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HIGHLIGHTS of AGRICULTURAL RESEARCH

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AGRICULTURAL EXPERIMENT STATION SYSTEM
of the ALABAMA POLYTECHNIC INSTITUTE

SERVING ALL of ALABAMA

Light for broilers
HOW MUCH?

CLAUDE H. MOORE, *Associate Poultry Husbandman*
FRED MOULTRIE, *Poultry Husbandman*°

THE PROBLEM of correct lighting for broilers is a "toughy" for growers!

Of all conditions associated with broiler production, lighting probably is the most variable and least understood. This is indicated by the wide difference in amounts used, ranging from 10 to 15 hours of natural light to continuous artificial light.

Some difference is the result of variation in broiler house construction. However, most of it is due to lack of evidence to indicate what amounts of light affect growth and efficiency.

Studies of Light Begun

Do long periods of light retard growth of older chicks? Do younger chicks need more light? To get answers to these and other questions, the API Agricultural Experiment Station began a study of effects of light on growth.

In a basement room equipped with temperature and humidity controls, 16 experimental units (4×4×3 ft.) were built. Automatic ventilation, heat, and light controls were installed, as shown in photo.

Forty broiler strain, White Rock chicks (20 males and 20 females) were placed in each unit. Birds were removed at random as they grew in order to give some control of floor space. Eight of each sex remained per unit at end of the 8-week growing period. Weights were taken individually at 2-week intervals. Recommended management practices were followed.

Treatments provided a wide range in amount of light as well as in number of daily light periods. Total daily light included 24, 18, 12 and 6 hours.

Among the treatments used were:

No. 1, 24 hours light.

No. 2, 18 hours on and 6 off.

No. 7, 12 hours on and 12 off, is about average light provided by sun.

No. 12, 6 hours on and 18 off.

The foregoing treatments, No. 1, 2, 7, and 12, were used to determine the effects of different amounts of light when applied as one period daily. Three treatments (18, 12, and 6 hours) were applied in 1, 2, 4, 6, and 8 periods daily to determine effects of intermittent light. Intensity of light in all instances was 1 foot candle at floor level.

Results of Experiment

A summary of 8-week weights of the 3 replications completed to date is given in the table. Starved weights are presented in order to equalize amount of feed in each bird. This partly accounts for the smaller than expected weights.

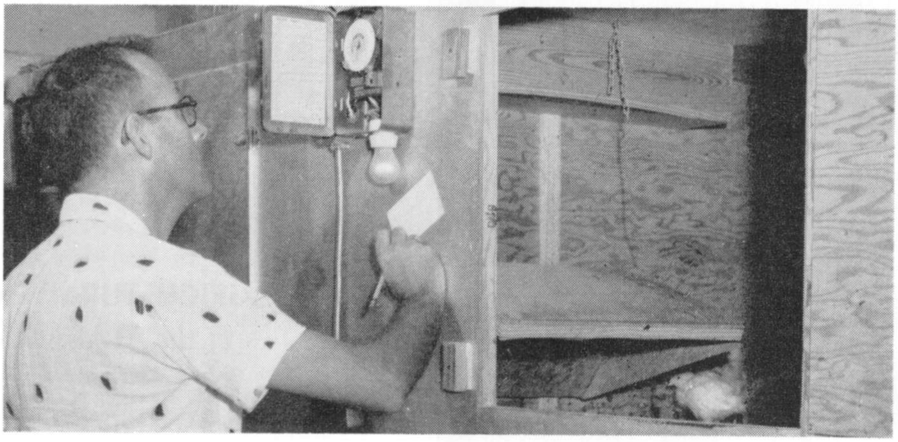
There is little difference in weights between treatments, irrespective of total light (24, 18, 12, or 6 hours) or number of light periods daily (1, 2, 4, 6, and 8). In practice, this would mean that amount of light and method of application have little to do with growth.

