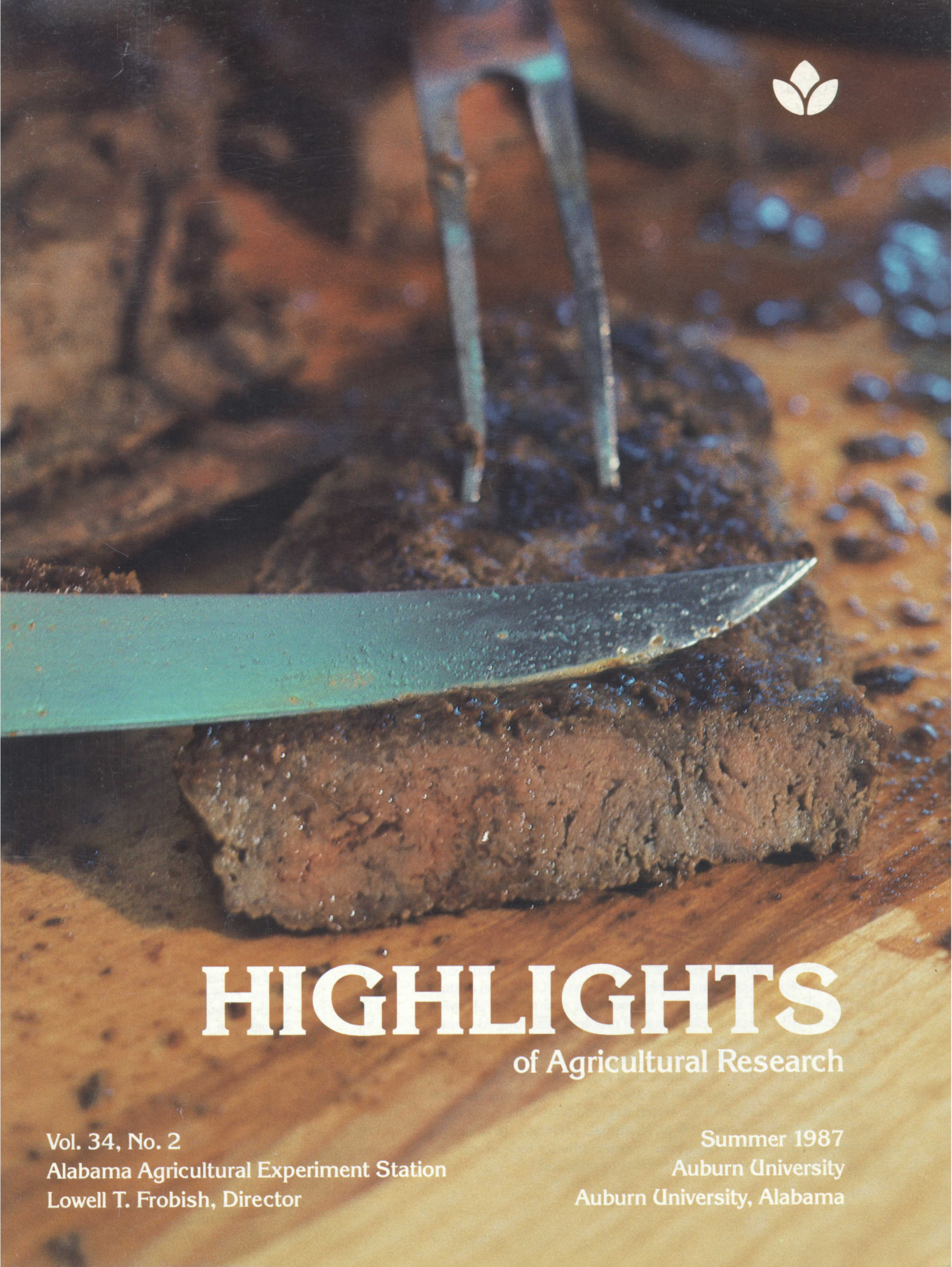

HIGHLIGHTS

of Agricultural Research

Vol. 34, No. 2
Alabama Agricultural Experiment Station
Lowell T. Frobish, Director

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A WORD WITH THE EDITOR

"THE ADOPTION of the Hatch Act of 1887 was one of the most significant steps ever taken in American agriculture. It is no exaggeration to say that the wealth of technical knowledge developed at these stations (state agricultural experiment stations) has enabled America's farmers to revolutionize the practice of agriculture and bettered life for millions of people the world over."

This statement was part of the proclamation signed by President Ronald Reagan on March 2, 1987, to commemorate the 100th anniversary of passage of the Hatch Act, which created the U. S. system of agricultural experiment stations at the nation's land-grant colleges. The President's proclamation highlighted a major observance held on that date in Washington, D. C., to recognize the vital role agricultural research has played in the development of the United States during the past 100 years and its contribution to the daily life of all Americans.

Although eight states, including Alabama, had already established experiment stations before 1887, there was no national research system, and only meager funds were available to support research. The Hatch Act authorized annual funding of $15,000 for an agricultural experiment station in each state, thereby assuring a continuing program of research to serve the nation's agriculture, and through it, to serve all Americans. This legislation was a Godsend to the underfinanced experiment stations already in existence, as well as to make possible establishment of an experiment station in all other states.

R.E. STEVENSON

The goals stated in the Hatch Act were to "aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science...." These goals have been followed from the beginning, as evidenced by the science-based, highly efficient agricultural industry that has developed.

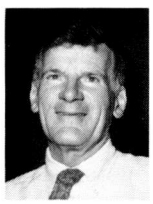
Although not specified in the language of the legislation, the cooperative efforts of the many independent state experiment stations through the years represent one of the major strengths of the Hatch Act. Researchers from many states have worked together on common problems, thereby getting maximum effect from available funds. Equally important, researchers take advantage of findings in other states, thereby avoiding costly duplication of research.

The Hatch Act's initial funding of $15,000 for each experiment station has shown large increases through the years. In 1986, for example, the Alabama Experiment Station received $3.7 million in federal appropriations. This supplemented the $13.5 million of state appropriations and $4.3 million in contracts and grants, allowing researchers to address a wide range of problems affecting Alabama.

The vision for a nationwide system of agricultural experiment stations came from William Henry Hatch, Congressman from Missouri's First District. A champion of legislation to aid farmers, Hatch's greatest victory came on March 2, 1887, when President Grover Cleveland signed the Hatch Act into law. A statue of Congressman Hatch was erected in Hannibal, Missouri, in 1915 as a lasting tribute to this man whose vision continues to lead agricultural science into even greater service to mankind.

may we introduce

Dr. Art Hiltbold, Professor of Agronomy and Soils. A native of New York, Hiltbold came to Auburn from Cornell University in 1955 as an associate professor. He was promoted to his current rank of professor in 1968. Prior to coming to Auburn he was an instructor at Cornell and worked as a lab technician in the Soil Testing Laboratory there.



He earned a B.S. degree in agronomy and soils from Cornell, then went on to Iowa State to earn an M.S. degree in soil sciences. He returned to Cornell to complete his Ph.D. in soil microbiology.

While at Auburn, Hiltbold has worked extensively with the transformation of nitrogen in the soil. His more recent work has centered on the ability of certain plants to utilize nitrogen from the air. His article on atmospheric nitrogen fixation by peanut plants is found on page 4 of this issue of *Highlights*. Hiltbold also has studied the problem of herbicide persistence in the soil, and conversely, the modes of loss of these pesticides from the soil.

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LOWELL T. FROBISH ..... *Director*
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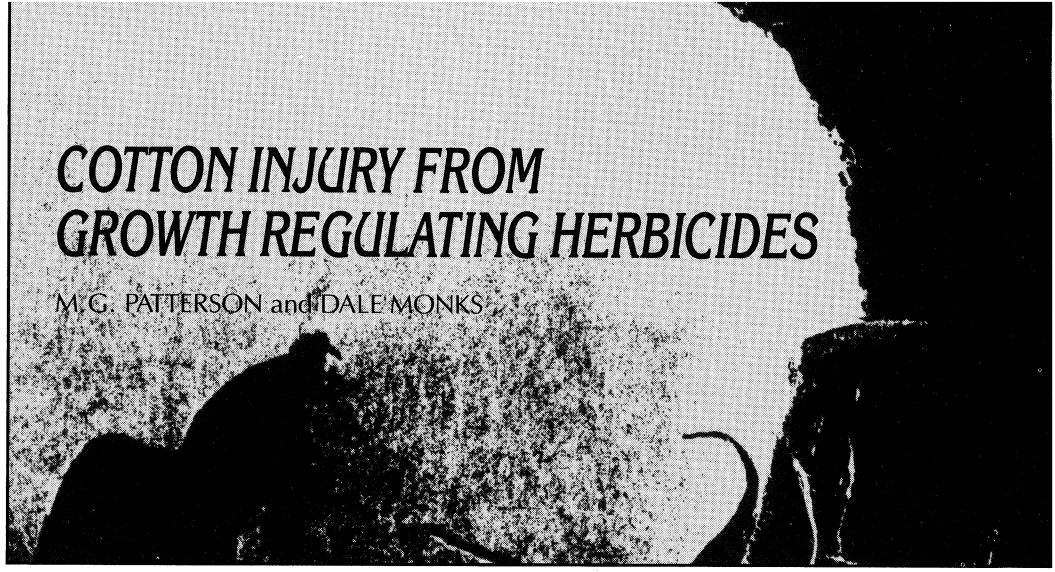
ON THE COVER. Tasty, tender restructured steaks can be made from less desirable meat cuts (see story on page 14).



COTTON INJURY FROM GROWTH REGULATING HERBICIDES

M. G. PATTERSON and DALE MONKS

IT HAS been known for many years that growth regulating herbicides such as 2,4-D, dicamba, and 2,4-DB can severely injure cotton if contacted by drift from adjacent fields or if spray tanks are not properly cleaned after using these chemicals. However, situations occur every year in which cotton is injured by these herbicides.

