections	50
	Yellow endosperm selections	53
	Ear Height	56
	White endosperm selections	56
	Yellow endosperm selections	56
IV.	CONCLUSIONS	59
LITERATURE CITED		62
VITA		66

LIST OF TABLES

TABLE		PAGE
1.	Mean Number of Ear Shoots per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations	20
2.	Percentage of Plants Bearing 0-4 Ear Shoots for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations	21
3.	Number of Ear Shoots per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations	22
4.	Number of Selections Significantly Greater than the Mean for the White Endosperm Selections Evaluated for Several Characters at Low and High Plant Populations at Knoxville	24
5.	Number of Selections Significantly Greater than the Mean for the White Endosperm Selections Evaluated for Several Characters at Low and High Plant Populations at Crossville	25
6.	Mean Number of Ear Shoots per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations	27
7.	Percentage of Plants Bearing 0-4 Ear Shoots for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations	28
8.	Number of Ear Shoots per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations	29
9.	Number of Selections Significantly Greater than the Mean for the Yellow Endosperm Selections Evaluated for Several Characters at Low and High Plant Populations at Knoxville	30
10.	Number of Selections Significantly Greater than the Mean for the Yellow Endosperm Selections Evaluated for Several Characters at Low and High Plant Populations at Crossville	31

TABLE PAGE

11. Mean Number of Ears per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 33

12. Number of Ears per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 35

13. Mean Number of Ears per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 36

14. Number of Ears per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 38

15. Mean Number of Nubbin Ears per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 39

16. Number of Nubbin Ears per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 41

17. Mean Number of Nubbin Ears per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 42

18. Number of Nubbin Ears per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 43

19. Mean Ear Weight (gm) per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 45

20. Ear Weight (gm) per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 46

21. Mean Ear Weight (gm) per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 48

22. Ear Weight (gm) per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 49

TABLE PAGE

23. Mean Nubbin Ear Weight (gm) per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 51

24. Nubbin Ear Weight (gm) per Plant for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 52

25. Mean Nubbin Ear Weight (gm) per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 54

26. Nubbin Ear Weight (gm) per Plant for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 55

27. Mean Ear Height (cm) for Sibbed and Crossed White Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 57

28. Mean Ear Height (cm) for Sibbed and Crossed Yellow Endosperm Selections Evaluated at Low and High Plant Populations at Two Locations 58

CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

Before 1900, two-eared and multiple-eared corn varieties were very popular across the U. S. (4). For the past 60 to 70 years, strong selection for single-eared types has been practiced in the major corn producing regions of the U. S., mainly the Corn Belt. The prolific types were in disfavor in the Corn Belt due mainly to three factors: 1) the ease of hand harvesting one large ear as compared to several smaller ears, 2) seed used for planting usually was obtained from larger ears coming from single-eared plants which tended to pass on the single-ear character, and 3) corn shows, which were very important at that time, awarded honors for large ears which tended to come from single-eared plants (4). Of the three, hand harvesting was probably the main factor causing growers to favor the single-eared types (11).

Although the main corn producing regions of the U. S. grew single-eared types, some parts of the South continued to grow the more prolific types (11). Prolific types in the South remained popular mainly because harvesting could be carried on throughout the winter if necessary and corn shows were not as popular as in the Northern States.

Today, with modern harvesting machinery, the main factor responsible for prolific corn being in disfavor has lessened. Therefore, if plant breeders can produce prolific hybrids which equal or exceed the elite standards of today's single-eared hybrids, corn production in the

U. S. may get another hefty boost from the advantages of the prolific characteristic.

Several studies have been conducted comparing the capabilities and potentials of single-eared types with those of more prolific types. These studies most often report five areas in which prolific types may have an advantage: 1) the potential to yield more grain, 2) reduction in barrenness at high plant populations, 3) stabilization of yields across differing environments or lessening the genotype x environment interactions, 4) the ability to make up yield by producing more ears per plant, and 5) allowing lower plant populations to be grown.

As early as 1923, Brown and Garrison (2) conducted experiments which showed that the prolific type was more productive than the single-eared type. They reported the prolific type to be more efficient in increasing the number of ears per plant whereas the single-eared type was more efficient in increasing the ear weight. They found that increasing the number of ears per plant was more effective for increasing yield per plant than was increasing the weight of the ears. Also, the authors reported that the prolific type adjusted better to varying conditions.

In 1976, Harris et al. (16) found that prolific single crosses yielded more grain than single-eared single crosses of the same genotype. Within each of the several single crosses used, they found that the prolific plants produced significantly more grain than the single-eared plants. Overall, two-eared plants yielded 40% (82 grams per plant), more than the single-eared plants. Since all plants from a particular

single cross are homogeneous, these results show that the true yield potential of plants bearing only a single ear was virtually untapped. It is also apparent that the single-eared plants were capable of using only one energy sink which resulted in reducing its capability to produce grain. It was also shown in this study that three-eared plants, overall, produced 16% (46 grams per plant) more grain than two-eared plants within genotypes. Josephson (18) found that as plant densities increased, yields for full-season prolific hybrids increased more than for the full-season single-eared hybrids. He found that as plant densities increased, the number of ears per 100 plants decreased sharply. Some barrenness was reported for the single-eared plants at high plant densities. The prolific hybrids adjusted to the higher plant densities by reducing the number of ears per plant but without reverting to barren plants. This ability to produce one good ear per plant at high planting rates appeared to Josephson (18) to be the prolific hybrid's greatest advantage.

Collins et al. (4) studied 36 single-cross hybrids made up of one-eared (1X1), two-eared (2X2), and both one and two-eared (1X2) crosses grown at four plant densities, 8, 12, 16, and 20 thousand plants per acre. They reached the following conclusions: 1) the two-eared type yielded more consistently across changing plant densities than the single-eared type, which was attributed mainly to the ability of the two-eared type to change the number of ears produced, 2) the two-eared single-crosses outyielded the single-eared single-crosses at the lowest plant density. An explanation for this could be that the single-eared

plants had but one energy sink and reached its genetic limits, 3) under maximum planting rates for optimum yields, it was estimated the 1X2 ear and 2X2 ear crosses may perform better than the 1X1 ear crosses. Under high plant densities, a reduction in yield for 1X1 ear crosses is usually associated with increased barrenness, 4) the genotype x environment interactions were smaller for the two-eared lines than for the single-eared lines, and 5) the average yields for the 2X2 ear crosses (122 bushels per acre) when compared to the 1X1 ear crosses (127 bushels per acre) shows that the 2X2 ear yields were competitive with the limited amount of work that has been done with them.

Zuber et al. (31) also concluded that prolific hybrids were more consistent across plant densities than single-eared hybrids.

Josephson (17) and Crews and Fleming (5) reported that prolific hybrids were better able to compensate for poor stands. According to Hallauer (11), stands that are reduced before pollination by adverse conditions are able to make up in part the lost plants by prolific hybrids producing more than one harvestable ear per remaining plant.

Duvick (6) and Thomas (30) reported that prolific hybrids when compared to single-eared hybrids resisted barrenness much better at high plant densities. Russell (25), working with inbred lines, suggested that the advantage of two-eared lines lies in their ability to resist barrenness at higher plant populations and not in producing second ears in hybrid combinations.

Bauman (1) suggested that the primary advantage of prolific hybrids is their ability to be flexible and adapt to varying yield

levels in the South where most of the prolific hybrids are grown. Freeman (9) also reported on the great adaptability of Southern prolific hybrids.

Morris (23) found that in most cases prolific hybrids outyielded single-eared hybrids up to a plant density of 16,000 plants per acre, produced fewer barren stalks, and had a tighter and longer husk covering which aids in protecting the ear from insects and birds.

The preceding studies demonstrate that prolificacy is a desirable characteristic to incorporate into today's corn hybrids.

Buren et al. (3) suggest that prolificacy should be selected for when breeding for density-tolerant genotypes in order to reduce barrenness.

In order for the plant breeder to succeed in incorporating prolificacy into hybrids, he needs to know something about the inheritance and heritability of the prolific character.

Hallauer (13) found that the heritability of ear number in corn varied with different plant densities and populations. The pooled estimates of heritability for all crosses and densities in all environments were 0.2417 for ear number and 0.2738 for the ear number weight index. He found prolificacy seemed to be recessively inherited which agreed with the findings of Harris et al. (15). In addition, he suggested that the prolific character is controlled polygenically, but with a discontinuous distribution. Falconer (8) describes such a character as a threshold character or one that has discontinuous variation controlled by many genes. He suggests there is an underlying

continuous scale divided into discrete visible classes separated by thresholds. These thresholds are responsible for which class is expressed phenotypically such as the number of ears on a corn plant.

The higher the heritability of a character the greater the chance for the plant breeder to make progress by selection. According to Stuber et al. (28) and Stucker and Troyer (29) most of the variation of prolificacy is made up of additive variation with some dominance. The greater the additive variation of a character, the greater the heritability. Therefore, progress can be expected by selecting for prolificacy in a breeding program.