WEIGHTS OF 8-WEEK-OLD CHICKS GROWN UNDER DIFFERENT LIGHTING CONDITIONS

Light treatments		Weight
Total hours	Periods per day, number	Pounds
24	1	2.24
18	1	2.25
18	2	2.35
18	4	2.38
18	6	2.39
18	8	2.34
12	1	2.17
12	2	2.30
12	4	2.29
12	6	2.33
12	8	2.33
6	1	2.32
6	2	2.33
6	4	2.33
6	6	2.36
6	8	2.34

Light-growth relationship is more complex, however. Data indicate that 24, 18, or 12 hours of continuous light does not give growing birds adequate rest. This is particularly true as birds grow older.

Preliminary data indicate that true relationship of light to growth changes with age. Young birds, day-old to 3 or 4 weeks of age, apparently need more light than older birds. This light can be given as one period or several short ones. Young birds, when given only 6 to 12 hours of light daily, either do not have long enough feeding time or have periods too lengthy between feeding. As birds approach 8 weeks of age, this relationship changes to the point where less light and more rest is needed. Experiments are underway to evaluate light-age interaction as well as light effect on feed efficiency.



One of the 16 experimental units used in the study of lighting for broilers. Ventilation, heat, and light are controlled automatically in these units.

° Resigned

Alabama's CHANGING AGRICULTURE

J. H. YEAGER, *Associate Agricultural Economist*

FARMING ain't what it used to be!

There have been important changes in Alabama agriculture during the last quarter century. Farm operators, their facilities, machinery, crops, and livestock have undergone considerable change. These changes have great significance not only for farmers but also for townspeople.

Cotton and cottonseed accounted for 73% of all cash farm receipts as an average for the 5-year period, 1925-29. During 1950-54, cotton and cottonseed accounted for only 40% of all cash farm receipts. Peanuts comprised about 2% of Alabama farmers' cash receipts 25 years ago and approximately 5% today. All crops made up 85 cents of each dollar of cash farm receipts in 1925-29, but only 60 cents of each dollar in 1950-54, Figure 1.

In 1955, a good crop year, the composition of cash farm receipts from crops, and income from crops as a percentage of all cash farm receipts were almost the same as that during 1950-54.

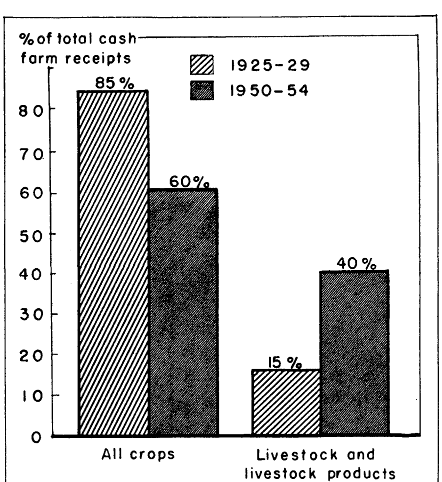


Fig. 1. Receipts from all crops and livestock and livestock products as percentages of all cash farm receipts, Alabama.

Income from Livestock Up

Livestock and livestock products have become increasingly important as sources of income. In 1955, livestock and livestock products accounted for 41.6% of the total cash farm receipts. During 1925-29, they made up only 15 cents of every cash farm receipts dollar.

In the last 25 years, all major classes of livestock have shown increases in the proportion of cash farm receipts they comprise. In 1955, the percentage of income from broilers, chickens, and eggs combined was 14.5% of total cash farm receipts. That from cattle and calves was 11.8; hogs, 7.6; and dairy products, 7.0%.

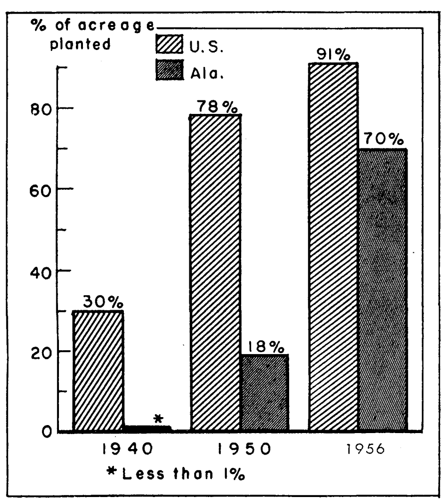


Fig. 2. Percentage of corn acreage planted with hybrid seed, Alabama and U. S.

