





The Cover Story



An all-out research attack on the fescue toxicity problem, being carried out by a research team from the departments of Agronomy and Soils, Animal and Dairy Sciences, and Botany, Plant Pathology, and Microbiology, is making progress toward solving that disorder which seriously limits cattle performance on tall fescue pastures. Early results established that a fungus is present in grass where the characteristic symptoms of fescue toxicity occur. Fungicides being tested show the potential for destroying the fungus in fescue seed and "cleaning up" infested pastures. A new fescue variety just released by the Alabama Agricultural Experiment Station, named Triumph, also promises to help overcome the problem. In the cover photo, members of the research team check condition of cattle on one of the infested plots at the Black Belt Substation, where the problem was identified. Condition of cattle in the photos on this page illustrates the significance of the problem. The brood cows and calves show the obvious poor condition that accompanies poor performance of cattle grazing fungus-infested fescue pastures. The steers shown have been grazing fescue that was not infested with the fungus, and their rate of gain has been about twice that of steers on fescue infested with the fungus.

Back Cover

Auburn research dealing with eggshell quality is providing information that should help the poultry industry overcome much of the multi-million dollar loss resulting from eggs with abnormal shells or without shells.

Director's Report to the people of Alabama

Just as a corporation's annual report tells its stockholders about operation of the company during the previous year, this report is meant to inform the citizens of this State about work of *their* Alabama Agricultural Experiment Station. In a real sense, we consider this a stewardship report in which we account for how we used funds in carrying out responsibilities of the Experiment Station that were first mandated by the Alabama Legislature in 1883.

Scientists, support personnel, and administrators take seriously their responsibility to conduct research to support Alabama's agricultural and forestry industries and to aid in managing and protecting its natural resources. Although our efforts are focused on the agricultural and forestry sectors for direct benefit to producers and agribusinesses, all facets of the State's economy and all citizens are served by our research. Any advance in production, processing, or marketing of food, fiber, and wood products directly benefits the consuming public, and the importance of this overall effect cannot be overemphasized.

A review of our 1981 work illustrates a revealing picture of the philosophy and operation of our overall research program. While current, day-to-day problems of agriculture were addressed, concentrated attention also was focused on the future. Such a forward-looking program is essential for agriculture to be ready for the problems and challenges that are sure to arise in the years ahead.

Tough economic conditions—consistently low market prices, high interest rates, and escalating costs of production—have called for even greater attention to production systems that offer greatest efficiency. In response to such needs, 1981 research of the Alabama Agricultural Experiment Station sought out better and more economical ways to minimize effects of drought, weeds, insects, diseases, soil fertility, and other factors that limit production. Other work was aimed at



finding more energy- and labor-efficient systems of producing and marketing field and horticultural crops and forest products and more feed-efficient methods of producing livestock, poultry, and fish.

Available finances are the key factor in determining just how many types of projects can be undertaken, of course, but we are proud of what we have been able to accomplish with limited resources. Hard decisions had to be made in selecting problems that would be researched and those which would be delayed until more funds are available. These choices were made on the basis of needs and importance of individual problems to the overall agricultural and forestry industries. Findings of a few of these research projects, re-

ported on the following pages, give an indication of some of the successes of our research efforts.

While the past 3 years have been difficult ones for most of our agricultural and forestry industries, I'm highly optimistic that we are moving in a positive direction. Quality research dealing with many facets of our agricultural and forestry programs will enable a more rapid recovery and a more desirable and economical level of productivity.

We appreciate your dedicated support of our past research efforts and invite your critical review and suggestions for further improvement in our research programs.

Gale A. Buchanan

Zoology-Entomology



Bacterial larvacides are showing promise for providing control of mosquitoes in floodwater situations, and with short residual activity.

Controlling Floodwater Mosquitoes

Two commercial formulations of bacterial spores of *Bacillus thuringiensis* var. *israelensis* were field evaluated for control of *Aedes* and *Psorophora* mosquito breeding in floodwater situations. These species are among the most troublesome mosquitoes attacking man and livestock in Alabama, especially during the spring and summer months following heavy rains.

When applied as a spray to the surface of water, both Teknar® and Vectobac® killed virtually all mosquito larvae within 24 hours. Upon ingestion by the larvae, the spores release a toxin which destroys the cells of the mosquito midgut, leading to paralysis and death of the larvae within a few hours.

Field tests conducted with a wide range of other aquatic organisms indicate the remarkable specificity of these materials for mosquitoes, virtually the only group affected under floodwater conditions. In addition, these bacterial larvacides exhibit little or no residual activity within 3 or 4 days after application.

Coccidiosis of Baby Pigs

Coccidiosis of baby pigs is now recognized as a major disease problem of the swine industry. Clinical symptoms of infected baby pigs typically include severe watery diarrhea, dehydration, weight loss, lethargy, and low to moderate mortality. Pigs which survive this disease usually require an additional 1 to 3 weeks to reach market weight.

A major Auburn research effort concerned with the disease, which is almost always attributed to infection by *Isospora suis*, is already providing information that should help provide biological, management, and chemical control measures. Techniques have been developed which will enable veterinary diagnosticians to provide more rapid and accurate diagnosis of this disease.

Studies of the life cycle of *I. suis* reveal that asexual stages of the parasite multiply in epithelial cells of the small intestine. Sexual development of *I. suis* results in the production of unsporulated oocysts which are present in the feces of baby pigs 5 days

after exposure. High temperature in the farrowing house provides an environment in which oocysts can sporulate within 12 hours and initiate infections in other baby pigs. This points up the need to keep fecal contamination to a minimum.

Preliminary studies indicate that a single clinical infection of *I. suis* renders pigs resistant to reinfection by the same species. These early findings point up the possibility of developing immunity through vaccination as a control measure.

Anti-hormones May Control Crickets

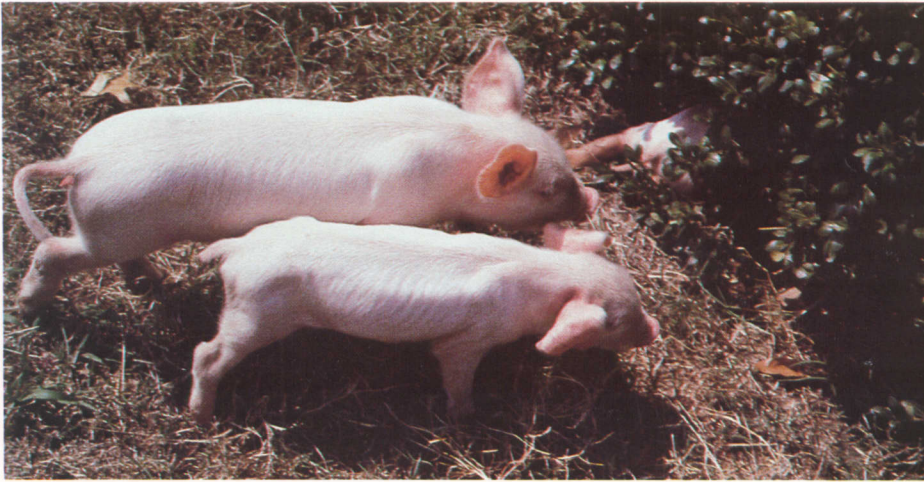
The striped ground cricket is a serious pest in Alabama's Black Belt. It feeds on clover seedlings, causing a reduction or complete loss of white clover stands in pastures of the area.

Investigations now underway are directed toward developing a hormonally based insecticide which would reduce the reproductive potential of crickets and other insect pests in the State. This approach is based on the fact that many physiological and behavioral processes in insects require juvenile hormone, an important regulator of insect growth and development.

Good progress is being made by using the house cricket, which is more adaptable for laboratory use, as a model for the pest species. It has been found that the formation of egg yolk, which is necessary for egg maturation, is juvenile-hormone dependent in crickets.

Certain plant-derived compounds called precocenes are known to selectively destroy the glands that produce juvenile hormone in insects. Thus, precocenes could be expected to prevent egg yolk formation and thereby greatly reduce the reproductive potential of crickets. This has been confirmed by recent experiments in which precocenes inhibited or delayed ovarian development in both the house cricket and striped ground cricket.

Ongoing work is designed to determine the most effective treatment re-



Studies with coccidiosis of baby pigs, a major swine disease problem, indicate the possibility of developing immunity through vaccination.

gime and the time in the life cycle when crickets are most susceptible to the antijuvenile hormone effects of precocenes.

Cryptosporidiosis in Calves and Humans

Most species of coccidia are quite host specific, infecting only one or closely related host species. This is not true for *Cryptosporidium*, a small coccidium which is associated with diarrhea in young calves. Recent Auburn findings have implicated this parasite in human health problems also.

In a survey of *Cryptosporidium* sp. in calves begun in July 1981, a technique was developed which provided rapid and accurate diagnosis of this disease in cattle. Since this development, 12 cases of human cryptosporidiosis have been diagnosed in healthy individuals who had direct contact with animals from three separate, unrelated outbreaks of the disease in calves. Four of the infected individuals had clinical symptoms (diarrhea and abdominal cramping) for several days. Oocysts of human and calf origin produced indistinguishable infections in mice and rats, and oocysts of human origin produced cryptosporidiosis in previously uninfected calves.

These findings demonstrate that *Cryptosporidium* is not host specific and that cryptosporidiosis should be considered a disease that can be transmitted from animals to man under natural conditions. Work is continuing on the biology and life cycle of the parasite, factors contributing to development of clinical disease in infected animals, and on treatment and control measures. Farmers, veterinarians, and others whose work brings them in close contact with young calves having diarrhea should take special precautions to prevent infection.

Auburn Entomological Museum

The Auburn University Entomological Museum is part of the University's commitment to the science of systematics, the scientific study of the kinds and diversity of organisms, and of any and all relationships among them. The approximately 166,500 specimens of insects and other arthropods preserved in the museum's collection constitute an irreplaceable source of information about the diversity, distribution, ecology, and evolutionary relationships of the species they represent. The museum project is first and foremost a research project, but it also makes major contributions to the teaching and extension functions of the University.

The museum project has supported research leading to publications on the taxonomy and biology of aquatic beetles, mites, moths, scale insects, stoneflies, weevils, and other species. These publications aid entomologists and others in identification of specimens. Recently a USDA Cooperative Research Review Committee singled out the museum project among Auburn's entomology research projects as being "highly productive." The museum has provided a total of 515 names of insects and other arthropods for Auburn staff and students and for others with interests and requirements ranging from those of local pest control operators to the Australian Commonwealth Scientific and Industrial Research Organization's Biological Control Unit.

Habitat of the American Woodcock

Since 1930, several million acres of former cropland have reverted to forest in Alabama. About 65 percent of these forest lands is structurally similar to habitat preferred by American woodcock for resting, feeding, and nesting. Auburn wildlife researchers are currently involved in a statewide inventory and analysis of available woodcock habitat in Alabama.

Data of this nature have not been gathered from southern wintering grounds of this migratory game bird. Information such as plant species composition, density, size, and stratification, along with soil type, litter depth, and soil moisture of woodcock coverts, is being gathered from all physiographic subdivisions of the State. Total acreage of woodcock habitat in Alabama is being documented for use in future management schemes.

