TRANSMITTALS

President Bradford Knapp,
Auburn, Alabama.

Dear Doctor Knapp:

I have the honor to submit herewith the Thirty-ninth Annual Report of the Agricultural Experiment Station of the Alabama Polytechnic Institute.

Yours very truly,

M. J. Funchess,
Director.

Alabama Polytechnic Institute,
Auburn, Alabama.

Governor Bibb Graves,
Montgomery, Alabama.

Dear Sir:

I take pleasure in transmitting to you the Thirty-ninth Annual Report of the Alabama Experiment Station of the Alabama Polytechnic Institute.

Yours very truly,

Bradford Knapp,
President.

NEW PUBLICATIONS

The Influence of Various Nitrogenous Fertilizers on the Availability of Phosphate and Potassium. (J. F. Fudge).—(Alabama Experiment Station Bulletin 227). This study was made on a number of soils from greenhouse work and samples of soil from plots of long-continued experiments conducted by the New Jersey, Alabama, Rhode Island, Pennsylvania, and North Carolina Experiment Stations. Availability was studied by determining the concentration of phosphate and potassium in displaced solutions and in extracts of soils, and by the Neubauer or plant seedling methods.

Acid-forming fertilizers caused a marked decrease in phosphate availability and an increase in water-soluble potassium. Physiologically basic fertilizers caused an increase in phosphate availability and a decrease in water-soluble potassium.

The influence of the individual fertilizers, based on the study of the soils from the long-continued experiments, is summarized.

CONTRIBUTION TO SCIENTIFIC JOURNALS

Parker, F. W., and Fudge, J. F.—**Soil Phosphorus Studies, I. The Colorimetric Determination of Organic and Inorganic Phosphorus in Soil Extracts and in the Soil Solution.** *Soil Science*, 24, 109-117. A study is made of the Deniges, and Fiske and Subbarow methods for the colorimetric determination of phosphorus in the soil solution and soil extracts. The procedure is given for the determination of total and inorganic phosphorus.

The method of Deniges is more sensitive than that of Fiske and Subbarow, and is, therefore, recommended for most work with soil extracts and the soil solution. Data are given showing that moderate amounts of silica do not influence the determination. The Fiske and Subbarow method may be useful in plant analysis or for the determination of phosphorus soluble in dilute acids.

Pierre, W. H., and Parker, F. W.—**Soil Phosphorus Studies, II. The Concentration of Organic and Inorganic Phosphorus in the Soil Solution and the Availability of Organic Phosphorus to Plants.** *Soil Science*, 24, 119-128. The content of organic and inorganic phosphate is determined in the displaced solution and 1:5 water extracts of 21 soils from 9 states. It is shown by absorption studies that plants will not absorb organic phosphate from the displaced soil solutions nor from soil extracts, while they absorb all of the inorganic phosphate present.

Parker, F. W.—**Soil Phosphorus Studies, III. Plant Growth and the Absorption of Phosphorus from Culture Solutions of Different Phosphate Concentrations.** *Soil Science*, 24, 129-146. A study is reported of the concentration of phosphate necessary for the maximum growth of corn and soybeans. Maximum growth was obtained in a culture solution containing 0.50 p.p.m. PO_4.

Growth at 0.25 p.p.m. was good, the dry weight being about 75 per cent of the maximum. It is suggested that a good growth might be obtained at a concentration of 0.10 p.p.m. $P0_4$ if that concentration could be constantly maintained. The bearing of the experimental data on present theories of plant nutrition is discussed.

Parker, F. W., and Pierre, W. H.—**The Relation between the Concentration of Mineral Elements in a Culture Medium and the Absorption and Utilization of these Elements by Plants.** *Soil Science,* 25, 337-343. Data are presented to show the minimum concentration of phosphate and potash required by plants in solution cultures.

Pierre, W. H.—**Nitrogenous Fertilizers and Soil Acidity, I. Effect of Various Nitrogenous Fertilizers on Soil Acidity.** *Jour. Amer. Soc. Agron.,* 19, 254-269. Studies are reported on the effect of various nitrogenous fertilizers on the H-ion concentration and the exchangeable hydrogen of soils. The studies showed that all fertilizers containing ammonia-nitrogen or fertilizers converted to ammonia, such as urea, are acid-forming. The relative amounts of acidity developed according to the exchangeable hydrogen data were as follows: ammonium sulfate 100; sodium nitrate –42; urea 42 to 50; Ammo-Phos A 100 to 104; ammonium nitrate 42 to 55; Leunasaltpeter 68 to 76; calcium cyanamid –55; and calcium nitrate –39.

Pierre, W. H.—**Nitrogenous Fertilizers and Soil Acidity, II. The Use of Fertilizer Combinations, Lime, and Basic Slag in Correcting the Acidity Formed by Various Nitrogenous Fertilizers.** *Jour. Amer. Soc. Agron.,* 20, 269-279. A combination of sodium nitrate and ammonium sulphate in which the proportion of nitrogen in these materials is in the ratio of 75 to 25, respectively, did not change the reaction of soils. The amounts in pounds of pure precipitated calcium carbonate required to neutralize the acidity formed by the various acid-forming nitrogenous fertilizers per pound of nitrogen were as follows: ammonium sulphate 5.85; ammonium phosphate 4.88; Leunasaltpeter 4.39; urea 2.92; and ammonium nitrate 2.92. Basic slag was found to be 55 per cent as effective as calcium carbonate in neutralizing the acidity formed by ammonium sulphate.

Pierre, W. H., and Fudge, J. F.—**The Adjustment of the Reaction of Indicator Solutions and Its Importance in Determining the H Ion Concentration of Slightly Buffered Solutions.** *Jour. Amer. Chem. Soc.,* 50, 1254-1262. The importance of adjusting indicator solutions to definite reactions when they are to be used with poorly buffered solutions was shown. Two methods of adjustment were proposed.

Fudge, J. F.—**Influence of Various Nitrogenous Fertilizers on Availability of Phosphate.** *Jour. Amer. Soc. Agron.,* 20, 280-293.

In a study of the influence of different sources of nitrogen on the availability of phosphate in soils the following methods were used: determinations of PO_4 concentration of the displaced soil solution, of 1:5 water extracts, of 1:5 carbonic acid extracts, and of continued leachings; Neubauer tests; and the removal of phosphate by soils from a solution of mono-potassium phosphate. All methods showed that physiologically basic nitrogenous fertilizers increased and acid-forming fertilizers decreased phosphate availability, as compared with the check plots, when lime is not applied. Lime increased the availability of the phosphate on all plots.

Salmon, W. D., Guerrant, N. B., and Hays, I. M.—**On the Existence of Two Active Factors in the Vitamin B Complex, II.** *Jour. Biol. Chem.*, 76, 487. There are presented data bearing upon three points which have received further consideration in the studies of the vitamin B complex now being conducted in this laboratory. These are (1) the relative adsorption of the B-P and the P-P factors by fuller's earth; (2) the further purification of the P-P fraction; (3) the retardation of growth by an insufficiency of the B-P factor.

