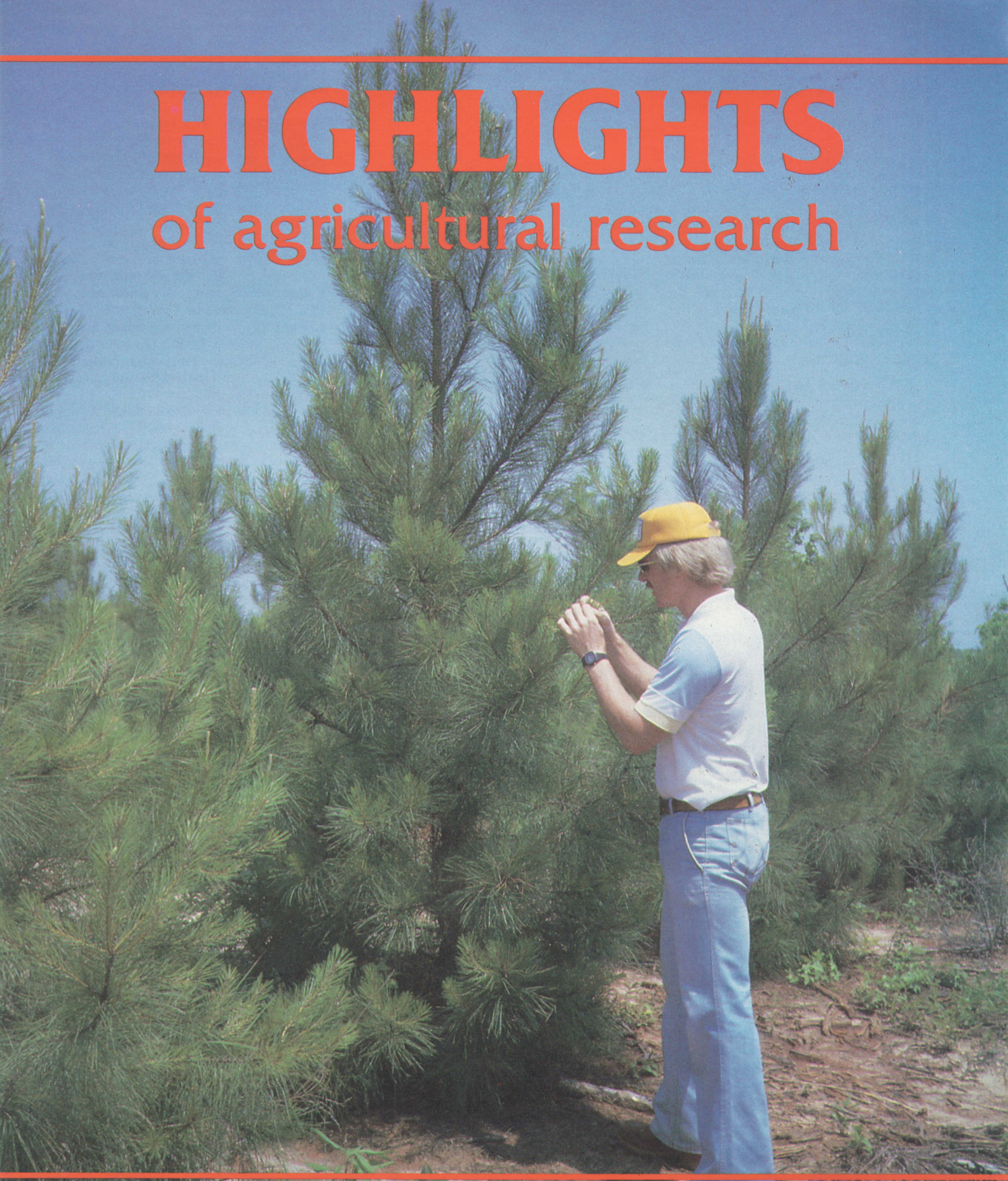
HIGHLIGHTS
of agricultural research



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GALE A. BUCHANAN, DIRECTOR

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DIRECTOR'S COMMENTS

SOIL IS THE FUNDAMENTAL RESOURCE underlining agriculture, the essential prerequisite for a civilization to develop and thrive. History is replete with examples of civilizations failing to survive because the soil resource was neglected. In our country, failure to protect our soils against mismanagement and abuse has led to mass upheavals in population, altering the lifestyles of many people. Farming practices and climatic conditions that combined to create the "dust bowl" of the Great Plains during the thirties destroyed the productive capacity of many farms and caused untold suffering of its people.

GALE A. BUCHANAN

Closer to home, many fields of our Piedmont were eroded so badly by water that they were abandoned and are now suited for growing only pasture or trees.

When grasses and legumes for pastures replaced cotton and corn in our own Black Belt, these easily eroded soils were effectively protected against erosion. We now see many of these grasslands being plowed once again and planted to soybeans, inviting serious soil erosion losses. On many farms in Alabama, from the Gulf Coast to the Tennessee Valley, there is little effort to terrace properly or contour farm, resulting in the unnecessary loss of much of their topsoil through erosion.

Methods for protecting our lands from serious soil losses caused by water and wind erosion are well known and available through the Soil Conservation Service and Cooperative Extension Service. Unfortunately, these are not being utilized as they should be.

There are, also, less-obvious soil losses constantly occurring, such as sheet and rill erosion which will gradually affect the soil's productivity. What is not known is the effect of sheet and rill erosion on productivity, although everyone seems to recognize the problem exists. However, our Agricultural Experiment Station has recently accepted the challenge of obtaining these loss data. It is essential that this Station, along with other research and educational agencies, carefully document the effect of the erosion problem and to develop better ways for protecting our soil resource. Elsewhere in this issue are preliminary findings regarding the effects of slight and moderate erosion on yield of soybeans and corn and various soil properties.

Most of the soils in this country have been used in crop production for less than 200 years while soils in much of the world have been used for thousands of years. Under current management practices in Alabama, where will our soil resource be in 5000 years?

I am confident we will succeed in determining the extent to which soil erosion reduces crop productivity. But that will not be enough. The real work of preserving our most basic resource, the soil, lies with the farming community. They must develop suitable leases, take pride in land ownership, feel dedicated to good stewardship, and have a vision of the need of future generations. Farsightedness must win over nearsightedness if our country is to continue to prosper.

ON THE COVER: Herbaceous weed control shows dramatic results in loblolly pines.

may we introduce . . .

Dr. Dean Harold Gjerstad, associate professor in the Department of Forestry. A native of Fort Dodge, Iowa, Dr. Gjerstad attended Iowa State University receiving the B.S., M.S., and Ph.D. degrees. His principal field is forest biology. He worked with the U.S. Forest Service as a forestry aid for summers, 1962-65. He came to Auburn in 1975 as an assistant professor and was made associate professor in 1980. He teaches forestry physiology and his major emphasis in research has been in the use of herbicides to control competition in forestry.

Gjerstad recently received the "Award of Excellence for Distinguished Service to Science, Research, and the Development of Forestry in the Southeast." He was particularly recognized for his role in developing and managing two large industry, government, and university research cooperatives: The Southern Forest Nursery Management Cooperative and the Silvicultural Herbicide Cooperative. The Cooperatives involve over 30 different forest industries, 12 state forestry commissions, the U.S. Forest Service, and Auburn University.

He is a member of Sigma Xi.

HIGHLIGHTS of Agricultural Research

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Release from Hardwood Competition Shows Dynamic Growth Response in Young Loblolly Plantation

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A MAJOR PROBLEM in Southern forestry is the control of hardwood species in young pine stands. Most chemical pine release was accomplished with 2,4,5-T prior to its 1979 suspension by the Environmental Protection Agency. Much attention is now being given to finding alternative release herbicides.

Hexazinone, sold under the trade name Velpar Gridball®, is the only herbicide registered for pine release in all Southern States. However, initial formulations of the Gridball were found ineffective on small-stemmed hardwoods common in young pine stands.

Research is being conducted in Tallapoosa County by Alabama Agricultural Experiment Station scientists to test various hexazinone formulations on small hardwood stems in a 1-year-old loblolly pine plantation. Treatments evaluated included 1 cc and 1/2 cc 10% pellets at 1.5 and 2.0 lb. ai per acre and 20% granular at 2.0 lb. ai per acre. The major soil series on this Piedmont site were Cecil and Gwinnett. The Cecil series consists of well-drained, nearly level to steep slopes, 0 to 25%, while the Gwinnett series consists of well-drained, gently sloping soils, 2 to 45%. The sandy loam A horizon had eroded on both soils exposing a red firm clay.

The study area, a mixed pine-hardwood cover type, was commercially clearcut and subsequently site prepared in April, 1978. Site preparation included shearing and disking with no post-treatment burn. The area lay fallow during the 1978 growing season, then was hand planted with improved loblolly pine (*Pinus taeda* L.) seedlings (500 per acre) in January, 1979. Hence, hardwood sprouts had one full growing season to establish prior to the planting of pines.

At the time of herbicide application (March, 1980), the pines had gone through 1 growing season while the hardwood had 2 growing seasons to become established. A dense hardwood cover, averaging more than 42,000 rootstocks per acre, was present with stem heights ranging from a few inches to approximately 10 ft.; however, the majority of competing hardwoods were less than 3 ft. in height. Predominant competing species included oaks (*Quercus* spp.), flowering dogwood (*Cornus florida* L.), hickory (*Carya* spp.), blackgum (*Nyssa sylvatica* Marshall), persimmon (*Diospyros virginiana* L.), and sumac (*Rhus* spp.).

Differences observed 2 years after treatment were dramatic. The pelleted formulations reduced the number of hardwood stems taller than 3.3 ft. by more than 65%; while increases of 55% and 135% occurred in 20% G and control plots, respectively, figure 1. The pelleted treatments reduced hardwood basal area by 50-70%, the 20% G increased 14%, and the control increased 78%, figure 2. Percent defoliation of hardwood stems greater than 3.3 ft. tall was greater than 70% for the pellets, only 45% for the 20% granule, and was 1% for the control. Two treatments - 1 cc at 1.5 lb. per acre and the 20% granule - had significantly greater pine mortality than the control. Herbicide treatments, including the 20% G, were not significantly different from each other in pine volume increment but all were significantly different from the control. Average pine volume increments of treated plots were 95-135% greater than the controls, figure 3.

Although the pelleted hexazinone formulation provided excellent hardwood control and pine growth response, the trends shown in pine mortality make this a questionable release treatment for young pine. Additional tests examining formulations and rates will be necessary to find treatments that minimize pine mortality while maintaining acceptable hardwood control.

The 20% G provided excellent herbaceous weed control which probably accounts for the increased pine volume increment. However, hardwood control was only fair with 45% mean defoliation after 2 years, and the pine growth response is not likely to continue as large or as long as the pelleted formulations.

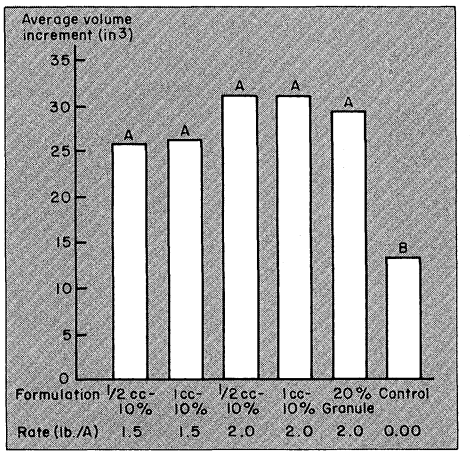

FIG. 1. Average pine volume increment during second year after treatment with hexazinone formulations.

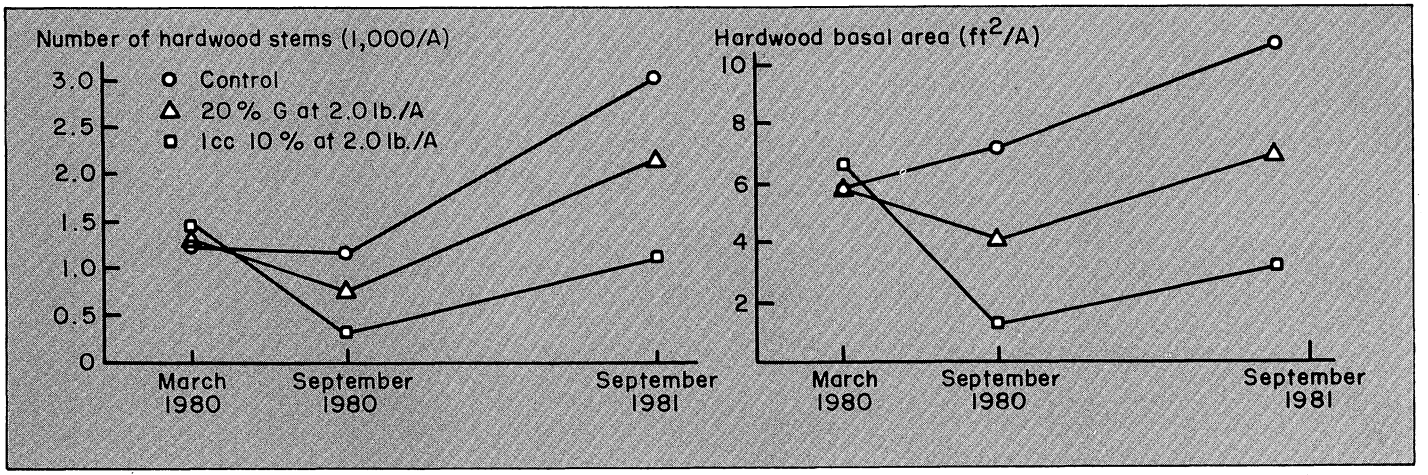

FIG. 2. The number of hardwood stems more than 3.3 ft. tall at time of herbicide application (March 1980), 1 growing season later (September 1980) and after 2 growing seasons (September 1981).

