FORTY-NINTH ANNUAL REPORT

January 1 to December 31, 1938

OF THE

Agricultural Experiment Station

OF THE

Alabama Polytechnic Institute

AUBURN

M. J. FUNCHESS, *Director*

AUBURN, ALA.

Contents

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*C. O. Prickett, B.A. — Associate Animal Nutritionist
G. A. Schrader, Ph.D. — Associate Animal Nutritionist
W. C. Sherman, Ph.D. — Associate Animal Nutritionist
W. E. Sewell, M.S. — Assistant Animal Husbandman
D. F. King, M.S. — Associate Animal Husbandman
C. D. Gordon, M.S. — Associate Poultry Husbandman
G. J. Cottier, M.A. — Assistant in Poultry Husbandry
J. L. West, D.V.M. — Assistant Animal Nutritionist

Botany and Plant Pathology:

J. L. Seal, Ph.D. — Head, Botany and Plant Pathology
E. V. Smith, Ph.D. — Associate Botanist and Plant Pathologist
J. R. Jackson, Ph.D. — Assistant in Botany and Plant Pathology
H. M. Darling, M.S. — (Fairhope) Assistant Plant Pathologist (Coop. State Dept. Agr. and Ala. Ext. Ser.)
Coyt Wilson, B.S. — Graduate Assistant

Horticulture and Forestry:

L. M. Ware, M.S. — Head, Horticulture and Forestry
C. L. Isbell, Ph.D. — Horticulturist
E. W. McElwee, M.S. — Assistant Horticulturist
Keith Barrons, M.S. — Assistant Horticulturist
Ozell Atkins, M.S. — Assistant Horticulturist
D. J. Weddell, M.S. — Assistant Forester
Hubert Harris, B.S. — Assistant in Horticulture
W. A. Johnson, B.S. — Laboratory Technician

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J. F. Duggar, M.S. — Research Professor of Special Investigations

Zoology-Entomology:

J. M. Robinson, M.A. — Head, Zoology-Entomology
H. S. Swingle, M.S. — Associate Fish Culturist
L. L. English, Ph.D. — Associate Entomologist
F. S. Arant, Ph.D. — Assistant Entomologist
A. M. Pearson, Ph.D. — Associate Biologist (Coop. U.S.D.A. and State Department of Conservation)

Substations:

Fred Stewart, B.S. — Superintendent Tennessee Valley Substation, Belle Mina, Ala.
J. K. Boseck, B.S. — Assistant Superintendent Tennessee Valley Substation Belle Mina, Ala.
R. C. Christopher, B.S. — Superintendent Sand Mountain Substation, Crossville, Ala.
H. A. Ponder, B. S. — Assistant Superintendent Sand Mountain Substation, Crossville, Ala.
J. P. Wilson, B.S. — Superintendent Wiregrass Substation, Headland, Ala.
C. A. Brogden, B.S. — Assistant Superintendent Wiregrass Substation, Headland, Ala.
K. G. Baker, B. S. — Superintendent Black Belt Substation, Marion Junction, Ala.
Otto Brown, M.S. — Superintendent Gulf Coast Substation, Fairhope, Ala.
Harold Yates, B.S. — Assistant Superintendent Gulf Coast Substation, Fairhope, Ala.

CHANGES IN STATION STAFF DURING 1938

Appointments:

R. M. Merrill, B.S. — Agricultural Engineer (Coop. U.S.D.A.)
G. W. Volk, Ph.D. — Associate Soil Chemist
A. A. Baxter, B.S. — Assistant in Agronomy
J. W. McClendon, B.S. — Assistant in Agronomy
J. I. Wear, B.S. — Assistant in Agronomy
M. E. Holt, B.S. — Graduate Assistant
Coyt Wilson, B.S. — Graduate Assistant
Ozell Atkins, M.S. — Assistant Horticulturist (Coop. U.S.D. A.)
H. A. Ponder, B.S. — Asst. Supt. Sand Mountain Substation, Crossville, Ala.

Resignations:

B. C. Small, B. S. — Graduate Assistant
C. M. Stokes, B.S. — Graduate Assistant
G. D. Scarseth, Ph.D. — Associate Soil Chemist
J. R. Taylor, Ph.D. — Associate Soil Chemist

*On leave.

NEW PUBLICATIONS

Articles in Scientific Journals

Arant, F. S.—**The Relative Efficiency of Certain Fluorine and Arsenic Insecticides Against the Cowpea Curculio.** *Jour. Econ. Ent.* 31: 309-313 (1938).

Arant, F. S.—**Difficulties Encountered in Field Dusting Experiments.** *Jour. Econ. Ent.* 31: 314-315 (1938).

Barrons, Keith C.—**Methods of Determining Root-knot Resistance in Beans and Cowpeas in the Seedling Stage.** *Jour. Agr. Res.* V. 57, No. 5: 363-370 (1938).

Barrons, Keith C.—**Varietal Differences in Resistance to Root-knot in Economic Plants.** *Proc. of Root-knot Nematode Conference.* Supplement 109. *Plant Disease Reporter.* (1938).

English, L. L., and Graham, C. P.—**Soil Sterilization Experiments on Killing Larvae of the White-fringed Bettle, Naupactus leucoloma** Boh. *Jour. Econ. Ent.* 31(6)769-773. (1938).

Kummer, F. A., and Nichols, M. L.—**A Study of the Nature of Physical Forces Governing the Adhesion Between Soil and Metal Surfaces.** *Jour. Amer. Soc. Agr. Engr.* Vol. 19, No. 2. pp. 73-78. (1938).

McElwee, E. W.—**Plant Hormones in the South.** *Amer. Nurseryman.* March 15, 1938.

Naftel, James A.—**Recent Studies on Boron in Soils.** *American Fertilizer,* Oct. 1:5-8 (1938).

Salmon, W. D.—**The Effect of Certain Oils in Alleviating Erythematous Dermatitis (Acrodynia or Vitamin B_6 Deficiency) in Rats.** *Jour. Biol. Chem.* 123, CIV-CV, 1938.

Schrader, G. A., and Prickett, C. O.—**The Influence of the Diet and Energy Intake Upon Acute Vitamin B_1 Deficiency in the Rat.** *Jour. Nutrition* 15: 607-620. 1938.

Smith, E. V., and Swingle, H. S.—**Relationship Between Plankton Production and Fish Production in Ponds.** *Trans. Am. Fish. Soc.* 68 (in press). 1938.

Swingle, H. S., and Smith, E. V.—**Fertilizer for Increasing the Natural Food for Fish in Ponds.** *Trans. Am. Fish Soc.* 68 (in press), 1938.

Swingle, H. S.—**Pondfish Growing Experiments Conducted at Auburn, Alabama.** *Game and Fish News,* Dec. 1938, p. 7.

Swingle, H. S.—**Relative Toxicities to Insects of Acid Lead Arsenate, Calcium Arsenate, and Magnesium Arsenate.** *Jour. Econ. Ent.* 31 (3): 430-441.

Ware, L. M.—**Influence of Major Fertilizer Elements on Earliness and Yield of Snap Beans.** *Amer. Soc. Hort. Sci.* 35: 699-703.

