VOLUME 15, NO. 1 SPRING 1968

HIGHLIGHTS

OF AGRICULTURAL RESEARCH

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY

LITTLE RIVER CANYON . . .
One of many Alabama tourist attractions

HIGHLIGHTS *of* Agricultural Research

A Quarterly Report of Research Serving All of Alabama

VOLUME 15, NO. 1 SPRING 1968

In this issue . . .

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New and Timely PUBLICATIONS

Listed here are timely and new publications reporting research by the Agricultural Experiment Station.

Cir. 152. Spacing and Rates of Nitrogen for Corn reports results that emphasize importance of close spacing and high nitrogen rate for top corn yields.

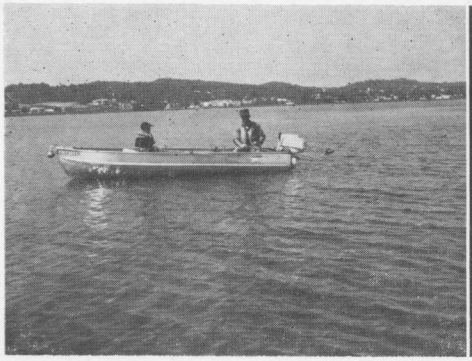
Cir. 155. Crop Varieties for Alabama—Field, Forage, Turf lists varieties that have performed best at several test locations in each area of the State.

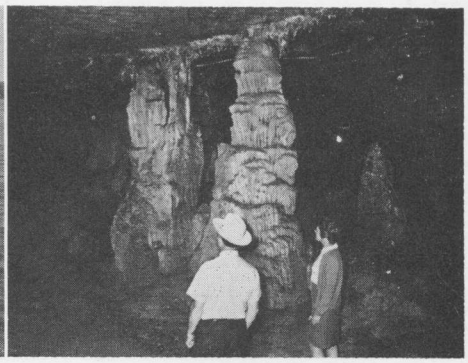
Cir. 158. Tourism-Recreation Potential in Cherokee, DeKalb, Jackson, and Marshall Counties Alabama identifies the many natural attractions of the area and suggests improvements that may be practical.

Cir. 159. Egg Industry Adjustments in an 8-County Area of Northern Alabama contrasts status of the egg industry in 1958 and 1966 in the northern Alabama study region.

Leaf. 76. Effect of Management on Yield and Quality of Sudax Sorghum-Sudan Hybrid and Gahi-1 Pearlmillet covers effect of seeding rate, stage of maturity, and nitrogen on the summer annuals.

Free copies may be obtained from your County Extension Chairman or by writing the Auburn University Agricultural Experiment Station, Auburn, Alabama.





Fishing on Guntersville Lake and scene inside Guntersville Caverns located 9 miles south of Guntersville, Marshall County.

TOURISM-RECREATION POTENTIAL in Four Northeastern Alabama Counties

L. S. DRISCOLL, *Department of Agricultural Economics and Rural Sociology*

A NEW INDUSTRY appearing on the American scene and becoming prominent in Alabama is tourism-recreation.

In certain areas and even whole states, tourism-recreation has stimulated and contributed greatly to the economy. Effective utilization of physical resources of an area's recreational potential may contribute even greater economic benefits than comparable efforts in other areas. Successful ventures in this field are partly dependent upon such factors as availability of recreational resources, quality of existing attractions, potential markets, and effective promotion.

In an effort to determine these factors, a study was made in Cherokee, DeKalb, Jackson, and Marshall Counties, Alabama. The 4-county area is richly endowed with scenic and natural attractions including lakes, gorges, caves, waterfalls, archeological sites, and game preserves. The greatest resource of the area is its abundant water supply, the basic ingredient for most outdoor recreation, with Guntersville Lake being the major attraction of the area. Four caves or caverns, two major state parks, Russell Cave National Monument, Val Monte Resort, Buck's Pocket, and the two large reservoirs combine to make very appealing recreational attractions. Other attractions include fishing camps, organized summer camps, county parks, and hunting areas.

Quality recreational attractions are a prerequisite for success and necessary for extensive tourism-recreation promotional effort. Thus, an effort was made to determine existing quality of attractions in the area. Visitors to four selected attractions were given an opportunity to rate each facility. Combined results indicated that more than 72% of 1,709 respondents rated the attractions as excellent with another 18% rating them good, see table. Individual attraction ratings ranged from about 4% below to 7% above the combined excellent rating.

As a check on the ratings given, respondents were asked if they would recommend the attraction to others. Willingness to recommend the facility by about 97% of the respondents indicated approval and susequent recommendations.

Population within a 50-mile radius of the center of the area includes nearly 1 million people; and, when the perimeter is extended to 100 miles another 1 million urbanized population of Birmingham and Atlanta are included. The proximity of the large urban population that possesses higher than average incomes and high mobility adds to greater patronage potential of the area. Also contributing to a greater market are the 5 major highways that complement the out-of-state tourism-recreation potential.

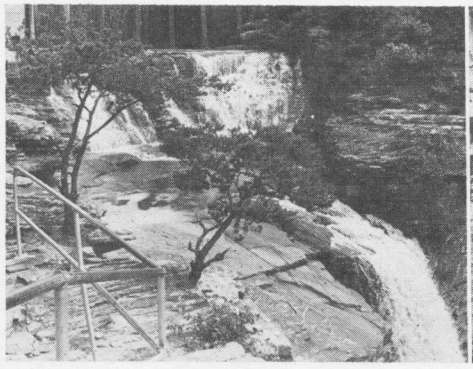
RATINGS GIVEN BY AREA PATRONS TO RECREATION ATTRACTIONS VISITED, NORTHEASTERN FOUR-COUNTY AREA, ALABAMA, JUNE-SEPTEMBER, 1966

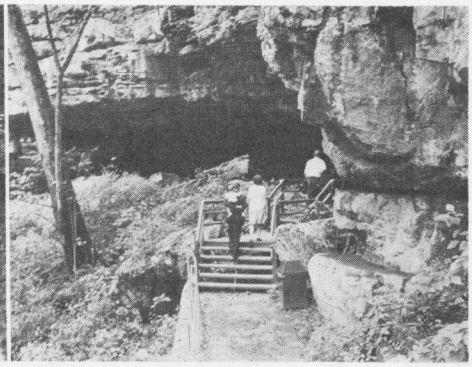
Area of residence	Visitors reporting		Rating of attraction by visitors					
			Excellent	Good	Average	Fair	Poor	No answer
	No.	*Pct. of total*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Alabama	721	42.2	72.8	18.9	5.3	.5	.4	2.1
Southern area	708	41.4	72.6	17.4	5.4	1.1	.7	2.8
Midwestern area	142	8.3	75.4	13.4	7.7	0	.7	2.8
Northeastern area	72	4.2	72.2	20.8	4.2	2.8	0	0
Western area	54	3.2	61.1	27.7	3.7	3.7	1.9	1.9
Foreign countries	12	.7	66.7	8.3	25.0	0	0	0
TOTALS	1,709	100.0	72.5	18.1	5.6	.9	.6	2.3

Approximately 40% of all cave-visiting respondents reported their visits resulted from recommendations of friends. Roadside signs were second with about 38%; post cards or brochures 10%; newspapers or magazines 6%; and other, including maps and travel guides, 5%.

Differences in data were reflected by individual attractions because of their location. The importance of quality was evidenced by the high number of visits resulting from friends' recommendations regardless of location. The effect of roadside advertising was higher for attractions located near main highways.

Patronage patterns for individual attractions also varied with location relative to main highways. Home state patronage was the greatest single source of customers with Louisiana, Mississippi, Georgia, Texas, Florida, and Tennessee following in that order. In terms of patronage, the Midwestern area was second to the Southern area.





Russell Cave, an outstanding archeological site located at Bridgeport, Jackson County, right, and Desoto Falls, Desoto State Park near Fort Payne, left.

Over A Ton of Channel Catfish per Acre

E. E. PRATHER
Dept. of Zoology-Entomology

IT IS NOW POSSIBLE to catch as much as 1¼ tons af channel catfish per acre from ponds. Research-perfected methods and procedures now make such high yields a reality.

Long considered one of the most valuable stream fishes, the channel catfish has become an important sport fish in ponds. Its feed conversion (lb. feed per lb. weight gain), good flavor, desirable size, lack of hard bones, and sport of catching have contributed to its rise in popularity.

It was once believed that channel catfish spawned only in running water. In recent years research revealed the value of the channel cat as a pond fish. Intensive research by Auburn University Agricultural Experiment Station on spawning, fingerling production, species combinations, supplemental feeds, and parasite and disease control has yielded results showing that catfish ponds are potentially profitable enterprises.