FIG. 3. Hardwood basal area at time of herbicide application (March 1980), 1 growing season later (September 1980) and after 2 growing seasons (September 1981).

ROOT SIZE OF TALL FESCUE AFFECTS YIELD, STAND PERSISTENCE

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TALL FESCUE is widely grown by beef producers in central and north Alabama. While fescue provides an economical pasture, its forage productivity and stand persistence are often limited by poor soil physical conditions and plant parasitic nematodes.

Findings from a 3-year Alabama Agricultural Experiment Station test identify another factor that may be involved in fescue performance—root size. Plants with large roots were found to persist better and produce more forage than plants with smaller roots.

Two Genotypes Compared

Clonal material of a large- and small-rooted genotype was planted in November 1978 on a loamy sand topsoil at the Plant Breeding Unit, Tallassee. Each genotype was planted in four treatments:

1. Conventional tillage-no fumigation.
2. Conventional tillage-methyl bromide fumigation.
3. Deep tillage-no fumigation.
4. Deep tillage-methyl bromide fumigation.

Forage was harvested eight times, beginning October 1979 and ending June 1981. Harvest dates varied according to environmental conditions and forage growth.

Plots of the small-rooted fescue in the deep tillage-methyl bromide fumigation treatment made the highest yields during the establishment year, table 1. Both genotypes showed increased yields from either deep tillage or fumigation, with maximum yield resulting from the deep tillage-methyl bromide fumigation treatment.

Second-year Differences

By the second season, the large-rooted tall fescue produced more forage than the small-rooted entry. With conventional tillage and no fumigation, the large-rooted genotype produced over 70% more forage than the small-rooted type under the same conditions. Autumn harvest of the small-rooted fescue was more severely affected by drought than the large-rooted type. Yield of the small-rooted genotype was further reduced by the third year regardless of treatment.

Plant parasitic populations were low in 1979; however, treatment effects were present in 1980, table 2. In general, stubby root and stunt nematodes were found in higher numbers in the large-rooted tall fescue plots. Methyl bromide fumigation reduced plant parasitic nematode populations found in root samples.

Plant survival and ground cover were greater in plots containing the large-rooted genotype. Of the original planting, 83% of the large-rooted plants survived to fall 1980, but only 51% of the small-rooted ones. Percent ground cover in the large-rooted fescue plots was twice that of the small-rooted genotype plots.

Excavation in 1980 revealed that deep root penetration occurred in plots of the large-rooted tall fescue, but not the small-rooted type. With the large-rooted plants, roots penetrated the plow pan in conventionally tilled soil, but not with the small-rooted genotype. The increased yield, persistence, and ground cover of the large-rooted genotype were due to increased root penetration.

These results indicate that forage yield and persistence of tall fescue can be increased by selecting for specific root characteristics.

TABLE 1. FORAGE YIELDS OF TWO TALL FESCUE GENOTYPES ON FOUR SOIL TREATMENTS, PLANT BREEDING UNIT, TALLASSEE, 1979-81

Tillage-fumigation treatment	Total forage yield, dry matter/acre			
	1979[1]	1980[2]	1981[3]	Total
	Lb.	*Lb.*	*Lb.*	*Lb.*
Large-rooted genotypes				
Conventional tillage-fumigation	764	6,405	4,380	11,549
Conventional tillage-no fumigation	0	5,380	4,506	9,886
Deep tillage-fumigation	1,985	6,648	3,714	12,347
Deep tillage-no fumigation	456	5,984	3,580	10,020
Small-rooted genotype				
Conventional tillage-fumigation	2,712	3,956	478	7,146
Conventional tillage-no fumigation	581	3,112	744	4,437
Deep tillage-fumigation	4,850	4,560	1,026	10,436
Deep tillage-no fumigation	3,018	4,220	866	8,104

[1]Two autumn harvests only.
[2]Three spring harvests, one autumn harvest.
[3]Two spring harvests only.

TABLE 2. PARASITIC NEMATODE POPULATION IN SOIL AND ROOTS OF A LARGE- AND SMALL-ROOTED TALL FESCUE IN FOUR SOIL TREATMENTS, 1980

Tillage-fumigation treatment	Nematode count	
	Per 50 cc soil	Per 10 grams roots
	No.	*No.*
Large-rooted genotype		
Conv. tillage-fumig.	37	5
Conv. tillage-no fumig.	36	13
Deep tillage-fumig.	23	10
Deep tillage-no fumig.	25	12
Small-rooted genotype		
Conv. tillage-fumig.	16	3
Conv. tillage-no fumig.	21	19
Deep tillage-fumig.	28	4
Deep tillage-no fumig.	10	7

Roots from large-rooted tall fescue were found to penetrate into the subsoil.

Switch to Skinning Appears Practical for Hog Slaughter Plants

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W.R. JONES, Cooperative Extension Service

PORK SLAUGHTER and processing industries are undergoing a transition from scalding to skinning hogs. It has been projected that, within the next 10 years, 90% of hog slaughterers will be skinning. Practically all sow processors are now skinning. Market hog processors are studying the feasibility of skinning.

The first skinners used were "cattle type" hide pullers, which pulled the hide over either the tail or head. These pullers did a good job of removing the hides, but considerable fat was left on the hide. Many processors who use the skinning method have switched from "cattle type" pullers to a vertical drum skinner. Packers report that using a vertical drum skinner results in an increase in carcass yield of 3-5%.

Commercial kill rates with a vertical drum skinner are comparable to those expected from a scalding operation. Ten men can skin 50 hogs per hour, giving an efficiency of 5.0 hogs per man-hour input. At this rate of kill, the actual skinning procedure would require the efforts of three men and the other seven would perform the remaining operations. Of the three men doing the skinning, two would prepare the carcass for the skinner and the other would operate the skinning machine. With a kill rate of 150 hogs per hour, 24 men could perform the slaughter operations with an efficiency of 6.25 hogs per man-hour.

For a kill rate of 50 hogs per hour, the vertical drum skinner would require a floor space measuring 5 x 5 ft., with two preparation platforms of about 3 x 5 ft. each. This is much less than the space required for a scalding tank, dehairer, and singers.

Kill floor clean-up time with skinning is much less than with scalding because the hair is left on the skin rather than on the tumbler and floor. The skinned carcass offers a definite advantage in the fabricating room since the hams and bellies no longer have to be skinned. Some processors think it is difficult to market skinless hams; however, it was estimated that 60-70% of the hams marketed in the United States in 1981 were either boneless, semi-boneless, or some other type of specialty ham.

TABLE 1. UTILITY COSTS OF SKINNING AND SCALDING MARKET HOGS[1]

Utility item	Per pig usage and cost			
	Scalding		Skinning	
	Usage	Cost	Usage	Cost
	Amt.	*$*	*Amt.*	*$*
Water, gal.	9.6	0.006	8.0	0.005
Steam, lb.	5.3	.025	.1	--
Elec., kwh.	.28	.010	.02	.0007
Gas, cu. ft.	13.5	.042	--	--
Sewage		.008		.007
TOTAL		.0911		.013

[1]Usage figures are based on reports from commercial operations. Utility prices: water, 65¢/1,000 gal.; electricity, 3.61¢/kwh.; steam, $4.70/1,000 lb.; gas, $3.10/1,000 cu. ft.; and sewage, 83¢/1,000 gal.

As utility costs continue to increase, techniques that are utility-cost efficient are becoming increasingly important. Possibilities for savings are illustrated by a comparison of utility costs for the two methods, table 1. The data show a cost of 1.3¢ per animal for skinning, as compared with 9.1¢ each for scalding. This is a ratio of 1:7.0, which means that for the utility cost spent to scald 1 animal, 7 could be skinned.

TABLE 2. CARCASS YIELDS AND PERCENT COOLER SHRINK OF SKINNED AND SCALDED MARKET HOGS

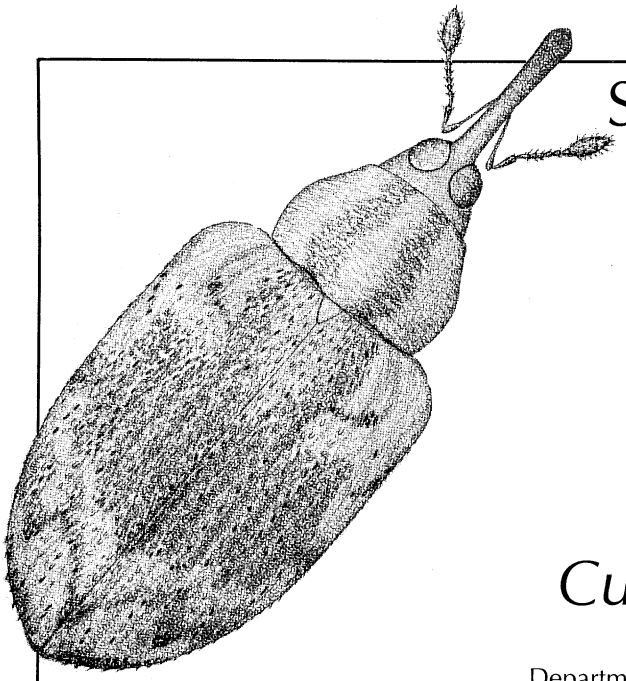
Item	Result, by method	
	Skinned	Scalded
Average live wt., lb.	230	232
Dressing pct.[1]	64.2	70.6
Cooler shrink, pct.	1.1	2.0
Skin removed on kill floor, lb.	16.8	--
Skin, pct. of live wt.	7.3	--
Feet removed on kill floor, lb.	4.4	--
Feet, pct. live wt.	1.9	--

[1]Hogs slaughtered directly off full feed.

In a study comparing skinning and scalding, 168 market hogs were slaughtered at the Alabama Agricultural Experiment Station, table 2. The cooler shrink during the first 18 hours postmortem for skinned carcasses was 1.1%, much less than the 2.0% shrink for the scalded carcasses. Further research, involving 36 market hogs, showed that the difference in shrinkage rate was principally due to moisture loss from the skin of the scalded carcass during the chilling cycle.

The value of hides from skinned hogs is greater than the value of scalded skins. In recent years, values for skinned hides have fluctuated from $2 to $8. Since the hide market is not consistent, most packers consider the loss of the ears, feet, and tail in skinning to be balanced by the extra value of the hide.

In further research, 36 pigs were slaughtered in groups of six, with three of these pigs being skinned and three scalded. No significant difference was observed for total microbial load on the carcass between the two slaughter techniques. The largest factor in determining total microbial load was the care with which the carcass was handled rather than the slaughter technique.



Systematic Studies on Weevils in the Family *Curculionidae*

WAYNE E. CLARK
Department of Zoology-Entomology

ABOVE: *Lignyodes horridulus* (Casey), one of the "ash seed weevils."

THE WEEVILS, or "snout beetles," are Coleoptera assigned to the family Curculionidae. A British theologian introduced a popular account of these "rynchophora" (snout bearers) by stating that their "hidden virtues... have yet to be discovered." Alabama farmers might echo this sentiment as they contemplate the impact of the boll weevil, the whitefringed beetles, the pecan weevil, and others.

The Curculionidae, some 44,883 described species of them, comprise the largest family of animals. With a few minor exceptions, the known species are phytophagous. The different species feed on plants in a wide variety of ways. With so much diversity it may not be surprising to find that the classification of the family is in a "chaotic" state. Bringing such chaos into order is a task for the science of systematics,..."the essential first step and the final integrator...for the biological, agricultural, and medical sciences."

The "essential first step" is to provide accurate identification, "the key to the scientific literature...." This step is frequently a complex one. For example, it has long been recognized that boll weevils from the Southeast differ in several respects from those in Mexico. It is also known that boll weevils feed on certain wild Malvaceae related to cultivated cotton. Weevils thought to be boll weevils, found recently in Mexico on one of these wild hosts, were determined to represent a new species, *Anthonomus hunteri*.

As this sort of information accumulates, scientists begin to pose questions which call for more systematic data. These questions go beyond "how can we control this insect?" to "what kind of boll weevil is this?" and "where does it fit in the overall scheme of things?" It is fairly certain that the boll weevil belongs in the subgenus *Anthonomorphus*. There are indications, however, that this subgenus is more clearly related to another genus of Anthonominae than to the other subgenera of *Anthonomus*. Does this mean that the genus *Anthonomus* is an artificial grouping? If so, how can we make valid generalizations about the relationships of the boll weevil? Must we reevaluate the classification of an entire subfamily before we can answer questions about one important species? Here is the plea for "final integration" mentioned above.