Information being gathered from the current investigations will be essential to modern wildlife management efforts geared toward ensuring adequate wintering areas for this popular species. Hunters, photographers, birdwatchers, and wildlife artists will have accurate descriptions of the most likely places to encounter this highly secretive bird.



Agronomy and Soils

Legumes Replace Commercial N

Winter legumes were widely used as a nitrogen source for summer grain crops in the early 1900's. But this changed following World War II when nitrogen production technology allowed the market to be flooded with large quantities of cheap nitrogen fertilizer. This change allowed farmers to drop the bothersome legume production and use economical nitrogen from fertilizers.

The rapid increase in nitrogen fertilizer prices in the 1970's has once again created a need for winter legumes in cropping systems. Unfortunately, cropping systems used 50 years ago that included winter legumes for nitrogen sources are not suitable for modern methods. Row spacings are narrower, plant populations grown are higher, varieties and even crops grown have changed, optimum planting dates are much earlier for some crops but later for others, and, most of all, maximum economical yields are essential. These changes, coupled with increased problems from nematodes, diseases, and insects, call for different systems of cropping than were used in years past.

During the past 18 months, studies have been established across Alabama to determine the value and feasibility of incorporating various winter legumes into current cropping systems.

Crimson clover (right) and rye (left) turned under ahead of grain sorghum compared effects of legume and nonlegume cover crops. Maximum yields resulted on plots following a legume where no nitrogen fertilizer was applied.

This work centers primarily around the use of high nitrogen-producing crimson clovers and common vetches recently developed by the Mississippi Agricultural and Forestry Experiment Station, USDA, and the Alabama Agricultural Experiment Station. Some of the older legumes are also being evaluated at some locations.

Data from five locations in 1981 (Headland, Monroeville, Camden, Camp Hill, and Crossville) indicate that several winter legumes will produce more nitrogen than sorghum will need for optimum yield. The following table reports amount of nitrogen produced by different legumes, along with yield of following crops of grain sorghum with various N rates, and compares this with production without legumes.

Amount of nitrogen produced by the legumes and grain sorghum yield varied with location. At all locations, however, maximum sorghum yields were obtained without nitrogen fertilizer when the sorghum followed a winter legume. At most locations, yields were lower when sorghum followed winter fallow even with high rates of N.

Legumes were heavily grazed during winter at Headland, which reduced the amount of nitrogen furnished to the following crop. In this case, 30 pounds of nitrogen fertilizer per acre resulted in optimum sorghum yield. Cutting the legumes for hay (Headland, Camden, and Crossville) increased the nitrogen requirements of sorghum to levels between 30 and 60 pounds per acre.

Winter crop	N produced/acre, lb.	Grain sorghum yield/acre with different N rates, bu.							
		Conventional tillage				No tillage			
		0 N	30 N	60 N	90 N	0 N	30 N	60 N	90 N
Clover	155	78	80	76	74	84	82	78	76
Vetch	178	93	84	78	65	90	95	81	85
Peas	276	95	84	87	87	87	87	87	90
Rye	—	53	66	65	70	48	68	71	78
Fallow	—	57	66	73	69	51	62	65	73



Oasis phalaris, being grazed by dairy cow at the Black Belt Substation (above), is a new cool-season perennial recently released by the Alabama Agricultural Experiment Station. The major advantage of the newly released Triumph tall fescue, its greater winter production, is illustrated at right above—Kentucky 31 variety (left) had much less growth on March 31 than Triumph (right).



New Pasture Varieties Released

Two new pasture crop varieties, Triumph tall fescue and Oasis phalaris, have been released by the Agricultural Experiment Station. Both show promise of providing badly-needed forage for Alabama cattlemen.

Triumph is apparently one of the first fescue varieties to be bred specifically for the Southeastern United States. Developed from Mediterranean introductions, it is tolerant to low fertility and acid soils, tolerant to many pests, persists well even when overgrazed, and is less competitive with clover than Kentucky 31. Its greatest attribute, however, is higher winter production than made by Kentucky 31. Triumph has been shown to produce over 80 percent more forage during the winter months, when forage is critically needed, than Kentucky 31.

The new variety of *Phalaris aquatica*, named Oasis, offers a perennial alternative to annual small grain pastures, especially in the Black Belt portion of the Southeastern States. Where adapted, Oasis will provide excellent fall and winter forage (63-74 percent digestibility). Oasis exhibits good seedling vigor, is drought tolerant, and forms a firm sod that resists plugging by cattle during the wet winter months. It is not highly tolerant of cold temperatures or nematode infestations, so should be used primarily on clay soils or wetlands in southern portions of the region.

Seed production of both Triumph fescue and Oasis phalaris is being done exclusively by International Seed Co., Halsey, Oregon. Seed should be available to Alabama farmers in 1983.

No-tilling sorghum into the legumes adversely affected sorghum yield at Headland and Camden, but not at the other locations. This was probably a result of delayed maturity, which resulted in the grain fill period occurring during a period of low rainfall.

Several of the studies with grain sorghum involve growing reseeding winter legumes. This type system results in essentially free N supplies after the establishment year.

Cotton was no-tilled into vetch and clover in Macon County. Too much nitrogen was probably produced by these legumes for optimum cotton production, but yields were higher than from cotton following a winter fallow system, as shown by the following data:

Winter crop	N produced per acre, lb.	Lint yield/acre with different N rates, lb.		
		0 N	30 N	60 N
Clover	124	649	568	512
Vetch	166	678	525	647
Fallow	—	457	561	543

Cotton planted into vetch developed root rot during the early growth stage, but survived without severe stand loss. The cotton was planted in late May after the legumes had matured and reseeded. Since the legumes were allowed to reseed, nitrogen produced by the 1981-82 legume crop will be free.

Unfortunately, winter legumes generally do not produce sufficient nitrogen early enough to supply the needs of early planted corn. But different cropping systems using reseeding legumes are being tried in efforts to overcome this problem so that legumes may be used with this crop. During the first winter, low rates of legume seed are planted with wheat to provide a source of seed for the following fall. Sorghum or soybeans are no-till planted into the stubble after wheat harvest. Legume seed in the no-till mulch germinate in August, which allows time for heavy growth before cold temperatures begin in December. The first cycle of these studies has been completed with success.

Fisheries and Allied Aquacultures



Better bass fishing in ponds was found to result from nearly continuous summer spawning of prey species, such as bluegill.

Ponds, Reservoirs, Streams Studied

Continuing study of factors that determine quality of fishing in Alabama's farm ponds, reservoirs, and streams is providing information needed for management of these valuable resources.

Structure of the largemouth bass population in farm ponds, community lakes, and large reservoirs was found to be related to the spawning success of certain prey species, such as the bluegill sunfish. Better bass fishing populations are found in bodies of water where the prey spawns more or less continuously throughout the summer. Under these conditions, survival and growth of young-of-the-year bass fingerlings are much better. Subsequent development of a year class of bass appears to be largely dependent on how many survive and how well they grow during their first summer of life.

A survey of macroinvertebrates has been conducted in the Conecuh-Escambia River in the vicinity of Brewton for 10 years. Results indicate no measurable changes in population in this period.

Catfish Production Emphasized

Catfish production problems continued to get major attention, with studies designed to support Alabama's important catfish industry. This work included projects on breeding, feeding, water quality, and off-flavor problems.

Pond feeding experiments in 1980-81 revealed that fishmeal is not required in the diet of channel catfish when the fish are fed to satiation. When feeding is restricted, however, diets must contain at least 6 percent fishmeal to support maximum growth.

Dissolved oxygen concentrations, measured in early morning and late afternoon, were closely related to daily solar radiation. Solar radiation and oxygen concentrations were so well correlated that catfish pond managers probably could use weather forecasts to good advantage in predicting when problems with low oxygen are likely to occur.

Paddlewheel water blenders used to reduce thermal stratification proved useful in catfish ponds. Although fish production was similar with and without the blenders, twice as much emer-

gency aeration (78.5 vs. 39.5 hours) was required in ponds without them.

Hybrid catfish were found to be more tolerant of low oxygen concentrations than channel catfish. In a pond where 50 percent of the channel catfish died from low oxygen, only 10 percent of the hybrids (female channel catfish \times male blue catfish) were lost. The channel \times blue hybrids also were 2.5 times easier to catch in corral-seine traps.

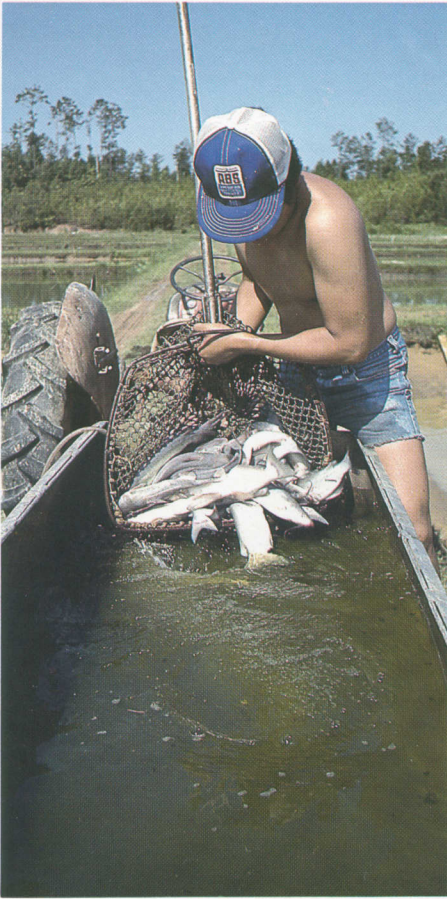
Another problem identified was nitrite poisoning in catfish production ponds. In laboratory experiments, methemoglobin (brown blood) levels in catfish were directly related to nitrite concentrations in water. Several other blood changes also were associated with nitrite toxicity.

In another study, selection appeared to be a useful method of increasing productivity of catfish. Response to selection for body weight in one generation was 17, 18, and 12 percent, respectively, for Rio Grande, Marion (Alabama), and Kansas strains.

Catfish were periodically removed from 42 commercial catfish ponds in west-central Alabama for 1981 taste panel tests for off-flavor. The trained taste panel found that off-flavor occurs frequently in catfish ponds of that area, but the intensity is not severe. The study also determined the amount of geosmin, the primary chemical causing catfish off-flavor, necessary to cause the problem.

Paddlefish for Caviar

Research on production of paddlefish (*Polyodon spathula*) was begun in 1981. Eggs of this fish bring a high price when sold for use as caviar. Brood fish of the species were captured in the Alabama River and spawned at Auburn. The fish were induced to spawn by injecting them with pituitary glands from the common carp and other paddlefish. When the recently-hatched fry were stocked in hatchery ponds, approximately 58 percent survived to a size suitable for stocking into production ponds.



Research on various problems associated with commercial catfish production provided information on such things as feeding requirements, water quality, breeding and selection for fast growth, and prevention of off-flavor of pond-raised catfish. A new project begun in 1981 is seeking methods of raising paddlefish (bottom photo) for commercial production of caviar.

