June 17, 1947

To the Committee on Graduate Study:

I am submitting to you a thesis written by Webster Pendergrass entitled "Response of Corn and Cotton to Phosphate and Potash Fertilization in Henry County, Tennessee." I recommend that it be accepted for nine quarter hours credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agronomy.

Eric Winters
Major Professor

We have read this thesis
and recommend its acceptance:

Lawrence N Skold

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Accepted for the Committee

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Dean of the Graduate School

RESPONSE OF CORN AND COTTON TO PHOSPHATE AND POTASH FERTILIZATION IN HENRY COUNTY, TENNESSEE

A THESIS

Submitted to
The Committee on Graduate Study
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

---

by

Webster Pendergrass

August 1947

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The writer wishes to express his gratitude to: Doctor Eric Winters for directing the study, Mr. Lester Odom for help in identifying soils and the farmers of Henry County who contributed their time and facilities.

Webster Pendergrass

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CHAPTER I

INTRODUCTION

The Problem

Soils of Henry County Tennessee present a wide range in fertility levels. Soils of the eastern half of the county, which are developed from coastal plains sediments, occur on rough topography and are rather low in fertility. Soils of the Western half are of loessial origin, smoother in topography and higher in fertility. Farmers have never practiced the use of phosphate or potash fertilizers on corn in either section of the county, but for many years have used small amounts of phosphate, and in some instances potash, on cotton at time of planting. The materials were used without regard to the needs of the plant or the possible deficiencies of the soil.

With an increasing interest in the use of soil amendments in crop production, there is a need for simple and practical methods of determining nutrient levels of soils. The following study was designed first to determine the effects of additions of phosphate and potash on the yield of two important crops. Second to compare the results of soil tests on samples from these plots with the

observed yield increases. In this way the degree of correlation between nutrient levels as measured by soil tests and response to fertilizer could be determined.

Review of Related Studies

Davidson (3) indicated a 14 per cent increase in corn yield from an application of 25 pounds of potash per acre on Hagerstown and Hartsells soils where the surface soil contained 190 pounds and the subsoil 100 pounds or less of exchangeable potassium per acre. With cotton Davidson reported increased yields on Loring silt loam from applications of 25 pounds of potash when the surface soil contained 190 pounds of exchangeable potassium and 160 pounds in the subsoil. On Cumberland silt loam where the surface soil contained 320 pounds of exchangeable potassium and 190 pounds in the subsoil no response was obtained from potash fertilization on cotton.

Evans (4) found no increase in corn yields with potash fertilization. However, he attributes this lack of response in part to adverse weather conditions. He found that cotton gave a 21 per cent increase in yield for a 75 pound application of potash on Hagerstown soil containing 120 pounds of exchangeable potassium per acre in the topsoil and 80 pounds in the subsoil. No response was obtained on the same soil series where the

exchangeable potassium was 210 pounds per acre in the topsoil and 130 pounds in the subsoil.

Ewing (5) found the approximate level at which potash fertilization ceased to give significant yield increases to be 140 pounds per acre for corn. He also found that the test for available phosphorus could serve as a basis for recommending phosphate fertilization for corn, providing other factors were properly evaluated.

CHAPTER II

PROCEDURE AND METHODS

General Plan

The procedure and methods followed in this study were similar to those described by Davidson (3), Evans (4), and Ewing (5), and will require only brief consideration.

Two crops, corn and cotton, grown under normal farm conditions on four selected soil types were used in this study. Soil types used extensively in the production of these crops were chosen. An effort was made to select areas that were uniform in order to obtain more reliable yield data.

Plot Areas

The plot size used was 1/100 of an acre. Plots of corn were four rows wide with an average spacing between rows of 3 feet 6 inches and an average length of 31 feet 2 inches. Plots of cotton, with one exception, were four rows wide with an average spacing of 3 feet 2 inches and an average length of 34 feet 5 inches. One cotton ex-

periment consisted of plots five rows wide with an average spacing of 3 feet 2 inches and an average length of 27 feet 7 inches. The systematized plot arrangement of each experiment is shown in Figure 1.

Three rates of phosphate fertilization and three rates of potash fertilization were used and each was replicated three times.

Planting and Culture

The experimental plot areas were planted by the farmer at the same time and cultivated in the same manner as the remainder of the field. In those fields where corn was interplanted with soybeans the beans were removed immediately after emergence.

Varieties

Jarvis Golden Prolific was the variety used in five of the experiments with corn. A white corn of unknown variety was used in the other experiment. Delta and Pine Land cotton was the variety used in three of the experiments and Stoneville 2B was used in the fourth.

PLOT DIAGRAM

I 1	II 2	III 3	IV 4	V 5
VI 4	VII 5	VIII 1	IX 2	X 3
XI 2	XII 3	XIII 4	XIV 5	XV 1

Size of Plots -- .01 acre

Roman Numerals -- Plot Number
Arabic Numbers -- Fertilizer Mixture

****

FERTILIZER TREATMENT
(Pounds per Plot)

Treatment Number	20½% $(NH_4)_2SO_4$	Ground Limestone	43% Superphosphate	50% K Cl
1	2.5#	2.5#	0.0#	1.5#
2	2.5	2.5	0.5	1.5
3	2.5	2.5	1.5	1.5
4	2.5	2.5	1.5	0.5
5	2.5	2.5	1.5	0.0

Figure 1

Plot diagram and fertilizer treatment

Fertilization

A standard application was made to all plots consisting of 250 pounds per acre of ammonium sulfate (50 lbs. N.) and sufficient ground limestone (about 250 lbs. per acre) to neutralize the equivalent acidity of the nitrogen carrier.