Recent research at the Alabama Agricultural Experiment Station has focused on weevils in the subfamily Tychiinae. This subfamily has about 600 species in North and South America, Europe, Asia, and Africa. The larvae of some of the species develop in the flowerbuds or fruits of species of Leguminosae, including alfalfa and clover. Larvae of other species develop in the seeds of plants in the families Oleaceae and Rubiaceae. Thousands of specimens of Tychiinae from collections such as the Auburn University Entomological Museum, the U.S. National Museum of Natural History, and the British Museum (Natural History) have been examined.

Additional specimens have been collected in the United States, Mexico, and Central America. The specimens have been examined, noting modifications of the snout or rostrum, the eyes, the legs, the genitalia, and the shape, distribution, and color of hairs or scales on the body. In addition to keys and illustrations, a detailed description of each species has been prepared. Identification of previously named species required examination of the literature and of specimens in the collections of workers who described species of Tychiinae during the 1800's and early 1900's. Species of Tychiinae new to science, 159 of them to date, have been given names according to the rules of zoological nomenclature.

Determination of how the species of Tychiinae are related to each other amounted to proposing a classification. There has been considerable debate in recent years as to what methods produce the "best" classifications. There is not complete consensus in this area, but most workers seem to agree that a classification based on phylogenetic relationships produces a "natural" classification which is best because it provides the most general reference system for the biological sciences. The underlying assumption here is that order has been produced by evolutionary descent. To discover that order a simple rule is followed: species which share uniquely derived attributes share the same phylogenetic history. Since a corollary to evolutionary theory is that every attribute shared by a group of species is unique and derived at some level, following this rule can provide a phylogenetic framework for all species.

A "phylogenetic analysis" provided a basis for arranging the species of Tychiinae into apparently natural groups and resulted in considerable modification of existing classifications. Six genera of Lignyodini, one of the two tribes of Tychiinae, had been recognized as recently as 1977. Some of these genera had been considered to be tychiines when they were first established back in the 19th century. Later, they had been transferred to the subfamily Anthonominae. Now they are back in Tychiinae. The total number of species in the tribe was increased from 38 to 89, but the number of valid genera was reduced from six to two. The number of species in these genera is expected to increase as the rich faunas of Central and South America become better known. The other tribe of Tychiinae, the Tychiini, has also undergone extensive rearrangement during the course of recent studies. The number of genera has been reduced from eight to two, but as in the Lignyodini, the number of species has increased.

These studies and others like them have shown that the classifications of weevils bequeathed to us from the last century and from the early part of the present century are inadequate. They do not stand the test of critical evaluation by modern techniques interpreted by modern concepts. This problem is exacerbated by a deluge of undescribed species that pours in from all over the world. The task at hand is an almost overwhelming one, but the pursuit of solutions is justified from both economic and intellectual standpoints.

Vaccination of Broiler Breeders with an Experimental Inactivated Infectious Bursal Disease Virus Vaccine

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INFECTIOUS BURSAL DISEASE (IBD) has been a constant problem for the poultry industry. It is important because it may result in morbidity and mortality as well as compromise the immune response of susceptible birds.

Where IBDV induced immunosuppression occurs, it is age related. Infection during the first 2 weeks results in a more severe and prolonged effect on immunity, whereas infection at 3 weeks of age or later is less pronounced and shorter in duration. Therefore, an IBD vaccine that produces high levels of antibodies in breeder hens should result in progeny possessing maternal immunity which could protect them from the immunosuppressive effects of early IBDV infection.

Objectives were to demonstrate the protective effects of maternal antibody in preventing early IBDV infection in broilers from breeders receiving an experimental, commercially prepared oil emulsion vaccine.

Commercial broiler breeder flocks were from two companies, one in north and one in south Alabama.

The design was the same for both north and south Alabama trials. Seventeen-week-old broiler breeder pullets from a 4,500 flock in north Alabama and a 17,500 flock in south Alabama received an injection of 0.5 ml of an oil emulsion inactivated IBD vaccine subcutaneously behind the neck. To determine if the vaccine had any adverse effect on breeder performance, each vaccinated and nonvaccinated sister flock was monitored. Broiler progeny performance from vaccinated flocks was also compared to progeny of nonvaccinated breeders. In addition, 20 breeder hens from the vaccinated and nonvaccinated flocks were bled at 4, 10, 18, 25, and 30 weeks post-vaccination (PV) and sera tested for antibody. Broiler breeder and progeny performance and IBDV antibody titers were then used to measure the vaccine efficacy.

Data on breeder performance are summarized in table 1. Performance of both flocks that received the IBD vaccine were similar to the nonvaccinated sister flocks indicating the vaccine had no adverse effect.

Broiler performance data are summarized in table 2. Results from the north Alabama broilers from vaccinated hens represent an average of four different broiler flocks reared during four separate growout periods. South Alabama broiler data from vaccinated hens represent an average of five broiler flocks reared during four growout periods. Data for broilers from nonvaccinated hens represent a mean for all flocks in each company reared during the same period as broiler flocks obtained from vaccinated hens. These data demonstrated that broilers from IBD vaccinated hens had equal or better performance than the weekly average figures for broilers from nonvaccinated hens.

TABLE 1. PERFORMANCE DATA FROM BROILER BREEDERS RECEIVING AN OIL EMULSION IBD VACCINE

Breeder flock treatment	Performance data					
	10 weeks PV			23 weeks PV		
	Lay, hen house	Fertility	Hatch of total	Lay, hen house	Fertility	Hatch of total
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
North Ala.[1]						
Vacc.	76.8	ND	85.7	65.0	ND	87.2
Nonvacc.	75.7	ND	85.7	68.7	ND	87.2
South Ala.						
Vacc.	71.6	92.8	85.8	73.1	94.0	88.9
Nonvacc.	71.9	93.5	83.1	71.8	93.6	88.9

[1]Breeders from north Alabama were brought into production earlier than those of the south Alabama company.
ND - not done by company.

TABLE 2. PERFORMANCE DATA FROM BROILER PROGENY OBTAINED FROM BREEDERS RECEIVING AN OIL EMULSION IBD VACCINE

Breeder flock treatment	Performance data							
	Av. wt.	Feed conv.	Liv.	Cond.	Leukosis	Sept-tox	Synovitis	Air sac
			Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
North Ala.								
Vacc.[1]	3.77	2.29	94.28	1.21	.00	.25	.00	.15
Nonvacc.[2]	3.77	2.27	93.82	1.27	.01	.29	.00	.24
South Ala.								
Vacc.[3]	4.00	2.07	95.49	.99	.01	.18	.03	.32
Nonvacc.[2]	3.96	2.10	96.29	1.68	.04	.39	.06	.79

[1]Represents an average of four different flocks reared during four different growout periods.
[2]Represents the weekly average for all broilers during the four growout periods in which the broilers from the vaccinated hens were grown.
[3]Represents an average of five different flocks during four separate growout periods.

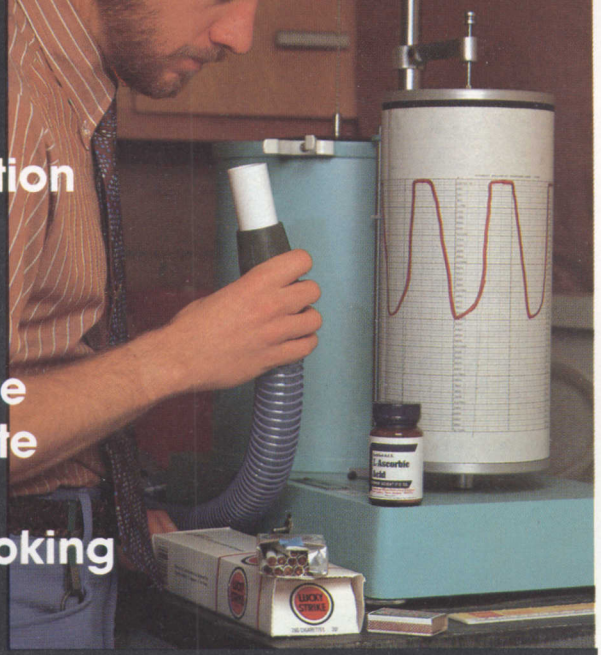
TABLE 3. IBDV NEUTRALIZING TITERS FROM BREEDERS RECEIVING AN OIL EMULSION VACCINE

Breeder flock treatment	Mean IBDV titers, weeks post vaccination[1]					
	4	10	18	25	30	40
North Ala.						
Vacc.	716^{a}	819^{a}	506^{ab}	360^{a}	147^{a}	88^{a}
Nonvacc.	294^{b}	415^{b}	320^{c}	136^{b}	182^{a}	75^{a}
South Ala.						
Vacc.	488^{c}	860^{a}	672^{b}	425^{a}	129^{a}	52^{a}
Nonvacc.	230^{b}	188^{c}	254^{d}	124^{b}	163^{a}	69^{a}

[1]Numbers followed by different superscripts within the same column differ significantly.

The IBDV antibody titers for hens are presented in table 3. The titers for IBD vaccinated hens peaked at 10 weeks PV and then gradually declined through 25 weeks. Titers from vaccinated hens were 1½ to 4 times that of nonvaccinated hens from 4 to 25 weeks PV. After 25 weeks PV, titers from vaccinated breeders rapidly declined until 30 weeks PV when no differences from nonvaccinated hens were evident.

Vitamin C Supplementation and its Effect on Lung Function, Blood Pressure and Heart Rate Following Cigarette Smoking



ROBERT E. KEITH and SUSAN B. MOSSHOLDER, Department of Home Economics Research

CIGARETTE SMOKING, a habit shared by 30-40% of the United States population, has been shown to reduce tissue vitamin C levels, indicating possible relationships between vitamin C and smoking.

Bronchoconstriction, a decrease in the diameter of the bronchial passages, increased heart rate, and increased blood pressure caused by cigarette smoke lasts approximately 35 minutes. Thus, a person smoking one package of cigarettes daily would suffer variations in bodily function 10-12 hours of each day. Furthermore, acute constriction and partial obstruction of the airpaths caused by cigarette smoke play an important part in sites of chronic infection, inflammation, and permanent damage in the lungs of smokers. Increased heart rate and blood pressure seen in smokers has also been associated with adverse effects on individual health. Vitamin C has been shown to have a bronchodilator effect, able to increase bronchial passage diameter, in humans and animals treated with various airway-constricting drugs, as well as positive effects with certain asthma patients. Other studies have demonstrated reduced resting heart rate and blood pressure with vitamin C administration. The possibility exists that vitamin C could have an effect on the acute physiological changes caused by cigarette smoke. Little or no research has been performed concerning vitamin C and the acute effects of smoking. Therefore, the purpose of the present study by researchers of the Alabama Agricultural Experiment Station was to determine the effects of vitamin C supplementation upon the acute respiratory and cardiovascular effects of cigarette smoking.

Subjects for the present study were 18- to 24-year-old healthy male and female cigarette smoking volunteers. Informed consents were obtained from all subjects and the project was approved by the Auburn University Human Subjects Committee. Subjects were initially given 24-hour food recalls which were analyzed for vitamin C content. All subjects taking vitamin C supplements or large quantities of citrus products in their diets were excluded from the project. Subjects were randomly assigned to treatment groups and all volunteers received either a single 400 or 1,200 mg dose of vitamin C or an equal amount of a sugar placebo dissolved in unfortified grape juice 4 hours prior to testing. Supplements were administered in such a manner that neither the subjects receiving the supplements nor the technicians giving the supplements knew if the juice contained vitamin C or the placebo. All subjects received both the vitamin C and placebo supplements. Initial treatments were alternated with each new subject, and vitamin C and placebo treatments were separated by a 1-week time period. Subjects were asked not to smoke or participate in strenuous physical activity prior to testing. Subjects were placed in the sitting position and allowed to rest for 5 minutes after which presmoking resting heart rate and blood pressure measurements were recorded. Lung function measurements were recorded with a 9-liter spirometer. Subjects were then asked to smoke two nonfilter cigarettes in 10 minutes. Following smoking, subjects again performed the various heart rate, blood pressure, and lung function tests.

Sixty-two subjects completed the study. The 400 mg group totaled 33 subjects (15 male, 18 female) while the 1,200 mg group totaled 29 subjects (14 male, 15 female). Smoking adversely affected all recorded cardiovascular and respiratory values. These findings agree with those of previous investigators. Administration of 400 mg of vitamin C resulted in a significantly smaller increase in systolic blood pressure following smoking when compared with placebo values. However, 1,200 mg of vitamin C resulted in a larger increase in diastolic blood pressure, and resting heart rate, than that elicited by the placebo. All of the effects of vitamin C on blood pressure and heart rate were more pronounced in females than in males. Vitamin C failed to alter any of the respiratory changes that occurred following smoking.

In experiments by other investigators, vitamin C has been shown to have a direct relaxing effect on smooth muscle, which would tend to reduce blood pressure. On the other hand, vitamin C has also been shown to be necessary for the synthesis of adrenaline, which when released by the presence of nicotine would tend to cause smooth muscle contraction, increased blood pressure, and increased heart rate. Thus, the different dosage effects of vitamin C on blood pressure and heart rate may be attributed to a balance between direct influence on vascular smooth muscle versus indirect effects on adrenaline synthesis.

Females in the study had lower body weights, thus increasing nicotine dose per body weight; however, their changes in lung function, heart rate, and blood pressure were no different from those of the males. This would tend to negate body size as a factor responsible for the greater vitamin effect seen with the females. A lower dietary intake of vitamin C compared to the males or innate sex differences in vitamin C metabolism are more likely as possible causes for the greater vitamin C effect seen with the females.