Natural Control of Nematodes

A survey of fungi associated with populations of the cyst nematode, *Heterodera glycines*, from soybean field soils in Alabama and four other Southern States indicates a diverse mycoflora that includes a number of highly destructive endoparasites of nematode eggs. Certain species of *Codinaea*, *Exophiala*, *Pseudospiropes*, and *Stagonospora* are capable of invading healthy eggs and ultimately destroying larvae. Other fungi have been found to be active in degrading nematode cysts. Evidence is accumulating that a number are effectively operative, at least to some degree, as biological control agents of nematodes in soybean field soils.

By providing an understanding of conditions under which these parasites of nematodes develop, these findings may lead to specific recommendations for soybean growers to follow to enhance parasitism against nematodes. When biological control of this type is successful, it can virtually eliminate the target nematode from a field on a permanent basis.

Auburn research has documented the disappearance of the soybean cyst nematode in several fields in Florida and Alabama where the pest formerly caused severe damage. In each of the

test fields, the cyst nematode was subjected to severe parasitism by one of the fungi that act as parasites of nematode eggs. As a result, it is now difficult to find the nematode in soils of the fields.

Because of the potential for development of economical methods for controlling nematodes, these findings represent an exciting application of basic research to the solution of problems faced by growers.

Solving the Fescue Toxicity Syndrome

Examination of fescue pastures responsible for poor weight gain in cattle has regularly revealed the presence of a fungus inside the plant tissue. Pastures free of this fungus have typically given substantially greater daily weight gains by grazing cattle than pastures with infested fescue.

This so-called "summer syndrome" has been a high priority goal for several departments in the Agricultural Experiment Station. Results to date offer encouragement that the problem, which is seriously limiting returns to Alabama cattlemen, may be solved in the future.

An important development during 1981 was identification of the fungus associated with infested fescue. It has



Potential for biological control of the cyst nematode is illustrated by these photos of nematode eggs: Left, healthy egg; right, egg parasitized by one of the nematode-destroying fungi being tried.

been identified as a previously undescribed species of *Acremonium*, for which the name *Acremonium coenophialum* has been proposed. Although its role in summer syndrome has not been established, the fungus has been found regularly in affected grass.

Treatment of fescue seed with fungicides has been successful in eliminating the fungus from seed, affording farmers the opportunity to plant clean fescue pastures. Additional research has indicated that the same fungicides can eliminate the fungus from established plants. Continued research will be needed to find the best time for fungicidal treatment, to determine proper application rates, and to minimize costs of control.

Converting Cellulose to Fuel

Chemical pretreatment of wood chips is part of a newly developed microbial process for degrading lignocellulose into energy compounds. Wood chips that had been ozonated proved to be more susceptible in conversion to soluble intermediates by enzymes from the bacterium *Polyangium*. This work, in cooperation with the Department of Chemistry, will continue with the purpose of determining the suitability of converting the solubilized product to alcohols and methane.



Cattle grazing wheat-ryegrass-Yuchi arrowleaf clover gained rapidly and at low cost, and were essentially finished at the end of a 183-day grazing period.

Animal and Dairy Sciences

Fescue Toxicity Solution Nearer

Performance of a new tall fescue variety and results of overseeding fescue with clover to overcome fescue toxicity provided encouraging results during 1981. Although cattle performance was above average on all fescue during the year, pastures infested with the fungus showed seriously reduced gains by grazing steers. Three-year average data show that steers on fescue pastures not infested with the fungus gained 1.8 pounds per day, as compared with only 1.0 pound for those grazing fungus-infested fescue. Body temperatures averaged 2°F higher for steers on infested pastures

(104° vs. 102°F), which indicates health effect of the fungus.

Triumph, the new Auburn-developed variety, appears to be fungus free. Grazing gains during the favorable 1981 season averaged 2.1 pounds per day. This variety makes more forage per acre than Kentucky 31, which resulted in 60 pounds per acre more beef gain than on fungus-free Kentucky 31.

Overseeding clover into infested fescue greatly improved daily gains of grazing steers. With clover making up 6 percent or more of the total forage, steer gains were doubled over what was made by infested fescue alone. Red clover seemed slightly superior to ladino clover.

Storing Restructured Steaks

Work on storage of restructured steaks is the latest phase of the meats project at Auburn. The Auburn-developed technique for making restructured steaks and chops offers the meat industry an opportunity to effectively merchandise meat from lower price wholesale cuts. Improvement of storage qualities would help to gain industry acceptance of the system.

In the new phase, restructured beef steaks were manufactured from boneless cow rounds and frozen under three different storage conditions. When frozen with carbon dioxide snow, meat color improved and cooking losses were decreased. Carbon dioxide gas had a detrimental effect on steak color, but did not affect palatability traits. Oxygen gas also improved the steak color, but had no effect on cooking losses or taste panel judging.

A major deterrent to acceptability of restructured fresh meat steaks is a rancidity problem. This problem was prevented in the research. Antioxidants prevented this problem, when used with techniques developed in the study.

Understanding Animal Growth

The process of growth is intimately tied to the production of protein. The major protein in animals is collagen, a component of the cell membrane which is one of the first structural elements in the development of all tissue.

A major component of connective tissue is hydroxyproline, and the levels of hydroxyproline in the urine are highly related to the physiological maturity and, therefore, the body composition of animals.

This work was conducted with rats, and will be applied to meat producing animals in 1982. It has great potential for improving genetic selection for muscle deposition in cattle and swine.

Hogs Make Poor Use of Digestor Effluent

Effluent from anaerobic digestors used for methane production had only limited value as a feedstuff for swine in 1981 Auburn research. Digestor temperature had no effect on effluent solids or total nitrogen content, but



Milking cows in the research herd at the E. V. Smith Research Center were able to utilize 18.5 percent whole cottonseed in their rations.

increasing the temperature decreased the amount of organic nitrogenous compounds in the effluent. A similar effect was noted for the amino acid content.

Broiler litter was also tried in feed for finishing swine, but it was not an economical feed ingredient. Adding 20-24 percent broiler litter to a corn-soybean meal diet severely decreased gain and efficiency.

Economical Pasture Finishing

Cattle grazing wheat-ryegrass-Yuchi clover gained rapidly and were essentially finished for slaughter at the end of a 183-day grazing period (November 20 to May 22). Cost of the pasture was just slightly above 12¢ per pound of gain.

Digestible dry matter of the forage varied from 75 to 81 percent. The lower value occurred in late February and the high value in mid-December.

Summer Annual Creep Grazing for Calves

Tifleaf-1 pearl millet proved to be valuable as a summer pasture for creep grazing of nursing calves. Each acre of Tifleaf-1 grazed by calves resulted in 431 pounds extra gain, which amounted to \$200 income over feed costs per acre. An added benefit of the creep grazing was a net gain of 23 pounds per cow nursing the creep-grazed calves. Without creep grazing for nursing calves, the brood cows lost 46 pounds each.

Whole Cottonseed for Dairy Cows

Whole gin-run cottonseed is a high energy, high fiber, high protein feed that can be used for lactating dairy cows. Often this feed is an inexpensive source of nutrients for dairy rations, particularly in states where cotton is produced.

Research at the E. V. Smith Research Center indicates that milking cows can utilize 18.5 percent whole cottonseed in their rations. Careful management is required, however. If early signs of gossypol toxicity are observed, cottonseed should be removed from the ration or the amount reduced.

Forestry

Herbicidal Treatments Show Promise

Pine release studies have concentrated on the use of Velpar® (hexazinone) formulations, which show good promise. Small pellets have given best hardwood control with only minimal pine injury. Liquid Velpar has given promising results, but it is not registered for use in pine. Higher rates are needed for liquid than for granular Velpar, results show.

Site preparation work in 1981 was seeking treatments that will provide close to 100 percent control of overstory hardwoods and understory brush. Field observations indicate that treatments of liquid Velpar at 6 pounds active per acre, Garlon® (triclopyr) at 4 pounds, and a combination of Velpar and Garlon, 4 and 2 pounds per acre, respectively, provided excellent control of most pest species. Earlier results indicate that the Velpar Gridball will effectively control hardwood stems larger than 2 inches in diameter breast high, but that small stems and sprouts are not well controlled.

Excellent herbaceous weed control in pine plantations resulted from treatments with combinations of Goal® (oxyfluorfen), Velpar, Dowpon® (dalapon), and Ronstar® (oxadiazon). Combinations of Princep® (simazine), Goal, and Velpar were economical treatments that proved to be effective.

Preemergence treatments also have been tried in hardwood plantings, but the herbicides did not provide effective weed control. However, post-emergence applications of Roundup® (glyphosate) in a directed spray were effective. This treatment can be used only on tall seedlings, such as ash or



Value of weed control in pine is dramatically illustrated by this comparison of no weed control plot (top) and one getting complete weed control (bottom).



In efforts to develop new uses for hardwoods, an Auburn research project developed a structural plywood panel made from a mixture of oak and pine that might compete with current panels that are 100 percent pine. The half-inch panel is made of 50 percent southern oak particleboard as core material faced with southern pine veneer.

Physical and mechanical properties of the composite plywood were found to meet commercial standards. In many properties, the composite panels were actually superior to half-inch southern pine plywood. Evaluations were done with the panels dry, water saturated, and redried.

Reforestation Incentives Program Studied

Cost sharing programs to promote intensive forest management, being tried in several states to assure adequate timber supplies in the future, are getting a close look in an Auburn study. Virginia's 10-year-old program was the subject of the cost-benefit analysis study.

The real benefit of the program was considered to be the value of timber produced over one rotation, since future land use is independent of the reforestation program. The real costs are the value of resources foregone because of investment in forestry. In Virginia, total costs for the first 6 years were divided up into 48 percent for the landowner, 35 percent for the

State, and 17 percent for program operating costs.

Benefit cost ratios were calculated to range from about 12.7 to 0.4, depending on site quality and interest rate. The first 6 years in Virginia cost about \$8.3 million and return benefits are set at \$29 million, giving a benefit cost ratio of about 3.5. This is based on a real interest rate of 6 percent and a base age of 25 (site index, 60), which is average for eastern Virginia.

Three basic assumptions were used in the analysis:

1. Harvesting will be done at age 25. Highest benefit cost ratios occur when all timber is grown to age 30 and lowest when timber is harvested as pulpwood at age 20.

2. Future prices are expected to increase at about 3 percent per year in the southern pine region. Since price increases have the opposite effect as interest rate increases, final benefit cost ratios are highly sensitive to perceived changes in prices.

3. Acres planted with the subsidy would not otherwise have been planted. Although this assumption results in paying what could be called "free loaders" (those who would have replanted without any financial subsidy), this has less effect than might be expected. If only 60 percent of the program acres are net additions, the benefit cost ratio is decreased from about 3.5 to 2.6 when the site index is 60 and interest rate is 6 percent.

Virginia's program has been successful partly because it is designed to

sycamore, that have foliage-free lower stems so spray can be directed without getting herbicide on leaves.

Value of weed control in pine was dramatically illustrated in growth impact studies that established effect of competition on tree growth. Three-year-old trees in plots with 100 percent weed control for 2 years were 9 times larger in volume than trees grown without weed control.

