SOME FACTORS AFFECTING YIELD AND MOISTURE CONTENT OF CORN

Thesis for the Degree of M. S.

MICHIGAN STATE COLLEGE

William Zurakowski

1949

THESIS

This is to certify that the

thesis entitled

"Some Factors Affecting Yield
and Moisture Content of Corn."

presented by

William Zurakowski

has been accepted towards fulfillment
of the requirements for

M.S. degree in Farm Crops

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Major professor

Date May 24, 1949

M-795

SOME FACTORS AFFECTING YIELD AND MOISTURE CONTENT OF CORN

by

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A THESIS

Submitted to the Graduate School of Michigan State College of Agriculture and Applied Science in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

Department of Farm Crops

1949

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ACKNOWLEDGEMENT

The author wishes to acknowledge his indebtedness ot Dr. E. E. Down for his guidance and aid in making this study.

The author is grateful to Mr. H. M. Brown and to Dr. L. Katz for their cooperation and assistance in the statistical analysis, also to Mr. H. M. Brown for his constructive criticism.

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INTRODUCTION

Material progress has been made towards improving the yield of corn in the past 50 years, but very little work has been reported concerning moisture content of the grain at harvest time. Both yield and moisture content are of importance to Michigan farmers. Maximum yields mean a greater financial return from the crop. Lower moisture content indicates an earlier maturing corn as well as a better chance for the corn to come through the winter without molding.

Various cultural practices have been tried in other states in an attempt to increase the yield of corn. Some of these cultural practices have proved to be highly successful in some states, while in other states contradictory results have been reported. The question arises, can cultural practices increase the yield of corn in Michigan as well as decrease the moisture content?

The purpose of this problem was to determine whether different times of plowing and rates of stand have any affect upon the yield and moisture content of corn and whether different varieties react the same to the above factors. The times of plowing were fall plowing, spring plowing and no plowing. The rates of stand were 3 stalks per hill and 2 stalks per hill. The varieties included numerous commercial hybrids and experimental single crosses.

REVIEW OF LITERATURE

Kiesselbach, Anderson and Lyness (8), in a 6-year comparison of seedbed preparation practices for corn at the Nebraska Experiment Station, showed that early spring plowing yielded 12 percent more grain per acre than late spring plowing and 13 percent more than fall plowing.

Kiesselbach, Anderson and Lyness (9), in an 11-year comparison of seedbed preparation practices for corn at the Nebraska Experiment Station, showed that early spring plowing yielded 5 percent more grain per acre than late spring and 18 percent more than fall plowing.

Foster and Merrill (4) found that seeding 6 kernels per hill gave 9.07 bushels per acre more than 9 kernels per hill and 15.41 bushels more than 3 kernels while using Common White Flint.

Montgomery (10), using Hogue's Yellow Dent for a 5-year period, found that corn planted at the rate of 3 stalks per hill averaged 75.5 bushels per acre, and corn planted 2 stalks per hill averaged 67.7 bushels per acre.

Bull (1) believed that 3 stalks per hill yielded considerably more than 2 stalks per hill.

Helm (5), at the Missouri Experiment Station, showed that checked corn of 2 stalks per hill averaged 2.3 bushels per acre more than the 3 stalk rate over a period of 3 years.

Kiesselbach (7) found the grain yields, over a 4-year period with the planting rates of 1, 2, 3, 4, and 5 plants per hill, were, respectively, 40.7, 49.4, 52.9, 50.7, and 49.3 bushels per acre. It was felt that a stand from about 2.5 to 3.0 plants per hill was optimum for the local varieties grown under the experiment station conditions.

Kiesselbach, Anderson, and Lyness (8) found that the yields of checked corn, with the hills spaced 3.5 feet apart, having stands of 1, 2, 3, 4,

and 5 plants per hill were, respectively, 36.8, 45.4, 48.7, 46.0, and 42.9 bushels per acre over a 12-year period using Hogue's Yellow Dent.

Wallace (15) suggested that corn be planted with a stand 3 stalks to the hill rather than 2 stalks per hill with the hills 3.5 feet by 3.5 feet apart. He also feels that corn with 2 stalks per hill will yield better during a dry season.

Kiesselbach, Anderson, and Lyness (9), over a 14-year period with a stand of 1, 2, 3, 4, and 5 stalks per hill that were planted 3.5 feet apart, found that they yielded, respectively, 37.3, 46.5, 46.8, and 44.1 bushels per acre. During an 18-year period with the rates of 2, 3, 4, and 5 plants per hill, they found that the rates produced 43.6, 46.3, 42.8, and 41.6 bushels per acre, respectively.

The Ohio Agricultural Experiment Station (12) says, "For the 21-year average, a stand of 4 plants per hill with hills 3.5 feet by 3.5 feet apart gave the largest yield of shelled corn per acre from both ears and nubbins with 3 plants leading in poor seasons and 5 plants leading in good seasons. From sorted ears only, 3 plants gave the largest 21-year average yield and also for the poor seasons; whereas 4 plants led for the good seasons".

Mooers (11) believes that different varieties require appreciably different rates of planting. In general, the small and short-seasoned varieties require a thicker planting than the large, long-seasoned varieties. To approximate the proper stand of corn, a simple equation may be used, as follows:

$$N = \frac{56\ Y}{F}$$

In this equation, N stands for the number of the stalks per acre, Y for

the expetancy or approximate production in bushels per acre of the field in question under average seasonal conditions, and F is the standard varietal factor, or the average weight of grain per plant at the best rate of planting, as determined experimentally for the variety in question.

Osborn (13) said that on reasonably fertile land with a favorable season, corn planted at a rate of 9000 plants per acre would outyield a 6000 rate. Using upon pollinated varieties, he found, over a 5-year period, that 8 of the varieties tested gave definite increases of over 5 bushels as the rate increased from 6000 to 9000 plants per acre; 3 of the varieties showed increases of 3 to 4 bushels; with 5 varieties, the 9000 rate yielded within a bushel above or below the 6000 rate; 2 varieties gave a decrease of 1 to 2 bushels in the 9000 rate as compared with the 6000 rate; and 1 variety gave a definite decrease of 5 bushels in the 9000 rate.

The Kentucky Agricultural Experiment Station (6) states, "In determining the proper rate of seeding corn, a good many factors must be taken into consideration. For example, in comparing the yielding capacity of corn planted at the rate of 2 plants per hill and 3 plants per hill, experiments have shown that the yield depends largely upon the size of the plant. From a large growing variety, such as Boone County White, the largest yield is very likely to be obtained with 2 stalks per hill, whereas with the smaller varieties allowing 3 stalks per hill, or its equivalent in drilled corn, often gives the best results. This year, for example, the yield among several early varieties tested was strictly in favor of the 3-stalk hill as compared with the 2-stalk hill".

Duncan (3) experimented with 4 different open pollinated corn varieties

on 4 different soil types. He found that large-growing corn varieties that require a full season to mature will give a maximum yield, if planted at the rate of 3 kernels per hill. Earlier maturing varieties with smaller stalks and requiring less than a full season to mature, will give its maximum yield, if planted either 3 or 4 kernels per hill.

Table 1. Example showing field arrangement of varieties with the check and standard included.

	Columns											
Plowings	U				S				F			
Rates	3	2	3	2	3	2	3	2	3	2	3	2
Rows	00	00	70	70	00	00	70	70	00	00	70	70
	01	06	71	76	03	04	73	74	02	05	72	75
	02	05	72	75	01	06	71	76	04	03	74	73
	03	04	73	74	05	02	75	72	01	06	71	76
	04	03	74	73	02	05	72	75	06	01	76	71
	05	02	75	72	06	01	76	71	03	04	73	74
	06	01	76	71	04	03	74	73	05	02	75	72
	10	10	80	80	10	10	80	80	10	10	80	80

The check variety is indicated by a last digit of 0.
The standard variety is indicated by last digit of 1.
The other numbers indicate other varieties.

U is ground that was unplowed.
S is ground that was plowed in the spring.
F is ground that was plowed in the fall.

The figures 3 and 2 under rates are 3 stalks per hill and 2 stalks per hill, respectively.

During 1947, squares 74300, 74310, 74320 and 74300 are found in the left hand pair of columns under each time of plowing and squares 74370, 74380, 74390 and 743100 in the right pair of columns.

During 1948, squares 84300 through 84380 are found in the left hand pair of columns under each time of plowing and squares 83410 through 83490 in the right hand pair of columns.

All varieties in 1947 were double crosses.

The varieties in squares 84300 to 84380 were double crosses while the varieties in squares 83410 to 83490 were single-crosses.

Methods and Materials

The data on yield and moisture content for this investigation were collected from corn trials at East Lansing, Michigan, in 1947 and 1948.

1947 Test:

The crop that preceeded the corn trial in 1947 was alfalfa. This crop was cut and left in the field that year. A heavy application of straw was applied to the ground to be plowed down at the designated time.

The preparation of the seedbed for corn planting involved 3 different times of plowing: (1) fall plowing, (2) spring plowing and (3) no plowing. The un-plowed ground received the same cultural treatments as did the ground which was plowed with the exception that the alfalfa was not plowed under as one of the steps in seedbed preparation.

The area was divided lengthwise into thirds with a time of plowing being randomly assigned to each third, table 1. Thus, there was no true replication for time of plowing. Since the different times of plowing were confounded with location effects, times of plowing will be called locations hereafter.

Each location area was divided lengthwise into 2 equal strips. Half of the varieties were assigned to one strip in each location (time of plowing) and half of the varieties to the other strip in each location. This gave 6 strips running lengthwise of the field. Each of these 6 strips were further subdivided in half, lengthwise of the field, giving 6 pairs of sub-strips. To each pair of sub-strips there were then randomly assigned the 2 rates of stand - 3 plants per hill and 2 plants per hill, table 1.

The elemental plots in this test were 2 rows wide and 7 hills long with the hills being planted 3.5 feet by 3.5 feet apart and with the long

way of the plot running across the rate of stand. The various varieties were planted 5 to 6 kernels per hill and thinned down to the desired rate of stand before the plants were 18 inches tall.

Forty-one double cross corn varieties were planted in a series of 6 x 6 Latin squares. Five varieties were planted in each square along with a sixth variety which was common to all squares and was the "standard" variety for the experiment. In addition, one row of this common variety was planted between successive squares and is termed a "check", table 1.

Of the 6 "columns" in each Latin square, 1 pair were assigned to each location (time of plowing). One column of a pair was then randomly assigned to each of the 2 rates of stand. Thus, within any one Latin square there were 3 locations and 2 rates within each location.

1948 Test:

The crop that preceeded the corn trial in 1948 was oats, seeded to alfalfa with the alfalfa being used as a green manure crop.

The general field layout was similar to that of 1947. The same variety was again used as check and standard in the entire test. Sixteen of the double crosses used in 1947 were planted along with 30 other double crosses and 45 single crosses. The double crosses were kept together in 9 squares while the single crosses were kept together in 9 other squares.

Table 2. Table showing layout and partial analysis of Square 84300, 1948 yield data.