Experiments were conducted recently at the Alabama Agricultural Experiment Station's E. V. Smith Research Center in Shorter, Tennessee Valley Substation in Belle Mina, and Wiregrass Substation in Headland to determine the effects of 2,4-D, dicamba, and 2,4-DB on cotton yields. At Shorter, 2,4-D rates of 0.0001, 0.001, 0.01, and 0.1 lb. per acre were applied to cotton in the early squaring stage in the first year and to cotton in the late bloom stage the following year. At Belle Mina and Headland, 2,4-DB was applied at rates of 0.001, 0.01, 0.1, and 0.5 lb. per acre, while dicamba and 2,4-D were each applied at rates of 0.01 and 0.1 lb. per acre. All herbicide rates were applied independently to cotton in the six-leaf stage and first bloom stage during 1986. Lower rates (0.01 lb. and lower) simulated drift or contaminated spray tanks. Dry conditions occurred at Shorter and Headland when these trials were conducted, while rainfall at Belle Mina was close to average. Low volatile formulations of all three herbicides were used. Herbicides were sprayed over the top of cotton in 15 gal. of water per acre.

Seed cotton yields at Shorter were reduced 48 and 86% the first year when 2,4-D rates of 0.01 and 0.1 lb. per acre were applied to cotton in the squaring stage, table 1. Rates of 2,4-D lower than 0.01 lb. per acre did not decrease yields when applied to squaring cotton in the first year. In the second year, rates of 2,4-D lower than 0.1 lb. per acre did not decrease yields when applied to cotton during late bloom. However, application of 0.1 lb. per acre to cotton in late bloom at Shorter reduced yields 34% in the second year.

When averaged over all rates of application, 2,4-DB treatments at the six-leaf stage reduced yields 49 and 48%, respectively, at Belle Mina and Headland, table 2. First bloom applications reduced yield 69% at Belle Mina, but only 25% at Headland. The yield potential of cotton was significantly lower at Headland than Belle Mina due to dry conditions, which slowed translocation of 2,4-DB in the plant and possibly explains the yield difference.

The average yield reduction increased from 9 to 83% as 2,4-DB rates increased at Belle Mina and Headland, table 3. Comparing yield reductions of the three herbicides at equal rates shows 2,4-D to be more injurious than 2,4-DB or dicamba when all were applied at 0.01 lb. per acre (50% vs. 33% and 27%, respectively). However, at 0.1 lb. per acre, 2,4-D and 2,4-DB were equally injurious to cotton yields, while dicamba was somewhat less harmful (64 and 61% vs. 52%, respectively). Nevertheless, each herbicide severely reduced yields at the 0.1 lb. per acre rate. Yield reductions obtained were primarily due to a decrease in boll number per plant and percent open bolls as herbicide rates increased.

Typical spray tank contamination or drift could easily contain 0.01 lb. per acre of 2,4D, 2,4-DB, or dicamba, and even this low rate could reduce yields enough to eliminate any profit from a cotton crop.

Patterson is Assistant Professor of Agronomy and Soils and Monks is former Research/Extension Associate of the Tennessee Valley Substation.

TABLE 1. EFFECTS OF FOLIAR APPLICATION OF 2,4-D ON YIELD OF SEED COTTON IN A TWO-YEAR TEST AT THE E.V. SMITH RESEARCH CENTER, SHORTER

2,4-D rate/ acre, lb.	Seed cotton yield/acre[1]			
	Year 1		Year 2	
	Lb.	*Red.*	*Lb.*	*Red.*
Control	512	0	907	0
0.0001	496	0	937	0
0.001	502	0	841	0
0.01	265	48%	843	0
0.1	70	86%	598	34%

[1]Average of four replications.

TABLE 2. EFFECT OF TIME OF 2,4-DB APPLICATION ON COTTON YIELDS AT BELLE MINA AND HEADLAND

Time of application	Seed cotton yield/acre[1]			
	Belle Mina		Headland	
	Lb.	*Red.*	*Lb.*	*Red.*
6 leaf	1,247	49%	925	48%
1st bloom	758	69%	1,320	25%
Untreated	2,434	—	1,770	—

[1]Averaged over all rates.

TABLE 3. EFFECT OF TIME AND RATE OF HERBICIDE APPLICATION ON COTTON YIELDS AT BELLE MINA AND HEADLAND

Herbicide rate, lb./acre	Seed cotton yield/acre[1]				Average reduction
	Belle Mina		Headland		
	6 leaf	1st bloom	6 leaf	1st bloom	
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Pct.*
2,4-DB					
0.001	2,132	1,821	1,624	1,570	9
0.01	1,707	1,364	853	1,679	33
0.1	613	417	962	1,107	61
0.5	261	114	436	526	83
2,4-D					
0.01	882	580	780	1,688	50
0.1	874	253	608	1,134	64
Dicamba					
0.01	1,993	939	1,298	1,797	27
0.1	1,511	572	835	1,062	52
Control	2,434		1,770		—

[1]Average of four replications.

Peanut Nitrogen from the Air

A.E. HILTBOLD

MOST of the nitrogen (N) in a peanut crop comes from the air. Certain bacteria (bradyrhizobia) enter peanut roots in the seedling stage, then multiply within nodules that the plant forms around them. The plant's photosynthesis provides the bacteria with energy required to convert atmospheric N into forms the plant can use. While this is going on, peanut roots also absorb nitrate-N that may be in the soil from residual fertilizer or decomposing organic matter. But soil-absorbed N alone is insufficient for crop needs. The role of atmospheric N fixation in peanut production was determined in an experiment at the Alabama Agricultural Experiment Station's Wiregrass Substation in 1986.

To distinguish atmospheric N from soil-absorbed N in Florunner peanut plants, a non-nodulating relative of Florunner (M4-2) was used for comparison. Since M4-2 does not fix any N, its total supply must come from the soil. Florunner obtains the same amount of N from the soil; therefore, the N content of M4-2 may be subtracted from the total N in Florunner to calculate atmospheric N fixed.

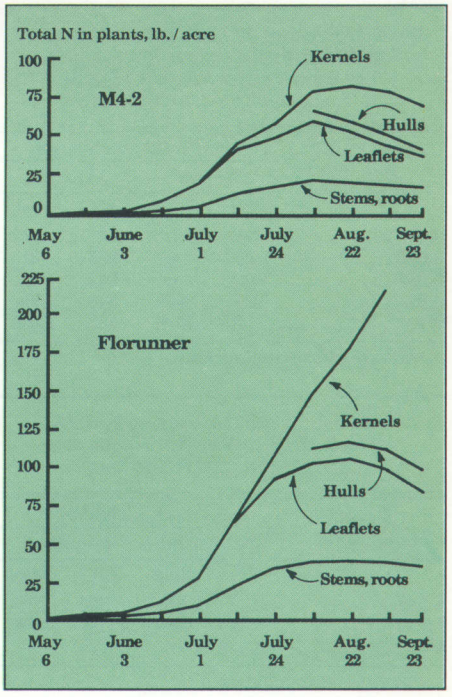
Both cultivars were planted on May 6 in 6-row plots 60 ft. long. No fertilizer N was used and soil testing showed adequate levels of phosphorus and potassium. Irrigation was applied as needed during an unusually dry season. Stands were thinned 2 weeks after planting to space plants 4 in. apart in the rows. Ten 3-ft. sampling intervals were marked in rows 2 and 5 of each plot. Every 2 weeks, nine plants in each plot were dug and divided into roots, stems, leaflets, and later into kernels and hulls. Dry weights and total N contents were determined. At maturity, rows 3 and 4 of each plot were machine harvested.

Florunner and M4-2 plants grew similarly during the first 8 weeks until July 1 when the first pods were developing: M4-2 had produced 900 lb. per acre of plant dry matter containing 21 lb. per acre of seed- and soil-derived N, while Florunner had produced 1,040 lb. per acre of dry weight containing 27 lb. per acre of total N. The difference, 6 lb. per acre of N, represents atmospheric N fixed by Florunner up to the stage of early pod development. However, Florunner plants were well nodulated and dark green while M4-2 plants were chlorotic and N deficient.

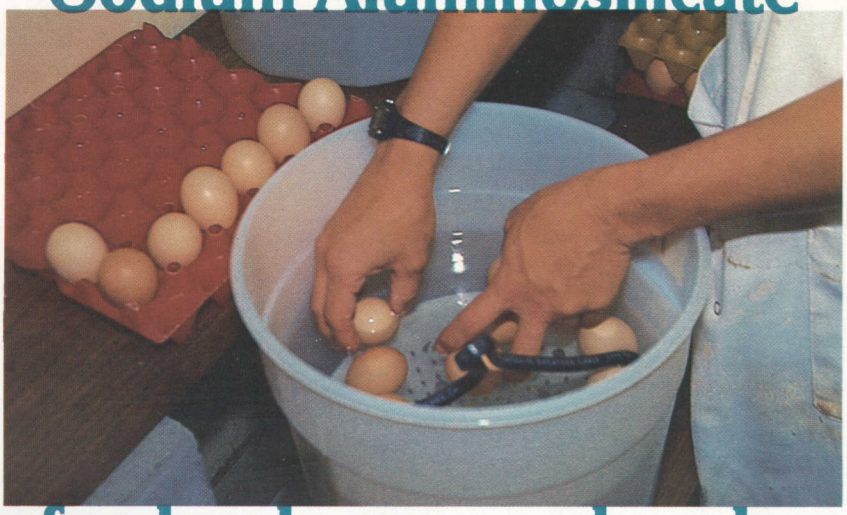
Differences between the varieties became more pronounced as the season advanced, as illustrated by the photo. M4-2 plants reached their maximum growth (6,860 lb. per acre of dry matter, 86 lb. per acre of N) on August 26. Nitrogen for maturing kernels was drawn from M4-2 leaflets, reducing their N percentage to half of their midseason content. Florunner, on the other hand, increased continuously to September 23, (140 days after planting) with 9,160 lb. per acre of dry matter and 221 lb. per acre of N. The difference in N content of Florunner and M4-2, 135 lb. per acre, is the seasonal total of atmospheric fixation. It made up 61% of the total N in Florunner, most of it going into pod yield of 4,010 lb. per acre grading 72% sound mature kernels (SMK). M4-2, without benefit of N fixation, yielded 1,380 lb. per acre of peanuts grading 60% SMK. The significance of N fixation is clear; it supplies the N required for high yield of quality peanuts.

Hiltbold is Professor of Agronomy and Soils.

Nitrogen accumulation by M4-2 peanuts (soil N only), compared to Florunner peanuts (soil and atmospheric N).



