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On the cover. Yield response of Coastal Bermudagrass to high rates of nitrogen fertilization has been proved in research and by farmer experiences. This fast-growing perennial produces large amounts of forage when fertilized and managed properly. One problem with Coastal is a drop in quality of forage late in the growing season. Results of studies aimed at learning how to prevent this quality loss are reported in the article on page 15. Rate of nitrogen fertilization, frequency of application, and frequency of harvest were found to affect crude protein content of Coastal forage, which is a good indicator of quality.

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New and Timely PUBLICATIONS

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

Bul. 342. Production-Consumption Interrelationships of Alabama Farm Businesses.

Bul. 343. Adaptability of Corporate Organization to Family Farms.

Bul. 344. Effects of Deep Turning and Non-Dirting Cultivation on Bunch and Runner Peanuts.

Cir. 126. Using Low-Volume Farm Sprayers.

Cir. 127. Mechanized Cotton Production in Alabama.

Cir. 143. Psychrometric Chambers for Poultry.

Leaf. 69. Performance of Peach Varieties in Alabama.

Leaf. 70. Serala—A New Sericea Variety.

Prog. Rept. 79. Controlling Chinch Bugs on St. Augustine Grass Lawns.

Prog. Rept. 84. Rainfall Distribution in Alabama.

Free copies may be obtained from your County Agent or by writing the Auburn University Agricultural Experiment Station, Auburn, Alabama.

These experimental cows are shown just after being turned into a new strip in the area managed for strip grazing. Although cows did well on strip grazing, the system required extra labor.

Managing Johnsongrass for Highest Possible Milk Production

GEORGE E. HAWKINS, *Dept. of Dairy Science*
L. A. SMITH and H. W. GRIMES, *Black Belt Sub.*
R. M. PATTERSON, *Dept. of Agronomy and Soils*
J. M. LITTLE, *Dept. of Dairy Science*

JOHNSONGRASS IS AN IMPORTANT perennial grass in the Black Belt. It is ideally suited to that area of Alabama and is widely grown for forage.

In previous Auburn University Agricultural Experiment Station studies, Johnsongrass grazed continuously was equal to sweet Sudangrass or millet for milk production. Thus, where it is adapted, Johnsongrass is preferred over the annual forages.

Management Systems Compared

To determine the system of management that will support the most cows per acre and produce the most milk, Johnsongrass was: (1) continuously grazed, (2) 1-day strip grazed, (3) rotationally grazed, and (4) green-chopped. In this 4-year experiment at the Black Belt Substation, Marion Junction, three of the systems were compared each year. Six cows were used on each system each year.

Cows on continuous grazing had access to the complete paddock at all times. Those on 1-day strip grazing were confined to an area they would eat in 1 day. Rotationally grazed paddocks were divided into four sub-paddocks. When sub-paddocks were grazed down (about 1 week), cows were moved to the next one. Green-chopped Johnsongrass was cut daily and hauled to cows confined to a drylot.

Experiments covered 8-week periods each year, except the second was 10 weeks. The fourth year test was split into two 4-week periods because drought prevented growth of enough forage for a continuous 8-week test.

Forage Quality Measured

Cows on rotational grazing consumed the most forage (on basis of dry forage per 100 lb. body weight) and those on green-chopped Johnsongrass ate the least (see table). During each year of the test, cows rotationally grazed had higher forage intakes than cows continuously grazed or fed green-chopped forage. Also, cows on strip grazing consumed more forage each year than cows on green-chop. Other comparisons did not show a consistent trend. Ranges of intakes between years by systems were: strip grazing, 2.68 to 3.26 lb.; rotational grazing, 2.98 to 3.17 lb.; continuous grazing, 2.52 to 2.96 lb.; and green chop, 2.55 to 2.93 lb. per 100 lb. of body weight.

Digestibility of Johnsongrass was similar when strip, rotationally, or continuously grazed (see table). Green-chopped forage was consistently lower in digestibility than that of the other systems. Ranges in digestibility percentages for each system were: strip, 66.1 to 58.4; rotational, 66.6 to 58.6; continuous, 68.2 to 59.8; and green-chop, 60.1 to 54.4.

Milk production of cows on strip, rotational, and continuous grazing was similar. Daily average on these systems was 4.5 to 4.9 lb. more milk (4% fat corrected) per cow than on green-chop (see table).

RELATIONSHIP BETWEEN MANAGEMENT SYSTEMS FOR JOHNSONGRASS AND PERFORMANCE OF DAIRY COWS, 4-YEAR AVERAGE

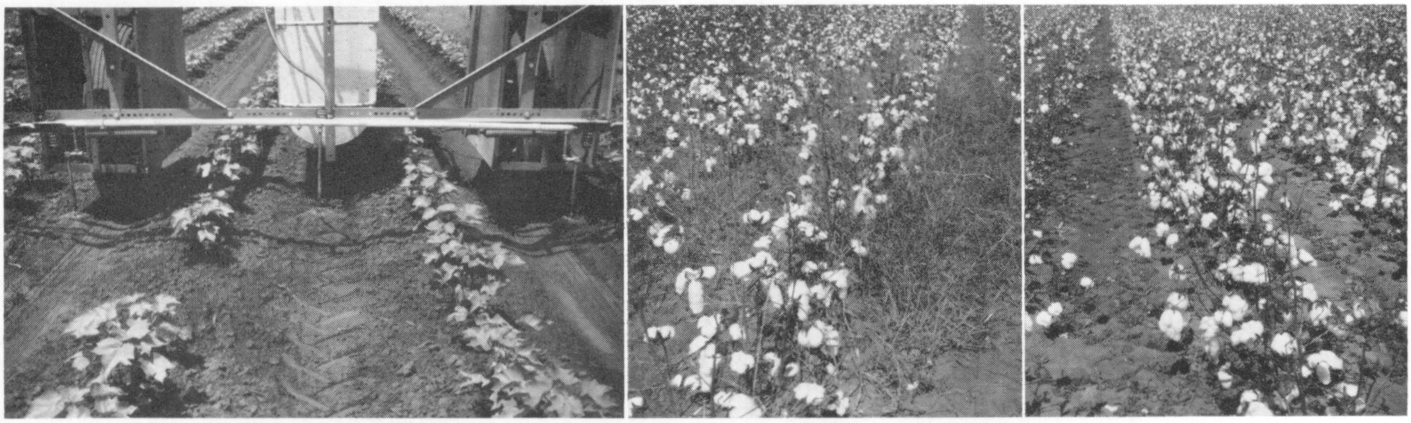
Performance criteria	Result, by system of management			
	Strip	Rotational	Continuous	Green-chop
Dry forage intake per cwt., lb.	2.9	3.1	2.8	2.7
Digestibility of dry forage, pct.	62.6	63.5	64.0	56.6
Milk per day per cow, lb.	27.9	28.3	28.1	23.4
Body weight change per cow per experiment, lb.	+19.0	+12.8	+ 9.2	−11.5
Acres per cow, no.	0.62	0.63	0.74	0.62
Milk per day per acre, lb.	45.2	44.9	38.0	37.7

Changes in body weight were variable between systems. Cows on green-chop lost weight and those on other systems gained.

About the same acreage was required to support 1 cow on strip and rotational grazing and on green-chopped forage (see table). Continuous grazing required 17.5% more area per cow than did the other systems. Surplus forage ranging from 448 to 951 lb. per acre was harvested from green-chopped paddocks.

Daily milk production per acre was higher on strip and rotational than on continuous grazing or on green-chopped forage (see table).

Taking all factors into consideration, rotational grazing appears to be the most satisfactory method of managing Johnsongrass for dairy cows. Disadvantages of the other systems were: strip, needed extra labor; continuous, required most acreage; and green-chopped, produced less milk and required extra labor.



Application of lay-by chemical 20 days before normal lay-by is shown at left, a plot laid-by 20 days early without chemical treatment, center, and a plot laid-by 20 days early with chemical treatment, right.

The use of LAY-BY HERBICIDES in mechanized cotton

T. E. CORLEY, *Associate Agricultural Engineer (Coop. USDA, ARS, AERD)*

ANNUAL GRASSES and broadleaf weeds can be controlled with chemicals from lay-by to harvest.

However, since late weed infestation cannot be predicted at lay-by time, the chemical is applied as a weed insurance and the economics of this practice is doubtful. One way to make more economical use of a lay-by chemical is to eliminate one or more mechanical cultivations and lay-by early.

Tests were conducted by the Auburn University Agricultural Experiment Station in 1961 and 1962 on a clay soil at the Tennessee Valley Substation and on a sandy soil at the Sand Mountain Substation to evaluate the use of lay-by herbicides in a mechanized cotton program. The tests were designed to determine the number of mechanical cultivations that might be eliminated without affecting picker efficiency, cotton quality, and yield.

A normal cultivating and hoeing schedule was maintained on all plots until chemical application. The chemical was applied immediately after a scheduled cultivation. Diuron was applied as the lay-by chemical at the rate of 1 lb. (1¼ lb. of 80% W powder) in 25 gal. of water per acre with one suspended flooding nozzle per middle.