In slightly acid aqueous solutions containing both the B-P and the P-P factors there is a tendency for fuller's earth to adsorb selectively the B-P factor. If a small amount of fuller's earth is used, an adsorbate which is very rich in the B-P factor but very low in the P-P factor may be obtained.

Three successive treatments of an extract of velvet bean leaves with fuller's earth and a fractionation of the concentrated filtrate with alcohol furnishes a preparation rich in P-P factor but containing only a trace of B-P factor. The final trace of B-P factor may be inactivated by heating for 4.5 hours and 15 pounds pressure.

A low concentration of either the B-P or the P-P factor in the diet limits the rate of growth. More B-P factor is required to produce growth than merely to protect a non-growing rat against the onset of beriberi. The rat-growth method cannot be used as a measure of the potency of a food in the P-P fraction unless the experimental diet provides an optimum of the B-P factor.

AGRONOMY

Rotation Experiments. (R. Y. Bailey).—The Old Rotation experiment was started in 1896. This experiment includes plots cropped continuously to cotton and corn with or without legumes, a two-year rotation of cotton and corn with legumes, and a three-year rotation of cotton, corn, and oats with legumes. Each plot in the experiment has received the same applications of phosphate and potash. No nitrogenous fertilizer has been applied since the beginning of the experiment.

Average yields for the eight-year period, 1920-1927, show

that plot 1, which has been cropped continuously to corn with legumes, has produced 8.2 bushels of corn per acre more than plot 2, which has been cropped continuously to corn, without legumes. Plot 1 produced 2.6 bushels of corn per acre more than plots 4 and 7 on which a two-year rotation was followed, and .7 bushel per acre more than plots 10, 11, and 12 on which a three-year rotation was followed. Continuous cropping of cotton with legumes produced 436 pounds of seed-cotton per acre more than continuous cropping to cotton without legumes. Continuous cropping to cotton with legumes produced 101 pounds of seed cotton per acre less than a two-year rotation and 16 pounds of seed cotton per acre more than a three-year rotation. Legumes were grown in both the two and three-year rotations. The crop of 1925 failed because of drought. The 1920-1927 yields represent an eight-year average of seven crops.

The Cullars Rotation experiment was started in 1911 to study the relative value of superphosphate and rock phosphate in a three-year rotation. The rotation includes both summer and winter legumes that are turned under before cotton and corn are planted. Rock phosphate has produced approximately the same yields of corn and oats as superphosphate. Superphosphate has produced an average annual yield of 82 pounds of seed cotton per acre more than rock phosphate for the entire period of the experiment, 1911-1927. Superphosphate was applied at the rate of 544 pounds per acre and rock phosphate at the rate of 1,088 pounds per acre. Uniform applications of muriate of potash and nitrate of soda were made on all plots.

In 1914 additional treatments were started to study the effect of legumes in the rotation. Plots A and B each had 480 pounds of superphosphate and 100 pounds of muriate of potash per acre in the rotation. Plot A had legumes turned under while plot B had no legumes. Average yields for the seven-year period, 1920-1927, show that plot A has made 384 pounds of seed cotton, 20.9 bushels of corn and 7.5 bushels of oats per acre more than plot B. These increases in yield are due to the effect of legumes in the cropping system.

A Comparison of Superphosphate and Rock Phosphate for Cotton. (R. Y. Bailey).—An experiment comparing superphosphate and rock phosphate as sources of phosphorus for cotton has been conducted since 1920. Four plots in the experiment received 320 pounds of superphosphate per acre, three plots received 320 pounds of rock phosphate per acre, and two plots received no phosphate. Each plot in the experiment received 160 pounds of kainit and 160 pounds of nitrate of soda per acre annually. The average yield of seven crops, from 1920 to 1927, show that the four superphosphate plots averaged 937 pounds of seed cotton per acre. The three rock phosphate plots averaged 825 pounds of seed cotton per acre and the two plots which received no phosphate averaged 617 pounds per acre.

Methods of Seeding Oats. (H. B. Tisdale).—From 1921 to 1927, an experiment comparing different methods of seeding oats was conducted. The experiment included five different methods of seeding. All treatments were run in duplicate. The methods of seeding used, the yields for 1927, and the average yields are shown in Table 1.

Table 1.—Method of Seeding and Yields of Oats

Plot	Method of seeding	Bushels of oats per acre	
		1927	Average yield 1921-1927*
1	Broadcast and disked in	52.9	40.5
2	Drilled with one-horse drill	52.2	40.2
3	Broadcast and plowed in with twister	55.9	47.6
4	Land broken with two-horse plow, seed broadcast and disked in	55.9	48.6
5	Land broken with two-horse plow, seed drilled with one-horse drill	59.3	47.5

*Crop of 1924 discarded on account of freeze injury.

Cotton Variety Tests. (H. B. Tisdale).—Twenty-five *non-wilt-resistant* varieties of cotton were tested in Colbert, Marion, Morgan, Marshall, Lee, Autauga, and Perry counties. Table 2 shows the five highest yielding varieties and the yield of lint-cotton per acre for each section of the state.

Table 2.—Average Yield of Lint Cotton per Acre for Each Section of the State

North Alabama Average 14 tests 1922-1927		Central Alabama Average 8 tests 1924-1927		Black Belt Average 5 tests 1922-1927	
Variety	Yield	Variety	Yield	Variety	Yield
	Pounds		Pounds		Pounds
Cook 1010	424	Cook 1627	436	Piedmont	
Piedmont				Cleveland	378
Cleveland	375	Cook 1616	436	Cook 1010	374
Bottoms	374	Cook 588	422	Dixie Triumph	352
Cook 588	370	Dixie Triumph	420	Cook 588	335
Dixie Triumph	369	Bottoms	408	Bottoms	335

Twelve *wilt-resistent* varieties of cotton were tested in Lee, Autauga, Escambia, Covington, Houston, and Lowndes counties. The average results of 26 tests over a period of 5 years (1923-1927) show the yield of lint cotton per acre from the highest yielding varieties to be as follows: Cook 307-6, 375 pounds; Dixie Triumph, 360 pounds; Toole Petty, 359 pounds; Toole Council, 347 pounds; and Lewis 63, 346 pounds.

Corn Variety Tests. (H. B. Tisdale).—Twenty varieties of corn were tested in North, Central, and South Alabama. Table 3

shows the five highest yielding varieties with the yield in bushels of grain per acre for each section of the state.

Table 3.—Average Yield of Corn per Acre for Each Section of the State 1922-1927

North Alabama Average 9 tests		Central Alabama Average 6 tests		South Alabama Average 7 tests	
Variety	Yield	Variety	Yield	Variety	Yield
	Bushels		Bushels		Bushels
Weekley	21.0	Whatley	27.8	Neal's Paymaster	23.8
Pee Dee No. 5	20.3	Douthit	26.5	Whatley	22.6
Hastings	19.9	Weekley	26.1	Weekley	21.4
Neal's Paymaster	19.9	Hastings	25.8	Douthit	21.4
Douthit	19.7	Pee Dee No. 5	25.1	Hastings	21.3

Cotton and Corn Breeding. (H. B. Tisdale).—The work on the leading varieties of cotton to improve the yield and staple was continued. A number of better strains of Cook 1010, Cook 1627, Bottoms and Cook 307-6 *wilt resistant* have been isolated from plant to row tests and multiplied. Several promising cotton hybrids are being studied.

