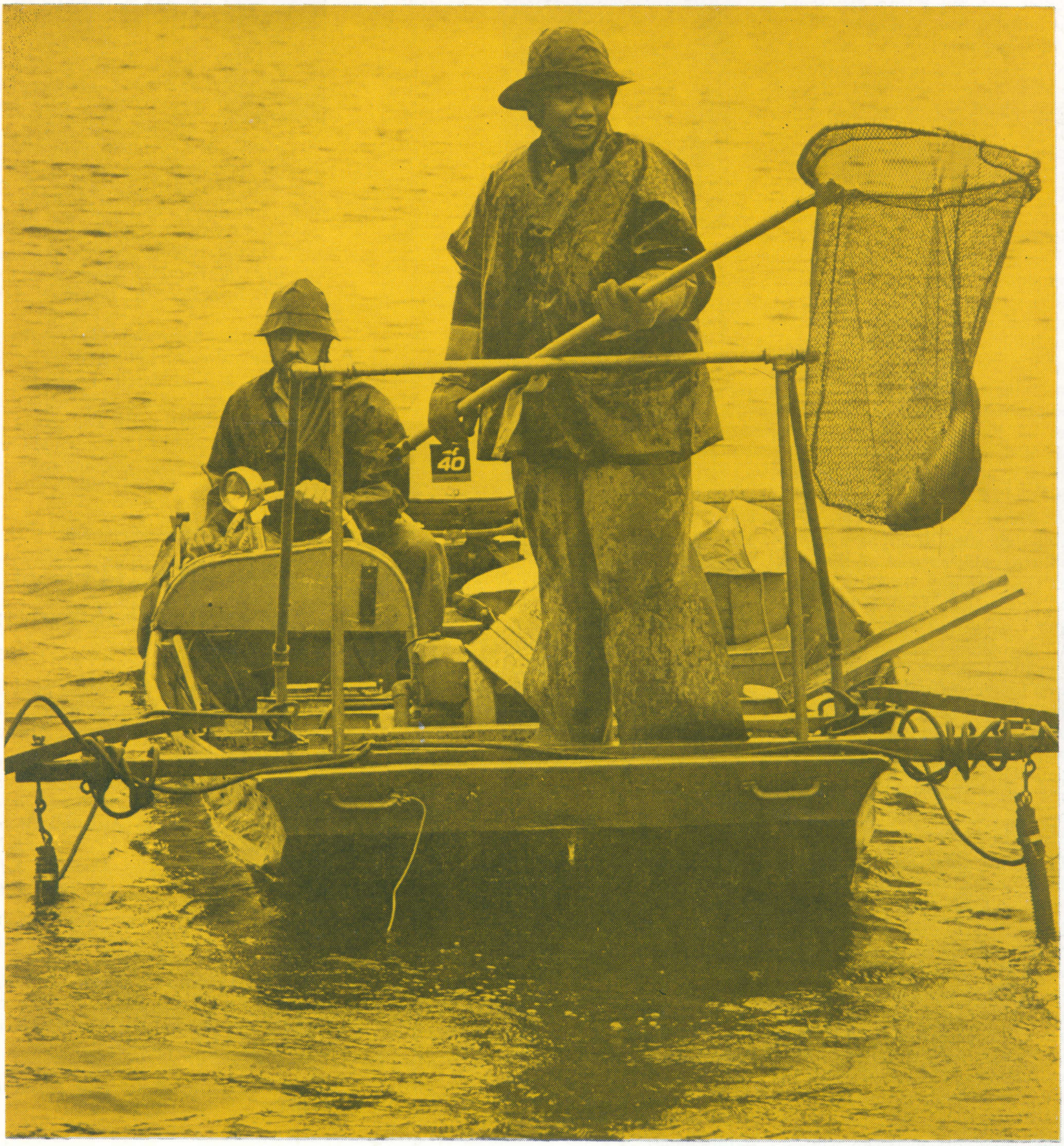
# highlights

of agricultural research



Volume 23, No. 2

Summer 1976

Agricultural Experiment Station
R. Dennis Rouse, Director

Auburn University
Auburn, Alabama

# DIRECTOR'S COMMENTS

AGRICULTURE is the number one industry in Alabama, but its potential is far from being realized. Numerous opportunities exist for improvement, provided the proper decisions are made concerning production alternatives. Such decisions are especially complex in Alabama since alternatives and opportunities for crop and livestock production are much broader than in most areas of the Nation.

R. DENNIS ROUSE

All segments of the agricultural industry – farmers, agribusiness, and credit agencies – are involved in decisions about use of agricultural resources. The success of all groups depends on the choices made among the available alternatives.

Decisions to shift from one commodity to another are long-term decisions. Farmers cannot afford to stop and restart production of a particular commodity. However, decisions on volume changes within commodities can be readily made in response to economic conditions. For example, cotton acreage in Alabama increased in 1976, mostly as a result of increases on farms that produced cotton in 1975.

Alabama's 1975 gross farm income was estimated at $1.46 billion by the Alabama Cooperative Extension Service. Some 11 commodities made important contributions to the total, which emphasizes the diversity of agricultural opportunities. (Income, in millions of dollars, from individual commodities was: broilers, 336.0; soybeans, 150.0; eggs, 133.0; forestry, 125.0; hogs, 124.0; beef cattle, 114.0; peanuts, 105.0; cotton, 100.5; horticultural crops, 89.0; dairy, 71.0; feed grain, wheat, and hay, 61.0.)

Certainly there is opportunity to greatly increase production and production efficiency of all the above commodities, but some stand out. Production of beef is an example. The recent wide swing in beef prices that significantly affected the Southeastern cattle industry emphasized opportunities for production of finished beef in the region by taking advantage of forage. Our research clearly shows that this region can profitably produce calves and grow them out on forage. Some of these animals can be finished on forage but some will need to be finished on grain. Such a program will require a lot of coordination, along with research developments in breeding, management, and forage production and better credit and marketing. But it can be done. There are less than 600 grade A dairy producers in Alabama, and milk imports continue to grow. Yet, the knowhow exists to produce milk profitably, and many State dairymen are highly successful.

These examples are representative of the possibilities for increased production in commodity after commodity. But what can be done to make these improvements become a reality?

One step is to establish realistic short-range and long-range production goals for the various commodities and then work to reach these goals. The Cooperative Extension Service is involving all components of agriculture in an effort to develop valid production goals for all commodities. Requirements for meeting these goals, which must be precisely determined, are many and varied. For some goals, a concentrated research effort will be necessary; for some the knowledge is adequate but needs to be put into practice on a larger scale or by more farmers; some will require a different kind of credit structure; for others, market structure changes and volume capability increases will be a requirement.

Let's join together in this effort during the next few months to establish realistic goals, identify limiting factors, and work together to move agriculture to a more important role in Alabama.

## *may we introduce . . .*

Dr. William D. Davies, Assistant Professor in the Department of Fisheries and Allied Aquacultures, reports early findings of his study of changing fish populations in the new West Point Reservoir in the story on page 3. This project represents one phase of research by Davies, who specializes in work dealing with population dynamics of reservoir fishes, analysis of fishery statistics, and sport fish management.

A native of Cincinnati, Ohio, Davies did his undergraduate study at Purdue University, received the M.S. from Ohio State University, and did his doctoral studies at North Carolina State University. During 1966-67, he was a research biologist for the U.S. Bureau of Commercial Fisheries in Beaufort, North Carolina.

Davies has been a member of the Auburn faculty since 1970, serving in both teaching and research roles for the School of Agriculture and Agricultural Experiment Station. He also serves as a member of Auburn's International Center for Aquaculture staff and has worked in foreign nations on assignment from the Center.


# HIGHLIGHTS of Agricultural Research

SUMMER 1976 VOL. 23, NO. 2

A quarterly report of research published by the Agricultural Experiment Station of Auburn University, Auburn, Alabama.

R. DENNIS ROUSE ........ *Director*
STANLEY P. WILSON ........ *Associate Director*
CHAS. F. SIMMONS ........ *Assistant Director*
T. E. CORLEY ........ *Assistant Director*
E. L. MCGRAW ........ *Editor*
R. E. STEVENSON ........ *Associate Editor*
ROY ROBERSON ........ *Assistant Editor*

*Editorial Advisory Committee:* STANLEY P. WILSON; O. L. CHAMBLISS, *Associate Professor of Horticulture;* WALTER D. KELLEY, *Assistant Professor of Botany and Microbiology;* EARL L. WIGGINS, *Professor of Animal and Dairy Sciences,* AND E. L. MCGRAW.

Auburn University is an equal opportunity employer.


**ON THE COVER. Electrofishing techniques are used to gather fish population samples in the West Point Reservoir.**

# Largemouth Bass Growing Fast in West Point Reservoir


W. D. DAVIES, *Department of Fisheries and Allied Aquacultures*

W. L. SHELTON, *Alabama Cooperative Fisheries Research Unit*

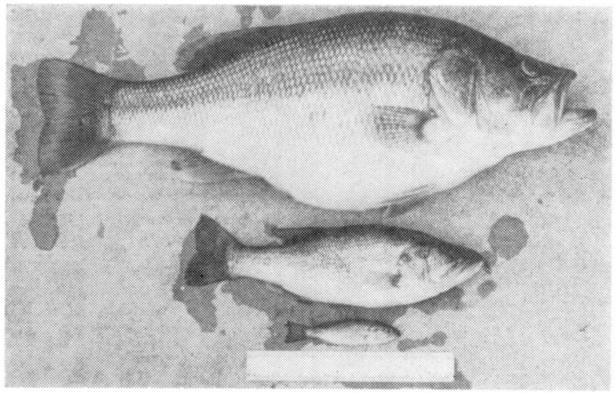

NEWLY IMPOUNDED reservoirs provide exceptional fishing, especially for carnivorous species such as the largemouth bass. Within a relatively few years, however, ease of catching fish appears to decline. This boom and bust sequence is probably a reflection of the dynamics of expanding fish populations.

The filling of a new reservoir presents a vast new area of unoccupied space. Inundated trees and stumps provide cover, and flooding of rich bottom lands contributes to fertility of the body of water. These conditions of increased space and cover and an abundance of food are ideal for rapid population expansion. For example, a large number of bass are usually hatched in a new reservoir. A large percentage of the forage fish present is of a size that can be readily eaten by yearling bass, so growth and survival are excellent. With passing time, however, adult fish make up a greater percentage of the population mass, causing a suppression of reproduction of both bass and forage fish. This condition eventually is reflected in a decline in catch per unit of effort.

Impoundment of the Chattahoochee River to form West Point Reservoir offers an excellent opportunity to document changes that take place within a new impoundment. Auburn University Agricultural Experiment Station is taking advantage of this opportunity, with research[1] underway to gather information needed to formulate management policies for optimizing fishing and other recreational benefits of reservoirs. Beginning in July 1975, fish populations in West Point Reservoir were sampled each week by electrofishing to determine population changes.