On the clay soil in 1961, the cotton was treated 30, 20, 10, and 0 days before normal lay-by time (Station practice) when the approximate plant heights were 7 in., 9 in., 14 in., and 19 in., respectively. In 1962, the treatments were made 25, 15, and 0 days early and the respective plant heights were 12 in., 21 in., and 29 in. During both years, plant height was 34 in. at harvest time.

On the sandy soil in 1961, treatments were made 20, 10, and 0 days early and the respective plant heights were 12 in., 16 in., and 24 in. In 1962, treatments were made 16 and 0 days early and plant heights were 16 in. and 31 in. The cotton was 38 in. at harvest time both years.

In one test at each location, a diuron-surfactant mixture was applied to emerged weeds two weeks after lay-by with mechanical cultivation. In all tests, the check consisted of cotton laid-by at normal time with mechanical cultivation and without chemical. A good cotton stand was obtained and the plot area was free of perennial weeds in each test.

In 3 of the 4 tests, weed infestation at harvest time was not considered severe enough in any of the treatments to affect picker efficiency or cotton quality. These tests were hand-harvested for yield data.

In the 1961 test on the clay soil, weed infestation was rather heavy for some treatments and picker performance data were obtained, see table.

The lack of weeds limited the data and benefits obtained. Based on these and other tests, the use of lay-by herbicides will not always pay, and the need will vary with seasons and fields, cotton stand, cotton plant size, and potential weed infestation.

Cotton laid-by and treated with a chemical 10 to 20 days before normal lay-by time was free of weeds at harvest time. This early treatment saved 1 to 2 cultivations, and did not affect picker efficiency, cotton quality, or yield. Cotton laid-by 30 days early with a chemical had considerable weeds at harvest time.

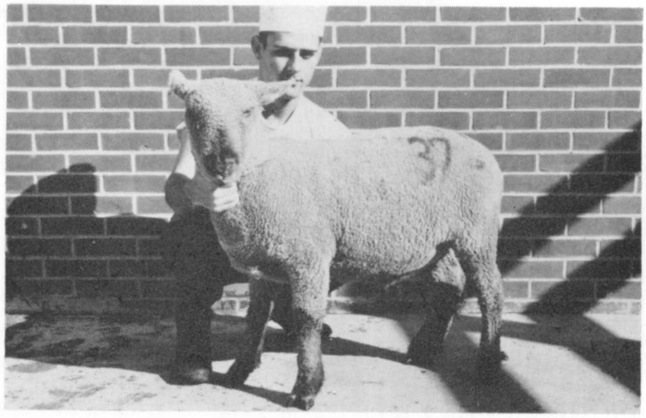
The amount of grass did not affect picker efficiency but resulted in differences in grass content of the harvested cotton. In the severe infestation, the grass content was probably large enough to cause a grade reduction, depending on ginning equipment. Preliminary tests with a lay-by chemical-surfactant mixture show promise of delaying treatment until the need for weed control is evident.

PICKER PERFORMANCE AND GRASS INFESTATION FOLLOWING LAY-BY TREATMENTS WITH AND WITHOUT CHEMICALS—TENNESSEE VALLEY SUBSTATION, 1961

Lay-by treatment	Lay-by time, days before normal lay-by	Crabgrass stems at harvest time, per 10'[1]		Picker eff.	Grass content of harv. seed cotton
		6" high	24" high		
	No.	*No.*	*No.*	*Pct.*	*Pct.*
Chemical	30	21.4	8.2	94.5	0.28
Chemical	20	3.1	1.0	95.1	0.07
Mechanical	20	52.4	16.5	95.2	0.78
Chemical	10	3.2	0.6	94.8	0.04
Chemical	0	1.1	1.0	95.3	0.03
Mechanical	0	8.9	1.0	95.2	0.04

[1] Only the stems subject to passing through the picker were counted.

The lamb at right was fattened on dehydrated and pelleted peanut vines.



DEHYDRATED-PELLETED PEANUT VINES—a new enterprise for peanut farmers[1]

W. B. ANTHONY, J. G. STARLING, C. A. BROGDEN, RONALD NIX, and R. R. HARRIS[2]

DEHYDRATED AND PELLETED peanut vines may become a valuable by-product of the 200,000-acre peanut crop in Alabama.

Preliminary research conducted in 1962 by the Auburn University Agricultural Experiment Station at its Wiregrass Substation shows that dehydrated and pelleted peanut vines have high nutritive value and harvesting vines is beneficial to the nut-thrashing operation.

Methods Used

Peanut vines were cut with a conventional forage chopper fitted with a sickle bar attachment and harvest was just ahead of the conventional digging operation. The vines were hauled to a dehydrator and processed immediately into a pelleted product. The material was fed to steers and lambs.

Chemical composition and digestibility data for the peanut vines are given in the table. Although the crude protein is a little lower than the content of crude protein in the usual commercial alfalfa meal, the composition data are very similar to that of alfalfa. The carotene content is especially high in this product. The cellulose is lower in the vines than is usual in Alabama hays and this is desirable.

Digestion Tests

Four yearling Hereford steers were used to determine the digestion coefficients that are summarized in the table. Prior to digestion trials, these animals were housed in individual stalls and full fed the pellets. The average consumption was 18 lb. per head daily, which was 3% of animal live weight. This rate of intake was equal to the intake obtained for the highest quality forages fed in other tests. The dehydrated and pelleted peanut vine forage, therefore, is very palatable to livestock, one of the two major categories for judging forage quality. The second category for judging quality is the nutrient availability. Based on laboratory results for many kinds of forage, the dehydrated and pelleted peanut vine product is equal to the best forages studied. It is superior to most grass forage.

CHEMICAL COMPOSITION AND DIGESTION COEFFICIENTS FOR DEHYDRATED AND PELLETED PEANUT VINES USING STEERS

	Amount present	Digestibility
	Pct.	*Pct.*
Dry matter	90.20	60.03
Energy	----	64.22
Crude protein	15.67	58.78
Ether extract	5.00	59.66
Cellulose	29.89	58.57
Starch	5.81	73.76
Sugar	4.62	+90.00
Other uncharacterized carbohydrate	15.32	
Ash	13.89	
Calcium	1.96	
Phosphorus	0.22	
Magnesium	0.43	
Cobalt	0.10	
Carotene	289,000 I.U. or 173.4 mg./lb.	

Nutrition Tests

To obtain further information on the nutritive value, two lambs were fed the pellets as the only source of food except water and salt for 62 days. The lambs weighed 81 lb. at the start of the test and were in good flesh. The daily gain on test was 0.38 lb. and feed per pound gain was 10.45 lb. These data indicate, therefore, that the pelleted vines constitute a balanced diet and are palatable over an extended period of time when fed as the sole source of food.

Alabama's livestock industry would greatly benefit from an increased supply of high quality legume forage such as dehydrated and pelleted peanut vines would supply. The pelleting of the vines is relatively easy as contrasted to the extreme difficulty encountered in pelleting Coastal Bermudagrass. Furthermore, feeding results at the Station show that the pelleted vines are far superior to Coastal Bermudagrass in digestible nutrients and possibly superior as a source of carotene. Although all research conducted so far has been with dehydrated and pelleted vines, it may prove best for individual farmers to conserve the vines as silage.

Problems

At least two problems must be overcome if the peanut vines are to be direct cut and used for feed. The first of these problems is that presently the peanut crop is treated with DDT. This renders the forage unfit for feed. This may be overcome by using Sevin instead of DDT. It controls insects as well as DDT and the forage can be fed.

The second problem is that in the peanut growing area there must be established facilities for dehydrating and pelleting the vines. The harvest period is of short duration and, for this reason, the dehydrating plants would need to obtain other crops to process to extend the period of operation.

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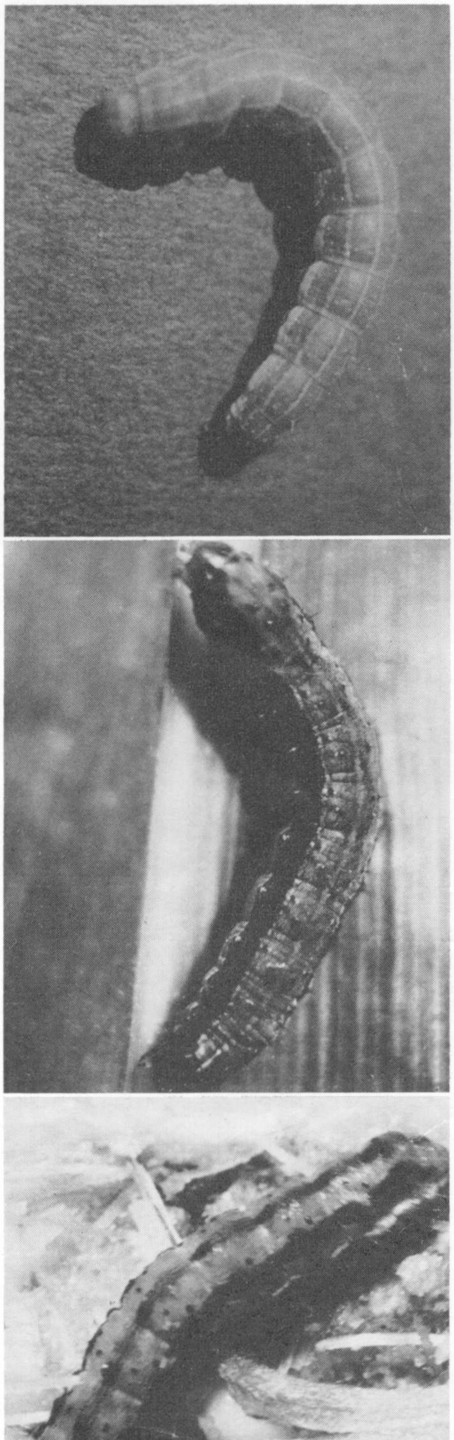
[1] Appreciation is expressed to John B. LaGarde, Piedmont, Alabama, who dehydrated and pelleted the vines used in this study.