Several strains of the Whatley variety of corn were self-fertilized for the purpose of obtaining pure line strains that may be combined for better yields.

Rate of Fertilizing Cotton. (J. T. Williamson).—The average of many early experiments by this station show that a complete fertilizer gives best results on cotton on nearly all Alabama soils.

Recent tests on rate and ratio of applying fertilizers to this crop which have been made on Norfolk, Greenville, Hartsell, Cecil, Decatur, Clarkesville, Oktibbeha, and Houston soil groups show that 100 pounds of nitrate of soda, 200 pounds of superphosphate, and 25 pounds of muriate of potash is the proper ratio of combining these materials for cotton under the conditions of the experiments.

When these fertilizing materials were combined in the above ratio and applied at rates of 325 pounds, 650 pounds, and 975 pounds per acre, the most dependable profits resulted from the use of 650 pounds on all soils except the Houston group. On this group the 325 pound rate gave best results. The use of 975 pounds of fertilizer was often more profitable than smaller amounts; however, due to the small margin of profit, this rate of application is not recommended.

A complete report of these results can be found in Bulletin 228 of this station.

Stable Manure, Nitrate of Soda, and Vetch as Sources of Nitrogen for Cotton and Corn. (F. E. Bertram).—An experiment comparing stable manure, nitrate of soda, and vetch as sources

of nitrogen for cotton and corn has been conducted since the fall of 1924. The manure plots receive 5 tons per acre annually and the nitrate of soda plots receive 325 pounds per acre annually. Vetch is allowed to grow until about April 1 before being turned under.

The results of the past three years show that the manure plot made 1,287 pounds, the nitrate of soda plot 1,092 pounds, and the vetch plot 1,340 pounds of seed cotton per acre. The two unfertilized check plots averaged 390 pounds of seed cotton per acre. The corn yields per acre were 6.8 bushels on the check plots, 27 bushels on the manure plots, 31.2 bushels on the nitrate of soda plot, and 32 bushels on the vetch plot.

The Nature of Soil Buffer Action with Special Reference to the Exchangeable Complex. (W. H. Pierre).—A study of the buffer action of soils and soil colloids showed that the buffer action of soils is largely confined to the colloidal fraction. Not only did the amount of colloid influence the buffer action of soils but the chemical composition of the colloid was equally important. Colloids which had high SiO_2:R_2O_3 values were found to have a much higher buffer capacity than those which had low ratios. Thus, the "specific buffer capacity", determined between pH 4.5 and 6.5, of a colloid obtained from a gray silt loam from Illinois was found to be 13.8, while that of a fine sandy loam from Alabama was only 6.6. The SiO_2:R_2O_3 values of these colloids were 2.78 and 1.17, respectively. A study of a large number of soils from several states showed a close correlation between the buffer action and their total exchange capacity. Thus, the buffer action of soils may be considered as largely due to ionic exchange between the base or acid added to a soil and the bases or hydrogen found in the exchange complex.

The Neutralizing Values and the Rates of Reaction with Acid Soils of Different Grades and Kinds of Liming Materials. (W. H. Pierre).—Studies were made of the reaction of ground limestone, crushed oyster shells, and basic slag of different degrees of fineness with acid soils after various periods of time. The results showed that the two important factors influencing their rates of reaction are the H-ion concentration of the soil and the degree of fineness of the liming materials. The greater the H-ion concentration or the greater the avidity of the soil acids the more quickly do the liming materials react. Ground limestone and oyster shells coarser than 20-mesh were very slowly reactive with medium acid soils. Limestone coarser than 20-mesh gave a value of about 20 after two years, as compared with a value of 100 for precipitated calcium carbonate, while with an extremely acid soil the value was 37 after one year. The 20 to 60-mesh limestone gave values with the medium acid soils after two years of about 60, while with two very acid soils it gave values of about 88 after one year. Crushed oyster shells gave about the same neutralizing value after the various periods of time as the

ground limestone of similar grades of fineness, although the coarse grade shells seemed slightly less effective than the coarse grade limestones. Results with basic slags also show a greater rate of reaction as the degree of fineness is increased and a greater rate with strongly acid than with medium acid soils.

Methods for Determining the Amounts of Lime Required to Bring Soils to Definite pH Values. (W. H. Pierre).—Studies were made of the buffer action of soils to a base and of the determination of exchangeable hydrogen as methods for determining the amounts of lime required to bring soils to definite pH values. The buffer capacity of the soil toward a base can be determined in the laboratory by the "dialysis colorimetric" method. A three-day period of contact between the soil and $Ba(OH)_2$ was found to be sufficient for the establishment of equilibrium. The amounts of lime necessary to bring potted soils to definite pH values were found to be higher than the amounts of base required in the laboratory. The relation between the two values, called the "liming factor", was found to be quite uniform for various soils. Seventy-seven soils of widely different texture and acidity gave an average "liming factor" of approximately 1.5 when they were brought to pH values below neutrality. Liming soils in accordance with their content of exchangeable hydrogen brought the soils to pH values of approximately 6.5. These two methods, therefore, can be used to determine the lime necessary to bring soils to definite pH values.

The Concentration of Organic and Inorganic Phosphorus in the Soil Solution and Soil Extracts and the Availability of the Organic Phosphorus to Plants. (W. H. Pierre and F. W. Parker).—The displaced soil solutions of 21 soils from 9 states were found to have an average of 0.09 p.p.m. of inorganic and 0.47 p.p.m. of organic phosphate. The 1:5 soil extracts of the same soils gave an average concentration of 0.35 p.p.m. inorganic and 0.22 p.p.m. organic phosphate.

It was shown by absorption experiments that plants would not absorb organic phosphate from soil extracts or the displaced solution. In the same experiment the plants absorbed all of the inorganic phosphate present. In another experiment corn made no growth when organic phosphate in soil extracts was the only source of phosphorus, but made good growth in other soil extracts containing inorganic phosphate. The growth in the various extracts was almost proportional to the inorganic phosphate present.

The Adjustment of the Reaction of Indicator Solutions and Its Importance in Determining the Hydrogen-Ion Concentration of Slightly Buffered Solutions. (W. H. Pierre and J. F. Fudge).—The quinhydrone electrode can be used for determining the reaction of the indicator solutions; the hydrogen electrode is not absolutely reliable when indicators are present, for a constant

potential is not obtained. Apparently this is due to the reducing effect of the hydrogen as the indicator solutions gradually turn a yellowish-green color as the hydrogen is introduced. The "varying drop method" is also useful for the adjustment of indicator solutions. It depends on the principle that if an indicator solution is more alkaline or more acid than the weakly buffered solution to be tested, a different pH value will be found when different quantities of the indicator solution are used. Indicator solutions made up without neutralization, solutions adjusted to pH 7.0 and those made up according to Clark, give erroneous results with slightly buffered solutions. For such solutions the indicator solutions are shown to require adjustment to a pH corresponding to about the middle of the transition interval.