Along with livestock farming have come changes in how farms are operated. In 1930, about 65% of Alabama's 257,395 farmers were tenants. Today, only one out of three is a tenant. Cash tenants and croppers have declined more proportionally than share tenants.

Farms Larger

Alabama farms are getting larger, as an average. In 1930, the average Alabama farm was 68.2 acres in size. In 1955, it was 117.6 acres. There are 6,530 more farms of 260 acres or larger today than in 1930. In that year, only 640 farms were reported to be 1,000 acres or larger. The 1955 Census reported 2,365 farms 1,000 acres or over in size.

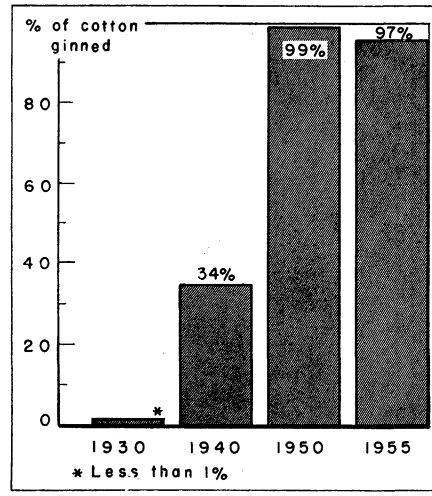


Fig. 3. Percentage of cotton ginned of 1 in. or longer staple length, Alabama.

Much of the machinery and equipment, commonplace on Alabama farms today, did not exist 25 years ago. Although many farmers have not mechanized completely, the number of tractors on farms increased from 4,664 in 1930 to 65,175 in 1955. Also reported on farms were 65,360 trucks, 5,086 combines, 2,974 corn pickers, and 3,016 pickup balers.

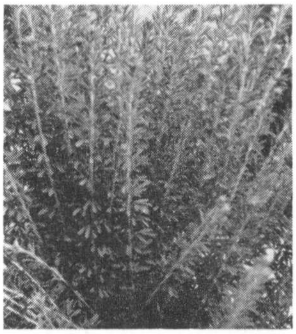
Better Living Conditions

Work and farm life have been made easier with new and improved facilities. Last year, almost 90% of all farms reported electricity, 38% had running water, 16% had home freezers, and 18% reported television sets. Nevertheless, rural farm population continues to go down. In 1930, one out of every two persons lived on farms, whereas 20 years later the ratio was one out of three. The urban population of Alabama in 1950 accounted for 43.8% of the total.

Varieties of crops, breeds of livestock, amounts and kinds of fertilizer, and farm practices have changed. As recently as 1940, less than 1% of the corn acreage in the State was planted with hybrid seed, Figure 2. In 1956 70.5% of the acreage was in hybrids.

Tremendous improvement has been made in staple length of cotton. In 1930, approximately 1% of the cotton ginned in Alabama was 1 in. or longer in staple. In 1955, cotton 1 in. or longer in staple length accounted for 97% of the total, Figure 3.

Changes are taking place daily. Nevertheless, agriculture remains a basic industry in supplying food and fiber for the population.



SERICEA—*short as a nutritive roughage*

GEORGE E. HAWKINS, *Associate Dairy Husbandman*

SERICEA is a controversial plant!

Because it grows well under adverse conditions, many farmers believe they can't do without it. On the other hand, milk production and weight gains have been so low on sericea forage that its usefulness is limited.

