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Soil Fertility Experiments with Peanuts in 1972[1]

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THE COOPERATIVE RESEARCH PROGRAM, which began in 1967, to better define soil fertility requirements of peanuts was continued in 1972. This program is especially intended to improve correlation between fertilizer requirements and soil-test values. This is accomplished by conducting experiments on farmers' fields throughout the peanut growing area of southeastern Alabama. The selection of experimental sites is based on soil testing. Thirty-three experiments in eight counties were initiated in 1972 and 23 were harvested (7 in Dale, 4 in Barbour, 3 in Henry, 2 each in Crenshaw, Geneva, Houston, and Pike, and 1 in Coffee).

The experimental area on each farm was divided into the required number of plots, each plot being 4 rows wide and 100 feet long. Each farmer planted, cultivated, sprayed, and harvested peanuts within all plots the same as those in the remainder of his field.

All experimental materials were applied by the researchers. Four plots in each experiment received no treatment; the remaining plots consisted of four replications of one or more of the following treatments: (1) a phosphorus-potassium fertilizer, (2) gypsum, (3) basic slag, (4) "Magi-Cal," (5) boron, or (6) lime.

FERTILIZER (P AND K) EXPERIMENTS

Five experiments were conducted to determine if fertilizer applied in the spring would increase peanut yields on soils testing "low" or "medium" in either phosphorus (P) or potassium (K). In three of these experiments, the fertilizer was broadcast and then disked-in (Croft, Martin, and Buie farms). In the other two, the fertilizer was broadcast and then turned under (Baker and Deloney farms). The crop preceding peanuts was corn on two fields; the other three had been idle in 1971.

Each fertilizer experiment consisted of eight plots. Four plots in each experiment received 400 pounds per acre of 0-10-20 fertilizer broadcast; the other four plots received no fertilizer.

Three experiments were with the 'Florigiant' variety and two were with the 'Florunner'. Three soils tested "low" in phosphorus (P) and two "medium"; three tested "low" in potassium (K) and two "medium".

The results of these experiments are given in Table 1, and they continue to confirm results from previous years. Although some yields were relatively low because of an extended drought, they show that fertilizer did *not* increase yield or grade of peanuts in a single experiment. These experiments show once again that a direct application of fertilizer to peanuts is not a profitable practice. They support Auburn's recommendation that fertilizer should be applied to the crop that precedes peanuts in the rotation and not to peanuts directly. Even previously idle land needed no additional fertilizer to give maximum peanut yields.

CALCIUM (Ca) EXPERIMENTS

Topdressing gypsum at early bloom is a common and effective practice of supplementing the soil's supply of available calcium to peanuts. This is a money-making practice on soils with too little available calcium but a bothersome and uneconomical practice on soils with adequate calcium. Consequently, a major objective of soil testing for peanuts is to identify those soils that need supplemental calcium to produce maximum yields of top-quality nuts.

Fifteen such experiments with gypsum topdressed at 500 pounds per acre were harvested in 1972. Four of these experiments simply compared gypsum with "no calcium". Four others compared basic slag as well as gypsum with "no calcium". Three others compared "Magi-Cal" as well as gypsum with "no calcium". (Magi-Cal is the trade name of a concentrated suspension of extra fine gypsum that its manufacturer recommends be sprayed onto peanut foliage). Four

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TABLE 1. EFFECT OF BROADCAST FERTILIZER ON YIELD AND SMK OF 'FLORIGIANT' AND 'FLORUNNER' PEANUTS, ALABAMA, 1972

Variety and farmer	County	Soil type	1971 crop	Soil-test values			Yield per acre[1]		SMK[1]	
				pH	P	K	No fert.	Fert.	No fert.	Fert.
					Lb./A.	*Lb./A.*	*Lb.*	*Lb.*	*Pct.*	*Pct.*
Florigiant										
P. L. Baker	Dale	Lucy loamy sand	corn	6.1	40(M)	32(L)	1,550	1,640	63	62
G. Croft	Dale	Fuquay loamy sand	corn	5.4	15(L)	17(L)	2,350	2,460	67	64
F. C. Martin	Barbour	Blanton loamy sand	idle	6.3	7(L)	29(L)	2,150	2,210	69	67
Florunner										
W. Buie	Houston	Unclassified	rye-idle	6.2	32(M)	43(M)	1,590	1,770	62	65
B. Deloney, Jr.	Dale	Lucy loamy sand	idle	5.8	14(L)	47(M)	3,240	3,220	77	76