ANIMAL INDUSTRY

Forage Crops for Fattening Hogs. (J. C. Grimes and W. E. Sewell).—A study of forage crops for fattening hogs shows that hogs which were self-fed corn and tankage while grazing oat and vetch pasture made larger daily gains, but more expensive gains, than hogs on similar pasture with the corn and tankage limited to 3 per cent of the live weight of animal. In the former case the rate of gain was 1.94 pounds per day at a feed cost of $8.50 per hundred-weight gain and in the latter 1.58 pounds per day at a feed cost of $4.94 per hundred-weight gain. The check group receiving corn and tankage in the dry lot gained 1.85 pounds per day at a cost of $8.62 per hundred-weight gain.

Three-fourths of an acre of pasture gave a return in feed value of $21.40 when the grain ration was limited and $7.60 when it was self-fed.

Winter Feeding and Time of Marketing Steers. (J. C. Grimes).—The steer-feeding studies were continued. Steers that received a ration of cottonseed meal, Johnson grass hay, and a medium allowance of blackstrap molasses for a period of 112 days made larger daily gains, carried more finish at the close of the experiment, and returned a greater profit than did those receiving a ration of cottonseed meal and Johnson grass hay.

Johnson grass hay alone proved to be a satisfactory ration for wintering steers. The average daily gains were increased 0.23 pound per head by adding 2.18 pounds of cottonseed meal daily. The results again indicate that it is more profitable to limit the winter ration and finish steers on grass for the June market than it is to full-feed during the winter and market in the spring. The feeding of 7.73 pounds of cottonseed meal daily to steers that were finished on grass increased the daily gains .83 of a pound and the profits $3.42 per head.

Improving Scrub Hogs by the Use of Purebred Sires. (J. C. Grimes and W. E. Sewell).—The experiment on improving scrub

hogs by the use of purebred sires is being conducted with a view of determining the improvement which can be made on the native scrub hog by using purebred boars in a "grading up" process. Several groups of pigs representing scrubs, fifty per cent, seventy-five per cent, and eighty-seven and one-half per cent purebreds have been fattened on a ration of yellow corn and tankage, self-fed, plus a mineral mixture, self-fed. Results are measured in length of time and amount of feed required to reach 200 pounds in weight.

The experiment shows that with one exception the length of time and the amount of feed required to produce a 200 pound hog decreased as the grade of the animal increased.

The 87½ per cent purebred hogs reached 200 pounds in weight 61 days sooner than the scrubs and required 167 pounds less feed to make 100 pounds gain. The cost per pound gain was 6.5 cents for the high grade and 9.8 cents for the scrubs.

The 50 per cent purebred hogs made a better showing than the 75 per cent purebred group, from the standpoint of both rate and cost of gains. This was not to be expected but might be explained by the individuality of the animals in the two groups.

Mineral Supplement in the Dairy Ration. (W. H. Eaton).—The effect of mineral supplements on milk production of cows and size of offspring is being studied. All cows in the college herd are fed as nearly alike as conditions permit with the exception of the mineral supplements. Group I is a check lot and receives no mineral. The cows in Group II, in addition to the regular ration, receive 4 ounces daily of bone meal, while those in Group III receive 4 ounces daily of marble dust.

Records have been secured covering two complete lactation periods on mature cows in the college herd. The observations to date show that mineral supplements have had no marked effect on milk production or size of offspring.

The Effect of H Ion Concentration Upon Adsorption of the Vitamin B Complex. (W. D. Salmon, N. B. Guerrant, and I. M. Hays).—Previous studies in this laboratory have shown that fuller's earth adsorbs the B-P and P-P factors of the vitamin B complex. These studies have, moreover, shown the tendency of the earth to selectively adsorb the B-P factor from solutions containing both factors. The adsorption has always been made from acidic solutions but the reaction of the solutions was not carefully controlled. A study of the effect of H ion concentration upon the adsorption of the two factors by fuller's earth was undertaken with the idea that a basis for a more effective action of the adsorbent might be obtained.

It was found that the reaction of the solution determines to a large extent the efficiency of adsorption of either the B-P or the P-P factor. The optimal adsorption of the B-P factor was obtained in a zone between pH 3.0 and pH 5.5 (equilibrium pH) with the maximum at about pH 4.0. From this zone there is a

gradual decrease in adsorption with increase in acidity and a rapid decrease with increase in alkalinity. The adsorption reached zero at about pH 11.00. On the other hand the absorption of the P-P factor was optimal at pH 0.08, the most acidic solution tested. The adsorption gradually decreased to pH 6.3, from which point it remained practically constant throughout the alkaline range of the tests.

These results indicate fundamental differences in the chemical nature of the two factors as they exist in the extracts of maize and yeast which were treated with the adsorbent. The B-P factor behaves like a cation, resembling quinine in its adsorption phenomena; it probably has somewhat weaker basic properties, however, than has quinine. The P-P factor, on the other hand, more nearly resembles glucose in its behavior toward fuller's earth. The possibility is not excluded, however, that the P-P factor is acidic in nature.

In the above studies the P-P factor has been considered as dual in nature, having both a growth-stimulating and a pellagra-preventing action. Some preparations were obtained in these studies which enable rats to grow for considerable periods but which did not prevent the onset of pellagra. Some of the animals continued to grow even after the ophthalmia and dermatitis of pellagra were quite pronounced. Eventually, the morbid changes became so severe that the animals declined and died. Such results seem to show that the growth-promoting and the pellagra-preventing properties are not inherent in a single substance but that at least two factors are involved in this dual function of the P-P fraction.

Factors Affecting the Adsorption of Quinine, Oxalate, and Glucose. (N. B. Guerrant and W. D. Salmon).—A study of some factors affecting the adsorption of an organic cation, anion, and non-electrolyte was made. This was considered desirable in order that a better understanding of the behavior of the active factors of the vitamin B complex might be obtained. The studies involved two adsorbents, fuller's earth and Norite.

The size of particle of the adsorbent is of minor importance in the adsorption of electrolytes but is of major importance (when the specific surface is affected) in the adsorption of a non-electrolyte. Heating of fuller's earth to a moderately high temperature decreases its adsorptive capacity for quinine or oxalate but does not affect its ability to adsorb glucose.

The concentration of H ion in the solution from which adsorption occurs is of prime importance in the adsorption of electrolytes; it may also affect the adsorption of a non-electrolyte. The optimal adsorption of quinine by fuller's earth or Norite occurs in a zone extending from about pH 5.0 to pH 7.0. There is practically no adsorption of quinine from solutions more alkaline than pH 9.0, equilibrium reaction. The optimal adsorption of oxalate by fuller's earth occurs in the same zone but alkalinity

does not depress the adsorption as rapidly as in the case of quinine. Adsorption of oxalate by fuller's earth ceases at pH 1.0. The adsorption of oxalate by Norite is greater in strongly acidic solutions, decreasing rather rapidly with decrease in H ion until it becomes insignificant at pH 8.0. The optimal adsorption of glucose by either fuller's earth or Norite occurs in strongly acidic solutions.