Ware, L. M.—**Summer Legumes for the Commercial Potato Crop in South Alabama.** *Amer. Potato Jour.* V. 15, No. 7: 183-188.

Yoder, R. E.—**The Significance of Soil Structure in Relation to the Tilth Problem.** *Proc. Soil Sci. Soc. of Amer.* Vol. II: pp. 21-33. 1938.

Experiment Station Publications

Arant, F S.—**Life History and Control of the Cowpea Curculio.** Bulletin 246, 1-34 (1938).

AGRICULTURAL ECONOMICS

Purchases and Consumption of Food by Farm Families. (Buis T. Inman).—Emphasis during the year was placed upon obtaining information regarding the purchases and consumption of foods by farm families. This information indicates that the purchases of food products that were adapted to some extent to production in the State were valued at $13,543,222 or an average of nearly $50 per farm family in 1935 (Table 1). Of these purchases, livestock products and fish represented $7.22 per census farm, fruits and nuts $1.16, and vegetables $1.06. The largest expenditures for foods were for processed field crops, which amounted to $40.09 per farm, $30 of which was for flour.

Of the foods consumed that were produced or were adapted to some extent to production in the State, 80 per cent was grown on the farm where used, and 20 per cent was purchased. The percentages of the various foods that were produced on the farm varied from 98.3 per cent for vegetables to 33.0 per cent for field crops. The proportions of livestock products and fruits produced were 94.2 and 79.3 per cent respectively.

TABLE 1.—Amount and Value of Foods Purchased by Alabama Farm Families, 1935[1].

Kind	Amount	Value
	Pounds	Dollars
Pork and lard	4,690,439	$ 698,240
Other livestock products and fish	9,781,079	1,275,589
Fruits, canned, dried and fresh	7,272,082	318,484
Vegetables, canned, dried and fresh	10,448,304	288,550
Flour	177,383,283	8,159,631
Shortening	15,420,373	1,881,285
Other foods processed from field crops	36,132,437	921,443
Total	260,537,997	$13,543,222

[1]Includes only foods that are adapted to some extent to production in Alabama.

An analysis of the value of home-grown foods that were consumed on the farm indicated that the amounts varied in relation to the tenure of the farmer or with his equity in the farm. The production and consumption by tenure of the various groups of foods tended to follow this same relationship except that croppers consumed a larger amount of field crop products than those in other tenure groups. The data indicate, however, the quantity of food consumed per individual in the cropper group was smaller than in any other tenure group. The above relationships are illustrated by the data from Pickens County shown in Table 2.

TABLE 2.—Average Value Per Person of Products Purchased or Produced on the Farm and Used in the Home, by Tenure Pickens County, 1935[1].

Kind	Full Owners	Part Owners	Tenants	Croppers
Number of farms	92	8	31	10
Total purchased[2]	$ 9.95	$11.28	$ 8.57	$ 8.26
Total produced	96.10	79.24	72.74	67.84
Vegetables	20.90	16.91	15.97	16.04
Fruits	4.67	2.75	2.09	1.12
Field crops	7.47	7.45	5.83	8.96
Livestock products:				
Poultry	3.40	3.06	2.05	1.34
Meats	24.11	20.33	19.06	17.42
Milk products	30.63	23.72	24.61	21.14
Eggs	4.93	4.92	3.07	1.82
Other	0.08	0.10	0.03	--
Total	$106.14	$90.52	$81.31	$76.10

[1]Includes white farmers only.
[2]Purchases include only those foods adapted to production in Alabama.

AGRICULTURAL ENGINEERING

Dynamic Properties of Soils as Applied to the Elements of Implement Design. Development of Reduced-Friction Surfaces and Materials for Experimental Plows. (F. A. Kummer).—Comparative field tests conducted at the Black Belt stations of Alabama and Mississippi with bottom plows having impregnated wooden surfaces or standard steel moldboards, revealed that the impregnated wooden surfaces produced considerably better scouring than the steel moldboards.

In order to determine the extent to which various factors contributed to scouring, the materials were subjected to sliding friction and adhesion tests in the laboratory. The results from tests on sliding friction between soil and wood or metal surfaces showed that under the same conditions considerably less force was required to move the impregnated wooden sliders over the soil than was required to pull the steel sliders. In some cases, the pulling force required on impregnated sliders was 50 per cent less than that required for steel sliders.

The laboratory tests on the relative adhesion of untreated wood and steel surfaces showed spreading of the water films over large areas and contact angles less than 90 degrees, while on the impregnated wood surfaces the contact angles exceeded 90 degrees, thus indicating decreased wetting of the contact area. It has been generally conceded that adhesion between soil and metal is caused by the competition of the soil and plow surface for film moisture. Since greased or waxed surfaces do not compete strongly for such moisture it is believed that the improved scouring of impregnated surfaces is caused by the decreased competitive action between the two solids.

AGRONOMY AND SOILS

Development of Crotalaria Spectabilis Strains Intermediate in Maturity. (H. R. Albrecht).—Crotalaria spectabilis has become an important soil improvement crop in Alabama. The early variety, which seeds heavily, produces far less vegetative matter than the late. Late crotalaria, on the other hand, seldom matures its seed before frost.

D. G. Sturkie made selections of individual plants of intermediate maturity in an effort to develop a strain which would yield more material for turning under, but which would also produce ample seed for reseeding purposes. These lines have since been reselected and new selections have been made. Several of the intermediate crotalarias, when tested at the substations, produced more vegetative matter than early spectabilis, but less than the late. At the same time, they produced ample seed to reseed the land. These are now being multiplied for further testing and some seed may soon be available for distribution.

The Tarnished Plant Bug and the Pea Aphid as Factors in Reducing Seed Yields of Vetches. (H. R. Albrecht).—A severe infestation of pea aphids (*Macrosiphum pisi* Kalt.) occurring in the winter legume breeding gardens in the spring of 1937 revealed that the vetches differ considerably in degree of susceptibility to aphid injury. The monantha, common, and Hungarian vetches were the most seriously injured, although certain strains of common vetch displayed remarkable resistance. The hairy and smooth vetches proved to be highly resistant to aphid injury.

Tests conducted with caged monantha, hairy, and common vetch plants during the spring of 1938 indicate that both the pea aphid and the tarnished plant bug (*Lygus pratensis* Linn.) may be important causes of reduced seed yields even when insect populations do not approach abnormally great numbers. Flower buds, pods, and stem tips even of hairy vetch were readily injured by both species, resulting in blossom drop, retarded development of immature pods, and arrested elongation of stems. Plants caged, but protected from insects, produced as many or more seeds than the uncaged check plants. The plants caged with insects, however,

yielded few seeds, and, those only from pods that had begun to develop before the plants were caged. These seeds were, in most cases, shriveled and not viable.

Time of Turning Winter Legumes for Cotton and Corn. (E. L. Mayton).—During the last thirteen-year period winter legume crops were turned for cotton and corn on March 25, April 5, and April 15 of each year. Planting usually followed after a ten-day interval. Companion plots of cotton were fertilized with 300 pounds per acre of nitrate of soda and companion plots of corn at rates of 200, 300, and 400 pounds of nitrate of soda for the April 5, April 15, and April 25 plantings respectively.