To be reasonably certain of successful operations, pond owners wanting to produce maximum catches of channel catfish must follow essential steps in management of their ponds. High yields from catfish ponds involve considerably more expense than that for bass-bluegill ponds. Therefore, only pond owners willing to meet necessary costs should stock and manage their ponds for maximum catfish production.

Pond requirements for channel catfish are about the same as those for bass-bluegill combinations, such as satisfactory water supply, adequate clay subsoil to keep seepage to a minimum, and ample watershed. It is essential that a drain pipe be provided. Excess water must be diverted since catfish will leave ponds with excessive overflow at spillways. Minimum depth of 1½ ft. and maximum of 6 to 7 ft. are best. Although ⅓- to ½-acre ponds usually are too small for good bass-bluegill production, they may be managed successfully to provide family fishing for catfish.

Research at Auburn has shown that maximum catch was obtained when 3,000 catfish, 1,000 fathead minnows, and 50 largemouth bass were stocked per acre during winter. Success of this combination depends largely on absence of other species that would either eat small stocked catfish or compete with them for food.

The pond should be given two applications of fertilizer in March and April; additional fertilizer is not needed.

For maximum production of catfish, it is necessary to feed daily beginning March 1 and continuing through October or until water cools below 60°F. in fall. The daily rate of feeding per acre (pelleted fish feed) ranges from 3 lb. at start of period to a maximum of 30 lb. The amount of feed is reduced the next year as fish are caught.

Pond owners must be constantly alert to possible fish losses caused by parasites or low oxygen concentrations in the water. Treatment of fingerlings before stocking is important but does not provide lifetime immunity to parasites or diseases. Therefore, frequent pond inspection for sick or dead fish is a "must"; occasional pond treatment may be necessary.

Heavy feeding causes "pollution" of pond water with lowered oxygen concentrations that may cause distress or even death of fish. Daily feeding in excess of 30 lb. per acre is dangerous in ponds that have little water exchange or no mechanical aeration. Another source of trouble is excessive algal "blooms" that decrease light penetration and lower oxygen concentration in deeper water. These may be safely controlled by periodic treatments with ¾ lb. of copper sulfate per surface acre.

Four-in. catfish fingerlings stocked by February and fed according to schedule reached harvestable size of 0.7 lb. by October; 8-in. fingerlings averaged 0.7 lb. by August when fishing began. In tests at Auburn where number of fishermen was not limited, they caught 2,655 lb. of catfish and 30 lb. of bass in the 10 months of fishing. (See table.) During the period 1,096 people per acre fished and caught 85% of the catfish stocked. The catfish spawned the second summer but not enough young escaped bass predation to maintain satisfactory fishing. Since few fish were left after heavy fishing, the pond was drained and restocked. Ponds that are lightly fished should provide good fishing for several years.

PERSONS FISHING, CHANNEL CATFISH CAUGHT, AND CATCH PER ACRE BY MONTHS, 10.7-ACRE POND, MAIN STATION, AUBURN, ALABAMA, 1966-67[1]

Years and months	Fishermen and catch per acre		
	Persons fishing	Channel catfish caught	
	No.	*No.*	*Lb.*
Fall, 1966			
August (1) opened	155	499	333
September	143	440	364
October (25) closed	107	320	332
Spring-summer, 1967			
March (15) opened	159	455	522
April	239	552	667
May	115	171	247
June	69	71	116
July	70	27	44
August	30	12	26
September (7) closed	9	1	4
TOTAL	1,096	2,548[2]	2,655

[1] Pond stocked with 3,000 channel catfish, 1,000 fathead minnows, and 50 bass per acre; fed daily in months of March through October.
[2] Total is 85% of channel catfish stocked.

Using High Moisture Corn in Steer Growing Rations

R. R. HARRIS, *Dept. of Animal Science*
J. K. BOSECK, *Tennessee Valley Substation*
W. B. ANTHONY, *Dept. of Animal Science*

CORN OR OTHER GRAIN can be stored at 25-30% moisture with minimum nutrient losses if storage is oxygen-free or nearly so. If properly handled, the grains come out of storage with a bright color and yeasty odor.

Feeding high moisture grains was first practiced by farmer-feeders with a small size operation who wanted to conserve all the feed nutrients they produced. Now the practice is spreading to some of the nation's big feeding operations. The idea is not new, being used at least 20 years ago in the Midwest.

Tests several years ago at Iowa State and Purdue universities with corn and at Texas A & M with milo showed that feeding value of these grains may be improved 8-10% with the oxygen-free fermentation process. In addition to improving feeding value, other important advantages include lowered grain loss during harvest and more efficient use of labor and equipment by early harvest.

In the fall of 1965, a sealed-bin structure was erected at the Tennessee Valley Substation so that high moisture shelled corn (HM) could be evaluated in cattle nutrition research. Corn was harvested with a conventional picker-sheller at moisture content of 28-30% and was stored as whole kernel corn in the sealed bin. When removed for feeding it was crimped with a commercial roller-crimper. Such corn must be prepared fresh for feeding since it spoils rapidly in warm weather.

Additional corn from the same area was put in a metal grain bin and dried by artificial heat to about 14% moisture. Conventional snapped corn (ear and husk) served as the control feed in all feeding trials.

In 1965-66 and 1966-67 experiments, corn or sorghum silage was fed as the major energy source for growing stocker steer calves. A supplement of 1.5 lb. cottonseed meal and 2 lb. of ground snapped corn was fed daily in addition to a full feed of silage. Dried or high moisture corn replaced the snapped corn on an equal weight basis for some of the treatments. The trials lasted 128 days, with 12 calves on each test ration each year.

Corn silage fed in 1965 was excellent, containing 44% grain on dry-matter basis, but that fed the following year was only mediocre (21% grain). Even so, animal performance data were not drastically different between years. The sorghum silage contained about 47% head both years and was considered excellent. A medium-growing, high grain content hybrid forage variety (NK-300) was the sorghum grown and PAG-488 was used for corn silage. All silages were about 31% dry matter at ensiling.

PERFORMANCE OF STOCKER CALVES ON SILAGE WITH SNAPPED, SHELLED, OR HIGH MOISTURE CORN, TENNESSEE VALLEY SUBSTATION, 1965-66 AVERAGES

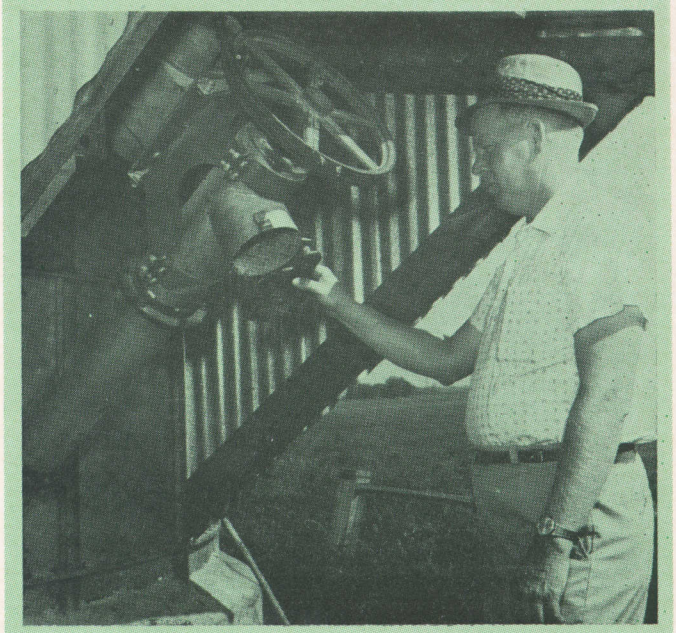
Performance factor	Result, by test ration			
	Sorghum silage + HM corn	Corn silage + corn		
		Snapped	Dry shelled	HM shelled
Initial wt., lb.	456	454	456	455
Final wt., lb.	652	673	664	662
Gain/head, lb.	196	219	208	207
Av. daily gain, lb.	1.53	1.71	1.62	1.62
Feed per head, lb.				
Silage	4,181	3,973	3,904	3,988
Cottonseed meal	192	192	192	192
Corn	254	254	254	254
Feed/cwt. gain, lb.				
Silage	2,142	1,815	1,886	1,928
Cottonseed meal	98	88	92	93
Corn	131	116	122	122
Feed cost/cwt. gain	$16.54	$13.86	$15.38	$15.12

Data in the table show that, as in previous studies, cattle fed corn silage gained faster than those getting sorghum silage (1.62 vs. 1.53 lb. daily). This was true even though the sorghum silage had grain content of 47%.