The findings are in cooperation with 21 industry, Federal, and state organizations in 13 Southeastern States making up the Auburn University Silvicultural Herbicide Cooperative.

New Uses for Hardwoods

Alabama's timber inventory is about evenly divided between softwoods and hardwoods. Utilization in the industry, however, is much greater for softwoods than for hardwoods. Consequently, new commercial uses for hardwoods could expand the economic benefits for the State's forest resource.

Structural plywood panels made with 50 percent southern oak particleboard in the core, with southern pine veneer as facing, were found to meet commercial standards.



promote land use change. It is not designed to repeatedly subsidize at public expense replanting of pine trees on lands which are already growing pine. The program's position is that it should be the landowners' responsibility to ensure that their timberland continues to grow trees. There is a seed tree law in that state, which requires state approval of reforestation

plans before pine stands can be harvested. The reforestation subsidy is only available to owners whose lands do not fall under the seed tree law. Thus, existing timberland must be reforested after harvest, and state incentives are provided only for those who are willing to convert other land to intensive pine production.

analysis indicates that a majority of the non-protein nitrogen and ash pass in the liquid portion, removing two problem components from the solid to be refed. For digestion, the separated solids contain 70-80 percent of the volatile solids, providing an ideal base as a methane substrate. For use as a digestion substrate, screen mesh size of 60 and flow rate of 20 gallons per minute resulted in total solids of 10 percent from the original 1-2 percent of the flushed waste.

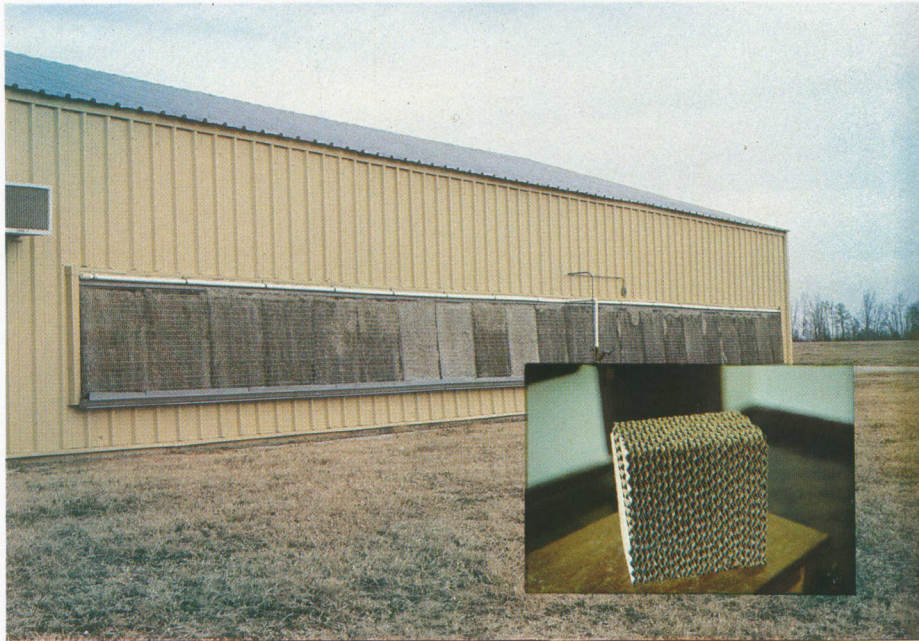
Studies using the continuously expanding digestors revealed a number of encouraging characteristics. It was learned that these digestors can be operated stably at a 90-day cycle time and 10 percent total solids loading. This reduces the volume requirements for treating the same amount of raw waste. Operationally (at 90 days and 10 percent total solids) the digestors performed better than conventional digestors with methane production per unit of waste material being slightly higher and waste reduction being greater.

A validated dynamic computer-based mathematical model was developed in 1981 and has been used to examine the differences in animal waste types when subjected to anaerobic digestion. A summary of these differences shows that beef and swine waste are the most suited for methane production, having the least inhibitory nature while providing an acceptable methane yield. Problems of high nitrogen content and high acidity potential make caged layer waste less attractive for methane production than either beef or swine waste. Dairy waste has a different type problem: reduced biodegradability and thus lower methane production. The yield of methane from dairy waste is only about half that from beef and one-third that from swine waste. Thus, much more dairy waste is required for equivalent methane yields.

Heating and Cooling Poultry Houses

Solar energy is feasible for heating poultry houses in Alabama. Flat plate collection systems using either liquid storage or rock storage furnished 20-30 percent of total needs during cold

Agricultural Engineering



Tests with a cellulose evaporating cooling pad (inset shows material) are providing information that should be useful in cooling poultry houses to avoid production losses from summer heat.

Cultural System Reduces Compaction

A cultural system designed to control compaction-producing forces by moving wheels of the tractor farther from the row was begun in 1980. It consists of two 40-inch rows centered on a swatch width of 95 inches and utilizes a 4-wheel tractor with front and rear wheels spread to 95 inches on center for all cultural operations.

Where traffic was controlled by using a wide-wheel tractor, 2-year average seed cotton yield was 2,395 pounds per land acre as compared with 2,277 pounds from conventional solid-planted cotton. The skip-row pattern had 16 percent less row feet (11,004)

of cotton per land acre than the solid-planted (13,068 row feet). This decrease in total row length for the skip-row planting resulted in less cost of production and harvesting for each land acre, and without sacrificing yield.

Animal Waste Utilization

Preliminary results of Auburn's swine waste utilization research indicate that the final form of the screened solids can be made compatible with either direct refeeding or anaerobic fermentation requirements. Using screen sizes of 8 or 10 mesh, the separated solids produced can be dewatered and used as a feed ingredient. Preliminary

months and 100 percent of heat during mild and warm months in Auburn tests. Wood burning was integrated into the system as a source of auxiliary energy, which represents a significant step in freeing poultry production from total dependence on fossil fuels.

Results of tests on a cellulose evaporative cooling pad indicate that temperature of the water can have a significant effect on the exit air temperature. The information may be used to change the water flow pattern from a recirculation mode to a single

pass system during periods of high temperature to reduce production losses in poultry.

Molting Hens by Computer

A mathematical model developed at Auburn will predict the weight loss characteristics of Leghorn hens during a forced molt. Prediction equations were also developed for liver weight, ovary weight, oviduct weight, and total grams uterine lipid. Critical changes in uterine lipid and optimum post-molt egg production and eggshell qual-

ity were associated with a weight loss of 30-35 percent.

A fortran program was developed to simulate weight loss of hens using the model described. The program will inform the user of changes in the physiological parameters and the approximate date when the hens will reach 30 percent weight loss. Use of this program makes it possible to predict the length of the molting period for particular flocks and weather conditions.



In swine waste utilization studies, continuously expanding digestors gave encouraging results on the basis of methane production and waste reduction.

Home Economics Research

Chickens Used for Human Health Research

Nutrition experiments with humans, which might contribute to health problems, are almost impossible to justify and conduct. Therefore, animal models that react similarly to humans toward specific nutritional deficiencies are needed. A current study at Auburn involves feeding chickens diets deficient in essential fatty acids to determine whether they can serve as an

animal model for research on lung complications seen in cystic fibrosis.

Chickens fed diets deficient in essential fatty acids for 11 weeks showed poor weight gains, suppressed sexual development, lowered concentration of essential fatty acids in blood serum, and lowered production of certain prostaglandins in lung tissue incubations. After 11 weeks, lung lesions of chronic respiratory disease were more prevalent and more severe in the group fed a diet containing the lowest amount

of essential fatty acids. These data support the theory that the low levels of fatty acids seen in cystic fibrosis patients may be related to their susceptibility to pulmonary lesions.

Consumers Rate Cotton, Cotton Blend Upholstery Fabrics

Six cotton or cotton/polyester blend upholstery fabrics were rated for perceived quality by 235 consumers in Montgomery and Elmore counties.



Five of the six fabrics were rated good or excellent by 60-70 percent of the respondents. The sixth fabric, a cotton/polyester plain weave, was rated good or excellent by only 33 percent, largely because of design characteristics. Ratings were on the basis of three characteristics:

1. Fabric properties, primarily the respondent's perception of fabric weight.

2. Fabric color and design, which were rated on the basis of likes or dislikes of the respondents.

3. Label information, with cotton fiber content, Scotchgard® stain repellent finish, preshrunk, and vat dyed being label terms associated with good quality.

Rapid soiling and shifting of cushion welt cords are problems that have occurred in the early months of a home and accelerated wear study involving 76 upholstered chairs.

Nutritional Health of Adolescents

Nutritional status problems were found in large numbers of adolescent girls who were subjects for a study of dietary recall, biochemical, socioeconomic, and anthropometric factors. The 103 subjects were 12, 14, and 16 years old, about equally divided between black and white.

Most of the black girls were found to be at the marginal level or below in their vitamin C status, whereas all

Rapid soiling and shifting of welts occurred in the early months of a home and accelerated wear study of upholstery fabrics on 76 chairs.

of the white girls had acceptable blood plasma values. Approximately 16 percent had dietary vitamin C intakes of less than half the recommended dietary amount (RDA).

Plasma total cholesterol, high density lipoprotein-cholesterol, and low density lipoprotein-cholesterol were consistently higher for black than for white girls. Mean total cholesterol and low density lipoprotein-cholesterol tended to be lower for the older girls. Approximately half of the girls had folate red blood cell levels lower than the acceptable standard, and 59 percent had folic acid intakes less than 50 percent of RDA. Folic acid deficiency can contribute to anemia.

Almost 35 percent had dietary iron intakes of less than 50 percent of RDA levels. Four percent of the girls had low hemoglobin values (below 11.5 g/dl). Marginal iron status, as measured by plasma iron levels, was present in 6.8 percent of the blacks and 1.9 percent of whites.

Effects of Liquid Protein Diets

Feeding a liquid protein diet supplemented with vitamins and minerals to obese female rats for 28 days decreased serum fatty acid concentrations to less than 50 percent of control levels. Refeeding with lab chow for 4 days restored the linoleic acid (an essential fatty acid) concentrations. The arachidonic acid level was unchanged, and there were only small increases (not significant) in remaining fatty acids. These observations indicate insufficient time or enzymes to convert linoleic to arachidonic acid and possible conservation of linoleic acid for other vital processes.

Serum potassium levels were decreased by 2- and 4-week feeding of the liquid protein reducing diet. Refeeding restored serum potassium to control levels. Concentrations of calcium, magnesium, and sodium in blood serum were not significantly lowered after 4 weeks of a liquid protein diet.

Animal Health Research

Viruses of Cattle

Bovine leukosis virus, which infects 20 percent of the beef cattle and 40 percent of dairy cattle in Alabama, is getting attention in Auburn research. Emphasis is on preventing spread, which was found to be done by insects.

The findings suggest that insect control and use of good sanitation measures when castrating, dehorning, or vaccinating can reduce the spread. Semen is not important in the transmission of bovine leukosis virus, the results show.

Bluetongue virus infection is common, especially in the western part of the State. It can sporadically cause such things as abortions, stillbirths, weak calves, muzzle, teat, and foot lesions, excessive salivation or nasal

Emphasis of research on bovine leukosis virus, which infects 20 percent of the beef cattle and 40 percent of the dairy cattle in Alabama, is on preventing spread.

discharge, and fever. Control of infection is mainly by controlling the insect vector, gnats (*Culicoides variipennis*).

