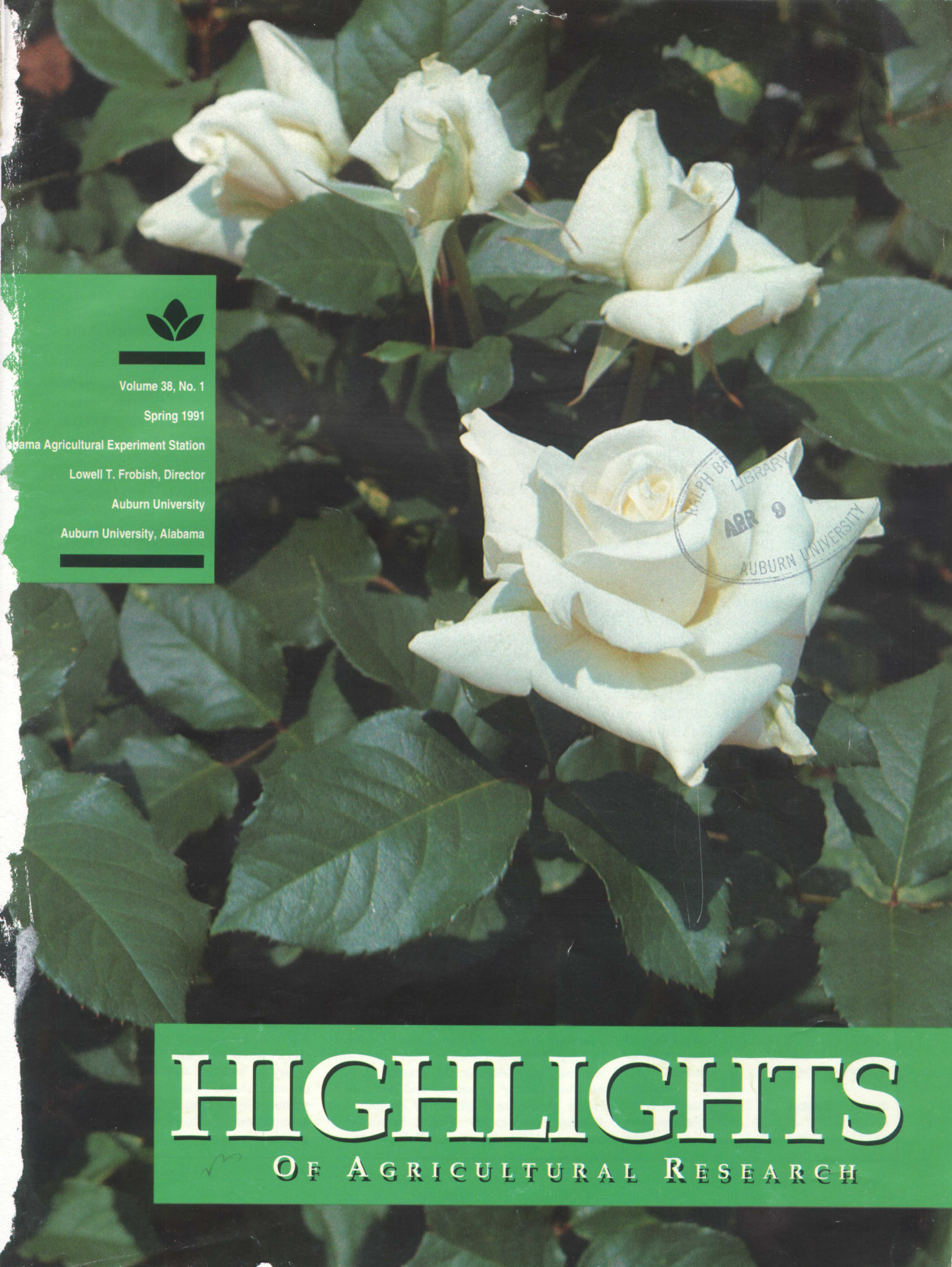

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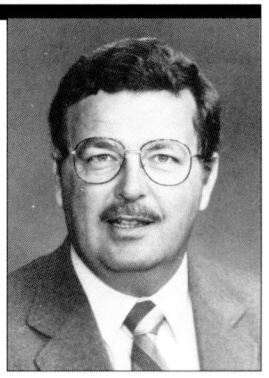
abama Agricultural Experiment Station
Lowell T. Frobish, Director
Auburn University
Auburn University, Alabama

HIGHLIGHTS

OF AGRICULTURAL RESEARCH

Director's Comments



LOWELL T. FROBISH

To paraphrase the quote about no man being an island, agricultural production today is far from being an island and isolated from everything else. With today's global concerns about economics, sustainability of agriculture, and the environment, production agriculture faces difficult problems. Agencies traditionally not involved in agriculture now have immense impact on agriculture. Agencies not that familiar with agriculture may regulate the types and amounts of chemicals used in crop and livestock production.

Complex problems require different expertise to solve them. A team approach is required to develop a system that addresses all of the issues. Team members should not be limited to the scientific community but should include a technology transfer component, Federal agencies, and, most important of all, agricultural producers.

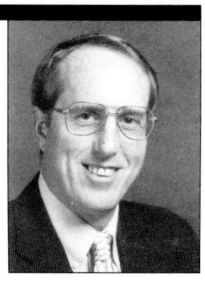
Recently a program was developed that incorporated all aspects of a team approach to attack a poultry problem. Poultry is Alabama's top farm commodity, totaling $1.11 billion income in 1989 and providing the direct livelihood for 6,000 Alabamians. Alabama is the second largest broiler producing state, and our goal is to become the number one state.

The rapid growth of this industry has not been without problems, of which poultry manure and dead bird disposal are of prime importance. Manure produced has enough nitrogen to fertilize more than 270,000 acres of cropland at a rate of 200 lb. per acre. In addition, the phosphorus and potassium content of poultry manure would satisfy the requirements for many of Alabama's crops. Based on a normal mortality rate, it is estimated that 750 tons of dead broiler carcasses must be disposed of each week. Unacceptable practices of waste and dead bird disposal can cause serious problems for the poultry industry.

Now for the rest of the story. Representatives from the poultry industry, Cooperative Extension Service, Soil Conservation Service, regulatory agencies, and Agricultural Experiment Station came together and tackled the problem of poultry waste disposal. The end result was the development of a Poultry Waste Management and Protection Manual. The manual provides information on the planning of poultry production units, management of the waste produced, use of the waste material as fertilizer or cattle feed, controlling the spread of diseases through dead birds, and, most important of all, protection of the environment.

The team is to be congratulated for its effort in facing the problem, developing recommendations to correct the problem, and policing the industry to ensure that proper waste disposal methods are used.

May We Introduce



Dr. Richard K. (Rick) Wallace, Associate Professor of Fisheries and Allied Aquacultures, who is headquartered at the AU Marine Extension and Research Center in Mobile. A native of Toledo, Ohio, Wallace first came to Auburn as a doctoral student, prior to his appointment as an Associate Professor in 1983.

He earned a B.S. degree in zoology from Ohio Wesleyan University and a M.S. degree in marine science from the University of Puerto Rico. While earning the Ph.D. in fisheries at Auburn, he served as a Research Assistant and Research Associate.

In his current position, Wallace is working on several alternative production practices for oysters and has been instrumental in mapping shrimp nurseries in the Mobile Bay estuary and developing a system of predicting the impact of environmental factors on location and abundance of shrimp. Some results of this work are reported on page 5 of this issue of *Highlights.*

ON THE COVER. Regular application of fungicides provided effective control of rose diseases in AAES research. (See story on page 13.)

Spring 1991 Vol. 38, No. 1

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EDITOR'S NOTE. Mention of trade names does not indicate endorsement by the Alabama Agricultural Experiment Station or Auburn University of one brand over another. Any use of pesticide rates in excess of labeled amounts in research reported does not constitute recommendation of such rate. Such use is simply part of the scientific investigation necessary to evaluate various materials. No chemical should be used at rates above those permitted by the label. Information contained herein is available to all persons without regard to race, color, sex, or national origin.

P.A. BACKMAN, J.C. JACOBI, and D.P. DAVIS

Peanut Leafspot Control System Cuts Fungicide Use, Maintains Disease Control

CONTROL of leafspot disease is expensive for Alabama peanut growers, usually requiring 6-8 sprays applied on a 14-day schedule. An Alabama Agricultural Experiment Station-developed system called AU-Pnuts, based on environmental factors and history of leafspot development on Alabama peanuts since 1980, offers an alternative for this approach. Use of AU-Pnuts successfully eliminated one or more fungicide applications without reducing leafspot control or yields in tests throughout the major U.S. peanut areas.

Plant pathologists have long known that the fungus that causes peanut leafspot requires moisture to infect the leaf. Therefore, applications made during dry periods are of little value when leaves are not wetted by rain, fog, prolonged dews, or irrigation water, within a period of about 10 days after the fungicide is applied. Additionally, rotated peanuts usually need not be sprayed as early in the growing season as peanuts planted behind peanuts, since fungal spores from peanut residue are not present. The end result is farmers over-treating for leafspot because of the lack of a system that advises a more appropriate timing for leafspot control sprays.

To develop a set of rules to manage leafspot, research was begun by looking at the progress of the disease in Florunner peanuts in every year since 1980. These studies indicated that rainfall of 1/10 in. or greater on any given day was a good predictor of leafspot development. Close examination of the data indicated that after 6-8 days with 1/10 in. of rain, disease begins to develop quickly. From this and a knowledge of disease development, guidelines were developed and tested, for the management of leafspot on Florunner peanuts, using Bravo® fungicide. The only equipment necessary is a rain gauge that can accurately measure 1/10 in.

