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Gale A. Buchanan, Director

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A WORD WITH THE EDITOR

More than 30 years have passed since the Alabama Agricultural Experiment Station began publication of *Highlights of Agricultural Research* as part of its effort to develop "even more effective ways of bringing our research activities to the attention of Alabama's farm leadership." Even the magazine's name was chosen to indicate its stated purpose of "presenting the highlights of our broad-based agricultural research programs."

Many things have changed since Vol. 1 No. 1 was mailed in June 1954 to a select audience of farmers, foresters, agribusinessmen, and other agricultural leaders. Farming methods have changed dramatically as scientific technology has boosted per acre, per animal, and per farm worker productivity. Crop varieties are quite different today, cropping systems have shifted, and livestock and poultry show significant type changes when compared to 30 years ago. Rural communities have changed considerably, as has the level of living of Alabamians. Concern for the environment has reached an all-time high, with strong efforts now underway to protect soil and water resources that provide the basis for all agriculture. Research of the Alabama Agricultural Experiment Station has played a vital role in these developments, and *Highlights* has helped make its readers aware of the latest findings of this research.

R.E. STEVENSON

Highlights has changed over the years, too, as long-time readers have obviously noticed. Instead of the 8-page issues of those early years, today's quarterly issues are either 16 or 20 pages (usually 20). This larger size allows coverage of more projects, thereby doing a more complete job of reporting findings of the broad-based research effort that is underway to serve the State's divergent agricultural industry. Full-color photographs are used for illustrations to make results clearer and to make the magazine more appealing at a time when readers are bombarded with a wide selection of competing materials. Circulation has been increased to better blanket the State with research information.

Despite changes in size and methods of presentation, *Highlights*' philosophy of service has not changed since its first issue. It is still published to report results of latest research being done at the Experiment Station to support Alabama's agricultural and forest enterprises. It neither promotes nor campaigns against farm programs, group undertakings, Auburn student activities, or any other cause. Its only function is to report research findings to those who can use the information to advance agriculture.

Some other things have remained the same, also. Stories are still limited to one page in length, a requirement that was established to encourage authors to get to the "meat of the coconut" without a lot of unnecessary verbiage. Holding to the single-page requirement has also had the advantage of allowing coverage of a variety of research projects within the page limitations in effect.

There is no question that agricultural research is essential for success of today's agriculture. Unfavorable economic conditions make it doubly important that farmers and foresters produce top quality products as efficiently as possible and use the best possible marketing methods. Auburn's research programs are dedicated to solving the problems that threaten the agricultural sector, and *Highlights* is viewed as a major vehicle for getting new findings into the hands of those who can use them to best advantage.

You, the readers, stand as the final judge of the success or failure of *Highlights of Agricultural Research* in carrying out its mission. If it is serving your needs, then we need to continue the approach that has been followed since 1954. If not, we need to direct our efforts in the direction that will best serve your needs. Your comments or suggestions will be welcomed.

may we introduce

Dr. Archie J. Latham, Associate Professor of Botany, Plant Pathology, and Microbiology, who is senior author of the story appearing on page 4 in this issue. Latham has been a regular contributor to *Highlights* during his 18 years at Auburn, reporting on research concerning disease control in such horticultural crops as apples, peaches, plums, and pecans. He is also a regular program participant in horticultural crops field days at substations of the Experiment Station.

A native of Idaho and World War II Army veteran, Latham received his B.S. degree in Education-Biological Sciences from Idaho State College in 1956, M.S. in Plant Pathology from the University of Idaho in 1958, and Ph.D. in Plant Pathology from the University of Illinois in 1961.

He joined the Auburn faculty in 1967 as Assistant Professor, following work as a research biologist for Gulf Research and Development Co., Merriman, Kansas. He was promoted to Associate Professor in 1976. His primary responsibility at Auburn has been research on the pathology of fruits and nuts.

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ON THE COVER. New herbicides offer hope for better control of broadleaf weeds in soybeans, see story on page 5.

Potential for growth in Alabama's turfgrass-sod industry shows up in marketing survey

J.L. ADRIAN, C. LOKEY, and R. DICKENS

COMMERCIAL PRODUCTION of turfgrass-sod in Alabama increased more than 10-fold between 1968 and 1983, from 500 acres to about 5,500 acres. Gross farm income (wholesale basis) from this crop amounted to $7.1 million in 1983, not including delivery and installation charges.

With the heightened economic importance of the industry has come the need for a better understanding of the markets for sod and marketing techniques. To provide this information, an Alabama Agricultural Experiment Station study of sod markets was begun in 1984. Data from 1983 and 1979 were analyzed at the producer, landscape contractor, and consumer levels.

Sod production firms in the State range from 5 to 820 acres in size, with an average operation having about 160 acres. Producer experience in sod production averages 12 years, with a range of 2 to 33 years. The largest concentration and the majority of producers are located near or within major metropolitan areas. Most producers are located near their major markets—large cities where much industrial and residential development activity exists. About three-fourths of the State's total sod acreage is in three counties: Baldwin (39%), St. Clair (19%), and Lee (15%).

Bermudagrass is the most widely grown and marketed sod, comprising 48% of the acreage and 60% of the gross farm revenue. The remaining acreage is about equally divided between zoysiagrass (27%) and centipedegrass (23%). Revenues generated by these two grasses account for 24% and 16% of the total, respectively. A small amount of St. Augustinegrass is also grown.

In terms of varietal composition, Tifgreen 328 and Tifway 419 are the most prominent bermudagrasses grown (31% and 15% of the total, respectively). Emerald and Meyer are the most common zoysiagrasses, accounting for 12% and 10%, respectively, of the market.

The majority of the sod produced in Alabama is marketed within the State. However, the relative proportion of in-state marketings declined slightly from 78% in 1979 to 72% in 1983. Out-of-state markets include the bordering states plus Arkansas. Georgia accounts for approximately 70% of the out-of-state total, with most of this going to the greater Atlanta market area.

Major buyers and users of sod were divided into six categories: (1) landscape contractors, (2) homeowners, (3) garden centers, (4) building contractors, (5) golf courses, and (6) other growers. Landscape contractors are dominant in the market, accounting for 34% of total sales. Homeowners and garden centers follow with 22% each, and building contractors account for 17%.

Sod rolls are the primary product form marketed, accounting for over half of the volume. Blocks or strips account for 43% of the total volume. "Scrap" grass comprises 3% and sprigs account for 1% of the total marketed.

Producers report sales in all months of the year, with May (13%) and June (14%) being peak months. April (12%), July (11%), August (11%), and September (11%) are next in importance. Sales in 1983 were more evenly distributed among months than in 1979. Thus, producers have reduced the seasonality of marketing and improved their cash flow pattern.

About two-thirds of the growers used advertising to promote sales. The yellow pages and local newspapers were the primary media used. On average, about 2% of sales was allocated to advertising. Eighty-five percent of expenditures for advertising was made by firms with more than 250 acres of sod.

Landscape contractors are major purchasers and users of sod, representing a vital link in the State's sod marketing system. Their primary customers were divided into four categories: businesses, households, builders/contractors, and government agencies. Of these, builders/contractors purchased 46% of the total. Businesses, households, and government agencies accounted for 22%, 19%, and 9%, respectively, of the total volume of sod sold by landscape contractors. Sod is also purchased for athletic facilities and golf courses, but this amounts to less than 5% of the total volume.

Landscape contractors said they expect the demand for sod to steadily increase over the next few years as consumers become more conscious of the appearance of their lawns and increase their desire for an "instantaneous" lawn.

To evaluate market potential, landscape contractors were asked to rank expected growth for each market grouping. About 45% of the landscape contractors rated both builders/contractors and households as having "very high" growth potential. Private business was rated as "very high" in market potential by 38% and "high" potential by 36% of the landscape contractors. Government agencies were viewed as offering less potential than other groupings.

Bermudagrass (45%) and centipedegrass (31%) account for the majority of the grass handled and installed by landscape contractors. Zoysiagrass comprises 20% of the total and St. Augustinegrass 4%. Blocks or strips account for over 65% of the total and sod rolls 32%.

Consumer familiarity with the sod industry and its products was found to be good. Seventy-two percent of the 200 households contacted were familiar with the term "turfgrass-sod" when questioned. Further, 74% of those who initially responded negatively toward knowledge of the term were able to identify different sod types by common names after the term was defined by the interviewer.

Eighty-seven percent of all households knew something about the different sods. Bermudagrass and zoysiagrass were the most recognized types, followed by centipedegrass and St. Augustinegrass. Almost half of the consumers were familiar with all four product forms (sprigs, plugs, blocks, and rolls), and 71% could identify at least one of the forms.

Statistical analyses were made to determine which characteristics of the consumers and/or their holdings affect sod purchases.

Among those who had purchased sod in the last 3 years, purchases were found to be responsive to lot size, property value, and sod price. Quantity demanded by consumers was found to be highly responsive to changes in sod prices. For a 1% change in the price, quantity demanded changes by 1.83%.

For all consumers, house age, income, degree of interest in landscaping, and occupational status were found to be important factors affecting purchases. Sod purchases were found to show a positive response to income, with consumers showing a high degree of responsiveness at annual family incomes beyond the $30,000 level. This points to potentially larger sales as incomes and the general standard of living increase and identifies high income areas as prime sod markets.