Several studies have been done concerning the aspects of breeding for prolificacy. Josephson (17) found that prolificacy was not influenced by date of maturity and thus is available for early maturing varieties.

Duvick (6) used continuous backcrossing in order to transfer a quantitative character, prolificacy, in part to a nonprolific line. Hallauer (12) developed 14 primarily two-eared single-cross hybrids using full-sib selection and prolific varieties. He then compared them to six single-eared single-crosses composed of elite lines. The average yield of the two-eared hybrids was 143 bushels per acre compared to 131 bushels per acre for the single-eared hybrids. Ten of the two-eared hybrids yielded higher than the best single-eared hybrid. Of the 14 two-eared hybrids, 31% of their total yield came from second ears.

Lonnquist (21) practiced mass selection for prolificacy in the variety "Hays Golden" and found it effective for increasing the number

of ears per plant. The plants were selected in a density of 8,000 plants per acre. He reported that yield response per cycle from selection for prolificacy (6.28%) was greater than the yield response per cycle from selection for yield (2.68%) within the same variety. This greater effectiveness obtained from selection for prolificacy was suggested to be due to a higher selection intensity and a higher heritability for prolificacy than for yield alone. Kincer and Josephson (19) practiced mass selection for ear prolificacy in the variety 'Jellicorse' starting with the M6 generation of selection for yield. Total number of ears produced per plant increased 13.2% in five generations of selection and 33.1% more than the variety. Number of nub ears increased at a greater rate in selection for prolificacy than in selection for yield. Small but equal increases in yield of grain were obtained as with selection for yield. Laible and Dirks (20) and Robinson et al. (24) found that by using a selection index comprised of ear number and yield per plant, rather than selecting for yield alone, more progress could be obtained in the selection program.

Moll and Kamprath (22) selected plants on the basis of yield alone over ten generations. They found that with an increase in yield, the number of ears per plant increased more than any other component of yield. El-Lakany and Russell (7) also reported that the number of ears per plant was the most important component of yield.

When selecting for prolificacy, the plant breeder's main problem is choosing the most effective environment in which to do the selecting. Russell and Teich (26) suggest that this problem is due to genotype x

environment interaction and variations of heritabilities in different environments. The plant breeder desires to select in an environment which maximizes heritability of the character he wishes to improve.

Russell and Teich (26) tested the hypothesis that lines selected by performance in high-population densities will be superior at both low- and high- population densities, but that lines selected in low-population densities may not be superior in high-population densities. They found that the lines selected in the dense populations always were superior to the ones selected in the low-populations when evaluated in high plant densities. This did not hold true when evaluations were made at low plant densities. Thus, the hypothesis was rejected, although their data did suggest that selecting in a high density was more effective when developing new lines.

In 1972, Hallauer and Troyer (14) reported that when selecting for prolificacy, plant densities of 16,000 to 20,000 plants per acre may be appropriate at the present time. Also Hallauer and Troyer (14), Hallauer (10), and Duvick (6) reported a problem with excessive stalk breakage in prolific hybrids and suggested that higher stalk quality should be selected for when developing prolific hybrids. In 1974, Hallauer (13) conducted a study to resolve the optimum plant density in which selection for prolificacy should take place. His data showed no consistent or obvious trends and thus the optimum density for selection was not resolved.

The objective of this study was to determine whether selection for prolificacy was more effective in a low (13,068 plants per acre) or a

high (26,136 plants per acre) plant density when evaluated in both high and low plant populations.

CHAPTER II

MATERIALS AND METHODS

Development of Lines

The white and yellow prolific lines used in this study were selected by Dr. L. M. Josephson and Mr. H. C. Kincer at the University of Tennessee, Knoxville, Tennessee. Initially, the white prolific inbred T115 was crossed with the white single-ear inbred T141, while the yellow prolific inbred T232 was crossed with the yellow single-ear inbred Va35C. Both single crosses were advanced to the F_2 generation. Seed from these populations was planted in 40-inch rows at two plant densities each year of selection. For the low plant population density, plants were spaced 12 inches apart in the row providing a plant population of 13,069 plants per acre while for the high plant density, plants were spaced 6 inches apart in the row providing 26,138 plants per acre. Excess seed was planted for each rate and the seedlings subsequently thinned for the desired population density.

Selections for prolificacy only were made from both plant densities. Plants with more than one ear shoot were self-pollinated in each progeny. In most instances, second ears were self-pollinated, allowing the top ear to open pollinate. Selections were then made from plants with best developed second ears and full set on the top ears. In those cases where second ears did not silk adequately, especially in the high populations, pollinations were made on the top ears. Selections were made each year from only fully competitive plants.

The selections from each population and from both densities were selfed and selected for six generations. The final number of progenies selected varied by population and selection density. For use in the evaluation of the selection procedure reported in this study, the progenies from both selection densities were both sib-pollinated and crossed to a tester in 1976. The tester for the white lines was inbred 33-16 while that for the yellow lines was T226. Both tester inbreds are strictly single-eared types.

Entries Included in the Experiments

The sibbed lines and testcrossed lines from both selection densities and from both the white and yellow endosperm populations made up the entries used in this study. The number of lines developed from both populations are listed below:

T115 x T141 selections

16 lines (sib increased) selected in low plant populations.

21 lines (sib increased) selected in high plant populations.

6 lines selected in low plant populations and crossed on inbred 33-16.

14 lines selected in high plant populations and crossed on inbred 33-16.

T232 x Va35C selections

14 lines (sib increased) selected in low plant populations.

12 lines (sib increased) selected in high plant populations.

13 lines selected in low plant populations and crossed on inbred T226.

11 lines selected in high plant populations and crossed on inbred T226.

The sibbed lines and testcrossed lines from each population were grown in separate experiments.

The above lines were included in the Knoxville experiments. Sufficient seed of the above entries was not available to include in a similar experiment at Crossville. The total number and description of lines included in the Crossville experiments are listed below:

T115 x T141 selections

16 lines (sib increased) selected in low plant populations.

17 lines (sib increased) selected in high plant populations.

5 lines selected in low plant populations and crossed on inbred 33-16.

6 lines selected in high plant populations and crossed on inbred 33-16.

T232 x Va35C selections

14 lines (sib increased) selected in low plant populations.

12 lines (sib increased) selected in high plant populations.

7 lines selected in low plant populations and crossed on inbred T226.

5 lines selected in high plant populations and crossed on inbred T226.

Testing Procedure

The studies were conducted at the Plant Science Field Laboratory at Knoxville, Tennessee and at the Plateau Experiment Station near

Crossville, Tennessee, in 1977. The fields used for testing at both locations had been planted in corn in 1976.

At Knoxville, the old stalks were shredded and plowed in the fall. The fields were fertilized with 900 pounds per acre of 6-12-12, broadcast and disced in. All experiments were hand planted April 26, 1977. Seed for each entry was planted in a two-row plot twelve feet long including a three foot alley. The seeds were planted six inches apart. A 40 inch row spacing was used. Following planting, atrazine was applied at the rate of 2.5 pounds per acre. The experiments were thinned between May 31 and June 5. They were sidedressed with 200 pounds of ammonium nitrate per acre June 3. Heptachlor was applied in the leaf whorls June 21 to reduce damage from corn earworm and fall armyworm. The experiments were irrigated during the middle part of July when soil moisture supply was low.

At Crossville, the fields had ten tons of manure plowed under in early spring. Urea was applied at the rate of 250 pounds per acre and 0-14-42 was applied at 350 pounds per acre. The fertilizer was broadcast and disced in. The experiments were planted May 2 using two-row plots twelve feet long including a three foot alley. The seed was planted six inches apart and a 36 inch row spacing was used. The plots were thinned June 6. Heptachlor was applied in the leaf whorls June 28 and June 30. At both locations, weeds were eliminated by hand hoeing.

In this study, there were four groups of lines which included white and yellow endosperm lines selected in two plant populations. Each group had seed increased by sib-mating and testcrossing which in

turn was evaluated at a high and a low plant population at the two locations. At Knoxville and Crossville, 19,602 and 21,780 plants per acre constituted the high plant populations, respectively. The low plant populations for Knoxville and Crossville were 13,069 and 14,520 plants per acre, respectively. In order to obtain these plant populations, the plots were thinned to thirty plants per plot for the high plant population and to twenty plants per plot for the low plant population.

There was a total of sixteen separate experiments, each of which tested the effects of selection in high and low plant densities on certain agronomic characters. Below is a listing of the sixteen experiments. Beside each is a number in parenthesis which denotes the number of selections or entries combined from both selection densities. Entries denote either lines or hybrids depending on the particular experiment.