These rules were tested during the wet season of 1989 and the dry season of 1990 on irrigated peanuts at the Wiregrass Substation, Headland. In both years the number of fungicide applications was reduced without sacrificing disease control or yield.

During the 1990 season, additional tests of this system were conducted in Georgia, Florida, and Oklahoma. In all locations, fungicide sprays were reduced, requiring only 3-5 applications (depending on irrigation timing and rotation) to achieve a similar level of disease control and yield as peanuts sprayed seven times on the standard 14-day program.

Backman is Professor and Jacobi is Research Associate of Plant Pathology; Davis is a Postdoctoral Fellow of Entomology.

AU-Pnuts Rules Tested for Peanut Leafspot Control

For the use of these rules the term "rain event" means any day with more than 1/10 in. of rain, or more than 1/10 in. of irrigation water, or with a fog that begins before 8:00 p.m. If you have plans to irrigate soon, the forecast for a rain event is 100%.

A. TIMING FOR THE FIRST SPRAY OF THE SEASON:

1. After plant emergence, begin counting the number of rain events. For nonrotated peanuts, spray when 6 rain events have been recorded, while for rotated peanuts spray after 8 rain events. To qualify as rotated, there should be no volunteer peanuts in the previous rotation crop. Or,

2. if leafspot is observed in the lower leaves of the plant (2 or more leafspots per plant), spray immediately even if the number of rain events in rule 1 has not been reached.

B. TIMING FOR SECOND AND ALL LATER SPRAY APPLICATIONS:

1. Discontinue fungicide applications if you are within 14 days of harvest. Or,

2. if you are more than 14 days from harvest, wait 10 days after the previous fungicide application, then begin counting rain events and checking the 5-day weather forecast.

a. Even if no rainfall has occurred yet, if the average rainfall probability for the next 5 days is 60% or higher, spray immediately. Or,

b. spray after 1 rain event if the average rainfall probability is 40% or greater for the next 5 days. Or,

c. spray after 2 rain events if the average rainfall probability for the next 5 days is 20% or higher. Or,

d. spray when 3 rain events have been recorded.

A.H. CHAPPELKA, B.G. LOCKABY, R.S. MELDAHL, and J.S. KUSH

Response of Field-Grown Loblolly Pine to Ozone and Acidic Precipitation

ACID RAIN and ozone are the most prevalent atmospheric pollutants causing damage to forests in central Europe and high elevations in North America. There is some concern by scientists that these pollutants are causing a slowdown in growth in Southern pines. As part of a 5-year regional project supported by the Southern Commercial Forest Research Cooperative of the USDA Forest Service, research at the Alabama Agricultural Experiment Station found ozone to have more direct effect on some pine genotypes, though both pollutants are potential threats to Southern forests.

Effects of acidic precipitation and ozone on loblolly pine were investigated using 24 large open-top chambers constructed with rain exclusion covers. Three acid rain levels were applied: pH 3.3, 4.3, and 5.3. Four ozone treatments were used: chambers with air filtered through charcoal to remove ambient ozone (CF); chambers with ambient air (NF); and chambers where ambient air was supplemented with two concentrations of ozone above ambient, see table.

Six-month-old, container-grown seedlings from two half-sibling families, differing in ozone sensitivity, were planted in undisturbed soil in January 1988. The seedlings were exposed to acid rain and ozone treatments beginning in the summer of 1988.

After 2 years, height and diameter growth and above-ground dry biomass for seedlings grown in chambers containing ozone at 2.5 times that of ambient air were 8%, 18%, and 26%, respectively, less than the seedlings grown in CF (ambient) air, for the ozone-sensitive family, see table. Ozone did not significantly affect growth or biomass production in the tolerant family. Ambient ozone (NF) did not appear to significantly affect growth after 2 years.

These data indicate that if ozone concentrations continue to increase in this area, reductions in timber growth are possible. Further research is needed, however, to determine if current levels of ozone are affecting other pine genotypes or other tree species, or predisposing trees to other stresses, such as drought.

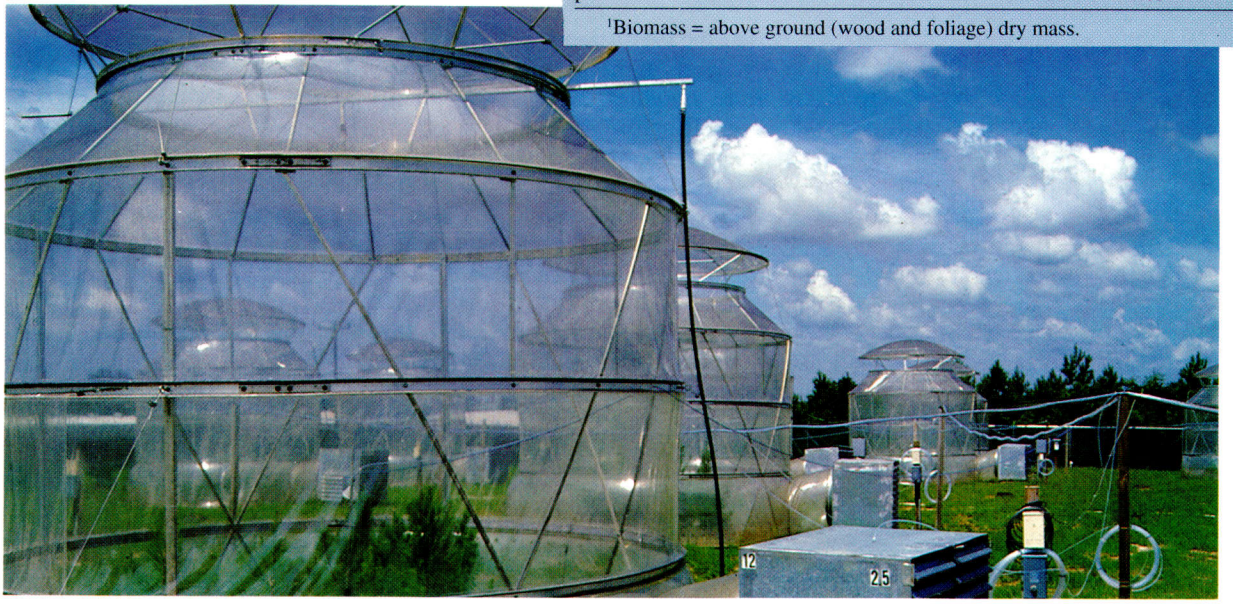
Trees tended to grow better at lower pH treatments (pH 3.3, 4.3) compared with those treated with pH 5.3 rain solutions, as noted in the table. The soil in which the trees were growing was deficient in N and P, and N inputs from the rain appear to act as a fertilizer. Because potential acid rain effects may be soil-mediated (aluminum toxicity, cation leaching, etc.), detrimental effects may not occur in just two growing seasons, but may take decades to appear.

Chappelka is Assistant Professor, Lockaby is Associate Professor, Meldahl is Assistant Professor, and Kush is Research Associate of Forestry.

Height and Diameter Growth and Above-ground Biomass by Family, Ozone, and pH Treatment for Loblolly Pine Saplings Exposed for Two Years in Open-top Chambers, Auburn

Treatment	Ozone-tolerant pines			Ozone-sensitive pines		
	Height	Diameter	Biomass[1]	Height	Diameter	Biomass
	In.	*In.*	*Oz.*	*In.*	*In.*	*Oz.*
CF	58	1.90	46	65	1.80	42
NF	62	1.95	40	65	1.75	35
NF X 1.7	60	1.80	34	66	1.75	34
NF X 2.5	64	1.98	48	60	1.65	31
pH 3.3	65	2.00	48	65	1.75	37
pH 4.3	60	1.85	41	69	1.80	41
pH 5.3	59	1.75	36	60	1.65	29

[1]Biomass = above ground (wood and foliage) dry mass.



Open-top plastic cylinders used to test the impact of ozone and acid rain on pine seedlings.

R. K. WALLACE, W.M. HOSKING, and C. L. ROBINSON

Environmental Factors Explain Shrimp Harvest Fluctuation

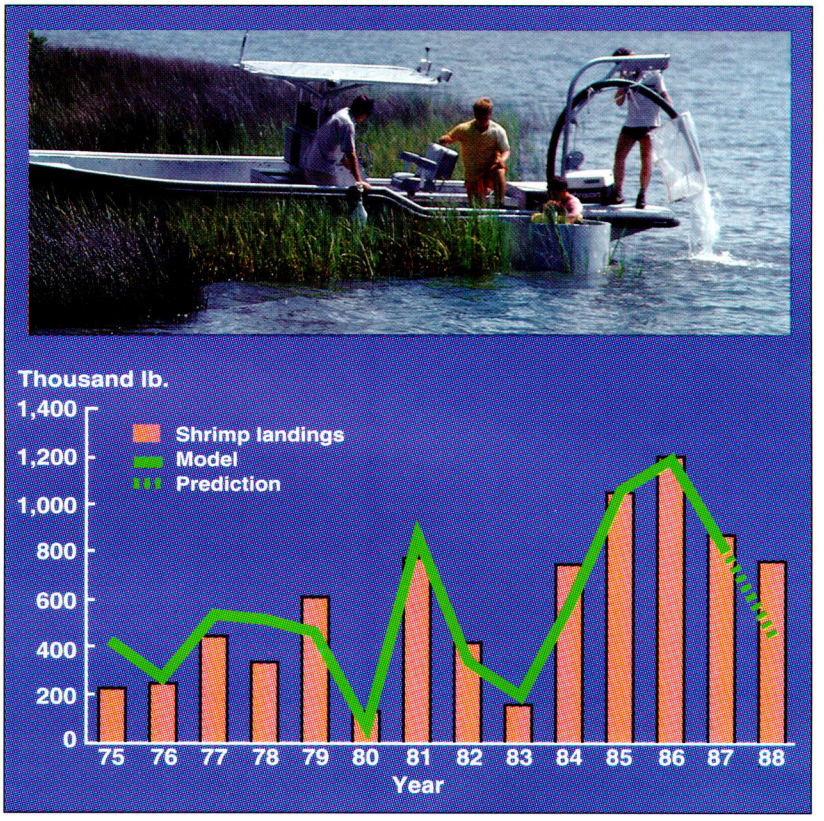
COMMERCIAL brown shrimp landings from Mobile Bay have fluctuated over the past 30 years, from a low of 110,000 lb. to a high of 1.2 million lb. Using environmental data from a 12-year period, Alabama Agricultural Experiment Station research was able to explain about 90% of this fluctuation.

