VOLUME 15, NO. 2 SUMMER 1968

HIGHLIGHTS

OF AGRICULTURAL RESEARCH

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY

FIRST YEAR GROWTH . . .

of hardwood seedlings
responds to fertilizer, see page 3

HIGHLIGHTS *of* Agricultural Research

A Quarterly Report of Research Serving All of Alabama

VOLUME 15, NO. 2 SUMMER 1968

In this issue . . .

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New and Timely PUBLICATIONS

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

Bul. 375. Soil Test Theory and Calibration for Cotton, Corn, Soybeans, and Coastal Bermudagrass.

Bul. 376. Response of Cotton to Lime in Field Experiments.

Bul. 377. Homemakers' Response to Food Information in Mass Media of—Anniston, Birmingham, Montgomery.

Bul. 378. Meat Buying Habits of Urban Homemakers.

Cir. 160. Variation in Seeds and Ovulate Cones of Some Species and Varieties of Cupressus.

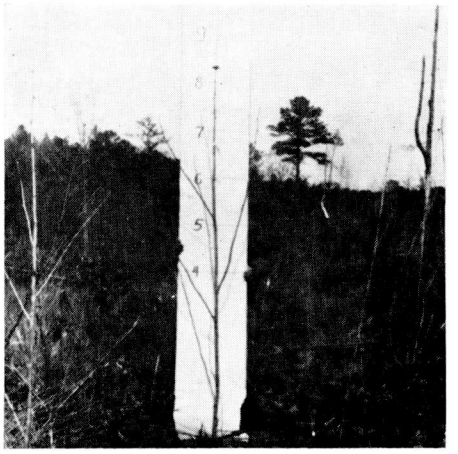
Cir. 161. Relative Responses of Grain and Annual Forage Crops to Lime, Phosphrous, and Potassium on Norfolk Sandy Loam.

Leaf. 73. Atkinson—A New Rootknot and Nematode Resistant Tomato Variety.

Prog. Rept. 84. Rainfall Distribution in Alabama.

Prog. Rept. 89. Soil Fertility Experiments with Peanuts in 1967.

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



Here is a sycamore seedling one year after fertilizer treatment.

TREE SEEDLING RESPONSES to FERTILIZATION by SPECIES and SLOPE

SHERMAN D. WHIPPLE and KARL MOECK
Department of Forestry

PLANTED HARDWOOD species survive best under favorable site conditions.

Causes of failure are not completely understood, but hardwoods apparently require higher levels of nutrients and moisture than native pines. On suitable sites, several hardwoods are capable of rapid growth exceeding that of pine. In view of the increasing demand for hardwood timber, an attempt to improve growth and survival of planted hardwoods on less than ideal sites appears justified.

A study was begun in the fall of 1966 at the Fayette Experiment Forest to compare survival and early growth of three hardwood species – yellow-poplar, American sycamore, and sweetgum to that of loblolly pine. Comparisions were made at different slope positions both between and within species. Also tested were the effects of fertilization on survival and early growth of all species.

The planting site is an upland hollow containing moderately well-drained to well-drained Ruston and Cuthbert soils on the slopes and imperfectly drained Mantachie local alluvium soils in the bottoms. All bottoms contain wet weather streams. The slopes and bottoms facing north were cleared of all trees and brush during the fall of 1966. The area was disked in November 1966 and planted to seedlings in February 1967. The yellow-poplar and sycamore were top-pruned at 15 in. above the root collar to provide uniform heights. Most of the sweetgum averaging slightly less than 15 in. were left unpruned. All pines were less than 15 in. and were not top-pruned. Seedlings of all species were root-pruned to 8 in. below the root collar to facilitate planting.

The plantings were replicated six times in three hollows. Each replication included two plots of 35 trees (6 × 6 ft.) of each species on each of three topographic positions. These positions were bottoms, and lower and upper slopes. One plot of each species was fertilized 1 month after planting at the rate of 100 lb. of phosphorus per acre by spreading 6.6 oz. of superphosphate (20% P) in a 2-ft. circle around each tree. During May 1967, 100 lb. of nitrogen per acre was applied by application of 2 oz. of ammonium nitrate (33.5% N) in each of two holes punched approximately 8 in. on opposite sides of the tree. No attempt was made to control weed competition.

The beneficial effect of fertilization, on height growth, was apparent by the end of the first growing season. Response to fertilization varied greatly between species but not with slope position. Based on the average of all slopes, fertilized sycamore had the best total growth averaging 4.07 ft., see table. Some trees were more than 9 ft. tall, see figure. Fertilized yellow-poplar and sweetgum rated second and third respectively. Fertilized pine did not grow as well as any of the hardwoods, fertilized or unfertilized. Fertilized yellow-poplar had the greatest increased growth over the check, with a 217% increase. Fertilized sycamore and sweetgum ranked second and third respectively, 163 and 110%. Fertilization increased pine growth by only 11%.

A tally of live trees taken in the fall of 1967 indicated that survival was better for all species when left unfertilized, see table. On the unfertilized plots, survival was greatest for all species on the upper slopes and less down the slope with the bottoms having the least survival. On the fertilized hardwood plots, survival was better on the lower slopes than on either the bottoms or upper slopes. Averaging all slopes, sycamore had the least difference in survival between fertilized and unfertilized plots. Sweetgum, loblolly pine, and yellow-poplar, had increasing differences in survival between these two treatments. A combination of weather conditions undoubtedly influenced the results of this study during the first year.

A visual judgment of the density of herbaceous vegetation was made before frost. Densities varied considerably between fertilized and unfertilized plots on the upper and lower slopes. The difference was not so evident on the bottoms. Unfertilized plots on the bottoms had as much and sometimes more competing vegetation than did the fertilized plots on the slopes. Competition from this vegetation appeared to be a critical factor on the bottoms and to a lesser degree on the slopes.

Results indicate that fertilization does increase the first year height growth of planted sycamore, yellow-poplar, and sweetgum. With many of these fertilized seedlings already equal to or above the height of the competing vegetation their chance of developing into a productive stand should be greatly increased over trees left unfertilized. Fertilization at the rates and by the methods applied did cause some mortality. Some species were more susceptible to damage by fertilizer than others. Lesser rates or different methods of application might have reduced this mortality. Irregular weather conditions can easily compound the problem especially with the additions of fertilizers. The persistence of the beneficial effects of fertilization must also be assessed.

FIRST YEAR SURVIVAL AND GROWTH BY SPECIES AND TREATMENT

Treatment	Species							
	Yellow-poplar		Sweetgum		Sycamore		Loblolly pine	
	Survival	Growth	Survival	Growth	Survival	Growth	Survival	Growth
	Pct.	*Ft.*	*Pct.*	*Ft.*	*Pct.*	*Ft.*	*Pct.*	*Ft.*
Unfertilized								
Bottom	92.9	0.78	88.0	0.93	82.0	1.35	52.0	0.61
Lower slope	95.1	0.66	91.4	0.93	86.6	1.86	55.7	0.56
Upper slope	97.1	0.65	94.9	0.81	89.4	1.45	74.3	0.58
Mean	95.1	0.70	91.4	0.89	86.0	1.55	60.6	0.58
Fertilized								
Bottom	38.6	1.80	55.7	1.65	75.1	3.88	35.1	0.53
Lower slope	50.0	2.38	67.7	2.11	79.4	4.16	28.6	0.58
Upper slope	29.1	2.48	66.3	1.85	75.1	4.18	45.7	0.71
Mean	39.1	2.22 (217)*	63.1	1.87 (110)*	76.6	4.07 (163)*	36.6	0.61 (11)*

* Shows growth increase, in per cent, of fertilized trees over those not fertilized.

ULTRA-LOW VOLUME

sprays offer effective cotton insect control

FLOYD R. GILLILAND, JR.
Department of Zoology-Entomology

RECENT DEVELOPMENT of ultra-low volume spray technique for control of cotton insect pests gives promise of reducing labor and machine operation costs, and increasing the effectiveness of chemical insecticides.

More economical and effective control methods always get the attention of cotton producers for the reason that cotton insect control is a major cost item. A season's supply of insecticides, annual depreciation of application equipment, and labor make up one of the largest single production expense items of cotton production.

Researchers throughout the cotton-producing areas of the United States are seeking new and less expensive control techniques that may largely replace chemical insecticides without resulting in concurrent reduction of yield and quality of the crop. At the present time, however, chemical insecticides remain our most reliable weapon against cotton pests. Researchers, therefore, are not overlooking the development of new and better insecticides and application equipment.

Longer Time Between Refilling

To define ultra-low volume (ULV), the U.S. Department of Agriculture has suggested that "the term ultra-low volume for applying concentrated or technical insecticides will be used when the total volume of spray solution applied per acre is ½ gal. or less." When compared with conventional spray applications that distribute several gallons of spray mixture per acre, ULV applications have obvious advantages to the grower or applicator or both. By increasing the acreage that a tank of spray can cover, the grower can decrease considerably the time wasted in returning to the supply tank or water source for refill. This advantage offered by ULV applications is probably most evident when using aerial application procedures. It is quite possible that the aircraft may run out of fuel before exhausting the supply of spray material.