Field arrangement:

			Columns				
Plowings	S		U		F		
Rates	3	2	2	3	2	3	
Rows	A	B	C	D	E	H	Sum
1	79.6	67.6	64.9	75.3	52.3	83.3	423.0
2	91.2	63.5	77.2	63.5	68.6	77.6	441.6
3	76.4	78.9	61.6	79.7	64.4	84.4	445.4
4	91.2	54.3	70.5	81.1	63.0	76.8	436.9
5	71.7	68.5	59.6	86.5	73.4	76.2	435.9
6	82.9	71.7	58.1	84.4	70.6	65.7	433.4
Sum	493.0	404.5	391.9	470.5	392.3	464.0	2616.2

Arrangement by varieties:

79.6	71.7	61.6	81.1	68.6	76.2	438.8
91.2	68.5	64.9	84.4	63.0	84.4	456.4
76.4	54.3	59.6	63.5	52.3	65.7	371.8
91.2	78.9	77.2	86.5	70.6	83.3	487.7
71.7	63.5	58.1	75.3	64.4	76.8	409.8
82.9	67.6	70.5	79.7	73.4	77.6	451.7
						2616.2

Analysis:

Source	D.F.	S.S.
Total	35	3441.5
Var.	5	1358.6
Rate	1	1584.0
Location	2	82.4
Ra x L	2	11.9
V x Ra	5	124.5
Error	20	280.0

Analysis:

There were 3 ways in which the data could be analyzed: First, by use of the checks and standards, which were all planted to the same variety both years. As mentioned previously, table 1, 4 of the 8 squares of 1947 were in 1 set of strips and the other 4 squares in the other set of strips. This meant that there were 4 squares side by side lengthwise of the field and 2 squares partially interwoven crosswise of the field. This arrangement required 5 rows of checks (1 at each end of the area and 3 between the squares) lengthwise of the field. Only 4 rows of checks were used, 1 row at one end of the field not being included. The 4 squares, lengthwise of the field, gave rise to 4 broken rows of standards. Each standard involved 12 plots across the field. The total number of checks and standards in 1947 was therefore 8 x 12 or 96.

The second way of analyzing the data omitted the checks, but it includes all squares, 8 in 1947 and 18 in 1948. Table 2 shows the yield data for one square under field arrangement and varietal arrangement. A partial analysis of variance is shown because the sums of squares and degrees of freedom for varieties, the V x Ra interaction and Error - 2 are additive. This is necessarily so for the reason that the varieties are different in the various squares. Under this method of analysis, the test was analyzed as a unit.

The third way of studying the results involved only such data as came from the 16 double crosses planted each year.

Data:

The ears from 10 full stand hills were harvested and weighed in the field. A sample of 10 ears, randomly chosen, were sectioned (2) to obtain a moisture sample. This sample was weighed in grams at once and then placed in a fast drying oven until a constant moisture had been reached (approximately 2 percent). The sample was then weighed again, and the moisture was determined for each plot. By means of these moisture contents, the yields of grain in bushels per acre were reduced to the comparative moisture content of 15.5 percent.

Corrections for missing plots in the Latin squares were made according to the formula given by Snedecor (14, p. 274).

EXPERIMENTAL RESULTS

Yield

Checks and Standards

1947 Data:

The yield data for the checks and standards are given in table 3 and the analysis of variance in table 5. It was found that row differences were not significant. Location differences existed, but the error term was so large that the F-value was not significant. Differences due to the different rates of stand were significant at the 1 percent level. Three stalks per hill yielded better than 2 stalks per hill.

1948 Data:

The yield data for the checks and standards for 1948 are given in table 4 and the analysis in table 5. The results obtained were somewhat different from those of the previous year. It was found that row differences were significant at the 1 percent level. This might indicate that soil fertility was not the same throughout the field. Location differences existed, but again the error term was so large that the F-value was not significantly different at the 1 percent level, with 3 stalks per hill yielding more than 2 stalks per hill.

When attempting to combine both years' results, it was found that homogeneity was lacking when the F-test was used with the Error - 3 mean square variances (14, p. 249), therefore, both years results could not be combined.

By casual observation of tables 3 and 4, it can be seen that plowings did not act the same over both years. As mentioned above, due to lack of replications in plowings, plowing effects were confounded with location effects. Hence, no definite statements can be made that location differences in yield were due to different times of plowing.

All Squares

1947 Data:

The yield data on all squares are found in table 6 and the analysis of variance in table 8. It was found that locations showed significant differences at the 5 percent level. Rates were again significantly different at the 1 percent level with 3 plants per hill yielding more than 2 plants per hill. Varieties showed a marked difference from each other, but that was expected since 41 varieties were used. However, it should be observed that the varieties responded the same to the different rates of stand. In other words, all the varieties used this year yielded better at 3 stalks per hill than at 2 stalks per hill.

1948 Data:

The yield data on all squares are found in table 7 and the analysis of variance in table 8. It was found that location differences did exist, but the error term was so large that the F-value was not significant. Rates were significant only at the 5 percent level.

The Error - 4 mean square variances were used to test for homogeneity. The F-test showed the differences between variances to be highly significant, consequently, both years' results could not be combined in this portion of the experiment.

Common Varieties

1947 Data:

In the over all experiment, 16 double crosses, other than the standard, were common to both years. The yield data for the common varieties in 1947 are found in table 9 and the analysis of variance in table 11. It was found that differences due to locations appeared to exist, but the F-test was not significant. Rates were significant at the 1 percent level with 3 stalks per hill yielding more than 2 stalks per hill. Varieties were also significant at the 1 percent level. As seen in table 10, all 16 varieties yielded better at the rate of 3 stalks per hill.

1948 Data:

The yield data for the common varieties in 1948 are found in table 9 and the analysis of variance in table 11. Differences due to locations and rates were apparently great, but the error term used to check them was so large that the F-value was not significant. An explanation as to why this error term was so large is not available. All 16 varieties reacted the same to the rates of stand with all varieties yielding more at the rate of 3 stalks per hill, table 10. This was true for both years.

The 2 years results could not be combined for the reason that they were not homogeneous, as tested by the Error - 2 mean square variances.

Moisture Content

Checks and Standards

The moisture content data for the checks and standards are given in table 12 and the analysis of variance in table 14. It was found that no significant differences existed between different locations or rates of stand in 1947. The same was found to be true in 1948, table 14.

The Error - 3 mean square variances of both years were checked against each other. The F-value obtained from this test was not significant. It was then assumed that homogeneity existed between the checks and standards over the 2-year period. Under this assumption, it was possible to combine the results of both years. When both years were combined, differences due to plowing times could be measured statistically by using years as replications.

The analysis of variance for the combined years of 1947 and 1948 is found in table 14. It was found that differences due to plowings were significant at the 5 percent level, with fall plowing causing the corn to have the lowest moisture content, table 15. There were no significant differences due to rates of stand when the 2 years were combined.

All Squares

1947 Data:

The data for this portion of the experiment are found in table 16, and the analysis of variance is found in table 18. Significant differences at the 5 percent level existed between locations and at the 1 percent level between rates. The moisture content of corn with a stand of 3 stalks per hill was higher than with corn thinned to the 2 stalk rate, table 16. Differences due to varieties were highly significant, as were differences due to squares. However, the latter has no direct bearing on either times of plowing or rates of stand.

1948 Data:

The data for this year are found in table 17 with the analysis of variance being found in table 18. Differences between double crosses and single crosses were rather great, but no comparison can be made for the reason that the inbreds involved in the single crosses were not the same inbreds that were in the double crosses. It can be seen, table 18, that the mean squares for the single crosses were considerably smaller than for the double crosses. This might indicate that the single crosses were more uniform in their moisture content.

There were no significant differences between locations or rates of stand, but the error term used to test these differences was so large that the F-value was not significant.

Both years:

The Error - 4 mean square variances of both years were not significantly different from each other as tested by the F-test. Therefore, it was possible to combine both years results. When these results were combined, it was found there were no significant differences between times of plowing or rates of stand. Too much stress cannot be placed on this statement

because of the different varieties that were used in both years. From table 19, there is an indication that differences due to rate may not be of material importance, but fall plowing apparently caused the corn to have a lower moisture content over both years. There was no apparent significant difference in the way the various varieties reacted to the different rates of stand.

Common Varieties

1947 Data:

The data on the common varieties are given in table 20, while the analysis is found in table 22. No significant differences existed between locations or rates even though the error term used to check these differences was practically negligible. Varieties were significantly different at the 1 percent level as far as moisture content is concerned, but that can be expected when 16 different varieties are tested.

1948 Data:

The data on moisture content for the common varieties in 1948 are given in table 20 and the analysis of variance in table 22. Although there appeared to be some differences in moisture content due to locations and rates of stand, the error term was so large that the F-values were not significant. The varieties were again significant at the 1 percent level.

Both Years:

The Error - 2 mean square variance were homogeneous for the 2 years, so both years' results could be combined. The analysis of variance for the combined results is found in table 22. It was found that no significant differences existed between plowings or rates of stand. There is an indication that fall plowing gives a lower moisture content for both years and that 2 stalks per hill will produce corn with a somewhat lower moisture content than the 3 stalk rate. From table 21, it would appear that there might be some differences in the way that varieties respond to the different rates of stand, but it would also appear that it depends on the year.

Conclusions

Under the conditions of this experiment, it would appear that 3 stalks per hill will yield significantly better than 2 stalks per hill, but that more data are needed before a definite statement can be made as to the effect of time of plowing on the yield of corn.

There is a rather strong indication that varieties will react the same way to different rates of stand in the production of grain. Under the conditions of this experiment, varieties tended to yield better at the rate of 3 stalks per hill than at the 2 stalk rate.

As far as moisture content of the ear is concerned, it would appear that rates of stand do not materially affect the moisture content. There is some indication that 3-stalk hills are slightly higher in moisture content.

There is some indication that fall plowing will cause corn to have a lower moisture content than will spring plowed or unplowed ground.

In moisture content, it would appear that there might be some differences in the way that varieties respond to the different rates of stand, but it would also appear that it depends on the year.

LITERATURE CITED

(1) Bull, C. P., Corn. U. of Minn. Agr. Exp. St. Bul. 149. 1915.

(2) Down, E. E., Thayer, J. W., Jr., and Vander Meulen, E., Sampling ear corn for moisture determination. Jour. Am. Soc. Agr. 36:461-463. 1944.

(3) Duncan, J. R., Rate of planting corn for grain. Mich. Agr. Exp. St. Quarterly Bul. 15:292-293. 1933.

(4) Foster, L. and Merrill, L. A., Corn experiments. Utah Agr. Exp. St. Bul. 66. 1900.

(5) Helm, C. A., Corn in Missouri. U. of Mo. Agr. Exp. St. Bul. 185. 1921.

(6) Kentucky Agr. Exp. Sta., Rate of seeding corn. 44th Ann. Rpt. for 1931.

(7) Kiesselbach, T. A., Corn investigations. U. of Nebr. Agr. Exp. St. Res. Bul. 20. 1922.

(8) Kiesselbach, T. A., Anderson, A., and Lyness, W. E., Tillage practices in relation to corn production. U. of Nebr. Exp. St. Bul. 232. 1928.

(9) Kiesselbach, T. A., Anderson, A., and Lyness, W. E., Cultural practices in corn production. U. of Nebr. Exp. St. Bul. 293. 1935.

(10) Montgomery, E. G., Experiments with corn. U. of Nebr. Exp. St. Bul. 112. 1909.

(11) Mooers, C. A., Planting rates and spacing for corn under southern conditions. Jour. Amer. Soc. of Agron. 12:1-22. 1920.

(12) Ohio Agr. Exp. St., Handbook of experiments in agronmy. Spec. Cir. 53. 1938.

(13) Osborn, L. W., Experiments with varying stands and distribution of corn. U. of Ark. Agr. Exp. St. Bul. 200. 1925.

(14) Snedecor, G. W., Statistical Methods. Collegiate Press 4th ed. 1946.

(15) Wallace, H. A., What kind of corn stand do you favor? Wallaces' Farmer 56:544-545. 1931.

APPENDIX

Tables 3 - 22 inclusive

Table 3. Yield in bushels per acre for the check and standard variety for the year 1947.