Previous studies have shown that the digestible protein content of commercial strains of sericea is low, averaging less than 5%. This is too low for high milk production or weight gains. Because of the low protein content, studies have been conducted by the API Agricultural Experiment Station to evaluate supplementing sericea hay with cottonseed meal, a protein supplement, and urea, a protein replacement, for growing calves and milking cows.

Calf Growth on Sericea

Dairy calves that were fed chopped sericea hay as the only roughage gained an average of 135.3 lb. from 4 weeks to 26 weeks of age. The same grade hay mixed with 41% cottonseed meal to bring the digestible protein content up to 10.5% produced gains of 174.3 lb. on similar calves during the same period (see photo). Calves in both groups received a maximum of 2 lb. of 16% concentrate daily, and were fed 6 lb. of milk a day until 7 weeks old. The hay contained 47.5% total digestible nutrients and 4.7% digestible protein.

It was already known that energy is not the primary growth limitation of calves fed sericea as the only roughage. Results of the study at Auburn suggested that a deficiency of digestible protein prevented high weight gains.

In another study urea, a relatively cheap protein replacement, was used to supplement sericea. It was fed in amounts to supply the same quantity of usable nitrogen as the digestible protein from cottonseed meal in the first study. There was little difference in weight gain from chopped sericea (147.3 lb.) and chopped sericea plus urea (145.2 lb.) during the period of 4 to 26 weeks of age. These calves received 3 lb. of 16% concentrate daily until 26 weeks old and 6 lb. of milk per day until 7 weeks old. Weight gains during the next 4 months were equal (0.52 lb. a day) for the two groups when all received 1 lb. of corn daily in addition to sericea hay.

Milk Production Drops

When milking cows were changed from alfalfa hay to sericea, production dropped 24.8% for those receiving sericea supplemented with urea to provide an equivalent of 10.5% digestible protein content. Production of cows receiving only sericea dropped 26.8%. Cows that remained on alfalfa during the same period declined only 6.6% in production.

The amount of total digestible nutrients consumed was similar for all groups, averaging 7.3% in excess of body maintenance and milk production requirements. The average apparent digestible protein content of the sericea, 5.6%, was enough to sustain milk production similar to that of alfalfa-fed cows. The protein content varied, and the lowest, 4.3%, was too low for normal milk production. Therefore, a response to urea supplementation of the lowest protein hay was expected.

Since there was no milk production or growth rate response when urea was fed, it appears that urea is not a satisfactory supplement for sericea hay.

Another investigation was conducted with milking cows using cottonseed meal as a supplement for sericea hay. Again there was no appreciable difference between milk production from sericea hay and sericea hay supplemented with cottonseed meal to a 10.5% digestible protein level. Production of both groups dropped about 24%.

Results from these experiments reemphasize that sericea is a poor-quality roughage. The tests with growing calves show that the nutrients needed for rapid growth are supplied by sericea hay, when supplemented with 1 lb. of 41% cottonseed meal to 3 lb. of hay. However, this ration did not supply enough nutrients for normal bone development (see arched back of calf at right in photo). Calves on this ration made good weight gains. Urea was not a satisfactory supplement for either growing calves or milking cows.

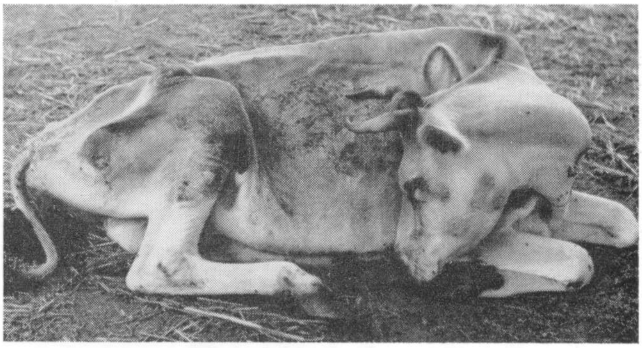
Sericea hay was not a satisfactory roughage for milking cows even when supplemented with cottonseed meal. This suggests that sericea contains a lactation inhibitor and should not be fed to milking cows.

