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E. V. Smith, Director
Auburn, Alabama

Soil Fertility Experiments with Peanuts in 1971

Dallas Hartzog and Fred Adams*

THE COOPERATIVE RESEARCH PROGRAM begun in 1967 to better define soil fertility requirements of peanuts and to improve correlation between fertilizer requirements and soil-test values by conducting experiments on farmers' fields was continued in 1971. Thirty-one experiments were initiated in 1971 in seven counties and 23 were harvested (8 in Henry, 5 in Barbour, 3 in Dale, 2 each in Coffee, Crenshaw, and Pike, and 1 in Houston).

The experimental area on each farm was divided into either 8, 12, 16, or 20 plots, each plot being 4 rows wide and 100 feet long. Each farmer planted, cultivated, dusted or sprayed, and harvested peanuts within all plots the same as those in the remainder of his field. Where the farmer did not carry out an effective program for the control of leafspot, the test area was sprayed with Benlate three times by the researchers.

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, basic slag, or Fairfield slag, (3) boron, (4) lime.

* Research Associate and Professor, Department of Agronomy and Soils.

FERTILIZER (P AND K) EXPERIMENTS

Five experiments were conducted to determine if fertilizer should be applied to peanuts in the spring on soils testing "low" or "medium" in phosphorus (P) or potassium (K). In three of these experiments, the fertilizer was broadcast and then turned (Bostick, Deloney, and Morgan farms). In another experiment, the fertilizer was broadcast after the land had been turned and disked (Johnson farm). The fertilizer was drilled at planting time in the fifth experiment (Fuquay farm). The crop preceding peanuts is listed in Table 1 for each farm.

Fertilizer was broadcast in four of the experiments at a rate of 400 pounds per acre of 0-10-20 to one-half of the experimental plots; the other plots received no fertilizer. With the "drilled fertilizer" experiment, the fertilized plots received 250 pounds per acre of a 5-15-30 plus boron.

Two experiments were with the 'Florigiant' variety, two with 'Florunner,' and one with 'Early Runner.' Three of the soils tested "high" or "very high" in phosphorus, one "medium," and one "low"; four tested "low" in potassium and one "medium."

The results of these experiments are given in Table 1 and confirm results of experiments from previous years. Fertilizer did *not* increase yield or

TABLE 1. EFFECT OF BROADCAST FERTILIZER ON YIELD AND SMK OF 'FLORIGIANT', 'FLORUNNER', AND 'EARLY RUNNER' PEANUTS, ALABAMA, 1971

Variety and farmer	County	Soil type	1970 crop	Soil-test values			Yield per acre[1]		SMK	
				pH	P	K	No fert.	Fert.	No fert.	Fert.
					Lb./A	*Lb./A*	*Lb.*	*Lb.*	*Pct.*	*Pct.*
Florigiant										
J. Bostick	Henry	Dothan loamy sand	idle	5.5	47(M)	56(L)	2,630	2,320	66	67
B. Deloney, Jr.	Dale	Lucy loamy sand	corn	6.4	145(VH)	39(L)	4,590	4,600	73	74
Florunner										
D. Morgan	Henry	Fuquay loamy sand	corn	6.2	94(H)	79(M)	4,330	4,540	74	73
L. E. & J. H. Johnson	Henry	Fuquay loamy sand	Bahia-grass	5.7	14(L)	37(L)	2,700	2,560	73	69
Early Runner										
T. D. Fuquay[2]	Barbour	Dothan loamy sand	corn	6.2	130(VH)	55(L)	3,150	3,430	77	75

[1] Fertilizer did not statistically increase or decrease yield.
[2] Fertilizer drilled.

TABLE 2. EFFECT OF RYE AND SPRING-APPLIED FERTILIZER[1] ON YIELD AND SMK OF 'FLORIGIANT' AND 'FLORUNNER' PEANUTS, ALABAMA, 1971

Variety and farmer	County	Soil type	Soil test values			Yield per acre[2]				SMK			
						Rye		Fallow		Rye		Fallow	
			pH	P	K	No fert.	Fert.	No fert.	Fert.	No fert.	Fert.	No fert.	Fert.
				Lb./A	*Lb./A*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Florunner													
Marshall Bro.	Henry	Faceville sandy loam	5.6	66(H)	77(M)	4,550	4,520	4,790	4,830	77	76	78	77
Florigiant													
F. Martin	Barbour	Alaga fine sand	5.1	48(M)	75(M)	3,060	3,010	2,770	2,930	71	71	69	70

[1] All plots received a fall application of fertilizer.
[2] Yields were not increased or decreased statistically by turned-under rye or spring-applied fertilizer.

grade of peanuts in any experiment. These experiments continue to show that a direct application of fertilizer to peanuts is *not* an economical practice.