Fluctuations in the shrimp population concern commercial and recreational fishermen, processors, and fishery managers. Fishermen are quick to blame managers and a variety of outside forces when the catch is poor and are quick to accept higher catches as the norm in good years. Research which defines and quantifies factors affecting shrimp production would help fishermen to have more realistic expectations and allow managers to better focus on conditions which may indeed contribute to declining populations.

Brown shrimp spawn in off shore waters of the Gulf during late winter. A single female may produce 500,000 to 1,000,000 eggs. After hatching, the microscopic shrimp larvae go through a series of developmental stages as they are carried toward shore by tides and current. As they approach coastal areas, they achieve the postlarval stage and seek the protection and food found in shallow bays and marshes (nursery areas). Here they become recognizable as juvenile shrimp. Upon reaching 1 to 2 in. in length, the shrimp begin to leave the shallows and slowly return (if not caught or eaten) to the Gulf to spawn and complete their life cycle. Brown shrimp generally do not live to spawn more than once, so production each year is dependent on a new crop of shrimp.

Results indicate there is no relationship between the catch in one year and the catch the previous year. Nor does there appear to be a relationship between the number of postlarval shrimp observed entering the coastal waters and the subsequent catch. However, there is evidence that environmental conditions found in nursery areas have a major effect on the number of shrimp available for harvest.

The AAES research, being conducted at the Auburn University Marine Extension and Research Center in Mobile, is seeking to determine if historically available environmental data can be used to explain past variations in the brown shrimp catch. Mobile River discharge, Mobile Bay water temperature, local rainfall, and wind (speed and direction) for 1975-87 were examined for their potential relationships to the shrimp harvest. These factors were compiled as monthly and half monthly averages, resulting in some 70 variables.



Brown shrimp prediction model (river discharge in January, precipitation the last half of March, and water temperature the first half of May). Inset: Researchers sample juvenile shrimp nursery in the Mobile Bay estuary.

High river discharges in early spring were correlated with low catches, while low discharges were correlated with high catches. However, river discharge in January had the highest correlation (0.70) with brown shrimp catch. When river discharge in January was combined with precipitation the last half of March and water temperature the first half of May, about 90% of the variation in shrimp landings could be explained, see graph.

The findings fit well with the known habitat requirements of shrimp, because low salinity water and low water temperature are not conducive to juvenile brown shrimp survival. High river discharge leads to low salinity conditions in nursery areas and is usually accompanied by low water temperature. Local rainfall further contributes to low salinity conditions.

The information also can be used to predict shrimp landings in advance of the season. January river discharge, March rain, and May water temperature were combined with landings in previous years to project 1988 landings (the last year with complete information). The mathematical model predicted a below average catch, while the actual catch was somewhat higher. Use of more precise field data from research should improve prediction capabilities.

Wallace is Associate Professor, Hosking is Professor, and Robinson is Senior Research Associate of Fisheries and Allied Aquacultures.

T.L. BARGE, J.R. HURST, and H.B. STRAWN

LONGEVITY AND STABLE WORK FORCE HELP SOUTHERN AG BUSINESSES SURVIVE

A RECENT three-state survey of agricultural businesses by the Alabama Agricultural Experiment Station indicates firms with many years in operation and a stable work force were more likely to survive the financial stress of the 1980's. Changes in credit policies and services offered also played key roles in survival.

The U.S. agribusiness sector expanded rapidly during the 1970's, evidenced by planted acreage of principal crops increasing an average of 1.6% per year from 1975 to 1981. Most sectors of the agricultural industry increased employment and production capacity to meet demand both at home and abroad. However, from 1981 to 1987, these trends reversed. In the South, acres planted in principal crops have declined 45, 41, and 24% for Alabama, Georgia, and Mississippi, respectively. As a result, demand for both agricultural inputs and commodity marketing services declined, and the agribusiness sector had to make adjustments to deal with the reduction in agricultural production.

In the AAES study, six counties with different types of farming systems were selected from Alabama, Georgia, and Mississippi. A directory of agribusinesses was developed for each county, and a brief questionnaire was sent to the firms, such as farm supply stores, machinery and equipment dealerships, and cotton and grain buyers, to collect general information concerning the type and scope of agribusinesses in that county.

Analysis of the agribusinesses in the study showed that most firms which survived the financial stress in agriculture during the 1980's had been established for some time and maintained the existing management throughout the downturn. The firms averaged more than 22 years in operation and almost 13 years under present management, indicating the importance of the professional reputation of the firm to its survival.

Sixty-eight percent of the agribusinesses preferred the advantages of limited liability, such as those a corporation can provide. These firms had substantial business holdings of more than $100,000 and employed an average of 10 persons.

Most surviving firms enjoyed larger volumes of business throughout the 1980's. In addition, many of the businesses that began operation during the decade increased sales to more than $1 million by 1988 by responding to customer needs in a particular area.

Changes in credit policies and extent of services offered were viewed by all types of agribusinesses as the most important areas in the survival of the firm. Most businesses also felt that their use of market information helped them make improvements such as recognizing changing farm enterprise combinations, demand for new producers and services, and non-agricultural opportunities. Changes in the number of employees, changes in product mix, and changes in advertising programs received only minimal credit for agribusiness survival.

To understand the actual changes that different types of agribusinesses experienced during the 1980's, six firms were selected for case study. The managers of the firms were personally interviewed to profile management strategies which allowed them to remain economically viable throughout the decade.

Several factors were common to the survival and success of each of the agribusinesses studied. Each manager had a strong understanding of the elements in the agricultural industry, and they were constantly evaluating the structure, direction, and economics of the sector in which they were involved. They recognized that agriculture is dynamic in nature and that examination of the driving forces that cause it to change both nationally and locally is necessary to formulate effective competitive strategies.

The importance of cash flow throughout the year was emphasized by all of the agribusiness managers. Industry-wide trends indicated more restrictive credit policies for customers stemming from the repayment problems that existed in the early 1980's. Most firms adopted a 30-day cash policy, and the continual monitoring of accounts receivable kept bad debt problems to a minimum.

The managers felt that they had built a strong reputation for providing excellent quality products and services at competitive prices with customers in their market areas, and they saw no need to mount direct attacks against their competitors. Rather, they retained existing customers and attracted new clientele by responding quickly and reliably to the changing markets in their area. For example, demand for lawn and garden products and services outpaced the demand for large scale agricultural inputs, and many firms aligned their product mix to the needs of the homeowner and small, part-time farmer.

Adding value to products by offering ready-to-use products or backing sales with quality service also was beneficial to increasing volume of business. Reducing the cost of providing goods and services also aided in keeping those firms profitable. Procurement costs of products were minimized by taking advantage of manufacturer incentives and by finding lower cost sources from which to purchase the items.

Retaining profitability during the contraction in the agricultural industry was crucial to the survival of agribusinesses. Increasing sales yields allowed for higher net revenues per unit sold. By maintaining detailed records of the cost of operating the business, information on per unit profit margins was obtained by allocating the costs among products and services. In turn, the managers solicited those segments of the market from which they could obtain higher per unit profit margins from sales.

The findings of this study indicate that the most critical element to the survival of agribusiness firms is a comprehensive understanding by management of the economic forces impacting the industry and the implications for their industry sector and a willingness and ability to make adjustments.

Barge is Associate Extension Economist; Hurst is Extension Economist; Strawn is Professor of Agricultural Economics and Rural Sociology.

M.D. CANNON, J.L. ADRIAN, and N.R. MARTIN

PROPOSED CAPITAL GAINS TAX REDUCTIONS WOULD INCREASE FARM FINANCIAL STRENGTH

CAPITAL gains is a major topic of discussion among U.S. lawmakers, and the issue is critically important to the Nation's agricultural industry.

Prior to the 1990 Congressional Budget negotiations, Ron Durst and Clifford Rossi, of the USDA Economic Research Service, analyzed the effects of alternative capital gains taxation proposals on tax liability and bid prices associated with Iowa farmland. Their methods and major assumptions have been applied in Alabama Agricultural Experiment Station research to determine how the current tax law and proposals would affect bid prices for Alabama farmland.

Primary issues concerning capital gains include effectively addressing treatment of such diverse assets as timber and corporate stocks, and handling variable holding periods, rates of inflation, and differential income levels of investors. The Tax Reform Act of 1986 discontinued the preferential effect of the 60% exclusion on capital gains income. This change has had an adverse effect on sellers of farm assets and timber who have relied on the capital gains exclusion for tax relief when assets are tied up for long time periods and inflation impacts value. Bid prices for farmland (prices that would yield a given after-tax return to the investor) have also been affected.

A proposal including a 45% exclusion for long-term capital gains was part of President Bush's 1990 Budget Proposal. Failure to pass this proposal led to consideration of variable percentage exclusions for capital gains in the President's 1991 Budget deliberations; that is, a 10, 20, or 30% exclusion for property held 1, 2, and 3 years, respectively.

Another capital gains proposal involves indexing for inflation. The current law, enacted in 1986, imposes taxes on the nominal change in value, not the real change. Thus, higher taxes result on the real gains when inflation is high. The primary objective of this AAES analysis was to see how farmland bid prices in Alabama would be affected by these alternative proposals for capital gains tax treatment.