Calf at left was fed sericea hay as the only roughage; one at right received sericea hay supplemented with cottonseed meal.

NITROGEN—

not guilty!

C. S. ROBERTS, *Animal Pathologist*



Cow down with green oat poisoning looks similar to animal with milk fever.

OATS AND WHEAT are mainstays in the winter grazing program of Alabama farmers. These small grains provide highly palatable and nutritious forage during winter months when grazing is at a minimum, and without seriously interfering with their yield of grain. For this reason, agricultural leaders have encouraged the planting of large acreages of oats and wheat.

A serious threat to the use of oats and wheat for winter grazing has developed in recent years. Numbers of cattle grazing these small grains have died from a disease resembling grass tetany. Losses have been reported from many areas of the State during the past 5 years, with the most deaths being in central and southern Alabama. Mississippi, Tennessee, and Georgia also have reported losses from green oat and wheat poisoning.

Some people have believed that the poisoning was caused by applying nitrogen-containing fertilizers to oats and wheat. Since nitrogen is essential for small grain that is to be grazed, the API Agricultural Experiment Station is conducting research to determine if recommended amounts of nitrogen can cause the disease.

Results from work recently completed at Auburn and at other locations in the South show that the oat and wheat poisoning more closely resembles grass tetany than nitrate poisoning. These results indicate that the disease is not related to the application of nitrogen to small grains.

Symptoms

First signs of the disease are usually tremors of the legs and flank region, stiffness of the hind legs, and difficulty in walking. Convulsions may develop if the affected animal is suddenly excited. Cows down with the disease usually assume a position with the head drawn back to one side (see photo), much the same as an animal with milk fever. Animals that get down usually die if not treated.

Information obtained from experiments at Auburn, and from livestock owners, veterinarians, and county agents indicate that heavy springers and cows that are nursing calves are more susceptible than dry cows, heifers, calves, steers, and bulls. This increased susceptibility of lactating cows is understandable, since it has been found that calcium and magnesium in the blood of an affected cow is much lower than normal. It has been known for a long time that milk production contributes to the lowering of the blood content of calcium and magnesium.

The Alabama tests have revealed that symptoms of poisoning do not develop until the cows have grazed oats or wheat for 2 to 3 weeks. These results agree with observations by farmers.

Nitrogen Not Involved

In grazing experiments conducted last winter near Auburn, in Autauga County, and at the Black Belt Substation, Marion Junction, oats fertilized with ammonium nitrate after planting were no more toxic than oats receiving no fertilizer after planting. No cattle were lost from oat poisoning on fields sidedressed with as much as 600 lb. of ammonium nitrate per acre; whereas, two head were lost from this disease on a field that received no fertilizer after planting. These results indicate that oats and wheat can be sidedressed with ammonium nitrate without danger of causing green oat or wheat poisoning of cattle.

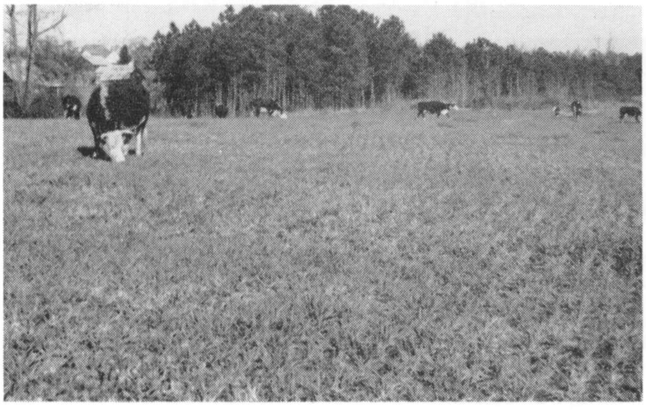
Recommendations

The following suggestions are offered as a means of preventing losses of cattle that are grazing oats and wheat:

(1) Heavy springers and lactating cows should be watched carefully for signs of oat or wheat poisoning and removed from the pasture at first sign of the disease.