Susceptibility of Newborn Calves

Newborn calves are susceptible to numerous viruses and bacteria that are nonpathogenic for more mature animals. While it has long been known that the newborn calf is able to produce antibodies to certain infectious agents and not to others, little has been known about its level of cellular immunity as compared to mature animals. Now there is much clearer understanding of this, based on results obtained by Auburn investigators who immunized bovine fetuses in the uterus and examined the cellular immune response of calves at various intervals after birth. They found that during the first week of life, a calf's ability to produce cellular immune responses is considerably less than that of animals 3 weeks or 6 months old.

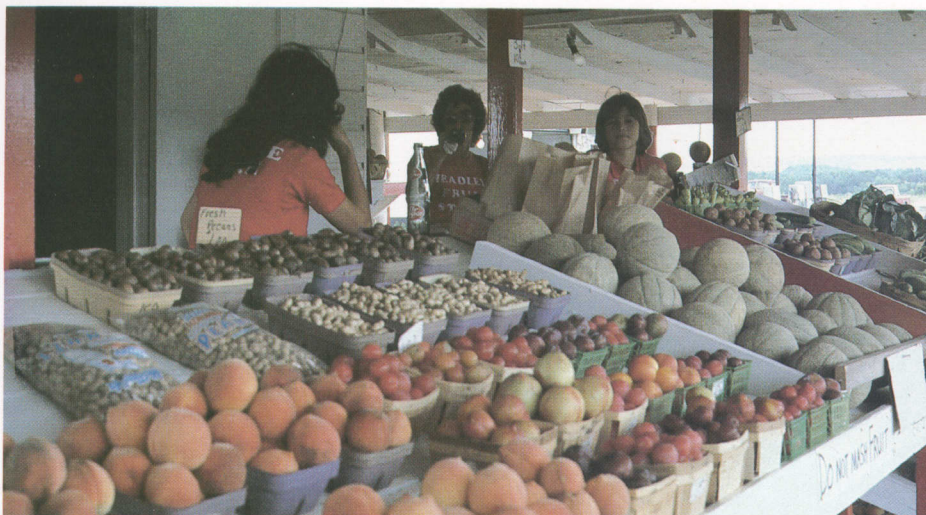
Respiratory Tract Disease of Cattle

Cattle that have been recently weaned, run through sales barns, shipped long distances, deprived of feed and water for various periods, and then placed in feedlots are especially susceptible to respiratory tract disease. Although vaccines have been widely used to help prevent respiratory tract disease, it is still prevalent. Prevention has been difficult because many infectious agents are implicated as causative agents, along with the stress factors mentioned. Various aspects of immunity are being investigated around the United States.

Auburn's research on the problem is focused on the cellular aspects of immunity in virus-infected cattle. Results show that subsequent to infection with infectious bovine rhinotracheitis virus, cells that are able to kill virus-infected cells are present in the blood for a week after infection. Just how these cells contribute to protecting the animal is currently being investigated.



Agricultural Economics and Rural Sociology



Good potential for expanding sales of locally produced fruits and vegetables was found in an Auburn study.

Potential for Locally Grown Produce

Good potential for expanded sales of locally grown produce was found in a study of the wholesale and retail market and producers in the Chattanooga, Tennessee, area. Managers of wholesale and retail outlets were willing to purchase locally grown produce if reasonable quality and price levels could be achieved. Impediments were found, however, which kept markets from being readily available to farmers.

The major impediment to purchasing locally grown produce was the inability of farmers to provide a dependable volume of quality products for a reasonable time span. It was estimated that local producers could supply 69 percent of the tomatoes, 32 percent of the sweet corn, 24 percent of the okra and field peas, 19 percent of the green beans, and 15 percent of the watermelons in peak production months.

Fruits and vegetables were often produced on small operations that lacked the labor, volume of product, and manager's time to meet requirements of the market. Producers were frequently older individuals or part-time farmers who were attempting to supplement their incomes.

The study also indicated that direct markets were viable alternatives that had not been sufficiently developed.

Better Marketing of Feeder Cattle

A market board association is an alternative market channel being used by a group of Alabama feeder cattle producers to increase returns. This method provides for selling cattle in lots based on descriptions provided by the producer. Cattle buyers may visit the farm to inspect cattle offered for sale.

An Auburn study of the market board association found that members enjoyed a net price differential of \$7.62 per hundredweight over selling through auction markets. This was a result of both higher prices paid by buyers because of uniformly high quality of cattle and lower cost of marketing than at auction markets.

Two needs for the system showed up in the study of nine market board sales: (1) Improved accuracy in weight estimates when regionally advertising for a sale, and (2) furnishing more information about the finish of cattle in a lot.

To Farm or Not to Farm?

Recent trends point to a growing number of agricultural students interested in farming and agriculturally-related careers. This trend led to an Auburn study of two samples of agricultural students at 1862 and 1890 land-grant schools in the South.

Nonwhite students were particularly less likely to expect a farm career, even though proportionally more black students came from backgrounds traditionally associated with farming. Many nonwhite students with a farm background had first-hand knowledge of the hardships and uncertainties of farming, which led them to rate farming as an undesirable career choice.

Expectations of a career in farming were found to be concentrated among those who stand to inherit a farm or begin farming under parental sponsorship.

Tenn-Tom Considered "Good Neighbor"

Residents of eight Alabama counties in the Tennessee-Tombigbee development area reported high expectations for the waterway. They felt that location advantages would bestow positive impacts on most aspects of the counties. Residents were most enthusiastic about the prospect for new industry coming to the area and most believed it would make the area a better place to live.

Most blacks and low income whites were fatalistic about the potential for dramatic shifts in their daily lives resulting from the waterway's impact on the area. Some reservations were expressed about health and environmental effects of new industry.

Residents felt that county leaders should be better organized to assist industrial prospects.

Agricultural students are interested in farming, but need help in getting started.



Horticulture



Tailor-made Flowering Plants

Chemical modification of plant growth has been successful in Auburn trials. Use of chemicals allows growers to produce plants that better fit market demands and which retain peak condition longer.

A new method of applying growth retardants — as tablets — was successfully used to reduce the height of poinsettia. A new growth retardant, EL-500, proved three times more effective than A-Rest® (ancymidol) in reducing the height of chrysanthemum.

Blooming life of geranium was ex-

tended by use of flower preservative solutions. Petal abscission was reduced by AVG (aminoethoxyvinylglycine), AOA (aminoxyacetic acid), and STS (silver thiosulfate). The same materials also prevented floret drop and prolonged the vase life of snapdragons.

Improved Packaging of Sweet Potato Puree

Quality and storage stability of sweet potato puree were improved by flash sterilization at extremely high temperatures followed by aseptic packaging. This Auburn method makes

Auburn research has designed handling procedures that help overcome livability problems when field grown woody ornamentals are planted in summer.

possible an institutional pack of sweet potato puree which does not require refrigeration or the inconvenience of thawing.

The use of innovative heat exchange equipment permitted processing of high solids puree without the burn-on problems of conventional heat exchangers. High temperatures involved did not reduce puree quality.

The highest quality puree was produced by rapid starch conversion followed by pulping and flash pasteurization. A highly acceptable product that incorporates the fiber and thus reduces processing wastes was attained by colloid grinding rather than pulping. Starch conversion was possible in a relatively short holding period at 167°F with sweet potatoes sliced to facilitate heat transfer. This rapid conversion should allow continuous or semi-continuous processing.

Summer Transplanting of Photinia

Auburn research has designed handling techniques that help overcome livability problems when field grown woody ornamentals are planted in summer.

Digging plants before 9:30 in the morning resulted in 80-100 percent survival of *Photinia fraseri* 1 month after transplanting. The critical period for subsequent survival of summer-dug photinia appeared to be during the post-transplanting phase of the study.

When photinia were dug after 1:00 in the afternoon, only plants treated with Vapor Gard® had acceptable livability. Those not treated with Vapor Gard® had only 20 percent livability.

Time in shipment, either 1 day or 3 days, had little effect on subsequent survival. Before loading, the photinia plants were soaked thoroughly, cross stacked on the truck, and covered with a tarpaulin.

Plum Leaf Scald Resistance Found

Resistance to plum leaf scald, a serious problem of plums, has been found in Agricultural Experiment Station research. This resistance has been incorporated into horticultural types, and seedlings are being evaluated for possible release for commercial and home use.

The organism causing leaf scald, a rickettsia-like bacteria, has shown relationship to the causal agent for phony disease of peach. Effects of leaf scald are reduction in new tree growth, tree size, and quality and yield of fruit. Decline of trees may occur in one season or over 2 or more years.

When 26 varieties and seedlings of plums were evaluated for presence of rickettsia-like bacteria, the seedling Methley A-21 and varieties Homeside, Mariposa, and Morris were lowest in counts in roots and twigs. Plum leaf scald ratings (percent scalded leaves on trees) corresponded with the concentrations of bacteria in the twigs. Symptoms were produced on growth from disease-free buds placed on infected plum trees.

Sweet Potato Improvement Underway

A foundation seed production program begun in 1981 at the North Alabama Horticulture Substation, Cullman, will provide foundation seed to Alabama sweet potato plant growers and producers. The final objective is improved seed stocks to producers, who can then grow a higher quality product for Alabama consumers.

Emphasis is currently on the variety Jewel and a numbered selection, NC-172 from North Carolina. Additional

varieties will be brought into the program as facilities permit.

Approximately 50 bushels of high quality Jewel breeder seed were produced in 1981 and will be used for the 1982 seed increase. In winter 1983, there will be a limited amount of Jewel foundation seed available for release to producers for sprout production.

Economical Fern Fertilization

Reduced fertilization of ferns may be possible without loss of quality or productivity, Auburn research results reveal. The common practice in commercial production is continuous watering with solutions of 100-200 p.p.m. nitrogen or weekly watering with 300-500 p.p.m. The Auburn results showed that ferns can tolerate a wide range of fertility without adverse effects, including fertilization rates lower than currently considered necessary for optimum production.

Three nitrogen rates applied one, two, or three times weekly were compared for Roosevelt Boston ferns. Results showed that ferns getting 150 p.p.m. nitrogen once each week were as large as ferns getting higher nitrogen rates and more frequent applications.

Ferns treated with 300 p.p.m. N two or three times a week had a greater concentration of tissue N and were greener than ferns getting 150 p.p.m. an equal number of times. However, desirable frond color can be attained by using high fertilization rates and frequencies the last week or two before marketing.

NC-172 and Jewel varieties are being used in the Auburn sweet potato improvement program.



Poultry Science



Auburn studies found that individual broiler breeders were able to maintain 100 percent fertility up to 10 days after insemination.

Low Levels of Aflatoxin OK in Feed

The feeding of low levels of aflatoxin B1 (less than 1,000 p.p.b.) does not significantly affect either growth and performance of young broiler chickens or their development of acquired immunity. Prior to this Auburn research finding, it was known only that these low dietary aflatoxin B1 levels do not produce clinical disease in broilers. It was believed that feeding the low levels caused subtle toxic effects on performance traits and the immune system of broilers. The Auburn findings concur with the FDA policy of allowing the sale and transfer of poultry feed containing 200 p.p.b. or less of aflatoxin B1.