A large number of bass were hatched during April-June 1975. Those that were hatched early (April) grew rapidly to 3 to 4 in. and utilized the large numbers of threadfin and gizzard shad that had been spawned from mid-March through April. It was a different story for bass spawned later (June), however, since they were smaller than the majority of forage fish remaining in the population and unable to feed on them. Thus, the 1975 year-class of bass shows a wide variation in size – up to 15 in. long (3.6 lb.) for the early hatch and as small as 4 in. for the later ones, Figure 1.

FIG. 1. There is wide variation in the 1975 year-class of largemouth bass in West Point Reservoir, as evidenced by these three collected from the lake. Size ranged from the top one, which measured about 15 in. and weighed 3.6 lb., down to the 4-in. one at bottom.



Fish larger than 7 in. are in relatively good condition (deep bodied with proportionally small heads), while smaller ones appear thin and often emaciated. Those in the 4 to 5 in. range are severely stunted. The majority of bass less than 7 in. that survived the winter and early spring should grow rapidly once the new year-class of shad and other forage species are produced in 1976.

Fishing in West Point Reservoir was relatively light during 1975. At that time, the majority of bass in the population measured less than the 12-in. Georgia legal limit. Bank fishermen frequently caught fish less than 10 in. Boat fishermen often located schools of bass ranging from 10 to 14 in. long and frequently caught large numbers. Many bass measuring less than 12 in. weighed more than 1 lb.

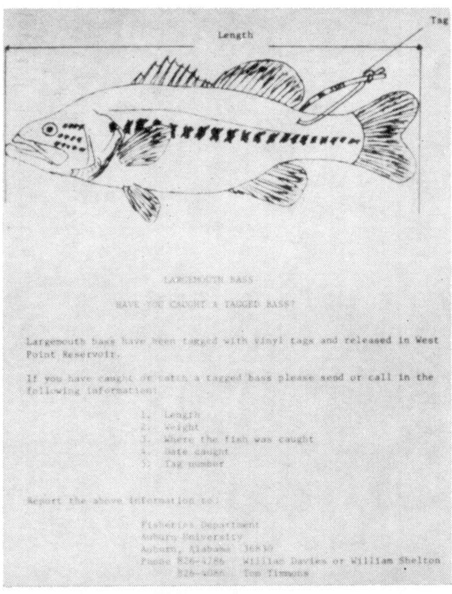



FIG. 2. Posters are used to request fishermen to report tagged bass caught, along with information about size and date and location of the catch.

Bass fishing in 1976 should be highly productive for fish in the 2-3 lb. range. Some 4- to 5-lb. bass of the 1975 year-class may be caught later in the season. Bass larger than this may be caught, but these probably were in the river before impoundment or came from farm ponds flooded by the reservoir.

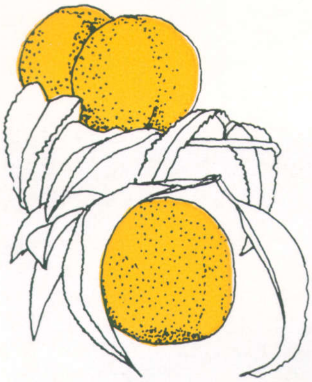
A large number of bass greater than 10 in. are presently being tagged. Reporting of tagged fish caught by fishermen will provide valuable information on the rate of exploitation, as well as on movements and growth of the bass population. Fishermen are urged to report all tagged fish caught, Figure 2, so the data can provide an accurate assessment of what is taking place.

Bluegill, black crappie, channel catfish, common carp, and bowfin are other prominent species in the reservoir. Carp and bowfin produced large year-classes in 1975, but their females were not sexually mature for the 1976 spawning season. Both species will probably become less prominent in subsequent years as predation pressure by largemouth bass increases. Fishing for bluegill, black crappie, and channel catfish should continue excellent for several years. Only threadfin shad were stocked in the impoundment. All other species were present in adequate numbers to provide spawning stock.

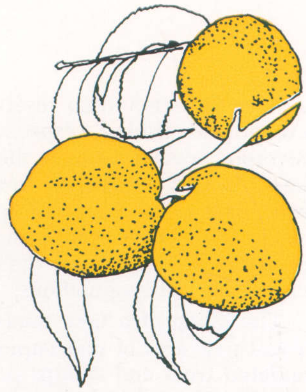
---


[1] Funded by U.S. Army Corps of Engineers and the Bass Research Foundation.

# Fungicides Used For Control Of Peach Scab May Affect Bacterial Wilt

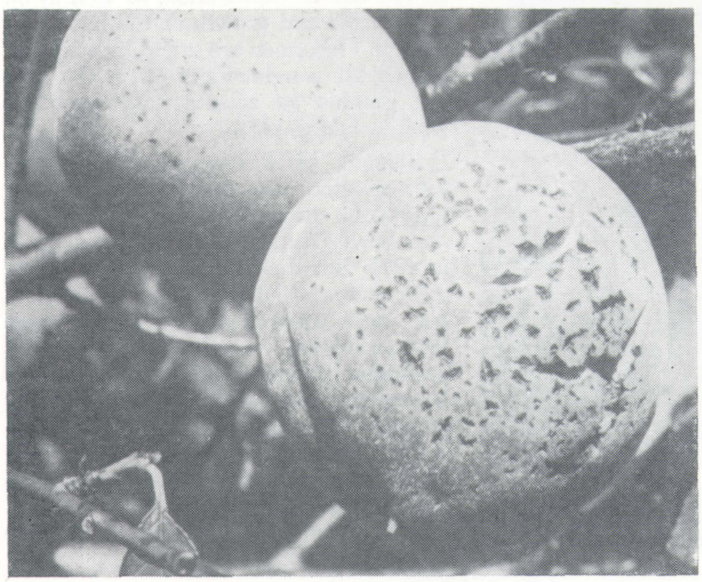


A. J. LATHAM, *Department of Botany and Microbiology*
C. C. CARLTON, *Chilton Area Horticulture Substation*



ONE OF THE important unresolved problems to Alabama peach production is bacterial spot caused by Xanthomonas pruni (see figure). During 1973 and 1974 damage by this bacterium was so extensive that evaluation of fungicide control of scab on Elberta peaches was impossible.

Selected fungicide treatments were applied with an air-blast sprayer to five-tree plots and were replicated four times in a randomized block design. Treatments were applied on Red Globe and Elberta cultivars during 1975 at the Chilton Area Horticulture Substation. Lime-sulfur (1 gal. per 100 gal. of water) was applied at 3-day intervals during bloom. Beginning with petal fall, the following fungicides were applied at 10-14 day intervals as cover sprays either singly or in combination: benomyl (Benlate 50W), captan (Captan 50W), dodine (Cyprex 65W), methyl-2-benzimidazolecarbamate (DPX 10), benomyl + captan (DPX 115B), cupric hydroxide (Kocide 101 83W), and thiophanate methyl (Topsin-M 70W). Unsprayed check plots were included for treatment comparisons. Recommended insecticides were used with the fungicides. Fruit disease counts were made from two boxes of peaches (450-500 peaches) harvested randomly per replicate.



INCIDENCE OF BACTERIAL SPOT AND SCAB FROM RED GLOBE PEACHES SPRAYED WITH FUNGICIDES, CHILTON AREA HORTICULTURE SUBSTATION, 1975

| Treatments and rate per 100 gallons | | Applications | Percent fruit affected at harvest | | |
|---|---|---|---|---|---|
| | | | Clean | Scab | Bacterial spot |
| | *Lb.* | | | | |
| Benlate 50W | 0.5 | F[1] | | | |
| Kocide 101 83W | 0.33 | 2c | 84.9b | 0 a | 14.9a |
| Benlate 50W | 0.5 | F | | | |
| Captan 50W | 2.0 | F | 80.6b | 0 a | 19.0a |
| Captan 50W | 2.0 | F | | | |
| Cyprex 65W | 1.0 | F | 92.1b | 0.2a | 6.7a |
| Captan 50W | 2.0 | F | | | |
| Kocide 101 83W | 0.33 | 2c | 71.3b | 15.6a | 11.1a |
| DPX 10 | 0.5 | F | 79.8b | 0 a | 19.6a |
| DPX 115B | 0.5 | F | 39.3a | 0.1a | 56.6b |
| Topsin-M 70W | 0.5 | F | 68.0b | 0.2a | 31.0a |
| Check (unsprayed) | ---- | F | 16.7a | 71.8b | 9.4a |

[1] F = full season application, 2c = 2 cover spray applications.

The small letters indicate Duncan's multiple groupings of treatments which do not differ significantly at the five percent level.

All fungicides gave excellent control of scab except the Captan 50W-Kocide 101 combination. The high incidence of scab in the unsprayed plots apparently masked bacterial spot symptoms. Control of bacterial spot was best with the highest number of clean fruit found in the Captan 50W plus Cyprex 65W treatment. The next best control of spot occurred when Captan 50W or Benlate 50W was used with Kocide 101. A comparison of the Benlate 50W-Captan 50W combination with DPX 115B showed nearly three times better bacterial spot control occurred with 2.5 lb. as with 0.5 lb. Thus, these fungicides demonstrated some bacterial activity at these rates (see table).

Kocide 101, a formulation of cupric hydroxide, is an excellent bactericide, however, it can cause phytotoxicity. These tests showed that, when used with Benlate 50W or Captan 50W, phytotoxic effects were prevented. In other tests on Elberta peaches, combinations of Kocide 101 with sulfur and Benlate 50W caused extensive leaf shot-holing and defoliation, and fruit maturity reduction. Further evaluations of copper compounds must be made to determine their efficacy for control of *X. pruni*. Kocide 101 is not recommended for use on peaches at the present time in Alabama, except during the dormant stage.

# MONENSIN TRIED AS FEED ADDITIVE FOR STEERS

R. R. HARRIS and W. B. ANTHONY, *Department of Animal and Dairy Sciences*
J. A. LITTLE, *Lower Coastal Plain Substation*
V. L. BROWN, *Department of Research Operations*

**Different ear tag colors were used to identify steers getting each rate of monensin in the experiment.**

MONENSIN IS A NEW TERM to most cattlemen, but one that is being heard frequently in animal science research circles. Reason for this interest is that monensin (sold by Eli Lilly and Co. as "Rumensin") reportedly improves feed efficiency of finishing cattle.

A bacterial fermentation product, monensin was used successfully by the poultry industry to control coccidiosis before its effect on cattle was discovered. As an additive in beef finishing rations, monensin later was found to decrease feed intake and improve feed conversion of finishing cattle. It is theorized that this effect on cattle is due to an increased proportion of propionic acid in the rumen.