May Result in More Residual Kill

There are other advantages offered by ULV that are not as obvious. Preliminary research evidence indicates that ULV-applied insecticides have more residual killing power than conventional, water-diluted sprays. This may allow an increase in the time interval between applications; thus, fewer applications would be required for season-long control. This would result in savings in insecticide, and machine operation and labor costs to the grower. However, additional research is needed to verify the preliminary evidence and before such a recommendation can be made. Other research data indicate that the ULV chemical formulations are more resistant to wash-off by rain than are conventional sprays. This characteristic of ULV formulations would be of great importance during a rainy, growing season.

Method Gives Effective Control

Will ULV insecticide applications control cotton insects? Regardless of the advantages offered by ULV applications, effectiveness is the most important criterion for evaluating this or any pest control procedure. Research data from the Auburn University Agricultural Experiment Station, as well as data from other stations, consistently indicate that ULV applications will effectively control cotton insects.

At the present time, only four insecticide formulations, Malathion, Malathion plus DDT, Guthion, and Toxaphene plus DDT, have received label approval from the U.S. Department of Agriculture for use on cotton. All of these materials have been tested by the Auburn Station. Results show that all four formulations are effective for controlling the boll weevil; however, only the formulations containing DDT are effective also in controlling bollworms. Many other insecticides are being tested for ULV usage. It is quite possible that soon there will be a larger variety of approved formulations available for use.

Problems Associated with ULV

In spite of the advantages offered by ULV technique of insecticide application, relatively little cotton acreage is being protected by this type of insecticidal spray. Such reluctance by the growers to accept the ULV technique is not entirely without merit for there are some problems currently associated with ULV usage.

One often heard criticism of ULV is that it will result in undue drift of the spray. It is true that when applying small volumes of material the spray must be broken into relatively small individual droplets, making the spray more subject to drift by air currents. However, many researchers believe that the magnitude of this problem is usually exaggerated and that the drift of ULV sprays is little worse than that encountered with conventional sprays.

Another problem of ULV usage is the lack of inexpensive, reliable and efficient ULV equipment for ground-operated machinery. Because of this, most ULV usage has thus far been associated with aerial application equipment. However, improvements in the ground-operated ULV equipment currently available and the development of new equipment may soon offer more growers the opportunity to take advantage of this application technique.

In conclusion, it must be pointed out that the existing problems concerned with ULV usage are relatively minor when compared with the advantages and possibilities this technique offers for the control of cotton insect pests.

Nematode-resistant sericea –

NOW POSSIBLE!

E. D. DONNELLY, *Dept. of Agronomy and Soils*
N. A. MINTON, *Crop Res. Div., USDA, ARS, Tifton, Ga.*

NEWLY DEVELOPED lines of sericea can now be used to breed nematode-resistant varieties that should produce higher yields and persist longer than present sericeas on sandy Coastal Plain soils of the Southeast.

The seven new breeding lines resistant to three common species of root-knot nematodes are the product of cooperative research of Auburn University Agricultural Experiment Station and USDA Agricultural Research Service, Tifton, Georgia.

Nematode Damage in Field

Evidence that nematodes severely damage sericea was obtained in 1955 when a number of breeding lines and varieties were grown at Auburn on a loamy sand. One line was severely stunted, had yellow foliage (Photo A), and produced much less forage and seed than others. Dr. E. J. Cairns, Auburn nematologist, found roots of the stunted line to be heavily infected with the southern root-knot nematode.

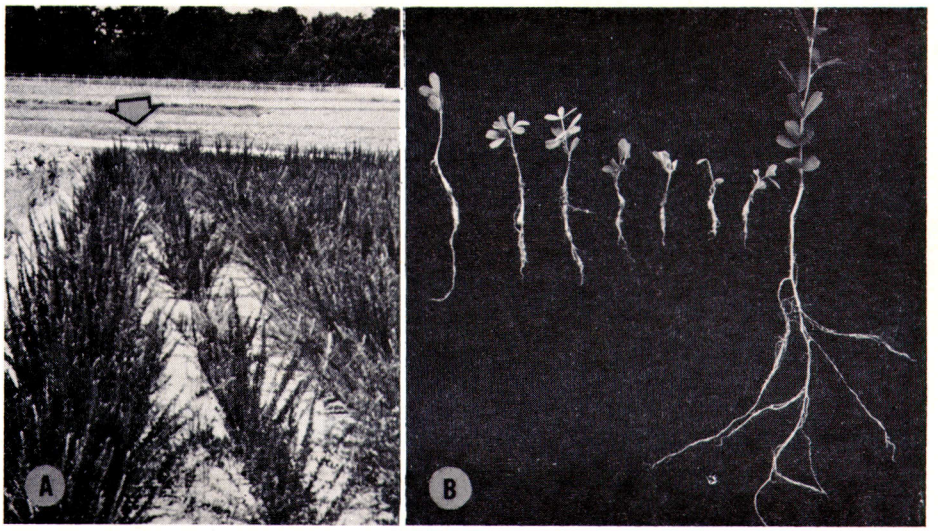
Sericea breeding lines also differed in persistence on sandy soils at the Station's Plant Breeding Unit near Tallassee where nematodes are abundant. Stands of some lines thinned or died out in nursery rows, whereas others remained vigorous and productive. In other test plots and large fields in the State, sericea performance generally has been poorest on light textured soils where root-knot nematodes are usually most prevalent.

The foregoing factors prompted the authors to determine reaction of numerous breeding lines and varieties of sericea to five species of root-knot nematodes.

TABLE 1. RELATIVE RESISTANCE OF VARIETIES AND FAMILIES OF SERICEA TO FIVE ROOT-KNOT NEMATODE SPECIES[1] (FIRST SCREENING CYCLE, 1964)

Family	Root-knot species				
	Southern	Cotton	Northern	Peanut	Javanese
A	1.0	1.3	1.0	3.4	3.0
B	1.0	1.5	3.3	3.5	3.1
C	1.5	1.8	2.7	3.7	3.8
D	1.5	1.9	2.2	4.1	3.4
E	1.8	2.5	3.8	3.8	3.2
F	2.5	2.4	1.0	3.5	4.1
G	1.6	2.4	1.2	4.4	4.6
H	4.7	5.0	3.8	3.4	3.6
'Serala'	2.2	3.6	3.4	2.5	3.3
Common	2.5	2.7	1.8	2.7	2.3

[1] Based on 1 = no galling, 2 = slight galling, 3 = light galling, 4 = moderate galling, and 5 = heavy galling.



(A) A root-knot nematode susceptible sericea (center), Auburn, 1955. (B) The large plant on right is from a sericea breeding line resistant to the cotton root-knot nematode and small plants at left are from a susceptible line.

TABLE 2. REACTION OF SERICEA LINES AFTER THREE CYCLES OF SELECTION FOR RESISTANCE TO ROOT-KNOT NEMATODES[1], 1966

Lines	Root-knot species		
	Southern	Cotton	Northern
A-1	1.0	1.0	1.0
B-1	1.1	1.1	1.0[2]
C-1	1.0	1.2	1.0
D-1	1.0	1.1	1.0
E-1	1.0	1.1	1.0[2]
F-1	1.1	1.2	1.0
G-1	1.0	1.2	1.0
H (susceptible check)	4.5	4.9	4.4

[1] These lines are progeny of original families selected in 1964 (Table 1). Root-knot indices based on 1 = no galling; 2 = slight galling; 3 = light galling; 4 = moderate galling; and 5 = heavy galling.
[2] Reaction in 1967 after four cycles of selection against the northern species.