Long Lasting Fertility

Auburn studies found that individual broiler breeders were able to maintain 100 percent fertility up to 10 days after insemination. This is considerably longer than had been previously reported.

Reproductive traits found to be associated with long duration of fertility were high egg shell quality and rate of production. Selection for long duration fertility is being attempted to establish lines for studying the physiological nature or duration of fertility and physiology of the reproductive traits associated with it.

Increasing Vaccine Effectiveness

A synthetic organic acid resin was found to have good adjuvant properties when used in vaccines for controlling poultry diseases. The resin adjuvant resulted in prolonged immunity and did not have the unacceptable side reactions induced by the presently used oil emulsion adjuvants.

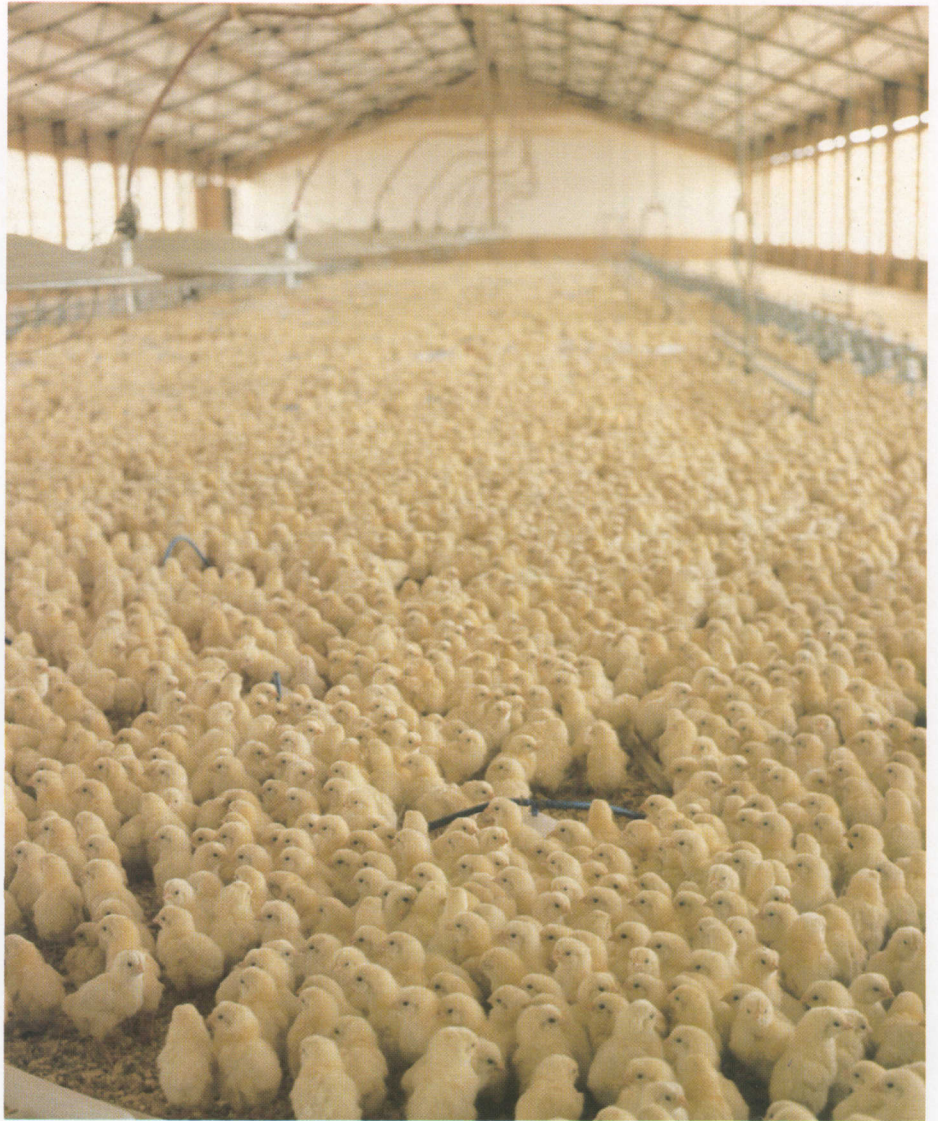
A procedure was developed for the rapid induction of pili (hair-like structures) growth in gram negative bacteria. Vaccines made with these bacteria provide additional disease resistance because the bacteria cannot adhere to internal organ surfaces.

Coccidiosis, Feeding Regime Important

Information from 1981 research reveals how low grade coccidiosis and certain feeding regimes affect broilers, replacements, and laying chickens in many economically-important ways.

A new finding was that low grade coccidiosis, which did not cause noticeable outward signs of the disease nor affect egg production, significantly reduced shell quality of eggs.

Restricted, skip-a-day feeding, a commonly practiced feeding regime for replacement broiler breeders, resulted in significant amounts of undigested feed being passed within 30 to 60 minutes after feeding. This was accompanied by flushing, which resulted in



Restricted, skip-a-day feeding, a commonly practiced feeding regime for replacement broiler breeders, was found to cause problems. In Auburn tests, this feeding system resulted in significant amounts of undigested feed being passed, accompanied by flushing, which caused wet litter.

wet litter, a common industry problem associated with rearing of replacement birds.

Molting Increases Shell Deposition

For over 50 years poultry researchers and producers have known that when hens are molted they produce at a higher rate when they come back into production. The reason for this was unknown. Recently, however, it

was postulated that molting rejuvenated the hen's reproductive system.

Auburn research in 1981 solved the age-old mystery, showing there was no "fountain of youth" effect that caused molted hens to increase production after molt. The hens do not lay more eggs, they simply put shells on eggs that were previously lost because they were shell-less. Thus, most of the improvement is due to increased shell deposition and not to an increase in ovulation rate.

Projects 1981

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Crops, Livestock, and Poultry

Economic Aspect of Commercial Turf-grass Sod Production in Alabama
The Impact of Changing Costs, Institutions, and Technology on the Southern Dairy Industry
Crop Budgets to Reflect Conservation Practices

Farm and Financial Management

Financial Management and Farm Growth
Development of Models for Evaluation of Credit Worthiness of Agricultural Borrowers
Alternative Business Organizations Used by Alabama Farmers
Law for the Alabama Farmer
An Economic Analysis of Swine Production Systems and Financing Alternatives

Marketing and Prices

Price Discovery and Informational Flows for Major Agricultural Commodities in the Southern Region
Organization and Efficiency of the Fruit and Vegetable Production-marketing Subsector in the South
Development, Production, and Marketing of Christmas Trees
An Economic Analysis of Alternative Marketing Strategies for Cotton Producers
Marketing Performance of Selected Milk Pricing Systems for the Southern Region
Supply, Pricing, and Marketing Alternatives for Cattle, Beef Systems in the South
Alternative Structures for Increasing Efficiency in Inter- and Intra-regional Grain Marketing Systems
Culture Systems for Year-round Marketing of Fish from Freshwater Ponds
Impact of International Trade on Alabama Agriculture

Resource Use and Planning

An Econometric Analysis of Variation in Rural Land Value
Changing Structure of Agriculture: Causes, Consequences, and Policy Implications
Effects of Investments in Recreational Resources on Income and Employment in Barbour and Marshall Counties
Efficient Vehicle Routing and Scheduling for Agribusiness Firms and Public Services

Rural Development

Defining and Achieving Life Goals: A Process of Human Resource Development
Public Services and Economic Development Along the Tennessee-Tombigbee Corridor
Improving Community Services in Non-metropolitan Counties

AGRICULTURAL ENGINEERING

Crop Production - Farm Machinery

Determining Farm Machinery Reliability for Southeast Field Conditions
Engineering Systems and Energy Needs for Cotton Production
Soil Surface and Profile Modification for Improving Soil-water Relationships

Fish Production

Freshwater Food Animals

Irrigation

Application Efficiency and Energy Usage of Irrigators on Irregularly Shaped Fields
Trickle Irrigation in Humid Regions

Nut Culture

Factors Influencing Vegetative and Reproductive Development of Young Pecan Trees

Poultry Production

Optimize Efficiency of Energy Utilization in Agricultural Housing Systems
Utilization of Solar Energy in Poultry Production
Environmental Influences on Poultry

Waste Control

Animal Waste Utilization and Treatment Systems
Process for Making Animal Feed from Waste from Cattle in Production Units
Development of An Integrated System for Total Utilization of Swine Waste

AGRONOMY AND SOILS

Beef Production

Beef Production on Selected Forage Systems
Developing Pasture, Hay, and Silage Management Systems for Cattle

Cotton Production

Evaluation of Cotton Varieties and Strains

Fertility Requirements of Cotton
N Requirements for Cotton Following Winter Legumes
Rotation of Cotton with Soybeans, Corn, and Alfalfa

Dairy Production

Energy and Protein Levels in Silage Concentrate Blended Rations for Dairy Cows
Evaluation of Phalaris and Tall Fescue Pastures for Dairy Cattle

Forage Crops

Chemical Profile and Nutritive Value of Forage Genotypes and New Forage Varieties
Establishment, Management, and Utilization of Improved Forage Species and Cultivars
Forage Legume Viruses
Plant Germplasm—Its Introduction, Maintenance, and Evaluation
Productivity and Quality of Phalaris, Annual Cool Season Grasses, and Legumes
Toxicity of Tall Fescue

Grain Crops

Grain Crops Cultivars and Experimental Strains Testing
Grain Sorghum Production

Plant Breeding

Breeding and Evaluation of Low-tannin Sericea and of Interspecific Vetch Germplasm
Breeding Phalaris and Tall Fescue for Improved Winter Forage Production
Breeding Soybeans for Improved Yield and Pest Resistance
Breeding White Clover for Yield and Virus Resistance

Soil Chemistry, Microbiology, and Fertility

Diagnosis and Correction of Manganese and Molybdenum Problems in Legumes
Distribution and Significance of Mineral Components in Alabama Soils
Effects of Soil Acidity and Calcium on Soil Solutions and Yield of Crops
Enhancing Biological Dinitrogen Fixation in Soybeans and Other Legumes
Fertilizer Budgets in No-till Crop Production
Fertilizer Requirements of Peanuts
Nitrification Inhibitors for Corn
Nitrogen Requirements of Agronomic Crops
Potassium Requirements of Sweet Sorghum
Soil Fertility and Fertilizer Requirements
Soil Testing and Plant Analysis
The Nature of Soil Acidity and Its Effect on Agronomic Crops in Alabama

Soil Physics

- Movement and Retention of Water and Solutes in Selected Southern Region Field Soils
- Water Movement in Selected Alabama Soils
- Water Transport Phenomena in the Soil-plant System

Soybean Production

- Cultural and Environmental Factors Influencing Soybean Yields in Alabama
- Enhancing Biological Dinitrogen Fixation in Soybeans and Other Legumes
- Soybean Variety and Experimental Strain Evaluation Program for Alabama
- Starter Fertilizers for Soybean Production