Knoxville

white, sib increased, tested at 13,068 plants/acre (37)

white, sib increased, tested at 19,602 plants/acre (37)

white, testcrossed, tested at 13,068 plants/acre (20)

white, testcrossed, tested at 19,602 plants/acre (20)

yellow, sib increased, tested at 13,068 plants/acre (26)

yellow, sib increased, tested at 19,602 plants/acre (26)

yellow, testcrossed, tested at 13,068 plants/acre (24)

yellow, testcrossed, tested at 19,602 plants/acre (24)

Crossville

white, sib increased, tested at 14,520 plants/acre (33)

white, sib increased, tested at 21,780 plants/acre (33)

white, testcrossed, tested at 14,520 plants/acre (11)

white, testcrossed, tested at 21,780 plants/acre (11)

yellow, sib increased, tested at 14,520 plants/acre (26)

yellow, sib increased, tested at 21,780 plants/acre (26)

yellow, testcrossed, tested at 14,520 plants/acre (12)

yellow, testcrossed, tested at 21,780 plants/acre (12)

A randomized complete block design was used for each experiment, where the entries selected at both high and low plant populations were randomized within each block or replication. Each experiment was replicated three times. The hybrids were grown adjacent to the lines at both locations. The replications of the low population densities were co-mingled with those of the high population densities.

Border rows were planted to insure fair competition among plots. Also, fill-in plots were planted when an entry was short of seed and only two replications were possible and to produce uniform experiments rectangular in shape. Inbreds T115, T141, and Mp339 were used as fill-in plots for the white endosperm selections. Border rows were planted with T115. For the white endosperm hybrids, T115 x T141 was used as fill-in and for border rows. Inbreds T232 and Va35C were used as fill-in plots while T232 was also used for planting border rows for the yellow endosperm selections. For the yellow endosperm hybrids, T232 x Va35C and T232 x T224 were used as fill-in with T232 x Va35C also being

planted as border rows. The fill-in plots were not included in the analysis of the experiments.

Collection of Data

The primary data were obtained on the number of ear shoots per plant prior to harvest. An ear shoot for this study was defined as one which produced silk and thus had the capability to produce grain.

Every plant in each two row plot was given a rating of 0, 1, 2, 3, or 4 depending upon the number of ear shoots produced on that particular plant. For example, a rating of 0 meant the plant produced no ear shoots. From this data, the number of plants with 0, 1, 2, 3, or 4 ear shoots could be obtained for each plot along with the total number of plants per plot and the total number of ear shoots per plot. The number of ear shoots produced on tillers was also recorded for each plot and added to the total number of shoots per plot. Ear shoots produced on a tiller were not included with a plant's individual rating.

Flowering dates were obtained only at Knoxville and were recorded as the number of days from planting to the day 50% of the plants in a plot shed pollen on the center spike of the tassel and when silks appeared.

Ear and plant heights were recorded in feet to the nearest tenth on a per plot basis. Plot averages were obtained for both characters by measuring eight to ten plants from each plot. Ear height was defined as the distance from the base of the plant to the top ear-node attachment. Plant height was measured from the base of the plant to the top of the center spike of the tassel.

Stalk lodging data were obtained for all replications at Knoxville and for two replications at Crossville by recording the total number of lodged plants per plot.

All plots were hand harvested. The Knoxville experiments were harvested September 5-7 while the Crossville experiments were harvested September 8 and 9. Plot weights were determined by weighing all ears, including nubbin ears, produced by the plot. The number and weight of the nubbin ears alone was also recorded. All ear corn weights were adjusted to 15.5% moisture. The total number of ears, including nubbin ears, was recorded for each plot.

Statistical Analysis

Before analyzing the data, several conversions were made. Ear height was converted from feet to centimeters. All of the other agronomic data were converted from a per plot basis to an individual plant basis. This was accomplished by dividing the plot data by the number of plants in the plot. All weights were converted from pounds to grams.

For each of the sixteen experiments, the entries were first grouped by selection density. Analysis of variance tables were then obtained which compared differences between the high and low selection densities for ear height, yield per plant, nubbin ear yield per plant, ears per plant, nubbin ears per plant, and ear shoots per plant. Comparisons were also made for the percentage of plants bearing 0, 1, 2, 3, and 4 ear shoots between the two selection densities.

The data were first analyzed using a nested design where the entries or genotypes were nested within each selection density. This made it possible to remove the unwanted variation among entries within the selection densities and therefore producing a more precise estimate of selection effects. Replications x selections interaction was used as the error term.

Secondly, each of the experiments was grouped by entries. Analysis of variance tables were obtained which compared differences among entries regardless of the selection density for yield per plant, nubbin ear yield per plant, ears per plant, nubbin ears per plant, and shoots per plant. Replications x entries interaction was used as the error term. If a significant F-value was found for a particular experiment an L.S.D. value was calculated at the .05 level of probability (27). This made it possible to observe differences among individual entries across both selection densities. When calculating L.S.D. values, three replications were used although in some experiments a few of the entries were replicated only twice due to a shortage of seed.

Since there was an unequal number of entries for the selection densities, type IV sums of squares was used throughout this study. All tests of significance were made using the .05 probability level. All calculations and analysis procedures were made using the IBM 360/65 computer at the University of Tennessee Computer Center.

CHAPTER III

RESULTS AND DISCUSSION

Ear Shoots Produced

White endosperm selections. The mean number of ear shoots produced per plant for the low and high density selections evaluated at Knoxville and Crossville in low and high plant populations is shown in Table 1. The high density sibbed selections produced a significantly greater number of ear shoots per plant in all evaluations, except the high plant population at Crossville. This is also illustrated in Table 2 showing that the high density selections had a higher percentage of plants bearing two or more ear shoots and a lower percentage of barren plants and plants bearing only one ear shoot. The data clearly illustrate that selection in high densities resulted in a greater degree of prolificacy. When the selections were crossed to a single-ear tester inbred, however, there were no significant differences in number of ear shoots produced per plant (Table 1), although selection in high densities resulted in a greater number of ear shoots produced (Table 2).

Data for the individual selections from both selection densities evaluated at low and high plant populations at Knoxville and Crossville are shown in Table 3. At Knoxville, three high density sibbed selections evaluated at each of the high and low plant populations were significantly greater than the overall mean, whereas only two low density sibbed selections were significantly greater than the mean at

TABLE 1

MEAN NUMBER OF EAR SHOOTS PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
		Sibbed selections		
Low	1.89 b	1.95 b	1.69 b	1.72 a
High	2.10 a	2.10 a	1.86 a	1.83 a
		Crossed selections		
Low	1.76 a	1.61 a	1.39 a	1.21 a
High	1.77 a	1.69 a	1.45 a	1.23 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

TABLE 2

PERCENTAGE OF PLANTS BEARING 0-4 EAR SHOOTS FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Number of ear shoots	Population at which evaluated							
	Low				High			
	Knoxville		Crossville		Knoxville		Crossville	
	Low sel.	High sel.	Low sel.	High sel.	Low sel.	High sel.	Low sel.	High sel.
	Sibbed selections							
0	3.5*	1.5	4.2*	0.2	5.3*	2.4	4.0*	0.8
1	17.3*	6.4	11.1	4.7	28.4*	17.4	24.6	19.6
2	66.3	73.9	71.7	80.6*	58.5	72.0*	66.6	75.3
3	12.7	17.8	12.8	14.3	7.8	8.1	4.8	4.3
4	0.1	0.5	0.2	0.2	0.1	0.1	0	0.1
	Crossed selections							
0	0.3	0.3	0.4	0	0.8	1.1	1.5	3.3
1	29.4	28.2	38.8	32.8	59.6	54.4	76.4*	71.1
2	66.8	66.1	60.2	66.2	39.1	43.7	22.2	25.5
3	3.5	5.5	0.7	0.9	0.6	0.9	0	0
4	0	0	0	0	0	0	0	0

*Denotes the selection density within the same location and population which is significantly higher at the .05 level of probability.