Columns

Plowings	U				S				F				
Rates	3	2	3	2	3	2	3	2	3	2	3	2	
Rows													Sum
Check	71.0	58.0	60.4	49.9	62.8	47.6	61.8	58.5	54.2	53.4	67.2	52.6	697.4
Standard	57.5	50.7	57.6	47.9	54.6	43.2	64.2	42.7	58.2	53.4	65.0	45.1	640.1
Check	56.5	55.0	65.2	48.0	57.6	45.8	59.8	55.0	61.0	54.2	62.8	47.4	668.3
Standard	61.0	51.6	68.1	54.7	53.8	48.0	63.4	44.8	62.9	52.5	(64.4)	51.7	676.9
Check	48.4	47.8	67.8	46.8	62.0	43.6	66.8	47.2	63.6	47.0	63.4	51.2	655.6
Standard	60.1	51.8	68.8	53.1	57.3	46.1	59.8	50.7	60.8	45.6	57.6	44.3	656.0
Check	52.6	50.4	65.2	53.4	50.6	43.6	63.2	54.8	67.2	41.2	62.0	50.2	654.4
Standard	58.2	48.0	69.3	41.1	49.7	46.3	59.2	52.7	60.2	49.6	61.9	47.4	643.6
	465.3	413.3	522.4	394.9	448.4	364.2	498.2	406.4	488.1	396.9	504.3	389.9	5292.3

The figure (64.4) is a calculated value from square 74380.

	U	S	F	Sum	Ave.
Ra 3	987.7	946.6	992.4	2926.7	60.9
Ra 2	808.2	770.6	786.8	2365.6	49.3
Sum	1795.9	1717.2	1779.2	5292.3	
Ave.	56.1	53.7	55.6		

U Unplowed ground
S Spring plowed ground
F Fall plowed ground

Table 4. Yield in bushels per acre for the check and standard variety for the year 1948.

Plowings	S				U				F				
Rates	3	2	3	2	2	3	2	3	2	3	2	3	
Rows	Columns												Sum
	82.2	75.7	76.8	66.4	59.9	78.5	68.2	76.6	67.2	73.3	66.2	88.0	879.0
	79.6	71.7	74.9	82.0	61.6	81.1	62.5	77.9	68.6	76.2	60.2	87.1	883.4
	85.1	74.7	84.9	76.2	66.4	82.3	56.3	73.6	65.9	78.6	67.3	90.6	901.9
	84.0	74.7	81.2	63.8	66.3	83.8	58.6	83.6	70.5	79.4	65.8	82.6	894.3
	86.1	78.6	67.5	70.3	63.4	73.5	61.1	70.7	69.4	83.8	61.8	81.9	868.1
	87.2	69.4	78.9	79.4	67.2	75.4	57.0	75.7	68.8	79.8	59.1	79.6	877.5
	92.5	61.9	68.0	59.6	64.3	75.3	61.1	55.5	57.8	74.7	63.0	72.9	806.6
	84.5	63.1	66.3	58.2	63.9	72.1	54.6	54.4	54.2	72.1	60.3	67.5	771.2
	88.3	64.7	69.7	56.1	59.1	66.5	63.0	64.8	51.1	75.5	54.2	76.8	789.8
	83.2	60.6	61.3	52.3	54.4	57.9	49.1	59.3	52.0	74.8	55.8	73.1	733.8
	75.8	70.9	79.0	62.4	62.0	69.9	45.1	59.2	57.9	73.6	60.5	76.4	792.7
	81.5	61.2	81.1	57.4	59.4	62.1	46.4	63.2	51.9	64.2	59.3	74.2	761.9
	71.6	60.3	66.4	57.4	59.3	68.6	54.3	72.4	65.1	73.9	61.0	67.4	777.7
	70.3	65.9	64.1	59.6	62.8	70.1	51.5	66.2	56.9	72.0	65.3	71.2	775.9
	74.4	66.8	73.7	65.5	70.5	80.4	75.1	63.7	68.4	77.6	63.8	72.2	852.1
	68.9	65.1	71.4	75.9	67.7	82.8	76.2	70.3	64.2	72.5	65.7	74.1	854.8
	79.7	76.6	81.4	73.8	60.9	74.2	56.3	65.1	62.9	75.1	65.6	66.8	838.4
	72.7	66.9	73.5	68.3	66.2	82.8	63.5	64.5	70.1	74.2	65.1	67.8	834.7
	75.0	59.1	83.6	59.3	57.9	71.8	66.4	66.1	64.3	79.2	60.4	66.6	809.7
	1522.6	1287.0	1403.7	1243.9	1193.2	1409.1	1126.3	1282.8	1187.2	1430.5	1180.4	1436.8	15703.5

	U	S	F	Sum	Ave.
Ra 3	2691.9	2926.3	2867.3	8485.5	74.4
Ra 2	2319.5	2530.9	2367.6	7218.0	63.3
Sum	5011.4	5457.2	5234.9	15703.5	
Ave.	65.9	71.8	68.9		

U Unplowed ground

S Spring plowed ground

F Fall plowed ground

Table 5. Table showing yield analysis of the check and standard variety for the years 1947 and 1948.

Analysis for 1947:

Source	D.F.	S.S.	M.S.	F.
Total	94	5390.4		
Rows	7	205.5	29.4	1.8
L	2	107.5	53.7	---
Re	1	203.9	203.9	3.7
Error - 1	2	110.1	55.0	---
Rate	1	3279.5	3279.5	50.0**
L x Ra	2	16.4	8.2	---
Error - 2	3	196.8	65.6	
Error - 3	76	1270.9	16.7	
Missing plot	1			

Analysis for 1948:

Source	D.F.	S.S.	M.S.	F.
Total	227	19254.2		
Rows	18	3850.5	213.9	7.1**
L	2	1307.5	653.8	4.6
Re	1	554.9	554.9	3.9
Error - 1	2	281.5	140.8	3.4
Ra	1	7046.3	7046.3	170.1**
L x Ra	2	121.1	60.6	1.5
Error - 2	3	124.3	41.4	
Error - 3	198	5968.0	30.1	

**	1 percent level of significance
L	locations (times of plowing)
Re	replications of rates within locations
Ra	rates of planting
---	F. test is less than 1.0
Error - 1	is (L x Re) and is main plot error. It is used to test locations and replications
Error - 2	is subplot error of this split plot layout, (Re x Ra) $\neq$ (L x Re x Ra). It is used to test rate and L x Ra.
Error - 3	is the Row x Column interaction. It is used to test rows the other error term.

Table 6. The yield in bushels per acre for 1947 is given in varietal order arrangement for each square. A partial analysis of variance for each square is also given.

Plowings	U		S		F		Sum	Analysis of variance		
Rates	3	2	3	2	3	2				
				Square 74300				Source	D.F.	S.S.
	57.5	50.7	54.6	43.2	58.2	53.4	317.6	Total	35	1721.1
	66.8	51.0	63.4	44.7	63.4	57.0	346.3	Var.	5	122.4
	63.4	52.1	67.0	47.5	56.9	49.9	336.8	Ra	1	1211.0
	67.2	52.0	65.9	48.1	65.4	54.2	352.8	L	2	80.2
	65.2	57.4	63.0	46.7	57.3	54.2	343.8	L x Ra	2	105.8
	64.1	53.1	62.3	50.4	62.5	49.7	342.1	V x Ra	5	55.4
	384.2	316.3	376.2	280.6	363.7	318.4	2039.4	Error	20	146.3
				Square 74310						
	61.0	51.6	53.8	48.0	62.9	52.5	329.8	Total	35	2720.9
	68.8	51.2	67.7	47.7	66.2	52.3	353.9	Var.	5	504.3
	74.7	51.8	66.0	46.6	70.3	56.9	366.3	Ra	1	1750.0
	56.6	49.6	58.5	42.0	62.5	45.3	314.5	L	2	174.2
	59.8	53.9	66.9	48.8	70.5	53.8	353.7	L x Ra	2	17.7
	67.6	57.0	67.3	53.1	74.8	62.8	382.6	V x Ra	5	96.2
	388.5	315.1	380.2	286.2	407.2	323.6	2100.8	Error	20	178.6
				Square 74320						
	60.1	51.8	57.3	46.1	60.8	45.6	321.7	Total	34	1607.2
	62.8	53.7	66.6	51.0	59.6	49.7	343.4	Var.	5	261.8
	68.3	49.7	62.1	55.1	60.9	55.3	351.4	Ra	1	944.5
	69.2	55.4	62.2	49.6	69.4	51.9	357.7	L	2	64.3
	(57.8)	46.1	53.5	45.4	55.3	55.9	314.0	L x Ra	2	13.5
	63.8	54.3	56.0	50.2	53.1	47.6	325.0	V x Ra	5	72.7
	382.0	311.0	357.7	297.4	359.1	306.0	2013.2	Error	19	250.4
				Square 74330						
	58.2	48.0	49.7	46.3	60.2	49.6	312.0	Total	35	1775.0
	67.4	53.1	57.4	48.6	67.7	61.9	356.1	Var.	5	219.9
	63.5	48.8	49.0	49.6	64.4	54.5	329.8	Ra	1	754.4
	62.1	48.8	64.1	42.2	59.3	54.6	331.1	L	2	493.9
	69.7	55.1	55.4	49.9	65.1	56.2	351.4	L x Ra	2	47.5
	63.2	55.9	53.9	46.9	63.8	59.3	343.0	V x Ra	5	42.8
	384.1	309.7	329.5	283.5	380.5	336.1	2023.4	Error	20	216.5

Table 6. Continued

Plowings	U		S		F		Sum	Analysis of variance		
Rates	3	2	3	2	3	2				
				Square 74370				Source	D.F.	S.S.
	57.6	47.9	64.2	42.7	65.0	45.1	322.5	Total	35	3366.8
	70.9	52.7	60.4	54.2	62.2	57.3	357.7	Var.	5	358.9
	71.8	51.6	67.7	50.4	80.0	55.2	376.7	Ra	1	2358.7
	73.2	49.2	67.7	43.9	68.4	56.7	359.1	L	2	125.9
	67.0	50.3	62.4	49.8	61.9	45.8	337.2	L x Ra	2	26.4
	78.4	56.2	59.2	54.2	70.3	53.7	372.0	V x Ra	5	119.8
	418.9	307.9	381.6	295.2	407.8	313.8	2125.2	Error	20	377.1
				Square 74380						
	68.1	54.7	63.4	44.8	(64.4)	51.7	347.1	Total	34	2514.0
	67.7	53.3	63.5	53.8	65.3	50.1	353.7	Var.	5	331.2
	67.0	50.6	63.2	50.8	62.9	49.2	343.7	Ra	1	1865.4
	75.8	61.0	69.9	53.3	73.4	53.5	386.9	L	2	95.7
	72.1	58.5	73.2	58.8	63.1	52.2	377.9	L x Ra	2	9.0
	72.7	57.8	65.7	59.1	75.8	54.9	386.0	V x Ra	5	16.6
	423.4	335.9	398.9	320.6	404.9	311.6	2195.3	Error	19	196.1
				Square 74390						
	68.8	53.1	59.8	50.7	57.6	44.3	334.3	Total	35	2385.0
	63.4	53.1	58.5	44.6	65.8	48.6	334.0	Var.	5	255.0
	73.1	57.7	71.4	56.5	68.2	49.5	376.4	Ra	1	1772.4
	63.8	49.2	66.2	50.5	63.1	48.7	341.5	L	2	81.4
	67.2	49.1	55.7	49.9	66.4	47.6	335.9	L x Ra	2	37.5
	66.3	54.9	63.0	53.8	69.3	53.2	360.5	V x Ra	5	16.7
	402.6	317.1	374.6	306.0	390.4	291.9	2082.6	Error	20	222.0
				Square 743100						
	69.3	41.1	59.2	52.7	61.9	47.4	331.6	Total	35	2559.3
	66.1	43.1	65.6	49.4	66.8	51.4	342.4	Var.	5	34.6
	62.9	47.6	61.6	54.0	71.6	48.0	345.7	Ra	1	1922.8
	57.0	45.6	65.2	55.9	61.6	52.0	336.4	L	2	120.7
	58.8	46.6	69.9	48.0	61.2	44.0	328.5	L x Ra	2	30.0
	54.8	53.4	64.9	54.5	64.4	45.9	337.9	V x Ra	5	91.7
	368.9	277.4	386.4	313.6	387.5	288.7	2022.5	Error	20	359.6

The figures (57.8) square 74320 and (64.4) square 74380 are calculated values.