Adrian is Professor of Agricultural Economics and Rural Sociology; Lokey is former Graduate Research Assistant in Agricultural Economics; and Dickens is Professor of Agronomy and Soils.

Suppressed blooming of tree at left contrasts with good blooming of trees at right.

Reduced apple bloom associated with sterol inhibitor fungicides

A.J. LATHAM, W.A. DOZIER, JR., J.W. KNOWLES, and M.H. HOLLINGSWORTH

MULTIPLE APPLICATIONS of the fungicide Vangard®, an ergosterol biosynthesis inhibitor (EBI), have been reported to affect apple trees in the same way that growth regulators do. These effects were shorter trees, retarded shoot elongation, and leaves that are smaller, thicker, less flexible, puckered, and darker green. Applications of Baycor® caused similar but less prominent growth effects.

The point of real concern, however, is that the fungicide may cause a reduction in bloom the year after use. This concern is obviously justified, based on results of a 1984 Alabama Agricultural Experiment Station study.

The research was begun following 1983 observations at the North Alabama Horticulture Substation that apple bloom differed among plots sprayed with various fungicides the previous year. Some trees sprayed with EBI fungicides did not have appreciably more blossoms than unsprayed check trees. This indicated the possibility of long-term inhibitory effects by some fungicides. Subsequently, these investigations were made to evaluate the effects of selected fungicides on return bloom of Delicious apples.

Test trees were Redspur Delicious seedlings that had been planted in 1977 and grown on trellises or as free-standing trees (Smoothee Golden Delicious and Winter Banana used as pollinators). Trellised trees (on M 26 dwarfing rootstock) were grown on a four-wire trellis and spaced 8 x 18 ft. apart. Free-standing trees (on M 106 semidwarfing rootstock) were trained to a modified central leader and spaced 20 x 20 ft. apart. Each rootstock was grown in a separate block. The fruit on all trees were uniformly thinned each year to a commercially acceptable fruit set to minimize alternate bearing effects resulting from a heavy crop load.

Treatments were applied to three-tree plots replicated four times. The fungicides were applied by handgun at 650 p.s.i. to runoff as dilute sprays. Spraying was done at 7- to 10-day intervals from early season to first cover and then at 10- to 14-day intervals throughout the cover spray period. Commercial insecticides and bactericides were applied to the entire test orchard as needed.

Fruit spurs with and without blossom clusters were counted at full bloom from a 24-in. section of branch trained on the second wire of trellised trees. Counts were made on free-standing trees by a similar procedure for branches 3 to 4.5 ft. above the soil. Data for trellised and free-standing trees were combined when there were no interactions between tree type and treatment.

The EBI fungicides Baycor and Vangard adversely affected return bloom in 1983 and 1984. Over that 2-year period, the percentage return bloom was found to be lower on trees treated with EBI fungicides than on those treated with Benlate® + Dithane® combinations, see table.

The data suggest that EBI fungicides may reduce apple bloom by inhibiting bud formation. There was no evidence to suggest that EBI fungicides reduced bloom by lowering overall tree vigor or leaf retention, or by failing to control scab. In fact, trees sprayed with Baycor and Vangard were relatively scab-free, retained their leaves through harvest, and produced fruit comparable to trees sprayed with Benlate + Dithane. Return bloom was directly affected by scab in the unsprayed trees. Due to extensive scab infection, unsprayed trees had lost a significant number of leaves by harvest. This defoliation resulted in a low percentage of bloom in the unsprayed trees.

How the EBI fungicides affect apple blossom formation is not clearly understood. Although growth regulator-like effects caused by EBI have been reported, such effects were not observed in the Auburn tests. Neither Baycor- nor Vangard-treated trees showed abnormally dark, small, or puckered leaves, which are characteristic of growth regulator effects.

The results reported indicate that season-long application of Vangard and Baycor may have had a cumulative effect, which was detrimental to apple bud formation and subsequent blooming the following year.

EFFECTS OF FUNGICIDES APPLIED IN 1983 ON NUMBER OF LEAVES AND RETURN BLOOM OF REDSPUR DELICIOUS APPLES IN 1984

Fungicide rate per 100 gal.	No. of leaves[1]		Return bloom[2]		
	Dithane added	Dithane not added	Dithane added	Dithane not added	Mean
	No.	*No.*	*Pct.*	*Pct.*	*Pct.*
Benlate 50W, 2 oz.	126	—	89.7	—	89.7
Baycor 50W, 4 oz.	128	122	72.4	57.5	64.9
Vangard 10W, 3.5 oz.	123	118	61.8	63.8	62.8
Control	110	34	49.4	31.0	40.2

[1]Number of leaves from 20 fruit spurs per plot August 18, 1983.
[2]Percentage of spur bloom on 24 in. of apple branch, two branches per tree.

Latham is Associate Professor of Botany, Plant Pathology, and Microbiology; Dozier is Professor of Horticulture; Knowles is Research Associate of Horticulture; and Hollingsworth is Superintendent of North Alabama Horticulture Substation.

SCEPTER and CLASSIC
New herbicides for soybean weed control

R.H. WALKER, B. NORRIS, and M. PEPPER

SOYBEAN FARMERS in Alabama will have two new herbicides, Scepter® and Classic®, to help control broadleaf weeds in soybeans next year. A third material, Canopy®, which is a combination of Lexone® and the active ingredient in Classic, should be labeled and available for use in 1987. Each of these materials was tested at several sites throughout the State by the Alabama Agricultural Experiment Station to determine efficacy, optimum rates, application methods, soybean yields, and crop damage.

In 1984, a test was conducted at the Black Belt Substation on Eutaw clay soil to evaluate effects of rates and methods of application of Scepter and DPX-F6025 (the active ingredient common in both Classic and Canopy) for cocklebur and sicklepod control, soybean yield, and crop damage. Scepter was applied pre-plant incorporated (PPI), preemergence (PRE), and post over the top (POT) at ⅛, ¼, and ⅜ lb. active ingredient (a.i.) per acre. DPX-F6025 was applied PPI and PRE at rates of 1, 1½, and 2 oz. a.i. per acre. It was also applied POT at ⅛, 3/16, and ¼ oz. a.i. per acre.

Each herbicide provided approximately 92% cocklebur control at the early rating and 96% at the late rating (averaged over rates and methods). Neither material provided adequate control of annual grasses. Early season sicklepod control averaged 76% and increased to 80% at the late rating. DPX-F6025 caused more soybean injury; but injury was slight with both products and caused no apparent yield reduction.

In comparing rates, low, medium, and high each provided 90% or better cocklebur control early, and 95% or better control later. Some differences in sicklepod control were evident for the low (70%), medium (78%), and high (80%) rates at the early rating; but by late season sicklepod control averaged 78, 81, and 82% for the respective rates. Soybean injury was slight even at the highest rate.

Comparison of methods of application showed 94% and 98% cocklebur control when herbicides were applied PPI and PRE, respectively, versus 84% when applied POT (early rating). All methods gave at least 94% cocklebur control at the late rating. Sicklepod control was generally lower compared to cocklebur, but was influenced similarily by method of application. When rated early, control was 87% PPI, 85% PRE, and 56% POT, compared to a later rating of 90% PPI, 90% PRE, and 60% POT. Applications made POT were applied to sicklepod 2 to 4 in. tall, which was too late to give acceptable control. Additional research has shown that for maximum efficacy both Scepter and DPX-F6025 must be applied POT when sicklepod has no more than one true leaf, or is less than 2 in. tall.

Soybeans treated with Scepter yielded 39 bu. per acre, compared to 37 bu. per acre for beans treated with DPX-F6025; however, there was no difference in yield among the three rates (averaged over herbicides and methods). Comparison of methods (averaged over herbicides and rates) showed PRE application yielded the highest, 41 bu. per acre, followed by PPI at 38 bu. per acre, and POT at 36 bu. per acre.

In a similar test conducted in 1984 at Prattville Experiment Field, Scepter was applied sequentially using all possible combinations of three rates, 1/16, ⅛, and ¼ lb. a.i. per acre. DPX-F6025 was applied PRE at four rates, ¼, ½, ¾, and 1 oz. a.i. per acre, followed by a sequential POT application of ⅛ or ¼ oz. a.i. per acre. Lexone was applied PRE at ⅜ lb. a.i. per acre as a standard reference. Earlier tests showed that a single PRE or POT application was insufficient for acceptable sicklepod control on Coastal Plains soils.

Soybeans were generally more tolerant of DPX-F6025 than Scepter, as evidenced by soybean injury ratings and crop biomass weights. However, soybean injury was slight as long as the total Scepter rate did not exceed ¼ lb. a.i. per acre.

Best sicklepod control was obtained with Scepter applied PRE followed 28 days later by POT, both at the ⅛-lb. rate. This provided 85% sicklepod control (without cultivation) with a 26% reduction in soybean biomass (measured 45 days after the POT application). Soybean yield was 26 bu. per acre compared to a hoed check plot which produced 32 bu. per acre. Lexone, by comparison, provided only 5% late-season sicklepod control and produced an 18-bu. per acre yield.