For the phosphate fertilization experiments all plots received in addition an application of 150 pounds of muriate of potash (75 lbs. K_2O) per acre to eliminate any serious deficiency of potassium. Forty-three per cent superphosphate was applied at rates of 0, 50, and 150 pounds per acre.

For the potash fertilization experiments all plots received in addition 150 pounds of 43 per cent superphosphate per acre. Muriate of potash was applied at rates of 0, 50, and 150 pounds per acre.

The methods of weighing and applying the fertilizer were identical with those used by Davidson (3). The method of mixing was by hand and performed not more than 24 hours prior to time of application.

Harvesting

Since methods for harvesting corn and cotton differed they will be described for each crop separately.

Corn

The corn was harvested on dates ranging from September 5th to December 7th. One experimental plot area was harvested in September, one in October, three in November and one in December. In each case only the two center rows were harvested, in order to avoid border effects. Although the corn was very dry when harvested, six ear composite samples were taken, weighed, dried and shelled to determine air dry weight and shelling percentage.

Cotton

The cotton was harvested from the experimental plot areas during the months of September, October and November. Four pickings were made in two experiments, three pickings in one and two pickings in one. As with corn only the two center rows were harvested, except in the experimental area where the plots were five rows wide. There the three center rows were harvested instead of the usual two. The cotton was weighed at the time of picking and the yields recorded as seed cotton. In the two experiments where four pickings were made the fourth picking was bolls and the yield weight recorded was one third of the boll weight.

Collection and Preparation of Soil Samples

Each plot was sampled before fertilization by taking four borings of the topsoil to a depth of six inches and four borings of the subsoil six to twelve inches. These surface and subsoil borings were composited separately for determinations of available phosphorus, exchangeable potassium and pH. These determinations were made at the Soil Testing Laboratory by Bruce Hatcher. The methods in use at the laboratory are as follows: pH is determined on a soil paste with the glass electrode; exchangeable (available) potassium and available phosphorus are determined by modifications of the methods of Bray (1) and Peech and English (7).

CHAPTER III

DATA AND OBSERVATIONS

The laboratory data on the composite soil samples are given in Tables I and II. Data include available phosphorus, exchangeable potassium and pH.

The available phosphorus in the Memphis series which included five experimental plot areas ranged from a reading of 1 (very low) to 5 (medium low). Three of the plot areas were very low, one low and one medium low. Exchangeable potassium varied from 135 pounds to 200 pounds per acre with an average of 159 pounds. The pH range was from a low of 5.6 to a high of 6.5. Two of the plot areas were below 6.0 and three above.

The three plot areas of Lexington soil showed a variation in available phosphorus from 1 (very low) to 5 (medium low). The exchangeable potassium range was from 150 pounds to 200 pounds per acre with an average of 173 pounds. pH determinations gave a low of 6.3 and a high of 6.5.

Soil tests of the one experimental plot area on Providence soil gave an available phosphorus level of 1- (very low), an exchangeable potassium level of 100 pounds per acre and a pH of 5.5.

The experimental plot area on Hymon soil had a

phosphorus availability level of 1- (very low), an exchangeable potassium level of 145 pounds per acre and a pH of 5.3.

Yield data and observations for corn and cotton will be presented separately.

Corn

Both the 1942 and 1943 seasons were unfavorable for corn production in Henry County. Heavy spring rains prevented early planting and dry weather that occurred during the latter part of the growing period cut yields considerably.

Since all experimental plot areas included studies of phosphate and potash fertilization, results from the use of the two materials will be considered together. Yield data for all corn plots are summarized in Table I. Detailed data for individual plots are presented in the Appendix.

Experimental plot area 1 on Providence soil produced average yields of 17.5, 21.8, and 28.0 bushels per acre with applications of 0, 50, and 150 pounds of 43 per cent superphosphate per acre, respectively. Applications of 0, 50, and 150 pounds of muriate of potash per acre gave average yields of 22.9, 22.5, and 28.0 bushels per acre. The phosphorus availability level was 1- (very low) and the

TABLE I

SOIL TEST AND YIELD DATA ON CORN PLOTS RECEIVING DIFFERENT RATES OF PHOSPHORUS AND POTASSIUM FERTILIZATION

Experiment No.	Year	Cooperator	Soil Series	Yield Bushels Per Acre					pH	Available P	Exchangeable K
				0 lbs. P_2O_5 75 lbs. K_2O	22 lbs. P_2O_5 75 lbs. K_2O	66 lbs. P_2O_5 75 lbs. K_2O	66 lbs. P_2O_5 25 lbs. K_2O	66 lbs. P_2O_5 0 lbs. K_2O			
1	1942	Olds	Providence	17.5	21.8	28.0	22.5	22.9	5.5	1- (very low)	100
2	1943	Olds	Hymon	37.2	40.8	44.6	40.5	38.7	5.3	1- (very low)	145
3	1942	Anderson	Memphis	33.1	36.2	37.3	37.5	34.8	5.6	1 (very low)	135
4	1942	Taylor	Memphis	49.5	48.4	47.1	46.9	51.4	6.4	5 (med. low)	140
5	1943	Anderson	Memphis	22.9	24.5	19.4	23.0	23.3	5.9	3 (low)	200
6	1943	Taylor	Memphis	25.0	33.1	27.1	28.0	24.2	6.5	1 (very low)	180