	U	S	F	Sum	Ave.
Ra 3	3152.6	2985.1	3101.1	9238.8	64.2
Ra 2	2490.4	2383.1	2490.1	7363.6	51.1
Sum	5643.0	5368.2	5591.2	16602.4	
Ave.	58.8	55.9	58.2		

Table 7. The yield in bushels per acre for 1948 is given in varietal order arrangement for each square. A partial analysis of variance for each square is also given.

Plowings	S		U		F		Sum	Analysis of variance		
Rates	3	2	2	3	2	3				

The following squares are double crosses.

Square 84300

							Source	D.F.	S.S.
79.6	71.7	61.6	81.1	68.6	76.2	438.8	Total	35	3441.5
91.2	68.5	64.9	84.4	63.0	84.4	456.4	Var.	5	1358.6
76.4	54.3	59.6	63.5	52.3	65.7	371.8	Ra	1	1584.0
91.2	78.9	77.2	86.5	70.6	83.3	487.7	L	2	82.4
71.7	63.5	58.1	75.3	64.4	76.8	409.8	L x Ra	2	11.9
82.9	67.6	70.5	79.7	73.4	77.6	451.7	V x Ra	5	124.5
493.0	404.5	391.9	470.5	392.3	464.0	2616.2	Error	20	280.0

Square 84310

84.0	74.7	66.3	83.8	70.5	79.4	458.7	Total	35	4157.2
88.0	68.2	74.1	76.6	71.4	92.4	470.7	Var.	5	268.3
98.4	71.5	68.7	84.8	78.4	92.2	494.0	Ra	1	2577.2
110.8	79.0	71.3	78.8	66.7	84.2	490.8	L	2	290.8
81.5	71.7	62.4	82.0	72.8	89.0	459.4	L x Ra	2	63.6
96.5	70.1	67.2	96.1	78.8	89.9	498.6	V x Ra	5	104.4
559.2	435.2	410.0	502.1	438.6	527.1	2872.2	Error	20	852.2

Square 84320

87.2	69.4	67.2	75.4	68.8	79.8	447.8	Total	35	3903.7
88.5	62.3	65.7	70.6	60.1	69.7	416.0	Var.	5	460.3
88.3	75.9	59.9	69.1	65.1	82.0	440.3	Ra	1	1325.0
89.0	66.3	63.2	69.9	65.6	80.9	434.9	L	2	1319.7
105.2	82.0	68.9	66.8	72.0	84.4	479.3	L x Ra	2	291.7
93.7	83.8	68.1	70.1	72.2	84.3	474.2	V x Ra	5	42.4
551.9	439.7	393.0	421.9	403.8	481.1	2691.4	Error	20	464.8

Square 84330

84.5	63.1	63.9	72.1	54.2	72.1	409.9	Total	35	5186.3
100.2	65.8	64.5	61.9	52.4	86.3	431.1	Var.	5	281.8
100.4	71.6	67.0	67.9	71.0	76.2	454.1	Ra	1	2043.0
92.3	69.7	70.5	65.8	61.2	81.4	440.9	L	2	1487.3
85.8	75.7	63.4	69.9	58.1	75.8	428.7	L x Ra	2	753.9
91.4	64.8	59.9	66.5	52.7	70.2	405.5	V x Ra	5	121.8
554.6	410.7	389.2	404.1	349.6	462.0	2570.2	Error	20	498.4

Square 84340

83.2	60.6	54.4	57.9	52.0	74.8	382.9	Total	35	6368.7
95.6	70.7	61.2	61.8	63.2	85.6	438.1	Var.	5	1153.8
78.8	58.6	63.7	41.7	41.8	57.6	342.2	Ra	1	1764.0
80.1	59.3	61.6	58.0	50.7	78.2	387.9	L	2	1377.3
92.5	77.8	59.6	70.8	51.6	86.9	439.2	L x Ra	2	979.1
87.0	58.3	65.3	71.2	65.0	65.7	412.5	V x Ra	5	214.5
517.2	385.3	365.8	361.4	324.3	448.8	2402.8	Error	20	880.0

Table 7. Continued

Plowings	S		U		F		Sum	Analysis of variance		
Rates	3	2	2	3	2	3				
			Square 84350					Source	D.F.	S.S.
	81.5	61.2	59.4	62.1	51.9	64.2	380.3	Total	35	4863.8
	79.5	58.5	64.6	58.1	48.4	58.0	367.1	Var.	5	773.0
	89.3	79.2	61.1	49.7	58.1	92.4	429.8	Ra	1	496.5
	83.4	72.6	63.2	61.5	61.7	71.8	414.2	L	2	1213.4
	68.1	80.0	64.8	63.5	75.1	94.5	446.0	L x Ra	2	657.4
	76.4	81.4	67.0	66.6	55.9	77.2	424.5	V x Ra	5	99.4
	478.2	432.9	380.1	361.5	351.1	458.1	2461.9	Error	20	1624.1
			Square 84360							
	70.3	65.9	62.8	70.1	56.9	72.0	398.0	Total	35	3544.0
	78.5	67.3	86.5	90.0	63.1	73.1	458.5	Var.	5	1507.5
	67.7	59.1	61.5	67.4	64.1	68.8	388.6	Ra	1	517.6
	77.0	73.9	66.7	78.6	78.6	89.4	464.2	L	2	67.8
	84.0	81.1	90.3	73.6	60.6	91.9	481.5	L x Ra	2	144.2
	79.2	62.7	62.4	66.0	58.2	60.6	389.1	V x Ra	5	11.6
	456.7	410.0	430.2	445.7	381.5	455.8	2579.9	Error	20	1295.3
			Square 84370							
	68.9	65.1	67.7	82.8	64.2	72.5	421.2	Total	35	5429.2
	94.6	75.6	78.0	84.1	73.5	76.8	482.6	Var.	5	2712.0
	87.9	76.6	74.5	95.5	80.2	87.3	502.0	Ra	1	1752.8
	93.2	70.6	61.9	87.3	66.3	80.9	460.2	L	2	218.4
	92.5	72.0	69.8	97.8	68.3	77.4	477.8	L x Ra	2	124.5
	67.1	48.2	57.9	65.0	48.9	58.9	346.0	V x Ra	5	185.7
	504.2	408.1	409.8	512.5	401.4	453.8	2689.8	Error	20	435.8
			Square 84380							
	72.7	66.0	66.2	82.8	70.1	74.2	432.0	Total	35	3091.5
	88.1	66.9	75.1	82.6	70.2	80.2	463.1	Var.	5	1231.9
	74.8	73.1	69.6	77.0	54.0	73.0	421.5	Ra	1	1174.2
	86.1	74.3	73.8	95.0	70.2	74.7	474.1	L	2	199.5
	72.9	62.3	60.8	74.7	65.0	70.3	406.0	L x Ra	2	32.1
	66.1	55.6	56.2	74.0	50.6	66.4	368.9	V x Ra	5	38.7
	460.7	398.2	401.7	486.1	380.1	438.8	2565.6	Error	20	415.1

Table 7. Continued

Plowings	S		U		F		Sum	Analysis of variance		
Rates	3	2	2	3	2	3				

The following 9 squares are single crosses.

Square 83410

							Source	D.F.	S.S.
74.9	82.0	62.5	77.9	60.2	87.1	444.6	Total	35	4372.4
74.5	61.5	63.0	80.0	65.5	84.4	428.9	Var.	5	1835.8
89.4	86.1	86.5	92.7	84.8	103.5	543.0	Ra	1	1230.8
76.3	78.2	78.4	88.4	76.6	74.3	472.2	L	2	117.6
67.4	60.2	67.3	80.8	60.5	90.2	426.4	L x Ra	2	358.3
69.6	63.1	61.0	75.3	63.9	85.1	418.0	V x Ra	5	229.7
452.1	431.1	418.7	495.1	411.5	524.6	2733.1	Error	20	600.2

Square 83420

81.2	63.8	58.6	83.6	65.8	82.6	435.6	Total	35	6000.1
86.1	71.3	69.3	87.1	72.8	98.6	485.2	Var.	5	1339.1
86.6	66.7	63.6	90.2	84.6	100.0	491.7	Ra	1	2196.5
56.3	69.3	54.8	69.9	58.5	84.6	393.4	L	2	1048.1
68.9	62.9	58.4	63.0	68.6	94.3	416.1	L x Ra	2	434.8
68.8	75.8	66.6	82.1	75.2	103.9	472.4	V x Ra	5	177.4
447.9	409.8	371.3	475.9	425.5	564.0	2694.4	Error	20	804.2

Square 83430

78.9	79.4	57.0	75.7	59.1	79.6	429.7	Total	35	4873.4
96.8	65.8	60.9	73.4	70.5	70.3	437.7	Var.	5	942.6
70.5	52.4	52.4	66.4	59.2	64.5	365.4	Ra	1	1725.0
98.6	69.3	61.7	58.6	71.2	96.7	456.1	L	2	779.3
85.4	71.3	64.8	80.4	60.1	79.4	441.4	L x Ra	2	54.0
79.0	67.5	57.9	69.8	58.7	64.4	397.3	V x Ra	5	57.0
509.2	405.7	354.7	424.3	378.8	454.9	2527.6	Error	20	1315.6

Square 83440

66.3	58.2	54.6	54.4	60.3	67.5	361.3	Total	35	4597.7
103.3	61.9	62.5	62.4	85.0	97.0	472.1	Var.	5	1436.9
75.7	57.5	60.5	60.5	58.5	67.7	380.4	Ra	1	568.8
77.4	61.5	69.2	57.5	67.1	88.6	421.3	L	2	735.8
76.3	62.5	64.3	74.3	73.7	83.1	434.2	L x Ra	2	407.4
61.4	67.1	64.4	60.6	65.0	62.9	381.4	V x Ra	5	384.0
460.4	368.7	375.5	369.7	409.6	466.8	2450.7	Error	20	1064.8

Square 83450

61.3	52.3	49.1	59.3	55.8	73.1	350.9	Total	35	5294.1
56.0	70.5	58.2	47.9	63.4	72.9	368.9	Var.	5	1257.4
68.8	60.9	51.1	58.4	80.2	97.8	417.2	Ra	1	833.3
75.1	60.7	54.1	57.3	59.9	73.5	380.6	L	2	1852.1
78.7	59.2	62.8	72.8	74.2	94.3	442.0	L x Ra	2	103.1
83.6	69.0	54.8	71.4	77.8	85.0	441.6	V x Ra	5	425.1
423.5	372.6	330.1	367.1	411.3	496.6	2401.2	Error	20	823.1