To assess the value of monensin to cattle under Alabama conditions, the product was studied by Auburn University Agricultural Experiment Station. It was tried as an ingredient of a supplement fed to grazing cattle and as an additive in a finishing ration.

Effect on grazing cattle was determined for both summer (Coastal bermudagrass) and winter (oats-ryegrass-clover) grazing at the Lower Coastal Plain Substation. Monensin was incorporated into cottonseed meal (CSM) or corn and fed daily to steers on continuous grazing. Steers were brought into a corral daily where they were fed the prescribed rate of monensin on an individual basis. Feed consumption was recorded daily and steers were weighed every 28 days.

TABLE 1. EFFECT OF COTTONSEED MEAL AND MONENSIN ON RATE OF GAIN OF STEERS GRAZING COASTAL BERMUDAGRASS, JUNE 1-SEPTEMBER 20, 1975

| Item | Result, by daily supplement/steer[1] | | | | | |
|---|---|---|---|---|---|---|
| | None | 1 lb. CSM | 1 lb. CSM + monensin | | | |
| | | | 25mg | 50mg | 100mg | 200mg |
| | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* |
| Initial weight | 570 | 573 | 572 | 570 | 572 | 572 |
| Total gain | 155 | 159 | 161 | 166 | 169 | 173 |
| Average daily gain | 1.38 | 1.42 | 1.44 | 1.48 | 1.52 | 1.55 |

[1] Averages of 20 steers per treatment group.

TABLE 2. EFFECT OF CORN AND MONENSIN ON RATE OF GAIN OF STEERS GRAZING OATS-RYEGRASS-CLOVER, DECEMBER 9, 1974-MAY 1, 1975

| Item | Result, by daily supplement/steer[1] | | | | |
|---|---|---|---|---|---|
| | None | corn 2 lb. | 2 lb. corn + monensin | | |
| | | | 50mg | 100mg | 200mg |
| | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* |
| Initial weight | 469 | 467 | 468 | 468 | 469 |
| Total gain | 265 | 299 | 289 | 308 | 315 |
| Average daily gain | 1.88 | 2.12 | 2.05 | 2.18 | 2.23 |

[1] Averages of 16 steers per treatment group.

For the 112-day summer test, Coastal pastures were stocked at the rate of 2 steers per acre. Twenty yearling beef steers were assigned to each of the following six feeding treatments: grazing only, and grazing plus 1 lb. of CSM with 0, 25, 50, 100, or 200 mg of monensin per animal daily.

The winter grazing trial lasted 141 days, with 16 steers per treatment. Feeding treatments were the same as with Coastal grazing, except the monensin was incorporated into corn and there was no 25-mg monensin feeding rate.

Performance data show that steers grazing Coastal bermuda gained at about the same rate whether supplemented with CSM or not (1.42 vs. 1.38 lb. per day). Monensin had little effect on rate of gain except at the higher feeding rates, Table 1.

Animal response to monensin on the oats-ryegrass-clover pasture was similar to that on bermuda. The major difference noted was higher daily gain on winter than on summer grazing (2.1 vs. 1.5 lb., respectively). Most gain increase from supplement feeding was from the corn instead of the monensin, Table 2.

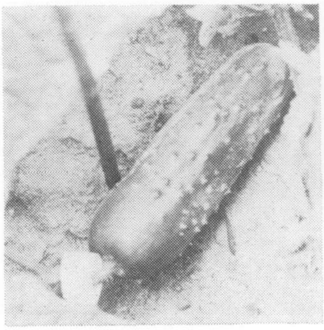
At the end of the 141-day winter grazing period, steers were finished on a ration of 64% shelled corn, 10% CSM, 15% grass hay, 10% cane molasses, and 0.5% each trace mineralized salt and dicalcium phosphate. All ingredients were ground and blended, and the mixture was self-fed. Two groups of 20 steers each were fed the basal ration and two comparable groups of 20 each were fed the ration containing monensin. The monensin was added at the rate of 10 mg per pound of feed. Carcass quality and yield grade data were collected at the end of the 84-day finishing period.

Monensin showed a positive effect in the finishing ration. Steers gained 2.64 lb. daily, as compared with 2.35 lb. for those getting the basal ration alone. Daily feed conversion also was improved by adding monensin, with feed per cwt. gain dropping from 1,017 lb. to 827 lb.

Results also indicate that adding monensin reduced amount of feed eaten by the steers. The material was removed from the ration 3 days preceding slaughter, and feed consumption increased by 15%.

Carcasses graded Good or Choice regardless of ration treatment. Monensin had no significant effect on carcass characteristics, such as quality or yield grade, or on moisture, fat, and protein content as estimated by a prediction equation.

Results from the Auburn tests, as well as other research reported in the literature, indicate that monensin will have little effect on performance of grazed cattle. However, adding monensin to finishing mixtures will improve feed conversion and may improve rate of gain.



# Breeding Pickling Cucumbers for Resistance to Cucumber Beetles

OYETTE L. CHAMBLISS, *Department of Horticulture*

BITTER IS BETTER.

At least that is the taste preference of the pesky cucumber beetle. And this fact is the basis for current efforts toward developing cucumber varieties that are resistant to that destructive insect.

Plants of the cucurbit family are characteristically bitter, and it is this bitterness that attracts the cucumber beetle. In fact, the insect does not like to feed on cucumber plants lacking that bitterness. Spotted cucumber beetles refuse to eat plants that do not have the bitter principle. Striped cucumber beetles prefer bitter plants, but will eat non-bitter types if no bitter ones are available. Thus, resistance due to plant bitterness is less effective against the striped beetle.

The bitter principles are especially concentrated in young seedlings, so the beetles are stimulated to begin feeding as soon as cucumber plants emerge. This makes beetle attacks of particular concern with pickling cucumbers, which are normally field seeded in commercial production. Severe stand losses often result when insect populations are high at time of plant emergence.

Non-bitter varieties of fresh market, or slicer, type cucumbers have already been developed to avoid the erratic occurrence of bitter fruit from varieties with bitter plants. Cucumber beetle resistance in these varieties was coincidental with lack of bitterness. A bitter taste is not as noticeable in pickled cucumbers and does not pose a serious problem, so non-bitter pickling varieties have not been developed. Therefore, pickling varieties in use are susceptible to cucumber beetles.

### Research Seeks Resistance

Getting cucumber beetle resistance into improved pickling type breeding lines is a major objective of the breeding program at Auburn University Agricultural Experiment Station. Eversweet, one of the earliest non-bitter slicer varieties, is the source of cucumber beetle resistance in the breeding program. Since Eversweet lacks the dominant gene for bitterness, its genetic make-up (homozygous recessive) prevents the development of bitter principles in any part of the plant.

Progenies were developed from crosses between Eversweet and commercial types with bitter plants. These progenies segregate for cucumber beetle resistance in a ratio of 3 susceptible to 1 resistant, which is typical of a character controlled by a single dominant gene. Other horticultural characteristics, such as plant and fruit type, also segregate.

Selections for cucumber beetle resistance were made from among plants that had already been screened for suitable horticultural characteristics. This speeded up progress since any resistant plant selected would also have desirable horticultural characteristics. These selections and the original segregating populations were compared in caged screening tests for resistance to spotted cucumber beetle. Segregating populations are shown in the photographs. In some cases single plants were segregating for resistance from populations in which all other plants were susceptible.

### Most Segregate Resistant Plants

Of the 14 selections tested for resistance, only 4 did not segregate resistant plants. This indicated that most of the plants selected for horticultural type carried genes for both resistance and susceptibility to cucumber beetles (heterozygous for resistance). When self-pollinated, the progeny therefore segregated for resistance.

Resistant plants were selected, hand pollinated for seed increase, and further selections were made for horticultural type in the field. Several of these selections have fruit types with pickling characteristics (see title photograph).

Selection will continue in each line for the improvement of fruit type, productivity, disease resistance, adaptibility to Alabama growing conditions, and general commercial adaptibility. However, resistance to cucumber beetles is the base from which selections will be made. Backcrosses to commercial types will contribute genetic factors from which improved types may be selected.

**Plants containing the bitter principles (left) show characteristic cucumber beetle damage, as contrasted with non-bitter plants (center) that were not damaged. Single plants sometimes segregate for resistance in otherwise susceptible populations (right).**

# FACTORS behind RISING Food COSTS
# Should the FARMER be BLAMED?

W. E. HARDY, *Department of Agricultural Economics and Rural Sociology*

For the past 4 years, everyone has been faced with extremely large increases in food prices. The average rise of 7% in 1975 appeared relatively mild after a 14% increase in 1974, and a 17% jump during 1973. Unhappy consumers have wanted to know who is getting rich from these price increases and who they should blame for their expensive bag of groceries.

The average retail cost of all foods, except eggs, was higher in 1975 than 1974. Livestock products and crop-related products shared the rise in retail prices during the year, a sharp contrast to 1974 when crop price increases contributed the most and 1973 when livestock products contributed more than two-thirds of the food cost increase.

Also during 1975, extreme price variations were witnessed for almost all food groups. Early in the year beef prices were lower than they had been for 2 years, however, they climbed rapidly during the latter months and then leveled off. The availability of grain fed beef had a great influence on these prices. The average retail prices per pound of beef were $1.27 in March, $1.61 in July, and down to $1.51 in December. Dairy product prices showed similar trends, declining for the first half of the year and turning up sharply during the last few months.

THE MARKET BASKET OF FARM FOODS: RETAIL COST, FARM VALUE, FARM-RETAIL SPREAD, AND FARMERS SHARE OF RETAIL COST

| Year and quarter | Retail cost | Farm value | Farm retail spread | Farmers share |
|---|---|---|---|---|
| | Dollars | | | Pct. |
| 1967 | 1,080.64 | 419.07 | 661.57 | 39 |
| 1968 | 1,113.06 | 441.28 | 671.78 | 39 |
| 1969 | 1,178.98 | 481.09 | 697.89 | 41 |
| 1970 | | | | |
| 1971 | 1,250.30 | 479.42 | 770.88 | 38 |
| 1972 | 1,310.82 | 524.26 | 786.56 | 40 |
| 1973 | 1,537.75 | 700.88 | 836.87 | 46 |
| 1974 | 1,749.56 | 747.94 | 1,001.62 | 43 |
| 1975 | 1,875.99 | 782.41 | 1,093.58 | 42 |
| **1973** | | | | |
| I | 1,413.48 | 625.67 | 787.81 | 44 |
| II | 1,496.69 | 673.24 | 823.45 | 45 |
| III | 1,603.01 | 780.31 | 823.38 | 49 |
| IV | 1,635.01 | 723.73 | 911.28 | 44 |
| **1974** | | | | |
| I | 1,720.38 | 779.05 | 941.33 | 45 |
| II | 1,731.19 | 708.23 | 1,022.96 | 41 |
| III | 1,750.64 | 743.01 | 1,007.63 | 42 |
| IV | 1,797.10 | 760.19 | 1,036.91 | 42 |
| **1975** | | | | |
| I | 1,824.12 | 724.57 | 1,099.55 | 40 |
| II | 1,838.17 | 764.80 | 1,073.37 | 42 |
| III | 1,919.22 | 837.72 | 1,081.50 | 44 |
| IV | 1,922.46 | 803.78 | 1,118.68 | 42 |

In spite of price increases for most food items during 1975, the overall rise was less than the 9% for all consumer goods and services. Since 1967, the retail cost of the market basket of farm foods has risen 74%, while the Consumer Price Index for all goods and services excluding food has increased only 57%. This slow down in food price increases and its continuance into 1976 could play a large part in reducing the overall level of inflation.