exchangeable potassium was 100 pounds per acre. Field observations on the check plots during the growing season revealed both phosphorus and potassium deficiency symptoms as described by Hoffer (6). The stand count varied from 19 to 29 plants per two row harvested area and the yields showed great variability. The preceding crop, redtop, was turned in the spring and the farmer was never able to get the land in suitable condition for planting. This largely accounts for the irregular stand. No lodging was observed on any of the plots. Although yields showed a 60 per cent increase with the addition of the second increment of phosphate (150 pounds 43 per cent superphosphate per acre) and a 22 per cent increase with the addition of the second increment of potash (150 pounds muriate of potash per acre) the increases were not statistically significant at the 5 per cent level.

Hymon soil, that had been continuously cropped in corn for many years, was used for experimental plot area 2. Average yields of 37.2, 40.8 and 44.6 bushels per acre were obtained with the addition of the same increments of phosphate as mentioned for experimental plot area 1. Potash applications as mentioned above gave average yields of 38.7, 40.5 and 44.6 bushels per acre. Field observations indicated slight phosphorus but no potassium deficiency symptoms. Stand counts varied from 24 to 32

plants per area harvested. Lodging was negligible. Although there was considerable yield variation between plots the 20 per cent increase in yield with the second increment of phosphate and the 16 per cent increase with the second increment of potash are statistically significant. These yield increases show a direct correlation with soil test data which were 1- (very low) for available phosphorus and 145 pounds for exchangeable potassium per acre.

Yield increases of 10 per cent and 20 per cent were obtained with additions of the first (50 pounds 43 per cent superphosphate per acre) and second increments of phosphate and 16 per cent with the addition of the first increment of potash (50 pounds muriate of potash per acre) on experimental plot area 3 on Memphis soil. The available phosphorus level was 1 (very low) and the exchangeable potassium 135 pounds per acre. The corn followed a crop of red clover and redtop. The stand count showed a variation of from 23 to 25 plants per area harvested. No lodging was observed and no deficiency symptoms of either phosphorus or potassium were noted. Although yield increases were obtained with additions of both phosphate and potash they were not great enough to be significant at the 5 per cent level.

Experimental plot area 4 was on Memphis soil which

had previously been cropped to red clover. No yield increases were obtained from applications of either phosphate or potash. The stand was thicker than on any other experimental area and the yields were higher. Deficiency symptoms were not observed for either phosphorus or potassium and lodging was negligible. The available phosphorus level was 5 (medium low) and the exchangeable potassium level 140 pounds per acre.

Experiment 5 gave the lowest yields of any conducted on Memphis soil. This in part can be accounted for by the extremely dry weather that occurred during the silking and tasseling stage. The corn followed a crop of red clover and redtop. The soil tests showed an available phosphorus level of 3 (low) and an exchangeable potassium level of 200 pounds per acre. There was no evidence of increased yields with the various treatments. Lodging was negligible and no deficiency symptoms of either phosphorus or potassium were observed.

Corn following red clover on experimental plot area 6 on Memphis soil gave a yield increase of 32 per cent with the addition of the first increment of phosphate but only 8 per cent increase over the check for the second increment. A yield increase of 16 per cent was obtained with the addition of the first increment of potash but only a 12 per cent increase for the second. However, due

to sub-plot yield variability these increases cannot be considered significant. Erect stalks ranged from 68 per cent to 89 per cent and stand count from 16 to 23 plants per area harvested. No phosphorus or potassium deficiency symptoms were observed.

Cotton

The 1942 and 1943 seasons, although rather dry, were better suited to cotton production than to corn, and cotton yields obtained were therefore proportionally higher. Frost reduced the yield of cotton planted late but early crops were not affected. As with corn all the experimental plot areas included studies of phosphate and potash. Yield data for cotton are summarized in Table II. Detailed data for individual plots are presented in the Appendix.

Cotton for experiment 1 was grown on Lexington soil having an available phosphorus level of 1 (very low) and an exchangeable potassium level of 170 pounds per acre. The area had been used the preceding year for corn. The cotton was planted on April 22nd and a poor stand secured. It was replanted May 10th and even then the stand obtained was rather irregular. Stand counts showed a variation of from 56 to 83 plants per area harvested. Phosphorus and potassium deficiency symptoms as described by Cooper (2)

TABLE II

SOIL TEST AND YIELD DATA ON COTTON PLOTS RECEIVING DIFFERENT RATES OF PHOSPHORUS AND POTASSIUM FERTILIZATION

Experiment No.	Year	Cooperator	Soil Series	Yield Pounds Per Acre					pH	Available P	Exchangeable K
				0 lbs. P_2O_5 75 lbs. K_2O	22 lbs. P_2O_5 75 lbs. K_2O	66 lbs. P_2O_5 75 lbs. K_2O	66 lbs. P_2O_5 25 lbs. K_2O	66 lbs. P_2O_5 0 lbs. K_2O			
1	1942	Sparks	Lexington	1707	1780	1893	1753	1613	6.3	1 (very low)	170
2	1942	Cowan	Lexington	487	547	520	680	620	6.3	4 (low)	150
3	1942	Anderson	Memphis	1174	1225	1375	1297	1219	6.3	1 (very low)	140
4	1943	Mitchell	Lexington	1427	1293	1313	1433	1227	6.5	5 (med. low)	200

were not in evidence at any time during the growing season. Applications of 0, 50, and 150 pounds per acre of 43 per cent superphosphate gave average yields of 1707, 1780, and 1893 pounds of seed cotton per acre respectively. A yield difference of 362 pounds per acre was necessary for significance at the 5 per cent level. Average yields of 1613, 1753, and 1893 pounds per acre were obtained on plots treated with 0, 50, and 150 pounds per acre respectively of muriate of potash. Again the yield increases were not large enough for significance.