Table 7. Continued

Plowings	S		U		F		Sum	Analysis of variance		
Rates	3	2	2	3	2	3				
			Square 83460					Source	D.F.	S.S.
	81.1	57.4	46.4	63.2	59.3	74.2	381.6	Total	35	5793.3
	82.8	68.4	48.0	59.7	72.6	68.2	399.7	Var.	5	1394.4
	88.7	65.3	47.0	51.0	69.1	66.7	387.8	Ra	1	1481.0
	90.6	77.6	57.5	74.5	68.5	95.7	464.4	L	2	2006.8
	80.2	77.5	60.3	76.4	74.0	91.6	460.0	L x Ra	2	18.2
	69.1	58.4	50.7	61.0	58.9	73.1	371.2	V x Ra	5	185.9
	492.5	404.6	309.9	385.8	402.4	469.5	2464.7	Error	20	707.1
			Square 83470							
	64.1	59.6	51.5	66.2	65.3	71.2	377.9	Total	35	3190.6
	70.3	71.8	55.6	82.0	67.3	94.6	441.6	Var.	5	890.8
	82.9	68.0	69.9	73.7	70.0	85.1	449.6	Ra	1	1041.1
	75.6	66.1	55.1	66.9	65.1	60.3	389.1	L	2	293.4
	76.2	61.3	61.2	61.6	60.5	70.2	391.0	L x Ra	2	0.6
	91.3	66.9	66.4	72.4	68.0	78.6	443.6	V x Ra	5	138.1
	460.4	393.7	359.7	422.8	396.2	460.0	2492.8	Error	20	826.6
			Square 83480							
	71.4	75.9	76.2	70.3	65.7	74.1	433.6	Total	35	2291.2
	81.6	77.9	72.9	82.1	63.7	88.3	466.5	Var.	5	613.2
	75.5	79.6	65.7	85.8	62.6	74.5	443.7	Ra	1	369.7
	69.2	60.2	71.0	64.8	68.5	65.1	398.8	L	2	147.0
	77.3	88.1	67.2	74.7	63.5	82.7	453.5	L x Ra	2	238.6
	73.1	66.6	57.9	77.9	57.0	71.3	403.8	V x Ra	5	287.7
	448.1	448.3	410.9	455.6	381.0	456.0	2599.9	Error	20	608.0
			Square 83490							
	73.5	68.3	63.5	64.5	65.1	67.8	402.7	Total	35	2845.1
	72.0	63.7	62.6	54.2	48.9	61.8	363.2	Var.	5	1170.4
	79.2	61.3	71.6	51.1	70.3	75.6	409.1	Ra	1	268.4
	84.7	74.4	69.3	80.0	68.6	81.5	458.5	L	2	133.0
	74.3	66.6	74.7	83.3	58.8	81.9	439.6	L x Ra	2	288.4
	77.2	81.5	78.6	73.6	69.2	79.1	459.2	V x Ra	5	223.6
	460.9	415.8	420.3	406.7	380.9	447.7	2532.3	Error	20	761.4

	U	S	F	Sum	Ave.
Ra 3	7768.8	8730.7	8529.6	25029.1	77.2
Ra 2	6922.8	7374.9	7019.9	21317.6	65.8
Sum	14691.6	16105.6	15549.5	46346.7	
Ave.	68.0	74.6	72.0		

Table 8. Table showing yield analysis of all squares for the years 1947 and 1948.

Analysis for 1947:

Source	D.F.	S.S.	M.S.	F.
Total	287	19432.7		
Squares	7	783.9	112.0	2.0
Var.	40	2088.1	52.2	4.2**
L	2	444.2	222.1	20.2*
Ra	1	12209.6	12209.6	1111.0**
Error - 1	2	22.0	11.0	
Sq. x Ra	7	369.1	52.7	2.8*
Error - 2	14	791.6	56.5	3.0*
Error - 3	14	265.9	19.0	
V x Ra	40	511.8	12.8	1.0
Error - 4	158	1946.5	12.3	
Missing plots	2			

Analysis for 1948:

Source	D.F.	S.S.	M.S.	F.
Total	647	86684.1		
Dx : Sx	1	472.4	472.4	1.8
B. Dx	8	4192.5	524.1	2.0
B. Sx	8	2775.5	346.9	1.4
Var.	90	20628.0	229.2	5.8**
L	2	4698.5	2349.3	4.2
Ra	1	21258.1	21258.1	38.1*
Error - 1	2	1117.4	558.7	14.1**
Sq. x Ra	17	1718.0	101.1	---
Error - 2	34	8671.0	255.0	2.3*
Error - 3	34	3844.1	113.1	
V x Ra	90	3051.8	33.9	---
Error - 4	360	14256.8	39.6	

* 5 percent level of significance
** 1 percent level of significance
--- F. test is less than 1.0
Dx : Sx double crosses versus single crosses
B. Dx between squares of double crosses
B. Sx between squares of single crosses
Sq. Latin squares
Error - 1 is L x Ra and is used to test rates and locations
Error - 2 is Sq. x L and is used to test squares, double crosses and single crosses
Error - 3 is Sq. x L x Ra. It is used to test Sq. x Ra and Error - 2.
Error - 4 is remainder. It is used to test varieties, V x Ra and Error - 1.

Table 9. Yield in bushels per acre during 1947 and 1948 for the 16 common varieties.

Plowings			U		S		F		Sum
Rates			3	2	3	2	3	2	
Year	Variety	Plot No.	Rows						
1947	Mic. 24B	74304	67.2	52.0	65.9	48.1	65.4	54.2	352.8
48	"	84336	66.5	59.9	91.4	64.8	70.2	52.7	405.5
1947	Mic. 36B	74305	65.2	57.4	63.0	46.7	57.3	54.2	343.8
48	"	84303	63.5	59.6	76.4	54.3	65.7	52.3	371.8
1947	Mic. 20D	74312	68.8	51.2	67.7	47.7	66.2	52.3	353.9
48	"	84342	61.8	61.2	95.6	70.7	85.6	63.2	438.1
1947	Mic. 29D	74313	74.7	51.8	66.0	46.6	70.3	56.9	366.3
48	"	84354	61.5	63.2	83.4	72.6	71.8	61.7	414.2
1947	Wis. 416A	74315	59.8	53.9	66.9	48.8	70.5	53.8	353.7
48	"	84386	74.0	56.2	66.1	55.6	66.4	50.6	368.9
1947	PAG 274	74372	70.9	52.7	60.4	54.2	62.2	57.3	357.7
48	"	84335	69.9	63.4	85.8	75.7	75.8	58.1	428.7
1947	Pio 373	74373	71.8	51.6	67.7	50.4	80.0	55.2	376.7
48	"	84313	84.8	68.7	98.4	71.5	92.2	78.4	494.0
1947	Pio 342	74374	73.2	49.2	67.7	43.9	68.4	56.7	359.1
48	"	84345	70.8	59.6	92.5	77.8	86.9	51.6	439.2
1947	F.Br.G12	74376	78.4	56.2	59.2	54.2	70.3	53.7	372.0
48	"	84326	70.1	68.1	93.7	83.8	84.3	72.2	472.2
1947	Ki KR2	74384	75.8	61.0	69.9	53.3	73.4	53.5	386.9
48	"	84362	90.0	86.5	78.5	67.3	73.1	63.1	458.5
1947	Ki D4	74385	72.1	58.5	73.2	58.8	63.1	52.2	377.9
48	"	84322	70.6	65.7	88.5	62.3	69.7	60.1	416.9
1947	Pio 349	74386	72.7	57.8	65.7	59.1	75.8	54.9	386.0
48	"	84333	67.9	67.0	100.4	71.6	76.2	71.0	840.1
1947	Dek 404A	74393	73.1	57.7	71.4	56.5	68.2	49.5	376.4
48	"	84343	41.7	63.7	78.8	58.6	57.6	41.8	342.2
1947	Ki KS6	74394	63.8	49.2	66.2	50.5	63.1	48.7	341.5
48	"	84302	84.4	64.9	91.2	68.5	84.4	63.0	456.4
1947	NWO N6	74395	67.2	49.1	55.7	49.9	66.4	47.6	335.9
48	"	84355	63.5	64.8	68.1	80.0	94.5	75.1	446.0
1947	PAG 56	743103	62.9	47.6	61.6	54.0	71.6	48.0	345.7
48	"	84314	78.8	71.3	110.8	79.0	84.2	66.7	490.8

Table 9. Continued

1947

P	U	S	F	Sum	Ave.
Ra 3	1117.6	1048.2	1092.2	3258.0	67.8
Ra 2	856.9	822.7	848.7	2528.3	52.7
Sum	1974.5	1870.9	1940.9	5786.3	
Ave.	61.7	58.5	60.6		

1948

P	U	S	F	Sum	Ave.
Ra 3	1119.8	1399.6	1238.6	3758.0	78.3
Ra 2	1043.8	1114.1	981.6	3139.5	65.4
Sum	2163.6	2513.7	2220.2	6897.5	
Ave.	67.6	78.6	69.4		

Table 10. Varietal response to different rates of planting. This 3-way table is taken from the yield data of the 16 common varieties in 1947 and 1948.

	1947			1948		
Rate	3	2	Sum	3	2	Sum
Variety						
Mic 24B	198.5	154.3	352.8	228.1	177.4	405.5
Mic 36B	185.5	158.3	342.8	205.6	166.2	371.8
Mic 20D	202.7	151.2	353.9	243.0	195.1	438.1
Mic 290	211.0	155.3	366.3	216.7	197.5	414.2
Mis 416A	197.2	156.5	353.7	206.5	162.4	368.9
PAG 274	193.5	164.2	357.7	231.5	197.2	428.7
Pio 373	219.5	157.2	376.7	275.4	218.6	494.0
Pio 342	209.3	149.8	359.1	250.2	189.0	439.2
F.Br G12	207.9	164.1	372.0	248.1	224.1	472.2
Ki RR2	219.1	167.8	386.9	241.6	216.9	458.5
Ki D4	208.4	169.5	377.9	228.8	188.1	416.9
Pio 349	214.2	171.8	386.0	244.5	209.6	454.1
Dek 404	212.7	163.7	376.4	178.1	164.1	342.2
Ki KS6	193.1	148.4	341.5	260.0	196.4	456.4
NWO N6	189.3	146.6	335.9	226.1	219.9	446.0
PAG 56	196.1	149.6	345.7	273.8	217.0	490.8
Sum	3258.0	2528.3	5786.3	3758.0	3139.5	6897.5

Each figure in the rate column constitutes the sum of 3 replications, one each location.

Table 11. Table showing yield analysis of varieties common to both years.

Analysis for 1947:

Source	D.F.	S.S.	M.S.	F.
Total	95	7615.5		
L	2	174.6	87.3	9.0
Ra	1	5546.5	5546.5	573.0**
Error - 1	2	19.4	9.7	---
Var.	15	655.5	43.7	2.6**
V x Ra	15	225.3	15.0	---
Error - 2	60	994.3	16.6	

Analysis for 1948:

Source	D.F.	S.S.	M.S.	F.
Total	95	16066.4		
L	2	2207.5	1103.7	2.7
Ra	1	3984.8	3984.8	9.9
Error - 1	2	806.9	403.4	6.6**
Var.	15	4650.5	310.0	5.1**
V x Ra	15	756.0	50.4	---
Error - 2	60	3660.7	61.0	

**	1 percent level of significance
---	F. test is less than 1.0
L	locations (times of plowing)
Ra	rates of planting
Var.	varieties
V x Ra	variety by rate of interaction
Error - 1	is L x Ra and is main plot error. It is used to test location and rates.
Error - 2	is subplot error of this split-plot design. It is used to test Error - 1, varieties and V x Ra.

Table 12. Percent moisture content of the ear for the check and standard variety during 1947.

Plowings	U				S				F				Sum
Rates	3	2	3	2	3	2	3	2	3	2	3	2	
	32.1	30.9	37.3	34.1	33.8	37.2	34.2	35.2	32.8	27.2	36.4	30.7	401.9
	37.4	34.7	36.9	34.7	34.7	34.7	35.6	37.2	37.2	30.7	32.0	38.0	423.8
	35.2	30.6	34.7	39.6	36.2	39.6	35.5	32.8	34.2	33.6	33.1	35.5	420.6
	37.0	33.4	34.2	35.5	35.2	32.9	34.1	35.1	35.5	30.6	(34.5)	34.2	412.3
	37.1	37.0	32.1	36.2	36.3	35.3	35.5	34.7	33.8	35.9	36.4	31.3	421.6
	39.0	30.4	31.4	34.2	38.2	37.6	33.7	31.4	35.6	33.4	36.1	36.4	417.4
	38.4	38.5	32.1	34.7	38.9	37.7	29.8	38.5	34.3	35.4	35.5	32.6	426.4
	38.0	37.2	31.8	36.1	37.8	34.2	35.6	31.4	34.2	32.9	35.7	33.2	418.1
	294.2	272.7	270.5	285.1	291.1	289.2	274.0	276.3	277.6	259.7	279.7	272.0	3342.1

The figure (34.5) is a calculated value from square 74380.