The 1925-38 average results of these experiments are presented in Table 3.

TABLE 3.—Yields of Cotton and Corn Following Winter Legumes Turned at Different Dates as Compared with Nitrate Fertilization.

Nitrogen or legume[1] treatment	Dates of		Average green weight of legumes turned. Pounds per acre	Average acre yield of crops	
	Turning legumes	Planting succeeding crops		Pounds of seed cotton	Bushels of corn
None		April 5		612	7.4
Nitrate of soda		April 5		1323	19.2
Winter legumes	March 25	April 5	4,317	1248	22.6
Nitrate of soda		April 15			27.7
Winter legumes	April 5	April 15	7,506	1213	29.0
Nitrate of soda		April 25		1264	28.6
Winter legumes	April 15	April 25	9,327	1275	32.7

[1]All plots of cotton or corn received ample and equal phosphate and potash fertilization.

Elements Required in Small Quantities for Plant Growth in Soils. (Anna L. Sommer).—Experiments to determine if certain Alabama soils were deficient in magnesium and trace elements necessary for plant growth were started in 1936. The results for the first two crops, corn and turnips, were reported last year. Cotton, crotalaria, and corn, in the order indicated, were the crops grown on these 16 soils during the year 1938.

Cotton was the first plant for which magnesium deficiency was demonstrated. Plants on several of the soils showed symptoms of a deficiency of this element, especially after the bolls began to mature. On a few soils cotton also showed symptoms of a deficiency of the trace elements. These symptoms were not nearly so marked as for the turnips reported last year and were not apparent on as many of the soils.

With crotalaria as a test plant, magnesium deficiency in varying degrees was apparent for 10 of the 16 soils. The effects of this deficiency appeared early and were very severe for plants grown on a number of the soils. In these cases, symptoms that might have

been due to deficiencies of the trace elements would probably have been obscured.

Corn was again planted after the crotalaria to determine if the marked magnesium deficiency showed by the crotalaria might have been caused by the depletion of this element in the small amount of soil used in these experiments. Corn showed no deficiency symptoms while growing. The dry weights, however, indicated that in certain cases a sufficient depletion of magnesium, of the trace elements, or both, had taken place to reduce the yield of corn.

The magnesium present as an impurity in the superphosphate appeared to be sufficient for the growth of the cotton when superphosphate was substituted for the purified phosphate. Where the magnesium deficiency was not too great, crotalaria also responded well to the substitution of superphosphate for the purified phosphate, but where this deficiency was great, little improvement was obtained. In the case of corn, substitution of the commercial salts in general appeared to supply the deficient elements in sufficient amounts.

Cotton Variety Tests. (H. B. Tisdale and J. B. Dick).—The average results of cotton variety tests conducted on the substations and experiment fields for the three years 1936-1938 show that Stoneville 5 A, D.P.L. 11 A (Deltapine), Cook 144, and Delfos (Washington) are the most satisfactory varieties producing staple around one inch in length for sections of Alabama not infested with the cotton wilt disease. Satisfactory varieties producing staple around 15/16 of an inch in length for non-wilt-infested sections are Cook 1627 and Cleveland. Clevewilt, Cook 144, Dixie Triumph, and Cleveland are the most satisfactory wilt-resistant varieties that produce staple approximately one inch in length. Wiregrass Cook and Auburn Cook are satisfactory wilt-resistant varieties that produce staple around 15/16 of an inch in length.

Methods of Inoculating Soil with the Cotton Wilt Organism. (H. B. Tisdale and J. B. Dick).—Results of a three-year study of different cropping and artificial inoculating methods for infecting soil with the cotton wilt disease show that:

1. Cultures of the wilt organism grown on the oat-wheat mixture applied approximately ten days before planting at the rate of 600 pounds per acre was the most effective method used;

2. The incidence of wilt was increased on a susceptible variety of cotton when planted after a crop of okra, sweet potatoes, cowpeas, or a susceptible variety of cotton.

Further Studies of the Influence of Liming on Boron Availability in Soils. (James A. Naftel).—Studies have been extended during the year on the value of lime when used simultaneously with boron. Borax, calcium borate, colemanite, and tourmaline,

were compared as sources of boron in soils where lime-induced boron deficiency had been produced. All of these sources of boron except tourmaline were satisfactory for supplying this element to plants. The use of five pounds of borax per ton of lime was sufficient to prevent boron deficiency regardless of the amounts of lime applied.

The acid-forming fertilizers, ammonium sulfate and urea, tended to overcome the lime-induced deficiency of boron while nitrate of soda tended to increase the deficiency. Both cottonseed meal and vetch produced cotton plants free from boron defiency; this probably resulted from the presence of boron in these materials.

The effects of lime and boron on certain biological activities in soils were studied. Some stimulation of nitrification of ammonium nitrogen was obtained from the use of small amounts of boron. The tolerance of nitrifying organisms to high concentrations of boron, 5, 10, and 15 P.P.M. boron and the effect of lime on reducing the toxicity were studied in soil cultures. Nitrification did not occur in the unlimed soils at any of the above mentioned boron concentrations; at 50 per cent Ca saturation, 10 P.P.M. boron was the maximum concentration where nitrification occurred; and at 150 per cent saturation, nitrification occurred where 15 P.P.M. boron was added.

The Leaching of Potassium Below the Feeding Zone of Plants. (N. J. Volk).—Since many good cotton soils are sandy to a considerable depth, it seemed important to determine whether these soils retain applied potassium within the feeding zone of the plant over a long period of time.

Samples of soils were obtained from the Rates of Potash Plots at the Wiregrass, Sand Mountain, and Tennessee Valley Substations. These samples were taken at three depths: 0"-8", 8"-16", and 16"-24". The plot studied had received annually, for a period of eight years, 600 pounds of fertilizer containing 0%, 2%, 4%, 8%, or 16% potash.

Analyses of these soils for replaceable potassium revealed that the leaching was most severe at the Wiregrass Substation (Norfolk FSL) and least severe at the Tennessee Valley Substation (Decatur Clay). The Norfolk fine sandy loam and the Hanceville fine sandy loam (Sand Mountain Substation) allowed 30% to 40% of the applied potash to leach below the eight-inch depth, while the Decatur clay allowed only about 20% to leach below the eight-inch depth. Leaching below the 16-inch depth was less severe. In this case the amounts of applied potash leached below the 16-inch depth for Decatur clay, Hanceville fine sandy loam, and Norfolk fine sandy loam were 9%, 15%, and 18%, respectively.

ANIMAL HUSBANDRY AND POULTRY

The Transmission of Factors Related to the Economical Production of Swine. (J. C. Grimes).—Superior and inferior strains of

swine from common ancestry are being selected in a study of individual variation in economy of feed utilization.

One hundred and twelve pigs representing the F_2 generation were fed in individual pens; 50 were from the superior strain and 62 from the inferior. The pigs in the superior strain were heavier at birth and at weaning age; they required fewer days to reach 225 pounds in weight, and consumed 27 pounds less feed per 100 pounds gain than the pigs in the inferior strain. However, even the superior strain of the F_2 generation of pigs required 30 pounds more feed per 100 pounds of gain in 1938 than the F_1 generation of pigs required in 1937 (Table 4). This may be explained in part by the fact that the F_1 generation of pigs consisted of eight litters which were selected as being the best phenotypically of 15 litters while there was no opportunity for such selection in the F_2 generation.