The best DPX-F6025 treatment was 1 oz. a.i. per acre PRE followed by ¼ oz. POT. This provided 63% late-season sicklepod control and yielded 26 bu. per acre.

In subsequent tests conducted in 1985 at Prattville Experiment Field, single applications of Scepter were applied to double cropped soybeans in the 1-2 leaf stage at 1/16, ⅛, and ¼ lb. a.i. per acre and double applications, with the second spraying coming 3 weeks after the first spraying using all possible combinations of the three rates. Single and double applications of DPX-F6025 were applied at ⅙, ⅓, and ½ oz. a.i. per acre and with all possible combinations of the three rates.

DPX-F6025 provided better sicklepod control than Scepter, and two applications were better than one. DPX-F6025 applied twice at ⅓ oz. followed by ⅙ oz. a.i. per acre, or vice-versa, provided excellent sicklepod control (92% without cultivation) and good crop tolerance (12% injury).

Scepter and Classic (DPX-F6025) show good potential for improving cocklebur, sicklepod, and annual morningglory control in soybeans. Cocklebur has been easiest to control, requiring only a single application. Sicklepod and annual morningglories have been more difficult, usually requiring two applications.

Walker is Associate Professor of Agronomy and Soils; Norris is a Graduate Research Assistant; and Pepper is a Research Associate of Agronomy and Soils.

FARMERS' OPINIONS VARY ABOUT DEER HUNTING WITH DOGS

J.E. DUNKELBERGER, M.K. CAUSEY, and J. EXUM

HUNTING DEER with the aid of dogs is popular in Alabama and most Southern States. By law, the use of dogs to flush deer is permitted throughout Alabama except in counties where residents have petitioned the Department of Conservation, Game and Fish Division, to disallow this form of hunting. As of January 1985, 11 of 67 Alabama counties were closed to deer hunting with dogs, and petitions to discontinue this practice were in process for two additional counties.

The practice of using dogs to hunt deer is often controversial, having both strong support and opposition within a county. One reason for opposition stems from the inability and sometimes the unwillingness of deer hunters to confine the chase within the boundaries of the property owned or upon which legal authorization to hunt has been obtained.

Farm owners and operators are often in the middle of this controversy. Their land and property rights are frequently involved. To date, however, little factual information has been accumulated about farmers' experiences with deer hunters using dogs on their land. Therefore, a study to obtain such information from farmers was conducted by the Alabama Agricultural Experiment Station.

A mail survey was conducted in Chambers, Clay, Cleburne, Covington, Marion, and Washington counties during spring 1984. These counties were randomly selected to represent counties that permitted deer hunting with dogs and had the heaviest incidence of this form of hunting in each Conservation District. Questionnaires were mailed to 1,132 farm operators. Completed questionnaires were returned by 748 farmers (a response rate of 69% after adjusting for bad addresses and persons no longer farming). Response rates by county ranged from 60% in Covington to 77% in Chambers. The higher rate for Chambers was probably due to a petition effort underway during the study period calling for an end to deer hunting with dogs in that county.

The deer population in Alabama is not uniformly distributed across the State. As late as 1910, huntable deer populations existed only in two or three isolated areas in south and southwestern counties. Now there are nearly 1 million deer in the State. Following years of no hunting or serious restrictions, deer hunting with dogs reappeared during the 1970's in Clay and Cleburne counties, while it had remained a continuing practice in Covington and Washington counties.

Because of differences in the history of the local deer population and in residents' ideas about deer hunting among the five counties, it is not surprising that attitudes of Alabama farmers toward deer hunting with dogs varies widely. Farmers in Cleburne and Chambers counties in the north and east, respectively, are more negative toward this type hunting compared to farmers in the south and southwest counties of Covington and Washington.

One attitude that differs markedly was farmers' appreciation for the "sport" of dog hunting for deer. Another differing attitude was the perceived negative aspects often associated with deer hunting with dogs. Both attitudes indicated the different value given this hunting practice by farmers in the two areas of the State. Marion County in the northwestern part of the State was in an area where farmers' attitudes are less crystalized at this time. There was little attitudinal support for deer hunting with dogs noted in Marion, but negative sentiments were weak as well.

Attitudes have their roots in past experience, so the survey sought information about the kinds of experiences Alabama farmers have had with deer hunters using dogs. Of the 68% of farm operators in the five counties who describe themselves as hunters, 80% hunt deer and 45% hunt deer using dogs. In 40% of the sample farmers' families, other members of the family use dogs to hunt deer. More than three-fourths of the farmers allowed some kind of hunting on their land by nonfamily members.

Alienating experiences take a variety of forms. Within the previous 2 years, more than three-fourths of the farmers reported having unauthorized deer hunting dogs on their land during the hunting season. Frequency with which deer hunters and their dogs crossed private property without authorization was described as "often" by 43% of the farmers. About half of these indicated they often had dogs chasing deer across their land when hunting season was closed.

There are two actions farmers can take when dogs cross their land. Over the last 2 years, 22% had attempted to remove the encroaching dogs from their land. The second action, asking unauthorized hunters to stop hunting on their land, had been attempted with satisfactory results by 52% of affected farmers. Among those who asked hunters with dogs to leave their land, about 20% had felt threatened or in danger when doing so.

In response to questions about property damage by deer hunters using dogs, 35% reported property damage during the last 2 years, but only 7% said the damage was "major." An estimated dollar value showed that about 10% of the damage exceeded $250 and 16% was less than $100. Only 10% of the farmers experiencing damage by deer hunters using dogs reported it to law enforcement authorities.

The kinds of property damage reported by affected farmers included: fence wire (63%), fence posts (45%), livestock killed (28%), crops (27%), woods burned (14%), livestock run off or stolen (8%), mailbox shot (6%), farm equipment shot (3%), and window shot out (3%). More than half the farmers surveyed (56%) indicated they had no problems with deer hunters using dogs on their land and only 13% felt that a serious problem existed.

The attitudinal differences and different patterns of experience among the study counties generally explain the wide difference in farmers' attitudes found in the survey. These survey findings suggest that the disrespect shown for farmers' property rights may have much more to do with this controversey than actual losses from property damaged by hunters and their dogs.

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Forest site preparation effects on soil properties and loblolly pine early growth

C.L. TUTTLE, M.S. GOLDEN, and R.S. MELDAHL

EACH YEAR in Alabama, over 600,000 acres of forest land are harvested and approximately 150,000 acres are site prepared and artifically regenerated. Currently, mechanical site preparation is used on over 80% of the artifically regenerated land at a cost exceeding $15 million. Intensive mechanical treatments typically involve the use of heavy machinery which may damage the site and lower productivity. Soils may become compacted, with bulk density increases of 25 to 75% resulting in decreased infiltration, porosity, and aeration, all of which can lower productivity. However, the most severe problem associated with mechanical site preparation is surface soil displacement. Raking and piling may remove up to 3 in. of soil from the plantable area, concentrating it into windrows and increasing the erosion hazard.

Three upland sites located in Autauga and Bibb counties in the Hilly Coastal Plain of Alabama with slopes of 7, 9, and 11% were used to compare three representative mechanical site preparation systems:

1. Shear/burn system in which everything is sheared off at ground level and burned.

2. Single chop/burn system in which everything is sheared at ground level, a mechanical drum chopper is pulled over it (one time), and then it is burned.

3. Shear/rake/pile/bed system in which everything is sheared at ground level, a mechanical root rake is used to pile debris into windrows, and a bedding harrow is used to form planting beds.

Soil and vegetation samples were collected prior to mechanical treatment, immediately following treatment, and at the end of two growing seasons. The site preparation treatments examined were applied by Hammermill Paper Company crews working on company lands.

Application of all three mechanical systems reduced hardwood competition from initial levels. After 2 years, the bed system had the lowest levels of hardwood competition, 5,688 stems per acre, compared to 10,993 and 11,454 stems per acre for the shear and chop systems, respectively. The bedding system provided superior hardwood control due to greater removal and disturbance of hardwood roots and stumps. With the shear and chop systems, stumps and roots not killed by the burn sprouted, resulting in large numbers of competing stems.

All the site preparation systems examined reduced litter and small debris (limbs, branches, and foliage) and increased exposed soil. The bedded system, being the most intensive, had the largest reductions in litter and debris and the largest increase in bare soil, while both the shear and the chop treatments had slight reductions in litter and increases in bare soil. During the raking, piling, and bedding operations, much of the soil covering was removed from the site or mixed with the upper soil layers.