	U	S	F	Sum	Ave.
Ra 3	564.7	565.1	557.3	1687.1	35.1
Ra 2	557.8	565.5	531.5	1655.0	34.5
Sum	1122.5	1130.6	1089.0	3342.1	
Ave.	35.1	35.3	34.0		

Table 13. Percent moisture content of the ear for the check and standard variety during 1948.

Plowings	S				U				F				Sum
Rates	3	2	3	2	2	3	2	3	2	3	2	3	
	36.2	28.4	36.1	38.0	36.1	32.0	29.1	31.4	28.3	35.2	33.7	31.6	396.1
	36.6	29.8	36.1	34.2	35.1	35.2	37.8	30.0	30.0	33.6	33.7	35.7	407.8
	35.7	34.7	34.7	36.6	33.5	35.5	37.6	31.9	36.9	35.3	35.7	35.7	423.8
	35.7	29.8	37.5	33.6	35.1	32.0	36.3	33.5	33.0	34.7	35.7	36.1	413.0
	35.5	28.9	37.6	36.5	36.4	36.9	35.7	36.2	30.5	29.7	34.2	36.9	415.0
	37.5	33.6	36.0	33.6	33.5	33.9	36.0	31.9	33.5	34.7	31.3	32.5	408.0
	38.4	35.3	37.1	33.9	31.4	32.7	33.2	36.8	36.0	30.9	32.0	31.2	408.9
	36.1	35.7	32.0	36.3	33.2	34.2	35.7	37.6	37.0	33.0	31.8	31.9	414.5
	32.7	30.9	34.2	37.8	35.3	30.0	32.8	32.6	35.7	35.3	35.7	34.2	407.2
	35.7	32.3	39.6	34.1	32.9	33.7	36.7	35.1	36.0	34.2	32.8	32.4	415.5
	33.0	30.7	34.3	35.2	36.3	31.6	34.1	30.6	36.7	30.5	34.7	31.6	399.3
	35.1	31.6	35.1	37.9	38.3	34.7	34.7	37.5	40.5	27.8	34.7	30.6	418.5
	38.0	33.2	37.9	38.8	37.6	33.7	33.6	30.8	31.4	30.2	34.2	32.4	411.8
	36.1	36.3	34.7	39.9	32.6	32.9	39.6	40.5	34.3	26.9	34.2	27.8	415.8
	34.2	38.3	36.8	35.1	38.3	36.3	35.7	36.9	34.7	33.4	30.2	30.9	420.8
	36.3	35.2	37.1	30.7	33.8	33.8	34.7	29.2	34.1	34.1	34.2	34.1	407.3
	35.7	36.3	31.7	31.8	32.4	32.9	39.9	36.3	34.7	35.7	38.0	34.7	420.1
	38.0	33.4	35.7	28.9	37.2	33.8	35.7	34.2	32.7	29.4	32.2	32.4	404.6
	37.0	36.0	38.0	37.7	36.7	36.4	32.7	36.8	33.2	30.7	38.8	32.5	426.5
	683.5	630.4	682.2	670.6	665.7	642.2	671.6	649.8	649.2	615.3	648.8	625.2	7834.5

	S	U	F	Sum	Ave.
Ra 3	1365.7	1292.0	1240.5	3898.2	34.2
Ra 2	1301.0	1337.3	1298.0	3936.3	34.5
Sum	2666.7	2629.3	2538.5	7834.5	
Ave.	35.1	34.6	33.4		

Table 14. Table showing moisture analysis of the check and standard variety for the individual and combined years 1947 and 1948.

1947				
Source	D.F.	S.S.	M.S.	F.
Total	94	568.6		
Rows	7	34.6	5.0	—
L	2	30.4	15.2	—
Re	1	7.5	7.5	—
Error - 1	2	31.0	15.5	1.1
Ra	1	10.7	10.7	—
L x Ra	2	11.2	5.6	—
Error - 2	3	44.5	14.8	2.8*
Error - 3	76	398.5	5.24	
Missing plot	1			

1948				
Source	D.F.	S.S.	M.S.	F.
Total	227	1594.2		
Rows	18	94.4	5.2	—
L	2	114.4	57.2	17.1
Re	1	16.8	16.8	5.0
Error - 1	2	6.7	3.3	—
Ra	1	6.4	6.4	—
L x Ra	2	119.2	59.6	7.4
Error - 2	3	24.1	8.0	1.3
Error - 3	198	1212.3	6.1	

Both years				
Source	D.F.	S.S.	M.S.	F.
Total	322	2176.6		
Rows	25	129.0	5.2	—
Year	1	13.8	13.8	16.0
Plowing	2	143.1	71.5	83.2*
Error - 1	2	1.7	0.9	—
Re	2[a]	24.4	12.2	1.1
P x Re	4[a]	37.7	9.4	—
Ra	1	0.1	0.1	—
P x Ra	2	61.2	30.6	—
Y x Ra	1	17.0	17.0	
Error - 2	2	69.2	34.6	
Error - 3	6	68.6	11.5	
Error - 4	274	1610.8	5.9	
Missing plot	1			

* 5 percent level of significance
L locations
Re replication of rates within locations
Ra rates of planting

For definition of error terms, see table 5.

For definition or error terms, see table 5.

a additive
Error - 1 is Y x P and is used to test years and plowings
Error - 2 is Y x P x Ra. It is used to test rates, P x Ra and Y x Ra.
Error - 3 is obtained by adding Error - 2 of 1947 to Error - 2 of 1948. It is used to test the mean square of Re and P x Re.
Error - 4 is obtained by adding Error - 3 of 1947 to Error - 3 of 1948. It is used to test rows.

Table 15. Table showing the effect of times of plowing and rate of planting on the ear moisture content of the check and standard variety for the combined years of 1947 and 1948. The figures are the average results for the 2 years.

	1947	1948	Ave.
Ra 3	35.1	34.2	34.6
Ra 2	34.5	34.5	34.5
Ave.	34.8	34.3	
U	35.1	34.6	34.8
S	35.3	35.1	35.2
F	34.0	33.4	33.7
Ave.	34.8	34.4	

Table 16. The percent ear moisture content for 1947 is given in varietal order arrangement for each square. A partial analysis of variance for each square is also given.

Plowing	U		S		F		Sum	Analysis of variance		
Rate	3	2	3	2	3	2				
			Square 74300					Source	D.F.	S.S.
	37.4	34.7	34.7	34.7	37.2	30.7	209.4	Total	35	216.4
	34.7	32.6	33.7	34.2	32.0	29.3	196.5	Var.	5	87.4
	37.6	36.3	32.5	34.2	35.7	35.2	211.5	Ra	1	19.2
	36.4	33.9	30.7	35.9	35.6	35.1	207.6	L	2	3.3
	31.8	27.7	32.8	31.8	35.7	29.0	188.8	L x Ra	2	29.8
	32.1	31.0	31.8	31.8	32.4	30.4	189.5	V x Ra	5	23.6
	210.0	196.2	196.2	202.6	208.6	189.7	1203.3	Error	20	53.0
			Square 74310							
	37.0	33.4	35.2	32.9	35.5	30.6	204.6	Total	35	449.2
	37.4	36.5	35.6	32.8	37.8	34.7	314.8	Var.	5	295.6
	35.7	36.7	36.1	37.0	36.4	35.1	217.0	Ra	1	23.4
	25.3	29.4	30.4	29.4	28.8	30.8	174.1	L	2	10.3
	35.5	26.5	30.4	28.8	29.8	30.2	181.2	L x Ra	2	1.0
	40.7	36.8	37.1	34.7	33.2	32.6	215.1	V x Ra	5	33.5
	211.6	199.3	204.8	195.6	201.5	194.0	1206.8	Error	20	85.4
			Square 74320							
	39.0	30.4	38.2	37.6	35.6	33.4	214.2	Total	34	584.7
	39.5	38.0	39.8	39.5	40.9	40.9	238.6	Var.	5	433.6
	37.9	38.3	40.3	38.2	42.1	41.7	238.5	Ra	1	15.3
	34.7	34.7	39.5	36.9	33.7	37.5	217.0	L	2	28.9
	(40.9)	42.0	44.8	42.7	41.7	36.3	248.4	L x Ra	2	0.7
	45.6	44.0	46.4	47.4	47.8	45.4	276.6	V x Ra	5	16.2
	237.6	227.4	249.0	242.3	241.8	235.2	1433.3	Error	19	90.0
			Square 74330							
	38.0	37.2	37.8	34.2	34.2	32.9	214.3	Total	35	288.3
	40.9	36.9	42.4	42.2	39.8	37.7	239.9	Var.	5	73.6
	37.5	37.2	43.0	37.5	39.1	33.8	228.1	Ra	1	24.0
	40.9	39.4	35.8	43.0	39.1	36.5	234.7	L	2	49.4
	34.2	36.8	38.2	36.1	36.3	38.1	219.7	L x Ra	2	3.0
	39.6	32.6	41.8	40.9	37.6	33.8	226.3	V x Ra	5	33.9
	231.1	220.1	239.0	233.9	226.1	212.8	1363.0	Error	20	104.4

Table 16. Continued

Plowings	U		S		F		Sum	Analysis of variance		
Rates	3	2	3	2	3	2				
			Square 74370					Source	D.F.	S.S.
	36.9	34.7	35.6	37.2	32.0	38.0	214.4	Total	35	191.5
	37.3	36.0	40.9	34.7	37.3	33.8	220.0	Var.	5	56.2
	35.1	32.5	34.2	35.9	32.1	37.1	206.9	Ra	1	0.0
	33.8	38.0	32.9	35.9	32.6	32.7	205.9	L	2	1.0
	32.5	34.7	32.6	28.0	33.9	34.3	196.0	L x Ra	2	4.6
	34.2	34.7	35.7	34.7	37.4	34.3	211.0	V x Ra	5	39.5
	209.8	210.6	211.9	206.4	205.3	210.2	1254.2	Error	20	90.2
			Square 74380							
	34.2	35.5	34.1	35.1	(34.5)	34.3	207.7	Total	34	994.1
	37.1	35.8	40.0	36.1	41.2	43.0	233.2	Var.	5	866.0
	25.1	23.4	22.2	24.5	25.8	22.9	143.9	Ra	1	4.8
	36.7	35.0	37.4	39.3	33.3	36.0	217.7	L	2	7.0
	31.5	25.2	28.8	28.1	33.9	30.0	177.5	L x Ra	2	2.2
	34.7	35.9	36.8	33.7	33.9	34.3	209.3	V x Ra	5	20.4
	199.3	190.8	199.3	196.8	202.6	200.5	1189.3	Error	19	93.8
			Square 74390							
	31.4	34.2	33.7	31.4	36.1	36.4	203.2	Total	35	423.5
	34.2	32.6	35.1	32.6	35.6	32.1	202.2	Var.	5	272.7
	38.6	39.3	36.4	36.4	37.3	35.1	223.1	Ra	1	4.4
	30.6	31.8	32.4	30.7	32.3	27.7	185.5	L	2	9.7
	36.4	35.2	38.6	37.1	34.7	44.2	226.2	L x Ra	2	9.3
	31.4	30.8	30.6	25.9	32.6	31.9	183.2	V x Ra	5	23.7
	202.6	203.9	206.8	194.1	208.6	207.4	1223.4	Error	20	103.6
			Square 743100							
	31.8	36.1	35.6	31.4	35.7	33.2	203.8	Total	35	208.5
	34.2	37.7	35.5	33.8	36.2	32.7	210.1	Var.	5	49.2
	32.4	35.1	31.7	31.0	31.1	31.8	193.1	Ra	1	6.2
	34.7	37.3	34.3	30.2	34.3	33.9	204.7	L	2	41.6
	35.6	36.9	31.7	32.9	36.0	34.7	207.8	L x Ra	2	21.3
	42.3	35.1	37.9	32.3	34.3	34.2	216.1	V x Ra	5	25.0
	211.0	218.2	206.7	191.6	207.6	200.5	1235.6	Error	20	65.3

The figure (40.9) of square 74320 and (34.5) of square 74380 are calculated values.