The most economical litter in the superior strain required 371 pounds of feed for each 100 pounds of gain while the least economical litter in this strain required 405 pounds of feed for each 100 pounds of gain. The most economical individual in the superior strain required 341 pounds of feed for each 100 pounds of gain and the least economical pig required 477 pounds of feed for each 100 pounds of gain. In the inferior strain the two extremes in feed consumption per 100 pounds gain were 320 pounds and 580 pounds.

TABLE 4.—Average Results Obtained with Eight F_1 Generation Litters (1937) and Eight F_2 Generation Litters of the Superior Strain (1938) and Eight F_2 Generation Litters of the Inferior Strain (1938).

	Average birth weight	Average weaning weight	Average weight at 72 days	Average number days to 225 lbs. weight	Average feed per 100 lbs. gain	Number farrowed alive	Number reaching 225 lbs. weight
F_1 generation (1937)	2.61	23.38	30.47	196.95	355.75	9	8.75
F_2 generation, superior strain (1938)	2.58	32.46	44.46	191.36	386.63	6.62	6.25
F_2 generation, inferior strain (1938)	2.32	27.14	36.41	225.61	413.03	9.12	7.87

There was no correlation between the number of pigs in the litter and the birth weight per pig. Likewise there was no correlation between the number of pigs in the litter and the amount of feed required to make a unit of gain. There was, however, a tendency for pigs in smaller litters to be heavier at weaning age and to reach a weight of 225 pounds at a younger age than pigs in larger litters.

Heavy feed consumption was associated with rapid gains and to a large extent with cheap gains. The feed consumption for each

100 pounds of gain increased rapidly as the length of time from birth to a weight of 225 pounds increased above 200 days.

Peanut Hay for Wintering Beef Breeding Cows. (J. C. Grimes).—Cows have been fed peanut hay during the past two winters. One group which received 13 pounds of peanut hay per head daily for 120 days lost 62 pounds each. The cost of wintering on this feed was $4.20 per cow. Another group which received 11 pounds of peanut hay and one pound of cottonseed meal per head daily lost 24 pounds each during the same period. The feed cost in this group was $4.65 per cow. The average initial weight of the cows in both groups was approximately 800 pounds.

Beef Production in East Alabama. (J. C. Grimes).—An experiment has been in progress during the past three years for the purpose of determining whether land which is rough, rolling, or otherwise unsuited for cultivation can be utilized profitably for beef production. Fifty-five acres of such land was used during the past three summers as a pasture for beef cows. This amount of pasture furnished grazing for an average of 19 cows from the 20th of March to the 20th of November each year. The grass and clover in this pasture consisted mostly of White Dutch clover, hop clover, lespedeza, carpet grass, and Dallis grass.

During the three winters each cow consumed annually an average of 524 pounds of peanut hay, 106 pounds of cottonseed meal, and 2,168 pounds of sorghum silage. The average annual cost of winter feed was $92.88 or $4.80 per cow.

The average annual gross returns in the form of beef produced from this herd were 5,328 pounds worth $364.87. The average annual net returns above the cost of winter feed, taxes, and interest were $2.58 per acre of land used.

Kudzu as a Grazing Crop for Beef Cattle. (J. C. Grimes).—A four-acre kudzu pasture which was set in February 1932 has been grazed with beef cows and heifers during the past five summers. The practice has been to use this kudzu pasture as a supplement to the permanent pasture. In the permanent pasture, grazing is plentiful in the spring and fall but scant in the middle of the summer.

Cows were usually turned on the kudzu pasture sometime in June and were removed in August or September. Following is a summary of the five years' results:

Number of acres kudzu grazed	4
Average number of cows on pasture each season	5
Average number of days the kudzu was grazed per season	68
Average pounds of beef produced per acre each season	128

At this rate of stocking (1.25 animal units per acre) and under the above system of management, the kudzu has been able to survive and make good growth. In fact, the carrying capacity of the

pasture has been greater during the last year or two than during the first year.

Shelter Versus No Shelter for Fattening Steers. (J. C. Grimes). —In order to study the value of shelter for fattening steers, 20 common steers were divided into two equal lots and fed on sorghum silage and cottonseed meal.

The steers which had access to shelter gained 16 pounds more and consumed 312 pounds less silage per steer during the 112 day feeding period than the steers which had no shelter. The profit per steer was $1.32 greater for the steers which had shelter.

Peanut Hay as a Roughage for Fattening Steers. (J. C. Grimes). —An experiment has been conducted during the past two winters to study (1) the value of peanut hay as a roughage for fattening beef steers, and (2) the value of grinding peanut hay for fattening steers.

Common steers weighing about 500 pounds each, which were fed all the unground peanut hay they would consume and approximately five pounds of cottonseed meal per head daily for a period of 112 days, gained an average of 1.20 pounds daily. They consumed 958 pounds of hay and 387 pounds of cottonseed meal for each 100 pounds gain. They returned a profit above feed cost of $7.77 per steer.

A second group of steers fed a similar ration except that the hay was ground made a daily gain of 1.58 pounds, consumed 842 pounds of hay and 293 pounds of meal for each 100 pounds gain and returned a profit above feed cost of $8.70 per steer.

At present prices the ground hay was worth $3.53 more per ton than the unground hay.

Studies on the Nutrition of Dogs. (C. J. Koehn). I. *Effect of Cooking Dry Dog Feeds*—Dry dog feeds are more palatable when mixed with water and baked in the form of bread. However, this materially increases the cost of feeding. Equally good results are obtained when these feeds are moistened with water and fed raw, although 30 per cent more food is required by the dogs when it is fed raw.

II. *Canned Dog Food as a Source of Energy for Dogs.*—The calorific value of 23 brands of commercial canned dog foods studied varied from 0.77 to 3.31 calories per gram of food. The nutritive ratio varied from 1.3 to 4.9. Whenever specific feeding directions were given on the labels they were found to be erroneous and misleading. Adult dogs weighing from 40 to 50 pounds required canned dog food equivalent to 86-112 calories per kilogram of body weight daily. From three to four cans daily of most dog foods were needed to meet this requirement. Young growing pups required about three times as much food per unit body weight as the

same individuals at maturity. The food requirement of bitches was doubled during lactation.

III. *Mineral Composition of Canned Dog Foods.*—Twenty-three brands of commercial canned dog foods were analyzed for ash, calcium, phosphorous and salt. All of the brands studied had a sufficiently high ash content to meet the mineral requirements of dogs if these minerals were combined in the proper proportions. Many of the foods had such a high ash content as to be considered adulterated. Minerals in amounts above the minimum requirement are superfluous and detract from the energy value of the food. Seven brands of dog food contained less than 0.001 per cent of calcium which is far below the minimum requirement. Dogs fed these foods without supplementation died in convulsions caused by a calcium deficiency. Most of the foods had sufficient phosphorous. Most of the foods had sufficient salt and many of them had a great excess of this mineral.