[2] Animal nutritionist, assistant superintendent, Wiregrass Substation, superintendent, Wiregrass Substation, assistant in animal science, and assistant animal nutritionist, respectively.

WHEN to TREAT SOYBEANS for WORM CONTROL

ANWARA BEGUM and W. G. EDEN
Department of Zoology-Entomology



Here are the most important soybean defoliators: (top) velvetbean caterpillar, Anticarsia gemmatilis Hubner; (center) fall armyworm, Laphygma frugiperda (J. E. Smith); (bottom) corn earworm, Heliothis zea (Boddie).

Both stage of plant growth and amount of insect feeding are important indexes for determining when to treat soybeans for worm control.

Although soybeans are attacked by several species of defoliating insects, the most important ones are the velvetbean caterpillar, fall armyworm, and corn earworm. When infestations are severe, the plant may be completely defoliated.

Defoliation experiments at different stages of plant growth were conducted in 1962 to determine the effects on yield and quality of soybeans. The research by the Auburn University Agricultural Experiment Station was carried on at its Plant Breeding Unit, Tallassee, and Gulf Coast Substation, Fairhope. Three degrees of defoliation were applied at three different stages of growth of the soybeans. One-third, two-thirds, and all of the leaves were removed from beans at blooming, when beans were half-grown in the pods, and when beans were full-grown but before they began to dry. Yields and grades were determined when the beans were harvested.

Yields following the various treatments at the two locations are presented in the table. It is obvious that removal of one-third of the leaves during blooming had little effect on yield. Loss of two-thirds or more of the leaves at blooming caused significant yield losses. When the beans were half-grown in the pods, all degrees of defoliation resulted in significant yield reductions. When the beans were full-grown in the pods, the effects of defoliation were less significant than at the earlier stages of growth.

Thus, a small amount of "ragging" by worms prior to blooming of soybeans has no important effect on the yield. The importance of protection of foliage increases from the time blooming begins until the beans are grown in the pods. After the beans are grown, protection of the foliage against leaf-eating insects is less important.

For worm control on soybeans, the following insecticides and rates are recommended: DDT, 1 lb. per acre, (20 lb. of 5% dust or 0.5 gal. of 2 lb. per gal. emulsifiable concentrate); toxaphene, 2 lb. per acre, (10 lb. of 20% dust or 0.3 gal. of 6 lb. per gal. emulsifiable concentrate), or Sevin, 1 lb. per acre, (20 lb. of 5% dust or 1¼ lb. of 80% sprayable).

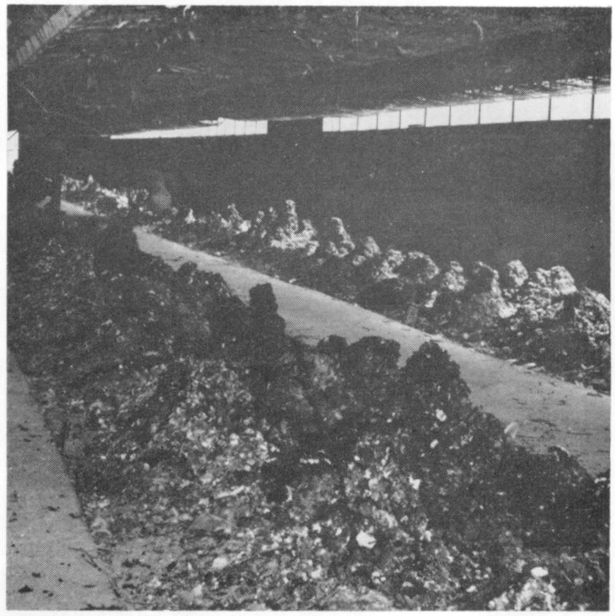
Yields of Soybeans Following Varying Degrees of Defoliation at Different Stages of Growth

Amount of defoliation	Stage of growth	Yield per acre		
		Tallassee	Fairhope	Mean
Pct.		*Bu.*	*Bu.*	*Bu.*
0	--------	42.5	34.9	38.7
33	Blooming	41.1	35.2	38.2
	Beans half-grown	37.0	28.4	32.7
	Beans full-grown	41.7	33.3	37.5
67	Blooming	43.9	27.6	35.8
	Beans half-grown	36.6	27.8	32.2
	Beans full-grown	35.4	34.5	35.0
100	Blooming	34.0	14.9	24.5
	Beans half-grown	5.2	9.3	7.3
	Beans full-grown	38.1	34.5	36.3
LSD, .05		4.8	2.7	2.5
.01		6.6	3.7	3.3

Control of HOUSEFLIES *Under* CAGED LAYERS

KIRBY L. HAYS and JOE F. BURKS

Department of Zoology-Entomology



HOUSEFLIES are scavengers during their complete lifetime.

Both the adults and larvae (maggots) are found in and around filth, and are commonly seen in manure, garbage, and decaying materials. The high reproductive rate and short life cycle are responsible for the rapid buildup in populations. One pound of manure may support as many as 1,000 larvae.

One female fly may lay more than 2,000 eggs in a month after emergence. These eggs hatch in 1 day in warm weather. The larvae feed for about 5 days before pupating. The pupal stage lasts about 4 days – thus the life cycle is passed in 10 days. If all eggs developed to adulthood, the progeny of one pair of flies would be about 200,000,000,000,000,000,000 (quintillion) individuals in a single season. Fortunately many factors serve to regulate housefly numbers.

Housefly Habitat

It may be safely said that where houseflies are abundant they have been bred in the immediate vicinity. However, they are known to fly several miles. If large swarms are seen on the farm, it is likely that flies are breeding in the area of farm buildings. Chicken houses are favored places, especially houses where birds are caged and manure is allowed to accumulate under the cages. Certain physical factors of the manure itself may be responsible for conditions more conducive for housefly breeding. Research by the authors at the Auburn University Agricultural Experiment Station's poultry farm in 1960 and 1961 has shown that houseflies can live in chicken manure containing 30 to 70% water by weight. The most favorable content was 55 to 60%. They will also tolerate a pH of 4.7 to 11.4. The optimum pH was about 7. Variations of temperature were shown to affect the housefly only when temperatures were raised above 104°F. However, the complete life cycle required 9.5 days at 88°F., whereas it required 20.2 days when the temperature was lowered to 68°F.

Housefly Control

The best housefly control is sanitation. On farms, the best method is disposal of manures. Manure should be removed daily from barns and chicken houses and spread on fields where it can dry out or be incorporated into the soil by rains. In chicken houses, where caged laying hens are kept, the daily removal of manure is impractical. If manure is allowed to accumulate under caged hens, the most important factor in fly control is to keep the manure dry, less than 30% moisture by weight. This can be accomplished by allowing the manure to lie undisturbed and form into dry cones under the cages. The cones should be kept free from moisture, such as drinking water of the hens and rain blown into the laying house. Large areas of wet manures should be removed immediately and spread on the fields.

Efforts have been made to control fly breeding by the addition of acids and bases to the manure at weekly intervals; however, the large amounts of materials needed prevent their effective use.

The housefly has become resistant to many chemicals formerly used for its control. However, the weekly addition of certain insecticides to chicken manure as it forms into cones has aided considerably in preventing the housefly from breeding under caged laying hens. Of several insecticides tested, Baytex, Kepone, and calcium arsenate (Kilmag) were the most effective in killing housefly larvae in chicken manure when applied to the manure as granules or dusts. Applications of Diazinon will also control the fly larvae. *Only calcium arsenate and Diazinon are approved for use at the present time and only if the birds do not come in contact with the insecticide in the droppings.*

Calcium arsenate is applied as a dust over the surface of the droppings at weekly intervals, using about 1 lb. per 500 sq. ft. of droppings area. Diazinon can be applied as a granule or as a spray. About 20 oz. of 5% granule should be distributed evenly over the manure, or spray with 2 oz. of 50% wettable Diazinon in 5 gal. water per 500 sq. ft. of droppings.

Extreme care must be taken to not contaminate the chickens, their feed, or water. Insecticides should be applied by shaker can or sprayer but *never by hand.* If clothing is contaminated, it should be removed immediately and washed. Persons applying the insecticides should wash all areas of exposed skin, such as face and hands, after treating the manure areas.

Temperature Requirements for Germination of Different Clover Species

C. S. HOVELAND, *Associate Agronomist*

HAVE YOU EVER wondered why one clover germinates in late summer while seed of others lie dormant until winter?

At first thought, this may seem mighty peculiar. But there is a logical explanation for this species difference – it's the result of different temperature requirements for germination.