The analysis is based on several assumptions: inflation rates of either 4 or 8%; a required after-tax rate of return of 6%; annual net income from land of $50 per acre; an investor tax bracket of 28%; and no real appreciation in land values. A 5-year holding period was used to determine short-term effects, while a 30-year holding period was used for testing the long-term effects of capital gains alternatives on the bid price, as illustrated by the table.

Using a 5-year holding period and 4% inflation, the bid price would be $524 per acre under the current law (no capital gains exclusions). Enactment of a 45% exclusion would increase the bid price by $32, or about 6%. The variable exclusion (10-20-30%) provision would increase the bid price by about 4% over the current law, to $545 per acre. However, the indexing proposal would increase the bid price of Alabama farmland to $600 per acre, a 14% increase over the current law.

At the 8% level of inflation and a 5-year holding period, the indicated bid price is $475 per acre under current law. The bid price would be understandably lower under 8% inflation because of the resulting higher real capital gains tax liability. Under 8% inflation, a 45% exclusion would increase the bid price about 10%, while the variable exclusion would increase it just over 6%, to $506 per acre. If inflation adjustments were imposed through indexing, the result would be a 26% increase in the bid price, to $600 per acre.

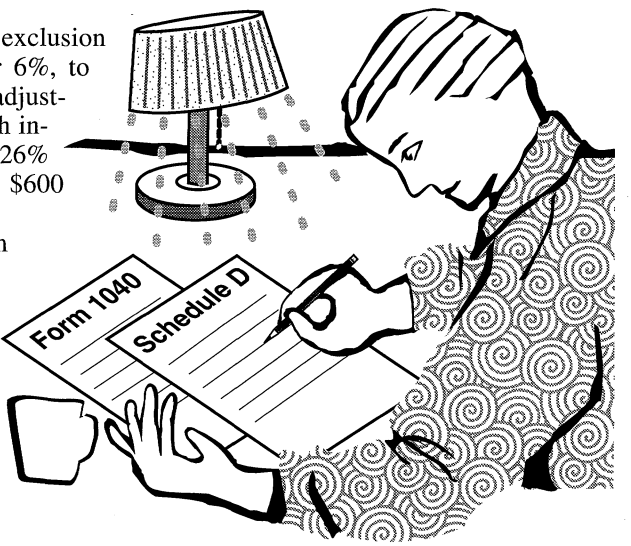
Analysis of the long-term effects of capital gains, using a 30-year holding period, indicated that bid prices exceed those under the current law for both 4 and 8% levels of inflation. Under a 45% exclusion, the bid prices would increase about 2%. With a 10-20-30% exclusion, the bid prices would increase about 1%, while with the indexing alternative it would increase about 5%.

The analyses show that all three proposals would be more favorable to sellers of farm assets and timber than the current law, especially under shorter holding periods and higher rates of inflation. The indexing alternative would encourage the highest per acre bid price. Higher bid prices would result in a stronger financial base for Alabama farmland owners. The proposed capital gains tax reductions could increase the financial strength of the farm sector and increase the attractiveness of investment in Alabama farmland.

Cannon is Graduate Assistant and Adrian and Martin are Professors of Agricultural Economics and Rural Sociology.

FARMLAND BID PRICES UNDER DIFFERENT CAPITAL GAINS TAXATION METHODS, 5-YEAR AND 30-YEAR HOLDING PERIODS AND 4% AND 8% INFLATION

Capital gains alternatives	Bid price by inflation rate and holding period			
	4% inflation		8% inflation	
	5-year holding period	30-year holding period	5-year holding period	30-year holding period
Current law	$524	$577	$475	$571
10-20-30% exclusion	545	584	506	586
45% exclusion	556	587	524	584
Indexing	600	600	600	600



G.E. AIKEN, S.E. SLADDEN, and D.I. BRANSBY

USING HIGHER MOWING HEIGHTS IMPROVES QUALITY OF BERMUDAGRASS HAY

FREQUENCY of mowing bermudagrass affects both yield and quality of hay. Frequent harvesting results in low yields and good quality, while infrequent harvesting boosts yield but reduces hay quality. Higher yields from delayed harvesting can provide some compensation for the low quality, but this is of little benefit if the goal is to produce high-quality hay. Mowing height is another factor known to affect yield and quality and using a higher mowing height could possibly offset the adverse effect that delayed harvesting has on bermudagrass quality. This possibility was investigated in the summer of 1990 on an existing stand of Coastal bermudagrass at Auburn.

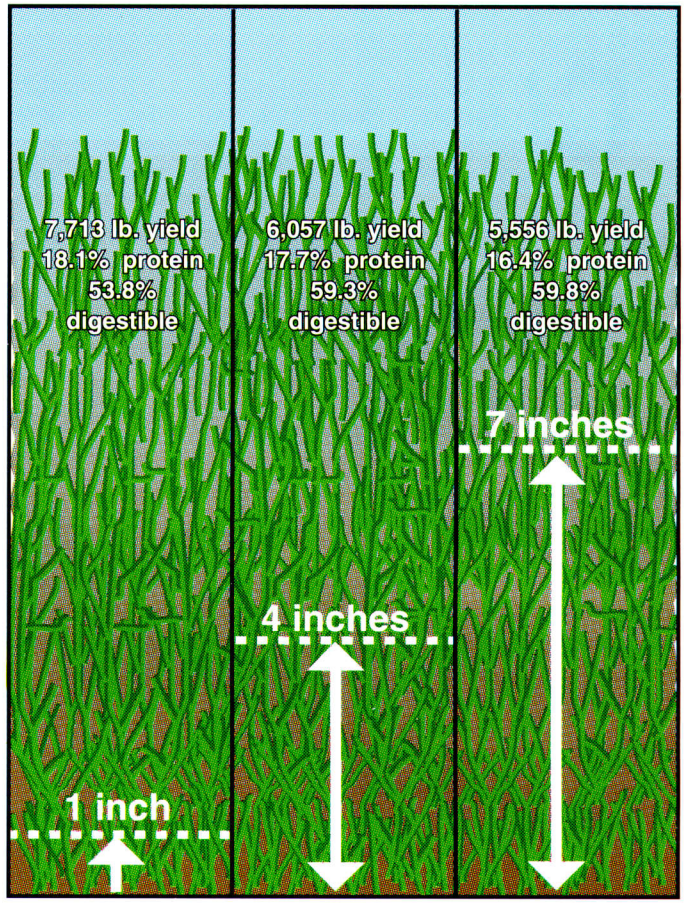
Plots were mowed with different combinations of three mowing heights (1, 4, and 7 in.) and five mowing intervals (1, 2, 3, 4, and 6 weeks) over a 12-week period. Prior to mowing, the plots were fertilized with nitrogen, phosphorous, and potassium at rates of 150, 44, and 166 lb. per acre, respectively. Nitrogen and potassium were each applied again at the midpoint of the study with rates of 150 lb. per acre. Irrigation was applied weekly to maintain active growth. Total yield and contents of protein and digestible organic matter were compared among treatments.

Averaged over all mowing heights, dry matter yield increased and forage quality decreased as mowing interval was extended. Yield for the 6-week mowing interval was 85% higher than that of the 1-week interval. Even though heavy applications of water and nitrogen fertilizer facilitated high crude protein levels for all mowing intervals, crude protein decreased 43% between the 1- and 6-week mowing intervals. Digestible organic matter decreased 14% between the 1- and 6-week mowing intervals. These decreases in forage quality were likely due to the higher proportion of stems to leaves as the mowing interval was extended.

Dry matter yields decreased 28% between the 1- and 7-in. mowing heights (average of all mowing intervals). The greatest declines (21%) in yield were between the 1- and 4-in. mowing heights; declines between the 4- and 7-in. mowing heights were only 8%.

Crude protein and digestible organic matter were opposite in their responses to increased mowing height. Between the 1- and 7-in. mowing heights, crude protein decreased 9% and digestible organic matter increased 11%.

Forage quality was affected differently by mowing height among mowing intervals. Although crude protein decreased as mowing height increased, declines for the 4- and 6-week intervals were small. Digestible organic matter increased with higher mowing heights, but the increases were less as mowing interval increased.



Effect of clipping height on yield and quality of Coastal bermudagrass hay, average of all mowing intervals.

A 4-week mowing interval for bermudagrass is generally assumed to produce good quality hay with acceptable yields. Yields for this interval were 11% lower than for the 6-week interval, but crude protein and digestible organic matter contents were 33% and 7% higher, respectively.

Differences between the 4- and 6-week mowing intervals confirm that, as mowing intervals are extended, yields will increase at the expense of quality. However, crude protein for the 6-week mowing interval was approximately the same for the three mowing heights; digestible organic matter content increased between the 1- and 4-in. mowing heights. This suggests that bermudagrass which has grown beyond a 4-week maturity could be mowed at a taller height to produce relatively higher quality hay than would be produced using a 1-in. mowing height.

Yield and crude protein were both lower for the 6-week mowing interval and 4-in. cutting height than for a 4-week interval and a 1-in. mowing height. However, digestible organic matter was approximately the same for the two heights. Forage quality was similar between the 4- and 7-in. mowing heights at the 6-week interval, but the 7-in. height was 20% lower in yield.

In this study, bermudagrass hay harvested at 6-week intervals was lower in quality than if harvested at 4-week intervals. Mowing 6-week-old bermudagrass to a 4-in. instead of a 1-in. height increased quality, although yield was reduced. There appears to be no advantage to mowing higher than 4 in. because yields will be reduced without further enhancement of forage quality.

Aiken is Postdoctoral Fellow, Sladden is Research Assistant, and Bransby is Associate Professor of Agronomy and Soils.