TABLE 3

NUMBER OF EAR SHOOTS PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1602	1.7	1.7	†		1.9	1.5		
1603	1.7	1.5			1.9	1.7		
1604	1.7	1.5			1.9	1.7		
1605	1.9	1.6			2.1	1.9		
1607	1.9	1.7			2.2	1.9		
1608	1.9	1.7	1.8	1.3	2.0	1.7	1.5	1.1
1609	2.2	1.9			2.2	1.9		
1612	1.7	1.3			1.5	1.3		
1613	2.1	1.9	1.8	1.4	2.2	1.7	1.8	1.2
1614	2.7	2.4	1.9	1.6	2.2	2.0	1.9	1.5
1615	1.9	1.8			2.3	2.1		
1617	2.0	1.9	1.6	1.3	2.0	1.7	1.5	1.2
1618	1.3	1.2	1.8	1.3	1.5	1.4	1.4	1.2
1619	1.1	1.0			1.1	1.6		
1620	1.8	1.7			1.8	1.6		
1622			1.7	1.4				
1623	2.6	2.2			2.9	2.3		
				Selected at high density				
1627	1.8	1.5			2.0	1.8		
1628	1.9	1.6			1.9	1.4		
1630	1.9	1.8	1.5	1.4	2.0	2.0		
1632	2.0	1.8			2.0	1.9		
1633	2.2	1.9	1.7	1.5	2.1	1.8		
1634	2.3	2.0	1.7	1.4	2.2	1.9		
1635	2.2	1.9	1.7	1.5	2.0	1.8		
1637	2.6	1.9			2.2	1.7		
1638	2.0	1.8	1.5	1.3	2.1	1.7	1.5	1.0
1639	1.8	1.7	1.6	1.2	1.9	1.7	1.7	1.1
1640	2.0	1.7			2.0	1.9		
1645	2.0	2.1	1.7	1.4				
1647	1.9	1.8	1.7	1.3	2.0	1.8	1.8	1.3
1648	2.1	1.9	1.9	1.5	2.0	1.8	1.7	1.3
1649	1.9	1.6						
1653	2.3	1.9	1.9	1.4			1.7	1.2
1654	2.7	2.5	2.0	1.5	2.8	2.4		
1655	2.3	2.0	2.0	1.6				
1657	2.1	1.9	1.8	1.6	2.5	2.0		
1658	2.5	2.2	2.1	1.7	2.2	1.8	1.7	1.4
1659	1.7	1.7			2.0	1.7		
Mean	2.0	1.8	1.8	1.4	2.0	1.8	1.7	1.2
L.S.D. (.05)	0.3	0.2	0.3	ϕ	0.7	0.2	0.2	0.2
				Parental inbreds				
T115	2.9	2.5			2.7	2.5		
T141	1.2	1.2			1.4	1.2		

†Missing data denotes insufficient seed available for evaluation.
ϕNo significant difference.

both plant populations (Table 4). The three high density selections were 1654, 1637 and 1658 for the low plant population evaluation and 1654, 1658 and 1645 for the high plant population evaluation. The two low density selections were 1614 and 1623 for both evaluations. At Crossville, one high density sibbed selection from each of the high and low plant population evaluations was significantly greater than the overall mean, whereas two low density selections evaluated at the high plant population and one evaluated at the low plant population were significantly greater than the mean (Table 5). High density sibbed selection 1654 and low density selection 1623 were significantly greater than the mean at both high and low plant populations, while low density selection 1615 was also significantly greater than the mean when evaluated at the high plant population.

None of the crossed selections evaluated at Knoxville produced a significantly greater number of ear shoots than the overall mean (Table 4) while at Crossville only one selection (1614), selected at low density and evaluated at the high plant population was significantly greater than the mean (Table 5). In most cases, the selections which produced the greatest number of ear shoots when tested in crosses also were the highest when tested as lines.

Although the mean data showed the high density selection group as having a greater degree of prolificacy, the individual data show the low density selection group having an equal number of selections significantly greater than the means, over all evaluations.

TABLE 4

NUMBER OF SELECTIONS SIGNIFICANTLY GREATER THAN THE MEAN FOR THE WHITE ENDOSPERM SELECTIONS EVALUATED FOR SEVERAL CHARACTERS AT LOW AND HIGH PLANT POPULATIONS AT KNOXVILLE

Character evaluated	Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.
	Selected at low density			
Ear shoots per plant	2	2	0	ϕ
Ears per plant	0	1	0	ϕ
Nubbin ears per plant	ϕ	0	ϕ	ϕ
Ear weight per plant	2	2	ϕ	ϕ
Nubbin ear weight per plant	ϕ	ϕ	ϕ	ϕ
	Selected at high density			
Ear shoots per plant	3	3	0	ϕ
Ears per plant	3	2	0	ϕ
Nubbin ears per plant	ϕ	1	ϕ	ϕ
Ear weight per plant	3	2	ϕ	ϕ
Nubbin ear weight per plant	ϕ	ϕ	ϕ	ϕ

ϕNo significant difference.

TABLE 5

NUMBER OF SELECTIONS SIGNIFICANTLY GREATER THAN THE MEAN FOR THE WHITE ENDOSPERM SELECTIONS EVALUATED FOR SEVERAL CHARACTERS AT LOW AND HIGH PLANT POPULATIONS AT CROSSVILLE

Character evaluated	Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.
	Selected at low density			
Ear shoots per plant	1	2	0	1
Ears per plant	1	0	ϕ	ϕ
Nubbin ears per plant	0	0	ϕ	ϕ
Ear weight per plant	1	0	ϕ	ϕ
Nubbin ear weight per plant	0	2	ϕ	ϕ
	Selected at high density			
Ear shoots per plant	1	1	0	0
Ears per plant	1	3	ϕ	ϕ
Nubbin ears per plant	0	1	ϕ	ϕ
Ear weight per plant	3	2	ϕ	ϕ
Nubbin ear weight per plant	2	2	ϕ	ϕ

ϕNo significant difference.

Yellow endosperm selections. Table 6 shows that there were no significant differences between the number of ear shoots produced by the two sibbed selection density groups when tested at both the high and low plant populations at both locations. However, the high density selections produced more ear shoots when evaluated at the low plant populations. There were also no differences found among the percentages of plants bearing 0, 1, 2, 3, and 4 ear shoots as shown in Table 7.

When the two selection density groups were tested in crosses, the low selection density group produced a greater number of ear shoots in all experiments, although only significantly more at the low plant population evaluation at Knoxville (Table 6). Table 7 shows that the low density selection group produced a greater percentage of plants bearing three ear shoots, whereas the high density selections produced a greater percentage of plants bearing two ear shoots.

Data for the individual selections are shown in Table 8 and are summarized in Tables 9 and 10. Tables 9 and 10 show that three sibbed selections from the high density selection groups produced a significantly greater number of ear shoots than the mean when evaluated at the low plant population level at both Knoxville and Crossville. The three high density selections were 1694, 1696 and 1697 at Knoxville and 1693, 1694 and 1696 at Crossville. When evaluated at the high plant population level selections 1690 and 1694 were significantly greater than the mean at Knoxville and selection 1696 was greater at Crossville. When evaluated at the high plant population, selection 1677 was the only low density selection to significantly exceed the mean at both locations.

TABLE 6

MEAN NUMBER OF EAR SHOOTS PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	1.84 a	1.97 a	1.52 a	1.58 a
High	1.96 a	2.06 a	1.51 a	1.54 a
	Crossed selections			
Low	2.13 a	1.66 a	1.87 a	1.43 a
High	1.93 b	1.53 a	1.73 a	1.37 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

TABLE 7

PERCENTAGE OF PLANTS BEARING 0-4 EAR SHOOTS FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Number of ear shoots	Population at which evaluated							
	Low				High			
	Knoxville		Crossville		Knoxville		Crossville	
	Low sel.	High sel.	Low sel.	High sel.	Low sel.	High sel.	Low sel.	High sel.
	Sibbed selections							
0	0.5	0.1	0.5	0.3	1.1	0.3	0.6	0.6
1	20.9	15.0	14.8	10.9	49.6	52.2	43.5	49.4
2	75.0	78.4	77.1	79.0	48.4	46.8	55.0	49.0
3	3.2	6.3	7.5	9.8	0.8	0.7	1.0	1.0
4	0.4	0.1	0.1	0	0.1	0	0	0
	Crossed selections							
0	0	0	0	0	0	0.1	0.9	1.0
1	5.7	12.3	38.0	47.1	18.4	27.1	55.3	61.3
2	76.3	82.4*	58.7	52.4	77.2	72.3	43.8	37.7
3	18.0*	5.3	3.3	0.5	4.3*	0.4	0	0
4	0	0	0	0	0	0	0	0

*Denotes the selection density within the same location and population which is significantly higher at the .05 level of probability.

TABLE 8

NUMBER OF EAR SHOOTS PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1662	1.4	1.0	2.0	1.7	1.5	1.2	1.3	1.1
1667	1.6	1.3	1.9	1.7	2.0	1.5	†	
1668	1.7	1.3	2.0	1.6	1.9	1.4		
1669	1.8	1.5	2.1	1.9	1.9	1.6		
1670	1.9	1.4	2.1	1.9	2.0	1.6	1.5	1.3
1672	1.9	1.6	2.3	2.1	2.1	1.7	1.9	1.6
1673	1.7	1.5	2.1	1.9	1.8	1.6		
1674	2.1	1.5			1.9	1.5		
1675	2.0	1.6	2.2	2.0	2.0	1.7		
1677	1.9	1.8	2.2	1.9	2.1	1.9	1.7	1.6
1678	1.9	1.7	2.0	1.9	2.1	1.8	1.8	1.5
1679	1.9	1.7	2.5	2.0	2.2	1.6	1.7	1.4
1680	2.0	1.7	2.1	1.9	2.0	1.5		
1682	2.0	1.7	2.1	1.8	2.1	1.6	1.8	1.5
				Selected at high density				
1683	1.7	1.2	1.8	1.7	1.8	1.5		
1684	1.7	1.4	1.9	1.7	2.2	1.6		
1685	1.8	1.2	2.1	1.8	2.1	1.4	1.7	1.6
1687	1.8	1.3	1.7	1.7	1.6	1.2	1.7	1.5
1688	1.9	1.4			1.9	1.4		
1689	1.9	1.2	1.9	1.6	1.8	1.2	1.4	1.3
1690	2.1	1.8	2.0	1.7	2.0	1.5		
1692	1.9	1.4	2.0	1.8	1.8	1.4		
1693	2.0	1.7	1.9	1.6	2.4	1.8	1.2	1.1
1694	2.3	2.1	1.9	1.9	2.4	1.8		
1696	2.4	1.7	2.0	1.8	2.5	2.0		
1697	2.2	1.7	2.1	1.9	2.2	1.6	1.7	1.2
Mean	1.9	1.5	2.0	1.8	2.0	1.6	1.6	1.4
L.S.D. (.05)	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2
				Parental inbreds				
T232	1.3	1.1			1.3	1.1		
Va35C.	1.3	1.1			1.4	1.1		
T232xVa35C.			1.8	1.5			1.4	1.1

†Missing data denotes insufficient seed available for evaluation.