Results of the present study suggest that vitamin C administration may alter cardiovascular responses following cigarette smoking, particularly in females. The 400 mg dose exerted a beneficial effect while the 1,200 mg level seemed to adversely affect blood pressure and heart rate.

Creep Feeding Heifers Neither Helps Nor Hurts Their Performance As Brood Cows

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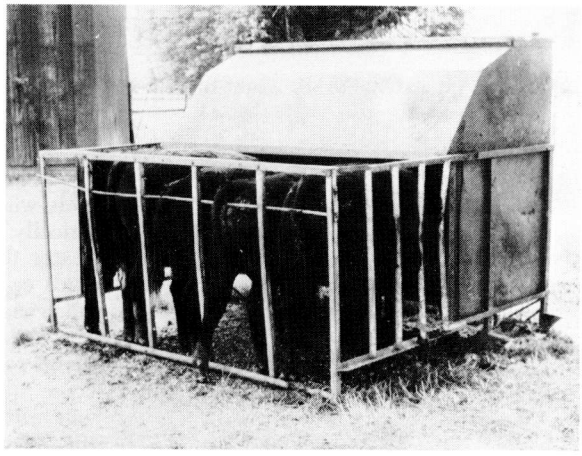

CREEP FEEDING is known to increase weaning weight of beef calves. But the practice neither increases nor decreases maternal performance of heifers that are kept as brood cows.

That was the major finding in a 6-year Alabama Agricultural Experiment Station project at the Black Belt Substation, Marion Junction. The study was done to evaluate the relationship between creep feeding of nursing calves and their subsequent performance as brood cows. Hereford, Charolais x Hereford, and Simmental x Hereford dams were used in the project, which involved 252 cows and heifers bred and the 230 calves they dropped.

Creep Rations Compared

When the cows used in this study were calves, they and their dams were equally divided into three groups, based on breed of calf, and assigned to the following treatments:

Control—no creep feed.

High protein creep—20% protein containing crushed corn, cottonseed meal, and alfalfa pellets.

Low protein creep—whole shelled corn.

The cattle grazed dallisgrass-white clover pasture at a stocking rate of 1½ acres per cow-calf unit. Calves had access to creep feeders from mid-November to weaning in July or August. After weaning each year, the heifers were saved to determine if creep feeding had any detrimental effects on their performance as brood cows.

The heifers were kept for two calf crops and then sold, since most effects of the previous creep feeding would be lost by the time the cows were approaching 4 years of age. This meant that the calves born each year were from 2-year-old heifers or 3-year-old cows. All calves were sired by Angus bulls in this phase of the study.

All cows and calves were managed as a single herd and the calves were not creep fed. Calves were weaned in July and August, at an average age of 228 days. The cows and incoming heifers were given supplemental johnsongrass hay plus 4 lb. of a 20% protein concentrate (crushed corn and cottonseed meal) during the winter when grazing was inadequate.

Heifer Performance Unaffected

Creep feeding had no detrimental effects on the heifer calves' subsequent performance as brood cows, table 1. All groups of heifers had at least a 90% calf crop born. The group receiving low protein creep (shelled corn) tended to produce slightly less milk, but this was not reflected in 205-day weights or average daily gains of their calves. Although heifers that had been creep fed averaged 70 lb. heavier at weaning than the control, there were no differences in their weights after they weaned their first calves.

Crossbreed Charolais and Simmental cows performed better than the straightbred Hereford cows, table 2. The crossbreds had a slightly higher percent calf crop, higher milk production, and weighed more after weaning their first calves. But the Herefords tended to catch up after two calves. Calves from the crossbred cows were heavier at birth and gained faster up to weaning, giving them a 67-lb. advantage in weaning weight.

Results from this phase of the study showed that creep feeding heifer calves had no detrimental effects on their subsequent performance as brood cows, at least through two calf crops. The results also showed that crossbred cows gave more milk and weaned heavier calves than straightbred Hereford cows.

TABLE 1. PERFORMANCE OF COWS THAT WERE CREEP FED AND THOSE NOT CREEP FED AS CALVES, AVERAGE OF ALL BREEDS

Dam's creep treatment as calf	Cow performance					Calf performance[1]		
	Percent calved[2]	Percent weaned[2]	24-hour milk prod.	Weight at weaning		Birth weight	205-day weight	Average daily gain[3]
				1st calf	2nd calf			
	Pct.	*Pct.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Control	92	81	9.6	895	1,049	68	462	1.92
High protein	92	82	9.5	935	1,057	68	459	1.91
Low protein	90	77	8.7	921	1,053	70	456	1.88

[1]Average of both calf crops.
[2]Based on the number of females exposed to bulls.
[3]Birth to weaning.

TABLE 2. PERFORMANCE OF DIFFERENT BREEDS OF COWS IN THE CREEP FEEDING TEST, AVERAGE OF ALL CREEP TREATMENTS

Breed of cow	Cow performance					Calf performance[1]		
	Percent calved[2]	Percent weaned[2]	24-hour milk prod.	Weight at weaning		Birth weight	205-day weight	Average daily gain[3]
				1st calf	2nd calf			
	Pct.	*Pct.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Hereford	88	76	7.2	860	1,012	61	413	1.72
Char. x Her.	94	82	10.0	951	1,090	71	479	1.99
Sim. x Her.	91	81	10.4	938	1,052	73	481	1.99

[1]Average of both calf crops.
[2]Based on the number of females exposed to bulls.
[3]Birth to weaning.

[1]Retired.

Past Erosion Reduces Current Yields

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ACCELERATED SOIL EROSION due to rainfall has been of concern for many years. Today, such erosion is considered to be a critical agricultural problem. The relationship between past erosion and crop productivity has not been adequately measured. Neither has the value of topsoil lost—the real cost of erosion—been adequately documented.

A current cooperative erosion-crop productivity study by the Alabama-USDA Soil Convervation Service and Alabama Agricultural Experiment Station is providing some insight into extent of loss from erosion. Not only do data from the 1981 season indicate the influence of past erosion on soil productivity, but results also identify and quantify soil factors that contribute to crop yield differences.

Soybean and corn fields with slightly and moderately eroded areas of the same soils were located in Coffee, Conecuh, Covington, Dale, Geneva, Henry, Houston, Mobile, Monroe, and Pike counties. Twenty-two corn and 30 soybean fields were located on soils of the Malbis, Dothan, Orangeburg, Red Bay, and Bama soil series. Erosion conditions were sampled at three sites in each field for a total of 140 plots. Each plot consisted of three replicates.

Thickness of the topsoil, texture, slope, color, and an estimate of the percent of subsoil mixed in the surface plow layer were determined for each replicate. Surface and subsoil samples were collected for laboratory analyses from each replicate and composited for each plot. The analyses determined percent clay, percent Fe_2O_3 (total iron oxides), pH, and soil test (calcium, magnesium, potassium, and phosphorus). Corn yields from each replicate were obtained by determining average grain weight per ear and the number of ears per 1/500 acre. Soybean yields were obtained by harvesting three 5-ft. row segments in each replicate.

Yields were obtained from 30 soybean fields. Of these, 19 showed reduced yields on moderately eroded areas. Yields were equal in six fields, while five fields showed yield increases on moderately eroded areas. Of the fields with reduced yields, 13 were statistically significant at greater than 75% probability. No single soil series was more susceptible than the others to soybean yield decrease as a result of erosion.

Of 22 fields of corn harvested, 12 showed yield reduction in eroded areas, 4 were the same, and 6 showed increased yield. Of the fields with decreased yields, 11 were statistically significant at probability levels greater than 75%. Six fields with reduced yields on eroded areas were on soils with yellowish-brown subsoils containing iron-rich bodies called plinthite (Dothan and Malbis series). No eroded areas of the Dothan or Malbis series showed yield increases. Soils with reddish-brown to dark red subsoils did not seem to be as susceptible to yield decreases due to erosion.

Overall average yields, like those reported for all fields in table 1, do not reflect the often large relative yield reduction on eroded soils. Since management, rainfall, past cropping treatment, and several other factors cannot be controlled and kept constant over all fields, each field must be considered as a separate experiment. In most cases, the surface thickness reported is the depth to which the soil was plowed. In a few slightly eroded areas, the thickness is greater than plowing depth, and these cases have depth to the subsoil recorded. The mixing percentage is a field rating usually made by two individuals who are trained to make observations of soil conditions in the field.

Yields and soil characteristics from fields with significant yield reductions on moderately eroded areas are summarized in table 2. Phosphorus, total Fe_2O_3, clay content in the surface soil layer, surface layer thickness, and surface-subsoil mixing were often correlated with yield. Phosphorus levels were always low in eroded areas; however, only corn yields were significantly related to P levels. No subsoil property was correlated with yields.

Yield reductions in 1981 were measured more frequently on moderately eroded areas. The study suggests that field measurements and observations of erosion (surface soil thickness and percent mixing) and laboratory determination of subsoil attributes in the plow layer (clay, Fe_2O_3, and P) do relate to decreased corn and soybean yields. Corn yield reductions on eroded areas were observed more frequently on soils with yellowish-brown subsoils with plinthite. Additional research is needed on soils in central and northern Alabama and for additional crop years before firm management practices, based on sound research data, can be recommended.

TABLE 1. AVERAGE YIELDS, SURFACE THICKNESS, AND PERCENT MIXING FROM FIELDS WITH SLIGHT (SL) AND MODERATE (MOD) EROSION

Yield and soil properties	Average, by soil series and erosion											
	Dothan		Malbis		Bama		Orangeburg		Red Bay		All soils	
	Sl	Mod	Sl	Mod	Sl	Mod	Sl	Mod	Sl	Mod	Sl	Mod
						SOYBEANS						
Yield/acre, bu.	41	39	33	31	37	35	36	34	37	32	37	34
Surface thickness, in.	9.5	7.5	8.6	5.0	7.5	5.5	8.6	6.6	8.6	7.1	8.6	6.4
Mixing, pct.	10	18	6	26	7	32	12	29	15	29	10	27
						CORN						
Yield/acre, bu.	59	55	100	83	--	--	61	61	76	74	66	64
Surface thickness, in.	10.5	8.6	10.5	8.0	--	--	10.1	7.1	9.0	7.5	9.8	8.0
Mixing, pct.	9	23	7	8	--	--	13	34	12	29	11	28

TABLE 2. SOIL PROPERTIES AND YIELDS OF FIELDS WITH SIGNIFICANT YIELD DECREASES ON ERODED AREAS

Yield and soil properties	Average, by soil series and erosion											
	Dothan		Malbis		Bama		Orangeburg		Red Bay		All soils	
	Sl	Mod	Sl	Mod	Sl	Mod	Sl	Mod	Sl	Mod	Sl	Mod
						SOYBEANS						
Clay, pct.	8.0	15.6	10.8	17.2	15.8	13.4	15.3	17.7	16.7	23.6	13.3	17.5
Fe_2O_3, pct.	2.0	4.1	1.5	5.0	3.4	4.1	3.3	5.2	3.8	7.1	2.8	5.1
Surface thickness, in.	9.0	5.0	9.0	2.8	7.1	5.0	8.2	6.0	7.1	8.0	8.2	5.0
Phosphorus, lb./acre	17.0	3.3	35.4	10.1	16.0	8.2	16.4	16.6	24.5	21.5	21.8	11.9
Yield/acre, bu.	44.0	22.0	33.0	23.0	44.0	25.0	36.0	25.0	39.0	32.0	39.0	25.0
						CORN						
Clay, pct.	8.2	18.4	6.4	31.6	--	--	11.0	14.6	11.8	13.1	9.4	19.4
Fe_2O_3, pct.	1.9	4.9	1.1	7.7	--	--	2.8	3.7	3.5	4.1	2.3	5.1
Surface thickness, in.	9.0	7.1	10.5	8.0	--	--	10.1	8.0	9.8	9.5	9.8	8.2
Phosphorus, lb./acre	22.0	7.3	16.9	11.2	--	--	34.1	22.4	10.8	11.7	20.9	13.1
Yield/acre, bu.	83.0	58.0	100.0	83.0	--	--	51.0	36.0	75.0	55.0	77.0	58.0

NEW POSTEMERGENCE HERBICIDES Offer Safe, Effective Grass Control in Field Grown Ornamentals

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CONTROLLING broadleaf weeds and grasses is a major problem in the production of field grown ornamentals, even though preemergence applied herbicides are normally used. One problem is that preemergence applied herbicides often fail to control weeds adequately because of improper timing and rate of application, weather conditions, and volatilization. Previously, postemergence applied herbicides have not been used because those that were effective injured ornamental plants. Thus, nurserymen had no option except hand hoeing to remove the problem weeds

Postemergence Treatments

Now research is looking at herbicidal control with postemergence applied chemicals. Preliminary Auburn tests in 1980 showed BASF 9052 (Poast®) to be safe on a number of ornamentals when applied over the top of the plant. The Alabama Agricultural Experiment Station testing was enlarged in 1981 to compare three postemergence applied herbicides for control of grasses and for toxicity to woody ornamental plants. The three materials tested were Poast (BASF Wyandotte Corp.), Fusilade® (ICI Americas, Inc.), and RO 13-8895 (MAGG Agrochemicals). Each herbicide was applied at three rates, 0.25, 0.50, and 1.0 lb. active per acre, on June 15, 1981, and 10 days later.