Calves fed snapped corn gained the fastest, 1.71 lb. daily, whereas those fed artificially dried or high moisture corn gained at the rate of 1.62 lb. These results indicate that HM corn was utilized more efficiently per unit of dry matter. The HM corn averaged 73% and the dried corn about 90% dry matter as fed.

Assuming that feed accounts for 75% of total cost of producing beef, then costs in these tests range from $18.48 to $22.05 per 100 lb. Thus, growing of stocker calves can be profitable for Alabama cattlemen if forages are used to maximum advantage.

Based on findings reported, snapped corn is preferred when available. Cattle performance was the same on dried or high moisture shelled corn, but the dry matter was utilized slightly more efficiently from HM corn. There are problems associated with feeding the perishable high moisture corn, such as feed spoilage, but being able to harvest corn early has compensating advantages.



Corn harvested at high moisture content was stored in this air-tight bin for use in feeding trials for growing stocker steers.

COMPUTERIZED RECORD SYSTEMS
What They Are and Can Do

BILL R. MILLER and VICTOR M. YELLEN
Department of Agricultural Economics and Rural Sociology

MODERN MANAGEMENT of a successful farm or any other business requires knowledge of an increasing amount of data as the business expands.

Farm business size in the South is beginning to grow rapidly. According to the latest census data for 10 Southern States, there were 20% fewer farms in the South in 1964 than in 1959, but commercial farms with more than 5,000 dollars gross sales had increased in number. Farms with more than 20,000 dollars gross sales almost doubled in number. Management efficiency will be enhanced if increased amounts of data resulting from larger businesses can be speedily summarized into a form suitable for decision-making. Electronic record keeping is one answer to improving management skills.

A survey of all known central record keeping programs conducted in fall, 1966 gave the following results: Eighteen replies were received from 26 programs. Thirteen programs responding were under the direction of various university personnel and five were directed by private enterprise. Most prominent of the private groups were programs now under the direction of the Farm Bureau and the Farm Journal. The largest programs were university related, up to 1,367 farmers in Michigan, but some private groups were forecasting 2,000 cooperators in 1968. One important interested private group was banks. The American Bankers Association has estimated that 100 banks are now offering some type of computer service. Several banks were participating in university and private programs included in the survey. Services offered by programs surveyed were in five categories: (1) tax records, (2) tax filing service, (3) cost and return for each enterprise on the farm, (4) general farm management analysis, and (5) research and education. Commercial services tended to be highly oriented to tax filing, whereas the university-related programs tended to be management analysis-research oriented. The oldest programs were university related; three in the survey were more than 35 years old. New programs were closely related to availability of computers. Ten new programs, of less than 5 years, began as computerized systems.

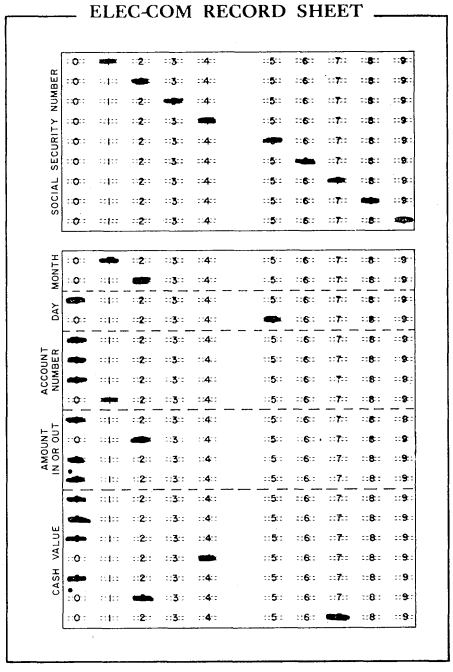
Complete systems covering all five service categories tend to be costly. The Department of Agricultural Economics and Rural Sociology, Auburn University Agricultural Experiment Station, established a research project, Elec-Com, in March 1966 with the objective of studying cost reductions in a completely automated management information system. To accomplish this objective two factors must be minimized: (1) cost of converting cooperator records to an input that can be digested by electronic data processing equipment, and (2) cost of a professional and clerical staff. One answer to factor one is automated input. This automation is least time consuming when using either an optical reader, voice interpreter, or an optical scanner. An IBM 1232 optical scanner as an input conversion device and a tape oriented IBM 7040-1401 data processing system were used as an approach to minimizing factor one. The second factor, reducing the cost of professional and clerical staff, is closely associated with type of code system, the person doing the coding, and where it is done.

The chart is of a scan sheet used in the project as an automated input device. As an example of its use, the cooperator filled in his social security number, 123456789, the date, December 5 (12/05), the account number, (0001), as looked up previously in a code book supplied to the farmer, and the number of cwt. of fertilizer bought. He had to convert 1 ton to 20 cwt. since the code book specified this to be the units used with this cotton fertilizer transaction. He was not required to code cotton as an enterprise and was not required to code the transaction as buy or sell as this information was coded in the computer as a part of the account number. He recorded the cash value ($40.27) of the fertilizer and the transaction record was completed. Every month the cooperator mailed his scan sheets to Auburn. The costs per transaction of this means of input to the computer have been found to be very low in comparison to other methods.

The table contains an analysis of the errors observed in using the system. Errors were divided into three types: (1) Type one errors were correctable by the system and comprised 11.4% of the year's total record entries, (2) type two errors were uncorrectable by the system and comprised 1.3% of total entries and, (3) a total of 1.4% type three errors was undetectable by the system as determined by an analysis at the end of the year. Errors of omission were perhaps the most substantial as a majority of the 30 cooperators obtaining year-end summaries had records that were incomplete.

Most farmers used records only for tax purposes although a few used them for management decision. As an example, several farmers kept detailed records of labor use on various jobs in their broiler enterprise. One set of records showed a cooperator that the $417 per year he was spending for labor for sweeping out broiler houses was more than enough to justify purchase of a sweeper attachment for his tractor.

This is a sample of scan sheet used in the project as an automated input device.



ERRORS IN THE USE OF ELEC-COM BY TYPE AND NUMBER FOR 7,300 TRANSACTIONS, MARCH, 1967

Field in error	Type 1 errors	Type 2 errors	Type 3 errors[1]
Social Security number	426	37	NA
Date	431	---[2]	NA
Account code	---[2]	47	94
Amount in or out	---[2]	7	8
Cash value	---[2]	8	1
Total errors	857[3]	99[3]	104
Total transactions	831	94	104

[1] Seventeen of the transaction errors were returned by cooperators and the remaining were estimated by system personnel by means of a questionnaire.
[2] Unchecked by the computer.
[3] More than one error of type one or type two can occur per transaction.

Tomato Variety Status— Good but Getting Better

WALTER H. GREENLEAF and SAM T. JONES
Department of Horticulture

THE TOMATO of yesterday isn't good enough for today, and today's varieties don't measure up to tomorrow's needs. Many surprises await the tomato fancier as breeders continue to discover new characteristics and incorporate them into improved varieties.

Despite the multitude of names, there are actually only three kinds of tomato varieties. Classification of tomato types is by the number of leaf nodes between flower trusses along the stem:

Type 1 – Tall growing indeterminate varieties with plants having three or more nodes between flower clusters, Fig. 1. (Indeterminate varieties mature fruit throughout the season, whereas determinate types mature most at one time.)

Type 2 – Intermediate height semideterminate varieties with plants having one or two nodes between flower clusters, Fig. 2. This type has the gene for self pruning, which causes the plant to terminate its growth in a flower cluster.

Type 3 – Dwarf determinate varieties, with plants having flower clusters at every node, Fig. 3.

Varieties of Type 1 produce best on tall stakes, those of type 2 on short stakes or unstaked, and type 3 varieties are best for unstaked culture. The concentrated fruit set of type 2 and 3 varieties is usually associated with more uniform maturity, which is essential for once-over machine harvest, Fig. 3. Desired fruit characteristics are the same for the three types, except that a smaller coreless variety is preferred for processing.

The ideal variety should have (1) heavy, concentrated fruit set, Fig. 3; (2) fruits that are large, smooth, thick walled, firm, and meaty, with a small core; (3) bright red external and internal color; (4) superior flavor, high acidity, and high total and soluble solids; and (5) resistance to cracking, wilt, rootknot, tobacco mosaic, and other diseases.