Sweet Sorghum

- Date of Planting for Sweet Sorghum
- Determining Nutritional Needs of Sweet Sorghum
- Enhancing Sugar Production with Growth Regulators

Turfgrass

- Production and Management of Turfgrass
- Selecting a Better Centipedegrass

Weed Science

- Biology of Weeds
- Competitiveness and Control of Weeds in Soybeans, Peanuts, Cotton, and Grain Sorghum
- Cultural and Environmental Effects on Herbicide Persistence
- Integrated Pest Management in Soybeans and Peanuts
- National Agricultural Pesticide Impact Assessment Program
- Turf Weed Control
- Weed Control in No-till Soybeans, Peanuts, Cotton, and Corn
- Weed Seed Population Dynamics

ANIMAL AND DAIRY SCIENCES

Biochemistry

- Metabolic Role of Uric Acid Riboside and Nucleotides in Cattle Red Blood Cells
- Kinetics of Bacterial Thymidylate Synthetase and Its Inhibition by Substrate Analogs
- Oxidation and Conjugation of Carcinogenic Hydrocarbons in Marine Animals
- Relationship of Diet to Cholesterol Concentrations, Pool Size, and Turnover in Tissues of Rats

Breeding

- Evaluation of Crossbred Beef Cattle Under Different Growing and Finishing Regimes
- Genetic Improvement of Efficiency in the Production of Quality Pork
- Parameters Associated With Growth Rate Curves in Beef Cattle
- Performance Testing of Prospective Sires as an Aid to Selection
- Selection at Two Weights and Its Effects on Efficiency of Swine Production
- The Effects of Breed and Breed Crosses on Milk Production and Other Production Factors in a Grade Beef Herd

Dairy Production

- Buffered Diets for Dairy Cattle Confined on Concrete
- Evaluation of Phalaris and Phalaris-ladino Clover Pastures for Dairy Cattle
- Relation of Feet and Leg Conformation to Lameness Diseases of Dairy Cows Confined to Concrete Floors
- Relationship Between Bacterial Quality of Raw Milk and Subsequent Pasteurized Milk
- Whole Gin-run Cottonseed in Lactating Rations

Meat Science

- Marketability of Beef Produced Under Forage-grain Management Systems

Physiology

- Effects of Environmental Stress and Endocrine Function on Growth and Reproduction in Swine
- Selected Reproductive Phenomena in Cattle and Swine

Ruminant Nutrition

- Beef Production on Selected Forage Systems
- Effect of Feeding Systems and Animal Size on Efficiency of Beef Production
- Evaluation of Pastures for Yearling Beef Steers
- Gluconeogenesis and Amino Acid Metabolism in Ruminants
- Growing-finishing Systems for Beef Steers in North Alabama
- Growing-finishing Systems for Steers in the Coastal Plains Area
- Increasing Protein and Energy Utilization by Beef Cattle
- Systems for Growing-finishing Stocker Cattle in the Gulf Coast Area

Swine Nutrition

- Nutrition and Physiology of Gestating and Neonatal Swine
- Nutritional Systems for Swine to Increase Reproductive Efficiency

Waste Management

- Animal Health and Food Safety Aspects of Feeding Animal Waste
- Development of an Integrated System for Total Utilization of Swine Waste
- Evaluation of a Lagoon Waste Management and Recycling System for Confined Dairy Cattle
- Liquid Fuel and Chemical Production from Cellulosic Biomass

ANIMAL HEALTH RESEARCH

Cattle

- Bovine Respiratory Viruses: Mechanisms Which Affect Virus Replication and Respiratory Tract Disease
- Effect of Chlamydial-induced Infectious Orchitis, Periorchitis, and Epididymitis on Sperm Maturation
- Immunopotential of Brucella Abortus Strain 19 Vaccine
- Infectious Bovine Rhinotracheitis Virus, Latency and Respiratory Disease
- Liposome — Antibiotic Enhanced Bactericidal Activity of Phagocytic Cells
- Neurology of the Reproductive System of the Bull
- Pathogenesis and Immune Mechanisms to Blue-tongue Virus Infections in Food Producing Animals
- Pathogenesis and Therapy of Intestinal Parasites in Calves
- Persistence of Natural Infection in Calves Born to and Nursing Brucellosis-infected Dams
- Prevalence, Transmission, and Immune Response Associated with Bovine Leukosis Virus Infection
- Relation of Feet and Leg Conformation to Lameness Diseases of Dairy Cows Confined on Concrete Floors
- Reproductive Diseases of Cattle
- Transmission of Brucellosis from Cattle to Non-ruminant Wildlife Mammals

Poultry

- Interaction of Physical Conditioning with Reproductive and Cardiovascular Parameters in Turkeys

Swine

- A Study of Aflatoxin on Immune System of Turkey, Chicken, and Swine
- Identification of Swine Dysentery Carrier Pigs and the Morphology of the Colonic Lesions
- Selected Factors Affecting the Immune Response of Newborn Pigs

BOTANY, PLANT PATHOLOGY, AND MICROBIOLOGY

Biological Control

Development of Microbial Agents for Use in Integrated Pest Management Systems

Diseases

Activities of Nematicides and Fungicides on Nontarget Soil Nematodes and Fungi

Biochemistry and Physiology of *Cronartium Fusiforme* on Southern Pines

Disease Control Systems for Peanuts and Soybeans

Ecology and Control of Soil-borne Fungal Pathogens of Forest Tree Seedlings

Ecology and Management of Fusiform Rust on Southern Pines

Effects of Seed Treatment Fungicides on the Rhizobium Host Infection Process in LDC Legumes

Epiphytology and Control of Apple and Peach Diseases

Epidemiology and Control of Pecan Scab

Variability of Root-knot Nematodes and Factors Influencing Their Population Dynamics

Forage Legume Viruses

New or Unusual Plant Diseases in Alabama

Plant Diseases in Relation to Forage Crop Breeding

Rhizosphere Ecology as Related to Plant Health and Vigor

Soil-borne Pathogens of Peanuts, Their Complexes and Control

Viral Diseases of Selected Grass: Identity, Control, and Role of Predisposition

Viruses and Mycoplasma-like Organism (MPLO) Causing Diseases of Corn and Sorghum

Fungi and Mycotoxins

A Study of Toxicity of Aflatoxin B1 on Immune System of Turkey, Chicken, and Swine

Chemistry and Physiology of Mycotoxins

Mycotoxicology of Foods and Feeds

Mycotoxins of Corn and Other Feed Grain

Herbicides

Effect of Chloracetamide Herbicides on Plant Membrane Integrity and Disease Susceptibility

Effects of Herbicides on Submerged Seed Plants

Influence of Crop Herbicide Management on Weed Population Dynamics and Subsequent Crop Physiology

Morphology, Physiology, Taxonomy, and Ecology

Changes in Lipid Metabolism and Competition of Water-stressed and Phytohormone-treated Plants

Floc Formation and Bulking in Activated Sludge Process for Treatment of Textile Wastewaters

Isolation and Identification of Odorous Metabolites of Aquatic Actinomycetes

Systematic and Ecological Studies of Fungi in Alabama

Taxonomy of Poisonous Vascular Plants of Alabama

Water Conservation in Cotton by Drought Induced Leaf Surface Wax Synthesis

Water Transport Phenomena in the Soil-plant System

Peanuts and Soybeans

Flower and Pod Abscission in Soybean (*Glycine max* (L.) Merr.)

Fungal Spore Germination Inhibitors and Stimulators Associated with Surface Waxes of Peanuts

Implementation of AMI Method for Determining Peanut Harvest Dates in Alabama

Systems for Disease Management in Peanuts and Soybeans

Miscellaneous

Auburn University Herbarium

Auburn University Mycological Herbarium and Culture Collection

Donald E. Davis Arboretum

FISHERIES AND ALLIED AQUACULTURES

Aquaculture

Aquaculture

Culture Systems for Year-round Marketing of Fish From Watershed Ponds

Warmwater Aquaculture I (Genetics and Breeding)

Warmwater Aquaculture II (Nutrition)

Warmwater Aquaculture III (Product Development and Quality)

Integration of a Solar Greenhouse with a Recirculating Fish Culture System

Aquatic Ecology

Stream and Impoundment Ecology

Fish Health

Cooperative Fish Parasite and Disease Study

Warmwater Aquaculture (Aquatic Animal Diseases)

Sportfish Management

Sportfish Management in Impounded Waters

Pond Fertilization and Liming

FORESTRY

Forest Biology

Breeding Strategies for Genetic Improvement of Commercial Forest Trees in the South

Development, Production, and Marketing of Christmas Trees

Effectiveness of Site Preparation for Loblolly Pine Regeneration in the Hilly Coastal Plain in Alabama

Genetics and Breeding of Selected Southern Forest Tree Species

Growth and Nutrient Requirements of Selected Hardwoods

Leaf Reflectance and Biological Processes of Trees as Affected by Environmental Conditions

Natural Regeneration of Desirable Bottomland Hardwoods

Reclamation of Drastically Disturbed Soils

Forest Management and Economics

A Multipurpose Growth Projection System for Southern Forests

Investment Behavior and Policy Analysis of Forestry Investments

Production and Supply Relationships Involving Non-timber Forest Outputs

Reclamation of Land Surface Mined for Coal in Alabama

System Approach to Wood Products Mill Design and Investment Analysis

The Forest Economy of Alabama: Its Structure and Development

Forest Measurements

Evaluation of Site Potential for Yellow-poplar in the Hilly Coastal Plain

Total Tree Volume and Weight Equations for Selected Tree Species in Alabama

Forest Engineering and Timber Harvesting

Improved Methods for Thinning Southern Forests

Predictive Maintenance for Forestry Equipment Used in the South

The Construction, Verification, and Validation of a Southern Forest Timber Harvesting Computer Simulation Model

Forest Products

Chemicals and Energy from Bark Resources

Design, Development, and Reliability of Woodbased Composite Beams

Evaluation of Floor, Wall, and Ceiling Systems in Housing for Maximum Energy Conservation

Evaluation of Structural Properties of Southern Yellow Pine Plywood

Flakeboard and Composite Wood Panels from Small Dimension Southern Yellow Pine and Low Grade Hardwoods

HOME ECONOMICS RESEARCH

Housing

Housing for Low and Moderate Income Families

Nutrition

Dietary Fat and Prostaglandin Content of Human Milk

Effect of Maternal Dietary Lipid on Prostaglandin Content of Human Milk
Metabolic and Histological Changes in Obese Adult Female Rats Fed Liquid Reducing Diets

Nutritional Health of Adolescent Females
Protein Utilization and Metabolism in Nutrition

The Essential Fatty Acid Deficient Chicken: A Model for the Study of Cystic Fibrosis

Vitamin C and Acute Physiological Responses to Cigarette Smoking

Textile Safety

Selected Factors Affecting the Consumer Use Performance of Flame Retardant Fabrics

Effects of Functional Finishes on Comfort and Protection of Consumers

Textile Utilization

Chemistry of Photo-degradation of Cotton Tentage Fabrics

Consumer Expectations, Consumer Satisfaction, and Performance of Upholstery Fabrics