Electrodialysis or acid treatment followed by electrodialysis did not increase the adsorptive capacity of fuller's earth for quinine; such treatment, moreover, almost destroyed the ability of the earth to adsorb oxalate. These treatments tended to increase the adsorption of glucose by fuller's earth. It is evident that the adsorption of electrolytes by fuller's earth is directly related to the ionic content of the adsorbent, since this type of adsorption is in the nature of an exchange of equivalent amounts of ions between the adsorbent and the solution being treated. There is a tendency for strong cations to bind strong anions and for weak cations to bind weak anions. Thus it happens that on the acid side of the neutral point of the earth there is a tendency for the weaker cations to be adsorbed by the earth and the more active cations to be left in solution, paired with the anions which are more active than the weak silicate anion; in other words, in acidic solutions the elements which rank highest in the electromotive series will be the least readily adsorbed. The reverse of this is true in alkaline solutions; the higher the rank of an element the more readily it is adsorbed. The same rule relating to the binding of ions of similar activity holds true in the adsorption of anions by fuller's earth. In this case, however, the silicate part of the complex plays a relatively unimportant role; it is the bases of the adsorbent that bind the adsorbed anion, although the insoluble silicate is removed along with the adsorbate.

The adsorption of a non-electrolyte, however, does not depend upon the ionization of the adsorbent but is directly related to the solubility of the substance to be adsorbed, to the viscosity and surface tension of the solution, and to the specific surface of the adsorbent.

Experimental Pellagra of the Rat. (W. D. Salmon, I. M. Hays and N. B. Guerrant).—It has previously been shown in this laboratory that rats, receiving the B-P factor as the sole supplement to an otherwise vitamin B-free diet, develop certain external symptoms which are characteristic of human pellagra. A careful study of this syndrome is being made.

The disease as it occurs among rats receiving the purified diet is characterized by emaciation, ophthalmia, alopecia, and usually a dermatitis which may be either a dry or a wet form. The feet become dry, scaly, and often cracked and hyperemic. Of the internal lesions, the most striking condition is a severe gastro-enteritis which is invariably found in advanced stages of the disease. In many cases the small intestine appears to be a

reddish-brown gelatinous mass. The walls of the intestine contain numerous hemorrhages and the content of the intestine is often reddened with blood. Atrophy of the spleen and fatty infiltration of the liver are common.

Rats that receive a diet which contains considerable amounts of the P-P factor but less than the amount required for complete protection do not develop the characteristic internal lesions; such animals, however, frequently develop a dermatitis. The dermatitis is usually the dry form but in exceptional cases weeping lesions develop.

A gram-positive coccus has been isolated from both forms of skin lesions; in many cases this organism has been obtained in pure culture from such lesions. The liver and spleen from rats in advanced stages of pellagra, frequently yield pure cultures of the same organism. An apparently identical organism has also been isolated from several cases of human pellagra.

The results obtained seem to indicate that the characteristic lesions of pellagra are caused by an organism. Nevertheless, the nature of the diet influenced to a marked degree the course of the disease, the effect of the diet being directly due to a specific substance, the P-P factor. It has been found that a relatively low concentration of the P-P factor inhibits the growth of the coccus in culture media. This may indicate that the beneficial effect of the P-P factor is intimately linked with its bactericidal action. The animal organism seems to be unable to establish an immunity against this infection except through a reserve of the P-P factor. This substance, moreover, cannot be synthesized by the rat or the human but must be ingested preformed in the food. It is therefore evident that the importance of including in the diet such foods as lean meat, milk, and fresh vegetables, particularly the green, leafy vegetables, which are known to have a high content of the P-P factor, cannot be overemphasized.

AGRICULTURAL ECONOMICS

Local Cotton Marketing in Alabama. (J. D. Pope).—The object of this study which began in the fall of 1926 is to measure the relation of the grade and staple of cotton to prices paid to producers.

Table 4 shows the percentage of different staple lengths composing the crop as indicated by sample of the crop taken.

Table 4.—Percentage of Different Staple Lengths Produced in Alabama 1926-1927

Marketing season	No. of bales sampled	Per cent distribution of staple			
		Below 7/8″	7/8″	15/16″	Inch and above
1926-27	5,047	0.65	92.39	6.26	0.70
1927-28	3,585	14.59	84.60	0.67	0.14

In 1926-27 farmers received for 2,632 bales of cotton used in the study an average price of 11.62 cents per pound. Had this cotton been sold on government grade at spot prices as officially quoted on the Montgomery market farmers would have received 12.56 cents per pound. In other words, the farm price was 0.94 cents per pound, or $4.70 per bale below the Montgomery price. It is very difficult to determine exactly what the farm price should be as compared with the Montgomery price but, according to the Alabama Farm Bureau Cotton Association, farmers in the towns studied should receive not more than about 10 points off Montgomery. This suggests that farmers did not receive the exact value of their cotton in 1926. The record-breaking crop with the demoralized marketing conditions was probably an important factor in this discrepancy in prices.

In 1927-28 farmers received an average price of 20.16 cents per pound for 2,076 bales of cotton. The official Montgomery price for the same grades of cotton on the same days was 20.38 cents per pound, a difference in favor of the Montgomery price of 22 points or $1.10 per bale.

The results of both 1926 and 1927 have indicated a lack of exact pricing of cotton according to grade in local markets. Length of staple is practically ignored in pricing individual bales. The data collected show that thirteen-sixteenths inch cotton, seven-eighths inch cotton, and fifteen-sixteenths inch cotton of the same grades brought about the same average prices, no staple differences in prices being apparent.

Wide variations occurred in prices paid for the same grade and staple of cotton on the same day amounting frequently to as much as $10.00 per bale.

Hog Production on Farms in Southeast Alabama. (J. D. Pope).—Special attention is being given in this study to the economics of hog production. The growing of pork in this area is based on the peanut crop, although between peanut crops the hogs get a good deal of corn and other feeds. Of approximately 4,500 acres of finishing crops used on 100 farms in this region, four-fifths of the acreage consisted of peanuts planted either solid or interplanted in corn, an average of 12 bushels per acre of corn being harvested before the hogs were turned in. Eight hundred eighty-six thousand pounds of marketable pork were produced on these farms from April 1, 1927 to March 31, 1928.

Preliminary summaries indicate that the hogs were fed an average of about four tons of concentrates per farm, mostly corn, but including shorts, velvet beans, sweet potatoes, and skim milk. The cost of the concentrates amounted to about two cents per pound of pork produced.

Those farmers who, in addition to permanent pasture, provided grazing crops in the spring and early finishing crops, fed much less grain per hundred pounds of pork produced than those who did not provide these supplementary grazing and

early finishing crops. However, the profitableness or unprofitableness of supplementary grazing crops has not been determined.

The average farm income was $1,111 but if interest on investment be deducted, a labor income of minus $28.00 is the result. There were considerable variations in income.

Economic Study of Poultry in Marshall County. (C. G. Garman and J. D. Pope).—Data on 31 farm poultry flocks for 1927 showed an average net return per farm, making no deduction for labor, of $205.00. If labor spent on these flocks is valued at current rates, the return per farm was $135.00. On 55 small farm flocks, averaging 33 birds, a return of $56.00 is indicated, making no charge for labor.