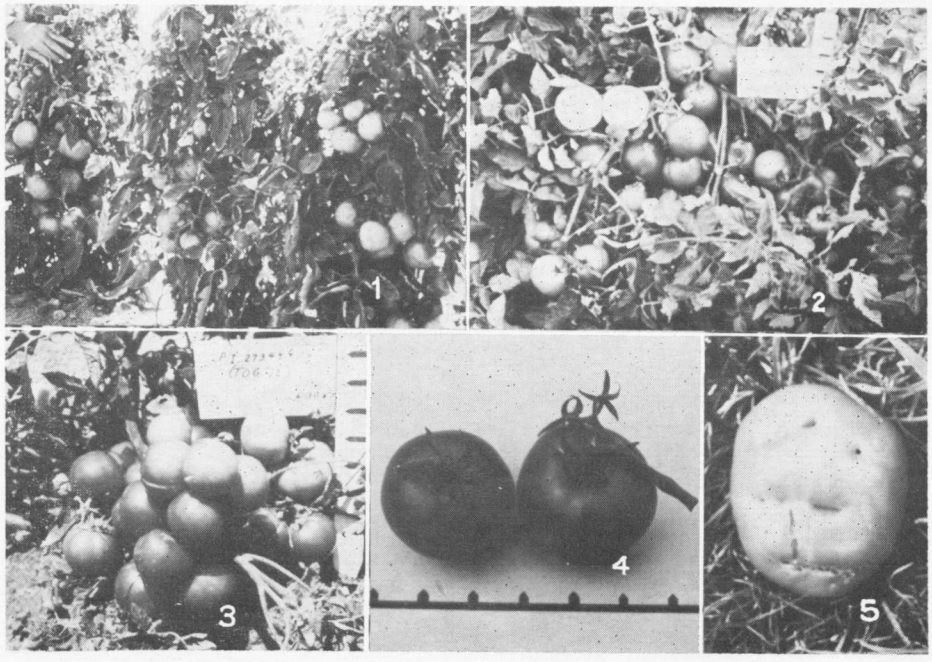
Tomato varieties of the future will probably be jointless – stem and calyx remaining on plant when fruit is picked – to eliminate hand stemming, Fig. 4. Being jointless will probably become an essential feature of all varieties for mechanical harvest to prevent premature fruit drop and fruit punctures. So far machine harvest is restricted to processing tomatoes, but it is likely for fresh market tomatoes when suitable varieties and improved harvesting machinery are developed.

Recommended varieties for the commercial fresh market are the indeterminate varieties Floradel, Manapal, and Marion and the semideterminate Homestead 24. The first two are medium late, high yielding varieties that produce firm, fairly crack resistant, slowly maturing fruits that are good for shipping. Marion is a mild flavored, productive, large-fruited, mid-season variety. Homestead 24, like Marion, is 3 to 4 days earlier than Floradel and Manapal.

Manapal seems to have the smoothest fruit of the four recommended fresh market varieties. In 1967, Homestead 24 had 46.8% as many catface and malformed culls as marketable fruit and Floradel 44.3%. The newly released Auburn variety, Atkinson, was about the same with 45.3%. The 12 varieties in the 1967 yield trials at Auburn ranged from 6.17% in AU21 to 184% in the Florida line STEP 516. Chances look good for controlling genetic defects that cause rough and malformed fruits like those in Fig. 5, thereby increasing marketable yields 40 to 90%.

Manalucie and the rootknot resistant Atkinson are primarily recommended as home garden varieties. Manalucie has large, deep, firm, smooth, and slowly ripening fruit of superior flavor. However, it has a green shoulder that ripens slowly, and a large core. Atkinson also produces large fruit that have good flavor, good internal and external color, and a medium to small core. Firm while mature green, it softens quickly after ripening. Atkinson is the choice for home gardens that have a nematode problem.

For processing purposes, the paste type varieties Roma and Chico Grande are recommended for Alabama. Both are determinate varieties that can be allowed to ripen fully in the field with a minimum loss from cracking and rotting. Fruit are small, firm, coreless, and pear shaped. Both varieties have yielded 20 to 25 tons per acre with usual production methods when hand harvested. Such yields should be possible with once-over machine harvesting by using varieties now being developed and improved cultural practices.



Different tomato types are shown here: 1—tall, indeterminate Floradel on stakes; 2—semideterminate variety of intermediate height. 3—dwarf determinate type having flower clusters at every node; 4—jointed (left) and jointless; 5—extreme catfacing.

Zinc deficiency in corn usually shows up as spots in field (left), with stalks having dark cross lines inside (center). Effect of zinc application to deficient field is illustrated at right. Larger corn at left got zinc, that at right same fertilizer without zinc.

Sources of Zinc for Plants

JOHN I. WEAR, D. L. HARTZOG, and E. M. EVANS, *Dept. of Agronomy and Soils*

ZINC IS RECOMMENDED for corn on sandy soils with pH of 6.0 or higher or when the soil is to be limed. These recommendations, in effect for 10 years, resulted from extensive field and greenhouse experiments.

Zinc sulfate was applied with the fertilizer in the tests; the recommendation has been 10 lb. of zinc sulfate per acre. Because of strong interest in other sources of zinc, the recommendation was changed to 3 lb. of zinc without reference to the carrier compound.

Sources of zinc for agricultural crops include:

(1) Agricultural grade of zinc sulfate ($ZnSO_4.H_2O$), containing about 35% zinc, is the most widely used source. It is readily soluble in water but may "cake" fertilizer if stored for several months after mixing.

(2) Zinc oxide, a fine white powder containing about 80% zinc, is not readily soluble in water and does not cake fertilizer. It is difficult to mix with fertilizer because of its fineness.

(3) Zinc EDTA is a chelated form containing about 14% zinc. It mixes well with fertilizer but is an expensive source.

(4) Zinc sulfide or sphalerite, containing about 60% zinc, is almost insoluble in water. This material is unavailable to plants when first applied to soils. Laboratory tests at Auburn show that bacterial oxidation in soils converts some of the insoluble sulfide to soluble zinc sulfate.

Greenhouse studies with the four sources were done on Norfolk loamy sand to determine relative uptake of zinc by plants. Sorghum, a good indicator plant, was grown for 4 weeks with three rates of zinc. Other fertilizers were added according to soil test result.

TABLE. 1. ZINC UPTAKE BY SORGHUM PLANTS FOR APPLICATIONS OF FOUR ZINC SOURCES IN GREENHOUSE TESTS

Zinc source and rate per acre	Yield of sorghum per pot[1]	Zinc uptake	
		Concentration	Total per pot
	Grams	*p.p.m.*	*μg.*
Zinc sulfate			
3.5 lb.	6.8	14.7	99
5.0 lb.	6.6	18.6	122
10.0 lb.	5.9	32.6	205
Zinc oxide			
3.5 lb.	6.5	14.5	94
5.0 lb.	6.4	17.2	111
10.0 lb.	6.7	25.8	173
Zinc chelate			
1 lb.	6.8	10.3	71
2 lb.	6.4	12.6	81
4 lb.	6.1	15.6	95
Zinc sulfide			
100 lb.	6.0	12.2	73
500 lb.	5.9	18.1	108
1,000 lb.	6.0	22.2	134
None	6.6	10.8	72

[1] Dry weight.

Although no differences in growth of plants were obtained, large differences in zinc uptake were noted for some treatments, Table 1. Zinc uptake was low when no zinc was applied and at the lowest rate of zinc chelate and with the zinc sulfide treatment. The 5-lb. rate of sulfate and oxide and the 4-lb. rate of chelate gave similar results. A 500-lb. rate of zinc sulfide was required to equal uptake from 5 lb. of zinc sulfate.

As a result of the greenhouse test, a one-time application of low rates of zinc sulfate and oxide was compared with a larger rate of the sulfide in field tests. Rates were based on the greenhouse test results. The first year tests were on Norfolk loamy sand (pH 6.2) near Auburn and were fertilized according to soil test recommendations.

Average yields for the 3-year period show a small increase for all sources of zinc, Table 2. Plants analyzed at the 3-ft. stage showed moderate increases in zinc concentration from zinc sulfate and the oxide and a large uptake from the sulfide applied 2 years before. The large uptake from zinc sulfide doubtless resulted from bacterial oxidation to the sulfate form.

Results from these studies indicate that zinc sulfate and zinc oxide are good economic sources of zinc for field crops. Sphalerite (zinc sulfide) used alone is too insoluble for immediate or short range use. However, it may have possibilities for blending with zinc sulfate to take care of both immediate and long range needs.

TABLE 2. RESPONSES OF CORN AND ZINC CONTENT OF PLANT FROM SOURCES OF ZINC IN A 3-YEAR FIELD EXPERIMENT AT AUBURN

Source of zinc and rate/acre	Per acre yield of corn				Zinc content of 30-in. plants	
	1965	1966	1967	3-year average	1965	1966
	Bu.	*Bu.*	*Bu.*	*Bu.*	*p.p.m.*	*p.p.m.*
None	52.6	42.2	54.8	49.7	27.4	29.2
Zinc sulfate, 3 lb.	56.6	45.9	66.8	56.7	35.9	36.5
Zinc oxide, 3 lb.	60.9	45.7	59.1	55.3	44.4	32.8
Zinc sulfide, (sphalerite), 500 lb.	68.0	47.2	63.5	59.6	81.0	102.1

New FUNGICIDES for Control of PECAN SCAB in Alabama

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Diseases are frequently a limiting factor in the production of pecans, the most important horticultural crop in Alabama.