TABLE 9

NUMBER OF SELECTIONS SIGNIFICANTLY GREATER THAN THE MEAN FOR THE YELLOW ENDOSPERM SELECTIONS EVALUATED FOR SEVERAL CHARACTERS AT LOW AND HIGH PLANT POPULATIONS AT KNOXVILLE

Character evaluated	Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.
	Selected at low density			
Ear shoots per plant	0	1	2	1
Ears per plant	1	0	1	0
Nubbin ears per plant	0	0	6	6
Ear weight per plant	6	7	6	1
Nubbin ear weight per plant	0	0	6	6
	Selected at high density			
Ear shoots per plant	3	2	0	0
Ears per plant	1	0	0	0
Nubbin ears per plant	3	5	6	6
Ear weight per plant	2	0	6	0
Nubbin ear weight per plant	2	2	6	6

6No significant difference.

TABLE 10

NUMBER OF SELECTIONS SIGNIFICANTLY GREATER THAN THE MEAN FOR THE YELLOW ENDOSPERM SELECTIONS EVALUATED FOR SEVERAL CHARACTERS AT LOW AND HIGH PLANT POPULATIONS AT CROSSVILLE

Character evaluated	Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.
	Selected at low density			
Ear shoots per plant	0	1	0	0
Ears per plant	0	0	ϕ	0
Nubbin ears per plant	0	ϕ	ϕ	ϕ
Ear weight per plant	0	1	ϕ	0
Nubbin ear weight per plant	ϕ	ϕ	ϕ	ϕ
	Selected at high density			
Ear shoots per plant	3	1	0	0
Ears per plant	1	1	ϕ	0
Nubbin ears per plant	0	ϕ	ϕ	ϕ
Ear weight per plant	1	2	ϕ	0
Nubbin ear weight per plant	ϕ	ϕ	ϕ	ϕ

ϕNo significant difference.

When the selections were tested as crosses, none were significantly greater than the means in the Crossville evaluations (Table 10). In the Knoxville evaluations, no selection from the high density group was significantly greater than the mean (Table 9). However, two low density selections (1672 and 1679) were significantly greater than the mean when evaluated at the low plant population and selection 1672 was the only selection to significantly exceed the mean when evaluated at the high plant population.

The mean data showed small differences between the two selection density groups. However, there were more high density selections significantly greater than the means than there were low density selections over all evaluations.

Ears Produced

White endosperm selections. The mean number of ears produced per plant for the low and high density selections evaluated at Knoxville and Crossville in low and high plant populations is shown in Table 11. When the selections were tested as lines, the high density selection groups produced a significantly greater number of ears per plant in all evaluations, except the high plant population at Crossville.

When tested as crosses, only the evaluation at Knoxville in the high plant population showed the high density selection group to produce significantly more ears per plant. The data again clearly illustrate that selection in high densities resulted in a greater degree of prolificacy.

TABLE 11

MEAN NUMBER OF EARS PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	1.45 b	1.57 b	1.15 b	1.19 a
High	1.73 a	1.80 a	1.39 a	1.43 a
	Crossed selections			
Low	1.30 a	1.06 a	1.03 b	0.91 a
High	1.32 a	1.08 a	1.07 a	0.94 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

Data for the individual selections are shown in Table 12 for all evaluations. Tables 4 and 5 (pages 24 and 25) show the number of selections which produced significantly more ears per plant than the mean for each selection density for all evaluations.

When evaluated as lines at Knoxville, the high density selection groups had three and two selections significantly greater than the means at the low and high plant populations, respectively (Table 4). At Crossville, the high density selection group had one and three selections significantly greater than the means for ears produced at the low and high plant populations, respectively (Table 5). The high density selection 1654 was the only one significantly greater than the means at all evaluations. The only low density selection significantly greater than the mean was 1623. It was significantly greater than the mean when tested at the low plant population at Crossville and the high plant population at Knoxville.

When the selections were evaluated as crosses, the evaluations either showed no significant differences or had no selections significantly greater than the mean (Tables 4 and 5).

Data for the individual selections shows that more high density selections exceeded the means in each of the evaluations. Therefore, the selection made in high densities resulted in a greater number of prolific selections.

Yellow endosperm selections. Table 13 shows that the high density sibbed selection group produced a significantly greater number

TABLE 12

NUMBER OF EARS PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1602	1.2	0.8	†		1.4	1.0		
1603	1.1	1.0			1.6	1.1		
1604	1.1	1.1			1.7	1.2		
1605	1.5	1.1			1.8	1.5		
1607	1.5	1.3			1.8	1.4		
1608	1.6	1.3	1.4	1.0	1.8	1.3	1.1	0.9
1609	1.8	1.6			2.0	1.5		
1612	1.0	0.9			0.8	0.8		
1613	1.4	1.1	1.2	1.0	1.4	1.0	1.0	0.9
1614	1.8	1.6	1.5	1.0	1.8	1.4	1.2	0.9
1615	1.6	1.2			1.9	1.6		
1617	1.6	1.2	1.2	1.0	1.7	1.1	1.0	0.9
1618	1.2	0.8	1.2	1.0	1.3	1.0	1.1	1.0
1619	1.0	0.8			1.0	1.1		
1620	1.8	1.1			1.4	0.9		
1622			1.4	1.1				
1623	1.9	1.7			2.2	1.4		
				Selected at high density				
1627	1.6	1.0			1.7	1.2		
1628	1.4	0.8			1.7	1.1		
1630	1.8	1.3	1.2	1.1	1.9	1.6		
1632	1.6	1.3			2.0	1.7		
1633	1.7	1.6	1.3	1.1	1.9	1.5		
1634	1.9	1.6	1.4	1.2	1.9	1.7		
1635	1.8	1.5	1.3	1.1	1.8	1.5		
1637	2.1	1.5			1.9	1.5		
1638	1.8	1.6	1.1	1.1	1.7	1.3	1.0	0.9
1639	1.4	1.3	1.2	1.0	1.4	1.1	1.1	0.9
1640	2.1	1.4			1.7	1.4		
1645	1.6	1.7	1.1	1.1				
1647	1.6	1.3	1.4	1.1	1.6	1.5	1.1	1.0
1648	1.8	1.4	1.2	1.1	1.8	1.5	1.0	0.9
1649	1.7	1.1						
1653	1.9	1.2	1.5	1.1			1.3	0.8
1654	2.1	1.9	1.5	1.2	2.3	2.0		
1655	1.9	1.5	1.3	1.1				
1657	1.5	1.5	1.3	1.0	1.8	1.5		
1658	1.9	1.5	1.5	1.1	1.7	1.1	1.1	1.0
1659	1.2	1.2			1.8	1.3		
Mean	1.6	1.3	1.3	1.1	1.7	1.3	1.1	0.9
L.S.D. (.05)	0.3	0.3	0.2	§	0.3	0.3	§	§
				Parental inbreds				
T115	2.2	1.8			2.2	2.0		
T141	0.9	0.9			1.0	0.9		

†Missing data denotes insufficient seed available for evaluation.
§No significant difference.

TABLE 13

MEAN NUMBER OF EARS PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	1.40 b	1.52 b	1.13 a	1.12 b
High	1.53 a	1.69 a	1.19 a	1.26 a
	Crossed selections			
Low	1.09 a	1.03 a	1.00 a	0.97 a
High	1.07 a	1.02 a	1.00 a	0.97 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

of ears per plant in all evaluations, except in the high plant population at Knoxville.

When the selections were crossed to a single-ear tester inbred, there were no differences in numbers of ears produced (Table 13).

Data for the individual selections are shown in Table 14. At Knoxville, selection 1682 selected at low density and selection 1694 selected at high density both evaluated at the low plant population rate produced significantly more ears per plant than the mean (Table 14). In the high plant population evaluation no selection significantly exceeded the mean. When the lines were evaluated at Crossville, the high density selection 1684 was the only selection to significantly exceed the means at both plant populations (Table 10, page 31).

When the selections were evaluated as crosses, only the low selection density line 1679 evaluated in the low plant population at Knoxville exceeded the mean (Table 14).