Feed is the chief expense in the poultry enterprise, constituting 73 per cent of the total. Labor is next in importance being 17 per cent of the total. In the cost of producing eggs, feed was 63 per cent of the total expense, depreciation of flock 16 per cent, and labor 14 per cent.

High production per bird appears to be essential to better than average profits, although merely securing high production per bird does not insure profits. The farms on which the cost of egg production was below 20 cents per dozen had an average production of 166 eggs per bird. The farms on which the cost was above 20 cents per dozen had an average production of 115 eggs per bird. The average selling price per dozen eggs was 27 cents.

Those farms which produced about half of their eggs during the months of high prices, September, October, November, December, January, and February received an average price of 29 cents per dozen eggs. Those farms which produced only about one-third of their eggs during these months of high prices received an average of 25 cents per dozen eggs. The former group

Table 5.—Income for Different Tenure Groups

Tenure group	Number of farms	Average capital	Farm income	Labor income	Int. on investment
		Dollars	Dollars	Dollars	Per cent
Owners renting out land ⅓ and ¼	17	10,633	689	51	3.9
Owners renting out land on halves	13	9,780	1,523	936	12.4
Owners renting out no land	29	6,369	599	217	5.4
Part owners renting in land for feed crops	7	3,639	483	261	5.5
Part owners renting in land for cotton	13	5,269	698	382	7.8
Renters	13	637	528	489	—
Average all farms	92	6,470	741	353	7.2

received an average return per hour of labor of 51 cents while the latter group received 22 cents per hour of labor.

Table 5 shows considerable variations in income for different tenure groups of these farmers.

AGRICULTURAL ENGINEERING

Farm Machinery. (M. L. Nichols).—The following conclusions and recommendations were made from experimental and investigational work in Lee, Macon, Crenshaw, Barbour, Henry, Dale, and Covington counties of Alabama.

(1) The two-mule cultivator and combination planter and fertilizer distributor were found to be the most needed equipment in this section. These are recommended as the first step when changing from a one-mule to a two-mule system of farming.

(2) It was found that one man could plant and cultivate 60 acres with the equipment listed above.

(3) The pipe-gang, large-wheel, pivot-axle cultivator was found to be best adapted to work on bedded or furrow crops. This should generally be equipped with a set of 10-, 12-, and 16-inch sweeps and disc hillers. Bedding may be done satisfactorily with a cultivator, in which case a bedding bar is desirable. The fertilizer side dressing attachments were found satisfactory where new process nitrates were used; with gummy or sticky fertilizer, this equipment was unsatisfactory. The cultivator was found to be well adapted to digging peanuts when equipped with half buzzard-wing sweeps.

(4) Surveys of farm practice on the sandy land of Crenshaw county showed that "pointrows" could be eliminated by running the rows across the terraces on gentle grades. The maximum grade found where this practice was followed was on land having a slope of 14 per cent. Experiments showed that this practice was satisfactory where cotton was planted flat or where a low bed was used.

Terracing. (M. L. Nichols).—Experiments were conducted in several parts of the state with a new type of terrace consisting essentially of the combination of a low mound and a shallow ditch. Two years tests of methods of construction indicate that this type of terrace can be constructed for less than one-half of the cost of the old-type, broad-base Mangum terrace, and that this type of terrace gives less trouble by breaking, in addition to being easier to cross.

Threshing and Plowing Vetch. (M. L. Nichols).—Experiments with various equipment for plowing under vetch showed that the rolling coulter attached to walking plows was the practical and economical equipment for the one- or two-mule farmer. Where sulkey plows were available, the combination jointer and coulter was most satisfactory in that the field was left in a clean-

er condition. Experiments in threshing showed that a standard threshing machine with a cylinder speed of 300-350 R. P. M. was satisfactory for threshing vetch.

BOTANY

Changes in Sweet Potatoes During Maturation, Curing, and Storage. (W. A. Gardner).—Three years' results indicate that during the growth of sweet potatoes there is a gradual decrease in the percentage of moisture, a gradual increase in the percentage of starch and sucrose, and no increase in percentage of reducing sugars. The data indicate that the removal of the tops about six weeks before general harvest induced an increase in the percentage of moisture and a corresponding decrease in the percentage of carbohydrates. With other conditions the same, uncured Porto Rico sweet potatoes contained a higher percentage of moisture and a lower percentage of starch and sucrose than the cured. When cured sweet potatoes were stored under dry and humid conditions respectively, but not ventilated, those under humid conditions contained a higher percentage of moisture and sucrose and a lower percentage of starch than those under dry conditions. When the effects of no ventilation and humid ventilation were compared for cured potatoes in a humid atmosphere, the percentages of moisture and sucrose were higher and the percentage of starch lower in those not ventilated. When the effects of no ventilation and dry ventilation were compared in the case of cured, dry-stored sweet potatoes, the percentage of moisture and sucrose was higher and the percentage of starch lower, in those not ventilated. Respiration was high in unventilated potatoes. There was usually more difference in respiration between ventilated and not ventilated, than between either cured and uncured potatoes, or those stored under the driest and most humid not ventilated conditions.

The Chlorophyll Decomposing Agent in the Rinds of Satsuma Oranges. (W. A. Gardner).—Though earlier work indicated the presence in Satsuma orange rinds of a catalyst, which materially hastened the decomposition of chlorophyll, it was found during the year that the acids in the rinds of these oranges were able to produce the same effect. Great difficulty was found in separating acid effect from enzyme effect. Colorometric determination of the hydrogen ion concentration was not possible because of the brown and yellow pigments which could not be removed by dialysis. Potentiometric determinations of various lots of water extracts of the rinds gave values ranging from pH 4.2 to pH 4.7.

ENTOMOLOGY AND ZOOLOGY

Biology and Control of the Southern Corn Root-Worm, *Diabrotica* 12-*punctata.* (F. S. Arant).—The Southern corn root-

worm was very abundant during the year 1927. Adults were found in the early spring congregated upon winter legumes. During the season, they were observed feeding upon twenty different species of field plants. Approximately 150 beetles were taken from the field between February 1 and December 20, and placed in the laboratory. Thirteen and nine-tenths per cent of all beetles taken from the field previous to February 16 were parasitized. Only one parasitized beetle was caught after that date.

Three complete generations occurred during the year and a few eggs were deposited for a fourth. The average egg incubation period for the first generation was 18.1 days; for the second generation, 7.3 days; for the third generation, 6.1 days. The average active larval period for the first generation was 26.4 days; for the second generation, 17.2 days; for the third generation, 16 days. The average pre-pupal period for the first generation was 7.6 days; for the second generation, 5.3 days; for the third generation, 5.6 days. The average pupal period for the first generation was 7.6 days; for the second generation, 6.3 days; for the third generation, 6.3 days.

The average number of days in the development (egg to adult) of the Southern corn root-worm for the first generation was 58.8; for the second generation, 34.5; and for the third generation, 34.