M.K. CAUSEY

Nutrition Enhances Growth and Antler Development of Alabama White-Tailed Deer

WHILE ALABAMA'S white-tailed deer population has experienced phenomenal growth in numbers during the past several decades, many sportsmen are noticing a reduction in average body size and antler quality. Because of this, the most common request for information directed to Auburn deer researchers is "How can we produce bigger deer?"

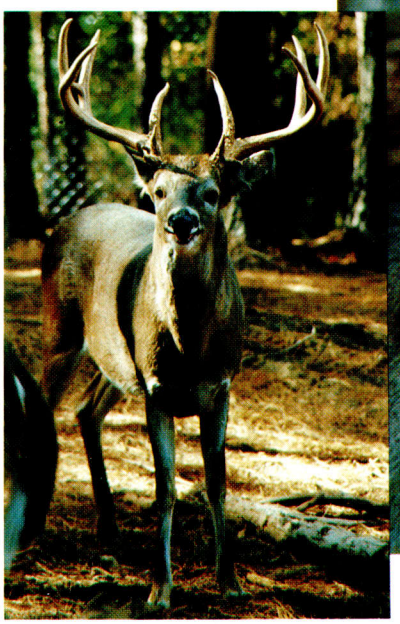
Age, nutritional plane, and genetic potential all are factors in the body and antler size of white-tailed deer. Of these, genetics is the most difficult to manage in a wild population and is the least significant factor in contemporary management. An Alabama Agricultural Experiment Station study begun in 1986 was designed to evaluate the impact the other two factors have on body and antler growth of Alabama white-tailed deer.

A random sample of 25 male fawns was captured from throughout the State for the test. The test deer were bottle-fed and then weaned onto a custom-blended, pelleted experimental diet containing 22% protein and all the known nutrients required by white-tailed deer for maximum growth and antler development. The study pens contained little or no natural foods, but deer were allowed unlimited access to the pelleted feed. All study animals were weighed and measured at 18, 30, and 42 months of age. Antler measurements were taken and included total weight, main beam length, inside width, and point number.

The weights of the 18-month-old male deer ranged from 111 to 150 lb. and averaged 129 lb. Antlers averaged 4.2 typical points, ranging from 2 to 8 points. At 30 months of age, well-fed male deer averaged 170 lb. body weight (ranging from 135 to 210) and had antlers averaging 7.7 points. At 42 months of age, deer weighed between 185 and 240 lb. (average 214) and grew antlers averaging 8.2 points each (ranging from 5 to 13).

Considering that male white-tailed deer do not reach their prime until 6-8 years of age, these results indicate that the 2- to 3-year-old research animals exhibited remarkable growth. Fifteen of 21 study animals weighed in excess of 200 lb. at 42 months of age and 4 of these weighed over 235 lb. each. Antler development was very good in all study animals and was exceptional in five 3-year-olds which had massive antlers with inside widths of 20 in. or more.

This study shows that quality of feed and age of the animal directly influence the body size and antler development of Alabama's white-tailed deer. These data suggest that supplemental feeding and restricting harvests of young deer would increase the numbers of quality animals in most Alabama habitats. Supplemental feeding may include planting high quality cool and warm season forages or providing pelleted rations to the wild deer. Research is underway to determine the best feeding strategies and help develop pelleted feeds for this use.



Good nutrition helps white-tailed deer produce impressive antlers and increases their body size.

Causey is Professor of Zoology and Wildlife Science.

C.W. WOOD and D.W. REEVES

Field Chlorophyll Measurements May Predict N Needs of Crops

BEING ABLE to predict nitrogen (N) requirements for crops would allow precise applications for efficient N use and protection against surface water contamination with nitrate. Unfortunately, such prediction is difficult. Soil tests have been used successfully in the West, but climatic conditions disallow their use in the humid Southeast. Tissue N tests have shown promise during early crop growth stages, but time for sampling and analyses prevents their timely use.

Measurement of leaf tissue chlorophyll, which is directly related to leaf tissue N, has been proposed as a useful tool for predicting N needs. If successfully correlated with crop yields, field chlorophyll tests have the potential to replace leaf N tissue tests to provide a simple and quick method of predicting N needs.

Hand-held meters are currently available for making chlorophyll measurements, and one of these showed promise for predicting corn N needs in 1990 Alabama Agricultural Experiment Station tests. The meter used weighs less than 1/2 lb., is powered by two AA alkaline batteries, has a 2-second interval between measurements, and can store and average up to 30 measurements. The meters read out in SPAD units, which are directly proportional to tissue chlorophyll content.

The meter was tested on corn at the E.V. Smith Research Center, Shorter. Field chlorophyll measurements and leaf tissue N concentration at the 10-leaf stage of growth (V10) were compared as to their ability to predict corn grain yield and the need for supplemental N fertilization. The relationship between yield and N concentration or chlorophyll level at that growth stage was chosen because the V10 stage of growth is late enough to predict the need for supplemental N but early enough for corn to fully utilize applied N.

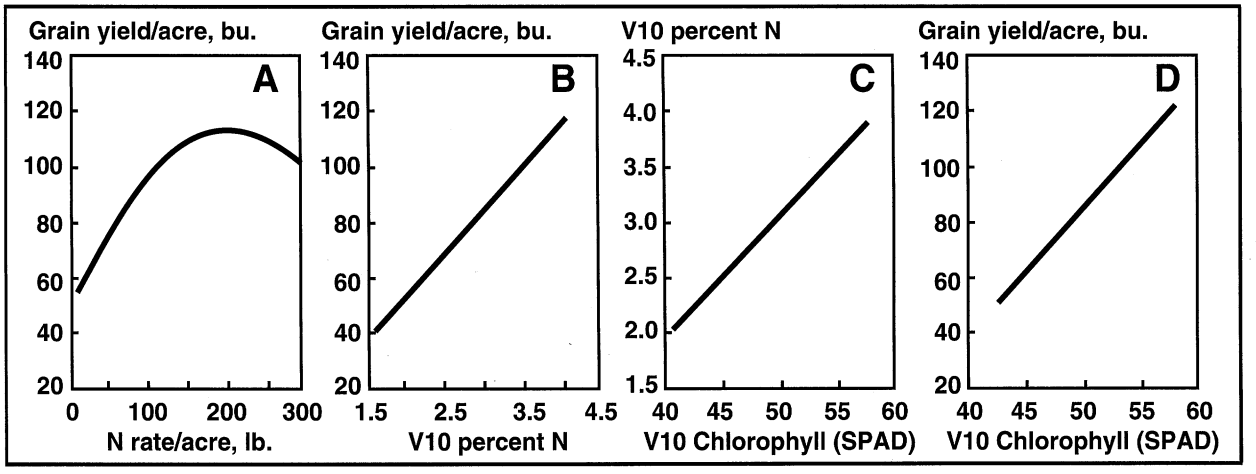
Corn (Dekalb 689) was planted April 18 and nitrogen was broadcast on the soil surface at rates of 0, 50, 100, 150, 200, 250, and 300 lb. per acre 12 days after planting to establish a range of chlorophyll levels, tissue N concentrations, and grain yields. All plots were fertilized with phosphorus, potassium, sulfur, and micronutrients to ensure that elements other than N were not limiting. Irrigation water was applied as needed.

Corn plants were sampled at the V10 stage June 1 for N analysis. Chlorophyll was measured the same day with the hand-held chlorophyll meter. Grain was harvested August 28 and is reported at 15.5% moisture.

A typical response to N fertilization was observed, with peak grain yields of about 115 bu. per acre for 150 to 200 lb., graph A. Higher N rates caused yields to decline.

Tissue N concentration at the V10 stage of growth was a good predictor of grain yield. Grain yields increased linearly with increasing N concentrations at the V10 stage of growth, graph B. In the N rate range that produced peak grain yields (150 to 200 lb.), V10 tissue N concentrations were between 3.7 and 4.0%.

Field chlorophyll measurements were highly correlated with tissue N concentrations at the V10 stage of growth, graph C. The relationship was linear and suggested that field chlorophyll measurements could equal the grain yield and N requirement predictive capabilities of tissue N concentrations. In fact, grain yields were more closely related to V10 chlorophyll, graph D, than to V10 N percent, graph B. The 150- to 200-lb. N rate corresponded to chlorophyll SPAD readings of 55.5 to 56.7, the range equivalent to V10 tissue N concentrations between 3.7 and 3.8%. This agrees closely with the relationship between grain yield and N concentration at the 10-leaf stage. These results suggest that a SPAD reading of 55.5 at the V10 stage of growth might be the threshold level when N should be applied.



Relationship among (A) N rate and grain yield, (B) V10 tissue N concentration and grain yield, (C) V10 tissue chlorophyll level and V10 tissue N concentration, and (D) V10 tissue chlorophyll level and grain yield.

In summary, it appears that field chlorophyll measurements may serve as a good predictor of need for supplemental N fertilization for corn. Field chlorophyll measurements may be superior to chemical tests because of reduced time and increased convenience when compared to tissue chemical analysis.

Wood is Assistant Professor of Agronomy and Soils; Reeves is Research Agronomist, USDA-ARS, National Soil Dynamics Laboratory.

J. MIZE, S. F. DUNCAN, and W. H. NEWELL

GOOD PARENT/CHILD COMMUNICATION HELPS LATCHKEY CHILDREN COPE

LATCHKEY children—those who spend time alone or with a young sibling before or after school—are often thought of as being frightened or unhappy. But this was not the situation with a group of rural Alabama latchkey children who were interviewed in an Alabama Agricultural Experiment Station survey. These youngsters used the terms confident, safe, grown up, and happy more than any others in describing their feelings.

The AAES study was done because rural area dwellers face the same problem as urban dwellers in caring for children. Just as their urban counterparts, many farm and other rural families are characterized by both parents working away from home so that children come home from school to an unsupervised house.