Investigations of several new fungicides for control of pecan diseases have been conducted by the Auburn University Agricultural Experiment Station since 1961. Pecan scab, a fungus disease, has long been a major factor in the production of Success, Schley, Mahan, and other scab susceptible varieties. In 1966 the Stuart variety was attacked by a new race of the scab fungus and it is now considered susceptible.

With the development of efficient airblast and mist-blower sprayers, spraying of pecan orchards for disease and insect control has become a standard practice in Alabama. Simultaneous development of highly effective fungicides and insecticides has resulted in increased pecan production of better quality nuts with fewer off-years of low yields.

Six to eight applications of fungicides were sprayed on Success, Mahan, Stuart, and other varieties in orchards in Baldwin, Mobile, Autauga, and Montgomery counties (1961-1967) on a 3-week schedule from late April to early September. Sprays containing Duter (triphenyltin hydroxide), Brestan (triphenyltin acetate), and Cyprex (dodine) were applied with John Bean Airblast sprayers, Hurricane mist-blowers, or John Bean hydraulic sprayers. Insecticides were applied as needed throughout the season, usually in combination with the fungicide. Data were taken from 3 to 6 replicated, single-tree plots per treatment each year between August 25 and September 4. Scab data were collected using 50 green nuts from each tree before shuck-split.

Incidence of pecan diseases, particularly scab, was high throughout Alabama from 1964-67. Pecan scab was epiphytotic in 1965, and was widespread on Stuart pecans in 1966-67 for the first time in Alabama. Results of 4 years spraying of Success pecans in Baldwin County (Street Orchard) with new fungicides are given in Table 1. None of these 3 chemicals was used commercially for pecan spraying in 1961. Brestan, Cyprex, and Duter were all highly effective for scab control when applied on a 3-week schedule. Polyram, Parzate C, Kocide 101, and TD-225 gave inadequate control of pecan scab in most of these experiments. From these data it appears that 0.2 lb. is the minimum effective dosage of Duter on a 3-week schedule; the higher rates gave better disease control.

Results of 2 years spraying of Success pecan on a 4-week schedule in Mobile County are given in Table 2. Fair to good disease control was obtained in comparison with unsprayed trees, but commercial control was obtained only with Cyprex and the higher rates of 0.3 and 0.4 lb of Duter or Brestan. Control with 0.2 lb. was relatively poor.

Results from spraying Mahan and Stuart pecan trees for scab control were similar to those reported for Success variety. Excellent scab control was obtained in 1966 and 1967 in Montgomery County when Lewis pecan trees were sprayed with a Hurricane mist-blower on a 4-week schedule. Rates applied were from 0.4-0.7 lb. for Duter and Brestan and 1.7 lb. for Cyprex. These fungicides also gave excellent control of brown leaf spot, which was prevalent in this orchard. Duter controlled sooty mold in most experiments. The addition of 2 lb. sulfur (80-90)/100 gal. of spray applied in several midseason sprays gave excellent control of powdery mildew.

Spraying pecans commercially for disease and insect control is widespread. The major costs of spraying are in tractor and sprayer operation, and maintenance and labor. The expenditure for pesticide chemicals is a relatively small item. Data on disease control (Tables 1 and 2) clearly show the superior results obtained with 3-week spray intervals and the higher rates of fungicides in comparison with monthly applications and minimum rates of fungicides, which give partial control at best. This research indicates that pecan scab was controlled most effectively with 0.3 lb./100 gal. or equivalent of Duter or Brestan or 1.0 lb./100 gal. of Cyprex applied every 3 weeks from late April to September during the growing season.

TABLE 2. CONTROL OF PECAN SCAB ON SUCCESS PECAN BY FUNGICIDE APPLICATION AT FOUR-WEEK INTERVALS IN MOBILE COUNTY (1966-67)

Fungicide	Years	Rate per 100 gal.	Scab index	Scab infection of shuck		
				Clean	Light	Heavy
	No.	*Lb.*		*Pct.*	*Pct.*	*Pct.*
Cyprex	1	1.0	.28	80.5	15.5	4.0
Brestan	2	0.3-0.4	.25	84.0	14.5	1.5
Brestan	1	0.2	.41	69.5	29.3	1.2
Duter	2	0.3-0.4	.31	88.9	11.0	0.1
Duter	2	0.2	.54	66.9	27.6	5.5
Unsprayed	2	—	3.40	0	14.2	85.8

TABLE 1. SUMMARY OF FOUR YEARS CONTROL OF SCAB ON SUCCESS PECAN BY FUNGICIDE APPLICATIONS AT THREE-WEEK INTERVALS IN BALDWIN COUNTY (1964-67)

Fungicide	Years	Rate per 100 gal.	Scab[1] index	Scab infection of shuck		
				Clean	Light	Heavy
	No.	*Lb.*		*Pct.*	*Pct.*	*Pct.*
Brestan	3	0.3-0.4	.04	96.4	3.6	0
Cyprex	4	1.0	.11	89.9	9.7	0.4
Duter	2	0.6	.06	95.9	4.1	0
Duter	3	0.4	.05	95.3	4.5	0.2
Duter	2	0.3	.04	97.2	2.8	0
Duter	2	0.2	.16	89.2	10.2	0.6
Unsprayed	4	—	2.64	1.5	40.2	58.3

[1] Scab index: 0, no scab; 1, trace to 10%; 2, 11-25%; 3, 26-50%; 4, 51-100%.

Overwinter Survival of Root-Knot Nematodes

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THE ROOT-KNOT NEMATODE continues to be the chief nematode pest of many kinds of plants in the Southeastern States. This is why there is so much interest in all aspects of its life history in seeking ways for its detection and control.

As an example, the purpose of a new service available from the Nematode Analysis Laboratory at Auburn University is to provide control recommendations based on analysis of soil samples usually collected in the fall and winter months prior to spring planting. Accuracy of diagnosis depends upon an understanding of how the nematodes can overwinter, namely: stages of life cycle, their depths in the soil, and anticipated mortality rates from surrounding causes. This information is particularly important when concerned with production of annual host plants since such plants do not provide living roots to harbor the nematodes during winter such as occurs with perennial hosts.

Editor's Note: See your County Extension Chairman for complete information about this service, instructions, and for mailing containers.

At Auburn investigations of root-knot nematode overwintering have been conducted 2 years in a field where the ground was left bare following harvest until spring planting. The findings have been useful although they have not been entirely as expected.

Series of soil samples at various depths were made at intervals during winter up to planting time in a set of field plots providing uniform soil and root-knot disease conditions. The soil is a sandy loam overlying a hardpan at about a 24-in. depth.

In the past only the infective larval stage and males of root-knot nematodes could be found in soils assayed, and even though survival in other life history stages was indicated, details could not be obtained. Use of a recently developed soil processing technique in connection with standard processes enabled detection of all stages of the nematode in this study.

Under conditions that prevailed in the field at Auburn, the cotton root-knot nematode *(Meloidogyne incognita acrita)* survived the winter at all depths down to the hardpan. Infection of test plants occurred, with larvae hatched and already free in the soil and with other larvae subsequently hatching from eggs. The eggs remained together within the gelatinous matrix – the whole structure called the egg mass. Size of the egg mass was found not to be a reliable guide to the quantity of eggs contained.

Hatching was not induced by soaking in water for as long as 10 days, after which fungi frequently became apparent on the egg mass under laboratory conditions. If the eggs were released by disrupting the matrix, some hatching occurred. Perhaps in the field hatching is regulated by factors in addition to moisture, as is known for some of the cyst-nematodes that are closely related to the root-knot species.