Sodium Aluminosilicate in feed reduces egg breakage



D.A. ROLAND and P.E. DORR

A SMALL AMOUNT of sodium aluminosilicate in feed of laying hens may eliminate much of the costly egg breakage problem that plagues Alabama's poultry industry. That's the indication from research at the Alabama Agricultural Experiment Station.

Sodium aluminosilicate (SAS), or zeolite A, is characterized by its ability to gain and lose water reversibly and to exchange cations without a major change in structure. Although more than 40 naturally occurring zeolites and over 100 synthetic ones exist, SAS has the greatest ion exchange capability and highest selectivity for calcium (Ca) among the commercially available zeolites. Because of its unusually high ion exchange capacity, it was hypothesized that SAS might influence calcium metabolism in laying hens. The first report that SAS increased egg shell quality came from Auburn research in 1985.

Numerous experiments with SAS have been conducted since that time, with improvements of 1 to 4 units in egg specific gravity resulting from SAS additions. Results also indicate that the inclusion of 0.75% SAS in layer diets containing 3.75% calcium, 0.7% phosphorus, and 16% protein will improve feed efficiency 2 percent.

After numerous Experiment Station trials which showed consistent improvements in egg specific gravity, a commercial field trial was conducted using 32,000 hens. Eggs were evaluated for body checks[1], cracks, weight, and specific gravity at weekly intervals for 2 weeks. All hens were then fed 0.75% SAS for 6 weeks and the same data were recorded at 2-week intervals. At the end of the 6-week period, SAS was removed and the same data determined for an additional 2 weeks. All production and processing records were obtained by the producer. Four different check systems were utilized to help evaluate SAS: (1) egg breakage determined at farm, (2) eggs lost due to breakage as recorded by farm owner, (3) egg breakage determined at the processing plant, and (4) egg specific gravity determined in the laboratory.

The results given in the table indicate that feeding SAS increased egg specific gravity 3.3 units compared to the pre-experimental value and 2.1 units compared to the post-experimental value. This reduced lost eggs 33% as indicated by processing plant records, reduced cracked eggs 29% as indicated by processing plant records, reduced B-grade eggs 19%, reduced total undergrades 28% at processing plant, and reduced breakage 28% and body checks 44% at the farm. It also reduced broken eggs discarded by producers by 15%.

Cracked eggs determined at the farm level correlated directly to specific gravity. Breakage was approximately 3% prior to starting the treatment, but dropped below 2% within 2 weeks. The improvement in breakage averaged 28% during treatment. In every instance, when specific gravity increased, breakage decreased and vice versa.

The breakage at the farm was similar to the breakage determined in the processing plant. During the pre-experimental period, percent cracks determined at the processing plant averaged 3.1% versus 2.2% during the treatment period (a 28% reduction). Within 2 weeks after removing SAS, breakage had returned to 3%. While feeding SAS, percent lost eggs was reduced from 0.6 to 0.4; it increased back to 0.6 following the experiment. Percent B-grades decreased from 4.6 to 3.4, but was back to 4.5 within 2 weeks after removing SAS from the diet.

Another pronounced effect that had not been previously observed was the influence of SAS on body checked eggs. During the pre-experimental period, the incidence of body checked eggs was approximately 6%. After 6 weeks of feeding 0.75% SAS, the incidence of body checks had decreased to 1.5%. Within 2 weeks after removing SAS from the diet, the incidence of body checks had increased to 8%.

These data demonstrate that SAS fed at a level of 0.75% significantly improves egg specific gravity, reduces eggs loss due to shell problems, and improves feed efficiency. Thus, the field trial results were similar to results of preliminary trials at Auburn.

Roland is Professor of Poultry Science and Dorr is associated with ConAgra in Eldorado, Arkansas.

INFLUENCE OF SODIUM ALUMINOSILICATE ON VARIOUS CRITERIA, FIELD TRIAL

Criteria	Compared to pre-experimental value	Compared to post-experimental value
Improved egg specific gravity, units	3.3	2.1
Reduced egg loss at processing plant, pct.	33	29
Reduced cracked eggs at processing plant, pct.	28	26
Reduced B-grade at processing plant, pct.	19	21
Reduced total undergrades at processing plant, pct.	27	25
Reduced breakage at farm, pct.	28	49
Reduced body-checks at farm, pct.	44	57
Reduced cracked eggs discarded at farm by producer, pct.	15	1

[1]Body checks are eggs broken in the hen's uterus prior to lay; they are poorly repaired and have a ridge around the middle of the egg.

Insufficient Dietary Fiber Intake Is a Problem among the Elderly

R.E. KEITH and L.M. VARNER

DIETARY FIBER consumption is currently a hot topic among health conscious individuals. The press regularly reports that dietary fiber may contribute to the prevention and/or relief of several common chronic diseases and disorders (constipation, obesity, diabetes, high blood cholesterol levels, diverticular disease, and colon cancer). It is now known that dietary fiber is not a single substance, but several substances, each with a slightly different function. Thus, dietary fiber from raw fruits and vegetables may have different effects on the body when compared to the dietary fiber in beans, oatmeal, or various bran products.

Despite all the reports about fiber's importance, the nation's elderly seem to be largely unaware of the facts and may not consume enough fiber to fill their needs. This is especially meaningful because elderly persons frequently suffer from diseases or disorders associated with poor eating habits, including a possible lack of dietary fiber.

The magnitude of the problem is emphasized by population data showing that persons over 65 years of age currently make up approximately 11-12% of the total U.S. population. And this percentage is expected to increase significantly over the next 20-40 years.

Due to the increasing numbers of elderly persons and the lack of substantial data concerning dietary fiber intake in elderly persons, a study was conducted by the Alabama Agricultural Experiment Station. The purpose was to determine the dietary fiber intake and knowledge of food sources of dietary fiber in a group of apparently healthy elderly men and women.

Subjects in the study included six men and six women ranging in age from 60 to 88 years. Participants all lived in a retirement mobile home community, had completed at least a high school education, were married, and had full kitchen facilities available to them. All had retirement incomes above established poverty levels. Data related to health status, fiber intake, knowledge of dietary fiber sources, and lifelong dietary habits were obtained by personal interview in conjunction with written questionnaires and a 24-hour diet recall. Height, weight, and 24-hour dietary fiber intake data for the 12 subjects are reported in table 1.

Table 1. Height, Weight, and Dietary Fiber Intake Values in a Group of Elderly Persons

Group	Number	Height	Weight	Average dietary fiber intake/day[1]
		In.	*Lb.*	*Grams*
Males	6	67	158	11.4
Females	6	63	144	12.0
Total	12	—	—	11.7

[1]Recommended dietary fiber intake is 15-35 grams per day.

Table 2. High Fiber Foods Eaten by a Group of Elderly Persons

Food and serving size	Average servings/week
	No.
Raw fruits (1 medium) and vegetables (½ cup)	8.4
Cooked fruits and vegetables (½ cup)	6.7
Whole grain breads (1 slice) and/or cereals (1 oz.)	2.9
Peas, beans, seeds (½ cup)	1.4
Bran/bran cereals (1 oz.)	.7

Daily dietary fiber intake in the group ranged from 4 to 23 grams[1], with an average intake of 11.7 grams per day. Recommended dietary fiber intakes range from 15 to 35 grams per day. Thus, the dietary fiber intake in the study group of elderly could be characterized as low.

The low fiber diets of those surveyed are apparent in data in table 2. Raw and cooked fruits and vegetables were the high fiber foods most often eaten by the elderly respondents. The fiber intakes were characterized by the consumption of several foods containing some fiber rather than concentration of one high fiber food such as bran.

Two-thirds of the subjects could not recall ever receiving any professional or public information on dietary fiber. This finding was supported by the results of the dietary fiber knowledge questionnaire. A number of the subjects were familiar with several good sources of dietary fiber (raw fruits and vegetables, bran). However, none of the subjects knew that whole grains, beans, nuts, or seeds were good sources of fiber. In addition, several participants thought that low fiber foods, such as meat, white bread, milk, and yogurt, were good sources of fiber. Results indicated that there was an inability to consistently and correctly identify high and low fiber foods.

In addition to the dietary fiber data, health status results indicated that a high percentage of the subjects had at least one of the following disorders related to low fiber diet: constipation, obesity, diabetes, and diverticular disease. While the consumption of a low fiber diet cannot be directly implicated in the diseases noted, conditions associated with low fiber diets were found in the present group of elderly.

Data on subjects in the present study indicate that most had dietary fiber intake below or at the low end of the recommended fiber intake range. The fiber consumed by the elderly subjects was mainly from a variety of fiber sources rather than one major source such as bran. Subjects could identify certain high fiber foods; however, they could not consistently and correctly identify high and low fiber foods. Obesity, constipation, diabetes, and diverticular disease were low fiber intake-related disorders which afflicted some of the participants. These findings emphasize the need to increase dietary fiber consumption and knowledge in the elderly.

[1]One ounce = approximately 28 grams.

Keith is Associate Professor of Nutrition and Foods and Varner is a Graduate Student.

Social strength is present in open-country neighborhoods

J.E. DUNKELBERGER, C.R. GRAHAM, and G. LYLES

AS MARK TWAIN said about the erroneous reports of his death being greatly exaggerated, so it can be reported that neighborhoods are alive and functioning in Alabama. This finding by the Alabama Agricultural Experiment Station and Tuskegee University disputes the many gloomy reports about unhealthy conditions of rural and urban neighborhoods today.

A basic social unit, the neighborhood is often overlooked in social science research because it is not a political entity that has members or elects officers. Instead, the neighborhood is a locality group that exists as a result of people (families or households) building houses and making their homes near one another. Although relatives sometimes live in the same neighborhood, the most common pattern is for the residents to be strangers prior to moving into an area.

Much has been written recently about the deterioration or disappearance of neighborhoods as meaningful social units in American society. Concern has focused on farm neighborhoods as well as city neighborhoods. In cities, families living in close proximity are believed to have little social interaction—to interact less frequently and with fewer neighbor families than was true in the past. Similar changes are believed to be occurring in rural areas. Farms have grown larger and fewer. Rural residents no longer share a common occupation and attachment to agriculture. Many local people commute to jobs in town and their children leave the neighborhood to attend school. The result is a greatly restricted set of interactions characterizing social life at the neighborhood level.