The farm food market basket is a gauge established by USDA to measure average changes in retail food prices and indicate the relative returns to farmers and the processing and marketing process. The so-called market basket contains the average quantities of domestic farm-produced foods bought annually per household in 1960 and 1961 by families of urban wage earners and clerical workers and by single persons living alone.

The retail cost of the market basket for a specific year is an estimate of what the foods in the 1960-61 food basket would cost in the current year. The cost does not represent all the money a typical urban family spends for food during the year. It does not include the cost of meals eaten away from home, nor does it contain the cost of seafoods or imported foods such as coffee or bananas.

The table gives an idea of how the farmer has fared since 1967 as the price of the market basket of farm foods has increased. Quarterly information is given for the past 3 years.

The retail cost of the market basket has shown a continued upward trend for the 9 years. Similar movement is found in data for earlier years. The relative amount that the farmer has received from the total increased slightly over these years with 1973 appearing to be the best year for the producer. During that year, the third quarter in particular, farmers were receiving all-time high prices for their goods. The farmer's share of the food dollar reached 46%, its highest peak in recent history. Also, these higher farm values accounted for an unusually high percentage of the total increase in food prices during 1973, 78%.

The increase in farm value figures for the last 2 years reflects somewhat more of a normal situation. The increase in this value was responsible for only 22% of the overall gain in food prices from 1973 to 1974 and 24% of the increase from 1974 to 1975. Certainly a great reduction from the changes witnessed in 1973. The remainder of the cost increases for those years was caused by the advance in the farm-retail spread – the marketing margin. This margin is composed of charges made by the food industry for assembly, processing, transporting, and distributing a market basket of farm produced foods, plus a certain amount for profit.

Since the ending of wage and price controls in mid-1973, these marketing margins have risen about 36% with the bulk of this increase coming in late 1973 and early 1974. These wider margins have accounted for two-thirds of the rise in food costs. In spite of these great changes, an adjustment to the retail price controls, there was little increase in the margin during 1975. In fact, it even declined slightly during mid-year, giving the producer a larger share of the total dollar.

Who is to blame for the higher food prices of the 1970s? The data seem to indicate that both the farmer and the middleman have gained during the period. The producer realized the greatest increase during late 1972 and early 1973, while those concerned with processing and marketing achieved the advantage during the closing months of 1973 and throughout 1974. Both segments shared in the gain during 1975 with farmers showing strength at mid-year but declining toward the end. This gradual decline has continued into 1976.

# FERTILIZING
# Farm Fish Ponds

CLAUDE E. BOYD, *Department of Fisheries and Allied Aquacultures*

PONDS IN Alabama are often fertilized to increase the production of microscopic plants (phytoplankton) that are the food of minute animals (zooplankton) and aquatic insects. Bream eat plankton and insects and bass feed largely on bream. Fertilization of bass-bream ponds usually doubles or triples fish production, but five to six fold increases are occasionally achieved. An additional benefit of fertilization is that plankton turbidity in ponds restricts light penetration and helps control underwater weeds.

The dense growths of tiny plants and animals in ponds discolor water, usually some shade of green, and are called "plankton blooms." Plankton blooms dense enough to restrict the visibility of underwater objects to depths of 18 to 24 in. should be maintained in bass-bream ponds. However, tests have shown that heavier plankton blooms are undesirable because they may suddenly die and decompose causing depletion of dissolved oxygen and fish kills. Dense plankton blooms may also cause oxygen depletion during prolonged cloudy weather. Therefore, over-fertilization should be avoided since it encourages excessive plankton blooms and is wasteful.

A fertilization procedure that Auburn University Fisheries researchers have found productive is to begin in February and apply 40 lb. per acre of 20-20-5 grade fertilizer, or equivalent, at 2-week intervals for three applications; then at 3-week intervals for three applications; then continue applications monthly or whenever visibility into the water exceeds 18 in. After plankton blooms develop in old ponds following two or three applications, satisfactory plankton turbidity may often be maintained by applying only 18 lb. of triple superphosphate or 40 lb. of superphosphate according to the schedule above.[1] However, results of recent research may be used to improve pond fertilization procedures.

Applications of agricultural limestone have improved conditions for fish growth in some ponds tested at Auburn. If ponds have acid bottom mud and water softer than 20 parts per million total hardness, fertilization often fails to cause good plankton blooms. The lime requirement procedure used in soil testing was modified for use on pond muds. Application of agricultural limestone to ponds at rates determined by the lime requirement procedure increased mud pH, water hardness, phosphorus concentration, phytoplankton growth, and fish production.[2] Liming of bass-bream ponds with extremely soft water may double fish production. Furthermore, waters stained with humic substances (dark waters) can be cleared with agricultural limestone.

Pond fertilization rates presently used resulted from experiments conducted in unlimed, soft water ponds on wooded watersheds. Casual observations of unfertilized ponds suggested that ponds in pastures almost invariably had better plankton blooms than ponds in woods. Therefore, a study was conducted to determine levels of primary nutrients (phosphorus, nitrate, ammonia, and potassium), water hardness, and plankton production in unfertilized pasture ponds, unfertilized ponds in woods, and fertilized ponds. Results are summarized in the table. Two-thirds of the fertilized ponds had wooded watersheds; the rest were in pastures.

Unfertilized ponds in pastures had higher concentrations of nutrients, harder water, higher plankton production, and less transparent water than unfertilized ponds in woods. In fact, the average plankton production in unfertilized pasture ponds equaled plankton production in fertilized ponds. Although little of the nitrogen and phosphorus applied to pastures is lost in runoff, high concentrations of nutrients in unfertilized pasture ponds were related to agricultural activities on the watersheds. For example, cattle grazing on pastures deposit considerable urine and manure in or near ponds, which serves as a source of nutrients. The amount of fertilizer applied to pastures and the number of cattle in pastures was not known. However, the unfertilized ponds with the best plankton blooms were in well managed pastures with high densities of cattle.

Most ponds in pastures do not need as much fertilizer for good plankton production as is normally applied to bass-bream ponds and fertilizer should only be applied if plankton growth is poor. Ponds on wooded watersheds frequently have soft water and need lime. No reduction of current fertilizer rates should be attempted for ponds on wooded watersheds.

[1] BOYD, C. E. AND J. R. SNOW. 1975. Fertilizing farm fish ponds. Auburn University Agricultural Experiment Station Leaflet 88. 4 pp.

[2] BOYD, C. E. 1974. Lime requirements of Alabama fish ponds. Auburn University Agricultural Experiment Station Bulletin 459. 20 p.

WATER QUALITY IN FERTILIZED PONDS AND IN UNFERTILIZED PONDS ON WOODED AND PASTURE WATERSHEDS

| Measurement | Unfertilized ponds: Wooded watershed (n = 34) | Unfertilized ponds: Pasture watershed (n = 53) | Fertilized ponds |
|---|---|---|---|
| Water hardness (parts per million) | 18.9 | 29.0 | 20.0 |
| Soluble inorganic phosphorus (p.p.m.) | 0.01 | 0.02 | 0.02 |
| Total phosphorus (p.p.m.) | 0.09 | 0.13 | 0.17 |
| Nitrate (p.p.m.) | 0.33 | 0.43 | 0.32 |
| Ammonia (p.p.m.) | 0.06 | 0.13 | 0.12 |
| Potassium (p.p.m.) | 1.5 | 2.9 | 1.7 |
| Transparency (ft.) | 4.1 | 2.2 | 2.4 |
| Plankton (p.p.m.) | 5.3 | 11.9 | 12.1 |

[1] n = number of ponds.

# FACTORS AFFECTING CATFISH PRODUCTION in West-Central Alabama

K. W. CRAWFORD, *Department of Agricultural Economics and Rural Sociology*

TEN YEARS of research have eliminated enough of the biological problems connected with catfish farming that producers are now demanding research concerning the economics of their operations.

Catfish producers want additional research about current prices, costs, management techniques, and marketing practices. In order to meet this demand, researchers collected data from commercial producers within the 10-county area centrally located around Greensboro in Hale County (see map). This area accounted for 71% of the 1974 commercial catfish production acreage in Alabama.

In an attempt to isolate factors which affected variation in total pounds of catfish produced, data from ponds cultured in 1973 and 1974 were analyzed.

Prior to the statistical analysis, the interrelationships between inputs and outputs were hypothesized. Economic theory and biological growth theory were used as the basis for selection of the input variables needed in the catfish production process.

The variables selected for the analysis were: (1) size of pond in surface acres, (2) pounds of fingerlings stocked, (3) tons of feed fed, (4) length of growing season in days, (5) season during which pond was stocked, (6) ponds managed under contract.

These variables did not exhaust the list of factors that influence harvest weight per pond. Other factors were not included because clear distinctions could not be made on a pond basis.

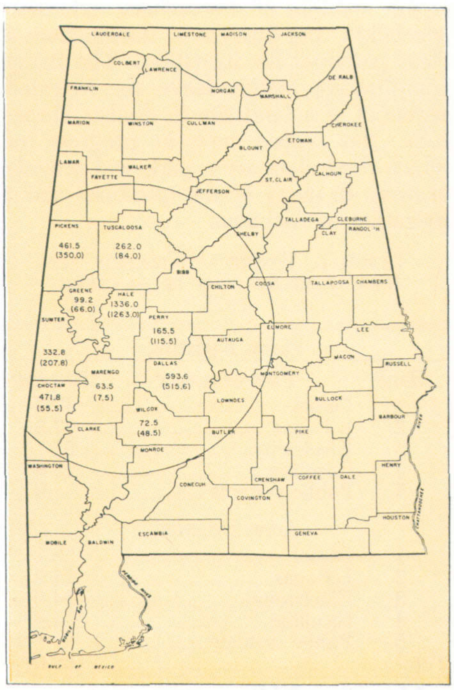



**FIG. 1. West-Central Alabama region with total acreage in catfish production and total commercial acreage in parentheses, 1974.**

An equation representing the mathematical relationships among all variables explained 94% of the variation in total pounds of catfish harvested from the ponds studied. The statistically significant factors were as follows: (1) ponds managed under contract, (2) pond acreage, (3) pounds of fingerlings stocked, (4) tons of feed fed.