In the first study, plants tested included Nick's Compact juniper *(Juniperus chinensis)*, Rotundifolia holly *(Ilex crenata)*, and taxus *(Taxus cuspidata)* grown in local nurseries at Crossville, Alabama. The junipers had been in the field 3-4 years and were heavily infested with Coastal bermudagrass. Rotundifolia holly liners had been planted in the spring and were infested with common bermudagrass. Taxus had been grown 2-3 years in the field and was infested with yellow nutsedge.

All Treatments Effective

When the first application was made, the bermudagrass was about the height of the junipers (2-3 ft.). At the second application date, only a few live sprigs of bermudagrass were observed. All three herbicides resulted in excellent control of both Coastal and common bermuda regardless of application rate, table 1 (data given only for Coastal bermuda). With the exception of Poast at the 0.25 lb. rate, all treatments provided greater than 90% control through the middle of October. No further evaluations were made after that time. None of the materials tested controlled nutsedge.

There was little or no phytotoxicity on plants tested. The only phytotoxicity occurred on the junipers growing in Coastal bermudagrass. The chlorosis following herbicide treatments may have been the result of sunscald, since it was most evident in the interior portions of the plant where the plants had been heavily shaded before the grass died. At the 60-day evaluation, most plants no longer exhibited chlorotic symptoms.

Single Application Tried

A second study evaluated the effectiveness of a single application of the same herbicides at the same rates on Plumosa Andorra juniper *(Juniperus horizontalis)* and Nick's Compact juniper. Treatments were applied July 1, 1981, and evaluated 14 and 60 days later for percent grass control and phytotoxicity. Neither plant species showed any toxicity.

All treatments except RO 13-8895 at the 0.25 lb. per acre rate resulted in 90% control of common bermudagrass after 14 days, table 2. At 60 days, only Fusilade and RO 13-8895 provided 90% grass control at the 1.0 lb. rate from a single application. Additional research is underway to determine minimum rates necessary for season long control, and to further screen these materials for toxicity to woody ornamentals. It appears that a second application, of ¼ to ½ lb., when regrowth grass is 2-6 in. tall, may provide adequate season long control with minimum chemical use.

Results of the Alabama Experiment Station tests indicate that good postemergence grass control is obtainable with the new herbicides tested. While the cost of these chemicals will be high, they are an inexpensive alternative to sending a crew of laborers to remove grass from field grown ornamentals.

TABLE 1. EFFECTS OF TWO APPLICATIONS OF POSTEMERGENCE APPLIED HERBICIDES ON CONTROL OF COASTAL BERMUDAGRASS IN FIELD GROWN JUNIPERS AND PHYTOTOXICITY TO PLANTS[1]

Rate, lb. active/ acre	Poast control, days after application			Fusilade control, days after application			RO 13-8895 control, days after application		
	14	30	60	14	30	60	14	30	60
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
None	0 (1.0)[2]	0 (1.0)	0 (1.0)	0 (1.0)	0 (1.0)	0 (1.0)	0 (1.0)	0 (1.0)	0 (1.0)
0.25	96 (1.3)	100 (1.0)	74 (1.0)	100 (2.0)	100 (2.3)	96 (1.0)	100 (1.3)	99 (1.5)	100 (1.0)
0.5	100 (2.3)	100 (2.0)	91 (1.0)	95 (3.0)	98 (2.3)	100 (2.0)	100 (2.0)	100 (2.3)	100 (1.5)
1.0	100 (2.3)	99 (2.0)	100 (1.5)	96 (4.3)	100 (3.3)	100 (2.0)	100 (4.3)	100 (3.0)	100 (1.8)

[1]Applications were made at 10-day intervals, with evaluations following 14, 30, and 60 days after second application.

[2]Numbers in parenthesis are phytotoxicity rating, made according to scale of 1 = no damage, 2 = slight chlorosis, 3 = chlorosis, 4 = foliar burn, and 5 = 25% defoliation.

TABLE 2. EFFECT OF SINGLE APPLICATION OF POSTEMERGENCE APPLIED HERBICIDES ON PERCENT CONTROL OF BERMUDAGRASS IN FIELD GROWN JUNIPERS

Rate, lb. active/ acre	Poast control, days after application		Fusilade control, days after application		RO 13-8895 control, days after application	
	14	60	14	60	14	60
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
0.25	90	53	91	79	68	29
0.5	94	74	94	87	93	85
1.0	94	85	98	97	100	93

FOLIAR FUNGICIDES FOR SOYBEANS—

Prediction Systems Make More Money

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AS EARLY AS 1977 the Alabama Agricultural Experiment Station provided data that indicated fungicides applied to control leaf and stem diseases in soybeans were not beneficial during dry periods. The northern portion of the State is much drier than the Gulf region during the summer months, see figure, and less frequent periods of rainfall result in decreased severity of soybean diseases. Experiment Station researchers have taken this into consideration in designing a fine-tuned system for the profitable application of fungicides to soybeans.

Tests were conducted throughout the northern region of Alabama to evaluate a system for the timing of fungicide applications based on local (on-farm) weather conditions. This timing system was compared to soybeans treated with the standard program (sprays regardless of weather, at early pod set and 14 to 18 days later) and soybeans that were not sprayed. Beginning at early bloom, weather conditions were recorded. Any day with 1/10 in. of rain or *extended periods* of fog and dew was considered wet. When 3 to 4 wet days had been recorded, a spray application of Benlate® (benomyl) 50 WP at 8 oz. per acre was made using a high clearance sprayer. This application usually occurred during early pod set, but occasionally was made during bloom. The second application was made 14-20 days after the first, if 3 to 4 more wet days occurred after the first application. During periods of especially wet weather, the interval was shortened to as little as 10 days to compensate for frequent disease infection periods and washing-off of the fungicide. All spray trials were replicated six times and results are reported as treatment means. Economic data were developed based on 1982 prices ($6.50 for a bushel of soybeans, and $8.50 to aerially apply 8 oz. of Benlate to an acre).

Data obtained from the meteorological timing system indicated several advantages over the standard spray program for soybean disease control. The number of fungicide applications was reduced an average of 40% in comparison to the standard program, while the frequency of nonprofitable fungicide applications was reduced to zero for the meteorological system from 60% for the standard program, see table. However, disease control was only slightly inferior to the standard program.

The economic data indicated that not only was the number of locations with non-economic return on fungicide investment reduced where the meteorological timing system was used, but that all locations gave a positive dollar return above cost. The ratio of increased crop value to cost of control was very positive for the meteorological program ($3.03 per $1.00) and only marginally beneficial for the standard program ($1.19 per $1.00).

These data indicate that foliar diseases can cause substantial losses in soybeans but, in the drier regions of Alabama, control measures cannot be utilized routinely at standardized times with the expectation of reasonable return on investment. The system described here for application of benomyl, based on the probability of damaging levels of disease developing, reduced total pesticide application by 40%, yet gave a greater dollar return per acre in all five experiments.

A portion of the success of this experiment can be related to the systemic nature of benomyl. The "kick-back" activity of this product allows for removal of established infections. Further, actual weather rather than predicted weather was utilized. Should contact fungicides be employed (e.g. Bravo 500®), sprays would have to be applied before infection periods as protectants, and predicted weather would have to be utilized.

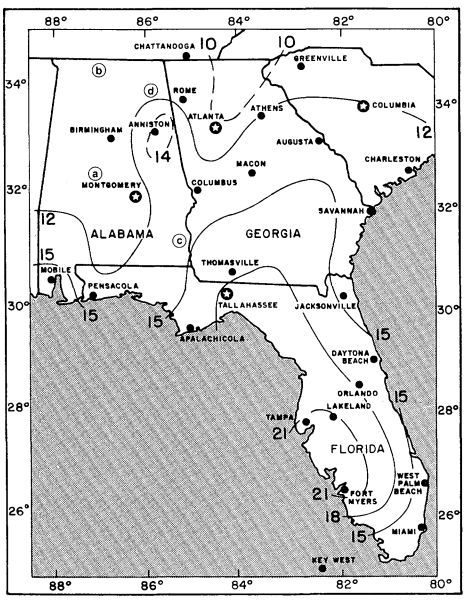
This fungicide spray-timing system can be adapted for changing economic conditions; should the value of soybeans rise, fewer infection days would be required to trigger a fungicide application, or if the price of benomyl increased, the number of infection days required to trigger a spray treatment could also be increased.

This research was supported in part by the Alabama Soybean Producers.

COMPARISON OF METEOROLOGICAL TIMING WITH STANDARD TIMING OF FUNGICIDE (BENLATE®) APPLICATIONS TO SOYBEANS, FOR EFFECTS ON DOLLAR RETURN PER ACRE

Location per year	No treatment Yield	Meteorological Sprays	Meteorological Increase	Meteorological Return[2] per acre	Standard program Sprays	Standard program Increase	Standard program Return[2] per acre
	Bu.	*No.*	*Bu.*	*Dol.*	*No.*	*Bu.*	*Dol.*
(a) Marion/81	20.7	0	0	0	2	0.7	-12.45
(b) Belle Mina/81	37.5	3	8.1	30.15	2	4.9	14.85
(b) Belle Mina/80	35.7	1	3.3	13.95	2	0.7	-12.45
(c) Ashford/80[1]	38.1	1	7.3	39.95	2	7.7	33.05
(d) Crossville/78	37.2	1	2.1	6.15	2	1.6	- 6.60
MEAN	33.8	1.2	4.2	18.04	2	3.1	3.28
Dollar value	220	9.00	27.30	-	17.00	20.15	-
Increased value per dollar invested	-		3.03	-	-	1.19	-

[1]Aerial application; data is average for two varieties (Cobb and Hutton).
[2]Dollar return = value of increased yield minus cost of applications. Assumes $6.50 per bushel and $8.50 per acre per application.



Average thunderstorm days for July for the Southeastern United States. Letters indicate test locations.

NUTRITIONAL DISORDERS OF PECANS

Characteristic Foliage Symptoms Identify Nutrient Deficiencies on Alabama Pecan Trees

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Department of Horticulture

NUTRITIONAL DISORDERS are common on pecan trees in Alabama. Many instances of unsatisfactory yield and quality of nuts can be traced directly to deficiencies of magnesium, zinc, potassium, or iron, or combinations of these nutrients.

Specific nutrient deficiencies can be identified by observations of characteristic foliage symptoms. Research by the Alabama Agricultural Experiment Station has described the foliar expressions of specific nutritional disorders, which enables growers to identify the problem so corrective action can be taken.

Magnesium Deficiency Common

Magnesium deficiency is the most common nutritional disorder in Alabama pecan orchards. Its foliar expression varies widely among varieties and seedlings. The range in expression of this deficiency is illustrated in figures 1 (Stuart variety), 2 (Moneymaker), 3 (Schley), and 4 (seedling). The foliar symptoms start first on basal leaves and progress toward the shoot tip as the deficiency becomes more pronounced.

Zinc deficiency, figure 5, first appears on tip leaves. It is rarely found in old Alabama orchards, but is quite common in young orchards. Since foliar symptoms of zinc deficiency resemble zinc toxicity, no application of zinc should be made to an old orchard without first confirming the diagnosis by leaf analysis.