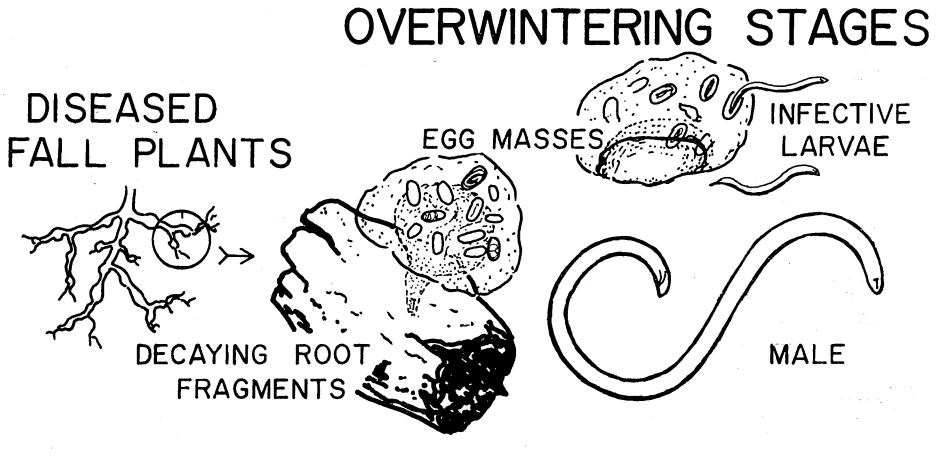
It was surprising to discover that living females persisted for such a length of time in dead and decaying fragments of roots, and in a few cases they contained or produced viable eggs from which larvae hatched and infected test plants.

Another surprise was the survival of infective larvae and egg masses in the upper inch of soil. The greatest quantity of males, larvae, and egg masses was distributed in the upper 12 in. with the top 6-in. layer generally containing the greater quantity. Numbers were reduced at depths below 12 in., with only a few specimens being found at the hardpan and none below.

The results of a current parallel study in Oklahoma indicate overwintering survival is only at the lower depths. Thus, climatic differences may be important in determining depth at which soil sampling must be done during late fall and winter months to detect this nematode. The actual importance of this under Alabama conditions is being checked in locations ranging from north to south.

The results of the overwintering study indicate that success of early planting as a means to escape severe root-knot disease development may depend on factors influencing hatching as well as distribution of surviving nematodes.

An immediate practical value of findings to date is confirmation that when soil samples are assayed for both larvae and egg masses a closer relationship results between the analysis and root-knot disease prediction. The question of how deep to take the samples in different climatic areas now has to be answered.



VARIATION of WOOD CHARACTERISTICS of SWEETGUM

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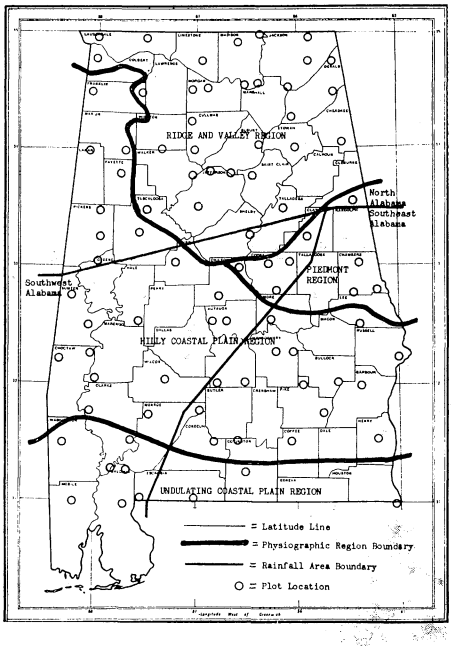
SWEETGUM is one of the most important southern hardwoods. It is currently receiving the attention of research foresters who are studying ways to develop and grow trees having higher growth rates and better quality wood. Knowledge of variation existing in wood is basic to the production of better trees.

Samples for studying wood characteristics were collected from 5 trees in each of 87 plots located in Alabama, see figure. Two 10-mm. cores consisting of wood extending from the pith to the bark were removed from each tree at breast height (4.5 ft.). Variables measured were: diameter, total age, percentage of colored heartwood based on years as well as inches, length of each of the first four 10-year growth intervals from the pith, and the specific gravity of each of these intervals.

To determine whether broad measures of environment were significant sources of variation in the wood variables, analyses were made so that differences between degrees of latitude, physiographic regions, and rainfall areas were tested. These classifications are delineated in the figure and means of the variables are presented in the table.

Generally, these broad categories accounted for only a small portion of the total variation in any given wood characteristic. But specific gravity and growth rate of wood formed during the first 20 years growth from the pith at breast height can be expected to vary with the broad measures of environment studied. While radial growth rate decreased, specific gravity increased from the southern to the northern portion of the state. Specific gravity and growth rate of wood 21-40 years from the pith and the proportion of colored heartwood do not vary to any degree between the broad measures of environment.

Correlations between all possible combinations of all variables were calculated. There was only a low correlation between specific gravity and growth rate, indicating that growth rate had little influence on specific gravity.



Plot locations, physiographic regions, rainfall areas, and latitudes included in the study of wood variation in sweetgum in Alabama.

MEAN VALUES OF VARIABLES STUDIED IN SWEETGUM AVERAGING 46 YEARS OF AGE IN ALABAMA

Classification of data	Colored heartwood years	Colored heartwood inches	Length of intervals				Specific gravity of intervals			
			0-10	11-20	21-30	31-40	0-10	11-20	21-30	31-40
	Pct.	*Pct.*	*In.*	*In.*	*In.*	*In.*				
Latitudes										
31°	18.4	19.4	2.20	1.93	1.39	1.18	.463	.477	.484	.483
32°	18.1	20.4	2.23	1.99	1.42	1.02	.474	.491	.490	.492
33°	18.9	17.5	2.07	1.98	1.48	1.07	.473	.488	.489	.489
34°	20.7	16.2	1.65	1.66	1.30	1.07	.482	.494	.492	.489
35°	25.1	20.8	1.68	1.69	1.28	1.06	.482	.502	.500	.501
Physiographic Regions										
Undulating Coastal Plain	15.0	17.1	2.50	2.13	1.56	1.18	.462	.473	.483	.483
Hilly Coastal Plain	19.1	19.1	2.02	1.88	1.39	1.07	.469	.487	.488	.488
Piedmont	18.0	18.1	2.38	2.13	1.49	1.05	.474	.489	.488	.498
Ridge and Valley	21.5	18.4	1.76	1.72	1.31	1.06	.483	.496	.494	.491
Rainfall Areas										
Southeastern Alabama	20.9	22.1	2.08	1.86	1.36	1.09	.470	.489	.490	.488
Southwestern Alabama	16.0	16.7	2.30	2.09	1.49	1.11	.470	.483	.487	.490
Northern Alabama	20.8	17.7	1.79	1.75	1.34	1.06	.479	.492	.490	.490
Mean ($\bar{x}$)	19.4	18.5	2.03	1.88	1.39	1.08	.473	.489	.490	.490

In sweetgum a definite zone of juvenile wood or core wood was found within the first 10 annual rings from the pith. But the small difference between juvenile and mature wood is probably not important enough to justify any change in current industrial procurement practices or usage of sweetgum.

Relationships between the percentages of colored heartwood and other variables appeared to be of little value in accounting for the variation in percentage of colored heartwood. But 10% of the trees sampled were 36 years of age or older at breast height and showed no colored heartwood formation.

Of the total variation found for any single variable measured, most was a result of variation between plots and between trees within plots. Variation between trees within plots interests the forest geneticist using individual tree selection, for this variation can indicate the presence of important amounts of genetic variation. The large between-tree variation found in specific gravity and percentage of colored heartwood suggests that enough genetic variation exists in sweetgum to warrant improvement in these characteristics through breeding programs.

Direct-Cut vs. Wilted Sorghum-Sudan Silage for Dairy Cows

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Different appearance of wilted (left) and direct-cut-sorghum-sudan is illustrated by these two samples of the test silages.

SORGHUM-SUDAN HYBRID forage harvested for silage in the immature stage is normally high in moisture content. Excess water in the forage increases problems of handling, seepage, and silo pressures, and generally results in unpredictable fermentation.

One approach to overcoming problems with high moisture silage is to wilt the forage before ensiling. This procedure was evaluated in 4-year tests at the Black Belt Substation, Marion Junction. A representative sorghum-sudan hybrid (DeKalb SX-11) was ensiled direct-cut and wilted to compare forage preservation, chemical composition, silage intake, and milk production.

Forage was harvested in the pre-head stage each year, about 42 days after seeding. Non-wilted forage was direct-cut with a forage harvester. That to be wilted was cut with a mower, conditioned with a stem-cracking machine, and allowed to wilt in the swath about 24 hours before being windrowed and chopped. All forages were ensiled in 15-ton experimental type tower silos.

Direct-cut or wilted silages were fed as the only forage to lactating dairy cows in 6-week feeding trials each year. In addition to silage, concentrates were fed each cow at the rate of 1 lb. for each 3 lb. of FCM (4% fat corrected milk) produced daily during a preliminary period that preceded each feeding trial.