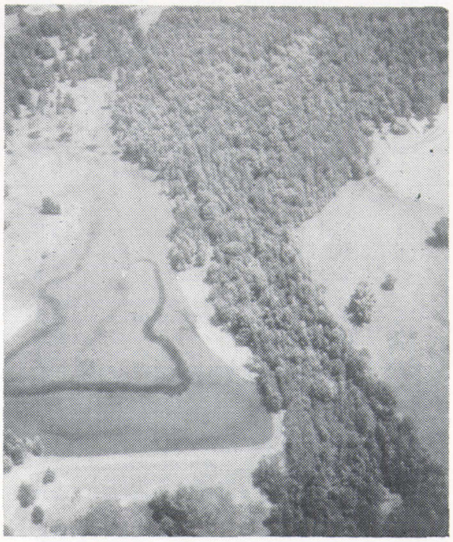


**FIG. 2. Typical West-Alabama pond.**

Of the 173 ponds, 14% were managed under legal contracts with one of the processing firms in west-central Alabama. These ponds yielded almost 2,470 lb. less than the total from ponds operated by independent producers, or 283 lb. less production per acre. Some contract producers indicated efficiency could have been increased had better quality fingerlings and feed been supplied by the processor. The problems with vegetation, disease, and parasite control may have been lessened if the producer had more control over techniques used. It was possible that reduced output may have resulted from poor producer performance due to sociological characteristics, such as motivations, personality, education, or management abilities. However, the answer may be unexplainable by either the contractor or producer.

The pond acreage variable was statistically significant and subsequently indicated that economies and diseconomies of scale existed. Further computations were performed to examine the nature of the relationship between total product using pond acreage as the input factor. The total poundage of catfish produced increased with increments in pond acreage until a unit size of 25 acres was reached. Beyond this level total poundage decreased.

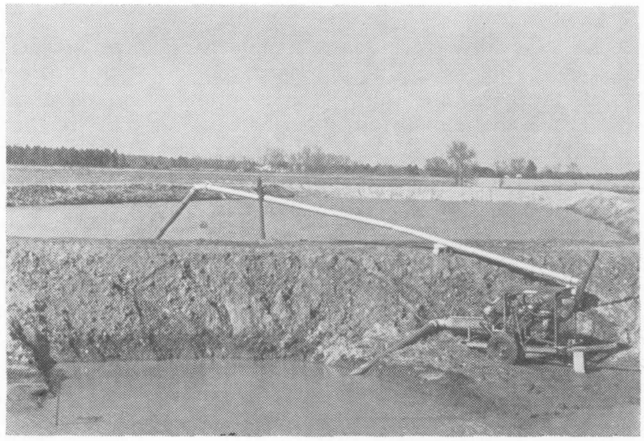
A direct relationship existed between pounds of catfish harvested and pounds of fingerlings stocked. The variable was expressed as total pounds of fingerlings stocked which was a function of the size of the fish and the rate stocked. The average size of fingerlings stocked was nearly 5 in., which weighed about 32 lb. per thousand. Using the average price of 1 cent per inch, the cost per pound was $1.60. The mean number of pounds of fingerlings stocked per pond was about 628. Based on these figures and the average size pond of 8.7 acres, the stocking rate per acre was about 2,300, and the cost of fingerlings to stock a pond of average acreage would be $1,005, or $116 per acre.

Based on the computed equation, the curve for the relationship between pounds of catfish harvested and the amount of feed fed turned upward instead of downward. The total average pounds of production estimated from the equation was 15,462 per pond, or 1,773 lb. per acre, with a feed conversion ratio of 1.74:1.0. Thus, producers in the sample, because of inflated feed prices, may have been reluctant to feed the fish to the biological limits. Further, the quality of the feed provided by the manufacturers may not have been adequate to produce the best gains. Using an average value of $235 per ton for feed costs and $0.45 per pound liveweight, the returns above feed cost were $3,797, or $435 per acre.

Total pounds of marketable catfish harvested from a farm pond are the product of a very complex ecosystem. However, the equation included variables that explained a large amount of the variation in total pounds of output among the ponds in the sample.

# IRRIGATION USAGE in ALABAMA

JAMES L. STALLINGS, *Department of Agricultural Economics and Rural Sociology*
EUGENE ROCHESTER, *Department of Agricultural Engineering*
JOHN A. McGUIRE, *Research Data Analysis*



RESULTS of a survey conducted to determine the extent and characteristics of irrigation in Alabama reflect irrigation practices for 1975 of 42% of the estimated 310 irrigators in the State. Included in the survey are crops being irrigated, systems used, water sources, and power utilized.

TABLE 1. IRRIGATION IN ALABAMA BY SOURCE OF WATER, 1975

| Source of water | Farms reporting[1] | Acres irrigated |
|---|---|---|
| | *Pct.* | *Pct.* |
| Well | 29.4 | 39.5 |
| Lake or pond | 63.3 | 38.9 |
| River or stream | 35.8 | 20.6 |
| Public and other systems | 6.4 | 1.0 |
| Total | | 100.0 |

[1] Will add to more than 100% because many farmers reported more than one source of water.

An examination of water sources data as presented in Table 1 shows that wells and lakes each accounted for approximately 39% of Alabama's irrigated acreage in 1975. Streams accounted for the remaining water usage except for 1% which is obtained from other sources such as public water systems. However, an examination of the number of farms reporting different water sources indicates that ponds are reported by more farmers as a source of irrigation water but account for smaller acreage irrigated than wells. About a third of the farms reporting reported more than one source of water.

TABLE 2. CROPS IRRIGATED IN ALABAMA, 1975

| Rank | Crop | Percent |
|---|---|---|
| | *Farms reporting* | |
| 1 | Corn | 20.8 |
| 2 | Peanuts | 9.3 |
| 3 | Cotton | 7.6 |
| 4 | I. Potatoes | 6.4 |
| 5 | Tomatoes | 6.4 |
| 6 | Peppers (all) | 3.8 |
| 7 | Cabbage (incl. plants) | 3.0 |
| 8 | Collards | 2.1 |
| All other misc. | | 40.6 |
| Total | | 100.0 |
| | *Acres irrigated* | |
| 1 | Corn | 35.7 |
| 2 | Peanuts | 13.6 |
| 3 | Cotton | 10.7 |
| 4 | I. Potatoes | 8.6 |
| 5 | Tomatoes | 3.6 |
| 6 | Soybeans | 3.3 |
| 7 | Bermudagrass sod | 2.9 |
| 8 | Cabbage (incl. plants) | 1.8 |
| All other misc. | | 19.8 |
| Total | | 100.0 |

TABLE 3. IRRIGATION IN ALABAMA BY TYPE OF SYSTEM, 1975

| Rank | System | Percent |
|---|---|---|
| | *Farms reporting[1]* | |
| 1 | Cable tow | 45.9 |
| 2 | Hand portable | 38.5 |
| 3 | Center pivot | 12.8 |
| 4 | Solid set | 10.1 |
| 5 | Stationary volume guns | 5.5 |
| 6 | Surface | 2.8 |
| | *Acres irrigated* | |
| 1 | Cable tow | 51.3 |
| 2 | Center pivot | 22.5 |
| 3 | Hand portable | 18.8 |
| 4 | Solid set | 5.0 |
| 5 | Stationary volume guns | 1.8 |
| 6 | Surface | .6 |
| Total | | 100.0 |

[1] Will add to more than 100% because some farms have more than one type of system.

Location is a major consideration in the selection of the water source. Areas having abundant underground water and poor pond sites rely more on wells. An example is Baldwin County, a low lying area which has plenty of underground water. A high percentage of the State's irrigation wells are located in this county.

An examination of crops by acreage irrigated indicates corn to be the major irrigated crop, 35.7%, Table 2, followed by peanuts, cotton, and Irish potatoes.

The cable-tow is the predominant system accounting for over half of the irrigated acreage, Table 3. This type system can be found in most of the State's agricultural areas and was the predominant system being purchased 5 or more years ago. The center pivot accounts for 22.5% of the acreage with most of these systems located in Baldwin County and the Wiregrass area. These systems have become more popular in recent years. Hand portable systems are used on most of the remaining acreage.

Engines are the predominant source of power, Table 4, including diesel with 58.1%, L.P. gas with 22.9%, and gasoline with 4.4% of the irrigated acreage. Electric motors provide the power for 14.6% of all land irrigated.

New systems are being installed yearly. For field crops, these systems are predominantly center pivots and cable tow. However, the total irrigated acres is still small. One reason for the failure of Alabama irrigated acreage to increase greatly is the inability of researchers, extension specialists, and farmers to demonstrate a clear potential for irrigation. The many complicating factors leave the irrigated potential of a land site in doubt. Hopefully, the project now in progress, of which these data are a part, will provide answers to many of the questions about irrigation in Alabama.

TABLE 4. POWER UTILIZATION FOR IRRIGATION SYSTEMS IN ALABAMA, 1975

| Rank | Fuel or power | Percent[1] |
|---|---|---|
| | *Farms reporting* | |
| 1 | Diesel | 47.7 |
| 2 | L.P. gas | 27.5 |
| 3 | Electricity | 21.1 |
| 4 | Gasoline | 15.6 |
| 5 | Public systems | .9 |
| | *Acres irrigated* | |
| 1 | Diesel | 58.1 |
| 2 | L.P. gas | 22.9 |
| 3 | Electricity | 14.6 |
| 4 | Gasoline | 4.4 |
| 5 | Public systems | * |
| Total | | 100.0 |

* Less than 0.1%.
[1] Will add to more than 100% because some farms use more than one source of fuel or power.

# Herbicide x Insecticide Interaction Varies With Variety, Soil Type

GALE A. BUCHANAN, *Department of Agronomy and Soils*
ELLIS W. HAUSER, *ARS-USDA, Georgia Coastal Plain Experiment Station, Tifton, Georgia*

INTENSITY OF HERBICIDE use on peanuts has increased greatly in recent years. At the same time, new peanut varieties that can produce much higher yields have been introduced. Since sensitivity of crops to pesticides varies among varieties, there has been concern about the possibility of interaction between the new varieties and the pesticides used in peanut fields. Major concern centered around potential yield reductions that might occur, although such interaction might either increase or decrease yields, or even have no effect on production.