Late planting and early frost contributed to the low yields obtained on experimental plot area 2. The area had been in corn the previous year. It had an available phosphorus level of 4 (low) and an exchangeable potassium level of 150 pounds per acre. The stand count varied from 47 to 71 plants per area harvested and the yields from 360 to 900 pounds per acre. No deficiency symptoms were observed in the field; and the yield increases obtained from the various treatments of phosphate and potash were not significant.

Experimental plot area 3 was on Memphis soil which soil tests showed to have an available phosphorus level of 1 (very low) and an exchangeable potassium level of 140 pounds per acre. Cotton followed a corn crop and was planted on well prepared land. The stand obtained was

good but somewhat irregular with counts varying from 91 to 126 plants per harvested area. Average yields of 1174, 1225 and 1375 pounds per acre were obtained with treatments of phosphate as described for experimental plot area 1. Treatments of potash as described for the same experiment gave average yields of 1219, 1297 and 1375 pounds per acre. These yields were obtained from four pickings. Although yield increases were not great the 17 per cent increase with the addition of the second increment of phosphate and the 12 per cent increase with the addition of the second increment of potash were sufficient to be statistically significant at the 5 per cent level. Field observations showed no phosphorus deficiency symptoms but slight potassium deficiency symptoms appeared near midseason on one of the plots receiving no potash.

Lexington soil used for experimental plot area 4 had a phosphorus availablity level of 5 (medium low) and an exchangeable potassium level of 200 pounds per acre. Soybeans preceded cotton on the area and were removed for hay. As a whole the yields were high but they failed to show any appreciable difference for the various fertilizer treatments used. Field observations during the growing season showed no difference in treatments.

Yield Response Curves

Bray (1) suggested that data of this type be presented graphically in order to bring out other significant relationships. Ewing (5) found Bray's method of presenting data of this type useful. For graphical presentation the average yield on the plots receiving the high increment of potash is taken as 100 per cent and the average yield on the check plots is computed as a percentage of this yield. Then the response of a given crop to potassium fertilization from a number of experiments may be plotted on the same graph. Yield data from phosphate studies may be plotted in a like manner.

The data for corn (Table I) and cotton (Table II) were plotted in the above manner. The response of cotton to fertilization was so eratic that no trend could be fitted to the experimental points and the graphs are not included herewith. The graphs for corn (Figures 2 and 3) show a general trend for the six experiments plotted. These trends resemble those found by Ewing (5).