IV. *Alabama Standard for Canned Dog Foods.*—Based on the results of chemical analyses, biological tests and the actual feeding trials of commercial canned dog foods sold in this state, the following chemical standard has been adopted for the regulation and sale of canned dog foods in Alabama.

Dry matter	not less than	26.00	per cent
Protein	not less than	7.50	per cent
Fat	not more than	6.00	per cent
	not less than	2.00	per cent
Ash	not more than	3.50	per cent
Calcium (Ca)	not less than	0.25	per cent
Phosphorous (P)	not less than	0.30	per cent
Salt (NaCl)	not more than	0.50	per cent
Crude Fiber	not more than	1.50	per cent

A study of Quality in Soybeans and Cowpeas for Human Food. (W. C. Sherman). I. *The Destruction of Carotene in Soybeans during Maturation.*—The carotene and moisture content of several varieties of soybeans in the green, semi-mature and mature stages as well as of soybeans which had been alowed to stand in the field about two weeks after reaching maturity were determined. The yellow varieties, Easy-Cook, Delsta, Rokusun and F.P.I. No. 83868, lost carotene rapidly throughout the entire period of maturation. The brown varieties, Biloxi and Tanloxi, retained high amounts of carotene in the semi-mature stage but lost a large amount during the final stage; whereas the olive-brown variety, F.P.I. No. 94168, lost less carotene during the final stage. The black variety, Matthews, lost carotene very rapidly up to the semi-mature stage. At this stage the black color started to develop in the seed coats, and little further carotene destruction occurred. The bright green variety, F.P.I. No. 93057 at all stages of maturity, had the most carotene of the varieties analyzed. The seed pod of this variety developed a black color during the late stages of maturation which afforded

protection to the seed pigments. Further carotene destruction, which in some varieties exceeded 50 per cent, occurred in all soybeans that were allowed to stand in the field for two weeks after reaching maturity.

II. *Identification of the Pigments Present in Carotene Preparations from Soybeans.*—The pigments present in carotene preparations from five varieties of mature soybeans were separated by passage through chromatograph tubes containing magnesium oxide. The quantity of pigment present in each of the adsorption bands was determined by spectrophotometric readings. Most of the pigment in the carotene preparations was beta-carotene. Alpha-carotene was found in small amounts (4 to 10 per cent of the total pigments). Only traces of gamma-carotene were present. No cryptoxanthin was detected; if it occurs in soybeans, it is present only in very minor traces.

The chromatographic work was substantiated by biologic assays of the soybean varieties for vitamin A activity. The growth response obtained when vitamin A deficient rats were fed ground soybeans at a level to supply two micrograms of carotene daily was comparable with that otbained with equivalent amounts of pure beta-carotene, indicating that almost all of the carotene of soybeans is the beta form.

Studies of the Vitamin B Complex. Further Studies of Vitamin B_6 Deficiency. (W. D. Salmon).—Further studies of vitamin B_6 deficiency in rats have shown that the erythematous dermatitis was cured more rapidly and more consistently by unsaturated oils or fatty acids when the heated yeast extract, previously mentioned, was included in the diet. Numerous cures were effected, however, by the addition of the unsaturated oils or fatty acid esters alone; in summer, cures from this treatment occurred frequently, although there sometimes were exacerbations; in winter, the lesions were more refractory to treatment with the oils alone.

Corn oil was more effective than linseed oil and methyl linolate more effective than methyl linolenate.

The effectiveness of corn oil was not increased by the addition of choline of nicotinic acid; hence the effect of the heated yeast extract was not due to these substances.

Management of the Farm Flock. (D. F. King).—A three-year record obtained on a flock of 50 heavy-breed hens from October through February and 30 of the same birds from March through September shows hens kept under farm conditions consumed 45 pounds of laying mash, 37 pounds whole corn and 1.2 pounds oyster shell per bird per year. They laid 138 eggs per bird per year. The yearly mortality among the hens was 20 per cent. At present feed and egg prices, these hens returned a yearly labor income of $1.68 per bird.

Detecting Infertile Eggs Previous to Incubation. (D. F. King).—Previous reports have described a candling machine by which the fertile and infertile eggs may be satisfactorily detected after preheating at 100 degrees F. for 15 hours. Recent investigations have been confined to developing a machine to detect infertile eggs without preheating. The new candling machine consists of two 1000-watt lamps placed so that the light enters both ends of the egg being examined. Both lights are filtered with a dark blue filter. In 17 different tests totalling 1,462 fresh eggs the total error in detecting both fertile and infertile eggs was 24.9 per cent.

Value of Kudzu and other Forms of Summer Green Feed for Poultry. (G. J. Cottier and D. F. King).—The object of this experiment was to compare kudzu, cowpeas, soybeans, lespedeza sericea and Bermuda grass as summer green feeds when grazed by poultry. The ration other than green feed was the same in all lots. This report covers five months in the summer of 1938. Kudzu produced the largest amount of green feed per acre and was effected less by drouth than the other crops in this study. The results are summarized in Table 5.

TABLE 5.—Summary of Results of Summer Green Feed for Poultry.

Crop grazed	Average number eggs per bird per month	Average weight of eggs (grams)	Average body weight (grams)	Mortality per cent	Average yield per acre (lbs.)
Kudzu	12.87	49.75	1476	23.31	10,487
Bermuda	11.80	49.65	1520	23.31	--
Lespedeza sericea	11.74	50.08	1465	26.64	3,388
Cowpeas	12.74	47.51	1455	29.97	3,146
Soybeans	11.07	49.02	1450	23.31	2,904
No green feed	4.57	48.10	1320	93.24	--

BOTANY AND PLANT PATHOLOGY

Seasonal Activity of the Bulbs of Wild Onion, Allium vineale L., as Related to Its Eradication from Pastures and Lawns by Creosote-Kerosene Sprays. (E. V. Smith).—Preliminary experiments showed that active plants of wild onion could be killed by spraying with a 10-90 mixture of creosote and kerosene but that the dormant underground bulbs were uninjured. Consequently, it appeared necessary to find the time when fewest bulbs were dormant for the most efficient use of this spray. The seasonal activity of bulbs has been studied over a six-year period and the results are summarized in Tables 6 and 7. The data presented in these tables show that the bulbs begin to germinate in the late summer and that germination proceeds at such a rate that 95 per cent of the bulbs are active and have leaves above ground by the end of December. New bulbs may be found developing within the tissues of the mother bulbs late in December but do not become separated

TABLE 6.—Summary of Rates of Germination During Autumns 1932-37 Inclusive.

Activity of bulbs	Per cent of total bulbs counted each week in each class							
	September				October			
	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week
Total dormant and sprouted[1] bulbs	57.5	62.0	58.8	54.8	57.1	36.3	42.5	33.8
Total small and large plants	42.5	38.0	41.2	45.2	42.9	63.7	57.5	66.2

Activity of bulbs	Per cent of total bulbs counted each week in each class							
	November				December			
	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week
Total dormant and sprouted[1] bulbs	32.1	26.7	15.4	21.6	17.4	13.0	9.7	4.7
Total small and large plants	67.9	73.3	84.6	78.4	78.4	82.6	90.3	95.3

[1]Leaves not above ground

TABLE 7.—Activity of Bulbs During the Winter and Spring-Six-Year Average, 1933-38 Inclusive.