The data, again show that selection in high densities resulted in a higher degree of prolificacy. However, there were nearly as many low density selections above the means as there were high density selections.

Nubbin Ears Produced

White endosperm selections. The mean number of nubbin ears produced per plant for the low and high density selections evaluated at Knoxville and Crossville in low and high plant populations is shown in Table 15. When evaluated as lines, the high density group selections produced more nubbin ears per plant than the low density selection group but only significantly more at the high plant population at Knoxville.

TABLE 14

NUMBER OF EARS PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1662	0.8	0.7	1.0	0.9	1.1	0.9	1.0	0.9
1667	1.3	1.2	1.0	1.0	1.8	1.1	†	
1668	1.4	1.0	1.0	0.9	1.6	1.1		
1669	1.5	1.1	1.1	1.0	1.5	1.2		
1670	1.5	1.1	1.1	1.0	1.6	1.1	1.0	1.0
1672	1.5	1.2	1.2	1.1	1.6	1.1	1.1	1.0
1673	1.1	1.0	1.1	1.0	1.4	1.0		
1674	1.4	1.1			1.4	1.1		
1675	1.2	1.0	1.0	1.0	1.1	1.0		
1677	1.5	1.1	1.0	1.0	1.6	1.2	1.0	1.0
1678	1.6	1.3	1.2	1.0	1.7	1.4	1.0	1.0
1679	1.6	1.2	1.3	1.1	1.7	1.2	1.0	0.9
1680	1.6	1.3	1.1	1.0	1.7	1.1		
1682	1.8	1.3	1.1	1.0	1.6	1.1	1.0	1.0
				Selected at high density				
1683	1.4	1.1	1.0	1.0	1.6	1.3		
1684	1.6	1.2	1.1	1.0	2.0	1.5		
1685	1.3	1.1	1.2	1.0	1.8	1.2	1.1	1.0
1687	1.3	1.0	1.0	1.0	1.4	1.0	1.1	1.0
1688	1.5	1.2			1.8	1.2		
1689	1.5	1.2	1.1	1.0	1.6	1.1	1.0	0.9
1690	1.7	1.3	1.2	1.0	1.7	1.3		
1692	1.4	1.1	1.2	1.0	1.6	1.2		
1693	1.7	1.3	1.0	1.0	1.9	1.4	1.0	0.9
1694	1.8	1.4	1.0	1.0	1.8	1.3		
1696	1.4	1.0	1.0	1.0	1.7	1.3		
1697	1.6	1.2	1.1	1.0	1.3	1.2	1.0	1.0
Mean	1.5	1.2	1.1	1.0	1.6	1.2	1.0	1.0
L.S.D. (.05)	0.2	0.2	0.1	0.1	0.3	0.2	§	0.1
				Parental inbreds				
T232	1.0	0.9			1.2	1.0		
Va35C	1.0	0.9			1.0	1.0		
T232xVa35C			1.1	1.0			1.0	0.7

†Missing data denotes insufficient seed available for evaluation.
§No significant difference.

TABLE 15

MEAN NUMBER OF NUBBIN EARS PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	0.34 a	0.45 a	0.28 b	0.41 a
High	0.42 a	0.47 a	0.39 a	0.52 a
	Crossed selections			
Low	0.16 a	0.11 a	0.16 a	0.20 a
High	0.18 a	0.11 a	0.15 a	0.19 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

The high and low density selection groups showed no significant differences in the number of nubbin ears produced when evaluated as crosses.

Data for the number of nubbin ears per plant for the individual selections for all evaluations is shown in Table 16. At Knoxville, only high density selection 1639 evaluated at the high plant population significantly exceeded the mean (Table 4, page 24).

At Crossville, only high density selection 1654 evaluated at the high plant population level produced significantly more nubbin ears than the mean (Table 16). Generally the data indicate that selections which produced the greatest number of ears was due, in part, to a greater number of nubbin ears.

Yellow endosperm selections. Table 17 shows that when the selections were evaluated as lines, the high density selection group produced more nubbin ears per plant than the low density selection group at both locations but only significantly more at the low plant population.

When the selections were evaluated in crosses, there were no significant differences between the two selection densities, except when evaluated at the high plant population at Crossville.

Data for the individual selections for all evaluations are shown in Table 18. When the selections were evaluated as lines at Knoxville, the high density selection group had three and five selections significantly greater than the means at the low and high plant populations, respectively (Table 9, page 30). These included selections

TABLE 16

NUMBER OF NUBBIN EARS PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1602	0.4	0.3	†		0.5	0.3		
1603	0.5	0.3			0.7	0.5		
1604	0.3	0.4			0.4	0.4		
1605	0.3	0.3			0.6	0.6		
1607	0.3	0.5			0.6	0.5		
1608	0.3	0.3	0.2	0.1	0.5	0.4	0.1	0.2
1609	0.4	0.3			0.4	0.6		
1612	0.3	0.3			0.4	0.3		
1613	0.3	0.2	0.1	0.2	0.4	0.4	0.1	0.2
1614	0.3	0.2	0.2	0.2	0.6	0.4	0.2	0.2
1615	0.2	0.2			0.2	0.6		
1617	0.6	0.5	0.1	0.2	0.5	0.4	0.2	0.2
1618	0.1	0.1	0.1	0	0.3	0.2	0.1	0.2
1619	0.1	0.2			0.2	0.2		
1620	0.7	0.4			0.4	0.3		
1622			0.2	0.3				
1623	0.3	0.3			0.7	0.7		
				Selected at high density				
1627	0.4	0.2			0.4	0.5		
1628	0.4	0.2			0.3	0.2		
1630	0.5	0.4	0.1	0.2	0.4	0.6		
1632	0.5	0.4			0.5	0.6		
1633	0.4	0.4	0.3	0.2	0.4	0.5		
1634	0.5	0.3	0.2	0.2	0.3	0.6		
1635	0.3	0.4	0.2	0.2	0.6	0.5		
1637	0.6	0.5			0.5	0.7		
1638	0.4	0.4	0	0.1	0.4	0.4	0	0.2
1639	0.5	0.7	0.1	0.1	0.6	0.5	0.1	0.2
1640	0.3	0.3			0.5	0.5		
1645	0.4	0.4	0.1	0.2				
1647	0.3	0.4	0.2	0.1	0.4	0.5	0.1	0.2
1648	0.3	0.4	0.1	0.2	0.5	0.3	0.2	0.1
1649	0.6	0.2						
1653	0.4	0.4	0.2	0.2			0.2	0.1
1654	0.3	0.5	0.3	0.1	0.8	1.1		
1655	0.5	0.5	0.2	0.1				
1657	0.4	0.4	0.2	0.1	0.5	0.6		
1658	0.5	0.5	0.2	0.1	0.3	0.3	0.1	0.2
1659	0.2	0.3			0.4	0.3		
Mean	0.4	0.3	0.2	0.2	0.5	0.5	0.1	0.2
L.S.D. (.05)	§	0.2	§	§	0.3	0.2	§	§
				Parental inbreds				
T115	0.6	0.3			0.6	0.8		
T141	0.2	0.2			0	0.2		

†Missing data denotes insufficient seed available for evaluation.
§No significant difference.

TABLE 17

MEAN NUMBER OF NUBBIN EARS PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	0.27 b	0.23 b	0.17 a	0.17 a
High	0.44 a	0.34 a	0.29 a	0.23 a
	Crossed selections			
Low	0.11 a	0.07 a	0.09 a	0.21 b
High	0.09 a	0.07 a	0.09 a	0.27 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

TABLE 18

NUMBER OF NUBBIN EARS PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1662	0.2	0.3	0.1	0.1	0.2	0.1	0	0.2
1667	0.3	0.1	0	0.1	0.4	0.3	†	
1668	0.2	0.2	0.1	0.2	0.2	0.1		
1669	0.4	0.2	0.1	0.1	0.3	0.3		
1670	0.3	0.1	0.1	0.1	0.2	0.1	0.1	0.2
1672	0.2	0.2	0.2	0.2	0.3	0.2	0.1	0.1
1673	0.1	0.1	0.1	0.1	0.2	0.2		
1674	0.2	0.1			0.2	0.1		
1675	0.1	0	0	0.1	0.1	0.1		
1677	0.3	0.2	0.1	0.1	0.2	0.2	0.1	0.3
1678	0.3	0.2	0.2	0	0.3	0.2	0	0.2
1679	0.3	0.2	0.3	0.1	0.2	0.2	0.1	0.2
1680	0.3	0.3	0.1	0	0.2	0.2		
1682	0.4	0.3	0.1	0.2	0.3	0.2	0.1	0.2
				Selected at high density				
1683	0.4	0.2	0	0.1	0.3	0.2		
1684	0.4	0.2	0.1	0	0.1	0.2		
1685	0.4	0.4	0.1	0.1	0.4	0.2	0.1	0.3
1687	0.3	0.3	0.2	0.1	0.4	0.2	0.2	0.2
1688	0.4	0.2			0.3	0.2		
1689	0.6	0.4	0.1	0.2	0.3	0.2	0.1	0.2
1690	0.6	0.4	0.1	0.2	0.4	0.2		
1692	0.5	0.4	0.1	0	0.3	0.2		
1693	0.6	0.4	0.1	0.2	0.5	0.4	0.1	0.3
1694	0.3	0.3	0.1	0.1	0.3	0.3		
1696	0.3	0.1	0	0.1	0.5	0.3		
1697	0.5	0.3	0.1	0.1	0.2	0.3	0	0.3
Mean	0.3	0.2	0.1	0.1	0.3	0.2	0.1	0.2
L.S.D. (.05)	0.2	0.1	§	§	0.2	§	§	§
				Parental inbreds				
T232	0.4	0.2			0.2	0.2		
Va35C	0.1	0			0	0.1		
T232xVa35C			0.1	0.1			0.1	0.3

†Missing data denotes insufficient seed available for evaluation.
§No significant difference.