Moisture content of direct-cut silages fed during the four tests averaged 82.3%, as compared with 66.4% for wilted silages. Differences in moisture content showed up in storage capacity of the silos. Approximately 20% more forage dry matter was stored per silo when wilted.

Forage preservation in the silo was similar for both treatments, with good silage recovered averaging 80.1 and 78.7% for direct-cut and wilted silages, respectively. Although there was little difference between ensiling practices in percentage of good silage recovered, differences showed up in the routes by which ensiled dry matter was lost.

No seepage losses occurred from wilted silage, but direct-cut forage averaged losing 3.5% of total ensiled dry matter as seepage. In addition, seepage created an unpleasant, foul smelling odor in vicinity of the silos. Average losses from spoilage and fermentation were higher for the wilted treatment than for direct-cut silage, but differences varied among years.

Data in the table show that average chemical composition of the silages did not differ widely. However, the crude fiber content of direct-cut silage was higher than that of corresponding wilted silages each year. This probably resulted from loss of some soluble nutrients in seepage from the direct-cut silage. Wilted silages had higher ash contents than direct-cut forages probably from soil contamination at harvest. Total digestible nutrient content of direct-cut silages averaged 6.3% higher than for wilted silages.

Silage consumption by cows on both rations was low. Intake of wilted forage dry matter per cwt. averaged 14.4% greater than for direct-cut silage. Nevertheless, cows consumed about the same total digestible forage nutrients daily from each of the silages.

Daily FCM production per cow was about equal on direct-cut and wilted silages, as shown in the table. Persistency of production was low for cows fed each forage.

Results of the Black Belt study indicate that lactating dairy cows perform equally well on direct-cut or wilted sorghum-sudan silage. However, high producing cows do not maintain a satisfactory level of milk production when either form of sorghum-sudan silage is the only forage.

Wilting before ensiling eliminates seepage and increases dry matter storage capacity of silos. On the other hand, wilting necessitates another field operation, requiring additional time and equipment and increases chances of weather damage.

Since cows performed equally well on the two silages, factors other than nutritional should be the basis for choosing between direct-cut and wilting methods.

COMPOSITION AND PERFORMANCE DATA COMPARING DIRECT-CUT AND WILTED SORGHUM-SUDAN HYBRID

Silage treatment	Composition, DM basis[1]			TDN	Intake DM/ cwt.	Lactation performance	
	CP	CF	Ash			FCM/ day	Persistency
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Lb.*	*Lb.*	*Pct.*
Direct-cut	9.4	34.7	7.4	55.9	1.32	32.0	82.9
Wilted	9.9	31.3	9.1	52.6	1.51	32.3	83.8

[1]DM, dry matter; CP, crude protein; CF, crude fiber; and TDN, total digestible nutrients.

MID-SUMMER ESTABLISHMENT OF COASTAL BERMUDAGRASS

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COASTAL BERMUDAGRASS can be established in mid-summer from mature green clippings as readily as from planted sprigs.

Use of this productive forage crop has probably been limited by the necessity of using vegetative materials (sprigs) for establishment. Planting green clippings offers an additional method that may be better suited to some farm situations than sprig planting. Green clippings are easily obtained using usual farm machinery.

Planting Coastal clippings was probably first tried on a field basis in Alabama several years ago at the Upper Coastal Plain Substation, Winfield. Since then numerous growers have successfully established Coastal by spreading freshly cut clippings on prepared land and disking into the soil.

A critical comparison of the clipping method with planting sprigs was needed, and four tests were established: July 23, 1963, July 17, 1964, and August 5, 1965, at the Lower Coastal Plain Substation, Camden; and July 11, 1963, at the Plant Breeding Unit, Tallassee. These tests compared conventional sprigging, disking in sprigs, and disking in green clippings.

All tests were on sandy loam soils that had been limed and fertilized according to soil test recommendations and tilled to provide a good seedbed. Plantings were made when soil moisture was good, using freshly dug sprigs and fresh clippings cut with a sickle-bar mower. Clippings were from grass that was 8 weeks old or older, so that each stem would have several joints or nodes for root initiation. Clippings from young grass contain few nodes and are too tender for use as planting material.

Rates of sprigs used were 1 per sq. ft., 1 for each 2 sq. ft., and 1 per 4 sq. ft. (the usual sprigging rate). Sprigs were dropped and covered conventionally or lightly by disking. Green clippings at rates of 5,200, 2,600 and 1,300 lb. per acre were spread and disked into the soil. These rates were equal to 1, ½, and ¼ ton of hay per acre, and were comparable in value to cost of the three rates of sprigs.

After planting, the test area was cultipacked and uniformly treated with a herbicide to control weeds. Evaluation was on the basis of dry matter yield per acre and estimated percentage of ground covered by Coastal.

EFFECT OF RATE AND METHOD OF PLANTING ON YIELD AND STAND OF COASTAL BERMUDAGRASS, LOWER COASTAL PLAIN SUBSTATION AND PLANT BREEDING UNIT, 1963-66

Rate and method of planting	First harvest[1]		Second harvest	
	Dry matter per acre[2]	Stand average	Dry matter per acre[2]	Stand average
	Lb.	*Pct.*	*Lb.*	*Pct.*
Clippings disked in				
5,200 lb./acre	2,852 a	80	3,925 a	100
2,600 lb./acre	2,060 bc	65	3,606 ab	99
1,300 lb./acre	1,594 c	52	3,153 b	90
Sprigs disked in				
43,560 sprigs/acre	2,360 ab	72	3,736 a	98
21,780 sprigs/acre	1,706 c	59	3,521 ab	98
10,890 sprigs/acre	1,564 c	49	3,633 ab	90
Sprigs in rows				
43,560 sprigs/acre	2,713 a	83	4,007 a	99
21,780 sprigs/acre	2,378 ab	77	3,829 a	98
10,890 sprigs/acre	2,055 bc	69	3,774 a	97

[1] First harvest after establishment was not until the following spring for three of the four tests.

[2] Any two averages followed by the same letter are considered equal; those not followed by the same letter represent differences resulting from the experimental treatments.

Treatment differences shown in the table were most evident the first harvest after establishment, which was not until the following spring for three of the four tests. At comparable rates all three methods were equally effective in establishing a stand, with one exception. At the intermediate rate, sprigs disked in were inferior to sprigs planted in rows.

Rate of plantings, regardless of method, had a pronounced effect on performance at time of first harvest. The high rate was superior to the intermediate and low rates for all planting methods, except when sprigs were planted in rows the intermediate rate equalled the high rate.

Advantage of using the high rate of planting material had largely disappeared by the second harvest, as measured by forage yield and stand estimates. By this time only the low rate of green clippings disked in had failed to completely overcome its earlier poor performance.

The general lack of planting method difference at the first harvest was also evident at second cutting. No difference existed among methods except at the low rate of planting. At this rate, sprigs planted in rows produced more dry matter than green clippings disked in.

Although the methods tested for mid-summer establishment were equally effective, planting at this season is not preferred over spring establishment with sprigs. Delayed planting lowers total production during the first season and moisture conditions are usually less favorable during mid-summer than in early spring.

Results of the studies identify three major findings:

(1) Coastal bermudagrass can be established equally well in mid-summer when moisture is ample by disking in green clippings, disking in sprigs, or planting sprigs in rows.

(2) The high rate of each method produced stands most rapidly as reflected by yield at first harvest.

(3) All rates studied produced good stands, 90% or better, and generally were equal by time of second harvest.

Preplant Herbicides for Sweetpotatoes

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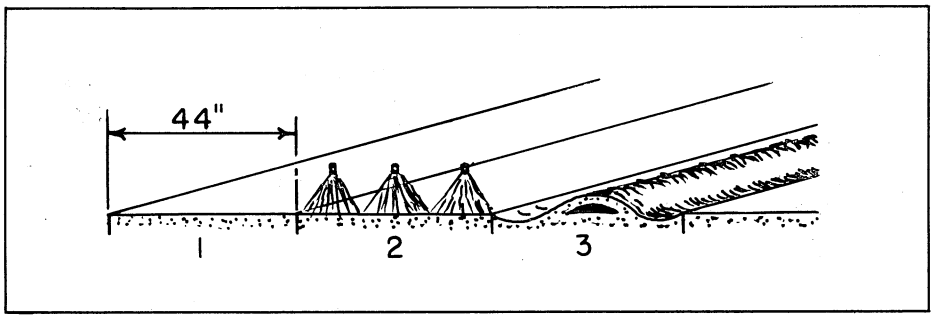
M. H. HOLLINGSWORTH, *North Alabama Horticulture Substation*

RESEARCH WITH HERBICIDES for weed control in sweetpotatoes in the past has dealt with post-plant applications.