What types of social interactions are most reflective of neighborhoods? Most would probably agree that "neighboring" best describes these interactions because they involve face-to-face contacts on a continuing basis over a long period with people and families who live nearby. Not every family in a neighborhood needs to "neighbor" with every other family. Some families may live near others and not interact, or interact only selectively, with neighbors; yet through this network of interactions among families, a sense of neighborhood exists.

The study reported here measured the strength of neighboring in different types of locational settings: open country, small town (2,500-10,000), city (10,000-50,000), and metropolitan city (50,000 or larger). Neighboring was defined as the frequency with which the members of a household or family have contact with other households living nearby. Data were gathered in a 1985 statewide survey of more than 1,600 Alabama households.

Neighboring interactions studied included: (1) going places together, (2) entertaining one another in each others' homes, (3) asking each other advice, (4) talking about problems, (5) borrowing things from each other, (6) visiting in each other's homes, and (7) watching out for each other. Average household neighboring scores are shown in the table for each type neighborhood interaction.

The results reveal that some behaviors identified as common within the neighborhood setting are practiced more often and by more Alabama households than are others. "Going places" with neighbors and reciprocated "entertaining in each other's homes" are least often practiced statewide. Conversely, the most common neighboring behavior is to "watch out for each other." More than 60 percent of households indicated that they often watched out for their neighbors. Visiting in neighbors' homes also was a fairly common behavior with 25 percent visiting often.

Rural or open-country families were more likely to experience a wider variety of social contacts with others living in their neighborhoods and to neighbor more often than were families living in other residential settings. Much neighboring occurs in metro neighborhoods, but people living in open-country neighborhoods consistently had the highest average neighboring score.

Comparison of average scores for the seven neighboring behaviors reveals that open-country neighboring patterns are different from city and metro residents on going places together, borrowing things from each other, and visiting in each other's homes. For each behavior, open-country people were more likely to neighbor this way than were city or metro residents. The only other significant difference was observed between open-country and town or city residents regarding entertaining one another in each other's homes. In this instance, residents of metro neighborhoods were more likely than either town or city residents to neighbor in this way.

What can be concluded from these findings? Reassuringly, they reveal that much neighboring is going on today in neighborhoods across Alabama. At the same time, the strength or intensity of neighboring today does vary depending on the type of residential setting. These findings suggest that open-country neighborhoods are probably best able to respond to crisis in times of emergency or need and to organize effectively for local voluntary projects because of their traditional patterns of neighboring interaction.

MEAN SCORES FOR SEVEN NEIGHBORING BEHAVIORS PRACTICED BY ALABAMIANS IN FOUR RESIDENTIAL SETTINGS

Neighboring behaviors[1]	Neighboring scores, by residential settings				
	Open country	Town 2,500-10,000	City 10,000-50,000	Metro 50,000+	Statewide
Going places together	1.35	1.20	1.10	1.11	1.23
Entertaining one another in each other's homes	1.37	1.17	1.18	1.23	1.28
Asking each other advice	1.61	1.49	1.51	1.55	1.56
Talking about problems	1.62	1.56	1.52	1.58	1.58
Borrowing things from each other	1.81	1.71	1.60	1.60	1.71
Visiting in each other's homes	1.95	1.85	1.76	1.73	1.86
Watching out for each other	2.49	2.46	2.47	2.51	2.49

[1]Item scores are based on scores and responses of 0 = never, 1 = rarely, 2 = sometimes, and 3 = often.

Dunkelberger is Professor and Graham is a Graduate Research Assistant of Agricultural Economics and Rural Sociology and Lyles is Associate Professor at Tuskegee University.

Early Planting and Reduced Tillage Help Control Lesser Cornstalk Borer in Peanuts

T.P. MACK, H.W. IVEY, and L.W. WELLS

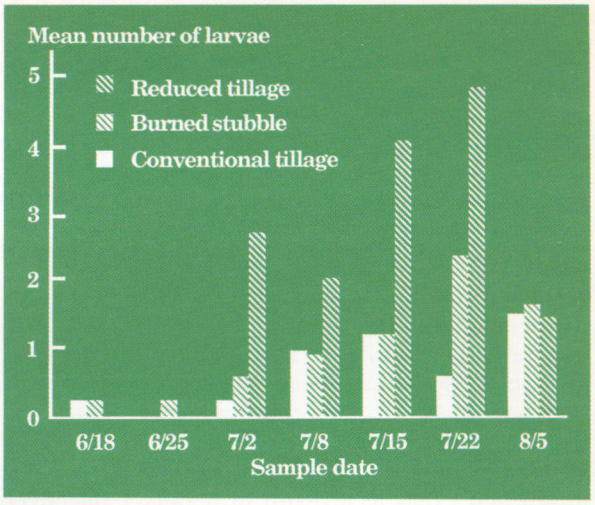


FIG. 2. Abundance of lesser cornstalk borer larvae in early-planted peanuts.

LAST YEAR'S HOT, dry growing season was ideal for the lesser cornstalk borer (LCB). Population outbreaks of this insect pest of peanuts, sorghum, small grains, and soybeans are associated with hot and dry conditions similar to those that prevailed during the summer of 1986. Although nothing can be done about the weather, results of Alabama Agricultural Experiment Station research suggest that early planting and reduced tillage can help reduce the problem.

LCB larvae feed directly on plant stems, causing extensive damage to soybean and peanut nutrient-conducting tissues. In peanuts, the larvae may also feed on developing pegs and pods. Peanut yield losses exceeding 70% have been reported.

Since population outbreaks usually develop in hot, dry weather, the potential exists for the reduction of LCB damage to peanuts by altering planting date so plants are less exposed to this type of weather. For example, by the time summer droughts occur, early planted peanuts would likely produce larger plants, making them less attractive to LCB than later planted peanuts. Tillage may also affect LCB population density by altering soil moisture and daily maximum soil temperatures.

A field study was begun at the Wiregrass Substation in 1986 to determine if planting date and tillage practices affected LCB abundance. Florunner peanut seed were planted in 36-in. rows in a Dothan sandy loam soil. Herbicides were applied according to Cooperative Extension Service recommendations, and no insecticides were used. Each treatment plot was eight rows wide by 50 ft. long. Two planting dates were used, May 23 and June 11, along with three tillage systems (conventional, reduced tillage, and burned stubble).

The conventional tillage treatment was defined as turning and disking before planting. Reduced tillage involved planting peanuts into wheat stubble with a Ro-til® subsoiler and planter combination. The burned stubble treatment was similar to the reduced tillage except that the stubble was burned off before planting. This treatment was included because smoke has been shown to attract adult LCB moths.

The abundance of LCB larvae, which is the damaging stage, was monitored with pitfall traps, figure 1. Two traps per plot were randomly placed in a selected central row within each plot. Traps were monitored weekly for most of the growing season.

Fewer larvae were caught in pitfall traps in the early planted, reduced tillage plots than in the conventional or burned stubble plots, figure 2. This was especially evident for samples collected on July 15 and July 22, when 3.4 and 7.0 times more larvae, respectively, were caught in traps in conventionally tilled plots than in the reduced tillage plots. Daily maximum soil temperatures are usually lower in plots containing thick stubble, apparently because the stubble shades the soil. Since LCB larvae are subterranean and cold-blooded, their growth rate would be slowed by such temperature reduction.

The number of larvae caught per trap showed no difference among late planted tillage systems. This suggests that all plants were susceptible to LCB attack at this time. Larval populations were larger in late than in early planted peanuts, with a peak of 6.7 larvae per trap on July 25 in conventionally tilled plots.

The early planting date yielded more peanuts than the late planting date, regardless of tillage system, 2,193 and 1,694 lb. per acre, respectively.

It is well known that the LCB is a hot and dry weather pest. In 1986, most of the hot weather occurred in July; 26 days had a daily maximum temperature of 95°F at Headland. The late planted peanut plants were smaller than the early planted peanuts because late planting was done during the drought. Thus, it should not be surprising that the late planted peanuts yielded significantly less than those that were planted early.

The month of May in Alabama typically has fewer hot days than June or July, so planting peanuts earlier to help avoid weather conducive to LCB population outbreaks is probably a wise strategy. Reduced tillage at this time may also help reduce the abundance of this pest on peanuts, as indicated by the 1986 data.

FIG. 1. Pitfall traps (anti-freeze in cup sunk into soil) were used to monitor abundance of lesser cornstalk borer larvae.

Mack is Associate Professor of Entomology and Ivey and Wells are Superintendent and Assistant Superintendent of the Wiregrass Substation.

Wood Ducks Nesting in Alabama Produce Two Broods Per Year

T.E. MOORMAN and G.A. BALDASSARRE

THE WOOD DUCK is an important game species in Alabama and usually ranks second or third overall among waterfowl harvested in the Atlantic and Mississippi flyways. It is estimated that 25,000 to 28,000 wood ducks breed in Alabama and annually produce some 60,000 ducklings. From this population, Alabama hunters kill 20,000 to 25,000 annually.

Wood ducks are the only species of migratory waterfowl that breed extensively throughout the South and the only one to regularly produce two broods in one reproductive season. Estimates of second brood production have ranged from 0.2% to 8.9%, but all reports have come from above 36°N latitude (the Alabama-Tennessee state line is approximately 35°N latitude). It has been suggested that the frequency of second broods by wood ducks may be greater at more southern latitudes because of longer nesting seasons. This led to an Alabama Agricultural Experiment Station study to determine the frequency of second broods in east-central Alabama (32°N), to assess this contribution to total production, and to correlate the effect of latitude with frequency of double broods by wood ducks.

The study was conducted at the 11,000-acre Eufaula National Wildlife Refuge located in Barbour and Russell counties in Alabama and Stewart and Quitman counties in Georgia. The refuge was selected because it is located at 32°N latitude, 4° south of previous reports of second broods. Further, because most timber on the refuge is less than 25 years old and provides few natural cavities, nesting wood ducks had to use the 221 available nest boxes located on the refuge. This facilitated accurate determination of second brood production because nearly all nesting hens could be monitored.