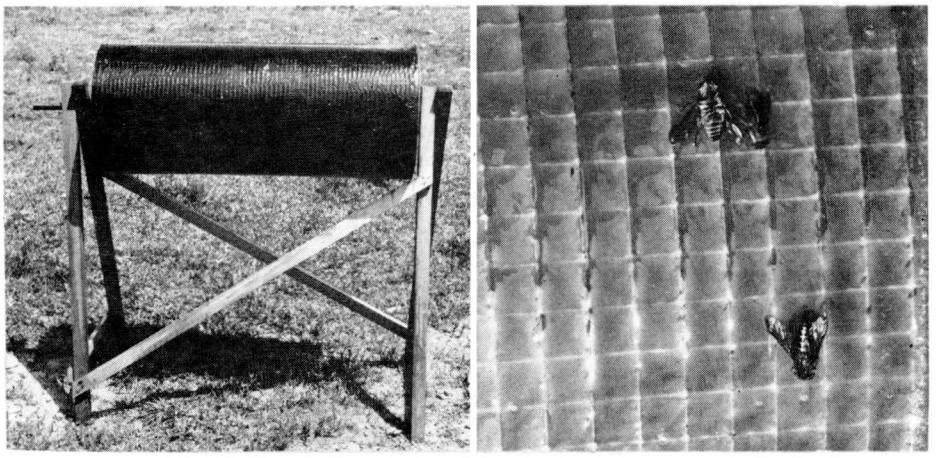
Lines Differ in Resistance

Between 1964 and 1967, more than 200 lines that previously had been bred for fine, soft-textured stems and other growth traits were tested for resistance in the greenhouse. Roots of seedlings were subjected to these nematodes for about 2 months. The seedlings then were dug and classified according to severity of nematode infection. Resistant and susceptible plants are shown in Photo B. Most of the original families were susceptible. However, several showed considerable resistance (Table 1). 'Serala' and common generally were intermediate in their reactions, except that common showed more resistance to the northern root-knot nematode species. Only 1 of 43 families tested in 1964, family A, had a high level of resistance to the southern, cotton, and northern root-knot nematodes. None of the families in the first or subsequent tests showed resistance to the peanut and Javanese species. Families B, C, and D were resistant to the southern and cotton root-knot nematodes. Family E showed some resistance to the southern species. Families F and G were resistant only to the northern species. Family H was susceptible to all 5 species. In subsequent tests family H was used as a susceptible check.

Resistant Lines Developed

Resistant seedlings from families that were segregating for resistance to a given nematode species (Table 1) were grown to maturity in the greenhouse. Seed were produced on 1-year-old plants, permitting progeny testing of these plants each year. After three cycles of selection, five lines resistant to three of the five root-knot nematode species were developed from the original families (Table 2). Two additional lines, B-1 and E-1, were identified in the fourth cycle of selection as being resistant to three of the five species. These were segregating in the third cycle of selection for resistance to the northern species.

Seed of these root-knot nematode resistant lines are being increased and evaluated in field tests.



This cylindrical trap was fabricated from plywood and hardwood cloth and covered with paper to determine if carbon dioxide would attract horseflies.

WHAT ATTRACTS BITING FLIES TO THEIR HOSTS?

KIRBY L. HAYS, *Department of Zoology-Entomology*

Why do these pesky flies always pick on me?

Everyone who hunts, fishes, or enjoys the out-of-doors has wondered how the myriad of insects that suck his blood; enter his nose, mouth, or ears; or attach to his skin could locate him when few other people were around. Man has known since he built his first campfire that certain insects are attracted to light at night. He soon learned from observation that non-flying parasitic insects and ticks were passive in seeking a host. These species climb on vegetation and wait. They will attach to any creature that happens to brush against their resting place.

Built in Mechanism

There appears to be some innate mechanism used by the flying blood-suckers to locate their host when a blood meal is needed. Since many of these species wander far from their hosts, there must be some factor of the host animal that triggers behavior patterns associated with seeking a host. However, some biting insects are attracted to non-living things. Mosquitoes of many species are attracted to lights, and many people have noticed that horseflies are attracted to automobiles and newly painted objects. Tests in Canada have shown that certain species of horseflies are attracted to shiny objects; thus the attraction of these insects to shiny automobiles and fresh paint. The Canadian researchers were also able to show that these flies were attracted to objects of certain shapes. A spherical shape was the most attractive and a cylindrical shape was next in attractiveness.

Insect Attractants

Interest in attractants for insects at the Auburn University Agricultural Experiment Station is long-standing and began with the development of an attractive bait for the imported fire ant. The first clue of attractants for biting flies uncovered at Auburn came during research on black flies or buffalo gnats. It was noticed that a person in vigorous exercise attracted great swarms of black flies, while the same people at rest attracted very few flies at the same place. Physiologically, a person in exercise produces more heat, perspiration, carbon dioxide and other metabolic wastes. The easiest of these metabolic materials to test was carbon dioxide since it could be purchased in the form of dry ice or as a compressed gas in a cylinder. The release of carbon dioxide within the clothing of a person at rest noticably increased the numbers of black flies attracted to him.

Attractant Effectiveness Measured

To measure the effectiveness of carbon dioxide as an attractant two identical New Jersey type light traps were placed near a population of black flies. The light was removed from both traps and carbon dioxide was released in one of the traps. In 25 weeks of trapping during which 266 samples were taken, the carbon dioxide baited trap collected more than 100 times as many flies as the trap without an attractant. On some days as many as 669 flies could be taken per hour.

Horseflies were seen to approach the New Jersey light trap that was releasing carbon dioxide. Cylindrical traps, see figure, were fabricated from plywood and hardware cloth and covered with paper to determine if carbon dioxide would attract horseflies. To prevent escape of flies attracted to the trap, the paper was covered with a synthetic resin "Tanglefoot®." The first year of testing when the traps were covered with black paper, these traps collected as many as 30 horseflies per hour at the Piedmont Substation. To separate the effects of the black color from carbon dioxide in attracting flies, paper of various colors was used the second season. The colors selected included red, green, blue, yellow, white, and black. Each colored trap emitted about ¾ lb. of carbon dioxide per hour from melting dry ice inside the cylinder.

Carbon Dioxide Plus Color

The colored traps were again coated with Tanglefoot®, which changed the color of the white paper to light brown, but only made the other traps more shiny. At the peak of the horsefly season, the black and red traps collected about 5 to 6 insects per hour when operated without carbon dioxide. When operated with carbon dioxide, these same traps collected about 30 horseflies per hour. The blue, green, and light brown traps were not as successful collecting 1 to 2 tabanids per hour without carbon dioxide and 5 to 10 flies when carbon dioxide was added. The yellow trap did not collect a measurable number of flies either with or without carbon dioxide. It appears that the yellow color used repels tabanids, however, this yellow trap was quite attractive to black flies in the vicinity.

Herbicides for Postemergence Weed Control in Soybeans

G. A. BUCHANAN and D. L. THURLOW, *Department of Agronomy and Soils*

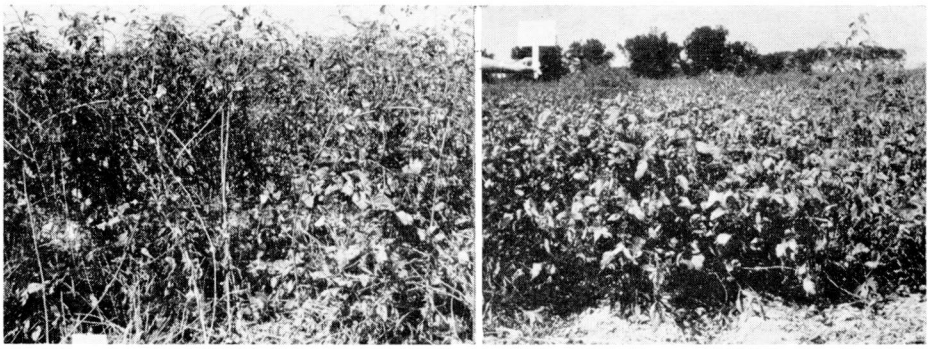
SOYBEAN FARMERS are rapidly shifting to use of preemergence herbicides for controlling weeds. Preemergence treatment is often successful enough that no further weed control is required where broadleaf weeds are not a problem. In many cases, however, additional control is necessary.

Late season weeds pose a serious threat to soybeans. They compete for nutrients and frequently for moisture at the critical period of flowering and bean development. Dense stands of many broadleaf weeds interfere with harvesting, and lower crop value by contaminating beans with weed seed.

Experiments during the past 3 years at several Alabama locations have evaluated postemergence herbicides in soybeans, either as a "directed" or "over-the-top" application, using about 25 gal. of water per acre. A surfactant, Adjuvan T or Surfactant WK, was included in some treatments at ½% by volume.

Chloroxuron (Tenoran) gave satisfactory control of many broadleaf weeds, such as morningglory, cocklebur, pigweed, and sicklepod (coffeeweed) in soybeans. Results from one of the experiments are illustrated by data in the table and the photos.

Predominant broadleaf weeds were morningglory and sicklepod, but crabgrass and goosegrass were present. Herbicide was applied when grasses and broadleaf weeds were approximately 2 in. high. None of the chloroxuron treatments gave acceptable control of the annual grasses. Stand and yield of soybeans was not affected by any rate of chloroxuron used.



Weedy soybeans at left got neither herbicide nor cultivation; plot at right was treated with chloroxuron at rate of 1.5 lb. per acre plus Adjuvan T, ½% by volume, put on as directed spray and was cultivated once.

Broadleaf weed control was acceptable with the exception of the 1.5 lb. per acre rate without surfactant. In general, broadleaf control was better when herbicides were applied as a directed spray rather than over the top. Since broadleaf weed counts were made in a 12-in. band over the drill, results indicate the poor coverage of weeds that can occur with over-the-top application. Chloroxuron is currently recommended for control of broadleaf weeds in soybeans at rates of 1.0 to 1.5 lb. per acre plus surfactant at ½% by volume.