Rye as a Cover Crop. Planting rye as a winter cover crop preceding peanuts has become a fairly common practice in the Wiregrass area. It has the obvious asset of providing winter grazing for cattle. In addition, it may have a beneficial effect upon the following peanut crop. To test this possibility, two experiments were conducted in which the effect of rye as a cover crop on peanuts was measured, Table 2. Rye was planted and fertilized in November 1970 and allowed to grow on one-half the plots. After turning under the rye in the spring, one-half of the plots were fertilized with 0-10-20 at the rate of 400 pounds per acre. The results in Table 2 show no benefit from the rye or from the fertilizer applied directly to peanuts in the spring. Excellent yields were made in both experiments: 2¼ tons per acre for one and 1½ tons for the other.

CALCIUM (Ca) EXPERIMENTS

Eleven experiments were harvested in which the effect of calcium, applied as 1,000 pounds per acre of gypsum at early blooming time, was determined. In addition, two of the experiments compared gypsum with basic slag and five compared gypsum with Fairfield slag (Fairfield slag is a by-product of modern steel-making processes and is similar to basic slag). Soil-test calcium ranged from 64 pounds per acre (low) to 512 pounds per acre (high) and soil pH ranged from 4.8 to 6.3. Thus, a wide range in soil calcium and soil acidity was represented by these tests. Results are summarized in Table 3.

Yields were increased by gypsum only on soils testing 214 pounds per acre (low) of calcium or less. Yields were not affected by gypsum on soils testing higher than this in available calcium.

Yields on the three soils "low" in calcium planted to 'Florigiants' were increased about 600 to 800 pounds per acre by the gypsum application. Gypsum

TABLE 3. EFFECT OF TOPDRESSING CALCIUM AT RATE OF 1,000 POUNDS PER ACRE OF GYPSUM, BASIC SLAG, OR FAIRFIELD SLAG ON YIELD AND PER CENT SOUND MATURE KERNEL (SMK) OF PEANUTS, ALABAMA, 1971

Variety and farmer	County	Soil type	Soil pH	Soil-test Ca	Yield per acre				SMK			
					No Ca	Gypsum	Basic slag	Fair-field slag	No Ca	Gyp-sum	Basic slag	Fair-field slag
				Lb./A	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Florigiant												
H. Hartzog and Sons	Barbour	Dothan loamy sand	4.8	87(L)	**2,060**[2]	**2,810**[2]	1,590	----	**51**[3]	**70**[3]	43	
F. Martin[1]	Henry	Troup loamy sand	5.7	167(L)	**2,910**[2]	**3,500**[2]	----	----	**64**[3]	**71**[3]	----	----
D. Averett	Coffee	Red Bay fine sandy loam	5.6	214(L)	**2,690**[2]	**3,300**[2]	----	2,770	67	70	----	65
D. and L. McCart	Coffee	Norfolk sandy loam	5.6	392(M)	2,370	2,240	----	----	72	74	----	----
Florunner												
J. Hartzog	Barbour	Tifton loamy sand	4.9	64(L)	**1,230**[2]	**1,770**[2]	----	----	65	68	----	----
E. Strickland	Crenshaw	Brogdon loamy sand	6.0	294(M)	4,850	4,810	----	----	75	76	----	----
E. Strickland	Crenshaw	Wagram loamy sand	5.8	319(M)	4,230	4,520	4,330	----	76	77	75	----
O. and B. Deal	Dale	Darco sand	6.0	337(M)	3,320	3,200	----	3,530	70	73	----	74
J. L. Falkner-1	Henry	Dothan sandy loam	6.1	402(H)	3,980	3,950	----	4,020	77	76	----	76
J. R. (Jack) Kelly	Houston	Dothan sandy loam	6.3	453(H)	3,780	3,670	----	3,740	73	75	----	73
J. L. Falkner-2	Henry	Tifton sandy loam	6.3	512(H)	3,840	4,050	----	3,890	76	76	----	76

[1] This experiment also included a "lime" treatment (see Table 4).
[2] Yield is statistically greater than yield on plots receiving no gypsum.
[3] Percentage SMK is statistically greater than SMK on plots receiving no gypsum.

TABLE 4. EFFECT OF LIME ON YIELD AND SMK OF 'FLORIGIANT' AND 'FLORUNNER' PEANUTS, ALABAMA, 1971

Variety and farmer	County	Soil type	Soil pH	Soil-test Ca	Yield per acre		SMK	
					No lime	Lime	No lime	Lime
				Lb./A	*Lb.*	*Lb.*	*Pct.*	*Pct.*
Florunner								
A. C. Fomen and Deal Bro.	Dale	Lakeland loamy sand	4.9	75(L)	**1,410**[1,2]	**3,740**[1,2]	77	74
Florigiant								
E. W. Washington	Henry	Wicksburg loamy sand	5.3	186(L)	------	------	**57**[3]	**62**[3]
R. Griffin and Sons	Barbour	Fuquay loamy sand	5.4	76(L)	3,510[1]	3,560[1]	69	70
F. Martin	Henry	Troup loamy sand	5.7	167(L)	**2,910**[2]	**3,480**[2]	**64**[3]	**70**[3]

[1] All plots received gypsum applied by farmer.
[2] Yield is statistically greater than yield on unlimed plots.
[3] Percentage SMK is statistically greater than SMK on unlimed plots.

also increased percentage SMK in two of these tests, one by 19 per cent. Only one "low" calcium soil was planted to 'Florunner,' and gypsum also increased its yield by more than 500 pounds per acre. Because this field was very acid, there is little doubt that the yield of the 'Florunners' was reduced by the very low soil pH (4.9) even on the plots receiving gypsum.