[1] Fertilizer did not statistically increase or decrease yield or percentage SMK.

additional experiments compared spring-applied lime as well as gypsum with "no calcium".

These 15 experiments were on soils that ranged in soil Ca from a low of 140 pounds per acre to a high of 528. The soils also ranged in pH from a low of 5.0 to a high of 6.3. The experiments are grouped as follows: (1) gypsum alone, (2) gypsum and basic slag, (3) gypsum and "Magi-Cal", (4) gypsum and lime.

Gypsum alone. Each of the four experiments in Table 2 consisted of four plots with topdressed gypsum and four plots without. With soil Ca at 194 pounds per acre (medium) gypsum increased yield of 'Florigiants' on F. C. Martin's farm by 990 pounds and grade (SMK) by 14 percentage points. 'Florunner' yield and grade were increased similar amounts on the "low" Ca soil of the Deal Brothers. The experiment on the Baxley Farms was located on an area with two distinctly different levels of soil Ca. Consequently, the results of this experiment are divided into "A" and "B" parts. The "A" soil had 528 pounds of Ca and yield was unaffected by gypsum; the "B" soil had only 140 pounds of Ca and yield was increased more than 1,600 pounds by gypsum.

Gypsum versus basic slag. Of the four experiments comparing gypsum and basic slag, three were "medium" and one was "low" in Ca, Table 3. The "low" Ca soil was on the Thrash farm with soil Ca at 174 pounds per acre and soil pH at 5.0. On this soil, neither gypsum nor slag increased yield. However, both increased grades — gypsum by six points and basic slag by four points. Neither gypsum nor slag affected yields or grades on the three "medium" Ca soils.

Gypsum versus "Magi-Cal". There have been numerous claims that liquid, sprayed-on calcium materials are effective sources of available calcium to peanuts. Such claims are contrary to the scientifically established fact that calcium cannot be supplied to the nuts via the leaves. Nevertheless, farmers continue to buy and use these spray-on materials. One such material is "Magi-Cal", and its use by farmers prompted three experiments with it in 1972. The results are given in Table 4. Two of the soils proved to be deficient in Ca. Yield was increased 860 pounds by gypsum on the Deloney farm. Correspondingly, grade (SMK) was increased 19 percentage points. Although yield was unaffected by gypsum on the Croft farm, grade was increased by 12 points. In contrast to these results, "Magi-Cal" was worthless, increasing neither yield nor grade. The third soil was not deficient in Ca because gypsum failed to increase yield or SMK. Neither did "Magi-Cal" affect yield or grade.

Gypsum versus lime. Four experiments were harvested in which the effect of spring-applied lime was compared to that of topdressed gypsum. A fifth experiment simply measured the effect of lime. Lime was applied in each case at the rate of 1 ton of dolo-

TABLE 2. EFFECT OF TOPDRESSING CALCIUM AT RATE OF 500 POUNDS PER ACRE OF GYPSUM ON YIELD AND PER CENT SOUND MATURE KERNELS (SMK) OF PEANUTS, ALABAMA, 1972

Variety and farmer	County	Soil type	Soil pH	Soil-test Ca	Yield per acre		SMK	
					No Ca	Gypsum	No Ca	Gypsum
				Lb./A.	*Lb.*	*Lb.*	*Pct.*	*Pct.*
Florigiant								
F. C. Martin	Barbour	Blanton loamy sand	6.3	194(M)	**1,050**[1]	**2,040**[1]	**46**[2]	**60**[2]
Florunner								
Deal Bros.	Dale	Blanton sand	5.8	152(L)	**640**[1]	**1,840**[1]	**58**[2]	**70**[2]
Baxley Farms—A	Geneva	Dothan loamy sand	5.8	528(H)	2,500	2,260	68	68
Baxley Farms—B	Geneva	Dothan loamy sand	5.4	140(L)	**730**[1]	**2,350**[1]	**59**[2]	**67**[2]
Bolin Farms	Geneva	Dothan loamy sand	5.7	310(H)	3,220	3,100	70	70

[1] Yield is statistically greater on plots receiving gypsum.
[2] Percentage SMK is statistically greater on plots receiving gypsum.