	U	S	F	Sum	Ave.
Ra 3	1713.0	1713.7	1702.1	5128.8	35.6
Ra 2	1666.5	1663.3	1650.3	4980.1	34.6
Sum	3379.5	3377.0	3352.4	10108.9	
Ave.	35.5	35.2	34.9		

Table 17. The percent ear moisture content for 1948 is given in varietal order arrangement for each square. A partial analysis of variance for each square is also given.

Plowings	S		U		F		Sum	Analysis of variance
Rates	3	2	2	3	2	3		

The following 9 squares are all double crosses.

Square 84300

							Source	D.F.	S.S.
36.6	29.8	35.1	35.2	30.0	33.6	200.3	Total	35	253.6
32.3	30.2	33.8	30.4	36.4	29.5	192.6	Var.	5	33.1
34.2	30.4	28.2	30.4	30.4	32.1	185.7	Ra	1	7.0
34.7	31.7	31.3	32.1	30.5	28.9	189.2	L	2	37.6
32.7	28.2	36.0	30.8	28.1	26.2	182.0	L x Ra	2	43.6
34.7	31.0	32.7	35.6	29.0	28.7	191.7	V x Ra	5	41.0
205.2	181.3	197.1	194.5	184.4	179.0	1141.5	Error	20	91.3

Square 84310

35.7	29.8	35.1	32.0	33.0	34.7	200.3	Total	35	208.0
33.2	31.7	31.1	34.7	28.0	30.8	189.5	Var.	5	27.8
36.8	30.4	35.8	35.0	34.2	33.6	205.8	Ra	1	21.5
33.0	29.0	34.2	33.2	35.2	34.0	198.6	L	2	8.6
38.9	32.6	34.3	33.5	33.4	31.1	203.8	L x Ra	2	48.5
36.3	32.9	34.7	30.5	28.0	34.2	196.6	V x Ra	5	3.6
213.9	186.4	205.2	198.9	191.8	198.4	1194.6	Error	20	98.0

Square 84320

37.5	33.6	33.5	33.9	33.5	34.7	206.7	Total	35	259.5
32.8	30.0	30.8	28.0	30.2	28.4	180.2	Var.	5	172.9
32.6	30.7	32.6	34.3	35.2	34.2	199.6	Ra	1	6.1
38.3	35.2	36.6	36.4	37.0	36.8	220.3	L	2	1.0
34.7	32.4	34.2	32.6	35.7	35.7	205.3	L x Ra	2	30.7
40.3	33.7	37.4	36.9	35.1	34.1	217.5	V x Ra	5	6.2
216.2	195.6	205.1	202.1	206.7	203.9	1229.6	Error	20	42.6

Square 84330

36.1	35.7	33.2	34.2	37.0	33.0	209.2	Total	35	320.8
35.1	31.1	26.5	32.3	30.8	29.7	185.5	Var.	5	156.1
40.7	37.9	38.5	37.9	35.4	35.7	226.1	Ra	1	14.6
39.8	36.7	31.4	31.1	35.2	37.3	211.5	L	2	56.9
40.7	35.5	33.6	36.4	35.1	36.9	218.2	L x Ra	2	12.6
36.7	35.5	36.1	34.2	35.1	35.4	213.0	V x Ra	5	20.2
229.1	212.4	199.3	206.1	208.6	208.0	1263.5	Error	20	60.4

Square 84340

35.7	32.3	32.9	33.7	36.0	34.2	204.8	Total	35	118.2
35.7	36.2	35.2	36.1	35.5	33.4	212.1	Var.	5	21.8
38.8	37.2	34.7	35.1	35.7	36.2	217.7	Ra	1	3.0
37.2	34.7	33.4	30.2	34.1	34.7	204.3	L	2	32.8
38.0	35.1	32.9	35.6	32.9	32.1	206.6	L x Ra	2	7.0
36.0	35.8	31.7	33.2	35.7	36.4	208.8	V x Ra	5	4.3
221.4	211.3	200.8	203.9	209.9	207.0	1254.3	Error	20	49.2

Table 17. Continued

Plowings	S		U		F		Sum	Analysis of variance		
Rates	3	2	2	3	2	3				
				Square 84350				Source	D.F.	S.S.
	35.1	31.6	38.3	34.7	40.5	27.8	208.0	Total	35	603.3
	31.1	28.9	36.4	28.9	30.0	31.2	186.5	Var.	5	282.9
	38.1	32.5	39.2	39.6	39.6	34.7	223.7	Ra	1	5.7
	40.9	37.4	38.1	39.5	40.2	36.2	232.3	L	2	25.8
	39.8	32.5	38.8	37.4	36.7	33.2	218.4	L x Ra	2	161.7
	42.0	36.1	38.1	40.5	45.3	35.2	237.2	V x Ra	5	26.3
	227.0	199.0	228.9	220.6	232.3	198.3	1306.1	Error	20	100.8
				Square 84360						
	36.1	36.3	32.6	32.9	34.3	26.9	199.1	Total	35	765.6
	38.9	35.0	35.5	35.5	35.7	32.5	213.1	Var.	5	545.6
	31.3	29.8	28.5	28.7	27.9	23.1	169.3	Ra	1	6.2
	38.4	34.3	35.5	33.9	35.7	31.5	209.3	L	2	35.3
	40.3	35.5	37.1	39.2	41.7	33.0	226.8	L x Ra	2	105.2
	28.0	23.8	28.4	25.8	29.8	26.5	162.3	V x Ra	5	5.9
	213.0	194.7	197.6	196.0	205.1	173.5	1179.9	Error	20	67.4
				Square 84370						
	36.3	35.2	33.8	33.8	34.1	34.1	207.3	Total	35	239.0
	36.3	36.1	36.1	39.9	36.0	36.1	220.5	Var.	5	162.2
	36.2	36.7	36.1	41.6	36.4	35.5	222.5	Ra	1	3.4
	36.4	35.5	36.8	35.5	35.1	35.7	215.0	L	2	10.8
	36.9	33.5	35.1	34.2	34.3	32.6	206.6	L x Ra	2	5.9
	33.2	33.2	28.1	29.8	30.4	29.5	184.2	V x Ra	5	2.6
	215.3	210.2	206.0	214.8	206.3	203.5	1256.1	Error	20	54.0
				Square 84380						
	39.0	33.4	37.2	33.8	32.7	29.4	204.5	Total	35	294.5
	33.9	30.4	32.1	33.9	32.2	32.4	194.9	Var.	5	118.9
	30.2	31.3	31.4	29.6	32.9	29.8	185.2	Ra	1	8.2
	35.5	34.7	33.9	35.8	35.1	35.3	210.3	L	2	22.5
	31.4	30.0	32.7	29.8	28.0	26.0	177.9	L x Ra	2	26.1
	29.4	30.4	38.2	33.2	36.3	28.3	195.8	V x Ra	5	39.7
	198.4	190.2	205.5	196.1	197.2	181.2	1168.6	Error	20	79.1

Table 17. Continued

Plowings	S		U		F		Sum
Rates	3	2	2	3	2	3	

The following 9 squares are single crosses.

Square 83410

36.1	34.2	37.8	30.0	33.7	35.7	207.5
35.8	33.2	33.7	33.4	31.5	33.2	200.8
36.5	34.7	37.9	34.7	35.6	37.7	217.1
38.2	38.6	38.4	34.7	38.2	40.2	228.3
34.0	30.0	32.1	31.4	34.7	36.2	198.4
31.1	30.5	30.0	25.4	27.2	30.9	175.1
211.7	201.2	209.9	189.6	200.9	213.9	1227.2

Source	D.F.	S.S.
Total	35	400.4
Var.	5	274.9
Ra	1	0.3
L	2	11.6
L x Ra	2	57.3
V x Ra	5	9.6
Error	20	46.7

Square 83420

37.5	33.6	36.3	33.5	35.7	36.1	212.7
30.5	34.2	32.6	34.2	35.6	34.7	201.8
29.4	37.0	38.4	33.6	37.5	37.4	223.3
33.6	30.2	28.8	28.6	30.4	29.6	181.2
35.7	33.8	39.3	36.5	37.6	37.3	220.2
38.2	36.9	38.5	36.8	34.2	37.6	222.2
214.9	205.7	213.9	203.2	211.0	212.7	1261.4

Source	D.F.	S.S.
Total	35	316.6
Var.	5	222.2
Ra	1	0.0
L	2	1.8
L x Ra	2	16.8
V x Ra	5	5.6
Error	20	70.1

Square 83430

36.0	33.6	36.0	31.9	31.3	32.5	201.3
36.1	33.7	34.7	33.6	32.9	34.7	205.7
30.6	29.1	30.8	29.6	31.1	27.4	178.6
34.7	35.7	37.5	34.7	31.9	34.7	209.2
38.8	34.2	32.6	34.2	34.7	34.7	209.2
31.8	33.2	32.6	32.4	32.7	35.1	197.8
208.0	199.5	204.2	196.4	194.6	199.1	1201.8

Source	D.F.	S.S.
Total	35	192.4
Var.	5	111.0
Ra	1	0.8
L	2	7.9
L x Ra	2	12.0
V x Ra	5	9.5
Error	20	51.2

Square 83440

32.0	36.3	35.7	37.6	31.8	31.9	205.3
40.1	40.1	38.2	37.5	35.1	38.6	229.6
32.6	33.3	30.6	28.7	29.0	29.1	183.3
38.9	37.3	37.8	38.3	36.6	35.9	224.8
38.9	38.2	36.0	35.7	35.5	36.7	221.0
33.7	36.9	33.4	33.7	32.5	31.1	201.3
216.2	222.1	211.7	211.5	200.5	203.3	1265.3

Source	D.F.	S.S.
Total	35	360.7
Var.	5	255.0
Ra	1	0.3
L	2	49.8
L x Ra	2	3.3
V x Ra	5	6.8
Error	20	45.5

Square 83450

39.6	34.1	36.7	35.1	32.8	32.4	210.7
32.9	34.2	32.8	34.7	30.2	28.6	193.4
38.2	38.6	36.7	36.4	34.7	34.1	218.7
32.4	31.3	27.5	30.5	28.3	25.0	175.0
38.0	38.8	40.3	36.3	38.6	34.7	226.7
37.7	38.0	38.4	37.8	36.0	35.2	223.1
218.8	215.0	212.4	210.8	200.6	190.0	1247.6

Source	D.F.	S.S.
Total	35	480.0
Var.	5	333.6
Ra	1	2.0
L	2	84.5
L x Ra	2	8.8
V x Ra	5	13.7
Error	20	37.4