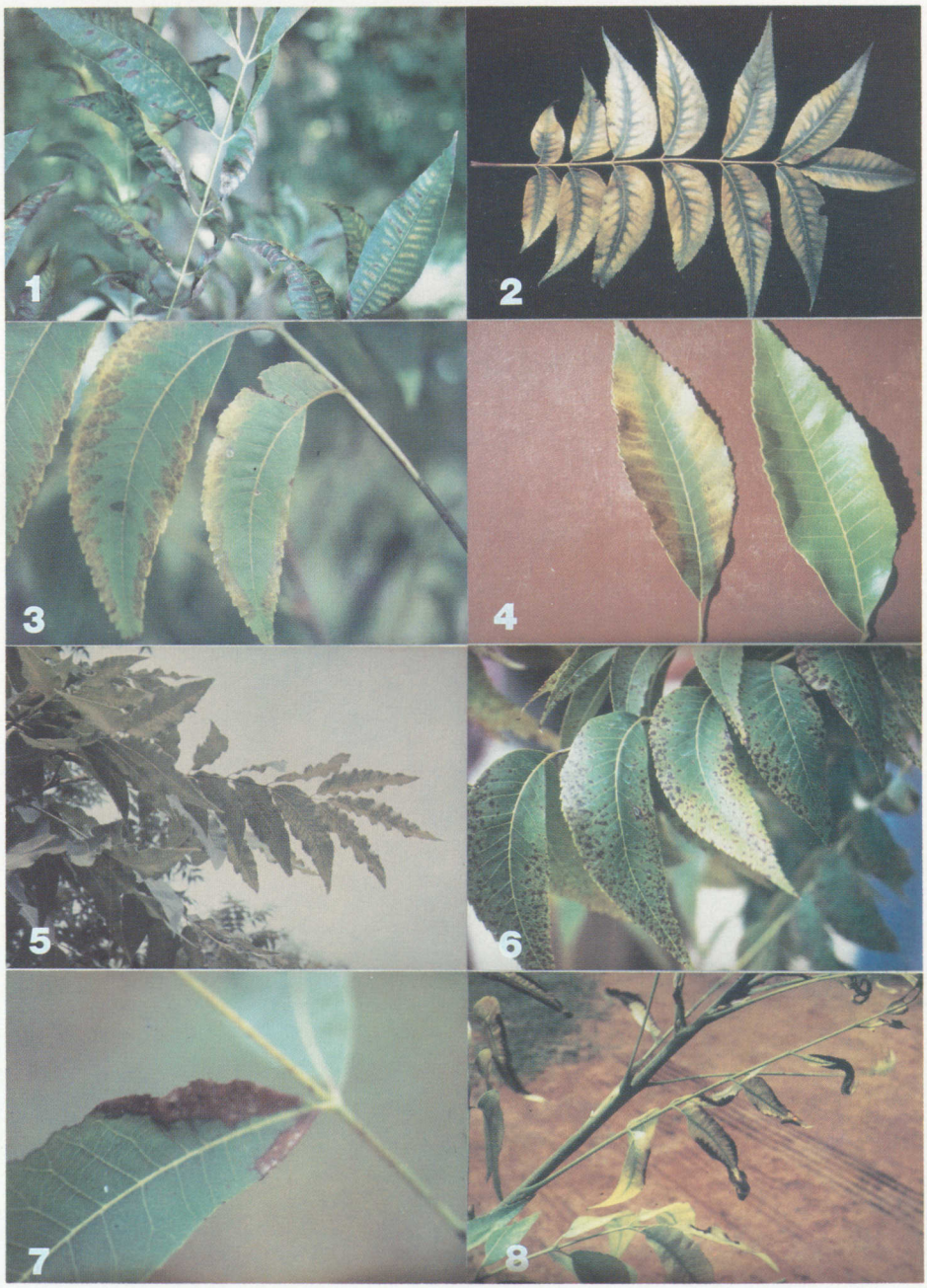
Potassium Deficiency in Older Trees

Potassium deficiency, figure 6, is a basal leaf disorder of older trees. This deficiency sometimes occurs when potassium is left out of the fertilizer program for an extended period of years. It has been found in Lee and Baldwin counties.

A nitrogen-potassium balance problem induces the foliar expression recorded in figure 7. It develops primarily on lower basal leaves in young orchards. This condition results from a high nitrogen-low potassium balance.

Iron Deficiency Puzzling

Foliar expression of iron deficiency, figure 8, in Alabama orchards is an induced phenomenon, the cause of which is currently unknown. Attempts to correct it by spray and soil applications of chelated iron and other iron sources have thus far been unsuccessful. Foliar leaf levels of iron in chlorotic leaves are the same as in normal green leaves.



Foliar expression of nutrient deficiencies: FIG. 1, magnesium deficiency, Stuart variety; FIG. 2, magnesium deficiency, Moneymaker variety; FIG. 3, magnesium deficiency, Schley variety; FIG. 4, magnesium deficiency, seedling; FIG. 5, zinc deficiency; FIG. 6, potassium deficiency; FIG. 7, nitrogen-potassium imbalance; and FIG. 8, iron deficiency.

The New Farm Bill

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FARM COMMODITY PROGRAMS, a major part of most farm bills, had their origins in 1933 as a result of the concern that farmers were seriously disadvantaged as compared to other segments of the population. In 1934, per capita disposable income of the farm population was one-third that of the nonfarm population. In 1980 it was 82% of the nonfarm population.

Commodity programs are justified on a number of bases. One of the major justifications is that farmers have no immediate means to pass higher costs on to the buyer of their products. Thus, inflation can seriously hamper gains in net farm income. Other justifications for commodity programs center on the fact that agriculture is based on biological processes and unpredictable forces of nature, including droughts and floods as well as insects and diseases, that can seriously affect net income. Food has been used both to serve political ends of this nation and as a factor in holding down inflation. Also, some argue that commodity programs have helped conserve soil and the family farm.

Progress has been made in restructuring commodity programs to meet the needs of society and, at the same time, provide at least minimal protection to farmers.

New Act

The Food and Agriculture Act of 1981 was a long debated bill, one of the major considerations being money or cost. The Reagan Administration wanted a farm bill whose 4-year cost would not exceed $10.6 billion. The House version of the bill was an estimated $16.6 billion over a 4-year period. The final vote in the House of Representatives was 205 in favor to 203 against, and a bill was passed that some groups claimed was unsatisfactory. Some argued that it did not provide adequate protection to farmers. Others maintained that it offered adequate price and income protection within the framework of a market-oriented agriculture.

In the debate over the bill from its early stages in March of 1981 until December, farm groups were divided and often opposed one another on major provisions. Traditional alignments of the past were disregarded and liaisons of long standing were splintered among commodity and interest groups.

The Agriculture and Food Act of 1981 is an omnibus farm bill that provides the framework within which the Secretary of Agriculture will administer the various food and agriculture programs for the next 4 years. The Act gives the Secretary substantial new discretionary authority to issue regulations and implement various provisions as the need arises.

Major Provisions

There are 17 titles in the act dealing with commodity programs, agricultural exports and Public Law 480, food stamp and commodity distributions, agricultural research and teaching policy, resource conservation, credit, agricultural development, family farms, floral research, and consumer information.

Cotton. The bill extends the cotton program with some modifications through 1985. The target price for 1982 crop cotton cannot be less than 71 cents per pound with 5 cents per pound increases each year, plus any adjustment for changes in cost of production or 120% of the loan level. The nonrecourse price support loan level is set by the same method as under the 1977 Act but can be no less than 55 cents per pound (48 cents per pound previously).

Deficiency payments will be made to producers if the national average price received by farmers for upland cotton during the calendar year, which includes the first 5 months of the marketing year, is below the target price. Under the new bill, producers will not automatically be entitled to disaster payments if crop insurance is available to them under the Federal Crop Insurance Act. As for acreage reduction, the Secretary is authorized to require a reduction in cotton acreage as a condition for eligibility for price support. Skip-row rules for acreage and area skipped are the same as under the 1977 Act.

Peanuts. The peanut acreage allotment system was eliminated but farm poundage quotas were continued. However, the poundage quota for 1982 will be 1,200,000 tons scaled down to 1,100,000 tons in 1985. Quota cuts, if possible, are to be made by reducing quotas on farms that have produced all or part of their quota except as a result of national disasters. Additional peanuts are now those in excess of quota rather than those in excess of quota but grown within the acreage allotment.

Support levels for 1982 are set at $550 per ton for 1982 quota peanuts with annual increases to 1985 to reflect increases in production costs but with a 6% limit for each annual adjustment. Support for non-quota peanuts will be set by the Secretary based on world market conditions and at a price that would avoid any net cost to the government.

Farm poundage quotas may be sold, leased, or transferred within a county.

Soybeans. The soybean loan rate will be based on 75% of the most recent 5-year national average price received by farmers, excluding the high and low years. The minimum price is $5.02 per bushel and no production adjustment, cross-compliance, or reserve program would be required. Soybeans are excluded from the farmer-owned reserve program and, thus, are not eligible for storage payments and there is no target price.

Wheat. The 1982 target price is $4.05 per bushel with increases scheduled to $4.65 in 1985. Minimum loan rate will be $3.55 per bushel for 1982-85. The Secretary is authorized, in years that surpluses are likely, to require farmers who want price supports to comply with set-aside or indirect wheat acreage reduction programs.

Feed Grains. The minimum loan rate for corn for 1982-85 is $2.55 per bushel. Target prices for corn are not less than $2.70 per bushel for the 1982 crop with increases scheduled up to $3.18 per bushel for 1985. Regulations on set-aside or direct acreage reductions are the same as for wheat. Target price protection is provided for grain sorghum and oats.

Thus, the major provisions of commodity programs have been set forth in the Food and Agriculture Act of 1981. These provisions are important to farmers and others and have far reaching implications.

MICROBIAL SAFETY of Animal Waste Formulated Rations

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Department of Animal and Dairy Sciences

RECYCLING ANIMAL MANURES as a component of rations is an alternative that makes use of the nitrogen, fiber, and minerals of wastes for ruminant animal production. Animal wastes have been used as a feed ingredient for nearly 30 years without harmful effects to animals eating the rations or to humans who have consumed food products derived from the animals.

Initially, the FDA did not condone the feeding of wastes to animals due to the lack of data relative to the safety of the practice on animal and human health. Recent research has demonstrated that the risk to health from feeding animal wastes can be controlled by treatment of waste prior to feeding and by withdrawal of these wastes from the ration prior to marketing of the animals. Consequently, in 1980, the FDA rescinded the policy which did not sanction the feeding of animal wastes.

Regulations for feeding of wastes are now primarily the responsibility of the states. Ten states have regulations which control the use of animal waste intended as a feed ingredient. Alabama and other states which have regulations for the use of animal wastes as a feed ingredient adopted the Model Regulations developed by the Association of American Feed Control Officials.

The principal health hazards associated with feeding animal wastes are drug residues and pathogenic microorganisms. To overcome the potential of drug residues in animal tissues or products derived from waste-formulated feeds, either wastes known to contain drugs should be avoided or rations with drugs should be withdrawn from animals prior to marketing to allow time for the drugs to clear the animal or to decrease to non-hazardous levels.

To eliminate the potential hazard of diseases being transmitted in animal wastes intended as a feed ingredient, the waste or the ration containing waste must be processed. Several methods have been advocated for the treatment of animal wastes to eliminate the potential of disseminating diseases. Heating wastes by mechanical means, as well as spontaneous heating that can be achieved by deep stacking broiler litter, is effective in eliminating transmission of disease. It is not necessary to sterilize the waste, but pathogens that are excreted by animals should be killed by the heat treatment. Either mechanical heating to 300°F for 30 minutes or spontaneous heating to 160°F or higher for at least 10 days is sufficient to eliminate most pathogens.

Research at the Alabama Agricultural Experiment Station has demonstrated that pelleting rations with 22% broiler litter is effective in eliminating fecal bacteria such as *Escherichia coli* and *Salmonella typhimurium*. Pelleting at 140°F reduced the number of these bacteria in rations containing broiler litter by a factor of 1/100,000, table 1. It is not likely that this high level would be encountered in waste-formulated rations and therefore the margin of safety would even be greater.

Fermentation is a practical and economical method of processing that has been used for many years to preserve animal feed and human food. Beef cattle waste and broiler litter can also be processed by fermentation to reduce the risk of disseminating diseases. The fermentation process can be accomplished by blending corn or other carbohydrate-containing feed ingredients with animal waste, adjusting the moisture to about 40% by adding ground hay or similar ingredients, and ensiling the material for at least 10 days thus achieving a desired acidity of pH 4.5 or less. The fermentation is similar to that accomplished with ensiling of corn or sorghum silage. Studies have shown that the fermentation of waste is detrimental to bacteria such as *Salmonella* and fecal coliforms, table 2.

Due to the higher acid buffer capacity of broiler litter, rations with litter should be ensiled for 30 days or more, whereas 10 days is sufficient time to eliminate most pathogens from beef cattle waste-formulated rations.

Although there have been no documented reports of disease of animals or humans associated with the feeding of animal wastes to food producing animals, rations formulated with animal wastes must be processed to ensure they are free of pathogens.

TABLE 1. EFFECT OF PELLET-PROCESSING ON ENTERIC BACTERIA IN BROILER LITTER FORMULATED RATIONS

Rations	Indigenous fecal coliforms	Inoculated	
		E. coli	*Salmonella*[1]
	No. viable enterics/g (or as indicated)		
Control (no litter)			
Before pelleting	8,000	39,000	46,000
Pelleted	<1/10 g	<1/10 g	2/100 g
Raw litter[2]			
Before pelleting	7,000	12,000	9,300
Pelleted	<1/10 g	<1/10 g	1/100 g
Deep stacked[3]			
Before pelleting	16,000	12,000	2,700
Pelleted	<1/10 g	<1/10 g	1/100 g

[1]No indigenous *Salmonella* detected in 100 g of rations.
[2]Formulated with 15% raw litter.
[3]Formulated with 22% litter deep stacked for 8 weeks.

TABLE 2. EFFECT OF ENSILING MANURE-FORMULATED RATIONS ON SURVIVAL OF ENTERIC BACTERIA

Silage	Day ensiled	pH	Indigenous fecal coliforms/g	Cultures added to rations[1]	
				E. coli	*Salmonella*[2]
60% beef cattle manure silage (40.8% moisture)	0	6.3	240,000	+	+
	1	4.7	24,000	+	-
	2	4.5	24	-	-
	4	4.1	<10	-	-
	5	4.1	<10	-	-
55% broiler litter silage (40.8% moisture)	0	8.2	260	+	+
	1	6.3	240	+	+
	2	5.8	43	+	+
	4	5.7	<10	+	+
	5	5.5	<10	+	+
	8	5.7	<10	+	+
	9	5.5	<10	+	+
	10	5.5	<10	+	+
	15	5.7	<10	-	-
Corn silage (71.0% moisture)	0	5.0	9,600	+	+
	1	4.2	2,400	+	+
	2	4.0	<10	-	-
	4	3.9	<10	-	-
	5	3.8	<10	-	-

[1]About 10^8 of each bacterium were added to each ration prior to ensiling. Survival of the bacteria is indicated by "+" and "-" if bacteria failed to survive.
[2]No indigenous *Salmonella* were detected in the rations prior to ensiling.