TABLE 3. EFFECT OF TOPDRESSING CALCIUM AT RATE OF 500 POUNDS PER ACRE OF GYPSUM OR BASIC SLAG ON YIELD AND PER CENT SOUND MATURE KERNELS (SMK) OF PEANUTS, ALABAMA, 1972

Variety and farmer	County	Soil type	Soil pH	Soil-test Ca	Yield per acre			SMK		
					No Ca	Gypsum	Basic slag	No. Ca	Gypsum	Basic slag
				Lb./A.	*Lb.*	*Lb.*	*Lb.*	*Pct.*	*Pct.*	*Pct.*
Florunner										
G. Holmes	Crenshaw	Norfolk loamy sand	5.4	240(M)	3,700	3,700	3,910	73	76	74
F. Thrash	Pike	Dothan loamy sand	5.0	174(L)	3,490	4,080	3,800	**67**[1]	**73**[1]	**71**[1]
J. Bagents	Crenshaw	Brodgen loamy sand	5.2	296(M)	1,650	1,770	1,410	70	72	68
L. Long	Pike	Norfolk loamy sand	5.1	210(M)	3,600	3,680	3,650	68	70	70

[1] Percentage SMK is greater on plots receiving gypsum or basic slag.

TABLE 4. EFFECT OF "MAGI-CAL"[1] IN COMPARISON TO GYPSUM (500 LB. PER ACRE) ON YIELD AND PER CENT SOUND MATURE KERNELS (SMK) OF PEANUTS, ALABAMA, 1972

Variety and farmer	County	Soil type	Soil pH	Soil-test Ca	Yield per acre			SMK		
					No Ca	Gypsum	Magi-Cal	No Ca	Gypsum	Magi-Cal
				Lb./A.	*Lb.*	*Lb.*	*Lb.*	*Pct.*	*Pct.*	*Pct.*
Florigiant										
B. Deloney, Jr.	Dale	McLaurin loamy sand	5.5	179(M)	**670**[2]	**1,530**[2]	**310**[2]	**43**[3]	**62**[3]	**41**[3]
G. Croft	Dale	Fuquay loamy sand	5.8	205(M)	1,840	2,250	1,390	**48**[3]	**60**[3]	**41**[3]
Florunner										
G. Holmes	Crenshaw	Norfolk loamy sand	5.4	240(M)	3,700	3,700	3,640	73	76	74

[1] "Magi-Cal" was applied at 2-week intervals, beginning at early pegging, at rate of 5 qt. per spray; 'Florunners' were sprayed twice; 'Florigiants' were sprayed three times.
[2] Yield is statistically greater on plots receiving gypsum.
[3] Percentage SMK is statistically greater on plots receiving gypsum.

mite per acre on turned and disked land in the spring. The lime was disked-in prior to planting peanuts. The results of these experiments are given in Table 5. Liming increased yields in two of the five experiments (Hartzog and Blankenship farms), even though yields were severely limited in both instances by unusually droughty conditions. The droughty conditions also caused unusually erratic plot yields in some of the other experiments. Consequently, apparent differences in yields are no more than random variation in those cases. Grade was increased by both gypsum and liming only on the Blankenship farm. In the two experiments where lime increased yield, lime was beneficial on the Hartzog farm because it raised pH and on the Blankenship farm because it supplied Ca.