TREATMENT EFFECTS ON SEEDLING HEIGHT, SURVIVAL, AND GROUND LINE DIAMETER (GLD) AT PLANTING AND AFTER TWO GROWING SEASONS

Time	Site preparation treatment	Mean seedling height	Percent seedling survival	Mean seedling GLD
		In.		*In.*
Planting	Shear/burn	5.4	—	—
	Chop/burn	5.6	—	—
	Bed	5.2	—	—
2 seasons	Shear/burn	27.0	83.1	.39
	Chop/burn	27.8	85.7	.42
	Bed	27.5	85.3	.50

After 2 years, differences among treatments in litter cover were reduced, but were still evident (32.2%, 36.1%, and 16.3% for the shear, chop, and bed treatments, respectively). Additionally, the incidence of bare soil was reduced due to vegetative cover returning to the site. Over 50% of the bedded areas were still bare after 2 years, while both the sheared and the chopped areas had 33% bare soil. Removal of the litter layer bares the soil surface to direct rainfall impact which can reduce surface soil structure by reducing particle aggregation. The small soil particles may then erode or filter into the surface soil pores, reducing infiltration and aeration. However, after two growing seasons, less than 5% of the study areas exhibited obvious evidence of erosion. A small amount of rill erosion and some slight sheet erosion occurred on all the study areas. The bedded plots had more rills (3% to 5% of the area) than the sheared or the chopped areas due to the larger quantity of bare soil resulting from this system. Less than 2% of the sheared or chopped areas exhibited obvious erosion after two seasons.

None of the mechanical site preparation systems examined differed significantly in their effects on soil nutrient concentrations (Ca, Mg, K, P, or N) in the top 12 in. of soil. However, as treatment intensity increased, nutrient concentrations generally decreased. The sheared areas had higher nutrient concentrations than the chopped areas, which in turn were higher than the bedded areas. Lower nutrient concentrations with increasing treatment intensity is likely the result of greater disturbance and displacement of the surface soil layers.

Site preparation systems significantly influenced surface soil bulk density immediately following treatment. During mechanical treatment, the shear and chop systems compacted the soil surface. Bulk density then began to decrease as a result of root growth, microbial activity, and such physical processeses as soil wetting and drying. By the end of the second season, bulk densities on all three systems tested had returned to approximate pretreatment levels. Bulk density on the bedded areas actually decreased immediately following site preparation. The bedding harrows disked the soil surface, loosening the upper layers. During the following two seasons, the beds settled resulting in bulk density increases to pretreatment levels. At no time during the study period did soil bulk density become an obvious detrimental factor. The bulk densities found were all well below levels (approximately 1.4 grams per cubic centimeter) which reportedly reduce loblolly pine seedling growth and survival.

Site preparation systems did not differ significantly in their effects on loblolly pine seedling height or survival after two seasons, see table. Seedling ground line diameter (GLD) was the only measure significantly affected by a mechanical site preparation system, with the bedded areas having larger diameters than the sheared or chopped plots.

Properly applied mechanical site preparation resulted in little soil loss or damage on upland areas of the Hilly Coastal Plain of Alabama. This indicates that the key in limiting soil damage, even on upland slopes, is to employ proper application techniques. After two seasons, there was little definite advantage in site or seedling results in selecting one system over another. However, the long term effects of the three systems studied cannot be fully evaluated until much later in the rotation.

Tuttle is Research Associate of Forestry; Golden is Associate Professor of Forestry; and Meldahl is Assistant Professor of Forestry.

Effect of skip-row patterns on cotton yield

C.C. KING, L.J. CHAPMAN, W.B. WEBSTER, and V.H. CALVERT

OUTSIDE ROWS (border rows) of a cotton field usually yield more than interior rows, because of less competition for light, nutrients, and moisture. Skip-row patterns are an attempt to take advantage of this increased yield from border rows. It is impressive to look at, but does it make up for the land that is vacated by the skip row patterns? A 2-year experiment at the Tennessee Valley Substation at Belle Mina has shown that the answer is no.

In 1983, when the Payment-In-Kind (PIK) Program was in effect, there was a great deal of renewed interest in several skip-row planting patterns. As a result, a test with five planting patterns was initiated by the Alabama Agricultural Experiment Station at the Tennessee Valley Substation. In both years, an area was planted to cotton in conventional, solid 36-in.-wide rows. Then all the cotton plants on designated rows were removed to create five planting patterns: (1) solid planted (no rows removed); (2) two in and one out; (3) two in and two out; (4) two in and four out; and (5) four in and four out. The last two patterns listed (with four-row skips) qualified as "set-aside" land which offered some economic considerations that were not allowed for the one and two-row skip patterns.

On a per planted acre basis, yields were increased from 26 to 63% by the skip-row patterns, as shown in the table. However, when yield was calculated on the basis of total land used, yields were 15 to 46% less on the skip-row patterns. For example, the 2 in and 1 out pattern produced 2,229 lb. of seed cotton per acre of total land, compared to 2,623 lb. per acre of solid planted cotton. The 394 lb. per acre difference in yield from the 2 in and 1 out pattern is a decrease of 15%. Similar calculations show even greater differences, ranging up to 46%, for the other patterns tested. So, although yield per planted acre increased dramatically in all skip-row patterns, none of them produced sufficient extra cotton to make up for the skipped areas.

The 1983 and 1984 growing seasons were markedly different in respect to cotton production. Rainfall was well below normal during the 1983 growing season and low cotton yields reflect this, whereas growing conditions and cotton yields were excellent in 1984. Earliness as measured by the percent of total yield harvested at time of first picking was not affected by row patterns in 1983. All patterns, including solid-planted, were 92 to 94% open at first harvest on September 30, 1983. Earliness was affected by planting pattern in 1984. On October 12, 1984, 86% of the solid planted cotton was open, but only 82, 76, 72, and 79%, respectively, was open for the 2 in and 1 out, 2 in and 2 out, 2 in and 4 out, and 4 in and 4 out patterns.

Although yield and maturity date are two of the major considerations in skip-row cotton production, there are other effects beyond the scope of this experiment that should be considered. Some of them, such as qualifying wide skips as "set aside" acreage, high performance records, and reduced costs of production when materials or operations can be applied only to the planted areas (seed, fertilizer, herbicides, insecticides, and picking), favor skip rows. Other considerations, such as alternative uses of land utilized in narrow skips and added costs which accrue because materials or operations are often done on a broadcast basis (tillage, fertilizer, herbicides, and insecticides) to skip-row cotton, favor solid planting. Thus, a complete economic analysis, taking into account a combination of factors, should be done when choosing planting patterns for cotton. This information is available in budget form at county extension offices.

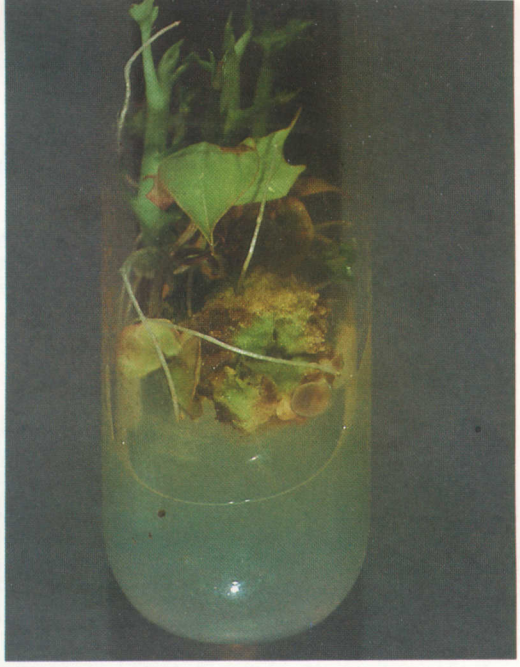
EFFECT OF ROW PATTERNS ON YIELD OF SEED COTTON, TENNESSEE VALLEY SUBSTATION, 1983-84

Row pattern	Land planted	Av. yield/planted acre				Av. yield/acre of land			
		1983	1984	2-yr. av.	Relative yield	1983	1984	2-yr. av.	Relative yield
	Pct.	*Lb.*	*Lb.*	*Lb.*	*Pct.*	*Lb.*	*Lb.*	*Lb.*	*Pct.*
Solid	100	1,112	4,133	2,633	100	1,112	4,133	2,623	100
2 in and 1 out	67	1,600	5,087	3,344	127	1,067	3,391	2,229	85
2 in and 2 out	50	1,891	5,652	3,772	144	946	2,826	1,886	72
2 in and 4 out	33	2,084	6,460	4,272	163	695	2,153	1,424	54
4 in and 4 out	50	1,453	5,183	3,318	126	727	2,592	1,660	63

King is Professor of Agronomy and Soils; Chapman is Head of Extension Agronomy; Webster is Superintendent and Calvert is Associate Superintendent of the Tennessee Valley Substation.

Tissue culture technique successfully produces seed stock sweet potatoes

M.A.W. ALKHALIFA, A.G. HUNTER, and O.L. CHAMBLISS



PRODUCING "TEST TUBE" plants is no longer just a novelty. The tissue culture technique now offers practical methods of propagating such crops as sweet potatoes.

Tissue culture is often used in various vegetatively propagated crops to avoid disease problems when propagating stock. It can also be successfully used to maintain and propagate foundation "seed" stock of sweet potato varieties, according to findings of Alabama Agricultural Experiment Station research.

The conventional method of propagating sweet potatoes by slips and vine cuttings is not totally effective in maintaining seed stock free from diseases and morphological variations which can occur over time as a result of mutation. Disease-free seed stock which maintains trueness to type is the objective of seed improvement programs.

The objectives of the Auburn research were (1) to develop tissue culture techniques suitable for propagating sweet potatoes by living tissue taken from sprouts (explants), and (2) to compare yield and genetic stability of sweet potato plants propagated by tissue culture and conventional methods.