Varying temperature requirements among species were shown in recent studies by Auburn University Agricultural Experiment Station. In these experiments, scarified seed of crimson, ball, mike, and arrowleaf clovers were placed on moist filter paper in glass petri dishes and germinated at varying temperatures. Sprouted seed were counted during and at the end of the germination period and sprout lengths were measured as an estimate of vigor.

Continuous 70° Ideal

As shown by data in the table, good germination of all the clovers occurred at the ideal temperature of continuous 70°F. However, such a continuous ideal temperature is unlikely in the soil surface where clover seed germinate. There are wide day-night temperature fluctuations at the soil surface where small seeded clovers germinate.

The high temperature treatments used in the study (see table) may come close to the late summer day-night fluctuations. Under these conditions, crimson clover germinated fairly well and vigor was good. The other three clovers had much lower germination and poor sprout vigor. When the starting temperature was 100°, germination and sprout vigor of ball, mike, and arrowleaf were further reduced.

Late fall soil surface temperatures may be approximated by the alternating 40° and 70° treatment tested. Extremes of 40° to 90° have also been recorded. The low temperature resulted in rapid germination of arrowleaf, ball, and mike clovers. Sprout vigor was also good. It was also noted that these three clovers had good germination and sprout vigor when subjected to continuous 40° temperature.

CLOVER GERMINATION AS AFFECTED BY TEMPERATURE

Temperature (F.)	Per cent germination			
	Crimson	Ball	Mike	Arrow-leaf
Continuous 70°	96	94	86	98
Alternating 100°, 8 hours—70°, 16 hours				
Starting temperature 70°	62	20	27	24
Starting temperature 100°	68	7	14	16
Alternating 40°, 8 hours—70°, 16 hours				
Starting temperature 70°	96	96	82	97
Starting temperature 40°	42	98	81	96

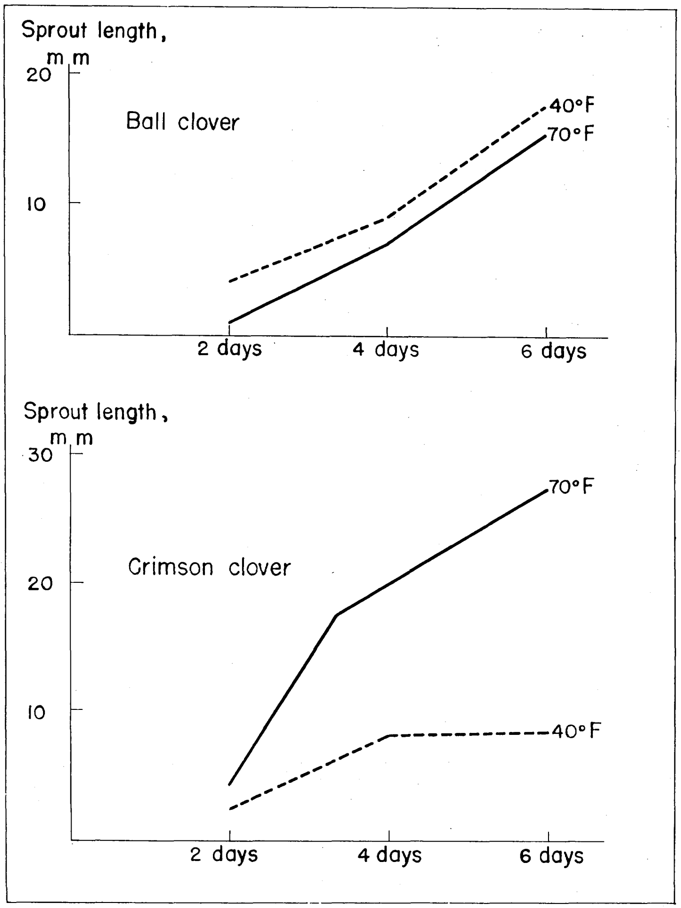
Crimson Germinated Slow

Crimson clover germination was much slower than for the other clovers and dependent on the initial temperature. Starting at the low temperature reduced total germination. Several samples of crimson clover seed that tested 95% at continuous 70° germinated only 24% when 40° was the initial temperature.

Sprout vigor of crimson clover was sharply reduced by an initial cold treatment of 40° for 8 hours, as shown in the graph. Sprout vigor of ball, mike, and arrowleaf clovers was unaffected by the low temperature treatment. In the case of crimson, even 1 hour at 40° followed by continuous 70° reduced sprout vigor after 5 days.

Just what do these findings mean? (1) Crimson clover, which was tolerant of high temperatures, can germinate in late summer or early fall. (2) Ball, mike, and arrowleaf clovers germinate poorly until temperatures drop, so they come on later than crimson.

The results may also help explain the persistence of ball clover as a reseeding legume in pastures. Since seed of this species germinate after hot weather, it may escape the usual fall drought and competition from the summer grass sod.



Effect of alternating temperature—70° for 8 hours and 40° for 16 hours—on sprout length of ball and crimson clovers is shown. Curves are labeled according to initial temperature used.

SOIL ORGANIC MATTER NOT INCREASED BY NITROGEN APPLICATIONS

A. E. HILTBOLD and J. T. COPE, JR.

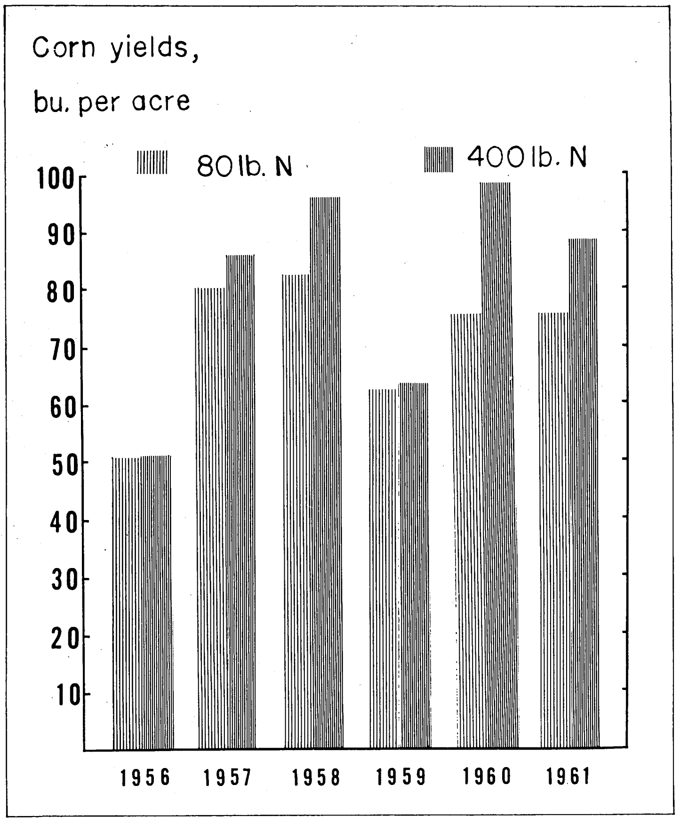
Department of Agronomy and Soils

SOIL ORGANIC MATTER is widely acclaimed, yet it has secrets that no one understands. We admire the dark, crumbly soil beneath a sod and see organic matter as part of that productive soil condition. But little is known of its chemistry and biology.

Nitrogen is an essential 4-6% of "humus," the well decomposed, dark organic matter of the soil. Nitrogen enters into the formation of humus from plant and animal residues and is released to growing crops from this organic reserve.

Research has shown that 2-3% of the soil organic nitrogen becomes available each year to crops. A soil containing 1% organic matter (20,000 lb. per acre) will thus release 20-30 lb. of N, enough to produce 10-15 bu. of corn or 400 lb. of seed cotton per acre. This small contribution toward crop needs is the primary reason soil testing for nitrogen holds little promise. Most of the nitrogen requirement of crops must be met with commercial nitrogen or supplied by legumes, such as vetch.

Plant and animal residues are drastically changed during decomposition. For example, a good corn crop may leave 3 tons per acre of leaves, stalks, and roots. More than half of this is cellulose and related carbon compounds, which are decomposed and lost from the soil in gaseous form. During this process, there is little loss of nitrogen until the residue approaches the composition of humus. The amount of humus that is formed depends, therefore, on amount of nitrogen in the plant material. Three tons of corn residue containing 50 lb. of N might be expected to produce 1,000 lb. of soil organic matter.



Corn yields at the two nitrogen rates used in the test illustrate findings in the study. Although yields were higher at the 400-lb. N rate, most of the excess above 80 lb. was lost. There was no increase in production of humus with the higher rates of N.

Will N Increase Humus?

It might be expected that increasing amount of nitrogen in corn residue with commercial nitrogen would increase amount of humus formed. This idea was tested in recent research at Auburn University Agricultural Experiment Station. The objective was to determine if soil organic matter could be increased by adding abundant nitrogen to corn, where the only source of organic matter was the corn stover produced under continuous cropping.

Two rates of commercial nitrogen were applied, 80 and 400 lb. per acre. The lower rate was considered adequate for maximum yields in average years. The high rate was chosen to supply additional nitrogen for conversion of crop residues into humus. One-fourth of the large amount was broadcast in the fall after stalks were cut.

The experiment was on Chesterfield sandy loam that had been in continuous corn at the 80 lb. N rate for the previous 8 years. Soil organic nitrogen and carbon were determined at the beginning of the study in 1956, again in 1958, and finally in 1961.