TABLE 5. EFFECT OF LIME AND GYPSUM ON YIELD AND SMK OF PEANUTS, ALABAMA, 1972

Variety and farmer	County	Soil type	Soil pH	Soil-test Ca	Yield per acre			SMK		
					No lime	Lime	Gypsum	No lime	Lime	Gypsum
Florunner				*Lb./A.*	*Lb.*	*Lb.*	*Lb.*	*Pct.*	*Pct.*	*Pct.*
J. Hartzog	Barbour	Sunsweet sandy loam	5.0	213(M)	**770**[1]	**1,350**[1]	1,070	68	72	72
P. W. Blankenship	Dale	Lucy loamy sand	5.3	174(L)	**1,250**[1]	**1,730**[1]	**1,980**[1]	**61**[2]	**66**[2]	**69**[2]
T. Kirkland	Dale	Faceville sandy loam	5.3	254(M)	1,360	1,770	1,690	67	68	67
R. Ward	Henry	Varina sandy loam	5.4	160(L)	1,070	1,580	1,500	63	68	68
G. Paramore	Houston	Dothan loamy sand	5.6	292(M)	3,450	3,520	----	74	74	----

[1] Yield is statistically greater on plots receiving lime or gypsum.
[2] Percentage SMK is statistically greater on plots receiving lime or gypsum.

TABLE 6. EFFECT OF BORON FERTILIZER ON YIELD AND PER CENT SOUND MATURE KERNELS (SMK) OF PEANUTS, ALABAMA, 1972

Variety and farmer	County	Soil type	Soil-test B	Yield per acre			SMK		
				No B	Herb. +B[1]	Fung. +B[2]	No B	Herb. +B[1]	Fung. +B[2]
			Lb./A.	*Lb.*	*Lb.*	*Lb.*	*Pct.*	*Pct.*	*Pct.*
Florigiant									
F. C. Martin	Barbour	Blanton loamy sand	0.11	2,080	1,900	2,240	66	67	70
Florunner									
Mobley Bros.	Henry	Fuquay loamy sand	0.11	2,610	2,620	----	69	69	67
Wiregrass Substation	Henry	Dothan sandy loam	0.29	3,110	3,430	3,210	69	70	68

[1] Mixture of 1 lb. boron + 3 qt. Balan + 3 pt. Vernam in 20 gal. water applied per acre as preplant and incorporated.
[2] Mixture of 0.15 lb. boron + 6 oz. Benlate in 10 gal. water per acre applied as first two sprays for leafspot control.

BORON (B) EXPERIMENTS

Three experiments were harvested in which boron was added to peanuts. In each of these tests, there were two methods of boron application.

(1) **Boron mixed with herbicide:** preplant incorporation of 1 pound of boron in a tank mixture of 3 quarts of Balan and 3 pints of Vernam using 20 gallons of water per acre.

(2) **Boron mixed with fungicide:** 0.15 pound of boron sprayed-on twice in June in 6 ounces of Benlate fungicide at 2-week intervals using 10 gallons water per acre for each spraying.

These experiments were intended primarily to determine the feasibility of adding boron by these procedures. Since adding boron to peanut fertilizers is a general practice that has about eliminated boron deficiency, no special effort was made to locate B-deficient soils for these tests. A significant finding of these tests is that no problems were encountered in applying boron by either method. The yields and grades are given in Table 6 and show no effect from the applied B. Although no boron deficiency—"hollow-heart"—was found in these experiments, the most significant result was that there was no evidence of boron toxicity from the herbicide-boron mixture or from the Benlate-boron experiments.

SUMMARY OF 1967-1972

The last 6 years of experimentation on farmers' fields have shown the following:

There have been no yield increases from directly-applied P and K fertilizers in 34 experiments.

Gypsum in 57 experiments increased yields only on soils with soil-test Ca at about 200 pounds per acre or less.

Boron in 23 experiments increased quality of nuts on soils very low in boron.

Neither basic slag nor Fairfield slag appears to be a satisfactory source of calcium when applied at blooming time.

"Magi-Cal" sprayed on peanuts during blooming and pegging time is not a satisfactory source of calcium.