In laboratory experiments, explants were taken from storage root sprouts of three types of varieties: White Star, Jewel, and AU-1 (mutant from Jewel), selected to represent white, copper, and red skin varieties, respectively. The sprouts were grown in the greenhouse under natural light at 80-85°F day temperature and 60-65°F night temperature.

Terminal cuttings were taken from the newly growing shoots, and explants consisting of 0.5-1.0 mm of the shoot tip were taken to initiate tissue cultures. Explants were surface rinsed with running water three times each for 3 minutes and soaked for 10 minutes in 1.05% sodium hypochlorite solution followed by three rinses with autoclaved distilled water. Cultures were grown at 80°F under cool-white fluorescent light at 400 foot-candles with 16 hours of light and 8 hours of darkness.

Callus growth began from explants of all varieties within 1 week after excision. Amount of callus growth varied depending on variety. All varieties formed plantlets in 5-7 weeks.

Plantlets produced by the techniques described were transplanted to pots and grown in the greenhouse for 6 weeks before transplanting to the field. Slips and vine cuttings were transplanted at the same time.

In preparation for producing slips and vine cuttings, storage roots were bedded in sterile sawdust in the greenhouse at 75-80°F. Slips were pulled from sprouted roots after 3 weeks in the bed and maintained in the same bed until they produced enough growth for vine cuttings. Slips, vine cuttings, and potted explants from tissue culture were hardened by transferring them outdoors 1 week before transplanting.

Field evaluations were conducted at the E. V. Smith Research Center, Shorter, on a fine sandy loam soil. Transplanting was done on June 27, 1984. A plot consisted of a single row of five plants spaced 12 in. apart in rows planted 3½ ft. apart. Each plot row was bordered with a row of slip-propagated plants of the variety Jewel to create equal competition for all plots.

Total yield from plants produced in tissue culture was not significantly greater than that from plants from slips and vine cuttings. However, the yield of culls from tissue culture was higher than from other propagation methods. Total and U.S. No. 1 yields from all treatments were considerably lower than normally obtained, probably because of late planting. The absence of jumbo sized roots indicated that production had not reached its full potential when an early frost forced early harvest.

Differences in skin and flesh mutations were not large enough to be related to propagation. Off-type roots (all abnormal storage roots such as culls and morphological malformations) were high in all varieties, but different among varieties. White Star produced more than Jewel, and AU-1 was intermediate. Tissue culture propagation resulted in more off-types than conventional methods of propagation.

These findings indicate that tissue culture techniques are useful in production of disease-free seed stock of sweet potatoes. Field experiments indicated that the use of tissue culture propagation may be less feasible economically than conventional methods (slips and vine cuttings). Although tissue culture-propagated plants did not produce higher yield than conventional methods, they did produce more culls and morphological off-type roots than produced by conventional methods. Thus, there is some indication that tissue culture would be a useful technique for propagating seed stock of certain varieties. Improvement in technique is needed to make it feasible for production of foundation seed stock.

Alkhalifa is Graduate Student of Horticulture; Hunter is Research Associate of Horticulture; and Chambliss is Professor of Horticulture.

ABOVE--explants were grown by tissue culture methods in test tubes; BELOW LEFT—plantlets were transplanted to pots and grown in greenhouse for 6 weeks; BELOW RIGHT—plants from tissue culture were grown in the field for production data.

WINTER COVER AIDS BERMUDAGRASS SURVIVAL

R. DICKENS and D.L. TURNER

BERMUDAGRASS is an excellent turfgrass for athletic surfaces throughout Alabama because it tolerates heat and drought and recovers rapidly from wear. However, unusually cold weather often results in winterkill of this species on closely mowed surfaces such as golf greens and tees. Sod fields harvested in the fall and winter months may also be injured or killed.

In areas where winterkill is likely, covering golf greens and tees has been a common practice for many years. Pine straw, cereal grain straw, or black polyethylene plastic have been the materials normally used. Each of these has distinct disadvantages. The straws require considerable labor to apply and remove and may introduce unwanted weed seed. Black polyethylene generally lacks adequate strength to resist tearing and does not allow free flow of air and water into the turf and soil. Neither of the materials is reusable over a period of several years

New materials currently under investigation by the Alabama Agricultural Experiment Station offer promise in overcoming many of the problems associated with covering turf areas for cold protection. These new materials are nonwoven fabrics produced from plastic filaments through either heat bonding or needle punching techniques.

During the winter of 1984-85, a field experiment was conducted at the Turfgrass Research Unit at Auburn to compare the effects of several nonwoven textile fabrics on temperature modification and spring greenup of a Tifdwarf bermudagrass putting green. Temperature sensors were installed in each of 12 plots on the dormant putting green at the turf surface and at depths of 1.2, 2.4, or 3.6 in. and connected to an electronic data acquisition system. Then the plots were covered in early January with one of the materials listed in the table. Temperature was continuously monitored and recorded during periods of unusual cold in January 1985. On March 5, 1985, the covers were removed and the amount of green turf cover was estimated for each plot.

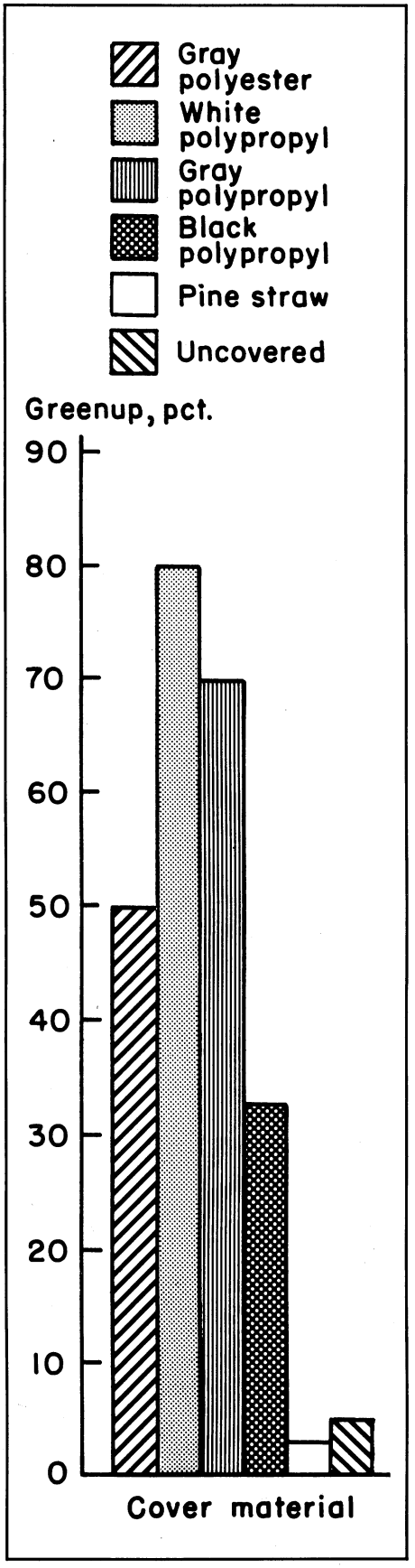
Pine straw reduced fluctuation of temperatures more than the nonwoven fabrics. The rate of warming of the turf surface did not vary greatly among the nonwoven fabrics regardless of color, material, or method of construction. The highest mid-day temperatures were recorded on plots covered with gray heatbonded polyethylene while the lowest temperature occurred on plots mulched with pine straw.

When the covers were removed on March 5, 1985, the most new green bermudagrass was present on plots which had been covered with either white or gray polypropylene, see figure. Plots covered with either black polyethylene or the gray polyester material had intermediate amounts of green turf, and the least amount of new growth appeared on the plots left uncovered or those covered with pine straw.

Nonwoven fabrics appear to be excellent substitutes for the traditional pine straw mulch in the protection of dormant bermudagrass turf. There appears to be little correlation between the amount of green bermudagrass in the spring and the temperatures observed under the various materials during the periods of cold stress in January. Research will continue to determine which of the materials is the most effective for both protecting from cold injury and promoting early spring greenup.

Dickens is Professor of Agronomy and Soils and Turner is Research Associate of Agronomy and Soils.

Effects of covers on greenup of bermudagrass evaluated March 5, 1985.