Nest boxes were checked biweekly in 1985 and weekly in 1986. Female wood ducks were captured on the nest and banded 2 weeks into incubation to minimize abandonment caused by observer disturbance. When possible, ducklings were web-tagged with serially numbered monel fish tags to allow age determination in subsequent years and potential determination of brood survival.

There were 101 successful nests in 1985, of which a minimum of 6.9% (seven nests) were produced by double-brooded hens. During 1986, 11.5% (16 nests) of 139 successful nests resulted from females hatching double broods, the highest percentage reported to date. Two key factors affecting this frequency may be food supply and length of breeding season; both are affected by latitude. Warm spring temperatures occur earlier in more southern latitudes, stimulating growth of aquatic insects, which are critical food sources for nesting females because they provide protein used in egg production. Data from previous investigations and this study indicate a 1.2% increase in the incidence of second broods with each degree decrease in latitude.

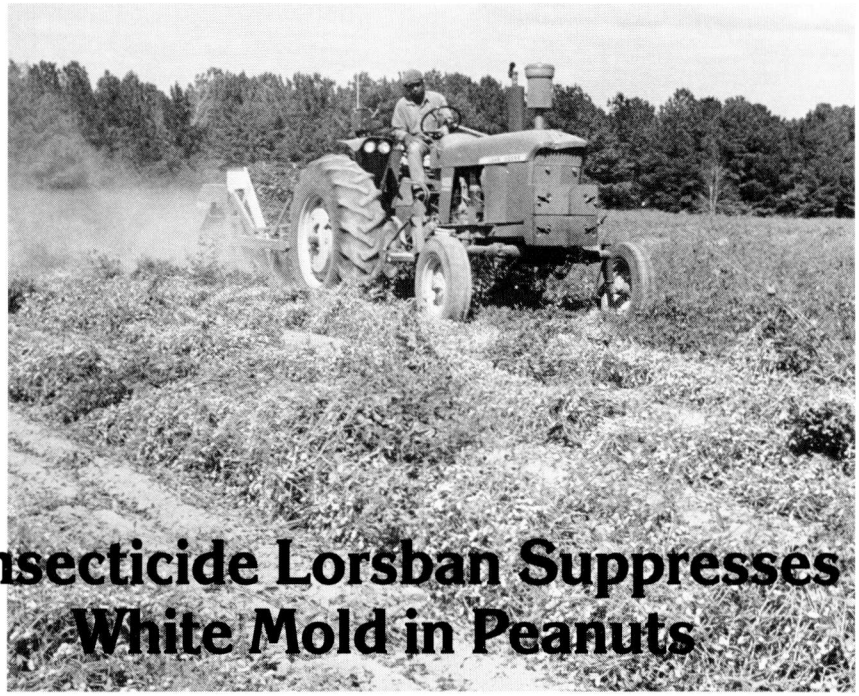
The mean interval between hatch of the first brood and initiation of the second clutch was 31.6 and 41.6 days in 1985 and 1986, respectively. However, because wood duck females remain with broods from 30 to 60 days and ducklings require 50-70 days to reach flight stage, some double-brooded hens must: (1) abandon the first brood to initiate a second nest; (2) initiate a second clutch concurrent with brood rearing (this seems unlikely), or (3) initiate a second nest following loss of the first brood. These explanations indicate that studies of wood duck brood survival are a necessary area for future research.

The total number of ducklings leaving nest boxes was 1,071 in 1985 and 1,671 in 1986, of which second broods accounted for 5.2% and 9.3% of total production in the respective years. Reported survival of wood duck broods ranges from 27% to 66%, with most estimates near 50%. However, one study reported that late season broods (which probably would include second broods) had much lower survival (22%) than early season broods (66%) because of deteriorating habitat conditions in mid to late summer. Thus, assuming a survival rate of 22%-50%, second brood production increased the fall population by 1.1-2.6% in 1985 and 2.0-4.7% in 1986.

These estimates of additional production are crude without a more accurate assessment of duckling survival from first and second broods of double-brooded females. Nonetheless, these data show that wood ducks in Southern States south of 36°N latitude are potentially more productive than their northern counterparts and that second brood production, when corrected for latitude, should be used to adjust total production estimates for nesting wood ducks.

Wood duck hen incubating eggs in a nest box at Eufaula National Wildlife Refuge (above) and baby wood duck (below).

Moorman is a Graduate Student and Baldassarre is Assistant Professor of Zoology and Wildlife Science.



Insecticide Lorsban Suppresses White Mold in Peanuts

A.K. HAGAN, J.R. WEEKS, and R.B. REED

DUE TO its sporadic occurrence, as well as a lack of reliable and economical fungicides for control, white mold remains one of the most damaging diseases of peanuts in the Southeast. Recent research at the Alabama Agricultural Experiment Station indicates that the emulsifiable concentrate (4E) formulation of Lorsban®, a widely used insecticide, has activity comparable to recommended fungicides against the fungi that causes white mold (*Sclerotium rolfsii*).

Since the 4E formulation proved phytotoxic to peanuts, scientists at Auburn tested the granular formulation (15G) of the pesticide. Plots were established each year from 1982 through 1985 on three farm fields with a history of white mold to compare Lorban 15G with the fungicide Terraclor® and Terraclor plus Lorsban for suppression of this disease on peanuts.

Florunner peanuts were planted in early May and recommended production practices were followed. At 80 to 90 days after planting, Lorsban 15G at 13.3 lb. per acre, Terraclor 10G at 100 lb. per acre, and Terraclor 10G + Lorsban 15G applied separately at 100 + 13.3 lb. per acre were applied in a 12-in. band centered over the row. Counts of white mold hits (one or more dead or damaged plants per foot of row = 1 hit) were made at maturity after the peanuts were inverted—about 140 days after planting. Individual treatments were harvested with a field combine.

On Farm Evaluation of Lorsban, Terraclor, and Teraclor + Lorsban for White Mold Suppression on Peanuts

Treatment	White mold hits/100 ft. of row	Yield/ acre[1]
	No.	*Lb.*
1982		
Lorsban 15G	10.7	3,745
Terraclor 10G	8.4	3,745
Terraclor 10G + Lorsban 15G	8.6	4,045
Non-treated control	16.9	3,495
1983		
Lorsban 15G	6.2	4,271
Terraclor 10G	5.8	4,221
Terraclor 10G + Lorsban 15G	3.1	4,523
Non-treated control	12.1	3,877
1984		
Lorsban 15G	10.5	2,966
Terraclor 10G	9.3	3,285
Terraclor 10G + Lorsban 15G	5.3	3,458
Non-treated control	17.8	2,903
1985		
Lorsban 15G	6.2	3,693
Terraclor 10G	7.0	3,971
Terraclor 10G + Lorsban 15G	4.0	3,890
Non-treated control	12.7	3,479

[1]Data are averages for three farms.

In 1982, white mold damage on peanuts was reduced by Lorsban, Terraclor, and Terraclor + Lorsban. As shown by data in the table, Terraclor and Terraclor + Lorsban maintained the best disease suppression. All treatments increased yields over the non-treated control by at least 250 lb. per acre and highest yields were obtained with Terraclor + Lorsban.

White mold incidence was considerably lower in the treated than non-treated control plots in 1983. Both Lorsban and Terraclor reduced white mold damage by about 50%, however, the combination of the two gave better suppression than either treatment alone. Yields were increased by all treatments, but the Lorsban + Terraclor combination yielded 302 lb. per acre and 252 lb. per acre higher than Terraclor and Lorsban, respectively.

In 1984, disease incidence was reduced by 41% by Lorsban, 48% by Terraclor, and 70% by Terraclor + Lorsban, as shown in the table. Lorsban failed to increase yield over the non-treated control despite good white mold suppression. Yields from plots treated with Terraclor alone or in combination with Lorsban were higher than those treated with Lorsban and the non-treated control.

White mold was effectively suppressed by all treatments in 1985, ranging from 45% control for Terraclor to 70% for Lorsban + Terraclor. Yields from the treated plots were higher than those from the non-treated control. Higher yields were obtained with Terraclor than Lorsban, although reductions in disease damage by the two treatments were similar.

Lorsban consistently reduced white mold damage on peanuts throughout the 4-year study and increased yields every year except 1984. Despite similar levels of white mold suppression, Terraclor use resulted in higher yields than Lorsban use in 2 of 4 years, and the average yield increase over the non-treated control with Terraclor was 367 lb. per acre, compared to 230 lb. per acre with Lorsban. Disease suppression and yield response with Terraclor + Lorsban were generally superior to Lorsban or Terraclor.

Inconsistent yield response reduces the value of Lorsban for peanut producers facing severe white mold problems. However, Lorsban proved in the Auburn tests to be an attractive alternative to Terraclor for white mold suppression on dryland peanuts because of its lower cost per acre and its excellent control of lesser cornstalk borer, the number one insect pest of dryland peanuts in Alabama.

Hagan is Extension Plant Pathologist, Weeks is Extension Entomologist, and Reed is a former Research Associate of Research Data Analysis.

Weed control in seedling sericea lespedeza increases stand and boosts seed yield

J.D. JONES and R.H. WALKER

LOW-TANNIN SERICEA lespedeza, such as the AU Lotan variety, has shown good potential as a warm season perennial forage species. However, establishment has been a problem due in part to poor seedling vigor which limits competitiveness with weeds, particularly during the first year. If weed competition could be reduced during the year of planting, then stand survival should be increased to provide acceptable stands for forage or seed production.

Research to solve the weed problem was begun at the Alabama Agricultural Experiment Station. The first step was to evaluate lespedeza's tolerance to commonly used herbicides. These experiments led to the conclusions that (1) sericea lespedeza is more tolerant to postemergence than preemergence applied herbicides, and (2) herbicides showing best weed control and least injury to sericea were 2,4-DB, 2,4-D, and Fusilade®.

The next step was evaluation of several postemergence weed control systems on AU Lotan and 73-162-19, a soon-to-be-released, low-tannin sericea lespedeza. Experiments were conducted at the E.V. Smith Research Center in 1985 (planted May 27) and 1986 (planted May 21) on a Norfolk loamy sand soil. Another experiment was conducted at the Prattville Experiment Field during 1986 (planted May 28) on a Lucedale fine sandy loam.