(2) Supplemental feeding of grain or legume hay is a means of maintaining and supplementing the level of blood calcium and magnesium of cows on small grain pasture.

(3) All cattle should be kept off the pasture until the fertilizer has thoroughly dissolved.



Oats and wheat can be sidedressed with nitrogen without danger of causing green oat or wheat poisoning. In Alabama tests, no cattle were lost from this disease on oats that were sidedressed with up to 600 lb. of ammonium nitrate per acre.

This plot was given no herbicide treatment. Note the large population of wild garlic, which is typical of many pastures in the State.

WILD GARLIC *and* ONIONS *now can be* CONTROLLED

V. S. SEARCY, *Assistant Agronomist*

CONTROL of wild garlic and wild onions is here! And, it can be done with ease and at fairly low cost per acre.

That should be welcome news to livestock farmers who in years past have had little with which to fight the two pests.

There are some who call them wild onions. Actually they are two distinct species – wild onions *Allium canadense* and wild garlic *Allium vineale*. Wild garlic occurs more often and is more difficult to control than wild onions.

Research in Alabama

During the past 4 years, the API Agricultural Experiment Station has had under way five field experiments on control of wild garlic with chemicals. All of these experiments are being continued to determine the lasting effects on wild garlic and certain forage crops. Three experiments are located in a Bermudagrass sod, and one each on sods of fescuegrass and of white clover-Dallisgrass. The following chemicals are being tested at various rates: 2,4-D, MH-40, Dowpon, EH-6249, Weedazol, and a 1 to 9 mixture of creosote-diesel fuel.

Results

Wild garlic made up almost 100% of the species in all experiments. With few exceptions, all chemicals at all rates and in all experiments reduced the wild garlic population when compared with untreated plots. Although significant reduction in wild garlic was obtained, no plot was completely free even in the oldest test. Wild garlic has not been allowed to mature seed or aerial bulblets in any test to reinfest the area. To date, 2,4-D and MH-40 are the best chemicals to use when considering their effect on wild garlic, Bermudagrass, Dallisgrass, white clover, and fescuegrass. When considering the cost of 2,4-D and MH-40, 2,4-D is by far the most economical.