Linuron (Lorox) applied as a directed spray when soybeans were 12 in. high was effective against both grasses and broadleaf weeds in an experiment at Auburn. This herbicide will injure soybeans if allowed to come in contact with foliage. Results from different rates of linuron, all with Surfactant WK in the spray, are given below:

Linuron rate, lb. per acre	*Grass control, pct.*	*Broadleaf control, pct.*
0.25	95	77
0.5	95	80
1.0	100	87
2.0	100	100
No herbicide	0	0

GS-16068 and GS-16065 are experimental herbicides that have been tried for postemergence weed control in soybeans. Over-the-top applications of GS-16065 caused substantial reduction in stand. Stands were also reduced by directed spray of this herbicide at the highest rate. GS-16068 caused only slight stand reduction when applied over the top at the highest rate. Both experimental compounds gave effective control of broadleaf weeds. GS-16068 was ineffective against annual grass when applied over the top, but directed applications proved considerably better.

The combination of CIPC plus DNBP gave fair control of broadleaf weeds. It was acceptable for grass control, especially at the higher rate, as shown by data in the table. Neither rate affected soybean stand.

Chloroxuron and linuron gave satisfactory control of broadleaf weeds in soybeans when applied postemergence. Linuron provided acceptable control of annual grasses. GS-16068 and CIPC plus DNBP offer some promise.

Yields and stands of soybeans were not affected by any herbicide except GS-16065, which reduced both stand and yield. In general, weed control was better when herbicides were applied as a directed spray rather than an over-the-top application.

WEED CONTROL AND EFFECT ON STAND OF SOYBEANS FROM POSTEMERGENCE HERBICIDES, GULF COAST SUBSTATION, 1967

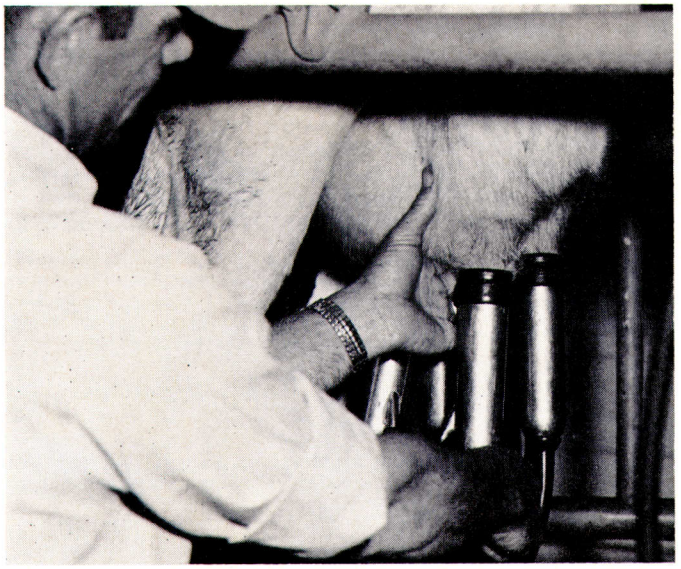
Treatment, herbicide rate per acre and surfactant used	Directed application			Over-the-top application		
	Plants per ft. of row[1]	Grass control	Broadleaf control	Plants per ft. of row[1]	Grass control	Broadleaf control
	No.	*Pct.*	*Pct.*	*No.*	*Pct.*	*Pct.*
Chloroxuron						
1.5 lb., no surfactant	10.3	0	71	9.5	4	19
3.0 lb., no surfactant	10.0	0	94	9.3	22	69
1.0 lb., Adjuvan T	8.0	4	97	8.6	82	44
1.5 lb., Adjuvan T	7.5	76	94	8.1	62	66
3.0 lb., Adjuvan T	8.6	45	94	7.2	17	87
GS-16068						
1.0 lb., Surfactant WK	8.6	0	87	7.8	0	84
2.0 lb., Surfactant WK	8.0	59	87	6.2	0	97
GS-16065						
1.0 lb., Surfactant WK	9.1	75	87	2.1	0	100
2.0 lb., Surfactant WK	3.3	68	100	0.2	87	94
CIPC + DNBP						
1.5 lb. each, no surfactant	8.8	39	81	----	----	----
3.0 lb. each, no surfactant	7.3	94	71	----	----	----
No herbicide	*8.6*	*0*	*0*	*8.9*	*0*	*0*

[1] Row width, 38 in.

MACHINE STRIPPING UNNECESSARY

can be eliminated without affecting dairy cow performance

J. A. LITTLE, *Department of Dairy Science*



OVER HALF of the Grade A dairymen in Alabama machine strip their cows. In these herds, stripping probably accounts for 20 to 40% of the milker's work routine.

With the continued increase in size of dairy herds and cost of labor, time required to milk cows is of utmost economic importance to the dairyman. For this reason, a study was done by Auburn University Agricultural Experiment Station to determine whether machine stripping could be omitted from the milking operation without adverse effect on milk production and udder health.

Thirty-six lactating cows from the Dairy Research Unit herd were assigned randomly to stripped or nonstripped treatments, with assignment changes made at 28-day intervals during the 12-week test. Selection of cows was based on stage of lactation and previous history of udder disease symptoms. No animals having a history of chronic mastitis were included.

Feeding and herd management of cows in each treatment group were identical throughout the study. All cows were fed corn silage and Coastal bermudagrass and alfalfa hays. They were on either fescue or small grain pastures when available. Level of concentrate feeding was based on individual production level and adjusted accordingly.

All cows were milked in a three-in-line, side opening parlor. Cows on the stripped treatment were milked and machine stripped by exerting downward pressure on the claw piece of the milker unit while massaging quarters individually.

Udders of cows on the nonstripped treatment were not handled after machine attachment, nor was pressure applied to the teat cups. Teat cups were removed from nonstripped cows when milk flow stopped, as observed through a glass weigh jar. Milk production by each cow was measured daily, and weekly determinations were made of percentages of milk fat, solids-not-fat, and total solids.

Elimination of machine stripping resulted in an average of 0.24 lb. reduction in daily milk production. As shown by data in the table, however, differences in production levels and milk composition between groups were too small to conclude that stripping treatment was responsible.

Symptoms of udder irritation were measured daily using a strip cup, and weekly with the California Mastitis Test (CMT) procedure throughout the 12-week study. A total of 864 quarters on each treatment was checked. More than 93% of those checked on each treatment scored negative by the CMT.

Trace reactions were scored on 45 and 51 quarters of stripped and nonstripped cows, respectively, indicating possible subclinical mastitis. In contrast, only milk from one stripped and four nonstripped quarters showed an indication of mastitis when a strip cup was used. This indicates that many cases of subclinical mastitis may go undetected in herds where only the strip cup detection method is used.

A survey of time required for various practices in the milking operation, Table 2, showed that machine stripping required an average of 49 seconds per cow. Total "machine on" time per milking averaged 36 seconds longer for stripped than for nonstripped cows. In a hundred-cow herd, eliminating machine stripping should reduce milking time 1½ to 2 hours daily.

Results of the Auburn study indicate that machine stripping can be eliminated without detrimental effects on health of cows and without adverse effects on milk production and composition. However, the following provisions are necessary: (1) for maximum milk yields without stripping, competent, well trained workers must do the milking and cows must have normal well shaped udders; and (2) cows with abnormally shaped udders will probably require some manipulation to get maximum milk yields.

TABLE 1. EFFECT OF STRIPPING ON MILK PRODUCTION AND COMPOSITION[1]

Stripping treatment	4% fat-corrected milk	Milk fat content	Solids-not-fat content	Total solids content
	Lb.	*Pct.*	*Pct.*	*Pct.*
Stripped	44.56	4.26	8.83	13.09
Nonstripped	44.32	4.34	8.81	13.16

[1] Treatment differences were not significant at 5% level.

TABLE 2. SURVEY OF TIME REQUIRED FOR VARIOUS PRACTICES IN MILKING OPERATION

Stripping treatment	Udder preparation	Using strip cup	Milking time	Stripping time	Total machine on time	Total time per cow
	Sec.	*Sec.*	*Sec.*	*Sec.*	*Sec.*	*Sec.*
Stripped	60	9	230[1]	49	279	348
Nonstripped	62	9	243	0	243	314

[1] Represents period from time of machine attachment until beginning machine stripping.

Implication of Change in AD VALOREM TAXATION of Timber

J. R. HURST and J. H. YEAGER, Dept. of Agricultural Economics and Rural Sociology

Two-thirds of Alabama's total land area, more than 20 million acres, is in trees. Much of this land presently produces little net income. Although standing timber on the land was subject to ad valorem taxation before 1967, owners paid relatively low property taxes.

In neighboring states, as well as others, property taxes paid by landowners have increased substantially in recent years. This resulted primarily from reassessment and valuation programs.