First generation larvae were very destructive to certain plantings of corn following a winter crop of vetch. The infestation of corn was very high on plots turned March 16, and planted March 17, 24, and 31, respectively. It was lower on plots turned March 16, and planted April 8 and 16, respectively. The infestation was relatively lower on all plots when the vetch was turned April 2, but was high enough to cause considerable damage to corn planted April 4 and 11. Corn planted April 18, April 25, and May 2, respectively, was damaged very slightly or none. Practically no infestation occurred in any of the plantings of corn following vetch turned April 16.

Boll Weevil Control with Calcium Arsenate. (J. M. Robinson and F. S. Arant).—The work on boll-weevil control was continued in 1927 on three soil types—namely, Norfolk sandy loam, Cecil clay, and Houston clay. The Norfolk sandy loam plots were on the experiment station farm. The Cecil clay plots were in Lee county, and the Houston clay plots were in Montgomery county.

Dusting on the Norfolk sandy loam gave a greater increase in yield this year than any other year of the experiment. A heavy infestation beginning June 13 extended throughout the season. Eleven applications of dust kept the infestation below 20 per cent until August 6. The infestation on the undusted plots gradually advanced to 88 per cent by August 6. The increased yield from poisoning was 224 pounds of seed cotton per acre on the unfertilized plot. The increased yield on the plot treated with

500 pounds of fertilizer was 562 pounds of seed cotton per acre; and with 1000, 1500, and 2000 pounds of fertilizer, the increases from poisoning were 739, 862, and 931 pounds of seed cotton per acre, respectively.

Table 6.—Relation of Dusting and Fertilization to Yield of Cotton on Plots at Auburn, 1924-1927

Fertilizer in pounds per acre	Plot treatment	Yield in lbs. of seed cotton per acre			
		1927	Increase	1924 to 1927	
				Av. yield	Av. increase
Unfertilized	Dusted	298		194	
	Undusted	74	224	153	41
Acid phosphate 300	Dusted	844		692	
Muriate of potash 50 Nitrate of soda 150	Undusted	282	562	432	260
Acid phosphate 600	Dusted	1,212		1,069	
Muriate of potash 100 Nitrate of soda 300	Undusted	473	739	703	366
Acid phosphate 900	Dusted	1,468		1,319	
Muriate of potash 150 Nitrate of soda 450	Undusted	606	862	944	375
Acid phosphate 1,200	Dusted	1,496		1,409	
Muriate of potash 200 Nitrate of soda 600	Undusted	565	931	1,035	374

The average increased yields for the four years of the experiment show that the increase from dusting was dependent upon the rate of fertilization and the per cent of infestation. Without fertilizer, dusting increased the yield only 41 pounds of seed cotton per acre. With 500 pounds of fertilizer the increase was 260 pounds per acre; and with 1000, 1500, and 2000 pounds of fertilizer the increases from poisoning were 366, 375, and 374 pounds of seed cotton per acre, respectively. These results show conclusively that dusting is profitable if the potential yield is one-half bale or more per acre and if the infestation exceeds 10 per cent.

On the heavy red clay the infestation was 40 per cent on the dusted plot June 14. With eleven dustings the infestation was kept below 20 per cent, except July 29, until August 5. On the undusted plots the infestation gradually advanced from 29 to 87 per cent. The average infestation on the dusted plots was 23 per cent; on the undusted plots it was 53 per cent. The first five dust applications were affected by rain within 24 hours. The

increase from dusting was 597 pounds of seed cotton per acre. This is a case of an early heavy infestation being controlled by dusting and the cotton having a potential yield of over a half bale per acre. The four-year average increase for dusting on the Cecil clay plots was 260 pounds of seed cotton per acre.

The infestation on the Houston clay soil was 19 per cent on the dusted plot June 4. Two applications of dust reduced the infestation to .2 per cent. Three dustings at irregular intervals kept the infestation below 20 per cent until July 2, at which time the infestation was 44 per cent. Two additional applications of dust kept the infestation below 20 per cent until July 22. The infestation on the undusted plots advanced to 68 per cent by July 22. The increase from dusting was 160 pounds of seed cotton per acre. The average increase for the four-year period was 260 pounds of seed cotton per acre.

Life History of the Belted Bean Beetle. (J. M. Robinson).—Twenty-one broods of the belted bean beetle were successfully reared from July 1, 1927 to June 30, 1928. One hundred forty-seven adults were reared from 612 larvae. Young corn plants were used as food for the larvae.

The incubation period varied from 3 to 11 days, the average being 6.3 days.

In the development of the larvae there were two distinct divisions, the active feeding stage and the resting or pre-pupal stage. The latter period was quite prolonged at the end of the last instar. The active larval developmental period varied from 10 to 20 days, the average being 14.6 days. The pre-pupal developmental period varied from 1 to 7 days; the average was 4.4 days.

The time required for the pupa to transform varied from 5 to 11 days, the average being 7.6 days.

The range of time for the development (egg to adult) of the belted bean beetle was 27 to 43 days, the average being 33 days.

FARM MANAGEMENT

Cost of Producing Oats. (J. F. Duggar).—Following a dry spring the yield of oats in 1927 was low on most farms studied; consequently, costs per bushel ranged higher than in the preceding year, being greater than the current market sale price of oats on about one-fourth of the 35 farms from which full records were obtained. On at least half these farms the production costs ranged from 30 to 55 cents per bushel, the crop thus affording in these cases fair to slight profit.

Cost of Producing and Storing Corn and Sorghum Silage. (J. F. Duggar).—In this dry year the farmers whose cost per ton was less than $3.50 constituted 45 per cent of those growing sorghum for the silo and only 11 per cent of those growing corn for

the silo. These figures are based on a total production of 2,697.5 tons of sorghum silage and of 1,295.25 tons of corn silage.

The farmers who produced silage at lowest cost per ton were, as a rule, those who secured the largest yield per acre.

Sorghum averaged a larger tonnage per acre by 40 per cent than did corn.

Effects of Time of Planting on Blooming Dates of Winter Legumes. (J. F. Duggar).—Practically all kinds of vetches, clovers, alfalfas, and other winter legumes reached the blooming stage in much shorter period from winter and late fall planting than from early fall planting, but the yields rapidly decreased as the planting date was postponed.

Table 7.—Effect of Time of Planting on Blooming Date

Kind	Days from emergence to blooming, with plantings made			
	Sept. 30	Nov. 3	Dec. 1	Feb. 24
Hairy vetch	182	150	125	59
Oregon vetch	180	145	126	
Monantha vetch	170	136	113	
Austrian gray winter pea	188	163	138	
Scotch vetch	157	121	100	42

HORTICULTURE

Composition of Fruiting and Vegetative Shoots of the Pecan. (C. L. Isbell).—During the spring of 1927 an attempt was made to determine the chemical composition of pecan shoots, both fruiting and vegetative, produced in 1926 and 1927. Determinations of reducing sugar, sucrose, total sugars, starch, hydrolyzable material other than starch, total carbohydrates, and total nitrogen were made. With the year-old shoots, samples were taken from the terminal and basal parts of the shoot and the middle part was discarded. Samples of the current season's (1927) growth consisted of entire shoots obtained just as soon as it could be determined whether shoots were to be fruitful or vegetative. Table 8 shows the results calculated to dry weight basis.