No weed control (left) as compared to total weed control (right) by broadcast and directed herbicide applications.

Herbaceous Weed Control Results in Accelerated Growth of Loblolly Pine

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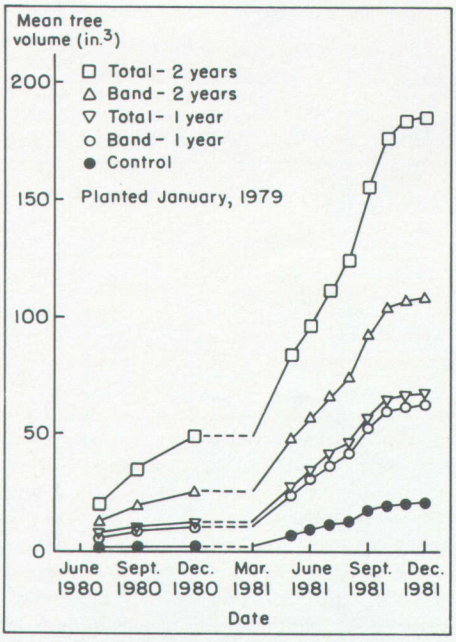
Department of Forestry

HERBACEOUS WEEDS are often severe competitors for water and nutrients in newly established forest plantations. Such competition can result in lower survival in new plantings and reduced growth rates in surviving stock. If the management objective is to maximize survival and growth, herbaceous weed control is a necessity.



Average volumes for growth impact study in Macon County.

A study to demonstrate the benefit of herbaceous weed control on the growth and development of loblolly pine was installed in Macon County, Alabama. This was accomplished by establishing five levels of herbaceous weed control in a newly planted loblolly pine stand and periodically measuring height and diameter through three growing seasons.

The treatments included in the study were total weed control for 1 and 2 years, weed control in bands for 1 and 2 years, and no weed control. Total weed control was obtained by broadcast and directed herbicide applications, while banded weed control was obtained by applying herbicides in a 4-ft. wide strip centered over the rows of trees. Since this study was not designed to represent an operational treatment, herbicides were applied as needed to achieve the desired level of weed control.

The average height, groundline diameter, and volume of individual trees at the end of the third growing season is compared, table 1. Trees receiving 2 years of total weed control average more than twice the height of trees with no weed control. The trees receiving either the total or the banded treatment for 1 year are about 1.5 times as tall on the average as the trees receiving no weed control. The mean groundline diameters for the 2-year treatments are twice that of trees with no weed control. Trees receiving either of the 1-year treatments are 1.5 times the average groundline diameter of trees with no weed control. The average volume per tree in both of the 1-year treatments is three times greater than for trees receiving no weed control.

Patterns of volume growth with five levels of weed control are compared in the figure. Trees receiving weed control grew at a faster rate than controls and continued growing for one or two additional months in the fall. The trees receiving 2 years of total and 2 years of banded weed control average eight and five times, respectively, more volume at the end of three growing seasons than trees receiving no weed control. The average volume per tree for the 1-year treatment is about three times greater than for the control plots, but there is no difference between total and banded weed control treatments.

Although several herbicides have been developed and registered in recent years for herbaceous weed control, new herbicides are needed which have broad spectrum weed control and pine tolerance, table 2. Current research within the Alabama Agricultural Experiment Station involves searching for cost effective herbicides to control herbaceous competition.

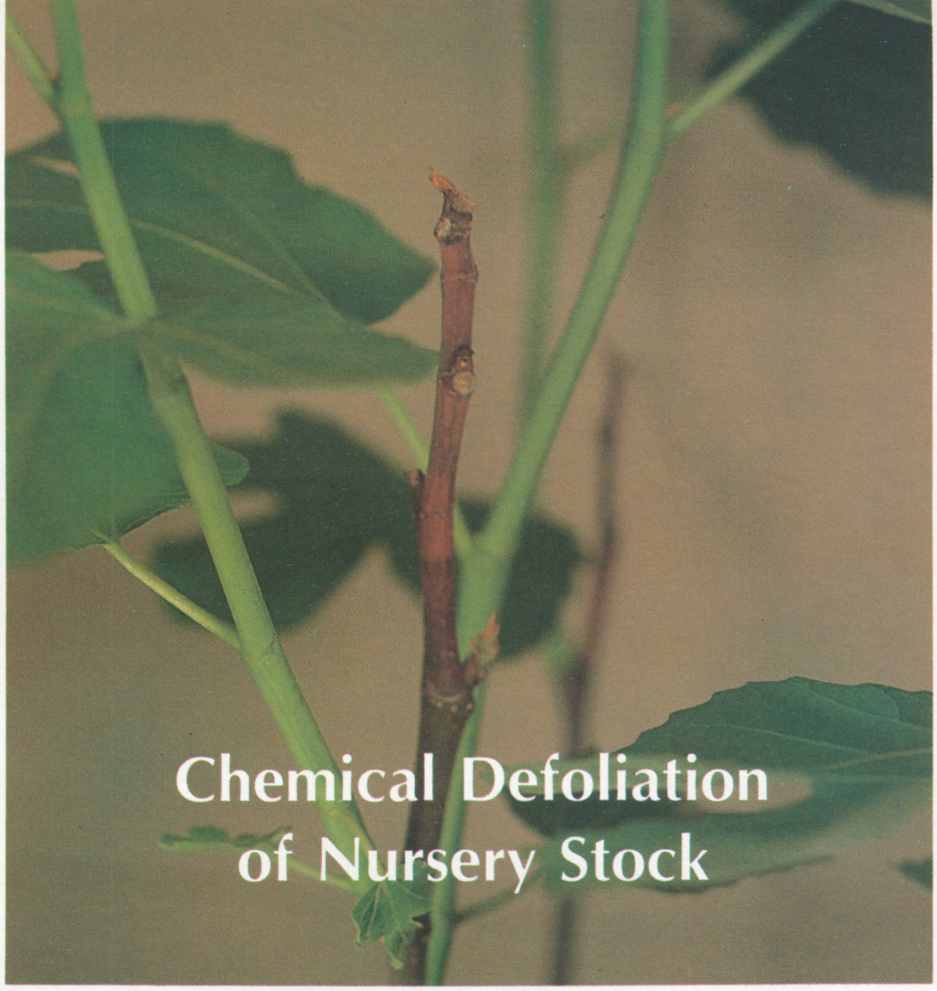
TABLE 1. AVERAGE TREE HEIGHT, GROUNDLINE DIAMETER (GLD), AND VOLUME AT THE END OF THREE GROWING SEASONS

Treatment	Height[1]	GLD	Volume
	Ft.	*In.*	*In.*^{3}
Total - 2 years	7.6 a	2.6 a	185 a
Band - 2 years	6.3 b	2.1 b	108 b
Total - 1 year	5.4 c	1.7 c	67 c
Band - 1 year	5.3 c	1.6 c	62 c
Control	3.6 d	1.0 d	21 d

[1]Means followed by the same letter are not significantly different at the 5% level of Duncan's new multiple range test.

TABLE 2. REGISTERED HERBICIDES FOR HERBACEOUS WEED CONTROL IN PINE OUTPLANTINGS

Herbicide and trade name	Manufacturer	Use
Hexazinone; Velpar L	Dupont	Do not use on extremely coarse textured soils; test prior to large scale use; pre and post-emergence control
Simazine; Princep	Ciba-Geigy	Preemergence only; grass control
Atrazine; Aatrex	Ciba-Geigy	Registered as tank mix with Princep; pre-emergent only
Glyphosate; Roundup	Monsanto	Directed post-emergent applications only



Chemical Defoliation of Nursery Stock

W.A. DOZIER, JR., C.H. GILLIAM, J.M. SNELL, and J.S. CROCKETT
Department of Horticulture

ABOVE: Typical injury following Harvade® treatments at high rates (400 to 1600 p.p.m.) the spring following treatment.

MANY NURSERIES in north Alabama produce fig tree nursery stock for sale. These plants are produced from field-rooted, hardwood cuttings placed in the field late winter or early spring. These cuttings produce roots during April and May and start vegetative growth in late May and early June. They grow rapidly, are very succulent in the fall, and as a result these plants are susceptible to cold injury. Therefore, the plants must be dug and stored in a protective building prior to freezing temperatures.

Before the plants can be dug, however, all leaves must be removed from the plant. Currently, the leaves are stripped from the plants by hand since natural leaf drop doesn't occur until after freezing weather. Hand defoliation is expensive, time consuming, and can result in damage to the bark and buds.

Use of a chemical defoliant that would induce early leaf abscission would result in a more efficient system of handling fig tree nursery stock than is currently used. However, one problem that has occurred on other plants sprayed with chemical defoliants is that tip or twig damage has often resulted the following spring. This study was conducted to detemine the effects of three chemical defoliants; Harvade®, Ethephon®, and Dupont's D-WK® surfactant on chemical defoliation and subsequent stem damage after overwintering of Celeste fig trees.

Hardwood cuttings of Celeste fig were placed in the greenhouse in February and grown in place until June, when they were potted in 2 gal. containers. The potting mix was four parts pinebark and one part sand amended with 6 lb. per yd.^{3} of dolomitic limestone, 4 lb. per yd.^{3} of Esmigran® (minor element mix), 1 lb. per yd.^{3} of superphosphate, and 1 lb. per yd.^{3} of Aqua-gro® (wetting agent). Osmocote® (18-6-12) was placed on the media surface 3 weeks after potting at the rate of 1 tbsp. per 2 gal. container.

Spray applications of defoliants were applied to the point of runoff on Oct. 21 using a hand sprayer, see table. Harvade and Ethephon were each applied at rates of 200, 400, 800, and 1,600 p.p.m. with Dupont's D-WK surfactant added to each treatment at the rate of 2% by volume. All leaves remaining on the plants were removed by hand on Nov. 15 and the plants were placed in a cooler held at 38°F to satisfy the chilling requirement. The plants were removed from the cooler on Jan. 15 and placed in the greenhouse so vegetative growth could begin. The plants were evaluated for terminal bud injury from the spray treatments on Mar. 5, 1982.

All rates of Harvade totally defoliated the Celeste fig plants within 2 weeks of treatment application, see table. At the 200 p.p.m. rate, Harvade removed all leaves within 7 days of treatment. The 1,600 p.p.m. Ethephon treatments resulted in 98 and 99% leaf drop in 7 and 14 days after treatment, respectively. The 400 and 800 p.p.m. Ethephon treatments resulted in 84 and 90% leaf drop within 14 days of treatment. However, the 200 p.p.m. Ethephon treatment resulted in only 34% leaf drop after 14 days.

Terminal bud or stem damage did not occur in any of the Ethephon treatments or the 200 p.p.m. Harvade treatments. However, slight terminal bud and stem damage occurred following the 400 p.p.m. Harvade treatment and severe terminal bud and stem damage occurred with the 800 and 1,600 p.p.m. Harvade treatments.

Commercially acceptable defoliation, without plant injury, was achieved with three treatments: 200 p.p.m. Harvade plus 2% Dupont's D-WK surfactant, and 800 and 1,600 p.p.m. Ethephon plus 2% Dupont's D-WK surfactant. Higher rates of Harvade resulted in plant injury and the lower rates of Ethephon did not adequately defoliate the plants.

EFFECT OF HARVADE®, ETHEPHON®, AND DUPONT'S D-WK® SURFACTANT ON DEFOLIATION OF CELESTE FIG NURSERY STOCK

Treatment	Pct. defoliation[1] 10/28 (1 wk.)	11/4 (2 wk.)	No. terminals per plant	Pct. terminals injured per plant[2]
(ppm)				
1. Harvade 200	100	100	2.8	0
2. Harvade 400	96	100	3.0	13
3. Harvade 800	86	99	2.3	64
4. Harvade 1,600	58	100	2.5	61
5. Ethephon 200	25	34	3.3	0
6. Ethephon 400	76	84	2.8	0
7. Ethephon 800	85	90	2.3	0
8. Ethephon 1,600	98	99	3.1	0
9. Check (H_2O only)	0	0	3.0	0
10. D-WK only	30	43	3.7	0

[1]Treatments applied Oct. 21 and rated for defoliation 1 and 2 weeks later.
[2]Plants rated for terminal stem and bud damage on Mar. 5, 1982.

Tillage Requirements for Optimum Wheat Yield

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WHEAT HAS BECOME an important agronomic crop throughout the Southeast during the past few years. Between 1979 and 1982, wheat acreage in Alabama increased more than five fold—from 140,000 to 970,000 acres.

As with most crops, methods of land preparation prior to planting wheat vary widely from location to location and even among farms within relatively small areas. As a result of rapidly increasing costs of crop production and a need to reduce production costs, there has been a trend toward reduced or no tillage crop production.

Research conducted in the past few years in several states, including Alabama, has illustrated that reduced forms of tillage can be profitable on many soils for corn and soybean production. However, studies designed to evalute the effect of tillage or land preparation prior to planting wheat have been relatively limited, especially in the southeastern Coastal Plains. At present, the most commonly employed method of land preparation for wheat is probably the disk-plant system.

In the fall of 1980, tillage studies for wheat were begun by the Alabama Agricultural Experiment Station at five locations in south Alabama, table 1; the sixth location, Gulf Coast Substation, Fairhope, was added in 1981. The land preparation methods consisted of: (1) no tillage, (2) disk only, (3) chisel-disk, (4) chisel-drag, (5) turn-disk, and (6) turn-drag. A roterra was used for the drag treatment at the Wiregrass Substation, Headland, Black Belt Substation, Marion Junction, and Gulf Coast Substation, Fairhope, and a metal drag bar was used at the other locations.