Corn yields averaged higher from 400 lb. N (80.8 bu.) than from the 80-lb. rate (71.2 bu. per acre). Responses to the extra nitrogen were greater in years when good yields were made with 80 lb. N.

No Increase in Organic

Initial carbon and nitrogen values indicated a low soil organic matter content, about 0.8%. During 5 years of cropping there was little or no change in organic carbon and nitrogen at either the 80 or 400 lb. N rate. Analysis of the subsoil for carbon and nitrogen showed no effect of the nitrogen fertilization. Neither was there any carryover of inorganic nitrogen within the surface foot of soil.

Of the 1,920 lb. of N applied in excess of the 80 lb. rate during the 6 growing seasons, only about 42 lb. was recovered in the extra yield, leaving 1,878 lb. of N that disappeared from the soil. Failure of this nitrogen to accumulate as humus in the soil is probably the result of climatic, soil, and cropping conditions that favor rapid and complete decomposition.

Some fertilizer nitrogen is incorporated in organic matter during decomposition, but apparently the products formed are not resistant to continuing decay. Thus, nitrogen should be applied only in amounts that can be expected to give an economic yield response.

The value of GRANITE and LIMESTONE GRITS for layers

J. R. HOWES, *Assistant Poultry Husbandman*

GIZZARDS of old-fashioned barnyard hens invariably contained small pebbles that supposedly aided in digesting whole grains and insects consumed.

With removal of the laying flock from pasture and the advent of the deep-litter laying house, insoluble grit, such as granite or gravel chips, was usually provided inside the house. Soluble grit, which gradually dissolves in the acidic digestive tract of the bird, was also often provided as an extra source of dietary calcium. Limestone chips or broken oystershells were used for this purpose.

In recent years, whole grain feeding has decreased in favor of all-mash diets, and many poultry growers have simultaneously discontinued feeding insoluble grit. However, some poultrymen contend that insoluble grit is necessary to fully develop the digestive tract for optimal egg production. Other poultry keepers contend that soluble grit will serve both as a source of calcium and a digestive stimulant.

A study was begun at the Auburn University Agricultural Experiment Station to investigate the merits of these practices, since it is essential that the modern poultry keeper obtain maximum nutritional value for the lowest possible cost.

Layers Tested

Three hundred and sixty, H3W strain, White Leghorn, 20-week-old pullets were placed at random in individual laying cages. The cages were divided into 36 groups, each containing 10 birds. Six treatments were applied at random to the 36 groups, each treatment being repeated 6 times. All birds received a similar diet containing 0.75% total phosphorus, 3.80% calcium, and the management of all birds was similar. Apart from the calcium in the basal ingredients of the corn-soybean diet, the birds in treatment A received their calcium as limestone. Treatment B received exactly the same diet, but in addition received 685 gm. of granite grit per 10 birds, 3 times a week. Treatments C and D were the same as for A and B, respectively, except oystershell flour was substituted for limestone.

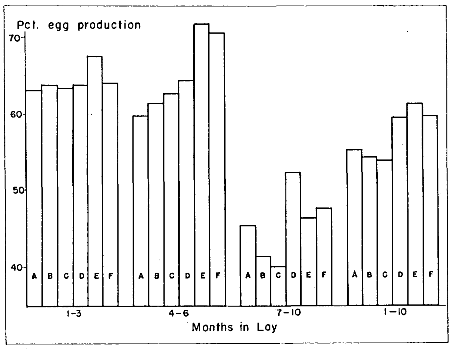


FIG. 1. The per cent egg production for each of the six treatments in the test is shown above.

Treatment E received all the added dietary calcium as limestone chips and the birds receiving treatment F received all the added calcium as oystershells. Thus, it was possible to compare the effects of granite grit fed with all the calcium included in one of 2 forms in the mash diet. It was also possible to compare 2 treatments in which 2 forms of soluble grit were fed on top of the feed without insoluble granite grit.

Production Results

Egg production data and pounds of feed required to produce 1 lb. of eggs are presented in Figures 1 and 2, respectively. The addition of grit to the limestone diet had no beneficial effects either in egg production or feed efficiency. However, granite grit added to the diet containing the oystershell flour increased the overall egg production by 5%, and a pound of eggs was produced on ⅓ of a pound less feed. The best egg production and feed efficiency of all treatments was obtained with the feeding of limestone chips, followed by feeding oystershells or the oystershell flour and grit combination. Feeding oystershells has about the same effect as pulverized shells fed with granite grit. Mortality was about the same for the first 4 treatments, granite grit having no beneficial or detrimental effects, however, mortality was reduced by limestone chips or oystershells. It is possible that birds receiving calcium as large particles may develop a better condition, and as a consequence be more resistant to stress. There were no significant differences between weights of the eggs or the eggshell thickness for various treatments.

Based on the findings of these studies over 1 year, it may be concluded that feeding limestone chips or oystershells on top of the feed will eliminate the necessity of granite grit. However, granite grit is beneficial for diets containing oystershell flour, but not pulverized limestone. These differences may result from several factors, including differences in calcium digestion and differences in the stimulation of digestive secretions by particles of different sizes.

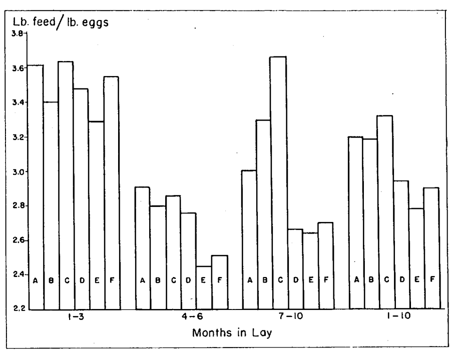
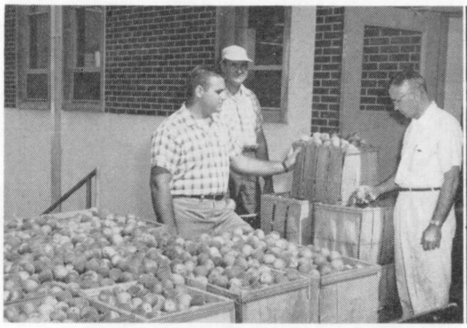
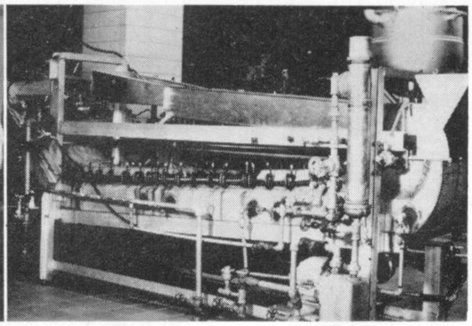


FIG. 2. This chart shows the number of pounds of feed required to produce one pound of eggs for each of the six treatments used in the test.

Pasteurized REFRIGERATED PEACH Products

HUBERT HARRIS, *Associate Horticulturist*





Shown are Chilton County peaches arriving at the processing laboratory, left; a special processing machine, right; and pasteurized refrigerated peaches, upper left.

SCIENTIFIC AND INDUSTRIAL advances in food processing have brought many improvements in packaged foods available to American consumers. As a result new products are now available to the housewife with added convenience, improvement in nutritive content, palatability, and other qualities.

Studies on new or improved food products and processes are part of the rerearch at Auburn University Agricultural Experiment Station. Current studies in the horticulture processing laboratory are concerned with the development of improved products using Alabama peaches. A result of this work is a new refrigerated peach product that is different from either canned or frozen peaches. Samples prepared by this method in 1960 rated excellent in color, texture, and flavor after 30 months of storage at 32-34°F.

The new process is designed to retain the high qualities of fresh prime-ripe peaches for a long period in packaged, ready-to-serve form. This is accomplished by using a carefully controlled pasteurization treatment, aseptic packaging, and refrigerated (32-34°F.) storage.

The peaches are prepared by pitting, lye peeling, washing, trimming, and slicing. In the packaging line, clean jars with 60% sugar syrup added at the rate of 3 fl. oz. per pint jar are sterilized by steam treatment. Simultaneously, the peach slices are pasteurized 2 minutes in boiling sugar syrup, fed directly to the hot sterile jars, and the jars filled in an atmosphere of steam. Enough fruit is used to bring the syrup into the neck of the jar. This requires approximately 0.87 lb. per pint. The jars are closed by a steam process that provides 19-22 in. of vacuum on the containers. The sealed jars are dipped 1 minute in boiling water, cooled, and moved to refrigerated storage. Citric acid appears to aid in the preservation of color. If used, it should be added just ahead of the fruit at the rate of 0.1% of the weight of the pack.

Compared with conventional methods, the new process tends to eliminate bad features and use good ones. While the relatively long heating treatment of canning is eliminated, the pasteurization treatment provides enough heat to destroy oxidative enzymes and provide surface sterilization of the peach slices. The harmful freezing and thawing treatments of frozen products are eliminated, but 32-34°F. refrigeration is used as an aid in preserving the product. While good syrup coverage and a suitable fruit-sugar ratio are provided in the pack, the drained weight is increased by approximately 40% over conventionally canned peaches.