HORTICULTURE

Breeding

Breeding Improved Tomato and Pepper Varieties for the South

Breeding Pickling Cucumbers for Resistance to Gummy Stem Blight and Cucumber Beetles

Genetics and Breeding for Pest Resistance in Muskmelons and Watermelons

Genetics and Breeding of Plums

Southernpea Breeding and Nature of Resistance to Cowpea Curculio

Management

Chemical Modification of Plant Growth Habit for Potted Plant Production

Culture and Cultivars of Peaches
Factors Influencing Vegetative and Reproductive Development of Young Pecan Trees

Nutritional, Cultural, and Varietal Improvements in Apples

Regulation of Pistillate Flower Development in Pecan

Trickle Irrigation in Humid Regions

Ornamentals and Landscape Conservation

Economics of Producing and Marketing Woody Ornamentals in the South

Identification and Control of Diseases on Ornamental Plants

Improving Production Efficiency of Woody Ornamentals

Nitrogen Requirements for Containerized Nursery Plants in Bark Growth Mixes

Utilization

Maximizing the Use, Nutritive Quality, and Consumer Acceptance of Sweet Potatoes and Their Products

New Foods from the Southernpea

Quality Attributes of Selected Cultivars of Fruits and Vegetables

Varieties

Vegetable Variety Trials for Alabama

POULTRY SCIENCE

Breeding

Bi-directional Selection for Long and Short Fertility Duration in Broiler Breeder Females

Reproductive Performance of Broiler Breeders Influenced by Management

Disease Control

Avian Coccidiosis: Immunological Resistance Against Clinical Infection

A Study of Toxicity of Aflatoxin B1 on Immune System of Turkey, Chicken, and Swine

Coccidia and Coccidiosis of Poultry

Coccidiosis Study

Development of Adjuvants for Immunopotentialization of Inactivated Microbial Antigens for Poultry

Diagnostic Service—Poultry

Differentiation Between Skin Leukosis (Marek's) and Skin Abnormalities from Other Causes

Genetic Bases for Resistance to Avian Diseases

Immunization for Control of Coccidiosis of Poultry

Infection and Immunity in Poultry

Interactions of Physical Conditioning with Reproductive and Cardiovascular Parameters in Turkeys

Environment

Eggshell Quality of Domestic Fowl

Environmental Influences on Poultry

Heating of Poultry Houses with Multiple Forms of Solar Energy

Optimize Efficiency of Energy Utilization in Agricultural Housing Systems

ZOOLOGY-ENTOMOLOGY

Ecology

Cattle Egret Ecology in Alabama

Parasitology-protozoology

Isoospora suis of Baby Pigs: Pathogenesis and Immunology

Epidemiology of *Isoospora suis* and Other Coccidia of Swine

Pest Control

Biology and Control of Selected Arthropod Pests of Ornamentals in Alabama

Bionomics and Control of the Pecan Weevil

Control Tactics and Management Systems for Arthropod Pests of Soybeans

Southern Pine Beetle

Bionomics and Control of the Face Fly and Other Diptera

Development of Microbial Agents for Use in Integrated Pest Management Systems

Biology and Control of Insect Pests of Peanuts

Biology and Control of Insect Pests of Vegetable Crops

Biology, Ecology, and Control of Insects of Forests and Shade Trees in Alabama

Integrated Management of Key Arthropod Pests of Cotton

Tactics for Management of Soybean Pest Complexes

Bionomics and Management of the Corn Rootworm Complex on Field Corn

Physiology

Structure and Function of Chemical Messengers of Arthropods

Reproductive Physiology of Farm Animals

Action of Anti-hormones in Reproductive Potential of Striped Ground Cricket *Nemobius fasciatus*

Neuroendocrine Regulation of Reproduction Function in Postpartum Animals

Wildlife Management

Factors Affecting Natalivity and Mortality of Alabama Mourning Doves

Habitats of American Woodcock in Alabama

Miscellaneous

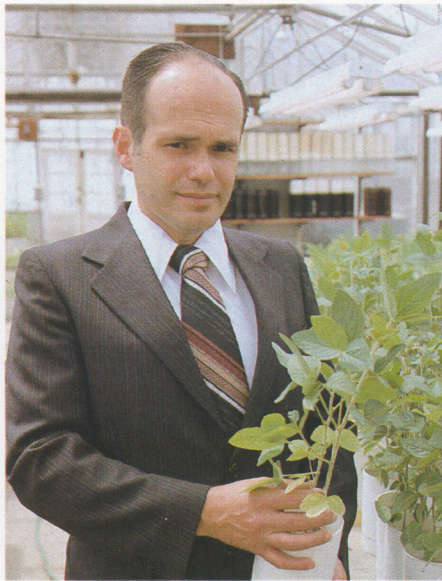
Herpetology Museum

Auburn University Entomological Museum

DIRECTOR'S RESEARCH AWARD



S. Allen Edgar



R. Rodriguez-Kabana



Paul A. Backman

A new program for recognizing Agricultural Experiment Station faculty for outstanding research accomplishments was established in 1981. Officially named the "Director's Research Award," the program is organized to recognize one member of the senior staff (full professor) and one junior researcher (assistant or associate professor) each year. Each winner receives a personal plaque, and a permanent plaque honoring recipients will hang in the Experiment Station's administrative offices.

"Recipients of the Director's Research Award are among those people who have done outstanding research in support of our agricultural and forest industries," Dean and Director Gale A. Buchanan said in announcing establishment of the award. The award reflects quality of individual research projects, but goes further to reflect a substantial total research contribution.

First recipients of the award were announced at the 1981 annual staff conference. R. Rodriguez-Kabana, Department of Botany, Plant Pathology, and Microbiology, and S. A. Edgar, Department of Poultry Science, were co-winners of the senior award, and

Paul A. Backman, Department of Botany, Plant Pathology, and Microbiology, received the junior award. The recipients were nominated by their departmental colleagues, with final selection made by an administrative selection committee.

Rodrigo Rodriguez-Kabana was selected for the honor because of his past and ongoing contributions to disease abatement in economically important crops of Alabama, principally soybeans and peanuts. The scientific soundness and practical aspects of his research are illustrated by his publication record in refereed journals and his recognition and acclaim from farmers and commodity groups, as well as by substantial grant support he has received from industry.

A native of Cuba, Rodriguez-Kabana joined the Auburn teaching and research faculty in 1965, and rapidly established himself as outstanding in his field. He received the Alumni Professor designation in 1970, a program by which the Auburn Alumni Association rewards outstanding faculty. He became an American citizen in 1971.

A recent national honor came to Rodriguez-Kabana when he was named

one of the nation's 10 leading soybean researchers, in the "Researchers' Recognition Program" of the American Soybean Society and ICI Americas. He joined the other honored scientists in a summer tour of seven research facilities in the United States and England, as part of the program's work to gain recognition for U.S. soybean research.

S. Allen Edgar was recognized for his more than 30 years of research aimed at improving the poultry industry in Alabama, the Southeast, and the Nation. All areas of the poultry industry have been aided by his efforts to upgrade efficiency of production.

A major breakthrough made by Edgar was his development of the technique of immunization of chickens against coccidial infection, a costly poultry problem. This marked a new advance in disease control, representing the first controlled immunological suppression of a protozoan parasite. He gave invited lectures in nine European and Latin American countries on avian coccidiosis and its control.

In the 1960's, when Marek's disease was costly in condemnation of broilers, Edgar worked with industry in

monitoring the use of turkey blood as a stop-gap method for vaccinating against the disease. This saved millions of dollars during the interim period before a vaccine became available.

Auburn University has received substantial financial benefit from royalties paid on Edgar's patented developments, such as the coccidiosis vaccine. These funds have made possible visiting lectureships, graduate fellowships and assistantships, and the matching of Federal or State funds for facilities and specialized scientific equipment.

Paul A. Backman, winner of the junior award, also was honored for his

success in efforts to reduce problems from diseases in peanuts and soybeans. His expertise has made him a popular speaker at field days and other farmer meetings to report on his findings in disease control research. His results have also been widely reported in scientific journals.

Backman has received various national and international recognitions since joining the Auburn faculty in 1971. He served during 1978-79 as a senior plant pathologist in Uruguay, in an assignment for the United Nations. Before that, he had served as plant pathologist for the Office of

Technology Assessment in the U. S. Congress.

Fungal diseases have received Backman's major research attention. He has developed innovative procedures to detect plant diseases through the use of infrared sensing devices. His development of programs to control plant diseases has included development of unique methods of applying chemicals through irrigation systems. He is currently working towards fungicidal control of the fungus associated with fescue toxicity, a serious problem in the Southeast, as part of a multi-departmental project.

E. T. York Distinguished Lecturer Series Established

A new lecture series that will bring national and world leaders in agriculture and related fields to Auburn was established during 1981. The series is named the E. T. York Distinguished Lecturer Series in honor of Dr. and Mrs. E. T. York, prominent Auburn alumni from Gainesville, Florida, whose significant contribution endowed the program.

The lecture series will provide intellectually stimulating experiences for faculty, staff, and students, and contribute to the enhancement of programs at Auburn University. Series speakers will be selected from among individuals working in agriculture, home economics, and veterinary medicine who have demonstrated outstanding leadership in advancing knowledge and disseminating information through teaching, research, or extension.

Establishment of the lecture series is just one of many ways the Yorks have brought honor to Auburn University. Both have a record of outstanding professional accomplishments in their respective fields.

Dr. York, a native of Valley Head, was an honor graduate of the class of 1942 at Auburn. He returned to Au-

burn for his M.S., which he received in 1947, and completed the doctorate at Cornell University in 1949. After work at North Carolina State University and for the American Potash Institute, in Washington, D.C., York became director of the Alabama Cooperative Extension Service in 1959.

After 3 years at Auburn, York became administrator of the Federal Extension Service, and then moved to the University of Florida as provost for agriculture. He later became vice president for agricultural affairs, then interim president, and finally in 1975 became chancellor of Florida's university system. Since his retirement, York has continued to participate in the international programs of the University of Florida and as a member of the Board of International Food and Agricultural Development of the Department of State.

Mrs. York, the former Vam Cardwell of Evergreen and a member of Auburn's class of 1946, was a campus leader while at Auburn. She has been active in real estate development in the Gainesville, Florida, area in recent years, successfully combining motherhood and a business career.

1981 FINANCIAL REPORT

Appropriated Funds

Federal	\$ 3,364,090	29.6%
State	8,003,848	70.4%
	\$11,367,938	100.0%

Expenditure of Appropriated Funds

Beef Cattle	13.7
Cotton	3.2
Dairy Cattle	4.6
Feed Grains	3.8
Fish and Wildlife	6.0
Forestry	10.6
Fruits, Nuts, and Vegetables	10.6
Human and Resource Development	3.6
Ornamentals and Turf	3.0
Pasture and Forage	6.7
Peanuts	2.0
Poultry	9.0
Recreation	.1
Soils, Land, and Water	4.7
Soybeans	5.9
Swine	9.7
Other	2.8
	100.0%

Other Funds

Grants	\$3,309,915
Sales	4,195,011
	\$7,504,926