The potential interaction problem has been studied since 1973 in cooperative Alabama-Georgia experiments that measured effects of several pesticides on different peanut varieties. The first series of tests, covering a 2-year period, was on Dothan sandy loam, Greenville sandy clay loam, Ocilla sandy loam, and Tifton sandy loam soils. The experiment became a three-state project when University of Florida (Wayne Currey, project leader) joined in 1974. Most of the data in this article came from the first series of tests.

PESTICIDE TREATMENTS USED IN ALABAMA-GEORGIA INTERACTION EXPERIMENTS

| Treatment number and pesticide trade name[1,2] | Rate per acre, lb. | How applied[3] |
|---|---|---|
| **Herbicides[2,4]** | | |
| 1—Vernam | 2.5 | PPI |
| 2—Vernam + Balan | 2.5 + 1.5 | PPI |
| 3—Vernam + Balan | 2.5 + 1.5 | PPI |
| Dyanap | 4.5 | C |
| 4—Vernam + Balan | 2.5 + 1.5 | PPI |
| Dyanap | 4.5 | C |
| Premerge (multiple) | .5 | P |
| 5—Vernam + Balan | 2.5 + 1.5 | PPI |
| Dyanap | 4.5 | C |
| Premerge (multiple) | .5 | P |
| Butyrac | .4 | P |
| 6—no herbicide | | |
| **Systemic insecticides[3]** | | |
| A—Disyston | 1.0 | in drill with seed |
| B—no insecticide | | |

[1] Common names are: Vernam = vernolate; Balan = benefin; Dyanap = naptalam + dinoseb; Premerge = dinoseb; Butyrac = 2,4-DB; and Disyston = disolfoton.

[2] This paper reports the results of research only. Mention of a pesticide does not constitute a recommendation by the USDA or Auburn University nor does it imply registration under FIFRA.

[3] PPI = preplant incorporated; C = cracking; and P = postemergence.

[4] Each of the herbicide treatments was applied with both the A and B insecticide treatments.

### Three Varieties Tried

Florunner, GK 3, and Tifspan varieties (runner, Virginia, and Spanish types, respectively) were tried with the pesticide treatments listed in the table. All pesticides were used at the standard or highest registered rate. Recommended production practices were followed to assure top yields.

The new variety, GK 3, was consistently the highest yielding one on Dothan soil, with Florunner second. The Spanish variety Tifspan made the fewest peanuts on this soil type, when yields with all treatments were averaged.

Florunner was the top yielder on Tifton and Ocilla soils in 1974. GK 3 made the highest yield on Tifton soil in 1973 and on Greenville soil in 1974.

### Insecticide x Variety Interaction

An insecticide x variety interaction occurred at least once on all soil types except the Dothan. This showed up as consistent and significant increases in yield of Florunner peanuts treated with Disyston. Disyston increased yields of Tifspan twice but did not affect yields of GK 3.

In the 14 interaction experiments to date in the Georgia-Florida-Alabama belt, yields of Florunner were increased 60% of the time, but never on Dothan soil. Past yield increases on the other soil types have varied from 50 to over 200 lb. per acre, with greatest differences on Greenville sandy clay loam.

### Effect of Herbicides

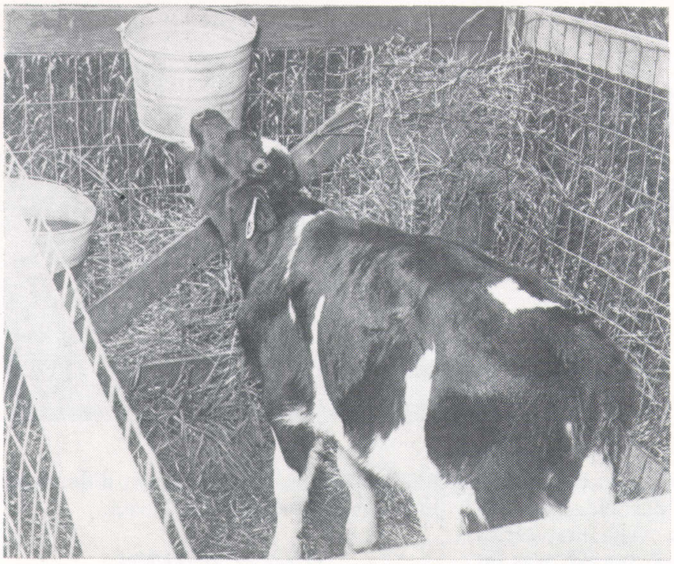
Herbicides decreased average yields only when the treatment sequence terminated with multiple applications of Premerge (treatments 4 and 5). An exploratory experiment in 1975 suggested that yield reductions were not due to the Premerge, but rather to the way in which the different herbicides applied in sequence interacted on the peanut plant.

There were only two cases of variety response to herbicides in the eight initial studies, one on Greenville sandy clay loam and one on Tifton sandy loam. GK 3 showed more reaction to herbicide sequences than did Florunner. The Spanish variety Tifspan was least affected.

The only herbicide x insecticide interaction occurred on Dothan sandy loam when Disyston increased yields with either no herbicide or when Vernam-Balan was applied. Expanded studies underway in 1976 will shed further light on how herbicides used singly or in sequence (with and without Disyston) will affect specific peanut varieties in different parts of the three-state belt.

All of the treatments included in these studies are presently labeled by EPA, with the exception of multiple applications of Premerge for which petition has been submitted. In earlier studies, as many as four applications of Premerge did not reduce peanut yields when the only previous treatment was Balan incorporated.

Use of a systemic insecticide in peanut production has been somewhat controversial. Hopefully, the current studies will help settle this controversy. Results to date document yield increases from Disyston on several soil types. Other systemic insecticides were not included in the test, however, so further research is needed to determine comparative yield effects by the other systemics.



# DAIRY HEIFER FEEDING AND MANAGEMENT

GEORGE E. HAWKINS
*Department of Animal and Dairy Sciences*

DAIRY HEIFER CALVES of the small breeds that gain an average of 1.25 lb. and of the large breeds that gain 1.7 lb. daily will be large enough to breed at 14 months of age. Growth similar to these rates should be achieved by following the feeding and management program given in this report, which is based on recent research findings.

Calves should be born in clean surroundings, the mucous removed from mouth and nostrils if needed, and the navel cord clipped to 3 in. and dipped with 7% tincture of iodine to assure a good start in life. The calf needs some of its dam's colostrum shortly after birth, either by nursing or hand feeding. Milk, surplus colostrum, or a milk replacer (available commercially) is recommended for the calf from 4 days to 5 weeks of age. Start with 6 to 12 lb. of milk or substitute daily, increase to 12 to 16 lb. at 3 weeks, then decrease the allowance by 0.7 to 1.0 lb. daily until weaned at 35 days of age. The preferred method of feeding is by nipple pail.

Start feeding a good quality hay, preferably alfalfa, at 1 week of age. Add calf starter, Table 1, to the ration at 15 days of age. Feed intake should be increased during the weaning process that starts at 22 days. Initially the calves will eat only a limited amount of hay or starter, but each should be fed all it will eat. Refused starter needs to be removed from the feed box daily and replaced with fresh feeds.

At 5 weeks of age the calves should eat about 2.7 lb. (large breeds) and 1.8 lb. (small breeds) of dry feed (hay plus starter) daily. On this early weaning system, calves to 6 months of age are fed hay (or corn silage after 3 months) free-choice plus all the starter they will eat up to 4 lb. daily. Dietary percentages of total digestible nutrients (TDN) and crude protein (CP) that will support rapid growth in calves from birth to 24 months are given in Table 2. To attain weights indicated at different ages, supplements are needed by heifers when grazed on most pastures. Some supplement mixes are given in Table 1. The quality of forage and age of the heifer will determine which of these supplements should be fed to supply the needed TDN and CP percentages given in Table 2.

Permanent identification, individual records, dehorning, and disease and parasite control are essentials of a good dairy heifer program. Just prior to moving heifers from individual to group pen housing at 3 months of age is a good time to give them any vaccinations recommended by your veterinarian. Blackleg and malignant edema, leptospira GHP, brucellosis, infectious bovine rhinotracheitis (IBR), and parainfluenza ($PI_3$) are common diseases for which vaccines are available.

Control of internal parasites is necessary for a good dairy heifer program. (Baymix, Thibenzole, Phenothiazine, and Tramisol are effective anthelmintic drugs if used according to manufacturers instructions.) Keeping heifers off pasture until they are 6 months old and rotation of pastures are management practices that will aid in the control of internal parasites.

Growth rate can be followed by using scales or a dairy cattle tape at monthly intervals and recording these weights on an individual record card.

TABLE 1. SIMPLE CALF STARTERS AND HEIFER SUPPLEMENTS

| Ingredient | Content of | | | |
|---|---|---|---|---|
| | Calf starter | Supplements 16% CP | 13% CP | 10% CP |
| | *Lb.* | *Lb.* | *Lb.* | *Lb.* |
| Soybean meal (44% CP) | 31.0 | 19.5 | 13.0 | 3.0 |
| Yellow corn, ground | 63.0 | 73.5 | 80.0 | 90.0 |
| Alfalfa pellets[1] | 5.0 | 5.0 | 5.0 | 5.0 |
| Limestone (feed grade) | .6 | .5 | .5 | .5 |
| Dicalcium phosphate | — | 1.0 | 1.0 | 1.0 |
| Trace mineralized salt | .4 | .5 | .5 | .5 |

[1] Added as a source of vitamins. By adding 2,000 I.U. of vitamin A and 400 I.U. of vitamin D per pound of starter or supplement, the alfalfa pellets can be replaced with corn or other feeds.

TABLE 2. DIETARY PERCENTAGES OF TOTAL DIGESTIBLE NUTRIENTS AND CRUDE PROTEIN RECOMMENDED FOR DAIRY HEIFERS AT SEVERAL AGES AND WEIGHTS[1,2]

| Heifer age and body weight | | | Recommended dietary contents | |
|---|---|---|---|---|
| Months old | Large breeds | Small breeds | TDN | Crude protein |
| | *Lb.* | *Lb.* | *Pct.* | *Pct.* |
| Under 1 | 90 | 55 | 100 | 22 |
| 1 | 120 | 75 | 80 | 18 |
| 2 | 170 | 105 | 72 | 15 |
| 3 | 220 | 145 | 70 | 14 |
| 6 | 373 | 260 | 66 | 11 |
| 10 | 590 | 420 | 62 | 10 |
| 14 | 805 | 575 | 58 | 10 |
| 18 | 985 | 695 | 56 | 10 |
| 24 | 1,250 | 875 | 56 | 10 |

[1] The ration should contain 0.4% calcium, 0.3% phosphorus, and 0.2% magnesium.
[2] Based on NRDC data.