Cold Storage of Pecans. (C. L. Isbell).—Nuts of different varieties of the 1926 crop were put in storage in April 1927. The storage room was used to store vegetables and fruits for commercial purposes. The temperature was not kept constant but was approximately 32° Fahrenheit. The humidity of the storage room was high.

A few nuts were removed from storage at three different times and examined for development of rancidity. The last lot was removed in April 1928. The nuts of 1926 crop were rather poor in quality when harvested but no noticeable change had

Table 8.—Chemical Composition of Fruiting and Vegetative Shoots of the Pecan

Variety and kind of shoot	Sugars			Starch	Hydrolyzable material other than starch	Total carbohydrates	Total nitrogen
	Reducing	Sucrose	Total				
One-year-old shoots							
Stuart							
Shoots that fruited							
Terminal part	3.14	1.56	4.70	3.31	16.02	24.03	1.04
Basal part	3.09	1.11	4.20	3.20	14.02	21.43	0.74
Vegetative shoots							
Terminal part	2.77	1.75	4.52	3.69	14.35	22.57	0.91
Basal part	2.37	1.85	4.22	3.76	14.29	22.29	0.72
Success							
Shoots that fruited							
Terminal part	2.68	1.17	3.86	3.12	15.48	22.47	1.03
Basal part	2.16	2.01	4.17	3.47	14.37	22.03	0.79
Vegetative shoots							
Terminal part	3.54	1.34	4.88	2.99	13.51	21.39	0.98
Basal part	2.68	1.44	4.13	3.33	15.04	22.51	0.74
Current year shoots							
Schley							
Fruiting shoots	2.77	1.61	4.49	2.65	12.91	20.06	1.95
Vegetative shoots	2.83	1.88	4.72	2.01	12.86	19.60	2.04
Non-fruiting Schley vegetative shoots	2.56	1.44	4.00	2.39	12.55	18.96	2.33
Stuart							
*Fruiting shoots	3.56	1.53	5.09	1.76	12.41	19.28	1.68
Non-fruiting Stuart which carried many male catkins vegetative shoots	2.52	1.65	4.17	1.59	12.65	18.41	2.07
Tesche							
*Fruiting shoots	3.96	1.15	5.11	1.59	12.11	18.76	1.96
Non-fruiting Tesche vegetative shoots	3.14	1.92	5.06	1.71	13.16	19.94	2.10

*Suitable vegetative shoots were not available on these trees.

developed with any of the varieties to April 1928 with the possible exception of some signs of oil appearing through the shell of the Frotscher variety. Nuts removed from cold storage in April were kept at ordinary room temperature until the middle of June. No noticeable change had occurred in the eating quality.

Peach Variety Test. (C. L. Isbell).—In 1919 an experiment was started to compare the value of recently introduced varieties of peaches with existing standard varieties for home and commercial purposes. Thirty-six varieties were compared. There were three trees each of most of the varieties but with a few varietes only a single tree was planted.

The general tendency toward heavy yields together with the quality and time of ripening justify the use of three of the recently introduced varieties. The June Elberta is a heavy bearer of attractive fruit with sufficient quality to recommend it as one of the most desirable very early varieties for home use and local market. It is a yellow-fleshed, semi-cling peach ripening from June 10 to 25. The Illinois is a very heavy bearer of excellent quality fruit which ripens July 1 to 20. The skin is an attractive red; the flesh is almost white, semi-cling, and too tender for distant shipment. The Augbert is a heavy bearer of fruit of the regular Elberta type. For all practical purpose, it is an Elberta ripening from ten days to two weeks later than the regular Elberta and is a good variety for extending the peach season or for supplying local markets that use peaches over a long period. It is possibly the latest maturing variety that can be grown without extending the spraying program so late that it is not economical.

Sweet Potato Variety Tests. (C. L. Isbell).—Fourteen varieties of sweet potatoes were compared. The average yields in bushels per acre of the six leading varieties in 1926-1927 were: Triumph 123, Red Jersey 124, Bunch Porto Rico 127, Porto Rico 132, Southern Queen 137, and Yellow Jersey 159.

Cabbage Fertilizer Experiments, Mobile County. (R. W. Taylor and C. L. Isbell).—The objects of these experiments were: (1) To compare nitrate of soda alone or nitrate of soda and superphosphate with complete fertilizer; (2) to compare cottonseed meal or sulfate of ammonia with various amounts of nitrate of soda as sources of nitrogen in complete fertilizer. Plots used as the basis for comparison were fertilized at the rate of 1000 pounds of superphosphate, 250 pounds of nitrate of soda, and 100 pounds of muriate of potash per acre before the plants were set, with additional side dressings of 500 pounds and 250 pounds of nitrate of soda made in February and early March, respectively. Plants were set in December.

The use of nitrate of soda alone resulted in the production of low yields of marketable heads. Superphosphate with nitrate of soda produced as high yields as the complete fertilizer, but a

smaller proportion of the crop was cut early in the season. Sulfate of ammonia as the source of nitrogen produced very firm heads but the yield was low. Increasing the amount of nitrate of soda to 1,500 pounds or decreasing it to 500 pounds per acre in complete fertilizer reduced the yield as compared with the use of 1000 pounds.

Effect of Fertilizer on Quality of Strawberries. (W. D. Kimbrough).—Studies were continued to determine the effect of source and rate of application of fertilizer and the time of applying nitrate of soda on yield, grade, quality, and carrying and keeping quality of strawberries. Data obtained indicate that climatic conditions had more effect on the moisture and sugar content of strawberries than fertilizer treatment. Berries harvested and analyzed at different times during the season varied in moisture and sugar content, but there was no consistent variation that could be attributed to differences in fertilizer treatment.

Effect of Fertilizer on Quality of Vegetables. (W. D. Kimbrough).—Studies were continued on the effect of fertilizer treatment on the yield, grade, quality, and carrying and keeping quality of certain vegetables.

(a) *Irish potatoes.* Potatoes fertilized with sulphate of potash showed no increase in starch content over those fertilized with muriate of potash. Fertilizer treatment had no apparent influence on the keeping of potatoes as all kept well regardless of fertilizer treatment.

(b) *Watermelons.* Fertilizer treatment had no apparent influence on the moisture and sugar content of the edible portion of watermelons. Melons with high sugar content were produced regardless of fertilizer treatment. There were no differences found in the keeping of melons from plots receiving different fertilizer treatment. Sugar content decreased rather rapidly in melons stored at room temperature.

(c) *Cucumbers.* The moisture content of cucumbers was found to be approximately 96 per cent, and the respiration rate was relatively high. The moisture content, respiration rate, or keeping quality were not noticeably affected by the fertilizer treatment.

(d) *Cabbage.* Plants which received nitrate of soda and superphosphate but no potash fertilizer grew very well until heads were beginning to form. At this stage the plants were affected by a physiological disease which resulted from potash starvation. The lower leaves were first affected, usually wilting from the margins until the entire leaf was involved. Plants on plots receiving similar treatment with the addition of muriate of potash were apparently healthy.