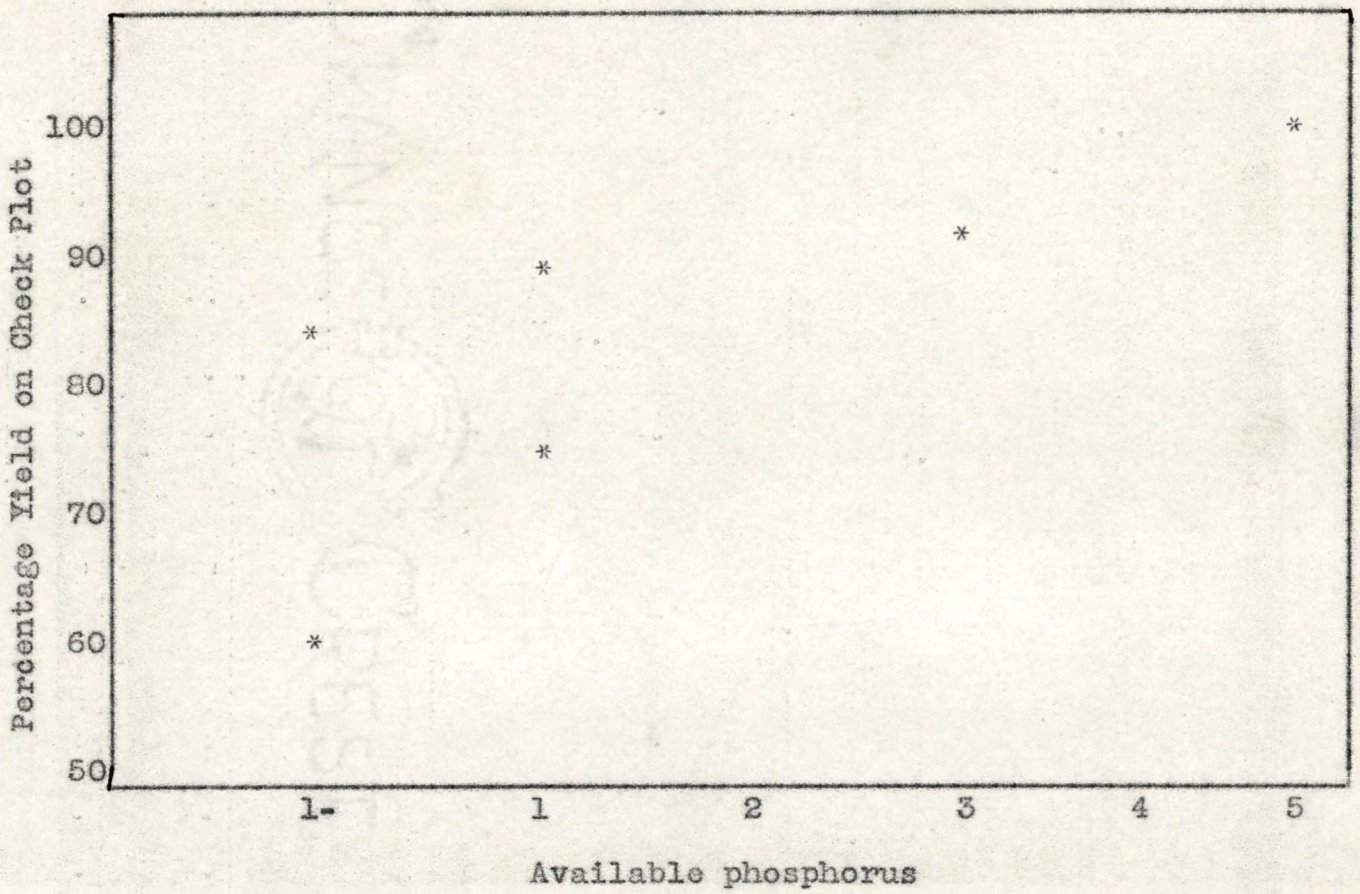

Figure 2

Relationship between available phosphorus in the soil and per cent corn yields on plots receiving no phosphorus

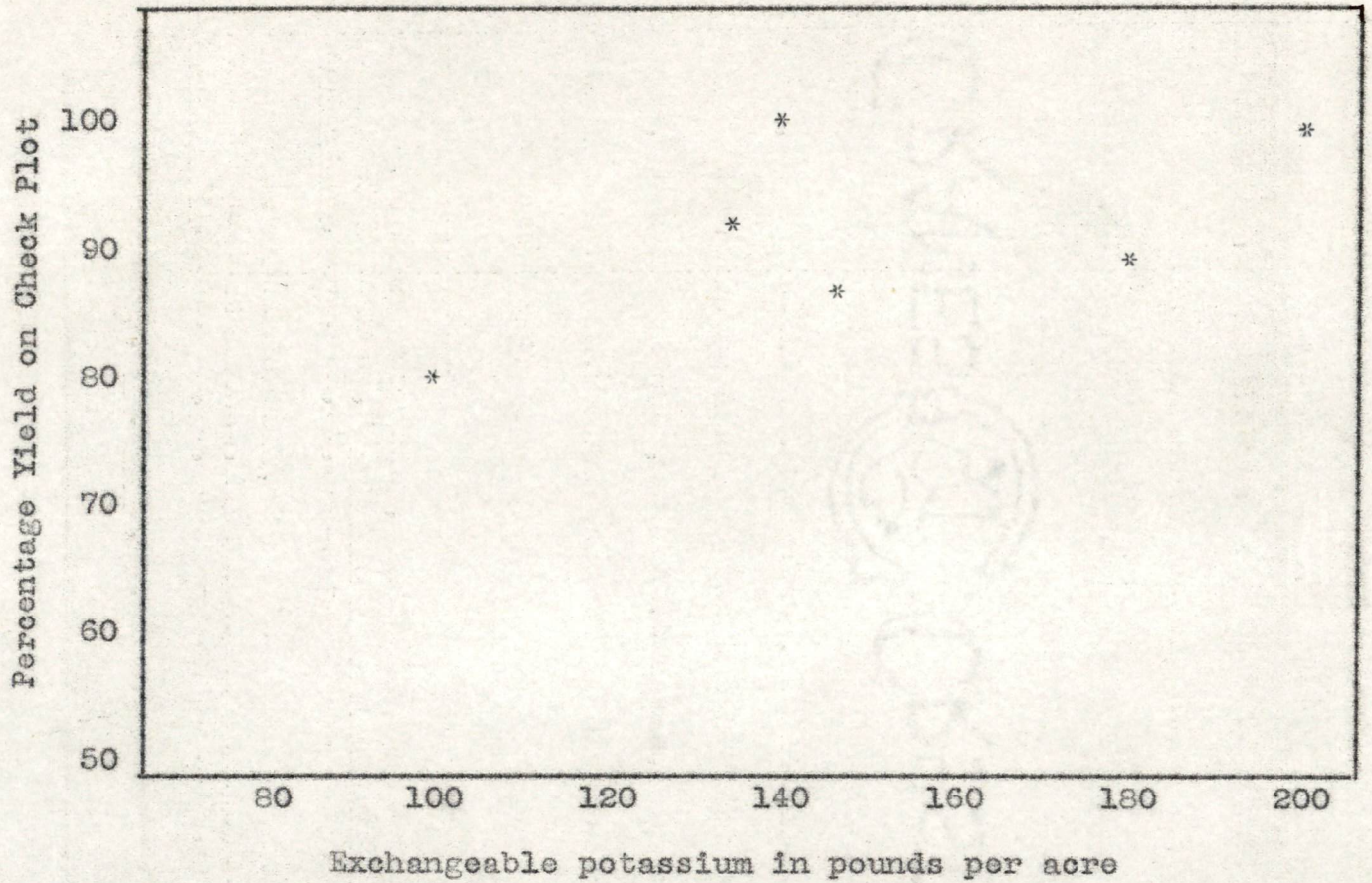

Figure 3

Relationship between exchangeable potassium in the soil and per cent corn yields on plots receiving no potassium