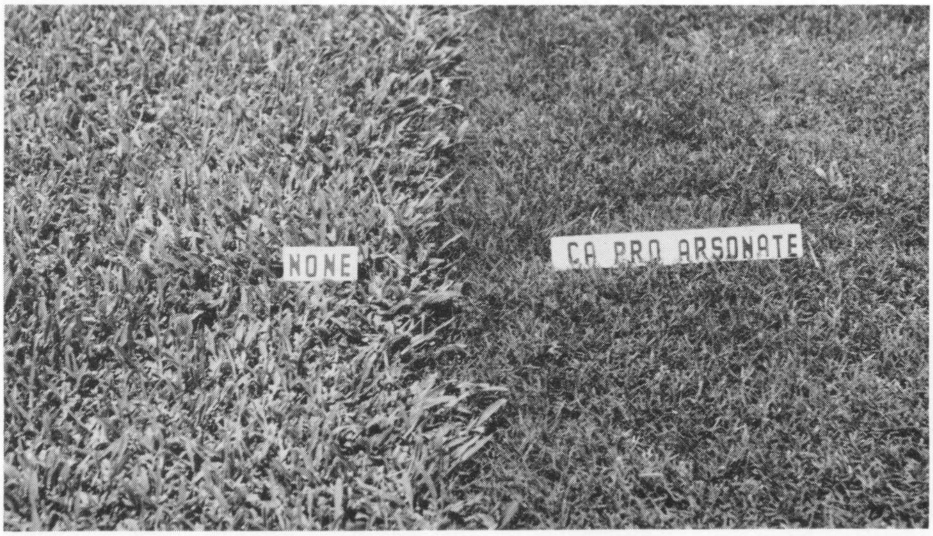
DRAINED WEIGHTS AND SOLUBLE SOLIDS OF PASTEURIZED REFRIGERATED PEACH PRODUCTS[1]

Product	Drained wt.		Soluble solids	
	Per unit	Per 28 oz.	Syrup	Fruit
	Lb.	*Lb.*	*Pct.*	*Pct.*
Refrigerated slices:				
28 oz. jar[2]		1.46	22.5	22.9
28 oz. jar[3]		1.39	23.4	24.1
gal. jar[3]	6.51	1.42	24.4	24.7
Ref. slices with coconut:				
16 oz. jar[3]	0.86	1.51	23.6	23.9
28 oz. jar[3]		1.44	24.7	24.9
gal. jar[3]	6.48	1.42	26.0	24.7
Canned, comm., No. 2½:				
Elberta, halves[4]		1.09	23.9	24.5
Cling, slices[5]		1.01	20.2	20.7

[1] Auburn pilot plant test, 1962.
[2] Elberta.
[3] Shippers Late Red.
[4] Extra heavy syrup.
[5] Heavy syrup.

A pilot plant study in 1962 provided further information on the new process. A special continuous blanching machine developed earlier by the Horticulture Department, proved ideal for the pasteurization treatment. A high quality refrigerated peach ambrosia was made by adding shredded coconut to the syrup in the jars before pasteurization. Test jars with low vacuum (1.5-12 in.) developed discoloration in the upper portion of the product. Jars with 19-22 in. of vacuum had no discoloration or other detectable quality losses after 8 months storage.

While the problems of preservation by this method have been largely solved, maturity variations and variety differences posed problems in standardization of color, texture, and flavor. To obtain maximum qualities in the packaged product, it is essential to use suitable varieties ripened to prime maturity.



These adjoining plots show how effectively crabgrass can be controlled with chemical weed killers. The crabgrass-infested plot at left got no treatment, whereas that at right was treated with an arsonate herbicide on June 6, June 21, July 14, and August 10.

Controlling CRABGRASS in LAWNS

D. G. STURKIE, *Agronomist*

CRABGRASS *Digitaria sp.* is one of the worst summer pests of lawns. It is an annual and spreads by seed, which seem always to be present.

Crabgrass comes up in lawn grasses that are not growing thick and vigorously. Lawn grasses that grow dense are not as likely to become infested as are those with less dense sods. Thus, zoysia crowds out crabgrass better than does common Bermuda.

One of the best means of control is to make conditions favorable for the lawn grass. Despite best efforts, however, some areas of crabgrass usually occur.

There are two types of chemical control used for crabgrass. One is applied pre-emergent (before crabgrass comes up) and the other post-emergent (after crabgrass comes up).

Pre-Emergent Herbicides

Pre-emergent herbicides that have been tested by Auburn University Agricultural Experiment Station and found effective are Betasan, Dacthal, Simazine, and Zytron.

The common perennial turfgrasses are highly tolerant of Dacthal and it is not likely to damage shrubs and shade trees. It is by far the safest of the herbicides named to use on turf.

Simazine may be used if recommended rates are followed closely. If rates are exceeded, it will seriously damage the new strains of Bermudagrass, such as Tifgreen and Tiflawn. It is not known what effect its continued use will have on lawn grasses.

All of the effective chemicals listed may be used on Bermuda, zoysia, centipede, and St. Augustine grasses. Zytron may cause slight discoloration of the grass a few days after it is applied, but this condition disappears in 1 to 2 weeks.

Pre-emergent herbicides should be applied before crabgrass seed germinate. Best application date varies among sections of the State and from year to year, depending on rate of temperature rise in the spring. Crabgrass seed require light and a temperature of at least 65°F. for germination.

Post-Emergent Chemicals

After crabgrass plants are up they may be killed by use of post-emergent herbicides, arsonates or P.M.A.

P.M.A. can be used on Bermuda, zoysia, centipede, or St. Augustine. It will not kill large crabgrass when used in rates low enough not to damage the turfgrass. Low rates will kill small plants (2 to 3-leaf stage) without damaging the lawn grass. Since crabgrass seed germinate during spring and summer, it is necessary to spray about every 2 weeks with P.M.A.

The arsonates are organic arsenicals. These should not be confused with arsenic compounds, such as sodium arsenite, arsenic acid, and other inorganic arsenic compounds. D.M.A. and other related methyl-arsonates, as well as propyl arsonates, give good control when properly applied. Several arsonates are on the market and all that have been tested at Auburn will kill crabgrass when used at recommended rates.

There are several formulations listed as crabgrass killers by companies distributing them. These materials will kill young or older crabgrass. The younger the crabgrass, the easier it is to kill. All of the arsenicals tested may be used on Bermuda and zoysia. They may produce some discoloration, but the plants soon recover.

The arsonates must not be used on centipede, bahia, Dallis, and St. Augustine. They will kill these grasses.

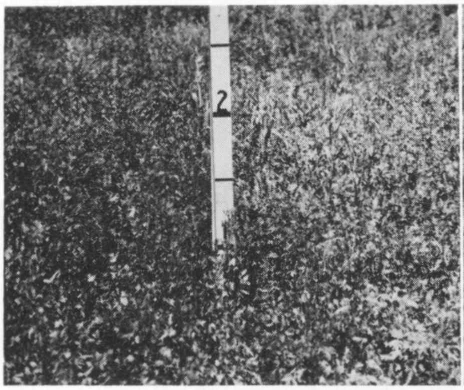
Since post-emergent herbicides are most effective if they stick to the plants, it is advisable to use a wetting agent. A good detergent (about 1 tablespoon per gal. of water) may be used in the spray mixture.

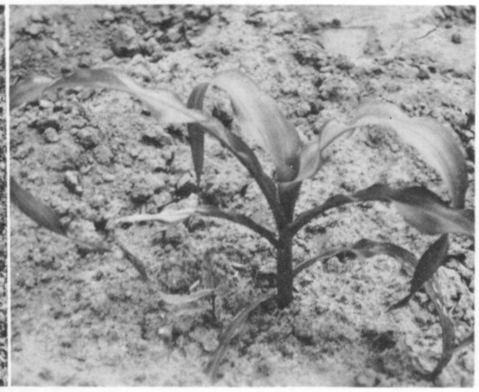
It is necessary to repeat the arsonate applications as often as a new crop of crabgrass develops. Three or more applications may be required during the summer.

Mixtures of post-emergent and pre-emergent herbicides may be used to kill the living crabgrass and prevent new plants from getting started. A mixture of one of the arsonates and Dacthal has given good control at Auburn. Each of the materials is applied at the recommended rate. In this case the treatment was applied after crabgrass was well established. Other mixtures might be effective. This was the only one tested.

Chemical names of the herbicides in the tests are: Betasan = N-(Beta-O-O-diisopropyl-dithiophosphorethyl 1)-benzene sulfonamide; Dacthal = dimethyl ester of tetrachloro-terephthalic acid; Simazine = 2-chloro-4-6-bis-(ethylamino)-5-triazine; Zytron = dichlorophenyl methyl isopropyl phosphoramidothiate; P.M.A. = phenyl mercury acetate; and D.M.A. = disodium monomethyl arsonate.

Alfalfa showing boron deficiency on right in contrast to normal alfalfa at left. Light areas and streaks in corn at right are zinc deficiency symptoms.





Minor Elements for Plants *in Alabama Soils*

JOHN I. WEAR, *Soil Chemist*

THE STORY of minor elements is long and involved. But in a nutshell such crops as cotton, corn, alfalfa, clovers, and truck crops suffer from minor element deficiencies in certain Alabama soils.