A significant change took place in Alabama in 1967, when standing timber was exempted from ad valorem taxation. This change centered in an amendment to Title 51, Section 21 of the Code of Alabama. At the same time, the level of assessment was lowered from 60% to 30%.

Arguments for exemption of standing timber from ad valorem taxation included the following:

(1) Timber is now managed as a crop similar to field crops, except the growth or production period is much longer.

(2) Under past regulations timber has been subject to severance, income, and property taxes, whereas sales of a field crop were subject only to income tax.

(3) Taxing timber at the statutory assessment level, 60% of fair market value, and rates of 6.5 mills for State and 18.5 mills as county average would reduce net income to a point where timber production would not be economically feasible. Such taxation would lower land values and make timber production nonfeasible, causing a deficit in supply of wood for Alabama's rapidly expanding wood-using industry.

Amount of property tax revenue from timber and ad valorem taxation prior to 1967 is unknown. Because of the problem of separating the value of bare timber land from the value of timber, it is almost impossible to determine the tax revenue from timber. In most Alabama counties, timber and timber land have been assessed at a given flat rate per acre. Estimates for 1964 show that counties with a relatively high proportion of total land in trees were considerably below the average for all counties in farm real estate property taxes, indicating relatively low taxation of timber and timber land.

As a result of the recent change in ad valorem taxation of timber, several significant questions can be raised.

What is the effect of ad valorem taxes on net income from land used for timber production? What effect does the ad valorem tax at various levels have on value of timber land?

To help answer these questions, three assumed situations were compared, as presented in the table. These assumed situations had timber assessed at either 60% or 12% of fair market value, or it was exempted.

Comparison of Three Levels of Timber Ad Valorem Taxation

Item	60% assessment	12% assessment	Exempt
Gross income (30 years)	$360.00	$360.00	$360.00
Present value (6%)	62.68	62.68	62.68
Present value of costs[1]	20.00	20.00	20.00
Present value of net income before tax (6%)	42.68	42.68	42.68
Total tax paid (30 years)	82.70	16.54	0
Present value of tax paid (6%)	28.10	5.62	0
Present value of net return after tax (30 years)	14.58	37.06	42.68
Annual net return (6%)	1.06	2.69	3.10
Capitalized value of bare land (7%)	15.14	38.43	44.28

[1] Includes site preparation, planting, and annual expenses.

Annual production was set at 2 cords per acre per year over a 30-year production period. This is much above the State average, but it is attainable. The land is clear cut at the end of 30 years, with market value of the wood $6 per cord.

Over the 30 years, each acre would produce $360 of product. Present value of the wood, however, is only $62.68 (derived by discounting the 30-year future income to present value by using 6% interest rate). Present value of costs was estimated at $20 per acre in each case, primarily for site preparation and planting. Since these costs are incurred the first year, they are not discounted to obtain present value. Annual costs for such items as fire protection would be discounted to present value.

Ad valorem taxes paid on the timber were based on 2 cords production per acre per year, worth $6 per cord. Property taxes were calculated as assessment level (from table) times market value times a tax rate of $2.50 per $100 value. This tax is on timber and not the land.

Property taxes paid per acre on the timber during the 30 years would amount to $82.70 at the 60% assessment level and $16.54 at the 12% level. Present value of the property taxes paid was derived by discounting each annual amount of the tax to the present, using a 6% rate.

Differences in present value of net income before and after property taxes provided the present value of the net return. This was 2½ times as great at 12% assessment as at the 60% level, and 3 times as high if tax exempt.

The next step was to determine annual net return over the 30-year period. Procedure in this case was to assume that present value of the net return after taxes could be invested as an annuity at 6%. Such an annuity would yield annually $1.06, $2.69, and $3.10, respectively, for the three tax situations. Income value of the land could then be determined by capitalizing the annual net return, as indicated in the table. A capitalization rate slightly higher than the interest rate was used to reflect additional risks of owning land and growing timber as compared with lending of funds or investing to accrue interest.

The 60% level of assessment with tax rates and value of product as used would support a capitalized value of land of only $15.14 per acre, well below the value of almost all timber land in the State. This level of assessment would result in extremely low returns and no doubt would severely restrict forestry developments.

Results of the 12% level of assessment compared to the exempt status differ less than might be expected. This is true both in annual net return and capitalized value of the property. The $16.54 total tax paid over 30 years is a simple average of 55¢ per year per acre on timber only.

Exempting timber from ad valorem taxation protects the timber industry against excessive taxes and should encourage expanded production.

C. C. Carlton, superintendent, Chilton Area Horticulture Substation, views a properly fertilized field of sweetpotatoes.

METHOD of Application and KINDS of Fertilizers for SWEETPOTATOES on Light Sandy Soils

W. A. JOHNSON and J. L. TURNER, *Department of Horticulture*
C. C. CARLTON, *Chilton Area Horticulture Substation*

Sweetpotato fertilizer applications are usually made in the row prior to planting.

In recent years, however, applications have been made under and to side of the row. Side applications are made at time of bedding and sometimes results in fertilizer being turned into portions of the bed where plants are set. This has caused some noticeable injury especially during dry periods. This may result in a reduction in yield even when symptoms are not visible. A study was begun on light sandy soil of low fertility at Auburn to evaluate broadcast vs. row applications to determine effects of varying N, P, and K on yields. Treatments used and results are shown in the table.

Results Compared

Broadcast and row applications of fertilizer were compared at three rates of N, P, and K; 20-26-50, 40-53-100 and 60-79-150 plus 15, 30 and 45 lb. N to side were used. Results show that yields from broadcast applications at all 3 rates were as high or higher than yields from row applications. At the 1,500-lb. rate yields of both No. 1 and total yields from broadcast applications were significantly higher than from row placement. When broadcast the highest rate produced significantly greater yields of No. 1 sweetpotatoes than those from the lowest rate. Increasing rates did not result in an increase in yield when fertilizer was applied to the row. When the crop was grown on a better soil as at the Chilton Area Horticulture Substation there were no differences in yields between broadcast and row applications nor was there any differences as a result of rates.

Without the use of a herbicide it would not have been practical to broadcast fertilizer because of excessive growth of weeds.

For both broadcast and row applications there were no differences in yields obtained from applying N in either one or two applications, treatments 2, 5, 7, and 8.

When 26 lb. of P and 50 lb. of K were used, increasing the nitrogen from 35 to 70 lb. per acre did not result in an increase in yields, treatments 1 and 11. Increasing the rate of N from 40 to 70 lb. when 53 lb. each of P and 100 lb. of K were used resulted in an increase of 55 bu. of No. 1 grade, 37 bu. of marketable grade and 52 bu. of total yield, treatments 7 and 9. When N was increased from 70 to 105 lb. per acre there was no increase in yields, treatments 2 and 10.

When 70 lb. of N was applied there were no differences in yields from 26 lb. of P and 50 lb. K and 53 lb. of P and 100 lb. K, treatments 11 and 12. When 26 lb. of P and 100 lb. of K were applied with 70 lb. of N, treatment 12, the increase in yields over treatment 11 was 51 bu. for the No. 1, 82 for total marketable and 82 for total of all grades.

At the Chilton Area Horticulture Substation on a sandy loam soil of higher fertility one year results showed that there were no significant differences in yields between the various treatments used.

Residual Supply of P

In a soil of this kind there may be an adequate residual supply of P to produce a crop of sweetpotatoes, but a maintenance supply should be applied to the crop to prevent a depletion of this element in the soil. A crop of 450 bu. of sweetpotatoes will remove approximately 12 lb. of P per acre from the soil. Therefore, somewhat more than this amount should be supplied to the soil to maintain its supply or to supply needed amounts for the crop growing on a soil of lower fertility. Therefore, a fertilizer ratio such as a 1-2-4 will supply adequate P for sweetpotato production.