Table 17. Continued

Plowings	S		U		F		Sum	Analysis of variance		
Rates	3	2	2	3	2	3				
				Square 83460				Source	D.F.	S.S.
	35.1	37.9	34.7	37.5	34.7	30.6	210.5	Total	35	391.5
	38.0	38.8	37.1	37.9	36.1	33.6	221.5	Var.	5	176.2
	39.8	37.6	36.0	37.2	33.1	35.1	218.8	Ra	1	9.9
	36.9	39.1	37.4	35.8	33.0	32.0	214.2	L	2	138.7
	38.8	37.4	40.6	34.1	33.8	33.5	218.2	L x Ra	2	3.0
	32.0	31.7	34.2	30.9	29.0	24.5	182.3	V x Ra	5	16.9
	220.6	222.5	220.0	213.4	199.7	189.3	1265.5	Error	20	46.9
				Square 83470						
	34.7	39.9	39.6	40.5	34.2	27.8	216.7	Total	35	342.0
	36.4	33.6	38.8	33.2	34.2	34.1	210.3	Var.	5	132.2
	34.7	36.2	37.2	32.9	34.7	34.2	209.9	Ra	1	9.4
	40.1	38.9	40.1	37.4	39.1	38.4	234.0	L	2	72.6
	33.0	31.1	36.0	35.2	30.2	30.5	196.0	L x Ra	2	4.0
	36.5	36.4	37.6	39.8	34.7	34.7	219.7	V x Ra	5	19.7
	215.4	216.1	229.3	219.0	207.1	199.7	1286.6	Error	20	104.0
				Square 83480						
	37.1	30.7	34.7	29.2	34.2	34.1	200.0	Total	35	378.0
	36.3	36.4	38.8	34.7	39.1	32.3	217.6	Var.	5	236.2
	38.2	37.0	40.3	38.4	36.4	36.5	226.8	Ra	1	14.7
	33.4	33.7	32.1	29.1	30.9	27.8	186.3	L	2	7.6
	37.3	38.4	39.3	36.6	35.7	37.5	224.8	L x Ra	2	37.8
	37.6	35.6	41.2	36.5	38.8	37.0	226.7	V x Ra	5	15.1
	219.9	211.8	226.4	204.5	214.4	205.2	1282.2	Error	20	66.5
				Square 83490						
	35.7	28.9	35.7	34.2	33.2	32.4	200.1	Total	35	142.7
	38.6	37.0	37.3	36.9	36.5	34.1	220.4	Var.	5	81.0
	35.5	34.7	35.3	33.1	34.3	34.2	207.1	Ra	1	1.4
	38.0	37.5	36.6	36.9	37.9	37.0	223.9	L	2	4.8
	36.7	35.6	35.7	37.6	36.1	36.7	218.4	L x Ra	2	16.2
	38.0	35.2	38.6	38.8	37.4	36.2	224.2	V x Ra	5	5.3
	222.5	208.9	219.2	217.5	215.4	210.6	1294.1	Error	20	34.0

	S	U	F	Sum	Ave.
Ra 3	3887.5	3698.9	3576.6	11163.0	34.4
Ra 2	3683.9	3792.5	3686.5	11162.9	34.4
Sum	7571.4	7491.4	7263.1	22325.9	
Ave.	35.0	34.7	33.6		

Table 18. Table showing moisture analysis of all squares for the individual and combined years of 1947 and 1948.

1947					1948					Both years				
Source	D.F.	S.S.	M. S.	F.	Source	D.F.	S.S.	M.S.	F.	Source	D.F.	S.S.	M.S.	F.
Total	287	4843.6			Total	647	7074.2			Total	935	12001.2		
Squares	7	1487.5	212.5	20.3**	Squares					Squares	24	2495.1	104.0	13.0**
					Dx : Sx	1	175.8	175.8	16.0**					
					B. Dx	8	636.4	79.6	7.2*					
					B. Sx	8	195.4	24.4	2.2					
Var.	40	2134.3	53.4	12.3**	Var.	90	3343.7	37.2	11.7**	Var.	130	5478.0	42.1	11.9**
										Year	1	83.4	83.4	3.5
L	2	4.7	2.3	29.3*	L	2	237.0	118.5	---	Plowing	2	194.5	97.2	4.1
										Error - 1	2	47.2	23.6	---
Ra	1	76.8	76.8	959.8**	Ra	1	0.0	0.0	---	Ra	1	23.6	23.6	---
Error - 1	2	0.2	0.1	---	Error - 1	2	288.4	144.2	45.3**	P x Ra	2	201.1	100.5	2.3
										Y x Ra	1	53.1	53.1	1.2
										Error - 2	2	87.5	43.7	12.4**
Sq x Ra	7	20.6	2.9	---	Sq x Ra	17	114.3	6.7	---	Sq x Ra	24	134.9	5.6	
Error - 2	14	146.5	10.5	2.0	Error - 2	34	373.8	11.0	1.2	Sq x P	48	520.4	10.8	
Error - 3	14	71.6	5.1	---	Error - 3	34	312.1	9.2		Error - 3	48	383.7	8.0	
V x Ra	40	215.7	5.4	1.2	V x Ra	90	252.0	2.8	---	V x Ra	130	467.7	3.6	1.0
Error - 4	158	685.8	4.3		Error - 4	360	1145.3	3.2		Error - 4	518	1831.1	3.5	
Missing plots	2									Missing plots	2			

For definition of error terms, see table 8.

For definition of error terms, see table 8.

Error - 1 is Y x P. It is used to test years and plowings.

Error - 2 is Y x P x Ra and is used to test rates, P x Ra and Y x Ra.

Error - 3 is Sq x P x Ra and is obtained by adding Error - 3 of 1947 to Error - 3 of 1948 and is used to test squares Sq x Ra and Sq x P.

Error - 4 is remainder and is used to test varieties and V x Ra.

Table 19. Table showing the effect of times of plowing and rate of planting on the ear moisture content of all squares for the combined years of 1947 and 1948. The figures are the average results for the two years.

	1947	1948	Ave.
Ra 3	35.6	34.4	35.0
Ra 2	34.6	34.4	34.5
Ave.	35.1	34.4	
U	35.2	34.7	34.9
S	35.2	35.0	35.1
F	34.9	33.6	34.2
Ave.	35.1	34.4	

Table 20. The percent ear moisture content during 1947 and 1948 for the 16 common varieties.

Plowings			U		S		F		Sum
Rates			3	2	3	2	3	2	
Year	Variety	Plot No.							
1947	Mic 24B	74304	36.4	33.9	30.7	35.9	35.6	35.1	207.6
48	"	84336	34.2	36.1	36.7	35.5	35.4	35.1	213.0
1947	Mic 36B	74305	31.8	27.7	32.8	31.8	35.7	29.0	188.8
48	"	84303	30.4	28.2	34.2	30.4	32.1	30.4	185.7
1947	Mic 20D	74312	37.4	36.5	35.6	32.8	37.8	34.7	214.8
48	"	84342	36.1	35.2	35.7	36.2	33.4	35.5	212.1
1947	Mic 29D	74313	35.7	36.7	36.1	37.0	36.4	35.1	217.0
48	"	84354	39.5	38.1	40.9	37.4	36.2	40.2	232.3
1947	Wis 416A	74315	35.5	26.5	30.4	28.8	29.8	30.2	181.2
48	"	84386	33.2	38.2	29.4	30.4	28.3	36.3	195.8
1947	PAG 274	74372	37.3	36.0	40.9	34.7	37.3	33.8	220.0
48	"	84335	36.4	33.6	40.7	35.5	36.9	35.1	218.2
1947	Pio 373	74373	35.1	32.5	34.2	35.9	32.1	37.1	206.9
48	"	84313	35.0	35.8	36.8	30.4	33.6	34.2	205.8
1947	Pio 342	74374	33.8	38.0	32.9	35.9	32.6	32.7	205.9
48	"	84345	35.6	32.9	38.0	35.1	32.1	32.9	206.6
1947	F.Br G12	74376	34.2	34.7	35.7	34.7	37.4	34.3	211.0
48	"	84326	36.9	37.4	40.3	33.7	34.1	35.1	217.5
1947	Ki KR2	74384	36.7	35.0	37.4	39.3	33.3	36.0	217.7
48	"	84352	35.5	35.5	38.9	35.0	32.5	35.7	213.1
1947	Ki D4	74385	31.5	25.2	28.8	28.1	33.9	30.0	177.5
48	"	84322	28.0	30.8	32.8	30.0	28.4	30.2	180.2
1947	Pio 349	74386	34.7	35.9	36.8	33.7	33.9	34.3	209.3
48	"	84333	37.9	38.5	40.7	37.9	35.7	35.4	226.1
1947	Dek 404A	74393	38.6	39.3	36.4	36.4	37.3	35.1	223.1
48	"	84343	35.1	34.7	38.8	37.2	36.2	35.7	217.7
1947	Ki KS6	74394	30.6	31.8	32.4	30.7	32.3	27.7	185.5
48	"	84302	30.4	33.8	32.3	30.2	29.5	36.4	192.6
1947	NWO N6	74395	36.4	35.2	38.6	37.1	34.7	44.2	226.2
48	"	84355	37.4	38.8	39.8	32.5	33.2	36.7	218.4
1947	PAG 56	743103	32.4	35.1	31.7	31.0	31.1	31.8	193.1
48	"	84314	33.2	34.2	33.0	29.0	34.0	35.2	198.6

Table 20. Continued

1947

P	U	S	F	Sum	Ave.
Ra 3	558.1	551.4	551.2	1660.7	34.6
Ra 2	540.0	543.8	541.1	1624.9	33.9
Sum	1098.1	1095.2	1092.3	3285.6	
Ave.	34.3	34.2	34.1		

1948

P	U	S	F	Sum	Ave.
Ra 3	554.8	589.0	531.6	1675.4	34.9
Ra 2	561.8	536.4	560.1	1658.3	34.5
Sum	1116.6	1125.4	1091.7	3333.7	
Ave.	34.9	35.2	34.1		

Table 21. Varietal response to different rates of planting. This 3-way table is taken from the moisture data of the 16 common varieties in 1947 and 1948.

	1947			1948		
Rate	3	2	Sum	3	2	Sum
Variety						
Mic 24B	102.7	104.9	207.6	106.3	106.7	213.0
Mic 36B	100.3	88.5	188.8	96.7	89.0	185.7
Mic 20D	110.8	104.0	214.8	105.2	106.9	212.1
Mic 290	108.2	108.8	217.0	116.6	115.7	232.3
Wis 416A	95.7	85.5	181.2	90.9	104.9	195.8
PAG 274	115.5	104.5	220.0	114.0	104.2	218.2
Pio 373	101.4	105.5	206.9	105.4	100.4	205.8
Pio 342	99.3	106.6	205.9	105.7	100.9	206.6
F.Br G12	107.3	103.7	211.0	111.3	106.2	217.5
Ki KR2	107.4	110.3	217.7	106.9	106.2	213.1
Ki D4	94.2	83.3	177.5	89.2	91.0	180.2
Pio 349	105.4	103.9	209.3	114.3	111.8	226.1
Dek 404A	112.3	110.8	223.1	110.1	107.6	217.7
Ki KS6	95.3	90.2	185.5	92.2	100.4	192.6
NWO N6	109.7	116.5	226.2	110.4	108.0	218.4
PAG 56	95.2	97.9	193.1	100.2	98.4	198.6
Sum	1660.7	1624.9	3285.6	1675.4	1658.3	3333.7

Each figure in the rate column constitutes the sum of 3 replications.

Table 22. Table showing moisture analysis of 16 common varieties for the individual and combined years of 1947 and 1948.

1947				
Source	D.F.	S.S.	M.S.	F.
Total	95	975.3		
L	2	0.5	0.3	—
Ra	1	13.4	13.4	14.2
Error - 1	2	1.9	0.9	—
Var.	15	595.7	39.7	9.2**
Ra x V	15	105.0	7.0	1.6
Error - 2	60	258.9	4.3	

For definition of error terms, see table 11.

1948				
Source	D.F.	S.S.	M.S.	F.
Total	95	923.4		
L	2	19.1	9.6	—
Ra	1	3.0	3.0	—
Error - 1	2	110.3	55.2	17.9**
Var.	15	522.0	348.0	11.3**
Ra x V	15	83.9	5.6	1.8
Error - 2	60	185.1	3.1	

For definition of error terms, see table 11.

Both years				
Source	D.F.	S.S.	M.S.	F.
Total	191	1910.8		
Year	1	12.0	12.0	3.2
Plowing	2	12.1	6.0	1.6
Error - 1	2	7.6	3.8	—
Ra	1	14.6	14.6	—
P x Ra	2	49.3	24.6	—
Y x Ra	1	1.8	1.8	—
Error - 2	2	62.9	31.5	
Var.	15	1044.5	69.6	12.0**
Y x V	15	73.1	4.9	—
Ra x V	15	76.5	5.1	—
Error - 3	15	112.4	7.5	2.0*
Error - 4	120	444.0	3.7	

Error - 1 is Y x P and is used to test years and plowings.
Error - 2 is Y x P x Ra and is used to test rates, P x Ra and Y x Ra.
Error - 3 is Y x Ra x V and is used to test varieties Y x V and Ra x V.
Error - 4 is remainder and may be used to test error terms.