Treatments included 2,4-DB amine at ½ lb. acid equivalent (a.e.) per acre and 2,4-D amine at 1/4 lb. a.e. per acre applied one, two, or three times. The first application was applied 14 days after planting (DAP) to lespedeza that averaged ½ in. in height. The second and third applications, where appropriate, were applied to lespedeza that averaged 1½ in. (28 DAP) and 5½ in. (42 DAP) in height, respectively. All these systems were designed for control of broadleaf weeds. Grass weeds were eliminated by treating all experiments with two applications of Fusilade at 3/8 lb. active ingredient (a.i.) per acre per application plus crop oil (2 pt. per acre per application). The first and second applications were applied 14 and 28 DAP, respectively. A hoed check and a weedy check were included for comparison.

Treatments were evaluated by estimating control of broadleaf weeds and by recording lespedeza stem height, stems per plant, seed yield, and germination.

WEED CONTROL AND LESPEDEZA GROWTH AND YIELD AS AFFECTED BY HERBICIDES, NUMBER OF APPLICATIONS, AND CULTIVARS, 1986

Herbicide/ number of applications[1,2]	Broadleaf control[3], 56 DAP		Stem height, 70 DAP		Stem number/ plant, 70 DAP		Marketable seed yield/acre[4], E.V. Smith Res. Cen.	
	E.V. Smith Research Center	Prattville Field	E.V. Smith Research Center	Prattville Field	E.V. Smith Research Center	Prattville Field	First year	Second year
	Pct.	*Pct.*	*In.*	*In.*	*No.*	*No.*	*Lb.*	*Lb.*
AU Lotan								
2,4-DB/1	64	49	14	7	16	16	25	437
2,4-DB/2	97	76	13	6	14	15	46	577
2,4-DB/3	100	90	14	7	19	18	50	614
2,4-D/1	48	56	11	6	15	15	40	583
2,4-D/2	88	85	12	8	14	19	53	542
2,4-D/3	92	96	10	8	15	20	51	573
Hoed check	100	100	15	6	18	16	58	523
Weedy check	0	0	8	6	13	15	9	259
73-162-19								
2,4-DB/1	53	75	16	5	18	12	25	480
2,4-DB/2	95	82	16	6	18	17	21	521
2,4-DB/3	95	96	12	7	17	7	32	532
2, 4-D/1	45	65	11	5	15	14	20	381
2,4-D/2	87	82	16	6	20	15	29	534
2,4-D/3	92	93	10	7	14	20	15	512
Hoed check	100	100	14	8	20	15	21	362
Weedy check	0	0	7	5	11	13	17	252

[1]All treatments, including the hoed and weedy checks, received two postemergence applications of Fusilade (3/8 lb. per acre) plus crop oil (2 pt. per acre) for annual grass control. Applications were made approximately 14 and 28 days after planting (DAP).

[2]2,4-DB amine at ½ and 2,4-D amine at ¼ lb. per acre per application, the first applied 28 DAP with sequential applications following in 14 days.

[3]Broadleaf species at E.V. Smith Research Center were sicklepod, coffee senna, and annual morningglories. Species at Prattville Field were sicklepod, annual morningglories, common purslane, and prostrate and spotted spurge.

[4]First-year yield is from an experiment at E.V. Smith Research Center that was established and treated in 1985. The second year is the same experiment but treated again in 1986.

First-year seed yields were obtained on a 1985 experiment at the E.V. Smith Research Center and on a 1986 experiment at the Prattville Experiment Field. Second-year seed yields were obtained at the E.V. Smith Research Center (experiment received identical treatments in 1985 and 1986). A portion of these data is presented in the table.

AU Lotan and 73-162-19 were tolerant to both 2,4-DB and 2,4-D applied as many as three times per season. Neither stem height nor stem number was reduced by herbicides. Lespedeza plants receiving either 2,4-DB or 2,4-D were actually taller with more stems per plant when compared to the weedy check. The plants at the Prattville Field were much shorter than at the E.V. Smith Research Center, due primarily to water stress. However, stem number per plant was almost identical for both locations.

Good to excellent broadleaf weed control was obtained with either two or three applications of 2,4-DB or 2,4-D at both locations. The two applications of Fusilade + crop oil eliminated annual grasses and produced no adverse effects on either cultivar.

In general, first-year seed yields were slightly higher for AU Lotan than 73-162-19. This was due in part to an overall better stand of AU Lotan. Lespedeza treated with either two or three applications of 2,4-DB or 2,4-D produced seed yields equivalent to the hoed checks.

Second-year seed yields of both cultivars were highest when either 2,4-DB or 2,4-D was applied two or three times. Controlling broadleaf weeds essentially doubled seed yields the second year. Neither herbicide affected seed germination.

Jones is Graduate Student and Walker is Associate Professor of Agronomy and Soils.

Weekly Herbicide Applications Prove Beneficial in Forest Nurseries

Control of yellow nutsedge was more effective with 12 weekly applications of Goal® herbicide (bed on right) than with three monthly treatments (bed on the left). The same total amount of herbicide was used in both beds.

OVER THE LAST 15 years, advances in weed control in Southern forest nurseries have resulted largely from federal labeling of new herbicides tested by the Auburn University Southern Forest Nursery Management Cooperative. The most effective chemicals tested (the diphenylether group) all have similar chemical properties. Currently, the most commonly used is oxyfluorfen, sold by the trade name Goal® 1.6 EC. Recent research conducted at the Alabama Agricultural Experiment Station has demonstrated that dramatic improvements in weed control can be obtained from Goal by changing the frequency of application.

Preemergence treatments with herbicides provide a large fraction of the total season weed control. However, regular postemergence applications are needed because the chemical barrier breaks down under conditions of heavy irrigation and rainfall. In addition, some weed species are highly tolerant to preemergence applications. Although most of the compounds in the diphenylether family do not translocate well within the plant, good contact activity on otherwise difficult to control weeds can be obtained with postemergence applications.

Currently some of the most difficult weeds to control in Southern forest nurseries are yellow and purple nutsedge and spurges. In general, pine seedlings are not tolerant to most herbicides which are used to control these weeds in agronomic crops. Because of the high value of pine seedling crops in the South ($18,000 to $25,000 per acre), nearly weed free conditions are required to obtain maximum economic yield. Therefore, there has been a need to continue expensive hand weeding operations.

In 1985 and 1986, in response to observations and experiences reported by several nursery managers in the South, nursery research at Auburn began comparing weekly vs. monthly herbicide applications. In all cases, Goal was applied postemergence, either three times on a monthly basis at a rate of 0.5 lb. active ingredient per acre (a.i.) per application or 12 times on a weekly basis using only 0.125 lb. a.i. per acre per application.

At five of seven locations, weekly applications significantly improved weed control when compared with monthly ones. Data from these experimental comparisons show that the impact of weekly applications depended heavily upon the presence of specific weed species. Yellow nutsedge, see figure, spurges, and goosegrass were the most strongly affected by weekly treatments.

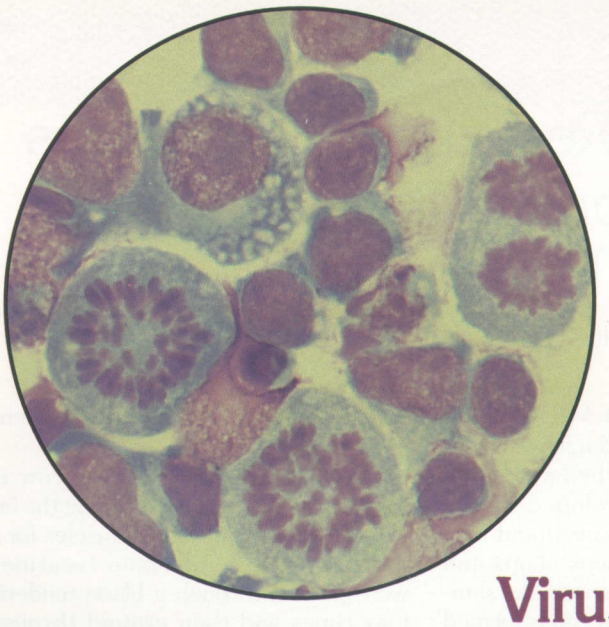
WEED CONTROL FROM WEEKLY AND MONTHLY APPLICATIONS OF OXYFLUORFEN (GOAL) IN FOREST TREE NURSERIES IN THE SOUTH, 30 DAYS AFTER LAST APPLICATION

Location	Fresh wt./plot, yellow nutsedge		Weeds/plot, spurge	
	Weekly	Monthly	Weekly	Monthly
	Oz.	*Oz.*	*No.*	*No.*
Alabama . . .	0.9	5.5	13	48
Arkansas . . .	1.6	2.2	20	40
Georgia	—	—	1	16

Weed fresh weights and weed numbers of yellow nutsedge and spurge at several nursery locations 30 days after the final application in August are shown in the table.

Operational comparisons made by nursery managers in 1986 also indicated that weekly applications substantially reduced their need for supplementary hand weeding. Changing the application frequency can reduce weed control costs and therefore lower pine seedling costs in the South. Some of the most responsive species are among the most troublesome weeds remaining in nurseries. In the past, adequate control of these species could not be obtained without hand weeding, but managers have indicated that control with weekly applications is sufficient in many cases to eliminate the need for expensive hand weeding.

Blake is a Post Doctoral Fellow and South is Assistant Professor of Forestry.



Bovine Leukemia Virus Infection May Lead to Cancer in Cattle

C.J. BRUNNER, P.D. JOHNSON, and D.G. McCLARY

BOVINE LEUKEMIA virus (BLV) infects approximately 40% of dairy cattle and 20% of beef cattle in Alabama. Cellular abnormalities associated with virus replication may contribute to the development of cancer in some animals.

A member of the retrovirus family, BLV is unusual in its widespread occurrence and structural similarity to certain human viruses. Despite its resemblance to human retroviruses, two decades of research have failed to produce evidence that BLV affects humans. Nonetheless, BLV serves as a valuable research model for virus-induced cancer.

When BLV infects an animal, it enters white blood cells (lymphocytes) and inserts its genetic material into the chromosomes of the cells. It usually remains dormant in the cell, causing no medical problems or decrease in productivity. In a few animals, however, expression of a segment of the viral DNA results in uncontrolled division of the infected cell, producing lymphosarcoma (a form of cancer).