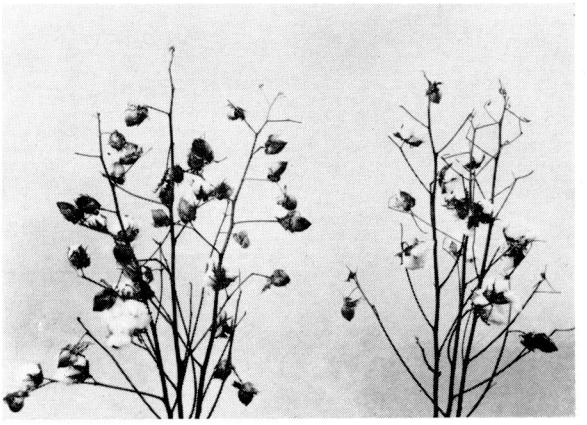
Yields of Sweetpotatoes from Rates of Fertilizer and Methods of Application on a Light Sandy Soil

Treat. No.	Fertilizer treatments[1]			Yields in bushels per acre		
	N-P-K[2], lb./acre	Method of applic.	No. of applic. of N.	1966-1967		
				No. 1's	Total mkt.	Total
1	35-26- 50	Bdc.	2	313bcd[3]	438bc	486bc
2	70-53-100	Bdc.	2	324abc	440bc	479bc
3	105-79-150	Bdc.	2	378a	490ab	521ab
4	35-26- 50	Row	2	285cd	410c	446c
5	70-53-100	Row	2	299cd	433bc	463bc
6	105-79-150	Row	2	305cd	422bc	449c
7	70-53-100	Bdc.	1	310bcd	445bc	484bc
8	70-53-100	Row	1	332abc	447bc	477bc
9	40-53-100	Bdc.	1	265d	382c	432c
10	105-53-100	Bdc.	2	317abc	454bc	490bc
11	70-26- 50	Bdc.	2	320abc	455bc	490bc
12	70-26-100	Bdc.	2	371a	537a	572a

[1] When N was applied in 2 applications part was applied at planting and part to side 1 month after planting. With 1 application all was applied at planting.

[2] 26 lb. P (60 lb. P_2O_5) 50K (60 lb. K_2O).

[3] Differences in yields between any 2 treatments are significant if letters are not alike.



This picture from South Carolina shows the difference in the fruiting of cotton at left with boron and at right no boron.

INTERACTION of NITROGEN and BORON for COTTON

JOHN I. WEAR and CLARENCE SCARSBROOK,
Department of Agronomy and Soils
J. W. LANGFORD, *Plant Breeding Unit, Tallassee*

BORON IS NOW RECOMMENDED for all cotton grown in Alabama.

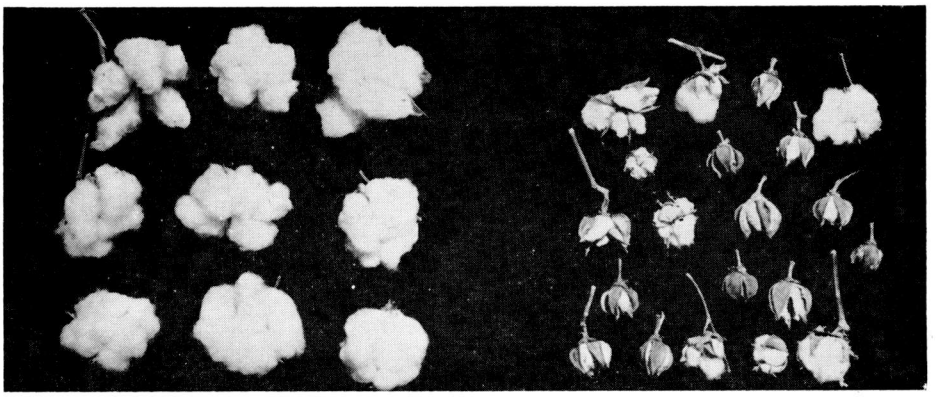
In the past, boron was not recommended because at low yields no response was obtained from many experiments conducted in the Southeastern States. There was sufficient boron in the soils for the normal small plants and low yields. Improved production practices, high fertilizer rates, and higher yields of seed cotton caused more boron to be removed each year.

Boron Experiments Conducted

Experiments begun at the Sand Mountain Substation 10 years ago showed increases of about 150 lb. of seed cotton from boron when high rates of nitrogen were used. Results of 21 different tests at other stations and on farmers' fields showed an average increase of more than 50 lb. of seed cotton as a result of boron applications. This average increase included a number of locations that did not give an increase in yield for boron (HIGHLIGHTS OF AGR. RES. Vol. 2 No. 4, 1964).

Tallassee Test Begun

To determine the effect of nitrogen rates on response to boron, an experiment was started on a boron-deficient sandy soil at the Plant Breeding Unit, Tallassee, in 1965. Treatments in this experiment included nitrogen rates of 60, 120, and 240 lb. per acre each with and without 1 lb. of boron added as a sidedressing. An excellent crop of cotton was produced in 1965, and as a result of poor weather conditions, smaller yields were obtained in 1966 and 1967. Responses from nitrogen and boron have shown the same trend for the past 3 years. The largest responses from boron were obtained when higher rates of nitrogen were used. Average increases for the added boron from four replications in the test were as follows: at the 60-, 120-, and 240-lb. levels of nitrogen, yield increases of 97, 168, and 219 lb. of seed cotton, respectively, see table.



This picture by the Potash Institute made of a Mississippi test shows difference in boll development with boron at left and no boron at right.

Although more than 200 lb. of seed cotton were obtained from boron in some treatments, boron deficiency symptoms were not evident. When boron deficiency symptoms are obvious in cotton, severe reductions in yield may be expected. The more prominent boron deficiency symptoms are: excess shedding of squares and bolls, dark discoloration at base of boll, short internodes, and bushy, dark green appearance of plant.

Boron Deficiency Prevention

To prevent boron deficiency, boron may be mixed with the fertilizer, applied as a preemerge with the herbicide, or included in insecticide spray applications. Boron deficiency is more prevalent on sandy, limed or dry soils. Since excessive amounts of boron are toxic to the cotton plant, care should be taken to follow recommendations; ½ lb. of boron per acre added with the fertilizer, premerge or in insecticide or 1 lb. per acre broadcast. The recommended rate of nitrogen per acre is 70 lb. except for the Sand Mountain area where the rate is 90 lb.

RESPONSE OF SEED COTTON TO NITROGEN AND BORON, TALLASSEE, ALABAMA

Nitrogen	Boron	Yield of seed cotton				
		1965	1966	1967	Av.	Increase from boron
Lb./A.	*Lb./A.*	*Lb./A.*	*Lb./A.*	*Lb./A.*	*Lb./A.*	*Lb./A.*
0	0	1,840	1,019	384	1,081	
60	0	3,110	1,404	796	1,770	
60	1.0	3,190	1,575	835	1,867	97
120	0	3,250	1,254	996	1,833	
120	1.0	3,560	1,353	1,090	2,001	168
240	0	3,420	1,359	965	1,914	
240	1.0	3,690	1,510	1,110	2,133	219

(A) Small pepper spot symptoms scattered on leaflets; larger lesions are mainly Cercospora spots. (B) Irregular scorched lesion on margin and tip of leaflet; Cercospora spots also present on the lesion and other parts of the leaflet.

LEAF SCORCH—*new or old peanut disease?*

J. A. LYLE and F. J. SUBIRATS, *Department of Botany and Plant Pathology*

Heretofore, loss of leaves by peanut plants has been attributed to infection by *Cercospora arachidicola* and *C. personata*, the organisms that cause early and late leafspot diseases, respectively.

Diseased peanut leaves being examined routinely in 1966 for Cercospora leafspot showed pepper spot and leaf scorch symptoms not normally associated with Cercospora leafspot. Examination by microscope and later laboratory culture of the lesions revealed presence of another fungus, *Leptosphaerulina arachidicola* as the causal organism.

Leaf scorch was first described in Taiwan in 1956, and was reported in 1960 as occurring in Georgia. The presence of Cercospora leafspot, which resembles the pepper spot symptom in its early stage of development, on the same leaves may result in an incorrect identification and diagnosis of either disease. Photographs made in 1946 and herbarium specimens of diseased peanut leaves obtained since 1960 show disease symptoms recognizable as those produced by the latter fungus. Thus, in all probability the disease has been present for some time in Alabama prior to its discovery in 1966.

Like Cercospora leafspot, leaf scorch primarily affects leaves although it also may occur on petioles and stems. Spots range in size from a pepper spot or leaf fleck initially to a leaf scorch at maturity, which may involve half or more of the leaf surface. The margin of the leaf is usually affected first with a yellow spot developing a brown center that soon becomes necrotic. The spots range in size from tiny pinpoint to spots or flecks, hence the name pepper spot or leaf fleck. (See Photo A.) As these necrotic lesions increase in size, they become irregular in shape and where numerous they form a diffuse net blotch that may cause death and subsequent defoliation. The irregular scorched areas in the center and margin of the leaflets are produced by a coalescence of these spots. (See Photo B.) In contrast to Cercospora leafspot which occurs on either leaf surface, this disease occurs principally on the upper leaf surface except in an advanced stage.

According to the report from Taiwan, the earliest symptoms of leaf scorch are yellow spots, produced normally along the margin of the leaf. When the lesion increases in size, the center changes from yellow to a brown color. The lesion gradually enlarges and may with other lesions involve the entire leaf blade surface. The surface of old lesions may be roughened by numerous fruiting structures of the fungus immersed in the dead tissue. Although this phase of disease development has not been observed in the Alabama material, the final appearance of the scorch lesions resembles that described in Taiwan.

The common field symptom on leaves appears to be pepper spot, and may occur in early May. Since initial symptoms of the disease are masked by those of the Cercospora spots, it is necessary to place affected leaves in a moist chamber until the characteristic fruiting structures of the fungus develop or to make isolations from the lesions.