CHAPTER IV

DISCUSSION

In order to predict phosphate and potash fertilization procedure from soil tests it is necessary that a correlation exist between yield increases and the amounts of phosphorus and potassium in the soil in an available or exchangeable form. Although the data and observations under consideration are incomplete certain tentative conclusions can be drawn. A discussion of these conclusions is presented separately for each crop.

Corn

Available phosphorus in soils where corn plots were located varied from 1- (very low) to 5 (medium low). Significant yield increases were obtained only on Hymon soil with a phosphorus availability level of 1- (very low). Providence soil with an available phosphorus level of 1- (very low) gave yield increases which were not significant probably because of great yield variability due to poor stand. However, the deficiency symptoms on the untreated plot indicated that the need for additions of phosphate existed. Slight yield increases on Memphis soil with an available phosphorus level of 1 (very low) were not significant. Memphis soil with available phos-

phorus levels of 3 (low) and 5 (medium low) gave no yield increases.

Hymon soil was the only one used that gave a significant response to potash fertilization. Although the 5 per cent increase in yield from the first increment of potash was not significant the increase of 16 per cent with the addition of second increment was significant and indicated the need for an application of potash when only 145 pounds of exchangeable potassium are present in the soil. Even though the 22 per cent increase on Providence soil, with the addition of the second increment of potash, was not significant field observations indicated that under favorable conditions potash could be expected to give some yield increase in soils of this type with levels of 100 pounds per acre or less of exchangeable potassium. Memphis soil with 135 pounds of exchangeable potassium per acre gave slight increases in yield with additions of the first and second increments of potash but the increases were not significant. Memphis soil with exchangeable potassium in excess of 180 pounds per acre gave no increase with potash fertilization.

Although no definite correlations can be made between yield response data and soil test data, indications are that definite response can be expected from phosphate fertilization on Hymon and Providence soils with very low

levels of available phosphorus and from potash fertilization on the same soils with less than 145 pounds of exchangeable potassium per acre. No response can be expected from potash fertilization on Memphis soil when soil tests indicate 200 pounds or more per acre of exchangeable potassium.

Cotton

Available phosphorus in soils where cotton plots were located varied from 1 (very low) to 5 (medium low). Significant yield increases were obtained only on Memphis soil with a phosphorus availability level of 1 (very low). Slight increases were obtained on Lexington soil with a phosphorus availability level of 1 (very low) but were not sufficient to be significant. No increase was noted on soils with levels of 4 (low) or 5 (medium low).

Field observations and yield data indicate that at extremely low levels of available phosphorus, applications of phosphate are beneficial and may be expected to give profitable returns. Data are too limited to enable one to predict the level at which it would be unprofitable to add phosphate fertilizer.

The same experimental plot area that gave response to phosphate fertilization also gave significant response to potash fertilization. With 140 pounds per acre of

exchangeable potassium in the soil the second increment of potash gave an increase of 17 per cent in yield. Since this yield increase was significant, one would expect that soils of the Memphis series with 140 pounds or less of exchangeable potassium per acre would give profitable returns from potash fertilization. Although a slight yield increase was obtained on Lexington soil with 170 pounds per acre of exchangeable potassium when the second increment of potash was added, it was not significant and no accurate decision could be based on the data. Lexington soil with 200 pounds per acre of exchangeable potassium gave no yield increase with either the first or second increments of potash. Therefore, similar soils with equally high or higher levels of potassium cannot be expected to produce profitable returns from potash fertilization.

Suggested Changes in Procedure

The great variations in yield that occurred on plots receiving the same fertilizer treatment indicate a need for certain changes in field technique. Since irregular stands seemed to be the largest single source of error it is suggested that plantings be made by hand and the necessary thinning done to give a uniform stand

on each plot. To avoid the possibility of disturbing the seedlings after germination it is recommended that the fertilizer be applied just before or immediately after planting. To minimize the error due to soil variation, stand irregularity and disease and insect injury additional replications of each treatment are suggested. The size of individual plots, row arrangement, methods of weighing, mixing and applying fertilizer are recommended for future studies of this kind.

CHAPTER V

SUMMARY

The effects of phosphate and potash on the yields of corn and cotton were studied on four soils in Henry County, Tennessee. The phosphorus availability level and the exchangeable potassium content of the soils were determined in order to evaluate the correlation between the soil test data and yield increases from fertilization. The major conclusions for each crop were as follows:-

Corn

Increase in yields of 10 per cent and 20 per cent were obtained from applications of 50 and 150 pounds per acre of 43 per cent superphosphate on Hymon soil with an available phosphorus level of 1- (very low). Field observations indicated a response to phosphate on Providence soil with a similar phosphorus availability level. No significant increases were found from similar applications of phosphate on Memphis soil with a phosphorus availability level of 3 (low).