Lymphosarcoma does not occur frequently enough to be of economic concern in most herds in the United States. However, isolated reports from Alabama veterinarians indicate that some closed herds with high prevalence of BLV infection lose as many as 10% of their adult cattle to lymphosarcoma each year. Whether these differences represent genetic susceptibility of the cattle, different strains of the virus, or other factors is the subject of investigation at the Alabama Agricultural Experiment Station.

The major economic disadvantage of BLV infection is due to import restrictions imposed on cattle by European countries. BLV infection in Europe is more frequently associated with lymphosarcoma than it is in the United States. In an attempt to control spread of the virus, many European countries require imported animals to be BLV-negative. Therefore, eradication of BLV from herds in the United States is desirable if animals are to be sold for export.

Fortunately, BLV is rather difficult to transmit. It is found within lymphocytes, and can rarely be isolated from body fluids other than blood, unless those fluids are contaminated with infected cells. Transmission can usually be prevented through disinfection of surgical instruments and equipment.

In the Alabama Agricultural Experiment Station study, two research herds have been established, one infected with BLV and the other free of the virus. Periodic testing allows detection of new infections in the "negative" herd. Despite strict sanitation and physical separation of the animals, one or two new infections appear each year. These are probably the result of transmission of BLV in the milk to heifer calves used as replacements. Separation of calves at birth would prevent this, but usually this is not practical in beef herds.

Approximately 30% of BLV-infected cattle develop a benign condition called persistent lymphocytosis (PL), in which the white blood cell concentration is extremely high. The increase is due entirely to B lymphocytes, cells normally responsible for production of antibodies in response to infections. Gradient centrifugation and fluorescent antibody staining of lymphocytes were used to confirm that many cattle with PL have more than 10 times the normal concentration of B lymphocytes. These techniques also enabled identification of a family of Holstein cattle with PL. All the females of two generations have PL; two of three daughters in the third generation have high lymphocyte concentrations, which will probably develop into PL as the cows mature. Lymphocytes from these animals were used in laboratory experiments to study whether BLV infection alters cell structure and function.

Mitotic figures typical of lymphosarcoma.

When examined microscopically, B lymphocytes from PL cattle looked normal; when cultured *in vitro*, they responded to stimulation with mitogens. Unexpectedly, however, the other major class of lymphocytes, T lymphocytes, did not react normally. T lymphocytes from cattle with PL produced unusually large amounts of interleukins, substances that regulate the growth and multiplication of other lymphocytes. Excessive interleukin production may disrupt normal control mechanisms, accounting for the high number of B lymphocytes in PL cattle and increasing the likelihood of tumor development.

Techniques to isolate and analyze lymphocyte membrane proteins have been developed at the Experiment Station. Solubilized membrane proteins were examined biochemically to determine if lymphocytes develop unique features in association with BLV infection. Current experiments are comparing membrane proteins from uninfected cattle to those of cows with PL or lymphosarcoma.

Further study of the effects of BLV on bovine lymphocytes will contribute to a better understanding of how and why some animals develop cancer after infection with retroviruses.

Brunner is Assistant Professor and Johnson is Research Associate of Microbiology and McClary is Assistant Professor of Large Animal Surgery and Medicine.

Auburn Restructuring Process Transforms Utility Beef into Tender Steaks

Y.H. CHU, D.L. HUFFMAN, and W.R. EGBERT

RESTRUCTURED MEAT products have received a lot of attention since 1970 when a restructuring process was developed at the Alabama Agricultural Experiment Station. This system produces chops and steaks that look and taste more like standard muscle meat than products formed from ground or flaked meat. The value of this development is that it offers a chance for better utilization of low grading beef and pork carcasses and opens the door for cashing in on the "fast food" market.

There have been problems, of course, with restructured products. For example, the prevalence of connective tissue in less desirable cuts used in restructured products results in toughness of the final product. This connective tissue could be trimmed away, but this approach is too costly. Mechanical and enzyme tenderization treatments have been tried with varying degrees of success.

The latest study at the Alabama Agricultural Experiment Station found that either mechanical tenderization or addition of food-grade enzymes improves tenderness of restructured beef cuts. However, the greatest improvement to tenderness resulted when both mechanical tenderization and enzyme additions were used. Increased cook loss when both treatments were used represented a disadvantage.

Rounds from Utility grade cow carcasses—with briskets providing the fat—were used for the study. Muscles for the mechanically tenderized treatments were passed through a blade tenderizer four times and then ground through a three-hole, kidney-shaped plate (1-in. X 2.5-in.). Control muscles (non-tenderized, no enzyme) were ground through the same size kidney-shaped plate. The fat component for the restructured steaks was obtained by grinding boneless briskets and mixing for 3 minutes to randomly distribute fat. The fat portion was divided into two equal portions for incorporation into steaks for the tenderized and non-tenderized treatments.

Four treatments were prepared from the lean and fat components described: (1) control, no mechanical tenderization, no enzymes added, (2) mechanically tenderized, no enzymes added, (3) mechanically tenderized, enzymes added, (4) enzymes added, no mechanical tenderization.

Nine-pound chunks of lean meat from the rounds were mixed with 0.75% salt, 0.25% sodium tripolyphosphate, and 2% water in a bowl mixer for 2 minutes. The fat portion (4½ lb.) from briskets was added to the mixer and mixed for another 4 minutes. For enzyme-treated samples, 100 p.p.m. papain and 50 p.p.m. ficin were dissolved in the 2% water, and added to the meat during the initial stage of mixing.

The meat mixture was stuffed into 4-in.-diameter casings and frozen (-10°F) for 24 hours. The frozen logs were tempered for 24 hours at 26°F, then pressed into a uniform shape and sliced into 3/4-in.-thick steakettes. These steaks were interleaved with waxed paper, sealed in plastic bags, placed in wax-lined cardboard cartons to simulate commercial storage conditions, and stored at -10°F for subsequent analyses.

Restructured beef steaks were cooked on a grill to an internal temperature of 158°F. Cooked steaks were randomly selected for cook loss, toughness, and soluble collagen (protein component of connective tissue) content analyses.

Restructured steaks treated with the combination of mechanical tenderization and enzyme addition had the greatest cook loss. Samples which had been mechanically tenderized also had a high percentage of cook loss, however, there were only small differences between the control and mechanically tenderized treatments. Samples with enzymes added (no mechanical tenderization) were not different in cook losses compared with the control. Both mechanically tenderized treatments showed higher cook losses than the control or enzyme treatment. This may be due to rupturing of the muscle cells by the needles during the tenderization process.

Results of tensile strength tests (Instron readings) indicate that the control treatment resulted in the best bind (force holding meat together). The mechanically tenderized treatment (no enzymes added) had better binding characteristics than the enzyme treated samples. Enzyme treated samples required the least amount of force to pull the meat apart.

Tenderness of meat mass was increased by either mechanical tenderization or enzyme addition. The greatest increase in tenderness, however, resulted from a combination of mechanical tenderization and enzyme addition.

Mechanical tenderization decreased both tensile strength and shear force. The addition of enzymes resulted in decreased force values, along with losses of physical texture. Values for tensile strength (Instron readings) and shear (Kramer readings) showed enzyme degradation of the muscle protein.

Another test done was the assay of soluble collagen. This showed that the enzyme addition increased the solubility of collagen, which is another measure of tenderness.

From this study it can be concluded that a processor can use less desirable cuts of meat to produce a restructured product that will have desired tenderness. This can be accomplished by use of mechanical tenderization and the addition of food-grade enzymes.

EFFECT OF MECHANICAL TENDERIZATION AND ENZYME ADDITION ON COOK LOSS, TENSILE STRENGTH, KRAMER SHEAR FORCE, AND SOLUBLE COLLAGEN CONTENT

Measure	Result, by treatments[1]			
	Control	MT	MT+E	E
Cook loss, pct.	15.9	17.0	18.8	15.8
Tensile strength, p.s.i.	9.8	6.7	2.1	2.1
Kramer shear, p.s.i.	62.0	41.1	25.5	30.9
Soluble collagen content[2]	129.2	129.0	768.2	752.6

[1]Control = no mechanical tenderization, no enzymes addition; MT = mechanical tenderization; MT+E = mechanical tenderization and enzymes addition; and E = enzymes addition, no mechanical tenderization.

[2]Expressed as ug soluble collagen per gram of cooked meat.

Chu is Graduate Assistant, Huffman is Professor, and Egbert is Research Associate of Animal and Dairy Sciences.

Preservation of High-Moisture Milo with Urea

R. RUSSELL, J. LIN, E.E. THOMAS, E.C. MORA, and G. DARNELL

PRESERVATION of feed grains presents many problems in the Southeast. The most common methods of preservation are field drying, artificial drying, application of acid, and ensiling. All these methods have specific disadvantages. Several trials were recently conducted at the Alabama Agricultural Experiment Station to determine if urea would provide an effective alternative method of preservation.

Urea has been used for many years as a non-protein source of nitrogen for ruminant animals. If used with a readily available source of carbohydrates, urea is an effective and safe way to increase microbial protein supply. Recent studies in England have shown that soaking barley in a concentrated solution of urea releases less ammonia in the rumen when fed to sheep than does a mixture of barley and urea. This would suggest better utilization of the urea nitrogen from the urea-soaked grain.

Most plant tissues contain an enzyme, urease, that catalyzes the conversion of urea to ammonia and is known to have preservative properties. Therefore, experiments were designed to test whether urea would preserve high-moisture milo. It is expected that urea-treated milo would have equal or improved feed value to dry milo, but additional trials are needed to determine feed values.

Dry milo (12% moisture) was reconstituted such that the reconstituted grain was either 22, 28, or 34% moisture and 0, 2, 4, or 6% urea on a dry weight basis at each moisture content. Reconstituted milos were stored in plastic 4-gal. buckets at approximately 75°F. Urea treatment was effective in preventing the milo from heating, which is an early indication that the grain eventually will spoil.

Urea treatment also reduced mold growth on the reconstituted milo, while milo reconstituted without urea spoiled and had extensive mold growth. Mold population on the urea-treated milos was less than on dry milo.

Urea treatment increased grain pH from pH 6.4 to approximately pH 9. This increase can be expected due to ammonia released from urea.