In 1967 at the Wiregrass Substation, Headland, seasonal development of the disease was studied from June through July on 48 different plants of the Early Runner variety in a peanut disease nursery. Infection intensity increased from light to heavy as the season progressed. Warm to high temperatures accompanied by maximum relative humidities, as measured by hygrothermographs and rain gauges located in the nursery, favored disease development.

In 1967 a survey was made of peanut belt fields in which stems and leaves were randomly sampled regardless of variety. The collections showed essentially the same disease infestation as that at the Substation.

Although this disease was first found in Alabama in 1966, its common occurrence over the peanut belt is obvious that it has been present for many years. It doubtlessly has escaped notice because its symptoms are obscured and masked by those of the Cercospora spots. Additional research is being conducted to determine symptomatology of the disease, its distribution and importance, and its relationship to the Cercospora leafspot, because it represents a potential threat to maximum peanut production.

Fresh Milk Substitutes—

ARE THEY COMPETITIVE?

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FRESH FLUID MILK is being challenged by substitutes in a number of markets throughout the United States.

These beverages, which resemble milk in taste, texture and appearance, are being solid below fluid milk prices. From available information, demand for milk substitutes is growing in some markets, whereas in others it has not increased appreciably. In an Arizona market where substitute milk products have been sold for about 1½ years, more than 5% of the market is accounted for by substitute products. Number of markets reporting sales of these products has increased in recent months.

Types of Products

Substitute milk products can be produced from a number of ingredients, but the basic characteristic of these products is use of lower priced vegetable fat instead of butterfat in milk.

No uniform terminology for fluid milk substitutes has been developed, but they can be grouped into three types. Type A is a combination of skim milk, vegetable oil, and some emulsifiers and stabilizers. Skim milk used in type A may be fresh or reconstituted nonfat-dry milk. Fat content may be a combination of vegetable oil and butterfat. This type is referred to as "filled milk" and is being marketed. However, the Federal Filled Milk Act **prohibits interstate shipment** of filled milk.

Type B is essentially the same as type A except sodium caseinate is the source of protein. Although sodium caseinate is manufactured from casein – a milk product, the milk substitute utilizing sodium caseinate does not fall within the Federal Act definition for filled milk. This is being marketed and may be shipped in interstate commerce.

Type C is a vegetable product and not a dairy product. In a recent study, the Milk Industry Foundation reported that nondairy substitutes are on the market, but they have flavor problems.

The Federal Filled Milk Act, passed in 1923, prohibits movement across state boundaries of a product containing a combination of milk, cream or skim milk and fats and oils rather than milk fat made in the semblance of milk. There are at least 32 states, including Alabama, that have similar statutes prohibiting production and sales of such products within the state.[1]

[1] Special Study No. 1, Milk Industry Foundation, 1968.

Ingredient Costs and Prices

Most fluid milk substitutes are filled milk in which vegetable fat replaces butterfat. The vegetable fat is usually coconut oil. Coconut oil can be purchased for about 28¢ per lb., whereas butterfat is about 80¢. A half gal. of product containing 3.5% fat weighing 4.3 lb. contains about 2½ oz. of fat. Cost of butterfat would be about 12¢ and coconut oil about 4.2¢. The cost advantage of filled milk because of difference in fat cost alone is nearly 8¢ per half gal.

If nonfat-dry milk solids were used instead of Class I skim milk, the ingredient cost advantage for filled milk could be as much as 15¢ per half gal. Such a large price difference has important implications for the dairy industry.

In most fluid milk markets throughout the country, producer milk prices are largely determined by state or federal milk marketing orders. Under these orders it is possible to regulate the cost of milk product ingredients used to make filled milk. Ingredient cost of a type A product may be raised by increasing the cost of skim milk used in the product. Some producer-pricing plans have been proposed that would achieve this purpose. The problem of pricing milk used in filled milk is being considered by national federal milk order hearings. Pricing guidelines are anticipated from these hearings.

In a survey conducted by the National Milk Producers Federation, retail prices for filled or imitation milk were reported for 29 markets.[2] In those markets the reported prices per half gal. for these products were 5 to 8¢ below regular milk in 12 markets and 12 to 15½¢ below in 9 markets. Retail prices for filled or imitation milk products ranged from 19 to 51¢. The most commonly reported price was 39¢. In only 5 markets were prices reported above 45¢ per half gal. Firms processing filled and imitation products included several regional and national dairy chains, and one milk producer marketing association.

What Is The Answer?

Historically, there has been no acceptable substitute for milk and demand has been highly inelastic. Quantity demanded of milk responded only slightly to price changes. As acceptable substitutes become available, demand will become more responsive to price. In this respect, the Milk Industry Foundation has stated that it is imperative to minimize costs to remain more competitive with substitutes.[1]

Troy Kern, president of the American Dairy Association in a recent article in a national farm magazine, proposes a positive program of action for the industry. Mr. Kern's proposals, which are in agreement with many dairy industry leaders, include (1) an expanded promotion program, (2) more research and development of new products, (3) dump some old, obsolete laws, and (4) keep prices competitive.

[2] Data presented by National Milk Producers Federation at Federal Milk Order Hearing, Memphis, Tenn., February 1968.

SUMMER VACATION NEEDED BY FESCUE

R. F. BERRY and C. S. HOVELAND
Department of Agronomy and Soils

JUST AS PEOPLE need a vacation for most efficient work, some perennial crops need time off for best production. Tall fescue is such a plant. Give it a long summer rest and it responds with more vigorous growth when weather gets cool.

How proper summer management will increase fescue yields during fall and winter months is shown by results of Auburn University Agricultural Experiment Station research. Time of summer forage removal was also found to affect yield the following fall and winter. These results indicate that it may be possible to overcome the low autumn yields that are characteristic of this crop in Alabama.

Kentucky 31, the most widely grown tall fescue variety in Alabama, and the new variety Goar were used in the Experiment Station tests. Kentucky 31 is characterized by low production during winter and high yields in fall and spring. Total yield from Goar over the cool season period is similar to that of Kentucky 31, but Goar produces much more forage during the critical winter months and matures about 2 weeks earlier in spring. Goar yielded 50 to 100% more forage during February and March than Kentucky 31 in Experiment Station tests reported in Leaflet 75, "Goar Tall Fescue."

Four summer clipping treatments were compared in the 2 years of testing at the Plant Breeding Unit, Tallassee: (1) cut in June, rested until September; (2) cut in June and July, rested until September; (3) cut in July, rested until September; and (4) rested all summer until September.

All treatment areas were cut during fall, winter, and spring, with the last harvest in late April. Old grass residue was cut and discarded in early September each year. Nitrogen was added at 40 lb. per application in autumn, two in winter, and spring. A total of 160 lb. N per acre was put out.

Fall and winter forage yields were increased 32% when Kentucky 31 was not clipped in July, as shown by the graph. Removing forage in June did not reduce yields. This treatment gave yield equal to resting all summer. However, when clipped in June and July both, there was a loss in yield the following autumn and winter.

Quality of fescue forage is low in midsummer. In this experiment, Kentucky 31 produced an average of 6,500 lb. of dry forage per acre during the cool season, which was similar to Goar production.

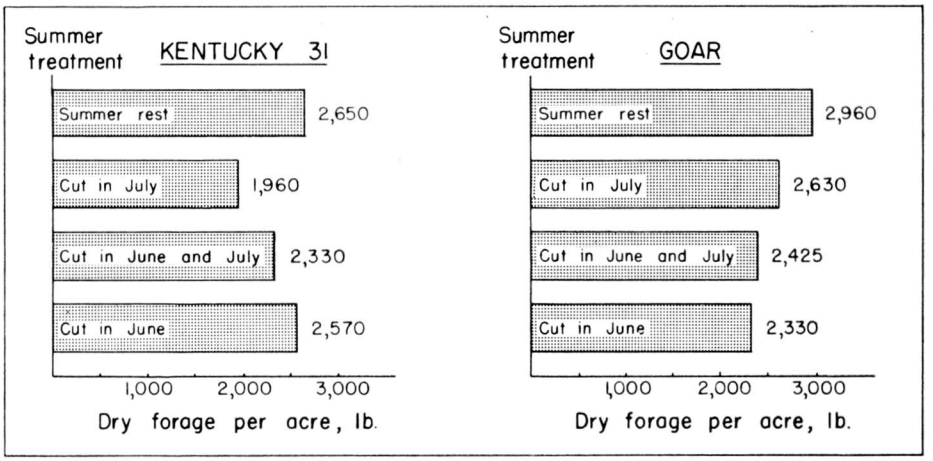
Results from this study show that food reserves are stored in the stem bases of Kentucky 31 plants after maturity. Because of the slow regrowth during summer, food reserves will be low if forage is removed during the time food reserves are being stored. The result is slower fall growth.