Activity of bulbs	Per cent of bulbs in each class									
	January		February		March		April		May	
	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
Old dormant bulbs[1]	2.4	3.0	1.9	1.6	0.9	2.5	0.8	0.4	1.0	-
New dormant bulbs[1]	0.0	0.0	0.4	3.3	9.2	23.7	28.8	41.8	32.0	43.6
Sprounted bulbs	1.8	1.6	0.9	1.3	0.9	1.8	1.5	0.2	2.3	1.1
Bulbs with living leaves	95.8	95.4	96.8	93.8	89.0	67.8	57.1	19.1	26.3	8.9
Bulbs with dead leaves	0.0	0.0	0.0	0.0	0.0	4.2	11.8	38.5	38.4	46.4

[1]Bulbs developed from axillary buds.

as new, dormant individuals before February and do not form a significant percentage of the total before March. Thus, there is a period of about two months, January and February, when a small percentage is dormant; it is significant that this is the period when the associated grass is most likely to be dormant and less likely to be killed by the spray. Bulblets are produced by some plants at the top of scapes in May and June; these bulblets, which are produced in large numbers, germinate in the fall.

Numerous experiments during the six-year period, 1932-38, showed that a 10-90 mixture of coal-tar creosote and kerosene was an effective contact spray for this weed. The data presented in Table 8 will serve as an example. The plots were one-half square

TABLE 8.—The Number of Killed and Uninjured Bulbs from a 2 by 2 Foot Area from the Center of Plots Two Weeks After Spraying with a 10-90 Creosote-Kerosene Mixture.

Effect of spraying on various types of bulbs	Plot Treatment		
	160 gal. C-K per acre	240 gal. C-K per acre	320 gal. C-K per acre
Large plants, bulbs uninjured	22	1	3
Large plants, bulbs killed	43	79	40
Small plants, bulbs uninjured	184	40	35
Small plants, bulbs killed	616	407	230
Germinating, leaves not above ground, uninjured	121	134	41

rod in area and the spray was applied with a knapsack sprayer. The lowest rate of application (160 gallons per acre) was not sufficient to cover all the onions and any plant that was not struck by the spray was uninjured. Bulbs that were dormant or that had germinated but that did not have tops above ground were also uninjured. For complete eradication a second spray will be necessary.

The Life History of Nut Grass, Cyperus rotundus L., as Related to Possible Methods of Control. (E. V. Smith, Botany and Plant Pathology, and E. L. Mayton, Agronomy and Soils).—I. *Tillage and Cropping for the Control of Nut Grass on Norfolk Sandy Loam Soil.*—Approximately an acre of land heavily infested with nut grass was used in this experiment. The infestation was reduced to about 0.1 per cent on plots plowed at intervals of one, two, three, and four weeks, respectively, during two successive growing seasons (April until November). The few plants that survived had their origin

in tubers located from six to twelve inches deep, and apparently below plow depth. Oats were grown on a plot that was turned during the summer. Apparent eradication was obtained in two years, but oats alone were not effective. Thus a winter crop may be grown on land being tilled for nut grass eradication, and the land protected from winter erosion.

An interesting treatment in this series was one in which the land was broken in the spring and plowed thereafter at intervals of two weeks with a sweep or scrape. This equipment is available on the smallest farm unit and the results were as good as those from a two-horse turn plow. Plowing or disking during one growing season reduced the infestation of nut grass to such an extent that the nut grass was of little hinderance to cotton production the second year, and by the end of the third year the cultivation of the cotton had almost completed the eradication. Three years of thorough cultivation of cotton reduced the infestation of nut grass to a negligible figure as compared to an infestation the first year that was so heavy that a satisfactory stand of cotton could not be obtained.

II. *Tillage for the Control of Nut Grass on Various Soil Types.*—Cooperative tillage experiments with farmers were located on various soil types. The treatments consisted of plowing or disking at intervals of two, three, and four weeks, respectively, or "sweeping" at intervals of two weeks.

The experiments were located on Norfolk Sandy Loam—deep phase, Orangeburg Fine Sandy Loam, Cecil Clay Loam, Ruston Sandy Loam, Susquehanna Very Fine Sandy Loam, Eutaw Clay, Amite Fine Sandy Loam, and Colbert Silt Loam; thus, the soils varied in texture from sandy loam to sticky clay. Plowing at intervals of three weeks or less for one growing season reduced the infestation of nut grass 90 per cent or more on all but two areas. In some of the heavier soils, a considerable number of tubers was found below the depth to which the land had been plowed, but even on these soils a majority was within plow depth.

III. *Depth Distribution of Tubers in Various Soil Types.*—Areas were dug on the soil types mentioned above and the soil screened by two-inch layers, the tubers from each layer being recorded separately. Regardless of the soil type, a majority of the tubers was found in the upper eight inches of soil and none was found deeper than 17 inches.

HORTICULTURE AND FORESTRY

Survival and Growth of Slash Pine from Different Grades of Planting Stock. (D. J. Weddell).—It has been the practice of some nurserymen to ship for planting all pine seedlings produced in their nurseries; others grade theirs and ship only the better grades. Slash pines are usually separated into three grades: Grade 1 is

composed of plants 10 to 16 inches long which have stout woody stems; grade 2 is composed of smaller plants which have weak to medium stout stems; grade 3 is composed of plants smaller than grade 2 which have weak, succulent stems.

An experiment designed to study the survival and growth of the three grades of slash pine was started in the spring of 1937. Alternating rows of seedlings from each grade were planted; 112 trees of each grade were used. Subsequent treatment was alike for trees of all grades.

During December, 1938, each tree was measured and the average height and the percentage of survival were calculated for each grade.

TABLE 9.—Survival and Height of Graded Slash Pine Seedlings, December, 1938.

Grade	Survival	Average height
	per cent	feet
1	55.5	2.9
2	41.0	2.3
3	20.1	1.6

The results show a considerable difference both in survival percentage and in the average height for the three grades of seedlings. There is a much greater difference in survival and some difference in the average height between grades 1 and 3 and between 2 and 3 than between grades 1 and 2. It is of considerable interest to note that in comparing grade 1 and grade 3 seedlings, the seedlings from grade 1 average almost twice as tall and more than twice as many have survived.

These results indicate the necessity for carefully grading pine nursery stock before it is shipped from the nursery for field planting.

Yield Studies with Pole Beans. (Keith C. Barrons).—Tests conducted during the summer of 1938 confirmed previous observations that Alabama No. 1 possesses the ability to out yield standard varieties of pole beans under adverse and also under optimum growing conditions. In addition to Alabama No. 1 and three standard varieties, six new strains were included in the tests. With the exception of A.P.I. 1124, they were all developed from Alabama No. 1 by hybridization or selection. The tests were conducted on two soils differing somewhat in fertility. Three replications were planted on each soil, and the analysis of variance was used in analyzing the yield data. Results of this yield experiment are recorded in the following table.