The effect of applying basic slag or Fairfield slag at early bloom was tested at seven sites. However, only two of these soils proved to be deficient in calcium and, therefore, suitable for a gypsum-slag comparison (H. Hartzog and Averett farms). In neither of these experiments was slag found to have any value as a calcium source when applied in this manner, whereas gypsum increased yields by 600 to 800 pounds per acre on the two soils that were "low" in calcium.

LIME EXPERIMENTS

Four experiments in which 1 ton per acre of dolomitic limestone was applied to peanuts were harvested in 1971, Table 4. Lime was applied in November 1970 on the Fomen-Deal farm; subsequently, the land was disked and turned. Lime was applied and disked-in in the spring on the other three farms after the land had been turned and disked.

Soil pH ranged from 4.9 to 5.7 and soil calcium was "low" in each case. The most acid soil was on the Fomen-Deal farm where the farmer added 450 pounds per acre of gypsum to all plots. Without lime (but with gypsum), the yield was 1,410 pounds per acre with a SMK of 77 per cent. With lime, however, the yield was 3,740 pounds, an increase of 2,330 pounds per acre. These yields provide a striking example of how lime serves as more than just a source of calcium on very acid soils. They also show that farmers suffer serious economic losses by not liming such soils.

Yields on the Washington farm (pH 5.3) were not obtained because of a harvesting problem, but samples from the plots were taken and graded. The results showed an increase of 5 per cent in percentage SMK from the lime, and it is reasonable to infer from this that there was also a yield increase from the application of lime.

Lime did not affect yield on the Griffin farm with soil pH at 5.4 and soil-test calcium at 76. However, the farmer applied 650 pounds per acre of gypsum to all plots, thus supplying adequate calcium to both unlimed and limed plots.

The experiment on the Martin farm (pH 5.7) showed that lime was not needed to increase soil pH but did serve as a satisfactory source of calcium. Both yield and percentage SMK were increased about the same from applications of gypsum and lime on this farm, Table 3. This shows that the increase in yield resulted from the application of calcium and not from the change in pH caused by lime.

BORON (B) EXPERIMENTS

Two experiments were harvested in which boron was added at a rate of 1 pound per acre, Table 5. Neither showed any evidence of the telltale symptom of boron deficiency – hollow-heart – even with soil-test boron at about 0.1 pound per acre. Thus, the "critical" soil boron level below which deficiency occurs continues to vary from year to year because

TABLE 5. EFFECT OF BORON FERTILIZER ON YIELD AND PER CENT SOUND MATURE KERNEL (SMK), ALABAMA, 1971

Variety and farmer	County	Soil type	Soil-test B	Yield per acre[1]		SMK	
				No B	Added B	No B	Added B
			Lb./A	*Lb.*	*Lb.*	*Pct.*	*Pct.*
Florunner							
H. E. McDaniel	Pike	Dothan loamy sand	0.086	2,650	2,760	71	73
Virginia-67							
L. Windham	Pike	Dothan loamy sand	0.120	2,470	2,390	64	64

[1] Boron did not increase or decrease yield statistically.

of differences in soil moisture (boron deficiency is more severe under droughty conditions).

The only appearance of boron deficiency in the 1971 experiments was on the Johnson farm, Table 1, with a P-K fertilizer experiment in which boron was omitted from the fertilizer. This field was in bahiagrass from 1960 until 1971. Soil samples were taken from all plots at harvest time and analyzed for available boron. The results are shown in Table 6 along with the amount of hollow-heart in each plot. The lower the level of available soil boron, the greater the percentage of hollow-heart. In this particular experiment, the "critical" boron level for deficiency was less than 0.07 pounds per acre, a value below the boron levels in either of the "boron" experiments.

Table 6. Soil-Test Boron and Percentage Hollow-Heart in a Fertilizer Experiment on Fuquay Loamy Sand in Henry County (Johnson Farm)

Plot no.	Soil-test B	Hollow-heart
	Lb./A	*Pct.*
1	0.090	0.0
2	0.070	0.0
3	0.058	1.0
4	0.060	2.0
5	0.066	---
6	0.066	6.0
7	0.046	9.0
8	0.060	6.0

SUMMARY

The last 5 years of experimentation on farmers' fields have shown the following: no yield increase from directly-applied P and K fertilizers in 29 experiments; gypsum in 37 experiments increased yield only on soils with about 200 pounds per acre of calcium or less; boron in 20 experiments was beneficial in the drier years on soils very low in boron; slag does not appear to be a satisfactory source of calcium when applied at blooming time.