Conservative estimates indicate there are from 2 to 6 million latchkey children in the United States—and maybe considerably more. These children are between 6 and 13 years old, but some even younger spend time at home without adult supervision, from a few minutes to several hours each school day. Lack of affordable child care in many rural areas and the separation of extended families by urban migration make it difficult for many families to locate after-school care in rural areas. Thus, the problem is of significant proportions.

Forty parents and children living in a rural area (6 farm families and 32 rural dwellers who were not involved in agriculture) were surveyed. Information sought related to safety of the neighborhood in which they lived, parents' childbearing patterns, after-school child care arrangements, and the parents' and children's satisfaction and comfort with the arrangements. Parents and children completed questionnaires separately.

In 70% of the families, both husband and wife worked, and the yearly income of half of the families was over $30,000 a year. The average age of the children was 10 years, and the range was from 8 to 14.

Most families reported that the child was alone at home without adult supervision at least occasionally — 63% said at least weekly and about 30% said it was every day or almost every day. Some children had started staying completely alone (without even a sibling) as early as 5 or 6, but most did not stay home completely alone until they were at least 10. Of the limits parents said they placed on children at home alone, about two-thirds were required to stay inside when parents weren't home. Almost 90% were not allowed to have any friends inside while parents were away. Most children (63%) said they "always" followed rules established by parents when home alone.

Rural youngsters used the terms confident, safe, grown up, and happy in describing their feelings

Many descriptions of urban latchkey children depict them as being afraid to come home alone. But are rural latchkey children equally uncomfortable? Children were asked to indicate whether they always, sometimes, or never felt scared, lonely, confident, and safe when home alone. Parents responded to a similar set of questions. In general, both children and parents described children as being quite comfortable when home alone. For instance, 94% of the children said they sometimes or always felt they could take care of themselves when home alone, although 70% said they sometimes felt scared.

Unfortunately, there was little agreement between individual parents and children as to how comfortable the child felt when home alone. Parents' perceptions that their children felt comfortable were influenced by how safe the parent believed the neighborhood to be and how much warmth and affection they said they showed to the child. Children's feelings, however, were not influenced by the same factors. Instead, children's feelings of comfort were predicted by their age, the amount of time they spent alone, and the degree of involvement they had in the parent-child decision-making process. That is, children who were older and who spent relatively less time without adult supervision felt more comfortable when they were home alone.

Children who were allowed some input into decisions such as how to spend an allowance, at what restaurant the family would eat, or what cereal to buy at the store were more comfortable staying home alone. Parents of children who felt more comfortable did not allow children complete freedom in these matters, but rather described themselves as discussing the issues with the child before making a decision or allowing the child to make the decision.

The results of this study have implications for helping the thousands of Alabama families who are faced with leaving children home without adult supervision. Since both age and amount of time alone predicted how comfortable children felt with the latchkey situation, parents should consider how much time alone is "too much." It may be possible for parents to find other child care options for part of some days, especially when children are younger. More surprisingly, it appears that parents may not be as aware of children's feelings about the latchkey situation as they thought. This suggests that there would be value in open discussions between parent and child regarding staying home alone. This idea is reinforced by the fact that children felt more comfortable staying alone when parents engaged them in discussions about decisions that affected the child. Children allowed some input in the decision-making process may come to feel more confident of their own abilities in a wide range of situations, including staying home alone.

Although most programs designed to help latchkey children focus primarily on teaching children safety skills for staying alone, data from this study suggest the value of discussion between parents and children about the latchkey situation and the involvement of the child in decisions concerning the situation.

Mize is Associate Professor, Duncan is Assistant Professor, and Newell is a graduate student in Family and Child Development.

L.L. HYCHE

Research Provides Insight into Habits of Yellow-Poplar Leaf-Mining Weevil

YELLOW-POPLAR, also known as tuliptree, is a prized ornamental shade tree in many urban and suburban areas. Unfortunately, its attractiveness can be greatly damaged by a small snout beetle, the yellow-poplar leaf-mining weevil[1].

Damage by these weevils occurs when adults feed on and larvae mine in yellow-poplar leaves. Infestations in natural forest stands occur only occasionally, are limited in scope and duration, and usually pose little threat to the yellow-poplar as a timber tree. However, in ornamental settings the weevil can be an important pest as its damage to foliage reduces the aesthetic value of trees and affects survival of young yellow-poplar transplants.

During 1989-90, a study was conducted at the Alabama Agricultural Experiment Station to learn more about the life cycle and habits of this pest. Trees involved in the study were young yellow-poplars located in the Auburn area.

Research results show that the weevil is active in the spring in Alabama. Weevil adults overwinter in the organic debris (duff) and litter found on the ground beneath the tree. Following budbreak in host trees, they emerge and feed on the undersurface of leaves, removing small oval-oblong patches of the lower leaf surface, figure 1. In the Auburn vicinity, this activity begins in mid-March. Weevils mate and females begin to lay eggs during the last half of March. Most eggs are laid during April, but some egg-laying continues through May.

Eggs are laid in the midrib of the leaf on the underside. The female punctures the midrib with her snout, figure 2, and deposits one to three (usually two) eggs in each puncture, figure 3. Commonly, there are four or five egg punctures at each egg-laying site and only one site per leaf. Midrib tissue at the site dies and the leaf usually breaks at this point.

Larval mines begin to appear in leaves as early as April 1 in the Auburn area. Larvae feed side by side in groups in a single mine leading away from the midrib. The number of larvae mining a leaf will vary. Commonly, 4 to 15 larvae can be found per leaf, though one leaf examined contained 21 larvae. Full-grown larvae, figure 4, are about 1/4 in. long. Pupation takes place in the larval mines in spherical silken cells, figure 5, and new-brood adults begin to emerge in mid-May.

New adults feed primarily on the lower leaf surface as did their parents, but feeding is more extensive and damage to the foliage is far greater. Attacks are largely on leaves not already damaged by the larval mining. Typically, new weevil feeding begins at leaf edges in the apical portion of the leaf blade, figure 6, and may progress until the entire leaf is destroyed.

The duration of new weevil activity appears to be about 3-4 weeks and, in the Auburn area, usually ceases by mid-June. Weevils move to the duff and litter and remain inactive until the following spring when they emerge to begin a new cycle. Thus, there is only one weevil generation per year.

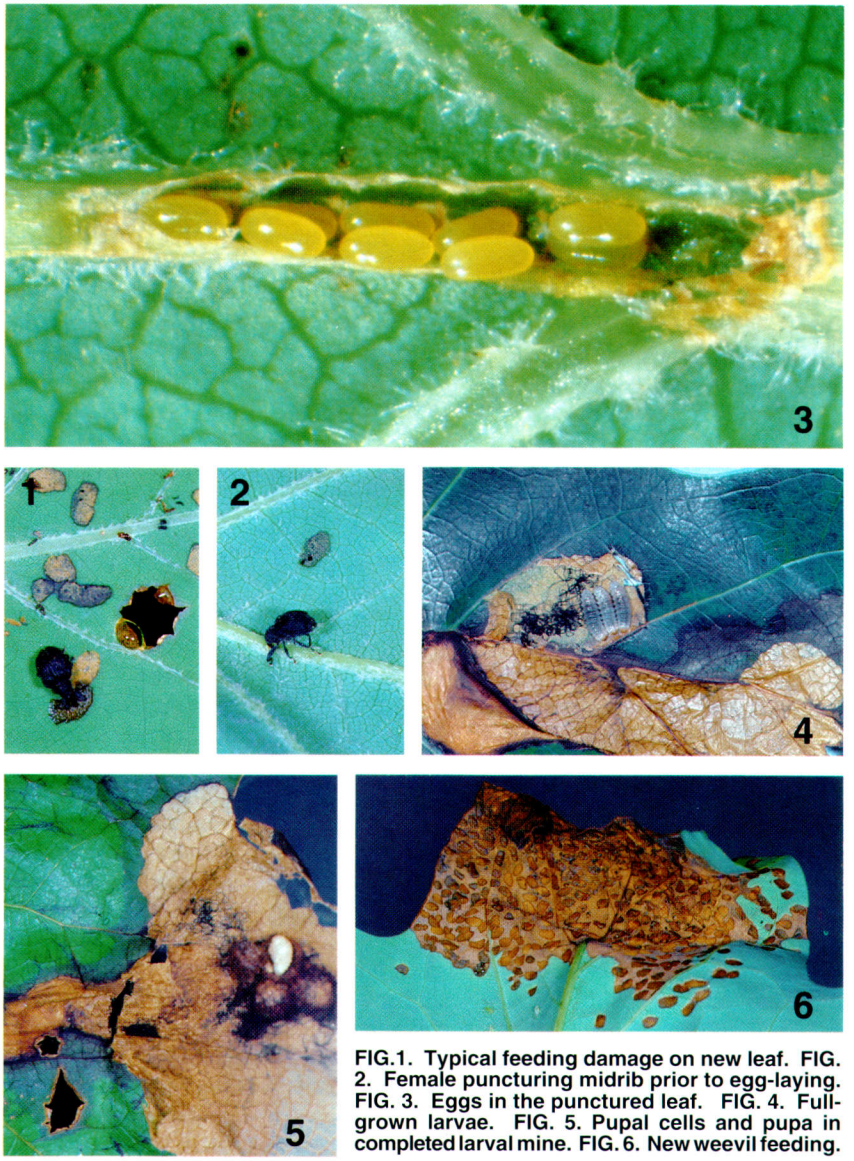


FIG.1. Typical feeding damage on new leaf. FIG. 2. Female puncturing midrib prior to egg-laying. FIG. 3. Eggs in the punctured leaf. FIG. 4. Full-grown larvae. FIG. 5. Pupal cells and pupa in completed larval mine. FIG. 6. New weevil feeding.