Research by the Auburn University Agricultural Experiment Station extending over many years was necessary to determine plant needs for sometimes obscure fertilizer elements required in very small amounts. They are referred to sometimes as minor elements, which include boron, zinc, manganese, copper, iron, and molybdenum. Many compounding factors complicated the research.

Differences in Plants

Plants differ in their ability to obtain minor elements from the soil. Alfalfa will starve for boron on a soil where a 100-bu. corn crop obtains a sufficient amount. Corn may be deficient in zinc on a soil that is capable of producing 4 tons of high quality hay. Other factors may also determine the needs for minor elements, such as soil pH, soil texture, and amounts of major and secondary nutrients in the soil.

Differences in Soil Types

Alabama agriculture has its roots in many different types of soils. The red soils of the Limestone Valley are generally well supplied with minor elements, and less deficiencies are found in crops grown on these soils than those from other areas.

COMPARATIVE AVERAGE AMOUNTS OF BORON AND ZINC AVAILABLE FOR PLANTS BY SOIL REGIONS IN ALABAMA

Soil regions	Boron ppm	Zinc ppm
Limestone Valleys	0.17	0.72
Black Belt	.18	.82
Coastal Plain	.09	.48
Sand Mountain	.09	.47
Piedmont	.11	.56
Clay Hill	.13	.42

Boron deficiencies of alfalfa, cotton, clovers, apples, and truck crops are prevalent on sandy Coastal Plain soils and on Sand Mountain soils. The available boron from these soils has been found to be about one-half as much as that in soils of the Black Belt and Limestone Valley regions.

Zinc content of soils from the Coastal Plain, Clay Hills, and Sand Mountain areas was found to be lower than that of the other regions. Zinc deficiency of pecans is prevalent in the Coastal Plain and Clay Hill areas, and zinc deficiency of corn frequently occurs in these and the Sand Mountain areas if the pH of the soil is 6.0 and above.

Soil tests show that the manganese contents of Alabama soils are high compared with that of soils in North and South Carolina and Florida. The high manganese content of Limestone Valley soils is expected because of the many manganese concretions found in these soils. When soils of this region have low pH values (about 5.0), manganese toxicity of cotton may occur. This abnormality is called crinkle leaf and can be prevented or corrected by applying lime.

Certain crops are iron deficient on lime soils of the Black Belt, and some ornamentals may suffer from iron deficiency on lime or neutral soils.

Zinc deficiency of corn appears as white to yellow streaks in the leaves and white to yellow bud when plants are 6 to 12 in. high. Yields may be increased 5 to 10 bu. per acre with an application of 10 lb. per acre of zinc sulfate in the starter fertilizer. Zinc deficiency of pecans appears as a rosette and dieback of shoots in the top of the tree. Generally it is prevented by applications of 2 to 3 lb. of zinc sulfate per tree per year or corrected by an application of ½ to 1 lb. of zinc sulfate for each year of the tree's age using a maximum of 10 to 15 lb. per tree.

Boron has been recommended for alfalfa, clovers, and certain vegetables for many years. It is now recommended for cotton on coarse-textured soils. Tests conducted for 3 years at the Sand Mountain Substation have shown an increase from boron of about 150 lb. per acre of seed cotton. Tests conducted at 21 locations in the State (mainly on farmers' fields) showed an average increase of 51 lb. per acre. Although not to be expected on all fields, the increase of 51 lb. of seed cotton is worth about $6 per acre for a 25¢ investment. Higher yields of 150 lb. of seed cotton would be worth about $18 for the same small investment. Three-tenths to a half lb. of boron per acre is recommended.

Management is the DIFFERENCE in Effective Cotton Insect Control

P. L. STRICKLAND and CHARLES TURNER*

COTTON INSECTS present a problem of economic importance to producers in Alabama. To attain top yields of quality cotton, many Alabama farmers invest considerable time and money each year in an insect control program. Success of such controls depends on good management – applying recommended insecticides at correct rate, right time, and in most effective way. A badly managed control program is ineffective and adds to production costs.

As a part of a Southwide USDA study last summer, agricultural economists stationed at Auburn University conducted a field survey in the Limestone Valley Areas of northern Alabama: (1) to obtain information pertaining to insect control practices used in 1961; (2) to estimate cost of such practices; and (3) to appraise effectiveness of such programs in terms of yields. Five counties were randomly selected for the survey. Farms in each county were classified into size groups on the basis of acres of cotton planted in 1961. DeKalb, Lauderdale, Lawrence, Madison, and Morgan counties were sampled, 150 farmers being interviewed. The farm size groups were: small farms, 5 to 19.9 acres of cotton; medium farms, 20 to 49.9 acres; and large farms, 50 or more acres.

On the sample farms, the average cotton acreages planted were 9.6 on the small farms, 32.9 on medium farms, and 140.6 on large farms. The average lint yield per acre in each size group was 377 lb. on small farms, 404 lb. on medium farms, and 506 lb. on large farms.

Insecticides were used on 45% of the total planted acreage of the small farm group, 72% of the medium group, and 82% of the large group. The average number of times treated was 6.4 on small farms, 5.2 on medium farms, and 6.3 on large farms. In each size group, the majority of the treated acreage was poisoned from 4 to 9 times. This indicates that most farmers who poisoned followed some type of regular schedule. On the farms using controls, the average cost of insecticide materials per planted acre of cotton was $8.90 on small farms, $6.32 on medium farms, and $9.64 on large farms.

Farmers generally used the rates per acre recommended by the Auburn University Agricultural Experiment Station. The average quantity of dust used per acre per application ranged from 9.5 lb. of 2% Trithion to 19 lb. per acre of toxaphene-DDT. The average quantity when sprays were used was 1 to 4 pt. of emulsifible concentrate per acre per application.

On a once-over basis (acres covered times number of applications), dusts were used on 59% of the acres treated. Of the acreage on which dusts were applied, toxaphene, toxaphene-DDT, or BHC-DDT were used on 79% of the acreage. Of the acreage sprayed once over, Guthion was used on 48% of the acreage.

In the small and medium farm groups, 94% of the insecticide was applied with tractor-drawn equipment. In the large farm group, 41% was applied by airplanes and 28% by high clearance sprayers.

In general, the farmers interviewed stated they were using insecticides to control both boll weevil and bollworm. Only a few farmers poisoned early for spider mites or thrips.

In the medium and large farm groups, average lint yields were, respectively, 78 and 108 lb. per acre more on farms that used insecticides than on those that did not use control measures. However, on small farms the average yield was 32 lb. less on farms using insecticides than on those that did not.

The situation on small farms contrasted with other size groups in the surveyed counties may be associated with managerial problems, such as lack of timeliness and thoroughness of application. In other areas of the State where cotton insects are more prevalent year after year, correct timing and proper application are essential.

Many small farm operators often wait until a high infestation is apparent before control practices are started. In general, operators of small farms are more reluctant to start insect controls and are less timely in subsequent applications than are operators of larger farms. The group of small operators who did not use insecticides includes some who did not think they needed to poison and some who decided against poisoning, whereas those who did treat included some operators who poisoned only as a last resort to save the crop from almost total loss. In such situations, a poorly managed program may be less profitable than no program.

SIZE OF FARMS, COTTON ACREAGE, YIELD, INSECTICIDE USE AND COST, BY SIZE OF FARMS, 150 FARMS, LIMESTONE VALLEY AREA, ALABAMA, 1961

Item	Unit	Size of farm		
		Small	Medium	Large
Number of farms	Number	48	47	55
Cropland (average per farm)	Acre	46.3	124.0	503.4
Cotton (average per farm 1961) planted	Acre	9.6	32.9	140.6
Cotton lint yield (per harvested acre) 1961	Pound	377	404	506
Farms using insecticides	Number	21	33	40
Proportion of total planted acres treated	Per cent	45	72	82
Average number of treatments	Number	6.4	5.2	6.3
Cost of material per planted acre on farms using insecticides	Dollar	8.90	6.32	9.64
Average lint yield per harvested acre, farms using insecticides	Pound	360	425	525
Average yield per harvested acre, farms not using insecticides	Pound	392	347	417

* Agricultural Economist, FPED, ERS, USDA, and Research Assistant, Department of Agricultural Economics.

Improving FORAGE QUALITY of COASTAL BERMUDAGRASS

R. M. PATTERSON, L. E. ENSMINGER, E. M. EVANS, and C. S. HOVELAND

Department of Agronomy and Soils

WITH GOOD MANAGEMENT, Coastal Bermudagrass will produce high yields of hay or furnish grazing for a large number of cattle on a small acreage. However, both growth rate of the forage and gain per animal decline during late summer, particularly after mid-July.

To determine if high yields of good quality forage could be maintained throughout the growing season, experiments were done by Auburn University Agricultural Experiment Station. The 1961 and 1962 studies were at the Lower Coastal Plain Substation, Camden, and Tuskegee Experiment Field. Value of irrigation, high rates of nitrogen frequently applied, and frequent harvesting were studied.

Test areas of Coastal were grown with and without irrigation and fertilized at 3, 6, and 12-week intervals. Nitrogen rates tested were 200, 400, and 600 lb. of N per acre annually. Harvesting intervals of 3 and 6 weeks were compared. Lime and mineral fertilizer were applied according to results of soil tests.