EFFECTS OF VARIOUS TURF COVERS ON TEMPERATURE OF DORMANT BERMUDAGRASS SURFACE JANUARY 23, 1985, AT AUBURN ALABAMA

Material	Color	Construction	Degrees F	
			Maximum	Minimum
Polypropylene	White	Heatbonded	53	28
Polypropylene	Gray	Heatbonded	69	26
Polypropylene	Black	Heatbonded	58	23
Polyester	Gray	Needle punched	58	29
Pine straw	—	—	48	29
Uncovered	—	—	61	25

Potential adoption of bovine growth hormone determined in survey of Southeastern dairymen

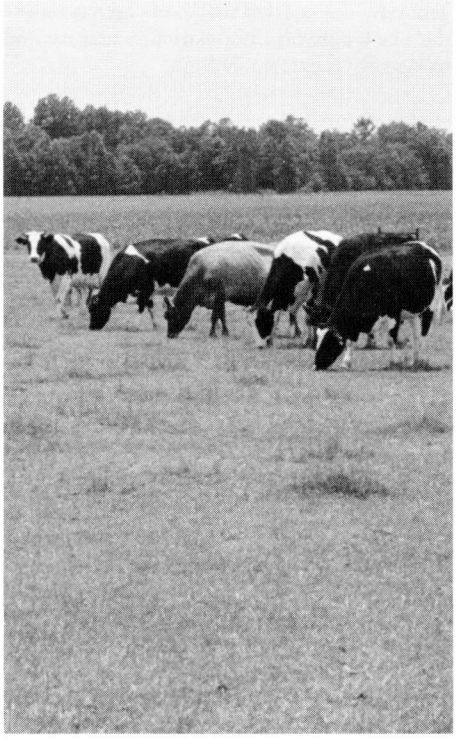
H.W. KINNUCAN and R. PENDERGRASS

BOVINE GROWTH HORMONE is probably 2 years or longer from FDA approval, but it is already creating lots of interest in the dairy industry. Reports that injection of the hormone (identified as bGH) increases milk output 10-40% in treated animals make its use appear appealing. Predictions that bGH will be available as an implant, which would eliminate daily injections, increases its appeal.

A protein that is produced naturally in small quantities by the pituitary gland of dairy cows, bovine growth hormone is a key determinant of milk output. For this reason, scientists theorized that if a dairy cow could be induced to increase the production of bGH, or if supplemental bGH could be administered, milk output would increase. Breakthroughs in molecular genetics made possible the manufacture of synthetic bGH in large quantities so its effects could be tested. Results from such testing indicated the potential for increased milk production, without ill effects and with only small increases in feed consumption.

Although there has been much speculation about how bGH will revolutionize the dairy industry, little hard evidence is available. Therefore, the Alabama Agricultural Experiment Station began research aimed at gauging the acceptance of bGH use by dairymen in Alabama and the Southeast. Such information should help define the potential impact on Alabama's dairy industry and help in planning for the future.

In a survey conducted in the fall of 1984, 1,000 questionnaires were mailed to a randomly selected sample of dairy farmers operating in Alabama, Georgia, Mississippi, and Florida. After follow-up post card reminders and an additional mailing of the questionnaire packet, 310 usable responses were received. A telephone survey of nonrespondents indicated that the sample provided reliable data.



Awareness of a technology is obviously a prerequisite for adoption. Results of the survey showed that only 50% of Southeastern dairymen were aware of bGH. This result was disconcerting because awareness levels among producers responding to a similar survey in New York approached 100%.

Another dimension of the adoption issue is dairymen's perceptions of feasibility of the new technology for their operations. In the survey packet, respondents were given a fact sheet describing the hormone in terms of its safety to animal and human health, mode of action, effect on feed requirements, and profitability. Calculations based on experimental data were also provided which showed profitability from hormone use assuming different response rates. Based on this information, about 70% of the survey respondents rated the feasibility of bGH "possible" or better. Stated another way, only 30% judged the product as having questionable feasibility in their operations. Thus, it appears that dairy farmers in the Southeast are receptive to at least experimenting with bGH.

Information on potential adoption rates was obtained by first asking the dairy farmer a series of questions relating to:

How soon after availability would the hormone be tried?

To what portion of the herd would the hormone be administered?

How long would it take to complete adoption?

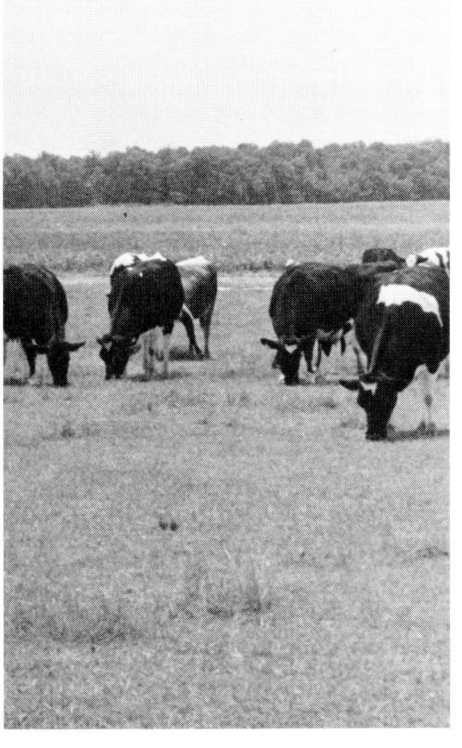
Responses to these questions assumed daily injection; availability of an implant was not considered. Answers all pointed toward a rapid rate of adoption in the Southeast: 41% indicated they would purchase the hormone immediately upon availability and 76% would try it within a year.

Although most (83.7%) of the early adopters would begin by administering the hormone on an experimental basis to only a portion of the herd, it appeared from the survey results that market saturation would occur within 3 years of availability. Thus, if bGH receives FDA approval in 1989 as expected, the data suggested that upwards of 90% of the Southeastern dairy herd could be expected to be on the hormone by 1992. Moreover, the rate of adoption would probably be rapid, according to survey results.

That bGH got favorable reviews by Southeastern dairy farmers is not surprising in light of the advantages claimed for the product, and the fact that it does not require significant outlays for implementation or require a minimum size for efficiency.

An important factor determining the impact of bGH on the dairy industry and Southeastern producers is its rate of adoption. Assuming success of the technology, rapid adoption of bGH nationwide could precipitate severe adjustment problems as the increased output of milk either forced prices down or caused government inventories to mount. At the individual farm level, early adopters of bGH might profit from the technology as they benefit from the time lag associated with price adjustment. Late adopters might have difficulties surviving if prices fall quickly because of growth in total production in the region or nationwide. Thus, timing of adoption may be critical if bGH comes into widespread use.

Kinnucan is Assistant Professor of Agricultural Economics and Rural Sociology and Pendergrass is undergraduate student in Agricultural Economics and Rural Sociology.



Black Cutworm Damage to Cotton

M.A. FOSTER
AND
M.J. GAYLOR

Cutting damage to young cotton plant by black cutworm.

BLACK CUTWORMS pose a potential threat to Alabama cotton growers, if conservation tillage practices become more common. Heavy infestations of these insects are most likely to occur when cotton is planted into legume cover or weedy areas with reduced tillage, because the cutworm's host plants are only minimally disturbed prior to cotton planting. In these cases, cutworm moths lay eggs on weeds or legumes, then the larvae move onto emerging cotton plants.

Conservation tillage practices provide an ideal environment for black cutworm and other cutworms, and if such practices become more common, growers will need well-defined treatment thresholds. As a first step in developing such thresholds, the damage done to young cotton plants by black cutworms was determined in Alabama Agricultural Experiment Station greenhouse studies.

Black cutworm larvae used in this study were offspring of wild moths. This cutworm species has six to seven larval instars, or stages, before it becomes a non-feeding pupa. The fourth and later stages are known to cut young cotton plants at the base of the stem. Individual cutworms in either the 4th (half grown), 5th, or 6th (mature) instars were placed in plastic dishpans of soil containing five cotton plants (McNair 235) in either the 1-node, 3-node, 5-node, or 7-node stage. Cutworm feeding behavior (cut plants or leaf feeding) was recorded at 1- to 2-day intervals. Additional cotton plants were transplanted into the dishpans if all five plants were cut. The soil was examined for pupae one week after cutting damage ceased to determine if larval development had been completed.

The total number of plants cut per larva decreased substantially as initial plant age increased, see table. Two factors are responsible: fewer plants cut per larva and a smaller proportion of larvae able to cut at least one plant. Both factors are related to the increase in plant size with age. All cutworm larvae tested were able to initiate damage to 1-node plants because they could easily cut the relatively thin mainstems. In addition, because larval development kept pace with increasing plant size, all these larvae were able to cut enough plants to develop into pupae.

The number of plants cut decreased with increasing initial plant age in part because older plants are larger and provide more food. In addition, only half of the 4th instars infesting 3-node cotton, 20% of the 5th instars infesting 5-node cotton, and 14% of the 6th instars infesting 7-node cotton were able to cut at least one plant. The remaining larvae in these treatments inflicted feeding damage at the base of one or more plants, but apparently were unable to cut all the way through the stem of any plants. Consequently, only a small proportion of these cutworms obtained sufficient food to complete development and pupate.

The results of this study indicate the susceptibility of cotton to black cutworm damage is greatest in the 1-node stage, decreasing with plant age to virtual immunity at the 7-node stage. Thus, black cutworm damage is most likely in young stands. Larvae cut fewer plants as plant age increases, suggesting that the cutworm treatment threshold should increase with stand age. Treatment is unnecessary in 5-node cotton unless most cutworms are mature. Finally, treatment is generally not needed in 7-node cotton unless the black cutworm population is mature and its density is extremely high.

Foster is Postdoctoral Research Associate of Zoology-Entomology and Gaylor is Associate Professor of Zoology-Entomology.