[1] Scientific name, *Odontopus calceatus.*

Hyche is Associate Professor of Entomology.

K.L. BOWEN, A.K. HAGAN, C.H. GILLIAM, and D.C. FARE

REGULAR TREATMENT STILL BEST CONTROL FOR ROSE DISEASES

ROSES ARE among the most popular flowers grown by homeowners, but growing healthy roses can pose some thorny management problems. Control of diseases, such as blackspot, is particularly nettlesome. However, new research suggests that regular treatment of roses with systemic fungicides can effectively restrict the spread of disease.

Blackspot, caused by the fungus *Diplocarpon rosae*, is the most common and damaging disease of backyard roses. This fungus produces microscopic spores that are easily carried on wind currents from diseased plants or leaves to healthy ones. Fungal spores need only a small amount of moisture to germinate and infect plants.

Because there is currently no known way of preventing spore formation on diseased leaves, control of blackspot depends on protecting healthy leaves. Fungicides are used to protect healthy plants from becoming infected by killing fungal spores during germination or shortly after infection. Unfortunately, fungicides may require regular reapplications as exposure to sun and rain or rapid plant growth cause them to gradually lose their effectiveness.

The Alabama Cooperative Extension Service recommends regular applications of fungicides at 1- to 2-week intervals in order to grow disease-free roses. However, homeowners frequently run into problems due to inclement weather, lack of time, or reluctance to use pesticides.

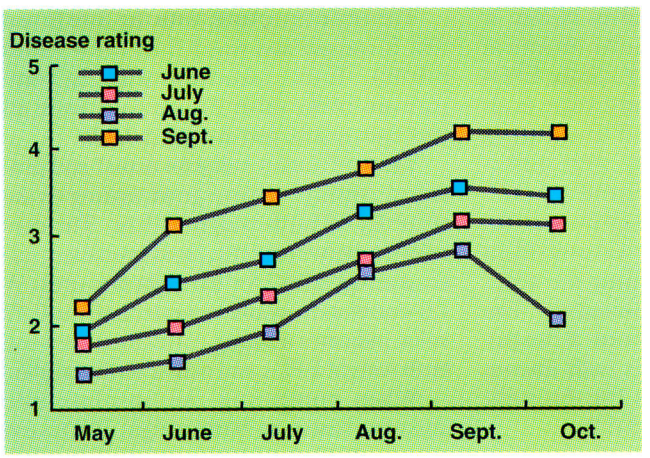


FIG.1. Effectiveness of two fungicides, applied at different intervals.

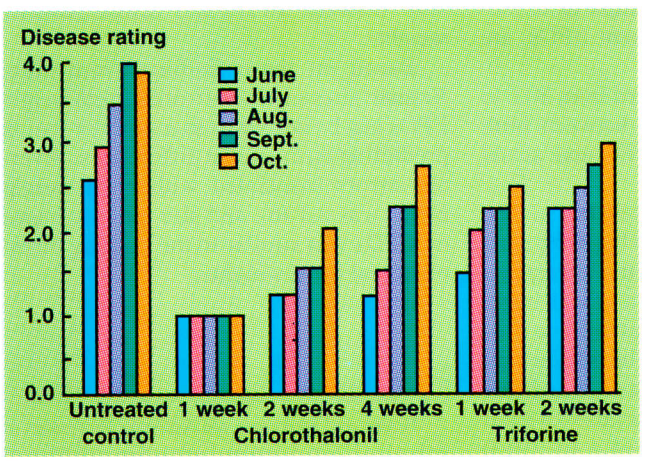


FIG. 2. Average blackspot disease progress over three seasons.

During the past decade, systemic fungicides have become more readily available to homeowners. Systemic fungicides have longer intervals of effectiveness against many fungi because they are absorbed by plant tissue and are not washed off by rain or degraded by the sun. One of the systemics, triforine, was compared to a nonsystemic, chlorothalonil, in an Alabama Agricultural Experiment Station study that evaluated application requirements of the two materials.

Both triforine and chlorothalonil are widely available to homeowners. Triforine (Funginex Rose®), the systemic, is labeled for application to roses for control of fungal diseases. It has fairly low toxicity, but is corrosive. Chlorothalonil (Bravo® or Daconil®) is a nonsystemic fungicide often used for blackspot control on roses. Chlorothalonil is a protectant fungicide, marketed since the mid-1960's, that withstands weathering and has moderate toxicity.

The fungicides were applied at 1-, 2-, or 4-week intervals with a hand-pump, compressed air sprayer. Rose plants treated with fungicides were rated according to the intensity of blackspot that occurred. A rating of "1" indicated that plants were disease-free; a "5" indicated that blackspot lesions were numerous and plants were severely defoliated. Blackspot intensity ratings were taken monthly through three summers.

While all fungicide treatments proved effective compared to an untreated control, the best disease control was obtained when fungicides were put on at weekly intervals, figure 1. Disease ratings on plants treated with chlorothalonil, applied at 1- or 2-week intervals, were lower throughout the season than on plants treated with triforine at weekly intervals, figure 2. Four-week intervals between chlorothalonil applications provided blackspot disease control that was comparable to triforine at 1- or 2-week intervals.

These results suggest that both fungicides can be effective if applied at regular intervals. Continual improvements are being made in chemical control of diseases, yet with blackspot of rose, the frequency of fungicide applications is the primary determinant of the effectiveness of that control. New fungicides are not always better or even safer to use, particularly when numerous applications of these fungicides are needed for effective control.

It should be noted that fungicides alone may not be enough to effectively control blackspot. Sanitation practices, such as removing dead leaves from the ground and leaves with disease lesions from the plants throughout the season, may also be necessary to guard against disease.

Bowen is Assistant Professor and Hagan is Associate Professor of Plant Pathology; Gilliam is Professor and Fare is Research Associate of Horticulture.

J. D. HOUGH, D. R. MULVANEY, and J. A. LITTLE

EPDs Predict Birth Weight Differences among Calves from Different Sires

ONE OF the newer management tools available to beef producers is "Expected Progeny Differences," commonly referred to as EPDs. An EPD is an estimate of the genetic merit of an animal—reported as pounds, inches, or other standard units of measure. Nearly every major U. S. beef breed association conducts a national genetic evaluation program and publishes an annual summary of sires' EPDs for many traits.

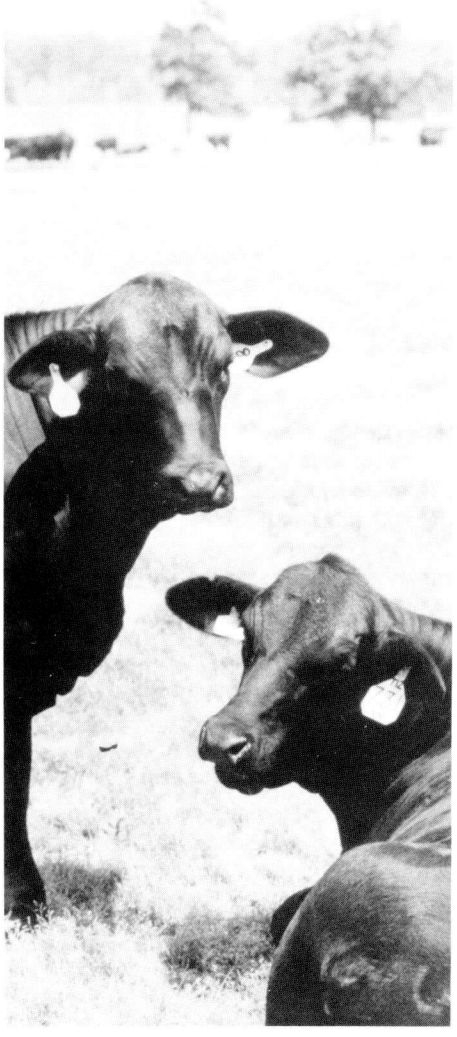
Use of EPDs in predicting birth weight differences of calves is being studied in Alabama Agricultural Experiment Station (AAES) research. Early results indicate the usefulness of this approach in managing a breeding program. With EPD information on sires, matings can be made to minimize problems associated with excessive birth weights in young, small females or to achieve other desired results.

A fact to remember is that EPDs only provide performance comparisons among individuals, they do not give predictions of actual levels of performance. For example, Sire X in a herd has a weaning weight EPD of -13 lb. and Sire Y in the same herd has an EPD of +11 lb. As an average, calves of Sire X would be expected to weigh 24 lb. less at weaning than calves of Sire Y. Since EPDs are only estimates, an accuracy value is always given with the values. The accuracy values range from 0 to 1, with higher values indicating greater reliability.

EPD Values Versus Actual Calf Birth Weights

Sire	EPD	Accuracy[1]	Actual birth weight, average	Number of calves
	Lb.		*Lb.*	
A	-1.7	0.74	87.9	15
B	-3.4	.93	80.6	16
C	2.4	.55	89.7	11
D	0.7	.92	89.0	8
E	3.0	.66	95.0	17
F	1.9	.93	93.0	20
G	-1.0	.24	86.3	13
H	-1.4	.22	89.3	7
Average	0.2	.69	89.0	13.4

[1]Accuracy ranges from 0 to 1, with higher values indicating greater reliability.



The AAES research with EPDs was begun in 1988 at the Lower Coastal Plain Substation, Camden, to evaluate the accuracy of birth weight EPD estimates. The study involved 107 purebred Brangus calves sired by eight bulls with known birth weight EPDs. EPDs for the eight bulls ranged from -3.4 to + 3.0 lb.

An average of 13.4 calves was produced by each sire, with a minimum of 7 and a maximum of 20 by a single sire. Detailed results, which offer 28 comparisons between sire pairs with different EPDs, are reported in the table.