Irrigation Of Little Value

Irrigation did not influence seasonal or total yields of Coastal Bermuda except at the Lower Coastal Plain Substation during the extremely dry summer of 1962. In this case, forage yield was increased about 75% by irrigation, but crude protein content of the forage was not greatly affected. Since results from both locations were similar during the 2 years, except for the 1962 irrigation difference, data from the 1961 test at the Lower Coastal Plain Substation are used to illustrate major findings.

When compared with the 6-week harvest interval, clipping every 3 weeks resulted in a 26% decrease in forage yield. Total dry forage yields from different nitrogen rates were:

Nitrogen per acre, pounds	*3-week harvests*	*6-week harvests*
200	6,761 lb.	9,892 lb.
400	9,808 lb.	13,474 lb.
600	12,059 lb.	15,074 lb.
Average	9,542 lb.	12,810 lb.

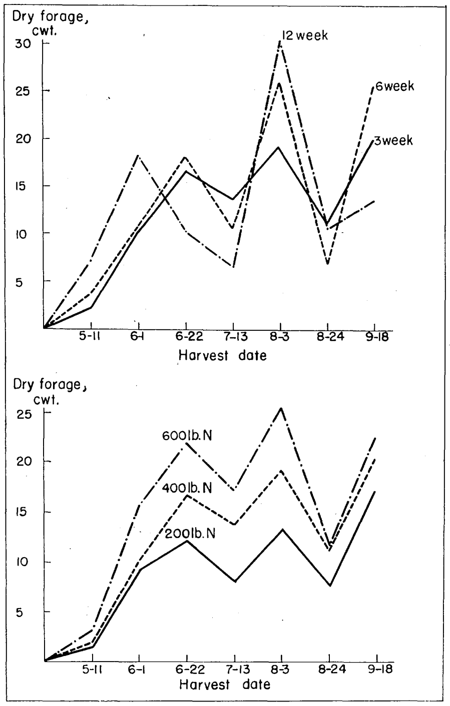


FIG. 1. How frequency and rate of nitrogen application affect distribution of forage production is illustrated here. The top graph shows effect of frequency of nitrogen application (400-lb. N rate). Effects of three nitrogen rates, applied at 3-week intervals, on yields is shown below.

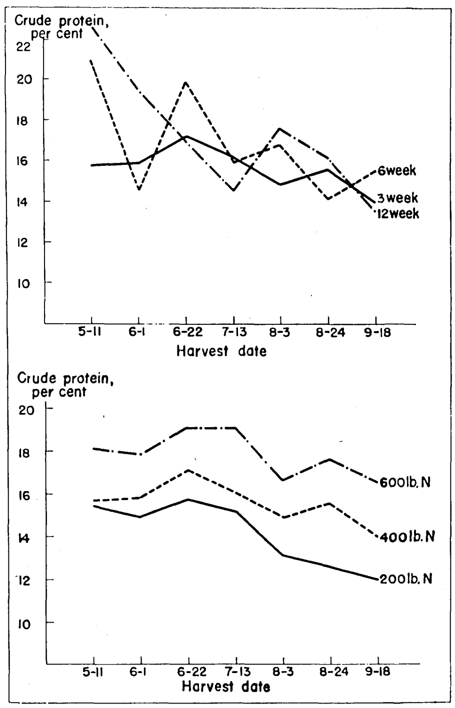


FIG. 2. These graphs illustrate effects of nitrogen rate and frequency of application on crude protein content of Coastal forage. Effect of application frequency (400-lb. N rate) is shown at top. Bottom graph compares crude protein contents from three N rates (3-week application frequency).

Crude protein content dropped as harvesting was delayed. Clipping every 3 weeks resulted in 30% higher protein content than in forage harvested at 6-week intervals. Protein contents were:

Nitrogen per acre, pounds	*3-week harvests*	*6-week harvests*
200	13.9%	10.9%
400	16.1%	12.4%
600	18.4%	13.9%

The influence of frequency and rate of nitrogen fertilization on seasonal forage production is shown in Figure 1. There were no differences in total yield from the three frequencies of nitrogen application. Fluctuation in yield from one harvest to another was greatest from the most infrequent nitrogen application and least from the most frequent application. The higher rates of nitrogen fertilization increased quantity of forage produced, with little effect on distribution of production.

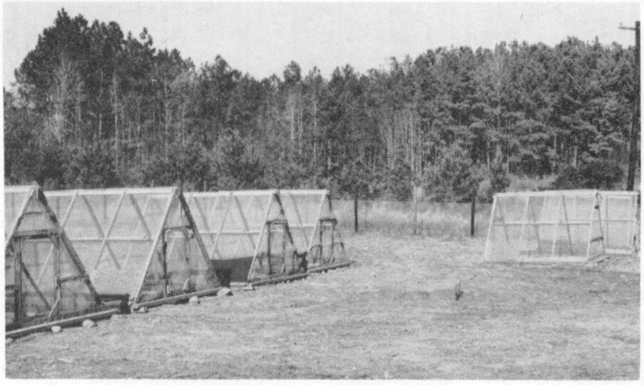
Protein Affected by N

Crude protein content of forage was greatly influenced by both frequency and rate of nitrogen fertilization, Figure 2. Harvest-to-harvest fluctuations in crude protein content were greatest when nitrogen was applied at 12-week intervals and least when smaller amounts were put on every 3 weeks.

Content of crude protein was directly related to rate of nitrogen fertilization, as shown by Figure 2. Regardless of nitrogen level, there was a slight decline in crude protein after the July 13 harvest.

As revealed by the test results, frequent clipping and frequent nitrogen application improved quality of Coastal Bermuda forage, as measured by content of crude protein. Quality was also directly related to rate of N.

Distribution of forage yield was more uniform with frequent applications of N and total yield was proportional to rate of N used. These and other tests indicate that irrigation would be only occasionally beneficial in intensive production of a deep-rooted grass like Coastal Bermuda.



Quail used in Station tests were confined in pens on treated soil. The fence in background eliminated predator problems.

New FIRE ANT BAIT

MAURICE F. BAKER,

Leader, Wildlife Research Unit

A NEW FIRE ant bait, mirex, may be used with no hazard to wildlife. This bait has been tested extensively without loss of wildlife.

Observations of the first large field test in 1961 indicated no effects on wildlife. Several demonstration treatments were observed in 1962 without significant effects. These preliminary tests were followed by controlled experiments where penned quail were exposed to various doses of mirex without loss.

Mirex is a bait composed of ground corn cobs treated with a vegetable oil solution of insecticide. In preparing mirex, corn cobs are ground to about the fineness of a turnip seed. Most chaff and pith are removed, leaving a material composed mostly of hard, even-sized granules. An oil solution of the insecticide is sprayed over the granules, making the bait .075% poison. The bait is adapted for an air or ground application. The usual rate of application is 10 lb. of bait per acre, or ⅛ oz. of insecticide per acre.

The first extensive field test of mirex was at Gulfport, Mississippi, in the fall of 1961. About 960 acres were treated and observations of wildlife made for a month. Quail were placed on freshly treated soil in small open-bottomed pens. These pens were moved twice daily to allow quail to feed mostly on natural foods and exposure to a maximum amount of bait. In addition, several broods of quail were located and repeatedly observed. Although accurate observations were not possible, no evidence of any adverse effect on quail or other wildlife was found.

Tests at the Auburn University Agricultural Experiment Station failed to show any effects of mirex on quail. In these tests bobwhite quail were placed in open-bottomed pens and kept on treated soil for a period of 8 weeks. Two plots were treated at the rate of 10 lb. of mirex bait per acre, 2 at the rate of 100 lb. and 2 at the rate of 1,000 lb. These represented treatments at the usual rate, 10 times the usual rate, and 100 times the usual rate.

Three open-bottomed pens, each covering about 100 sq. ft. of ground, were placed at one end of each plot. Two pairs of quail were placed in each pen immediately after treatment. Water was provided and birds fed on the ground. The feed consisted of a mixture of granulated game bird ration and baby chick scratch-feed ground to a fineness similar to the mirex bait. The pens were moved once a week for 8 weeks for sanitation and to expose the birds to additional treated soil.

Only one quail used in the experiment died. This bird became droopy and died shortly after the test began. Quail are frequently lost as a result of shipping and handling, and this death was not considered a result of mirex treatment. No losses occurred in the 6 pens subjected to the highest rate of application. Apparently, under the rather severe conditions of the test, no immediate damage to quail resulted.

This method of testing other insecticides could be expected to produce ill effects. At the Patuxent Wildlife Research Center, Laurel, Maryland, quail confined in open-bottomed pens have died as the result of exposure to moderate applications of some highly toxic chlorinated hydrocarbon insecticides. In this mirex test each quail, especially in the pens on most heavily treated areas, had ample opportunity to eat large quantities of the bait. They also walked on it and dusted in it, without visible signs of having been affected.

No adverse effects on quail, or wildlife in general have been noted in any studies at Auburn of the effects of mirex treatment.

PLAN OF THE PEN TESTS AND RESULTS

Group number	Treatment per acre	Relation to normal treatment	Loss of quail
	Lb.		*No.*
1	100	10X	0
2	10	1X	0
3	1,000	100X	0
4	none	control	0
5	10	1X	0
6	none	control	0
7	100	10X	1[1]
8	1,000	100X	0

[1] The one death was not attributed to the treatment.

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