Increase in yields of 5 per cent and 16 per cent were obtained from applications of 50 and 150 pounds per acre of muriate of potash on Hymon soil with 145 pounds per acre of exchangeable potassium in the soil. Field

observations indicated definite effects from potash fertilization in eliminating deficiency symptoms on Providence soil with an exchangeable potassium level of 100 pounds per acre. Memphis soil with 135 pounds of exchangeable potassium per acre gave no significant yield increases. The same soil with 200 pounds of exchangeable potassium gave no yield increase.

Cotton

Phosphate fertilization gave significant yield increases only on Memphis soil with a phosphorus availability level of 1 (very low). Lexington soil gave no response to phosphate fertilization at phosphorus availability levels of 4 (low) and 5 (medium low).

Memphis soil with 140 pounds per acre of exchangeable potassium gave significant yield increases to potash fertilization. Lexington soil with similar potash applications gave no increase in yield when exchangeable potassium was 200 pounds or more per acre.

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APPENDIX

TABLE III

FERTILIZER TREATMENT, CORN AND SOIL DATA FOR INDIVIDUAL PLOTS

Providence Silt Loam - 1942

Plot	Treatment Number*	Yield Bu. Per A.	Ave. of 3 Reps.	No. Stalks in Harvested Area	Per Cent Erect Stalks
1	1	18.0		22	100
8	1	14.3		20	100
15	1	20.1	17.5	28	100
2	2	28.3		33	100
9	2	18.3		19	100
11	2	18.9	21.8	23	100
3	3	29.4		29	100
10	3	18.9		19	100
12	3	35.7	28.0	29	100
4	4	21.1		22	100
6	4	9.4		16	100
13	4	36.9	22.5	35	100
5	5	24.3		27	100
7	5	21.4		22	100
14	5	22.9	22.9	27	100

Available P 1- (very low)
Exchangeable K 100 (low)
pH 5.5
LSD at 5% level 11.7 bu.
LSD at 1% level 17.0 bu.

*For schedule of treatments see Figure 1, page 6.

TABLE III (CONTINUED)

FERTILIZER TREATMENT, CORN AND SOIL DATA FOR INDIVIDUAL PLOTS

Hymon Silt Loam - 1943

Plot	Treatment Number	Yield Bu. Per A.	Ave. of 3 Reps.	No. Stalks in Harvested Area	Per Cent Erect Stalks
1	1	42.9		30	83
8	1	39.4		24	96
15	1	29.4	37.2	24	100
2	2	44.0		29	90
9	2	41.4		28	100
11	2	37.1	40.8	29	97
3	3	48.3		26	88
10	3	45.4		29	90
12	3	40.0	44.6	29	97
4	4	41.4		26	88
6	4	41.4		28	85
13	4	38.6	40.5	29	97
5	5	37.4		28	97
7	5	45.9		32	91
14	5	33.1	38.7	27	93

Available P - 1- (very low)
Exchangeable K - 145 (medium low)
pH - 5.3
LSD at 5% level - 5.9 bu.
LSD at 1% level - 8.6 bu.

TABLE III (CONTINUED)

FERTILIZER TREATMENT, CORN AND SOIL DATA FOR INDIVIDUAL PLOTS

Memphis Silt Loam - 1942

Plot	Treatment Number	Yield Bu. Per A.	Ave. of 3 Reps.	No. Stalks in Harvested Area	Per Cent Erect Stalks
1	1	31.1		24	100
8	1	35.4		25	100
15	1	32.9	33.1	24	100
2	2	39.7		24	100
9	2	36.9		24	100
11	2	32.0	36.2	24	100
3	3	37.1		24	100
10	3	37.1		24	100
12	3	37.7	37.3	25	100
4	4	38.9		24	100
6	4	34.3		24	100
13	4	39.4	37.5	23	100
5	5	29.4		23	100
7	5	38.9		24	100
14	5	36.0	34.8	24	100

Available P - 1 (very low)
Exchangeable K - 135 (medium low)
pH - 5.6
LSD at 5% level - 6.5 bu.
LSD at 1% level - 9.5 bu.

TABLE III (CONTINUED)

FERTILIZER TREATMENT, CORN AND SOIL DATA FOR INDIVIDUAL PLOTS

Memphis Silt Loam - 1942

Plot	Treatment Number	Yield Bu. Per A.	Ave. of 3 Reps.	No. Stalks in Harvested Area	Per Cent Erect Stalks
1	1	58.9		36	94
8	1	45.1		36	94
15	1	44.6	49.5	32	97
2	2	52.3		36	86
9	2	42.3		31	97
11	2	50.6	48.4	36	92
3	3	50.6		37	89
10	3	47.1		37	97
12	3	43.7	47.1	38	92
4	4	56.3		29	86
6	4	50.0		38	92
13	4	34.6	46.9	30	97
5	5	58.9		27	93
7	5	50.9		35	91
14	5	44.3	51.4	30	100

Available P - 5 (medium low)
Exchangeable K - 140 (medium low)
pH - 6.4
LSD at 5% level - 9.4 bu.
LSD at 1% level -13.6 bu.