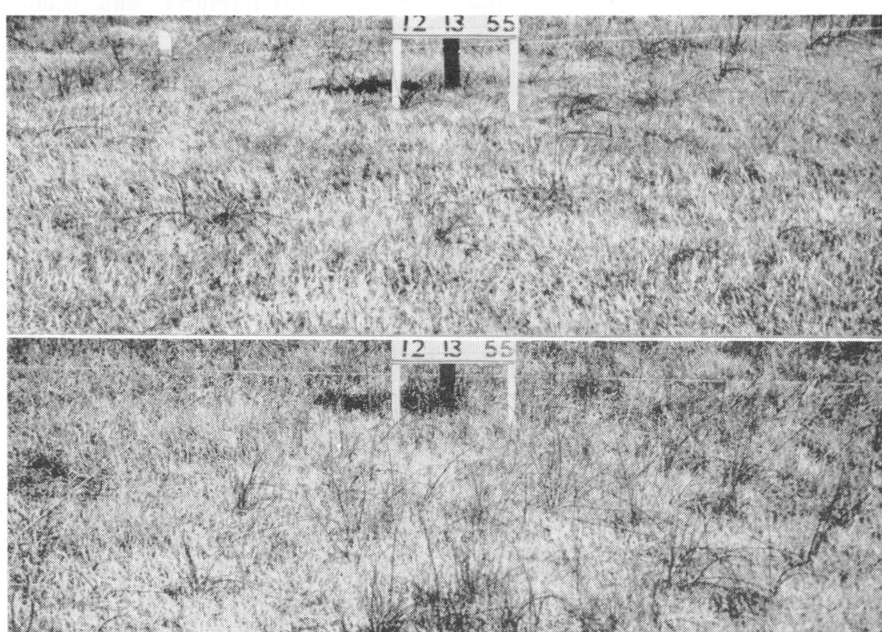
Recommendations

Based on results obtained, 2,4-D is recommended at the rate of 2 lb. (acid equivalent) per acre applied in 50 gal. of water. If an amine form of 2,4-D is used, be sure to add ¼ lb. of common household detergent to 50 gal. of spray. The detergent acts as a wetting agent. If an ester form of 2,4-D is used, the detergent is not needed. For milk production, the treatment is repeated as often as necessary for control, beginning usually in the fall. If milk is not a consideration, about as effective control will result by waiting until February to apply the 2,4-D.

The 2-lb. rate of 2,4-D will not harm established perennial pasture grasses. Well established white clover will be injured but will recover in most instances. Annual grasses for grazing, such as small grain, should not be sprayed until 6 or 7 in. high and well tillered. It is well to remember that 2,4-D will kill or seriously damage seedlings of most plants.

MH-40 at the rate of 10 lb. per acre does an excellent job of controlling wild garlic, but the cost is about 10 times that of 2,4-D.

It is emphasized that results point up control of wild garlic – not eradication. Since wild garlic bulbs and bulblets remain dormant in the soil for years, control therefore must by necessity be a continuing spray program.



In a 2-year period, wild garlic in plots was controlled most effectively by treatments with MH-40 (above) and with 2,4-D (below).

MAN-MADE WEATHER *for* COTTON RESEARCH

R. D. ROUSE and W. F. SOWELL
Department of Agronony and Soils

Half of Alabama's cotton crop is lost every year because of boll shed!

That is the estimated loss for years of good weather. In poor seasons, losses can run even higher.

Boll shed is one reason for low yields in the Southeast – 325-lb. average for the past 10 years. This is about half of the average yield in California, New Mexico, and Arizona, and on some farms in the Southeast. No cotton producer in the Southeast escapes boll loss even when all recommended practices are followed.

Field studies to determine the reason for boll drop have been made using various approaches, but with little success.

New Research at Auburn

The API Agricultural Experiment Station recognized the need for a more fundamental research approach to this problem than had been made in the past. In previous experiments, changes in weather conditions were most frequently considered responsible for boll shed. Therefore, complete control of environmental conditions was the first requirement in the new experiments. In 1955, a growth chamber was established at Auburn where studies are being conducted under controlled temperature and light.

The chamber is located in a well-insulated, windowless basement room. Light is produced by 70 8-ft. fluorescent and 48 40-watt incandescent lamps installed on a 1-in. plyboard 8 ft. above floor level. The lamps occupy an 8 × 12-ft. area. The 2,500 foot candles they supply is equal to one-third of the light intensity from the sun during midday in June when there are no clouds. Two cooling units, totaling 6½-ton capacity, control the temperature at desired level within 1° and relative humidity within 5%. An inside view of the chamber, with cotton in the squaring stage, is shown in Figure 1.

Fig. 1. Cotton at squaring stage in growth chamber at Auburn where boll shedding is being studied under controlled environmental conditions.

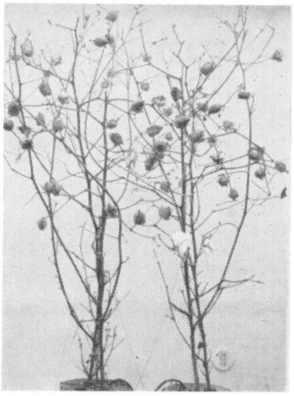


Fig. 2. Chamber-grown plants that failed to set bolls at 72° F. as indicated by the absence of bolls on lower part of plants. However, they set an excellent crop with temperature raised to 85° F.

Best Conditions Determined

Cotton plants suitable for boll-set studies had not been previously grown under completely controlled conditions. Therefore, the best conditions for growing cotton plants and obtaining boll set had to be determined. It was found that cotton does not set bolls when the day temperature is as low as 72°F, whereas, good boll set is obtained at 85°. Figure 2 shows plants grown in the chamber. These plants failed to set bolls at 72°F. as indicated by the absence of bolls on the lower part of the plants, but excellent boll set occurred when temperature was increased to 85°.