# FEEDING DAMAGE OF THE BLACK PECAN APHID

P. M. ESTES and K. R. LAKIN, *Department of Zoology-Entomology*

THE BLACK pecan aphid, *Tinocallis caryaefoliae,* is one of three common aphids found on pecans in Alabama. The adult of this species is small (⅛ in. or less long), shiny black with minute white body spots, and clear unmarked wings. The immature stages or nymphs are smaller than the adult, wingless, and either brownish black or dark smoky green in color. Both adults and nymphs may be found whenever pecans are in leaf, but are most abundant in late July, August, and September. At this time black pecan aphids are capable of completely defoliating an orchard in as little as 30 days.

*Tinocallis caryaefoliae* has a typical aphid life history. During the spring and summer the populations consist entirely of winged female aphids that give birth to living young. Development from birth through the four nymphal instars requires 8-9 days. Each female produces an average of 39 offspring during the 2 weeks of her life. In late fall male and wingless female aphids are produced, they mate and the wingless females lay the overwintering eggs in cracks and crevices on pecan twigs. As many as 10 generations may occur during one season.

Although population numbers of this species rarely exceed 10-15 individuals per leaflet, injection of a toxic substance during feeding causes extensive necrosis and leaf loss. Figure 1 is a microphotograph showing the feeding apparatus or styli of this aphid inserted into the pecan leaf. The styli may follow a serpentine path to the phloem cells where actual feeding occurs. The first signs of leaf necrosis are not evident until 3-4 days after feeding begins. The necrotic area gradually increases during feeding and continues to increase after feeding ceases. Figure 2 shows the progressive development of leaf necrosis during 6½ days of feeding by a black pecan aphid. Leaf necrosis begins as a bright yellow and darkens to rusty red as feeding continues. In laboratory studies the leaf necrosis has been shown to be due mainly to nymphal feeding. Little necrosis is caused by adult feeding. One aphid can produce a necrotic area of about 0.27 in.$^2$. Eight to ten spots such as this on one leaflet will cause it to drop.

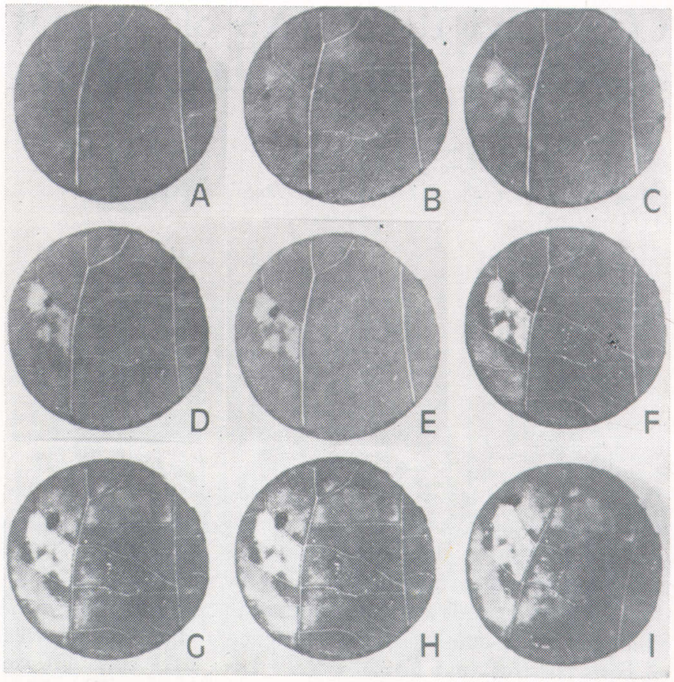



**FIG. 2. Progressive development of pecan leaf necrosis caused by feeding of the black pecan aphid. A. 2.5 days; B. 3.0 days; C. 3.5 days; D. 4.0 days; E. 4.5 days; F. 5.0 days; G. 5.5 days; H. 6.0 days; I. 6.5 days.**

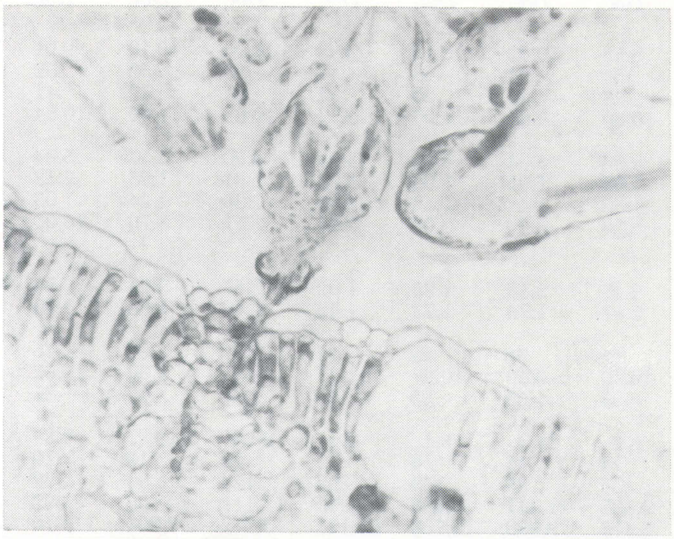


**FIG. 1. Microphotograph of a section of pecan leaf showing insertion of styli of the black pecan aphid.**

From these studies it is evident that chemical control cannot be effective when applied after leaf necrosis has developed. Timing of insecticidal sprays must be related to appearance of adult aphids during the critical period from late July through September. Insecticide trials conducted over the last 5 years have shown that all of the materials recommended for use on pecans except carbaryl are effective for black pecan aphid control. However proper timing is necessary to ensure a minimum of loss to this serious pecan pest.

# COST and RETURNS of PRODUCING GRADE A MILK in ALABAMA

SIDNEY C. BELL and JACK KIRKLAND
*Department of Agricultural Economics and Rural Sociology*

A SURVEY of 57 Alabama dairymen was conducted to determine operating costs, returns, and investments of producing Grade A milk and to analyze the effect of size of enterprise and efficiency on costs, returns, and investments.

Results of the survey showed the average total cost per cwt. of milk sold was $10.63. Feed cost averaged $5.47 of the total and was the largest cost item accounting for 51%. Non-feed variable cost averaged $1.90 per cwt. with machinery and equipment operating expense being the largest cost item in that category. Fixed costs were $1.49 per cwt. of milk sold and labor costs added $1.77.

Average gross receipts per cwt. of milk sold were $10.84, with the average price of milk being $10.01 per cwt. Gross receipts also included change in inventory and sales of cull cows, bulls, heifers, and calves. Average net returns to land, labor, and management were $1.98 per cwt. Average investment was $10.49 per cwt. (excluding land), with an average annual return to investment of 7.9%. Total labor utilized was 1.1 hours per cwt. with hired labor accounting for 0.5 hour and operator and family accounting for 0.6 hour. The 57 dairies had an average total production of 1.16 million lb. of milk per farm. The average herd size was 116 cows with an average milk production of 9,989 lb. per cow.

Four size groups were used to determine if economies of size were present. The size groups were less than 75 cows, 75 to 107 cows, 108 to 170 cows, and over 170 cows, see table. The data revealed that no economies of size were present. The total cost of production decreased from $10.52 per cwt. for the first size group to $10.36 for the second size group, but then increased to $10.78 and $11.07 per cwt. for the third and fourth size groups, respectively.

Gross receipts were $10.80, $10.84, $11.00, and $10.63 per cwt. for the less than 75-cow, 75 to 107-cow, 108 to 170, and over 170-cow size groups, respectively. The 75 to 107-cow size group had the highest returns to land and management averaging $0.48 per cwt. The over 170-cow size group was the only group with a negative return to land and management, minus $0.44 per cwt. The less than 75-cow and the 108 to 170-cow size group had returns to land and management of $0.28 and $0.22 per cwt., respectively.

Labor utilization per hundredweight for the less than 75-cow size group was 1.39 hours, 1.06 hours for the 75 to 107-cow size group, 1.0 hour for the 108 to 170-cow size group, and .91 hour for the over 170-cow size group. Thus, an economy of size for labor utilization was present.

To determine why some producers were more efficient than others, the data were divided into three producer groups based on cost of production. The average total cost for the low, middle, and high cost groups were $9.30, $10.61, and $11.99 per cwt., respectively, see table. Feed costs showed the largest decrease from the high to the low cost group. All aggregate cost items except fixed costs showed a continuing decrease from the high to the low cost group.

Gross receipts for the low, middle, and high cost groups were $10.68, $11.00, and $10.84 per cwt., respectively. Net returns to land and management were $1.39 per cwt. for the low cost group, $0.39 for the middle group, and a negative $1.15 for the high cost group.

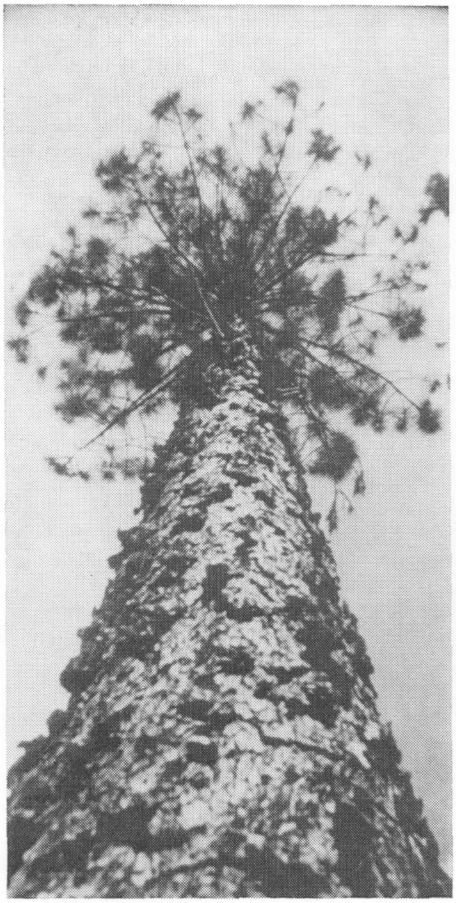
Another measure of greater efficiency by the low cost group was the hours of labor utilized per hundredweight of milk sold. The low cost group used only 0.85 hour of labor per cwt. of milk sold, while the middle cost group used 1.14 hours and the high cost group used 1.3 hours.

The differences in feed and labor efficiency were the major factors that contributed to a higher net return for the low cost producers. Based on this study, improving these two factors should result in improving net returns.