TABLE 10.—Yield in Bushels per Acre of Ten Pole Bean Varieties on Two Soils Differing in Fertility.

Variety	Good Soil	Poor Soil
Kentucky Wonder	247	153
Genuine Cornfield	314	271
Ideal Market	296	199
Alabama No. 1	380	405
Alabama No. 17	323	337
Alabama No. 18	375	381
Alabama No. 19	347	259
Alabama No. 20	355	251
Alabama No. 25	390	387
A.P.I. 1124	238	126

A Comparison of Ground Peanut Hulls and Other Organic Materials for Use in Greenhouse Soils. (E. W. McElwee).—An experiment was started in 1938 to study the comparative value of several sources of organic material used for greenhouse soils. The materials included were ground peanut hulls, sugarcane bagasse, Florida peat, and German peat.

The first phase of this study was concerned with the effect of the different organic materials on the nitrate levels of the soil and the corresponding growth of flowering plants. One part of each form of organic material was mixed with four parts of Norfolk sandy loam soil. Four kinds of treatments were given each of the four forms of organic material. In two treatments plants were grown, one with and the other without the addition of commercial nitrogen; in two other treatments plants were omitted, one treatment receiving and the other treatment not receiving commercial nitrogen. Snapdragons were used as the indicator plant. The soil was periodically analyzed for nitrate nitrogen to determine the influence of the organic material on the nitrate levels of the soil. Table 11 shows the results of these analyses.

The results show in Table 11 that Florida peat added more nitrate nitrogen to the soil at the beginning of the experiment than any other material; German peat added no nitrate nitrogen to the soil. Neither of these materials showed any depressing effect on the nitrate level of the soil. Peanut hulls added no nitrate nitrogen at the beginning of the experiment but caused a decided temporary depression of the nitrate level of the soil. After 14 days, however, the nitrate level began to increase and continued to increase until at the end of two and one-half months this soil contained more nitrate nitrogen than any other soil. Sugarcane bagasse did not add any nitrate nitrogen to the soil but caused a pronounced depression of the nitrate level of the soil during the two and one-half months of this study. The capacity of sugarcane bagasse to fix nitrate nitrogen was not determined by this study.

TABLE 11.—The Influence of Various Organic Materials on the Nitrate Levels of the Soil.

Organic material	Amt. NO_3 from $NaNO_3$ added to soil at start	Parts per million of NO_3 in soil at									
		start		14 days		29 days		40 days		75 days	
		without plants	with plants	without plants	with plants	without plants	with plants	without plants	with plants	without plants	with plants
Check	None	72	72	72	72	160	120	192	112	203	64
	100 ppm	160	144	160	144	208	224	240	320	176	208
Ground sugarcane bagasse	None	40	40	56	56	48	48	64	64	64	40
	100 ppm	225	175	56	48	32	32	48	64	64	32
Ground peanut hulls	None	40	40	32	48	224	128	384	352	448	208
	100 ppm	210	175	64	64	320	184	384	144	384	208
Domestic Florida peat	None	225	200	192	152	208	216	288	256	320	112
	100 ppm	300	400	256	160	320	272	352	256	352	96
Imported German peat	None	40	50	56	40	56	36	80	64	80	32
	100 ppm	175	250	144	160	144	96	176	96	160	32

The check, peanut hull and Florida peat treatments produced snapdragons of good quality both with and without additional nitrogen. The snapdragons in the peanut hull treatments produced longer stems than any other organic materials. The snapdragons grown in the German peat treatments, with and without additional nitrogen, made slow growth, were yellowish-green at flowering, and produced poor quality flowers and hard brittle stems. Snapdragons grown in the sugarcane bagasse treatments made very little growth after planting, turned yellow, and failed to flower.

Yield Differences in Certified Lots of Seed Irish Potatoes. (L. M. Ware and H. M. Darling).—Alabama Irish potato growers purchase outside of the State practically all potatoes used for planting purposes in the State. Three years ago the Alabama station began testing, as a part of the state's regulatory requirement, the yield of lots of potatoes from growers in other states who expected to market seed in Alabama. Although the seed tested have been certified in the state of origin, there have been very large differences in the yield of different lots of potatoes when tested in Alabama. A classification of the lots with respect to the three-year average yields is given in Table 12.

TABLE 12.—Number of Certified Seed Lots[1] in Different Classes According to Yield in the Alabama Field Tests.

Yield class Bushels per acre	Number lots
50	4
75	6
100	20
125	75
150	98
175	97
200	143
225	79
250	37
275	11
300	2

[1]Only seed potatoes certified in the state of origin were included in the tabulation.

Alabama is the only state with a yield requirement in its certification regulations. The regulations of all other states are based primarily on disease limits. Disease readings are made in the grower's field and in storage. If certain limits are not exceeded, potatoes qualify for certification. The Alabama records indicate that probably 20 to 25 per cent of the differences found in the yield of different lots may be due to disease. The balance must be accounted for by inherent strain differences or by great physiological differences which have affected the fitness of the seed for planting purposes at the particular time and under the conditions of planting in South Alabama.

SPECIAL INVESTIGATIONS

Stands from Delayed Planting of Scalded Crotalaria Seed. (J. F. Duggar).—Our earlier experiments had shown that scalding of otherwise untreated seed of Crotalaria spectabilis at 150°F. for 20 minutes greatly increased germination. In 1938 tests in both incubator and soil proved that crotalaria seeds thus scalded retained their increased germinating power for considerable periods of time. This is shown in Table 13.

TABLE 13.—Percentage Germination of Untreated and Scalded Crotalaria Seed.

	Untreated seed	Scalded seed promptly planted	Scalded seed dried and stored	
			Days stored	Per cent
	per cent	per cent		
In soil, June 18	11	76	35	88
In soil, July 8	35	78	67	72
In soil, June 4	33	-	33	84
In incubator	3	-	315	97

A condition for retention of germinative ability of scalded seed is that the seed should be promptly dried so as to prevent molding or extensive development of sprouts.

ZOOLOGY-ENTOMOLOGY

Vegetable Weevil. (J. M. Robinson).—Nine insecticides were tested as possible controls for the vegetable weevil larva. Ten larvae were used as a testing unit. They were exposed to turnip leaves which had been dusted with a particular insecticide and placed in a Petri dish. After five replications of such exposures, the net mortality was 100 per cent for barium fluosilicate, calcium arsenate, pyrethrum and sodium fluosilicate. The net mortality for lead arsenate, magnesium arsenate, pyrocide-talc, and derris-pyrethrum-sulphur was 98.8, 98.5, 95.6, and 92 per cent, respectively. The net mortality for pyrethrum, lead arsenate-talc and derris-sulphur was 89.7, 86.2 and 85.2 per cent, respectively. The net mortality for cube root was 79.5 per cent.

In egg deposition studies, the total eggs deposited by 20 adults over a period of 50 days varied from six to 323 eggs and averaged 88.4 per female.