Actual birth weights ranged from 80.6 to 95.0 lb. The average error between birth weights predicted from EPDs and actual birth weights was 3.1 lb.

The largest error between actual and predicted birth weights was between sires B and E. Sire B's EPD was the lowest and he produced the lightest calves at birth. Sire E's EPD was the highest and he produced the heaviest calves at birth. The predicted difference between Sire B's and Sire E's calves was 6.4 lb. (3.0 minus -3.4), but the actual difference was 14.4 lb. (95.0 minus 80.6).

The error associated with the Sire B and Sire E comparison was 8.0 lb. (14.4 minus 6.4 lb.). Errors associated with the comparisons of the other 27 sire pairs were all less than 8.0 lb. and averaged 3.1 lb.

The correlation between actual and predicted values provides a good reading on the accuracy of birth weight EPDs. The correlation between actual and predicted values averaged 0.87 for the eight test sires. A 1.0 correlation would be perfect, so the 0.87 value indicates a strong correlation between birth weight EPDs and actual birth weights.

When comparing the absolute sire rankings based on birth weight EPDs and actual calf birth weights, none of the sires was more than two positions out of order. This further established a strong relationship between EPDs and actual progeny weights.

Based on these findings from eight Brangus sires and 107 offspring, birth weight EPDs can be described as a superior tool in predicting birth weight differences. Average errors associated with birth weight EPDs was 3.1 lb., and sire ranking based on EPDs was similar to the ranking based on actual birth weights.

Hough and Mulvaney are Assistant Professors of Animal and Dairy Sciences; Little is Superintendent of the Lower Coastal Plain Substation.

R.A. SHELBY and S.P. SCHMIDT

LIVESTOCK MAY INFECT FUNGUS-FREE FESCUE PASTURES

WHEN A TINY endophyte fungus was identified as the cause of toxicity problems in livestock grazing tall fescue, many livestock producers began investing substantial amounts of time and money to establish fungus-free pastures. Recent Alabama Agricultural Experiment Station studies suggest that those costly efforts may be slowly sabotaged as animals graze these pastures.

A study was begun after several pastures of fungus-free fescue at the Black Belt Substation, Marion Junction, and the Piedmont Substation, Camp Hill, began to show puzzling infection sites after years of being noninfected. Since the fungus does not make spores and is spread only by infected seed, it was suspected that the cattle might be spreading fescue seed and its associated endophyte in their feces.

This theory was tested by confining a single steer in a small enclosure so feed intake could be strictly regulated and fecal samples could be easily collected. After 7 days of a seed-free diet, the steer was given a single meal containing live endophyte-infected fescue seed. Feces were collected at intervals, dried, and planted in the greenhouse so live seeds could germinate. When the plants emerged, they were examined for the presence of endophyte.

Results indicated that about 12% of the live seed which were fed to the steer were still viable after passing through the animal's digestive system. These seed were able to germinate into live plants and, of these, about 12% were still infected. Thus, about 1.4% of the fungus-infected seeds consumed by the steer germinated and grew into fungus-infected plants. This compares to a 91.5% germination rate on nonfed control seeds, 97.5% of which were infected.

Live seed were recovered beginning at 10 and lasting as long as 84 hours after feeding. The maximum was 8.25 live seed per gram of feces at 22 hours after feeding, as shown in the figure. The last infected seed was recovered at 38 hours after feeding and the last live noninfected seed was recovered at 84 hours after feeding. Thus, the fungus apparently dies at a faster rate than the seed while in the animal's digestive tract.

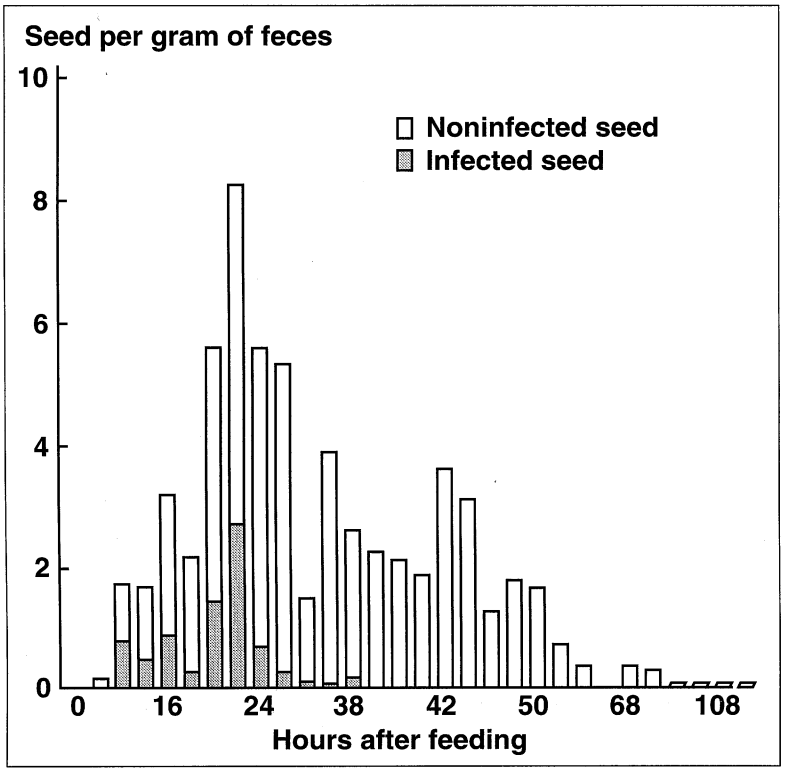
To test the passage of seed under more normal conditions, steers were allowed to graze an endophyte-infected field which had made seed. The steers were then moved to a noninfected seed-free field and fecal samples were collected for 6 days. In this case, the chronology of seed passage was similar to the first experiment, but the overall seed counts were somewhat lower.

The average steer passed 1.13 live seeds per gram of feces, which declined to zero by the fourth day after removal from the infected seed diet. Horses allowed to graze infected seed also passed live infected seed, although at a somewhat lower rate. A single sample from each of five mares averaged 0.44 live seed and 0.37 infected seed per gram of feces. The percent germination of nonfed control seed in this study was 48.3%, of which 97.8% were infected.

These data indicate that livestock are capable of spreading the endophyte, but only under certain conditions: (1) the animals must eat live infected seed either from standing plants in the field or from hay which was cut when seed were present, (2) animals are moved directly to endophyte-free pastures without a quarantine period, and (3) seed in the feces must be exposed to moisture and temperature conditions that favor germination and survival of the young plants.

Livestock owners can prevent infecting clean pastures by not moving animals from infected to noninfected pastures, or by quarantining animals for at least 3 days on a seed-free diet to eliminate all infected seed from the animals before placing them on the new pasture.

Shelby is Research Associate of Plant Pathology; Schmidt is Associate Professor of Animal and Dairy Sciences.



Passage of fescue seed through steer.

G.R. WEHTJE, C. H. GILLIAM, and J. A. REEDER

LEAFFLOWER POSES A NEW WEED PROBLEM IN ORNAMENTALS

Leafflower plants are a new pest in ornamental plantings.

DURING the past few years a new weed has been emerging in ornamental landscape settings that is causing concern among horticulturists. This weed, called leafflower[1], has fern-like leaves and tiny flowers that are nearly invisible to the unaided eye. Its presence in landscape settings can affect the aesthetic value of an area and, if left uncontrolled, can form a mat-effect and compete with ornamental plants and sod.

Leafflower plants produce three kinds of flowers: tiny flowers located under the main stem of the leaves are unisexual; female flowers, which are generally closer to the main stem of the plant and produce a ball-like seed capsule about 1/8-in. in diameter; and male flowers located near the tip of the leaf.

Examination reveals that seedlings commonly develop under the canopy of more mature plants, indicating the importance of seed reproduction. And removal of mature plants frequently results in a flush of seed germination. Consequently, it was assumed that light may be a significant factor in seed germination. In addition, infestations of leafflower are typically found in areas that are under intense irrigation or in low lying areas where water collects, suggesting that leafflower may be intolerant of dry conditions. Experiments were conducted to determine conditions favorable for germination in an attempt to find some means of control.

Germination was evaluated at a series of temperatures; 68, 77, 86, 95, and 104°F. These Alabama Agricultural Experiment Station trials were conducted both in light and in darkness. Almost no germination occurred in darkness. In light, germination averaged 78% at a temperature of 77-95°F . At 68°F, germination was reduced to only 30%. This weed is not commonly noticed until the middle of May in the Auburn area, indicating that germination is delayed until considerable soil warming has occurred.

Additional experiments, conducted to determine the effects of moisture stress on germination, showed that leafflower seed had almost no ability to germinate under any degree of moisture stress. When water was readily available to the seeds, germination rate was about 85%. Germination rates quickly declined as water availability declined, indicating that the seeds needed to be on the surface of nearly water-saturated soil for germination to occur.

These initial studies indicate that leafflower germination is dependent on three factors — high moisture, a moderately high temperature, and light. Witholding any one of these factors might provide a natural means of repressing this pest.

Since light is the easiest germination factor to control, further study was done to see if leafflower production could be regulated by using soil covering (mulching) to manipulate light. In a greenhouse, leafflower seed was sown on the soil surface and the soil was then covered with pine bark mulch to a depth of either 1 or 2 in. A control planting received no mulch. Watering and temperature were suitable for germination. Without any mulch, an infestation of leafflower quickly developed. However, mulching to a depth of 1 in. completely suppressed seedling establishment.

Preliminary trials indicate that maintaining a continuous mulch cover beginning early in the growing season (prior to May 1) can provide effective nonchemical control throughout the growing season.

Wehtje is Associate Professor of Agronomy and Soils; Gilliam is Associate Professor and Reeder is Research Technician of Horticulture.

[1] Scientific name, *Phythlanthus urinaria.*

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