1689, 1690 and 1693 evaluated at both plant populations, and 1685 and 1692 evaluated at the high plant population. No selections from the low density selection group were significantly greater than the mean at either plant population at Knoxville (Table 9, page 30).

All other evaluations either showed no significant differences or had no selection significantly greater than the mean (Tables 9 and 10, pages 30 and 31).

Data from the yellow endosperm selections illustrate more clearly that selecting at high densities resulted in a greater degree of prolificacy. However, the greater prolificacy was largely due to more nubbin ears produced.

Ear Weight per Plant

White endosperm selections. The mean ear weights per plant for the low and high density selections evaluated at Knoxville and Crossville in low and high plant populations are shown in Table 19. When the selections were evaluated as lines, the high density selection group produced a higher ear weight per plant in all evaluations but only significantly more when evaluated at the low plant population at Knoxville. When evaluated in crosses there were no significant differences between the low and high density selection groups.

Data for the individual selections for all evaluations are shown in Table 20. When the selections were evaluated as lines, at Knoxville, in the low plant population, three density selections (1637, 1645 and 1654) were significantly higher than the mean, whereas there were only

TABLE 19

MEAN EAR WEIGHT (gm) PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	50 b	83 a	37 a	58 a
High	53 a	86 a	38 a	62 a
	Crossed selections			
Low	223 a	222 a	153 a	151 a
High	223 a	227 a	158 a	152 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

TABLE 20

EAR WEIGHT (gm) PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1602	53	22	†		94	59		
1603	45	43			96	66		
1604	45	47			135	77		
1605	53	25			89	66		
1607	53	32			86	55		
1608	58	37	209	143	79	62	213	135
1609	75	50			94	59		
1612	40	27			34	38		
1613	68	51	220	153	75	53	219	148
1614	72	70	232	152	87	62	248	171
1615	32	22			116	72		
1617	31	19	213	151	73	41	203	154
1618	29	18	240	168	64	49	234	156
1619	19	25			53	68		
1620	37	24			71	53		
1622			228	148				
1623	85	85			106	62		
				Selected at high density				
1627	68	39			122	66		
1628	22	14			90	48		
1630	70	27	206	141	93	73		
1632	59	38			96	75		
1633	57	48	216	149	87	66		
1634	60	56	209	154	80	68		
1635	59	48	214	150	77	65		
1637	93	38			90	61		
1638	48	29	216	171	73	51	233	142
1639	15	10	251	163	41	32	238	148
1640	42	32			69	45		
1645	73	88	229	165				
1647	65	37	235	163	90	74	246	150
1648	60	52	227	151	125	90	206	166
1649	40	20						
1653	56	33	242	159			227	143
1654	77	60	241	182	87	62		
1655	34	28	206	149				
1657	32	32	209	145	55	46		
1658	36	26	212	161	66	40	217	162
1659	51	39			127	95		
Mean	52	38	223	157	85	60	224	152
L.S.D. (.05)	21	23	§	§	31	23	§	§
				Parental inbreds				
T115	88	63			87	62		
T141	22	29			91	74		

†Missing data denotes insufficient seed available for evaluation.
§No significant difference.

two (1609 and 1623) from the low density selections (Table 4, page 24). When tested at the high plant population, selections 1614 and 1623 from the low density group and selections 1645 and 1654 from the high density group were significantly higher yielding than the mean.

At Crossville, selections 1627, 1648 and 1659 from the high density selection group were significantly higher yielding than the mean when evaluated at the low plant populations while only selection 1604 from the low density selection group was significantly higher yielding. When evaluated in the high plant population test, only high density selections 1648 and 1659 were significantly higher yielding.

There were no significant differences found among the selections when evaluated as crosses. Although the mean data show small differences between the two selection densities there were large differences among individual selections with some selections having very low yields.

Yellow endosperm selections. Table 21 shows that when the selections were evaluated as lines, the low density selection group was significantly greater in ear weight per plant than the high density selection group in the low and high plant populations at Knoxville. The evaluations at Crossville showed no significant differences.

When evaluated as crosses, the low density selection group was also higher yielding but only significantly greater in the high plant population at Crossville. Data for individual selections are shown in Table 22. At Knoxville, there were six low density selections significantly greater than the mean when evaluated as lines at the low plant population and seven when evaluated at the high plant population

TABLE 21

MEAN EAR WEIGHT (gm) PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	120 a	127 a	100 a	88 a
High	100 b	122 a	79 b	88 a
	Crossed selections			
Low	264 a	199 a	217 a	134 a
High	256 a	191 a	215 a	115 b

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

TABLE 22

EAR WEIGHT (gm) PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1662	15	15	229	182	44	35	193	116
1667	110	103	259	204	14	83	†	
1668	114	92	242	168	134	84		
1669	107	87	257	220	113	87		
1670	117	100	260	212	141	101	196	139
1672	127	107	265	215	136	89	226	143
1673	122	110	264	230	148	95		
1674	118	109			130	101		
1675	144	117	248	218	122	106		
1677	139	105	259	224	137	93	190	147
1678	142	125	278	232	140	98	201	142
1679	146	112	285	244	144	89	171	118
1680	140	109	282	234	132	92		
1682	145	103	284	217	118	81	217	127
				Selected at high density				
1683	62	59	263	239	103	85		
1684	107	95	260	227	165	110		
1685	47	48	280	227	115	65	200	121
1687	101	75	253	230	117	81	171	122
1688	103	83			143	93		
1689	88	82	253	208	113	83	199	101
1690	95	71	277	217	108	93		
1692	71	59	246	214	98	84		
1693	132	94	264	196	110	78	170	01
1694	140	94	234	202	130	87		
1696	126	96	245	212	144	106		
1697	124	97	239	198	108	93	214	123
Mean	111	90	260	216	125	88	196	126
L.S.D. (.05)	19	16	§	25	25	17	§	24
				Parental inbreds				
T232	49	44			94	65		
Va35C	137	108			116	95		
T232xVa35C			253	205			200	105

†Missing data denotes insufficient seed available for evaluation.
§No significant difference.

(Table 9, page 30). There were only two high density selections significantly greater than the mean when evaluated at the low plant population and none at the high plant population.

When evaluated in crosses at Knoxville only one selection was significantly higher than the mean. This was low density selection 1679, evaluated at the high plant population.

At Crossville, only high density selection 1684 evaluated at the low plant population was significantly greater than the mean. When evaluated at the high plant population high density selections 1684 and 1696 were significantly greater than the mean. Low density selection 1675 was the only selection to significantly exceed the mean.

When evaluated as crosses, there were no selections significantly greater than the mean.

Nubbin Ear Weight per Plant

White endosperm selections. The mean weight of nubbin ears produced per plant for the low and high density selections evaluated at Knoxville and Crossville in low and high plant populations is shown in Table 23. The mean data showed no significant differences between the two selection density groups.

Data for the individual selections shown in Table 24, also shows no significant differences among selections at Knoxville. At Crossville, high density selection 1654 evaluated at both low and high plant populations produced significantly greater weight of nubbin ears than the means (Table 5, page 25). In addition, selection 1648 evaluated at

TABLE 23

MEAN NUBBIN EAR WEIGHT (gm) PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	6 a	10 a	4 a	9 a
High	6 a	10 a	4 a	10 a
	Crossed selections			
Low	11 a	9 a	9 a	14 a
High	11 a	10 a	10 a	12 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

TABLE 24

NUBBIN EAR WEIGHT (gm) PER PLANT FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1602	7	4	†		10	9		
1603	9	5			18	17		
1604	7	8			15	11		
1605	6	4			14	13		
1607	4	7			10	7		
1608	5	3	15	5	7	5	3	18
1609	9	4			11	12		
1612	6	4			4	5		
1613	6	4	12	12	12	9	8	9
1614	6	5	7	13	15	8	19	12
1615	3	3			6	16		
1617	5	4	9	7	9	5	12	16
1618	2	1	6	3	5	2	6	14
1619	1	3			4	5		
1620	5	4			6	7		
1622			17	18				
1623	6	5			12	14		
				Selected at high density				
1627	8	2			13	14		
1628	4	2			4	2		
1630	9	4	12	13	8	13		
1632	10	3			12	14		
1633	6	5	16	14	7	10		
1634	6	3	13	10	7	10		
1635	6	7	9	13	12	12		
1637	10	8			9	17		
1638	3	4	3	6	8	8	2	14
1639	2	3	5	13	6	7	13	10
1640	4	3			7	5		
1645	9	6	9	7				
1647	5	4	14	12	7	10	6	14
1648	3	5	8	17	20	7	14	9
1649	6	3						
1653	4	4	12	8			16	6
1654	5	7	18	10	18	22		
1655	4	6	16	7				
1657	5	5	9	8	9	9		
1658	6	5	16	8	4	4	7	14
1659	6	4			12	10		
Mean	6	4	11	10	10	9	9	13
L.S.D. (.05)	§	§	§	§	8	6	§	§
				Parental inbreds				
T115	13	6			8	13		
T141	2	2			1	4		

†Missing data denotes insufficient seed available for evaluation.
§No significant difference.

the low plant population and selection 1647 evaluated at the high plant population produced significantly greater weight of nubbin ears. Low density selections, 1603 and 1615 produced significantly greater nubbin weight when evaluated at the high plant population.