The Relative Efficiency of Rotenone-Containing Insecticides in the Control of Vegetable Insects. (F. S. Arant).—Laboratory and field experiments were conducted to determine the toxicity and efficiency of rotenone insecticides, mixed with various dilutents, to certain vegetable insects. In the laboratory experiments, the in-

secticides were applied by blowing them under constant pressure into a bell jar and permitted the dust to settle uniformly for a measured period of time. The amount of dust per unit of area was also determined and, in experiments with the catalpa sphinx, the milligrams of insecticide ingested was calculated.

Samples of devil's shoestring collected locally were slightly toxic to the Mexican bean beetle, *Epilachna varivestis* (Muls.), but were much less effective than derris or cube. At equivalent concentrations and dosages, derris and cube appeared about equal in efficiency. Talc-rotenone dusts appeared equal or slightly superior to sulphur-rotenone dusts. Small larvae and adults of the Mexican bean beetle were decidedly more susceptible to derris, cube, and devil's shoestring dusts than were half-grown larvae.

Derris, timbo, and a sample of devil's shoestring from the Bureau of Plant Industry, at 0.5 per cent rotenone content, were effective against the turnip aphid, *Rhopalosiphum pseudobrassicae* (Davis), and the cabbage aphid, *Brevicoryne brassicae* (L.). These dusts were slightly more toxic to the turnip than to the cabbage aphid in terms of speed of kill, but the net mortality of the two species was approximately the same at the end of the test. The rotenone dusts were also slower in their toxic action than a one per cent nicotine dust but the net mortality from rotenone insecticides approached or exceeded that from nicotine at the end of 48 hours.

Preliminary experiments indicated that rotenone-containing insecticides were relatively ineffective against a lepidopterous pest of lima beans, *Plathypena scabra* (F), a cutworm, *Feltia annexa* (Treit), and the varigated fritillary, *Euptoieta claudia.*

Derris and devil's shoestring (sample from B.P.I.), each containing approximately one per cent rotenone, were fed in leaf sandwiches to 379 last instar larvae of the catalpa sphinx, *Ceratomia catalpae* (Bdv.). The smallest lethal doses of derris and devil's shoestring were 0.038 and 0.016 milligrams, respectively, per gram of insect; the largest non-lethal doses were 0.105 milligrams of derris and 0.137 milligrams of devil's shoestring per gram of insect; the median lethal doses were 0.068 and 0.066 milligrams, respectively. Small larvae in the last instar were more susceptible to the insecticides than larger ones.

Preliminary field experiments were conducted for the control of the pickleworm, *Diaphnia nitidalis* (Stoll) and the melonworm, *D. hyalinata* (L.) in cantaloupes and squash. One per cent rotenone dusts of derris and talc, 1:3, and of derris, talc, and *Stimtox D*, 1:1½:1½, were applied at weekly intervals to cantaloupes and squash in separate experiments. Only six per cent of the cantaloupes were infested on the derris-talc plots; 17 per cent were infested on the plants with derris-talc-*Stimtox D* and 90 per cent on the checks. Six per cent of the squash on the derris-talc plot were infested; 63 per cent were infested on the adjacent check.

None of the squash dusted with derris-talc-*Stimtox D* were infested; 45 per cent were infested on the adjacent check.

The Control of Citrus Insects with Oil Emulsions. (L. L. English).—In laboratory experiments conducted out of doors, powdered derris root was just as effective for white fly larvae and purple scale as an acetone extract, and more effective than equivalent quantities of rotenone and *Derrisol*, when used as supplements to an emulsion made with *Mineral Seal* oil and diglycol oleate. Emulsions made with 41, 56 and 83 viscosity (Saybolt) oils showed little difference in effectiveness as derris carriers for white fly larvae, but the effectiveness dropped sharply when a 31 viscosity oil (refined kerosene) was used. On purple scale, no practical difference was obtained by using derris as a supplement to emulsions made from oils obtained by blending nine parts of *Mineral Seal* oil with one part of *Merusol Petrolatum, Acme Red Engine* oil, cottonseed oil, soybean oil, and peanut oil. No advantage in effectiveness was obtained by attempts to incorporate derris products in the oil phase of emulsions. Considerable evidence was obtained to show that *Derrisol*, rotenone, and acetone or water steepates of derris were more effective against purple scale when used as supplements to the dilute emulsions. A definite increase in the kill of purple scale was obtained by mixing derris with an aqueous dispersion of gum karays before adding the emulsion. An emulsion made with nine parts of *Mineral Seal* oil and one part of diglycol oleate, used at a concentration of 1½ per cent, gave a kill of 5.1 per cent; the emulsion supplemented with derris at 2:1000 killed 38.2 per cent; but when gum karays, 2:1000 was also used, a kill of 91.7 per cent was obtained.

In a field experiment, the toxicity of derris to purple scale was demonstrated by using *Mineral Seal* oil-diglycol oleate emulsion as the derris carrier instead of the California Tank-mix oil spray which gave negative results the previous season. The emulsion produced 24.3 per cent scaly fruit, while the emulsion-plus-derris produced 9.2 per cent scaly fruit on plots which were uniform at the beginning of the season, as determined by the production of scaly fruit the previous year.

Farm Ponds. (H. S. Swingle, Zoology-Entomology, and E. V. Smith, Botany and Plant Pathology).—Experiments conducted during December, January, and February showed that bluegill bream grew during the winter months where sufficient food was available. The rate of growth was much slower, however, than during the spring and summer months.

The pondweed, Chara, slightly increased the production of bluegill bream; Naias did not increase fish production and apparently is an undesirable plant in fish ponds.

Bluegill bream spawned at the age of three to four months where sufficient food was available for rapid growth. In several of the large ponds, the main spawning period of the bream was in late August and September.

Freshwater shrimp (*Palaemonetes exlipes*) were produced in ponds with bream and apparently increased fish production slightly. The maximum production of shrimp in a fertilized pond was 1048 pounds per acre. In pools where shrimp became very numerous, bream fry and tadpoles were greatly reduced in numbers or entirely exterminated.

Blue channel catfish (*Ictalurus furcatus*) did not spawn during a three-year period in a two-acre unfertilized pond. Apparently they are unsuited to shallow ponds.

In acre ponds the cost of fertilizer per pound of fish produced varied from three to six cents. Maximum production obtained in any pond this season was 505 pounds of bluegill bream per acre.

Food Crops for Game Birds. (A. M. Pearson).—Twenty-five kinds of game bird food crops were planted in plots at seven different locations over the state. At each location three different plantings were made, i.e., early, midseason, and late summer. From these experimental plots records were taken as to (1) range of possible planting dates, (2) time of ripening of seed, (3) yield of seed, (4) time and rate of shattering, (5) the duration of time the seed remain sound and available as bird food, and (6) diseases and pests. The annual lespedezas and certain millets were found to be the most dependable producers of seed for use over the entire state. Common lespedeza appeared to be more adaptable to a wide variety of locations than any one of the other annual lespedezas tested. Browntop, German, and Texas millets gave uniformly good results at all places planted. Soybeans, mung beans, and cowpeas showed desirable qualities but the seed were usually available in sound condition over a relatively short season. Certain sorghums were satisfactory in some cases, but they were often subject to insect and sparrow damage. Florida beggarweed and sesbania gave excellent results in the southern half of the state but were subject to frost damage when planted farther north.