The cotton plants are grown in water culture in 2-gal. pots so that the mineral elements required for plant growth can be carefully controlled and the amounts absorbed by the plants determined. Root aeration is regulated by release of compressed air into the solution. The pots are on tables that are adjustable in height so that as they grow the top of the plants can be maintained the same distance from the lamps.

Present studies are showing effects of ratio of mineral elements as well as pH and root aeration on boll set. Various rates of the elements potassium, sodium, magnesium, and calcium are being used at different pH and root-aeration levels.

If the balance of mineral plant food elements available to the cotton plant is a factor in boll shed, this study should indicate field practices that can help prevent loss of bolls and thus increase yields.

FERTILITY *important to quality production*

T. B. HAGLER, *Associate Horticulturist*
C. C. CARLTON, *Superintendent, Chilton Area Horticulture Substation*

CORRECT FERTILIZER applications can greatly increase production of high quality fruit.

This has been proved in many years of study by the API Agricultural Experiment Station.

Three factors govern the degree and kind of fertilization: (1) type of soil, (2) cultural practices, and (3) degree of pruning.

Peach trees must make 12 to 20 in. of annual twig growth for good fruit yields, according to research results. This is necessary to supply 1-year-old wood needed for heavy fruit bud set.

At the Chilton Area Horticulture Substation, the best fruit yields resulted from turning under a winter legume with no commercial nitrogen added. At the end of 7 years, weight per tree was 223 lb. and fruit yield per tree was 268 lb. This compared to a tree weight of 97 lb. and 77 lb. of fruit when clean culture was used (see photos). Best results were obtained when vetch was turned under as green manure. After 7 years, the average tree weight was 272 lb. and fruit yield was 363 lb. per tree.

When rye was disked into the soil, ¼ lb. of nitrate of soda was applied per tree annually per year of the tree's age. The average tree weight was 185 lb. and fruit yield was 259 lb. per tree as compared with 87 and 147 lb., respectively, for clean culture. Four hundred lb. of 0-14-14 were applied per acre in fall and spring to supply needed phosphorus and potassium.

Results of a survey in 20 Alabama counties showed that a winter legume was used effectively as a pecan cover crop. Best results were obtained by turning under crimson clover or vetch and applying 500 to 700 lb. of 8-8-8 per acre in the spring. The cover crop was fertilized with 500 to 600 lb. of 0-14-14 or 0-16-8 per acre in the fall. When Bermudagrass or small grain was grazed, an additional 50 lb. of nitrogen was applied per acre not later than June 1.

An application of 2 to 3 lb. of zinc sulphate per tree annually prevented rosette in pecan orchards. To correct rosette Alabama growers can apply 10 lb. of zinc sulphate per tree for 2 successive years.

Left — Growth of 2-year-old Elberta peach tree on land with no winter legume turned under: right—2-year-old Elberta on land where manganese bur clover was used as a winter cover crop.

New and Timely PUBLICATIONS

Listed here are timely and new publications reporting research by the Agricultural Experiment Station.

Bulletin 300. Alfalfa Production reports results from 30 years of experiments with alfalfa in Alabama.

Special Leaflet. General Fertilizer Recommendations for Alabama presents fertilizer recommendations for different crops in all regions of the State.

Special Leaflet. Small Grain Varieties for Alabama reports on the 1956 variety tests and lists recommended varieties.

Leaflet 48. Peach Varieties for Alabama describes leading peach varieties and lists varieties recommended by the Experiment Station.

Progress Report 61. Construction and Operation of Outdoor Brooder presents results from tests of an outdoor brooder and contains a construction diagram.

Free copies may be obtained from your county agent or by writing the API Agricultural Experiment Station, Auburn, Alabama.

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