The data indicate that the increased ear weight of the high density selections was due, in part, to an increase in nubbin weight.

Yellow endosperm selections. Table 25 shows that when the selections were evaluated as lines, the high density selection group produced a greater weight of nubbin ears per plant when evaluated at both plant populations. The differences were significantly greater at Knoxville but not at Crossville.

When the selections were evaluated in crosses, no significant differences were found between the two selection densities. Data for the individual selections are shown in Table 26 for all the selections at all evaluations. When evaluated as lines at Knoxville, two high density selections were significantly greater than the means at each of the plant populations (Table 9, page 30). Selection 1693 was significantly greater at both plant populations while 1697 was greater at the low plant population and 1689 at the high plant population. No low density selections were significantly greater than the means (Table 9).

When evaluated at Crossville there were no significant differences among selections either as lines or in crosses.

Since the low density selections produced a greater total ear weight per plant and the high density selections produced a greater weight of nubbin ears, it infers that selection in the high density

TABLE 25

MEAN NUBBIN EAR WEIGHT (gm) PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
		Sibbed selections		
Low	7 b	7 a	4 b	5 a
High	12 a	10 a	8 a	7 a
		Crossed selections		
Low	9 a	4 a	9 a	13 a
High	8 a	5 a	9 a	14 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

TABLE 26

NUBBIN EAR WEIGHT (gm) PER PLANT FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection Number	Knoxville				Crossville			
	Sibbed selections		Crossed selections		Sibbed selections		Crossed selections	
	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.	Low pop.	High pop.
				Selected at low density				
1662	2	2	6	11	2	2	2	15
1667	10	3	4	13	12	9	†	
1668	6	5	6	13	6	3		
1669	8	2	1	6	6	8		
1670	7	1	6	12	6	2	9	17
1672	6	5	18	16	10	6	1	10
1673	4	3	10	9	8	7		
1674	6	2			3	5		
1675	3	0	2	7	8	1		
1677	11	4	4	5	7	4	6	17
1678	6	9	17	3	11	6	2	11
1679	12	6	17	2	4	5	8	10
1680	8	7	9	5	8	5		
1682	14	7	12	19	6	3	3	8
				Selected at high density				
1683	6	4	0	2	7	7		
1684	11	9	14	6	5	7		
1685	5	6	10	14	13	5	7	18
1687	8	6	21	3	14	8	4	10
1688	14	7			7	7		
1689	14	19	9	24	11	7	8	11
1690	13	4	13	12	11	5		
1692	14	10	6	3	9	8		
1693	26	16	2	15	17	9	4	14
1694	8	3	5	4	6	6		
1696	8	4	3	5	16	7		
1697	22	11	1	10	6	9	0	16
Mean	10	6	9	9	8	6	5	13
L.S.D. (.05)	7	6	§	§	§	§	§	§
				Parental inbreds				
T232	5	3			3	5		
Va35C	1	1			1	4		
T232xVa35C			8	5			3	19

†Missing data denotes insufficient seed available for evaluation.
§No significant difference.

yellow endosperm group was largely for an increased number of small ears (Table 17, page 42).

Ear Height

White endosperm selections. The mean ear height for the low and high density selections evaluated at Knoxville and Crossville in low and high plant populations is shown in Table 27. When the selections were evaluated as lines, the low density selection group had a significantly higher ear placement when evaluated at Crossville in both plant populations. There were no significant differences at Knoxville, although the low density group had higher ear placement.

When the selections were evaluated in crosses, no significant differences were found between the two density selection groups (Table 27).

Yellow endosperm selections. Table 28 shows that when the selections were evaluated as lines, the high density selection group had a significantly higher ear placement when evaluated at the high plant population at both locations. There were no significant differences found between the two selection densities when evaluated as lines at the low plant population at either locations.

No significant differences were found between the two selection densities when the selections were evaluated in crosses (Table 28).

Data were also obtained for maturity, plant height, and lodging. The data did not show any differences which would distinguish the two selection densities and therefore, are not presented in this study.

TABLE 27

MEAN EAR HEIGHT (cm) FOR SIBBED AND CROSSED WHITE ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
	Sibbed selections			
Low	105 a	121 a	105 a	126 a
High	100 a	112 b	102 a	117 b
	Crossed selections			
Low	137 a	145 a	142 a	150 a
High	137 a	147 a	140 a	148 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

TABLE 28

MEAN EAR HEIGHT (cm) FOR SIBBED AND CROSSED YELLOW ENDOSPERM SELECTIONS EVALUATED AT LOW AND HIGH PLANT POPULATIONS AT TWO LOCATIONS

Selection density	Population at which evaluated			
	Low		High	
	Knoxville	Crossville	Knoxville	Crossville
		Sibbed selections		
Low	108 a	116 a	117 b	122 b
High	110 a	119 a	120 a	126 a
		Crossed selections		
Low	130 a	136 a	142 a	144 a
High	131 a	138 a	143 a	146 a

Means within the same location and population followed by the same letter are not significantly different at the .05 level of probability.

CHAPTER IV

CONCLUSIONS

The objective of this study was to determine which of two selection densities, 13,069 or 26,138 plants per acre, produced a greater degree of prolificacy. Prolificacy was measured as the number of ear shoots, total ears, and nubbin ears produced per plant. The weight of the total ears, and nubbin ears, as well as ear height are also reported in this study.

Selection at 26,138 plants per acre increased the number of ear shoots produced per plant more than selection at 13,069 plants per acre. The same was also true for the number of ears produced per plant.

Number of nubbin ears, which can be interpreted as second and third ears, increased with selection at 26,138 plants per acre.

From the data presented in this study, it is concluded that the degree of prolificacy was increased more by selection at a plant population of 26,138 plants per acre than at 13,069 plants per acre. Therefore, selecting for prolificacy under the stress condition of a high plant population tended to enhance the progress of the selection program. However, the increased prolificacy observed for the high density selections was due largely to an increased number of small ears. Prolific lines also were obtained from the low density selection group. However, as a group the low density selections had a lower degree of prolificacy and fewer outstanding selections.

Although several white endosperm selections exceeded the means for all characters measured, none were significantly greater than the prolific parent T115. Ear weight per plant was much greater for T115 but there was little difference in weight per good ear. Average weight per nubbin ear was greater for T115. For the yellow endosperm selection group the means of the selections exceeded the prolific parent T232 for all characters measured, except for number of nubbin ears. Ear weight per plant of the selections greatly exceeded T232 and mean weight per good ear, as well as each nubbin ear, was greater. The greater ear weight was likely due to the influence of the larger ear size of the single-ear parent Va35C. The data would suggest that selection for prolificacy was more effective in the yellow endosperm selections than in the white endosperm selections.

As for weight of ears produced per plant, the white endosperm selections yielded a slightly greater weight when selected at the high plant population. However, the yellow endosperm selections yielded a greater weight of ears per plant when selected at the low plant population. This indicates that prolificacy, in the high density yellow endosperm selections, was probably due to selection of smaller ears, since more nubbin ears were produced. Ear weight per plant was greater in the yellow endosperm selections than in the white endosperm selections at both selection densities, reflecting the larger initial size of ears in this population.

Among the white endosperm selections, individual selections producing the greatest number of ear shoots also produced the most ears

and had the highest ear weight. Among the yellow endosperm selections, those producing the most ear shoots did not necessarily have the greatest number of ears. There was little relation between number of ears produced and number of nubbin ears produced or ear weight.

Generally, selections superior when evaluated at the low plant population were also superior when evaluated at the high plant population. Evaluation of the selections in crosses generally did not differentiate the low and high density selections.

The white endosperm selections were found to have a consistently higher ear placement when selected at 13,069 plants per acre, whereas the yellow endosperm selections were found to have a consistently higher ear placement when selected at 26,138 plants per acre.

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VITA

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