TABLE III (CONTINUED)

FERTILIZER TREATMENT, CORN AND SOIL DATA FOR INDIVIDUAL PLOTS

Memphis Silt Loam - 1943

Plot	Treatment Number	Yield Bu. Per A.	Ave. of 3 Reps.	No. Stalks in Harvested Area	Per Cent Erect Stalks
1	1	22.9		23	100
8	1	24.6		24	96
15	1	21.4	22.9	23	100
2	2	22.3		23	100
9	2	23.1		23	87
11	2	28.0	24.5	21	100
3	3	22.6		22	100
10	3	19.7		20	95
12	3	16.0	19.4	24	96
4	4	24.0		23	96
6	4	21.4		23	96
13	4	23.7	23.0	22	95
5	5	19.7		24	100
7	5	22.0		29	100
14	5	28.3	23.3	22	95

Available P - 3 (low)
Exchangeable K - 200 (high)
pH - 5.9
LSD at 5% level - 6.0 bu.
LSD at 1% level - 8.8 bu.

TABLE III (CONTINUED)

FERTILIZER TREATMENT, CORN AND SOIL DATA FOR INDIVIDUAL PLOTS

Memphis Silt Loam - 1943

Plot	Treatment Number	Yield Bu. Per A.	Ave. of 3 Reps.	No. Stalks in Harvested Area	Per Cent Erect Stalks
1	1	27.1		19	84
8	1	32.9		21	81
15	1	15.1	25.0	18	78
2	2	34.3		21	76
9	2	33.6		23	74
11	2	31.4	33.1	17	71
3	3	30.0		19	68
10	3	18.6		16	88
12	3	32.6	27.1	20	80
4	4	18.6		16	88
6	4	34.9		19	89
13	4	30.6	28.0	18	89
5	5	22.9		20	75
7	5	32.6		19	74
14	5	17.1	24.2	18	83

Available P - 1 (very low)
Exchangeable K - 180 (medium high)
pH - 6.5
LSD at 5% level - 14.4 bu.
LSD at 1% level - 20.9 bu.

TABLE IV

FERTILIZER TREATMENT, COTTON AND SOIL DATA FOR INDIVIDUAL PLOTS

Lexington Silt Loam - 1942

Plot	Treatment Number*	Yield Lbs. Per A.	Ave. of 3 Reps.	No. Plants in Harvested Area
1	1	1780		62
8	1	2000		70
13	1	1340	1707	73
2	2	2240		83
7	2	1600		76
12	2	1500	1780	68
3	3	2080		68
6	3	1980		80
11	3	1620	1893	70
4	4	2260		86
10	4	1580		56
15	4	1420	1753	57
5	5	1920		76
9	5	1680		56
14	5	1240	1613	64

Available P - 1 (very low)
Exchangeable K - 170 (medium high)
pH - 6.3
LSD at 5% level - 362 lbs.
LSD at 1% level - 527 lbs.

*For schedule of treatments see Figure 1, page 6.

TABLE IV (CONTINUED)

FERTILIZER TREATMENT, COTTON AND SOIL DATA FOR INDIVIDUAL PLOTS

Lexington Silt Loam - 1942

Plot	Treatment Number	Yield Lbs. Per A.	Ave. of 3 Reps.	No. Plants in Harvested Area
1	1	600		62
8	1	360		47
15	1	500	487	60
2	2	440		55
9	2	480		60
11	2	720	547	65
3	3	600		61
10	3	440		66
12	3	520	520	54
4	4	460		71
6	4	680		61
13	4	900	680	56
5	5	560		55
7	5	660		63
14	5	640	620	57

Available P 4 (low)
Exchangeable K - 150 (medium)
pH - 6.3
LSD at 5% level - 243 lbs.
LSD at 1% level - 354 lbs.

TABLE IV (CONTINUED)

FERTILIZER TREATMENT, COTTON AND SOIL DATA FOR INDIVIDUAL PLOTS

Lexington Silt Loam - 1942

Plot	Treatment Number	Yield Lbs. Per A.	Ave. of 3 Reps.	No. Plants in Harvested Area
1	1	1319		122
8	1	1102		119
15	1	1102	1174	98
2	2	1319		118
9	2	1236		105
11	2	1119	1225	125
3	3	1334		123
10	3	1436		107
12	3	1353	1375	116
4	4	1420		100
6	4	1253		118
13	4	1219	1297	110
5	5	1186		91
7	5	1319		126
14	5	1152	1219	102

Available P - 1 (very low)
Exchangeable K - 140 (medium low)
pH - 6.3
LSD at 5% level - 156 lbs.
LSD at 1% level - 227 lbs.

TABLE IV (CONTINUED)

FERTILIZER TREATMENT, COTTON AND SOIL DATA FOR INDIVIDUAL PLOTS

Lexington Silt Loam - 1943

Plot	Treatment Number	Yield Lbs. Per A.	Ave. of 3 Reps.	No. Plants in Harvested Area
1	1	1480		79
8	1	1440		93
15	1	1360	1427	101
2	2	1160		93
9	2	1160		106
11	2	1560	1293	105
3	3	1340		98
10	3	1240		96
12	3	1360	1313	98
4	4	1320		96
6	4	1400		92
13	4	1580	1433	105
5	5	1160		106
7	5	1260		96
14	5	1260	1227	99

Available P - 5 (medium low)
Exchangeable K - 200 (high)
pH - 6.5
LSD at 5% level - 220 lbs.
LSD at 1% level - 318 lbs.