Autumn and winter yields of Kentucky 31 were not reduced when forage was removed into mid-June. This indicates that grazing can be continued until seed have matured without reducing fall forage production in central Alabama.

The production graph for the Goar variety shows that removing forage during summer decreased yields in autumn and winter. Clipping in June reduced yield 30% below production of that getting summer rest. Yields were decreased 15% when cutting was delayed until July. Summer growth of Goar is much slower than that of Kentucky 31. As a result, it appears that Goar cut in June does not build up a sufficient food reserve supply for rapid fall growth.

Goar requires a longer rest period for maximum autumn and winter yields than does Kentucky 31 variety. Fall and winter yields of Goar are reduced if forage is removed from booting until late summer in central Alabama.

Where grazing is desired until mid-June, Kentucky 31 is the better variety of tall fescue. If high yields during the colder months are desired, then Goar has a distinct advantage over Kentucky 31, especially when rested during summer.



How summer cutting affected fall and winter forage production of Kentucky 31 and Goar fescue during 2-year test at Plant Breeding Unit, Tallassee, is illustrated by the graphs.

PLUM STORAGE PROVED PRACTICAL

can extend marketing season to avoid price drop from over-supply

JOSEPH D. NORTON, *Department of Horticulture*

PLUM GROWERS can extend their marketing season 6 weeks or longer without growing additional varieties. Fruit of certain varieties retained their market quality in cold storage for long periods in tests at Auburn University Agricultural Experiment Station. Thus, cold storage extends the time for marketing, helps avoid a surplus on the market, and decreases losses from spoilage.

Generally regarded as unsuitable for cold storage, plums usually have been stored only a few days to avoid a temporary surplus on the market. But the Auburn results show that plum market life can be extended with cold storage, as is true for many other fruits. This is possible because cold storage retards the ripening process and prevents or slows development of decay organisms.

The Auburn plum storage study was begun in the summer of 1963. Fruit of 13 varieties were harvested and packed in quart containers and immediately placed in cold storage at 30°, 35°, and 70°F. Degree of ripeness, color, and condition of the fruit were recorded.

Four 10-fruit samples of each variety were removed from storage every 2 weeks. Two days after removal to room temperature, determinations were made of degree of ripeness, juiciness, texture, flavor, and amount of wilting and decay. All of these characteristics were satisfactory for marketable fruit when removed from storage.

TABLE 1. MARKETABLE FRUIT OF PLUM VARIETIES AFTER STORAGE AT 30° AND 70°F, 1963-66

Variety	Per cent marketable after storage for different periods				
	3 days	6 days	9 days	12 days	14 days
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
30°F storage temperature					
Santa Rosa	85[1]	60	25	10	0
Methley	70	45	15	0	0
Ozark Premier	65	40	10	0	0
Native	35	10	0	0	0
70°F storage temperature					
Santa Rosa	100	80	45	20	5
Methley	95	70	20	0	0
Ozark Premier	90	65	15	0	0
Native	20	5	0	0	0

[1] All varieties had freezing injury at 30° storage temperature.

TABLE 2. MARKETABLE FRUIT OF PLUM VARIETIES AFTER STORAGE AT 35°F, 1963-66

Variety	Per cent marketable after storage for different periods at 35°				
	2 weeks	4 weeks	6 weeks	8 weeks	12 weeks
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Sapa	100	100	100	100	100
Santa Rosa	100	100	100	100	80
Mammoth Cardinal	100	100	100	100	80
Methley	100	100	95	80	0
Satsuma	100	100	95	80	0
Giant Cherry	100	100	95	80	0
Early Gold	100	100	95	80	0
Shiro	100	100	95	80	0
Ozark Premier	100	100	80	0	0
Brilliant	100	100	80	0	0
Beauty	100	80	0	0	0
Burbank	100	80	0	0	0
Native	80	0	0	0	0

Length of Storage

How each variety responded to storage is shown by data in the tables. Varieties that retained market quality for the longest time were Mammoth Cardinal, Santa Rosa, and Sapa. At storage temperature of 35°F, these plums stored well for 10 to 12 weeks and remained marketable for 6 to 12 days after being removed from storage.

Satsuma, Methley, Giant Cherry, Early Gold, and Shiro varieties stored well for 6 to 8 weeks at 35°. After removal from storage they were in marketable condition for 4 to 10 days.

Ozark Premier and Brilliant retained market quality for 4 to 6 weeks of storage at 35°. Beauty and Burbank varieties and selections of native plums did not store well.

Temperature and Maturity Effects

Best results were with storage at 35°F. Fruit held at this temperature stored longer than under 30° or 70° storage. Considerable freezing injury was found in fruit held at 30°. At 70° storage, fruit continued to ripen at a rapid rate and there was rapid deterioration in general condition, texture, and flavor. Wilting and decay developed rapidly at 70°.

Degree of maturity at harvest affected keeping quality of fruit. For most varieties there was a short period when fruit was at the proper ripeness for harvest, and it was difficult to determine when this stage was reached. However, the Santa Rosa variety had a relatively long period when it could be harvested. It was found that Methley variety must be harvested while fruit is still firm.

Since plum fruit are perishable, there is no justification for storing them unless increased returns will compensate for cost and risk involved. Storage of fruit at 35°F during short periods of surplus was shown to be practical. Necessity was shown for careful harvesting to avoid bruising fruit when placing in containers.

FARM OPERATORS' POTENTIAL for CHANGE in OCCUPATION-INCOME

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WHAT PROSPECTS do farm operators in depressed farming areas have for occupation-income change?

To help answer this question, information was collected from a sample of 117 full- and part-time farmers living in five of Alabama's poorer farming counties. These counties are below the State average in farm incomes and have a high proportion of marginal or subsistence farms. For example, three-fourths of the sample farmers had net farm incomes of less than $1,000 in 1958-59.

More specific questions for which answers are needed include: What happens to farmers in these low-income areas over a period of time? What prospects do these farmers have for changing their occupational situation? And, when these farmers make occupation or farm changes, are they consistent with their resource potentials?

Evaluating the Resource Base

To get answers to these questions the sample farmers were contacted in 1959-60 to get information on personal and farm resources, and again in 1966 to find out about changes in occupation and farming. Each farmer's personal resources were evaluated in terms of age, education, and ability to work. His farm resources were viewed in terms of farm size, worth, and net income. Each farm operator was classified according to his own particular combination of these resources.

Only 15% of the farm operators studied possessed favorable personal resources for change, while 58% had poor personal resources and little prospect for occupational improvement. The situation was somewhat more encouraging with regards to farm resources where almost one-third possessed an adequate farm resource base. Even so, 45% of these farm operators had limited farm resources. More farmers rated good on farm than personal resources because a sizeable portion had already reached or passed their peak years of employability but still maintained their peak farm resources.

Potential Changes in Occupation

Personal and farm resources of sample farmers were combined to describe 5 different types of occupational alternatives. The goal in developing these "types of potential changes" for farm operators was to point out the prospects that really confront them as they attempt to improve their occupation income situation, and to show the proportion of operators in low-income farming areas who possess potential for socio-economic improvement. The 5 occupational alternatives considered were as follows:

Type A, 20%

Farmers possessing the resources required for either farm or nonfarm employment, but who should probably remain in farming.

Type B, 26%

Farmers having the farm resources to maintain an adequate farm operation but who lack the personal resources required for nonfarm employment.

Type C, 9%

Farmers best fitted for part-time farming because of good personal and only modest farm resources.

Type D, 13%

Farmers having the personal resources necessary for nonfarm employment but lacking an adequate resource base for farming.

Type E, 32%

Farmers lacking resources for either farm or nonfarm work.

Almost one-third of the farm operators participating in the study had severely limited potentials for any change except retirement from the labor force; these were classified as Type E. Equally important was the finding that 46% of the farmers had potentials for improvement within farming. This was indicated by their Type A and B classifications. Perhaps the most important finding was that only 21% of the sample farmers had potentials either for moving completely into nonfarm employment or into part-time farming. These findings provide a strong rebuttal to those people who contend that marginal farmers should be forced out of farming and into nonfarm work, when in fact most of these farmers have even less potential to earn an adequate living in nonfarm work than they have in farming.

Occupational Change

The kinds of occupation or farming changes made by the sample farmers between 1959-60 and 1966 revealed that some had actually made changes consistent with their resource potentials or left the labor force entirely, but most merely continued their earlier work situation. The most pronounced shift was out of farming into nonfarm employment among farmers classified as Type D. Similarly some farmers classified as Types B and E had shifted to enterprises demanding less labor such as beef cattle. Although farmers in Types A, B, and C, on the other hand, had the resource potential to expand their farming operations only two had done so. Most farm changes reported had been reductions rather than expansions. It appears that incentives for farm expansion among even the better farmers are lacking in these low-income farming areas.

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