BLACK CUTWORM DAMAGE TO COTTON PLANTS AS INFLUENCED BY INITIAL AGE OF CUTWORMS AND COTTON

Initial age		Cut plants per cutworm	Larvae cutting ≥ 1 plant	Pupation
Plant stage	Cutworm instar[1]			
		No.	*Pct.*	*Pct.*
1 node	4	4.6	100	100
	5	5.8	100	100
	6	4.1	100	100
3 node	4	1.3	53.8	7.7
	5	2.9	100	100
	6	2.3	100	100
5 node	5	.2	20.0	10.0
	6	1.6	100	100
7 node	6	.1	28.5	14.3

[1]Black cutworm larvae have six to seven instars (stages of development) before pupation.

Hot processing of hams proves successful

L.A. CECCHI, D.L. HUFFMAN, and J.C. CORDRAY

CHILLING HOG CARCASSES before processing is a costly step that may be unnecessary. Processing carcasses while they were still hot gave satisfactory results in Alabama Agricultural Experiment Station research. With this system, hams and other cured cuts can be fully processed in less than 24 hours after slaughter of the animal. This reduces refrigeration costs and cooler space requirements and speeds up inventory turnover.

The Auburn study was done to determine minimum time necessary from slaughter to processing to maintain a ham of equal quality to conventional methods. The objective was to determine the optimum processing time for accelerated processing of conventional bone-in hams, based on yield, sensory evaluation (taste test), color, shear test (tenderness), and overall desirability.

Twelve market hogs weighing 220-240 lb. were slaughtered and the hides removed with a vertical pork carcass skinning machine. The right hams were assigned to conditioning periods (at 65°F) of 1, 2, 3, or 4 hours postmortem. The left hams, which served as the control, were not processed until after 24 hours of chilling at 34°F.

Upon completion of the conditioning treatments, the hams were pumped with cure solution, smoked with smoke from hickory sawdust, and cooked to an internal temperature of 148-152°F. Final product yield was determined after 18 hours of chilling in a 32°F cooler. Five half-inch center slices were removed from each ham for chemical, shear, and sensory evaluation.

No significant differences were observed in relation to brine drip loss, cooking loss, or chilling loss of the product due to processing method. Chemical analysis for moisture content revealed hams conditioned for 1 and 4 hours retained less water than hams chilled before being processed, see table. However, those conditioned for 2 and 3 hours did not differ in moisture content from the control hams.

Hams conditioned for 1 hour were higher in percent fat than control hams. In contrast, those conditioned for 2, 3, and 4 hours were significantly lower in total fat content than hams processed by conventional methods.

A significant color difference was noted in relation to the cured meat pigment in the hams. The 1-hour-conditioned hams were lower in the percent meat pigments converted to the cured meat color when compared to the control. However, no color difference was noted between hams conditioned for 2, 3, and 4 hours and those processed by conventional methods.

Taste panel observations revealed that the 4-hour conditioned hams were tougher than conventionally processed hams; however, no tenderness differences were observed between hams processed 1, 2, or 3 hours and the controls. The time-conditioned hams were less juicy when compared to hams processed by conventional methods. However, no difference was observed in relation to juiciness among the hot processed hams. There were no significant differences for connective tissue, degree of discoloration, overall desirability, or shear measurement for toughness.

Since the hams are fully processed in less than 24 hours after slaughter, meat packers can reduce their energy costs and increase their inventory turnover rate. Based on results of taste test, chemical analysis, and meat pigment color evaluation, 2-3 hours of conditioning between slaughter and processing gave best quality hams.

Cecchi is Graduate Assistant of Animal and Dairy Sciences; Huffman is Professor of Animal and Dairy Sciences; and Cordray is former Research Associate of Animal and Dairy Sciences.

COMPARATIVE CHEMICAL ANALYSIS AND TASTE PANEL RESULTS OF HAMS FROM DIFFERENT HOT PROCESSING TREATMENTS AND CHILLED PROCESSING

Treatment	Chemical analysis			Taste panel results	
	Moisture	Fat	Pigment conversion	Tenderness[1]	Juiciness[2]
	Pct.	*Pct.*	*Pct.*		
Hot processing					
1 hour	62.3	6.8	73.4	6.2	5.6
2 hours	71.6	4.4	77.9	6.1	5.4
3 hours	71.8	3.9	76.9	6.2	5.4
4 hours	71.2	3.7	77.4	5.8	5.1
Control (chilled)	71.8	6.0	81.4	6.4	6.1

[1]Tenderness: 1 = extremely tough; 8 = extremely tender;
[2]Juiciness: 1 = extremely dry; 8 = extremely juicy.

Slow release fertilizers incorporated into the propagation media produce a better plant

K.C. SANDERSON, W.C. MARTIN, JR., and D. HANNINGS

ADDING COMMERCIALLY available slow release fertilizer to propagation media prior to rooting ornamentals can result in an improved plant at maturity, according to research at the Alabama Agricultural Experiment Station. This 'earlier the better' approach improved rooting nutrition and produced more height and flower numbers at maturity in the Auburn tests.

The slow release fertilizers (SL) were compared to a water soluble fertilizer and a treatment consisting of no fertilizer in two experiments. Unrooted chrysanthemum cuttings were propagated in steam pasteurized sand, six cuttings per 6-in. pot, under intermittent mist, at 70°F, with 10% shade in a glasshouse.

Since nitrogen (N) is an important nutrient in rooting and early growth, an initial experiment was conducted on Improved Albatross variety chrysanthemum to determine if and when cuttings absorbed N and the effect on rooting quality. Commercial slow release fertilizers (SL), Osmocote® 14-14-14 and 18-6-12, were incorporated into the sand medium at the rate of 6.4 oz. per cubic foot. Peters® 25-10-10, a water soluble (WS) fertilizer, (1 lb. per 100 gal.) was applied weekly at the rate of 6 fl. oz. per 6-in. pot. A no-fertilizer treatment was also included.

Starting at propagation and continuing at 4-day intervals for 20 days, leaf samples were taken by removing all ½-in.-long or longer leaves from five cuttings per fertilizer treatment. The leaves were analyzed for nitrogen content.

The figure shows a decrease in nitrogen content in all cuttings until the 8th day. By the 12th day the N content had increased, however it was still below the amount recorded prior to experimentation. Leaves of cuttings propagated in Osmocote fertilizers generally had higher N contents than the water soluble fertilizer and no fertilizer treatments. At 20 days, leaves of cuttings propagated in a medium containing Osmocote 14-14-14 SL had the highest N content.

In a second experiment, cuttings of Orange Bowl variety chrysanthemum were propagated as in the first experiment. In addition to the Osmocote SL fertilizers, Mag-Amp® 7-40-6 SL was compared to Peters 25-10-10 WS and to no fertilizer. Leaf samples were collected for foliar nitrogen, phosphorous, and potassium analysis at 6 and 18 days. Following rooting, a set of cuttings not used in foliar analysis was potted into an amended medium of equal parts of soil, sphagnum peat moss, and perlite. To assure adequate nutrition, 8 oz. of Osmocote 14-14-14 SL per cubic foot was incorporated at planting and the plants were fertilized weekly with Peters 20-20-20 WS at 2 lb. per 100 gal. Standard commercial practices for flowering branched, potted chrysanthemums were used. Height and flower number per plant were recorded at flowering

Foliar phosphorous content did not differ between fertilizer treatments on either sampling date. Osmocote 18-6-12 SL leaves consistently contained more N than other fertilizer treatments at both 6 and 18 days, however this treatment also yielded less foliar K than untreated cuttings. The highest foliar K at the 6th and 18th day occurred with Mag-Amp 7-40-6 SL and no treatment, respectively, table 1.

TABLE 1. NUTRIENT PERCENTAGE OF DRY WEIGHT

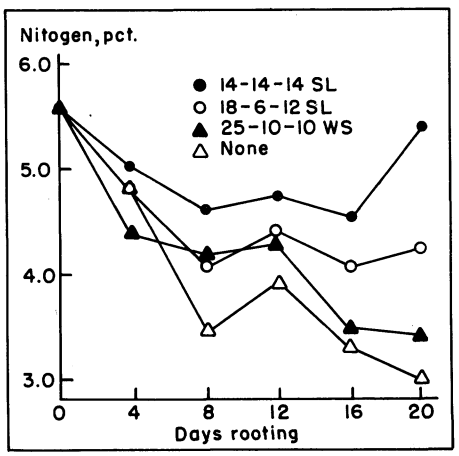
Fertilizer	N		K	
	6 day	18 day	6 day	18 day
7-40-6 SL	3.0	3.0	4.8	3.2
14-14-14 SL	3.7	2.9	4.2	4.1
18-6-12 SL	3.5	3.2	3.6	3.7
25-10-10 WS	2.9	1.9	4.6	3.6
No fertilizer	3.0	2.9	4.4	4.6

TABLE 2. HEIGHT AND FLOWER PRODUCTION OF FERTILIZER TREATMENTS

Fertilizer	Height	Flowers per pot
	In.	*No.*
7-40-6 SL	12.6	4.9
14-14-14 SL	13.1	4.9
18-6-12 SL	12.8	5.2
25-10-10 WS	12.0	4.6
No fertilizer	10.7	4.5

Slow-release fertilizers incorporated at propagation produced taller plants than Peters 25-10-10 WS. Osmocote 14-14-14 SL produced the tallest plants and Osmocote 18-6-12 SL produced plants with the most flowers, table 2.