Wheat yield responses to tillage varied between years, and locations, table 2. In 1981, the moldboard or turn-plow method of land preparation resulted in yields as high or higher than any of the other tillage treatments, and no tillage resulted in the lowest yields. At Headland and Brewton, but not at the other locations, there was some evidence that the chisel-plow method resulted in lower yields than did the turn-plow treatment. This difference may have been due to deeper tillage with the turn-plow than with the chisel-plow. Yield differences between soil-leveling methods (disk vs. drag) after turning or chiseling were not detected. At four of the five locations (Headland, Brewton, Monroeville, and Prattville), disking only prior to planting resulted in lower yields than did the deep tillage treatments; and at Brewton, Monroeville, and Prattville disking did not improve yields over those obtained with no tillage. Plant stands were relatively poor on the no tillage plots at Black Belt Substation, and may account for the low yield with the no tillage treatment at that location.

Wheat grain yield responses to tillage in 1982 followed similar trends to those obtained in 1981, table 2. The exceptions were: (1) at Fairhope there was no difference among tillage systems, (2) at Black Belt Substation there was evidence that the turn-plow treatment reduced yield and no tillage yields were as high as any other treatment, and (3) the disk-only method did not reduce yields when compared to deep tillage at Monroeville, but yield reductions were found at Prattville, Brewton, and Headland.

The results of the first 2 years of this study suggest that wheat yield response to land preparation is similar to other crops in that the optimum tillage practice will vary among years and soil type. With the limited quantity of data generated to date, it is difficult to draw firm conclusions, but it does appear that on the sandy soils of the Coastal Plain: (1) some form of deep tillage is needed prior to wheat, even if the preceding soybean crop is subsoiled, (2) disking after deep tillage is an expensive and unneeded tillage operation, and (3) no tillage and disk-only tillage for wheat are practices that may result in substantial yield reductions.

TABLE 2. WHEAT GRAIN YIELD IN 1981 AND 1982 AS AFFECTED BY FALL TILLAGE

Location	1981			1982		
	No-till	Disk	Deep-till*	No-till	Disk	Deep-till
Headland	34	40	47	37	37	50
Brewton	31	34	47	9	17	28
Monroeville	48	51	61	39	57	50
Prattville	59	61	66	26	41	49
Marion Junction	31	50	48	34	32	32
Fairhope	--	--	--	47	50	51

*The deep tillage data are averaged over 4 treatments; turn disk, turn drag, chisel disk, and chisel turn.

TABLE 1. LOCATION, SOIL TYPE, AND WHEAT VARIETY

Location	Soil	Varieties	
		1980	1981
Brewton	Bendale sandy loan	Coker 747	Coker 747
Headland	Dothan fine sandy loam	Coker 747	Coker 747
Monroeville	Lucedale sandy clay loam	Coker 747	Coker 747
Prattville	Bama sandy loam	McNair 1,817	Coker 747
Fairhope	Malbis fine sandy loam	---	Coker 762
Marion Junction	Sumter clay	McNair 1,003	McNair 1,003

MICROCOMPUTERS IN FARM MANAGEMENT

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APPLICATION OF COMPUTER TECHNOLOGY in agriculture is not a new concept. Agricultural research organizations adopted automatic data processing in the early 1950s, and large agricultural business firms adopted similar procedures during the 1960s.

A particular example, linear programming, was developed during World War II for the United States Armed Forces. In the early 1950s this technique was adopted by agricultural scientists to evaluate optimum farm resource and enterprise organizations and least cost formulations of feeds and fertilizers. Teams of researchers later used the technique to determine optimum production patterns among farming regions.

Until recently, computer technology exceeded the financial reach of farmers and small agricultural businesses. Cost reduction associated with the introduction of microprocessors in the late 1970s is the major factor underlying the current computer revolution on farms. More than 90 models of microcomputers are listed in a recent buyer's guide of base units that list for under $6,000. A wide range of "personal computer" alternatives is available in the $2,000 to $5,000 price range.

Although no estimate is available on number of computers on farms, more than one million microcomputers have been placed in service nationally. Reports from Mississippi indicate that more than 200 microcomputers are on farms in that state. Two agricultural software suppliers in Alabama are listed among 100 plus firms nationally. Agricultural software from private and public sources is now widely available. The owner of a common model of computer would easily find approximately 6 generalized software systems and 50 or more specialized software programs readily available.

At least five components make up the hardware of a microcomputer system. These components include a microprocessor, keyboard, display, storage device, and printer. Some computer models combine two or more components into a single cabinet. For example, the Radio Shack Model III contains a keyboard, video display, disk drives, and microprocessor in one cabinet. The fifth component, a printer, is a separate unit on almost all computer systems. In another example, the IBM Personal Computer, the keyboard and display are also separate units.

The following material is concerned with the hardware and software components of a microcomputer system. Numerous changes are continuously taking place in both components. A clear understanding and a process of updating information concerning computer systems has become extremely important to farmers and agribusiness managers.

The microprocessor is the distinguishing feature of a microcomputer from all other computing systems. Common to all microprocessors is the extreme miniaturization in the memory component. Ranging from 16,000 to 256,000 and more bytes of memory, the microprocessor is on a chip that is smaller than a thumbnail, and is assembled from components smaller than a single "." on a typed page. One byte of memory consists of 8, 16, or 32 bits. A 16 bit microprocessor has twice the memory capacity of an 8 bit microprocessor. The majority of microcomputers now available input and process information in 8 bits. Some models input in 8 bits and process in 16 bits, while two recently introduced models input in 16 bits and process in 32 bits.

The keyboard component of a microcomputer system has a typewriter configuration of keys plus specialized keyboard options. Specialized keys are used to access the additional functions of the microcomputer. Most, but not all microcomputers, have upper and lower case capability. The user must become acquainted with the particular arrangement he is exposed to and be aware of adjustments necessary when working with more than one model of microcomputer.

The display device may be a television or a similar screen. The screen is either monochrome or color. A monochrome screen may be green on black, white on black, or amber on black. Color displays range in capability from four to 16 colors. Screens also differ in size of display in terms of characters and lines. Most common choices are 40 or 80 characters x 24 lines.

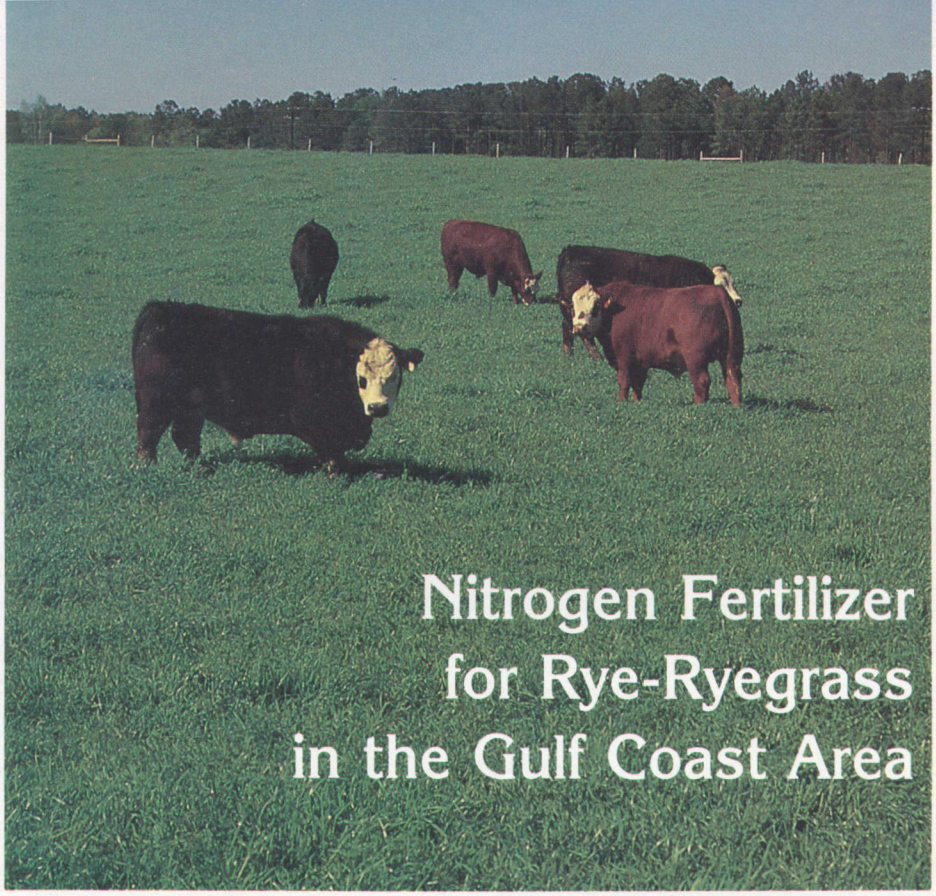
A storage device provides permanent memory and the ability to end a computing session and start again without reentering the program and data. Options include cassette tapes, floppy disks, and hard disks. Floppy disk sizes are either 5¼ inch or 8 inch and are capable of storing from 150,000 to 500,000 bytes of memory. Hard disks hold several million bytes of memory.

Printers provide the "hard copy" of computer input and output. Dot matrix printers form letter and character images with a matrix of dots arranged in 7 x 9 blocks. Letter quality printers are much like electric typewriters. Dot matrix printers produce lower quality copy, but at a faster speed and a lower cost. Paper size ranges from 9 inches to 14 inches. Some printers can vary letter size to print from 40 to 132 characters on 9 inch paper and/or 60 to 205 characters on 14 inch paper.

BASIC is the common language of practically all microcomputers. Users have the choice of writing their own BASIC programs or applying BASIC programs supplied by public or private sources. Some microcomputers also support FORTRAN, COBOL, Pascal, and/or other languages. Microcomputer software is also available that insulates the user from computer programming languages. Generalized software products include wordprocessing, electronic spreadsheet, and data based management programs.

Wordprocessing provides an electronic memory that facilitates easy correction and reformating of text material. Electronic spreadsheets such as VisiCalc provide for tabular materials and computations much like the capability of a pencil, paper, and hand calculator. These spreadsheet programs are most useful for investigations that involve many "what-if " questions and are not repeated enough to warrant the writing of a BASIC or other program. Data based management programs are used to store, manipulate, and retrieve data elements contained in large data systems.

Microcomputer alternatives are more numerous than can be completely covered in this review. Farmers that are seriously considering the acquisition of this new technology will realize substantial benefit from a careful study of the alternatives outlined above. Further research and experience in teaching and extension programs, involving microcomputer technology, will increase the body of knowledge available for use by farmers in assessing individual needs.



Nitrogen Fertilizer for Rye-Ryegrass in the Gulf Coast Area

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IN THE FALL of 1977, an experiment by the Alabama Agricultural Experiment Station was begun at the Gulf Coast Substation, Fairhope, to check the nitrogen (N) fertilizer needs of rye-ryegrass pastures. The current established need of 100 lb. per acre of N at planting and 60 lb. per acre of N in early spring, is based on small plot and grazing experiments from several locations in Alabama.

The nitrogen experiment at the Gulf Coast Substation, which included both rates of N and times of N application, was harvested by mowing; therefore, the reported yields may be higher than if the plots had been grazed. The Malbis fine sandy loam soil received phosphorus, potassium, and lime as needed and was sown with McNair Vita Graze rye and Gulf ryegrass.

When the yields for 5 years were averaged, the highest yield of forage over the entire growing season was produced by 200 lb. per acre of N. This is 40 lb. per acre more than the presently recommended rate of 160 lb. per acre of N. Unfortunately, the additional 500 lb. per acre of forage produced by this extra 40 lb. per acre of N all grew in the spring, see table. In the table, spring refers to forage cut after March 1. In grazing systems, where uniform forage production is as important as total forage production, it may not be possible to utilize more spring forage. When enough N is applied to give maximum total yield, the distribution of forage yield is controlled by the growth habits of the grasses and by the weather and cannot be altered by the timing of N application, see table.

Various combinations of fall- and spring-applied N were used to produce the forage yields. All of the treatments producing maximum forage yield received 100 lb. per acre or more of N at planting and 60 lb. per acre or more of N in the early spring. Application of all of the N at planting will result in serious leaching losses during the winter and less than maximum spring forage production.

The nitrogen recommendation for rye-ryegrass pastures is intended to produce the highest uniform forage yields possible for the majority of locations in Alabama. Rye-ryegrass at the Gulf Coast Substation responded to slightly more N than is recommended but only at the expense of uniform forage production. Those producers in the Gulf Coast area having a need for more spring forage production may wish to increase their spring N applications.

DISTRIBUTION OF RYE-RYEGRASS YIELD WITH DIFFERENT RATES AND TIMES OF APPLICATION OF NITROGEN (N) FERTILIZER AT THE GULF COAST SUBSTATION

Treatment			Rye-ryegrass yield, 5-year average		
Fall N	Spring N	Total N	Fall	Spring	Total
Pounds per acre					
100	60	160	2,600	3,300	5,900
150	60	210	2,600	3,800	6,400
100	90	190	2,600	3,900	6,500

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