There was a significant loss of nitrogen from the urea-treated, reconstituted milo during the first week of storage. Losses ranged from 43 to 72% of the amount of nitrogen contained in the added urea, depending on the moisture and urea content of the reconstituted milo. All the added urea could be accounted for as ammonia.

Urea treatment also was effective in preserving high-moisture milo in a field-scale experiment. Milo was harvested at 28% moisture and mixed in a horizontal mixer with a 50% (weight to volume) solution of urea, which was added on a dry weight basis of 2%. The urea-treated milo was stacked approximately 4 ft. deep in a 12-ft. x 30-ft. bay. The bay had a cement floor and was covered with a roof. There was a 10-ft. unwalled clearance between the walls of the bay and the eaves of the roof.

Though temperature of milo was not monitored, no significant heat-spoilage was observed. After 4 months of storage there were only 350,000 viable mold colonies per pound of milo (770 per gram). Dry milo in an adjoining bay contained 5.9 billion viable mold colonies per pound (13 million per gram). Urea treatment reduced mold by approximately 100,000-fold.

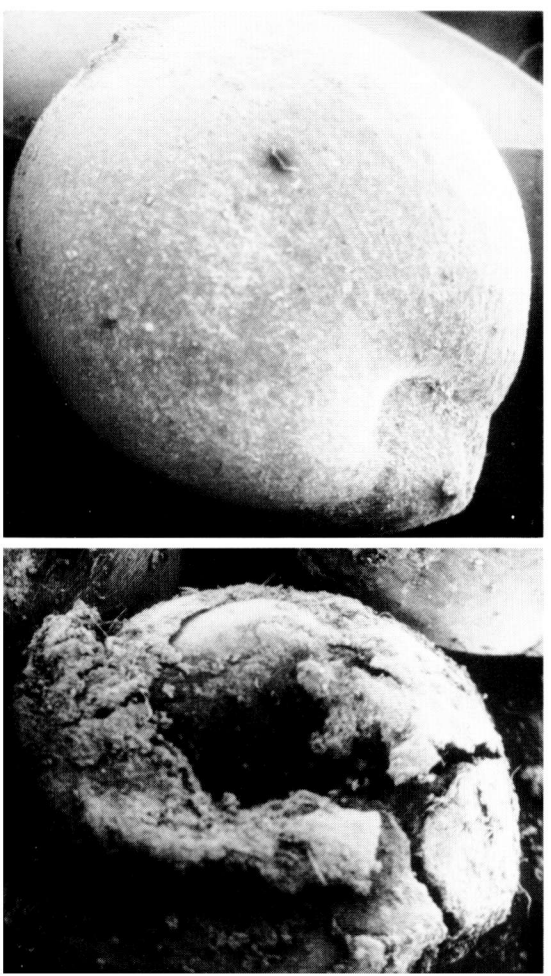
In contrast to storage in the laboratory, there was no nitrogen loss from urea-treated milo stored in the bay. Although most of the urea was converted to ammonia, it was retained with the milo with little odor. The differences between milo stored in the laboratory and milo stored in the bay could be due to rapid moisture loss from the grain stored in the laboratory. Moisture content of the milo in the bay after storage was 20% and the pH was 8.4 after storage.

Scanning electron micrographs of the surface of urea-treated and dry milo stored in bays are shown in the figure. Cracking of the surface of the urea-treated milos was clearly evident, but the surface of the dry milo was uncracked. High-moisture milo preserved by urea treatment can be crushed between the thumb and forefinger. It is expected, therefore, that urea-treated milo will be digested more easily by ruminants, and additional processing, such as grinding, may not be necessary.

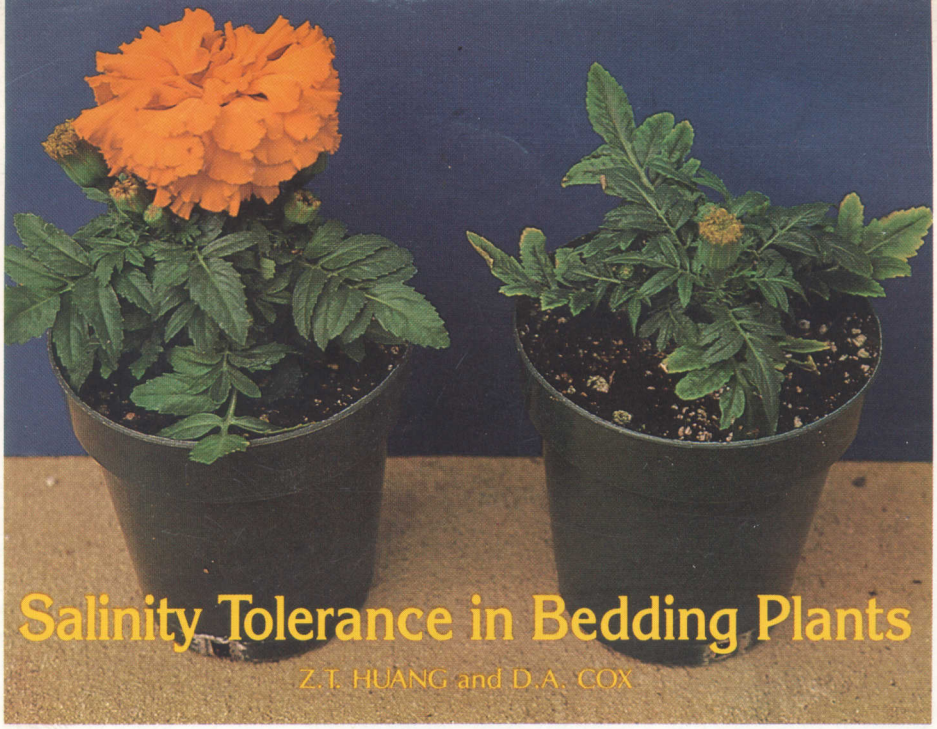
Harvesting milo at high moisture and preserving with urea has several potential advantages. Harvest at high moisture (28-32%) minimizes grain loss by bird predation, head shatter, and grain deterioration. Early harvest at high moisture also improves the probability of getting a ratoon harvest. (Milo will regenerate a seed head after the first harvest, allowing a ratoon, or second, harvest.) Urea is relatively inexpensive, non-caustic, and easy to apply. Only simple storage facilities are necessary. Additional processing may not be required prior to feeding.

The major disadvantage is a loss of marketing flexibility, because milo treated with urea is committed to be marketed by feeding to ruminant animals.

Scanning electron micrograph of urea-treated and untreated milo show smooth surface of untreated grain (top) and cracking on treated grain (below).



Russell is Assistant Professor, Lin is a Laboratory Technician III, and Thomas is Associate Professor of Animal and Dairy Sciences, Mora is Professor of Poultry Science, and Darnell is a Student of Animal and Dairy Sciences.



Salinity Tolerance in Bedding Plants

Z.T. HUANG and D.A. COX

Marigold with flower (left) shows no injury with non-saline water while the flowerless marigold (right) shows salt injury with saline water.

WATER QUALITY is an important and often overlooked factor in greenhouse plant production. Salinity, as measured by electrical conductivity (EC) of water, is one aspect of water quality which may affect plant growth and quality. High EC may result from excess fertilizer, use of water contaminated by industrial or agricultural runoff, saline wells, or proximity of water source to seawater. Damage to plants results from toxic effects of salt ions, restricted water uptake by roots due to high soluble salts in the growing medium, or both.

Research by the Alabama Agricultural Experiment Station found that marigold, geranium, and annual vinca irrigated with saline water are injured by high salinity levels, but show some tolerance of low and moderate levels of salinity.

Seeds of First Lady marigold, Jackpot geranium, and Pink Carpet annual vinca were sown in vermiculite. Seedlings were transplanted to amended peat-perlite (1:1) in 5-in. plastic pots. Plants were fertilized at every watering with 200 p.p.m. of N and K from ammonium nitrate and potassium nitrate. Increasing rates of a sodium chloride and calcium chloride mixture were added to the fertilizer solutions and irrigation water to increase EC. Salinity treatments were 1.3 (control), 3.0, 4.5, 7.9, and 13.9 mmho/cm EC (a unit of solution electrical conductivity).

Increasing salinity level reduced plant height and dry weight of all three species. Foliar symptoms of salt injury, leaf yellowing and marginal necrosis, occurred on marigold and geranium at the two highest salinity levels. No injury occurred on annual vinca at any salt level tested. Height and dry weight reductions of all species were generally less than 10% of the control at 3.0 and 4.5 mmho/cm, indicating some tolerance of moderate salinity levels, see table. At the highest salt level (13.9 mmho/cm) growth was reduced at least 25% for all species; reductions were greatest for geranium and marigold and least for annual vinca. Leaf analysis for sodium and chloride showed that each plant accumulated abnormally high levels of sodium and chloride in the shoots. Marigold contained significantly more chloride but less sodium than geranium and vinca. No wilting or other visible symptoms of reduced water uptake occurred in any treatment, indicating that injury (leaf yellowing and necrosis) and growth reductions were probably the result of toxic effects of excess sodium and chloride accumulation rather than water stress.

Results of this study show that growth and appearance of several bedding plants are adversely affected by increasing irrigation water salinity in the range of 3.0 to 13.9 mmho/cm. Bedding plant growers can check their water for potential salinity problems using a simple conductivity meter. However, salinity levels similar to those in this study may cause different effects because sodium and chloride salts were used to create salinity in this experiment and plants may respond differently to other salts.

Huang is a Graduate Student and Cox is Assistant Professor of Horticulture.

EFFECT OF IRRIGATION WATER SALINITY ON THE GROWTH OF BEDDING PLANTS

Salinity level, mmho/cm	Marigold		Geranium		Annual vinca	
	Height	Dry wt.	Height	Dry wt.	Height	Dry wt.
	In.	*Grams*	*In.*	*Grams*	*In.*	*Grams*
1.3 (control)	19.5	27.3	18.0	9.2	9.0	3.9
3.0	18.0	26.3	19.0	10.0	8.3	3.4
4.5	17.5	29.5	17.0	9.3	8.3	3.1
7.9	15.0	23.0	15.0	7.9	6.5	2.2
13.9	14.0	14.7	11.5	4.7	6.5	2.5

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