Results of these experiments show that nitrogen content declines during rooting, nitrogen and potassium fertilizer can be absorbed during rooting, and fertilization of cuttings during rooting influences final plant height, and the number of flowers per plant. Slow-release fertilizers, especially Osmocote 14-14-14 and 18-6-12, incorporated in the propagation medium were most effective.



Foliar content of Improved Albatross chrysanthemum cuttings during potting in a sand medium treated with fertilizers.

Sanderson is Professor of Horticulture; Martin is Research Associate of Horticulture; and Hannings is Associate Professor at California Polytechnic State University.

Evaluation of vaccination programs for preventing clinical reovirus infection in broiler breeder progeny

J.J. GIAMBRONE and R.P. CLAY

AVIAN REO (respiratory enteric orphan) viruses are prevalent worldwide and are found in most commercial poultry populations. Reoviruses have been associated with problems in poultry such as: arthritis affecting the major weight bearing joints of the legs, ruptured tendons, pericarditis, myocarditis, hydropericardium, necrosis of the proximal end of the femur, malabsorption, and maldigestion.

Reoviruses were first controlled by vaccinating breeder pullets with an attenuated S1133 viral tenosynovitis strain. The initial S1133 isolates varied in immunogenicity and pathogenicity. The more invasive immunogenic vaccines, given by drinking water, could be shed to the progeny resulting in clinical disease. In contrast, less immunogenic and pathogenic strains had to be given by injection. For many years the use of live S1133 vaccine strains helped control clinical tenosynovitis in breeder pullets, but not in progeny. With the advent of inactivated reovirus vaccines (CO_8, 2408, S1133, and 1733), emphasis was placed on stimulating antibody synthesis in breeders. This provided control of reovirus diseases in breeders and progeny.

Several studies have shown that the immune system with one live S1133 vaccine by 12 weeks of age followed by an inactivated reovaccine at 18 weeks provides immunity for both pullets and progeny against reoviruses. However, even with use of killed reovirus vaccinations, reovirus-associated diseases continue to be a problem in both breeders and broiler progeny.

A recent study at the Alabama Agricultural Experiment Station evaluated the efficacy of commercial reovirus vaccination programs in breeder pullets for prevention of clinical reovirus infections in broiler progeny. It also determined the proper timing and combination of live and killed reovirus vaccines to use in pullet flocks.

In each of three experiments, 70 day-old broiler chicks from four commercial poultry companies using combinations of live and killed reovirus vaccines in breeder pullets were used. Broiler chicks from each company were bled and serum analyzed for neutralization antibody. Twenty chicks from each company were challenged by foot pad injection with a virulent reovirus (S1133). Another 20 chicks were challenged with reovirus isolate (81-B) to determine susceptibility. An additional 20 chicks from each group were maintained as unchallenged controls. Chicks were examined for morbidity, mortality, and weight gain for 3 weeks. At this time all chicks were necropsied for gross lesions.

Data from all three experiments indicated a direct correlation among the number of doses of live and/or inactivated reovirus vaccines that the pullets received, antibody titer, and resistance to reovirus challenge infection in the day-old progeny. Progeny derived from breeder pullets that received one dose of live and two doses of inactivated reovirus vaccines had the highest maternal antibody and best resistance to clinical infection following challenge, see table.

This research indicates at least three doses of reovaccines are necessary during the growing period to provide pullets and their progeny adequate protection against disease. The first should consist of a highly modified live S1133 primer given at debeaking (7 to 14 days) by subcutaneous (SQ) injection to prevent early exposure to pullets, and the second an inactivated product given 6-8 weeks later by SQ injection to further protect the pullet and provide additional priming. When the pullets are moved from the growing to the laying facility, a third dose of an inactivated vaccine should be given to produce long lasting uniform titers in progeny.

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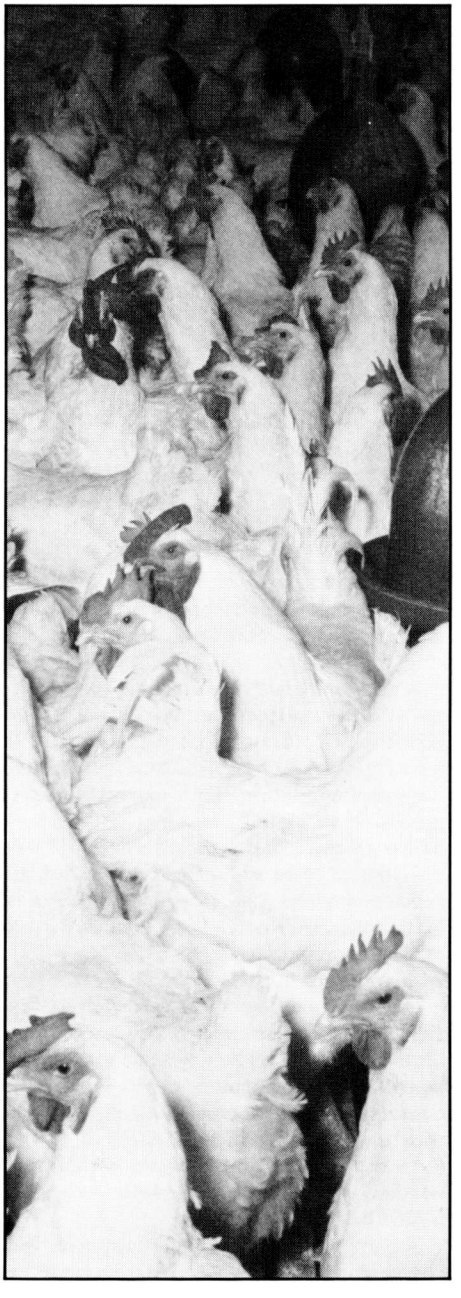

RESULTS OF LIVE AND/OR INACTIVATED VACCINES ON BREEDER PULLETS

Treatments	Mean VN titers[1]	Reovirus challenge group					
		S1133		81-5		None	
		No.[2]	Wt.[3]	No.	Wt.	No.	Wt.
			Oz.		*Oz.*		*Oz.*
None	64	18/20[2]	11.0	20/20	10.0	0/20	14.5
Live + killed	230	8/20	12.5	10/20	11.5	1/20	14.0
Two live + one killed	309	3/20	13.0	5/20	12.5	0/20	14.5
One live + two killed	384	2/20	14.0	2/20	14.0	1/20	14.5

[1]Arithmetic mean virus neutralization antibody titers against the S1133 virus.
[2]Numbers represent number of birds susceptible (showing morbidity, gross lesions, or mortality) over the total number of birds.
[3]Three-week body weight.

TOP—Hershey's Red azalea in 3-in.-deep pots of (left to right) 8, 6, and 4 in. width; BOTTOM—euonymus in 12-in.-deep pots of 8, 6, and 4 in. width.

Matching containers to rooting habits improves performance of woody ornamentals

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DISTRIBUTION OF PLANT roots in the soil is determined by both genetic and environmental factors. In the case of container-grown ornamentals, however, environmental factors probably have the dominant effect. Restrictive container walls, limited growth medium, and high water-holding capacity of the media cause root growth in containers to differ considerably from the field.

Numerous woody ornamental species are grown in nursery containers with a typical width/depth ratio of approximately 1:1. In tests conducted by the Alabama Agricultural Experiment Station, both canopy and root growth were stimulated when container dimensions were matched to the natural root distribution of dwarf Burford holly, dwarf Japanese euonymus, and Hershey's Red azalea. With tree seedlings in large containers, relatively low width/depth ratio containers generally produce larger seedlings.

Plants of each species were potted May 1983 in an amended peat-perlite growth medium and placed on benches in a glass greenhouse. The three species were planted in containers in nine combinations of three widths (4, 6, and 8 in.) and three depths (3, 6, and 12 in.). Plants were watered as needed, and root and top growth were determined in January 1984.

Top growth of Burford holly, a species with coarse, lateral, and deep roots, increased as both pot width and depth were increased. The greatest response to pot width occurred with the shallower pots and to pot depth with the narrower pots. Relative root density of holly increased as pot depth increased, except for a tapering off in the wider and deeper pots. Roots reached the bottoms of pots of all depths. Root density was highest in the lower half of containers, reflecting the relatively deep rooting habit of Burford holly.

Euonymus, a species with a densely branched, medium fine root system, increased in top growth as pot width and pot depth increased; the greater response was from increased width. Relative root density of euonymus was greatest in the narrow, shallow pots and decreased as pot depth and width increased.

Top growth of azalea, a fibrous and shallow-rooted species, increased in response to increased pot width, while pot depth had no effect. Relative root density of azalea, like euonymus, was greatest in the narrow, shallow pot and decreased as pot depth increased. Roots of azalea did not reach bottoms of all pots. This root growth pattern is different from that observed with Burford holly and reflects the shallow, natural root distribution of azalea.

Traditionally, there has been little regard for a plant's natural root distribution when selecting pots for production. Although additional volume of growth medium in wider and deeper pots must be considered a major contributor to plant response, results of this Alabama Agricultural Experiment Station study suggest it is beneficial to (1) grow shallow-rooted species in shallow, broad pots, and (2) grow deep-rooted species in pots deeper than standard nursery pots.

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