AVERAGE COSTS AND RETURNS PER HUNDREDWEIGHT OF MILK SOLD, BY SIZE AND COST OF PRODUCTION, 57 DAIRY ENTERPRISES, ALABAMA, 1974

| Item | By no. of cows in herd | | | | By producer cost groups | | |
|---|---|---|---|---|---|---|---|
| | Below 75 | 75 to 107 | 108 to 170 | 170 & over | Low cost | Middle cost | High cost |
| | *Dol.* | *Dol.* | *Dol.* | *Dol.* | *Dol.* | *Dol.* | *Dol.* |
| **Gross receipts** | | | | | | | |
| Milk sales | 9.98 | 10.03 | 10.12 | 9.88 | 10.04 | 10.10 | 9.91 |
| Livestock sales | .54 | .51 | .48 | .41 | .43 | .52 | .52 |
| Inventory change | .28 | .30 | .40 | .34 | .21 | .38 | .41 |
| Total | 10.80 | 10.84 | 11.00 | 10.63 | 10.68 | 11.00 | 10.84 |
| **Cost** | | | | | | | |
| Feed cost | 4.95 | 5.34 | 5.71 | 5.98 | 4.90 | 5.57 | 5.94 |
| Non-feed variable | 1.84 | 1.91 | 1.92 | 1.95 | 1.61 | 1.95 | 2.13 |
| Fixed | 1.56 | 1.41 | 1.42 | 1.68 | 1.30 | 1.24 | 1.93 |
| Total | 8.35 | 8.66 | 9.05 | 9.61 | 7.81 | 8.76 | 10.00 |
| **Returns** | | | | | | | |
| Returns to land, labor, and management | 2.45 | 2.18 | 1.95 | 1.02 | 2.87 | 2.24 | .84 |
| Labor cost | 2.17 | 1.70 | 1.73 | 1.46 | 1.49 | 1.85 | 1.99 |
| Return to land[1] and management | .28 | .48 | .22 | −.44 | 1.39 | .39 | −1.15 |
| Av. investment[2] | 10.99 | 9.49 | 10.47 | 11.27 | 9.51 | 8.90 | 13.02 |
| Return to investment | .94 | 1.05 | .85 | .24 | 1.95 | .92 | −.37 |
| Percent return to investment | 8.6 | 11.1 | 8.1 | 2.1 | 20.5 | 10.3 | 2.8 |
| No. of producers | 14 | 16 | 16 | 11 | 19 | 19 | 19 |
| No. of cows | 58 | 85 | 123 | 222 | 124 | 99 | 132 |
| Av. production per cow | 9,387 | 11,441 | 9,490 | 9,985 | 11,111 | 10,108 | 8,592 |
| Av. cwt. of milk sold, lb. | 5,478 | 9,689 | 11,708 | 22,122 | 3,772 | 9,964 | 11,310 |

[1] Return to land owned; charge for land rented included in expenses.
[2] Average investment does not include land value.



# GENETICALLY IMPROVED VARIETIES OF SOUTHERN PINES FOR USE IN ALABAMA

JAMES F. GOGGANS and KEITH D. LYNCH
*Department of Forestry*

THE ALABAMA Forestry Commission and Auburn University Agricultural Experiment Station are cooperating in a project that is designed to develop improved varieties of forest trees for use in Alabama. Currently, the major objective of this project is to produce sufficient seed of improved pine varieties to furnish all requirements of the Commission's three forest tree nurseries. The Forestry Commission is responsible for performing the practical, developmental phases of the breeding program while the Agricultural Experiment Station is responsible for providing technical aid, giving guidance, and performing research to solve problems associated with the program.

The well known recurrent selection breeding system commonly called the selection and seed orchard method is used in this project to develop new, synthetic varieties of pines. Generally the pines are being improved for volume growth, bole straightness, tree form, wood specific gravity, and fusiform rust resistance. Individual trees that are rated exceptionally good for these characteristics are found in forest stands throughout Alabama and graded by comparing them to the best surrounding trees in the stand.

When a tree qualifies, it is selected as a parent tree. All parent trees selected for developing a specific variety are transferred to a seed orchard by grafting. When the grafted parents in a seed orchard reach reproductive age they interbreed naturally and produce wind- or open-pollinated seed. Each parent tree must be progeny tested to make sure that it is actually producing improved offspring. Using the results of progeny tests, unsatisfactory parents are rogued from the seed orchard, and then seed of a tested, improved variety are produced by the orchard.

Since the inception of this project 12 years ago, 634 parent trees have been graded and selected for use in seed orchards. Information concerning the five improved pine varieties currently being bred is presented in the table. One additional southern Alabama loblolly pine variety having 100 selected parents is being established currently on 20 acres. This orchard will be expanded subsequently to 60 acres. Though all of the seed orchards are generally young, trees in the oldest portions of the orchards are beginning to bear cones in fair quantities.

Because varieties being developed in this project are intended for use in large areas of Alabama, progeny must be tested on several different sites in the area of use. Open-pollinated tests are relatively cheap and easy to establish; therefore they will be used for testing on different types of sites. Controlled-pollinated progeny tests, which are expensive and require much more work and time, will be used to provide material for second generation selection and to gain a better understanding of genetic variation in the breeding population. Seeds already have been collected for open-pollinated progeny tests of two loblolly pine seed orchards and controlled-crosses are being made in three seed orchards.

Two southern Alabama loblolly pine seed orchards and one Alabama slash pine seed orchard have been examined by the Alabama Crop Improvement Association and cleared to produce Certified, non-tested Seed Orchard Seed beginning in 1977. The cooperators intend to meet ACIA certification standards on all varieties being developed. All seeds presently being produced by seed orchards will be used to produce seedlings in the Forestry Commission's nurseries.

To avoid losing selected parent trees they are grafted into a seed orchard and a clone bank as soon as possible following selection. The clone banks, located in Tallapoosa and Lee counties, contain not only those parent trees currently being used in seed orchards, but also individual trees that were selected because of some outstanding single trait. Many selected shortleaf pine parents also are stored in the clone banks, although they are not being used in seed orchards. The cooperators will be glad to share selected material with any other organization involved in tree improvement.

ESTABLISHED SEED ORCHARD

| Variety and species | Location-county | No. of parents | Average age | Acreage |
|---|---|---|---|---|
| Northern Ala. Loblolly Pine | Macon | 42 | 7 | 17 |
| Southern Ala. Loblolly Pine | Geneva | 42 | 6 | 72 |
| Southern Ala. Loblolly Pine | Escambia | 20 | 9 | 5 |
| Ala. Slash Pine | Escambia | 20 | 9 | 5 |
| Ala. Slash Pine | Geneva | 42 | 6 | 70 |
| Northern Ala. Longleaf Pine | Autauga | 20 | 7 | 5 |
| Southern Ala. Longleaf Pine | Geneva | 42 | 5 | 20 |

# CLERIDENDRON THOMASONIAE

# SOUTHERN BLEEDING HEART

# TROPICAL VINE TO POT PLANT

KENNETH C. SANDERSON and WILLIS C. MARTIN, JR., *Horticulture Department*

TURNING A twining vine into an upright potted plant is the result of chemical magic that is producing a new houseplant for Alabamians.

Research at Auburn University's Agricultural Experiment Station has shown that treating Southern Bleeding Heart, *Clerodendron thomasoniae* Balf., with certain chemicals retards the plant's vining habit and produces an attractive upright potted plant. For many years this tropical West African plant has been grown in hanging baskets, on trellises, arbors, or trained in tubs.

European growers have restricted its growth habit by constantly pruning or pinching back growing shoots. The plant may climb to a height of 15 to 25 ft., if its growth isn't restricted. Dark green shiny leaves make it an attractive foliage plant. Clusters of flowers are borne on stalks, with each flower consisting of a pure white, inflated, five-angled, outer floral structure (½-¾ in. long) and a velvety, crimson red, slender inner circle of petals (1-in. long). Flowers become pink to purple with age but last up to 6 weeks before being replaced within the cluster. Auburn research has been done with a clone selected for prolific flowering.

Plants have been reproduced from one-node, double-eye cuttings. Cuttings have been rooted in 10-12 days by using soil, peat moss and sphagnum medium, a root-inducing substance, mist propagation, light, shade, and 70°F. Plants bloom in 10-12 weeks after propagation if grown in full sun, under high nitrogen fertilization and 70°F. Major production problems are control of height and flowering. Pinching has been recommended to cause compact growth, induce branching and stimulate flowering. Auburn's research has shown that plants pinched twice produce a better shaped plant than plants pinched one or three times. Chemicals tested in an effort to retard growth were ancymidol (A-Rest®) and Chlormequat (Cycocel®). Both chemicals were tested as drenches applied directly to the medium. Ancymidol was also applied to the plant as a spray. Ancymidol drenches or sprays were most effective in reducing plant height and overcoming the vining habit than chlormequat drenches as shown here:

| *Treatment* | *Height (in.)* |
|---|---|
| Untreated | 34.3 |
| Drench | |
| 2 p.p.m. ancymidol | 12.0 |
| 4 p.p.m. ancymidol | 10.6 |
| 3000 p.p.m. chlormequat | 21.8 |
| 2 p.p.m. ancymidol + 3000 p.p.m. chlormequat | 10.2 |
| Spray | |
| 150 p.p.m. ancymidol | 11.3 |

Chemical induction of branching was studied because increased branching might yield additional flower stalks. Drenches of ancymidol and chlormequat and sprays of ancymidol, Armak TD-6773MO (Tipnip®), Bayer 102613 ethephon (Ethrel®), and PBA (Accel®) were tested. Plants treated with ancymidol had the most flower stalks, whereas ethephon inhibited flowers as shown in the table.

EFFECTS OF DIFFERENT CHEMICALS ON NUMBER OF FLOWER STALKS AND PLANT HEIGHT

| Treatment | Number of flower-stalks | Height (in.) |
|---|---|---|
| Untreated | 7.2 | 25.7 |
| Drench | | |
| 2 p.p.m. ancymidol | 8.3 | 10.2 |
| 3000 p.p.m. chlormequat | 7.7 | 15.9 |
| Spray | | |
| 150 p.p.m. ancymidol | 8.2 | 11.0 |
| 500 p.p.m. Armak TD-6773MO | 6.8 | 15.8 |
| 2 p.p.m. Bayer 102613 | 6.2 | 24.5 |
| 4 p.p.m. Bayer 102613 | 6.7 | 19.5 |
| 2000 p.p.m. ethephon | 3.8 | 10.9 |
| 4000 p.p.m. ethephon | Buds only | 8.1 |
| 200 p.p.m. PBA | 7.5 | 21.7 |

This research shows that ancymidol is a most effective chemical for retarding height, overcoming vining habit and increasing flowering in *Clerodendron thomasoniae* Balf. The retarding effect lasts approximately 2 months making Clerodendron an attractive potted plant during that period.

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY
AUBURN, ALABAMA 36830
R. Dennis Rouse, Director
PUBLICATION—Highlights of Agricultural Research 6/76 10M
Penalty for Private Use, $300

POSTAGE PAID
U.S. DEPARTMENT OF AGRICULTURE
AGR 101
BULK RATE

U.S. MAIL

STATE AGRICULTURAL EXPERIMENT STATIONS
Serving Mankind
1875 1975