For these to be effective they have to be applied on freshly prepared soil before emergence of weed seedlings. It is also necessary that ample moisture be present for activation. Good weed control is not always possible from post-plant applications, especially with volatile type herbicides, under droughty conditions. During sweetpotato planting season, April 20 through May 30 at Auburn, there have been 15 drought periods ranging from 2-4 weeks during the last 10 years. During these periods an average less than ¾ in. of rain fell. A similar condition existed in most areas of Alabama.

To offset effects of dry periods and other difficulties of post-plant application, the preplant applications of herbicides are being emphasized, especially the volative types incorporated into the soil. Two effective methods of application are: (1) bed over and (2) broadcast and bed. Neither method of application requires any special equipment. The bed over method, like the post-plant application, requires an extra trip over field for applying the herbicide. With the broadcast and bed method, the herbicides can be applied when rows are bedded by placing spray nozzles ahead of bedding equipment.

Studies with preplant and post-plant methods were made in 1962-64 using Eptam and Vernam at 2,3,4 and 6 lb. per acre rates on broadcast basis in a 14-in. band for the bed over method. For broadcast and bedded method, 1.0 and 1.5 lb. rates were used. In these studies yields were equal to the hoed check. Good to excellent weed control was obtained from 4 and 6-lb. rates when the bed over method was used and from the 1.5 lb. rate using the broadcast and bedded method. The 1.5-lb. rate broadcast amounts to approximately 3 lb. actual in the bedded row since middles are turned into the row in bed preparation.



Shown in No. 1 is soil flat broke and disked early. No. 2 herbicide broadcast width of row and No. 3 fertilizer applied and row bedding.

During the past 2 years the broadcast and bedded method of application has been used to study rates and effects of certain herbicides. Results are given in the table. Highest yields were obtained from 1.5 lb. per acre of Vernam and Eptam. When rates were increased above 1.5 lb., yields were slightly depressed except for the 3-lb. rate of Vernam at Cullman that produced the highest yield. At all rates weed control was good to excellent.

A new herbicide, Ordram, looks promising in tests. Yields for 2 years study at rates of 4.0 and 6.0 lb. per acre were equal or in excess of those from the hoed check; weed control was excellent. The predominant weed in these studies was crabgrass *(Digitaria* spp.). There were some pigweed and Florida pusley; these were satisfactorily controlled by herbicides used. During 1967 there was a considerable amount of new grass, Broadleaf signal grass *(Brachiaria platyphylla),* which is becoming widely spread. As shown by rating for control in the table, Vernam at 1.5 and 2.0 lb. gave fairly good control but Eptam gave best control. In field tests both Vernam and Eptam gave good control of nutsedge (*Cyperus* spp.) and coffeeweed *(Daubentonia texane)* in the treated area.

Vernam has label clearance for using preplant and Eptam and Ordram will likely have label clearance soon.

EFFECT OF SEVERAL HERBICIDES APPLIED PRE-PLANT BROADCAST AND INCORPORATED ON WEED CONTROL AND ON YIELD OF SWEETPOTATOES

Herbicides, broadcast and bedded		Total yields at Auburn				Per acre at Cullman	Weed control rating[1]						Vigor[2] rating	
							Crabgrass				Broadleaf signal grass	Crabgrass Cullman		
Kind	Rate/a	1964	1965	1966	1967		1964	1965	1966	1967			1966	1967
						1966					1967	1967		
	Lb.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*								
Vernam	1.0	230	617				9.6	8.4						
Vernam	1.5	275		395	522	531	9.6		8.9	9.6	8.0	9.4	9.4	9.7
Vernam	2.0		658	299	425	483		9.4	9.3	9.9	7.7	9.9	9.0	9.4
Vernam	3.0			324	395	540			9.4	9.9	8.7	9.9	8.8	9.5
Eptam	1.0	240	669				9.7	8.1						
Eptam	1.5	245	614	363	543	513	9.7	8.6	9.0	9.9	9.0	9.8	9.0	9.6
Eptam	2.0		647	296	508			9.1	9.6	10.0	9.6		8.4	9.3
Eptam	3.0			318	430				9.5	10.0	9.7		8.6	8.9
Ordram	2.0			227	529				6.9	9.7	9.7		9.1	10.0
Ordram	4.0			381	578				8.7	10.0	9.7		9.8	9.9
Ordram	6.0				596					10.0	10.0			9.8
Check, hoed		271	660	352	472	532							9.5	10.0
Check, not hoed		221	552	127	135		0.0	0.0	0.0	0.0	0.0			

[1] Weed control rating: 0 = no weed control; 10 = complete control.
[2] Vigor rating: 0= no growth; 10 = excellent growth.

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HIGHLIGHTS of Agricultural Research

1967

HIGHLIGHTS with this issue enters its 15th year of publication. It was established in 1954 for the purpose of reporting results of research by the Agricultural Experiment Station to Alabama farm families, agriculturally based business, and industry.

Early issues were 8-page editions. To meet demand, the quarterly was doubled in size and increased to 10,000 copies. If you do not keep a file of Highlights, please share your copy with neighbors. Listed below are the articles published in last year's four issues.

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EFFECTS OF FEEDING INSECTICIDE-SALT MIXTURES TO STEERS—Brown and Hays. Vol. 14, No. 2. 1967.

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MANAGEMENT OF BEEF CATTLE IN CONFINEMENT—Harris, Anthony, and Brown. Vol. 14, No. 3. 1967.

RELATIONSHIP OF PERFORMANCE RECORDS TO SALE PRICE OF TESTED BULLS—Patterson and McGuire. Vol. 14, No. 2. 1967.

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DELAYING MATURITY *in* BROILER BREEDERS

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THE POULTRYMAN who delays maturity of his broiler breeders can gain in several ways.

During the last 5 years, a series of experiments by Auburn University Agricultural Experiment Station has been done with broiler breeders to ascertain the best method of raising such birds for top efficiency. Since broiler breeders are kept for the purpose of providing salable chicks, all other factors involved were made secondary.

Investigators elsewhere have evaluated systems of raising broiler breeders using such indexes as body weight, egg production, and age to maturity as measures of improvement. However, little research has been done on production of salable chicks as affected by feeding.

In early experiments, it soon became evident that delaying maturity of broiler breeders within limits had beneficial results. For instance, early eggs from birds on full feed during the growing period were small and resulted in fewer and poorer quality chicks than those from breeders on a delaying treatment. In addition to producing normal size eggs at start of lay, birds on the restricted diet during the growing period consumed less feed in the laying house, and, therefore, were more efficient.

Early experiments also demonstrated that feed restriction during the laying period was not advisable. It was also shown that birds raised during the fall could have their maturity delayed best by restricting the diet to 77% of that normally eaten during the period of 8 to 24 weeks of age, or by subjecting the birds to a declining light schedule normally experienced at that time of year. Spring-hatched heavy breeder chicks, however, required a combination of feed and light restriction treatments to obtain the best results.

In restriction programs, it was found that the type of litter on which the birds were placed was important since it could contribute to dietary intake in some instances. Cannibalism was rarely encountered in any of the treatments.

In all of these studies, the Pilch White Rock strain chicks was used. It was found that delaying maturity by water restriction, feeding grit, diluting the feed so that the protein or lysine content was extremely low, and several combinations of these and other systems were not as efficient. While these systems may have proved acceptable by standards of body weight at 24 weeks and days to maturity, they failed to produce as many salable chicks as the 77% restricted diet.

The most recent experiments demonstrated that all methods tested during the 5 years skip-a-day feeding (feeding alternate days) proved best, see table. Gross feed restriction (77% of the previous week) or light restriction was also satisfactory for fall-hatched chicks; spring-hatched chicks needed both.

After 24 weeks the birds were full fed a breeding mash. Manipulating the feed formulas involved changing feed and required the services of a nutritionist. The results were not consistent. Protein and lysine restriction produced higher mortality in almost every experiment.

COMPARISON OF METHODS USED TO DELAY MATURITY IN HEAVY BREEDER PULLETS, 1966-67

Method of delaying maturity	Time to maturity	Body weight 24 weeks	Av. egg production 252 days	Daily feed intake/day during lay period	Chicks per hen housed
	Days	*Lb.*	*Pct.*	*Oz.*	*No.*
1. Control (full feeding)	154	7.1	58.3	5.1	105
2. 77% of full feeding	164	6.4	59.3	4.9	115
3. Full feeding every other day	164	5.4	60.1	4.7	122
4. Full feeding + grit free choice	154	6.8	59.3	5.1	116
5. Corn, minerals, vitamins + 5% fat	175	5.1	56.9	4.6	107
6. Corn, minerals, vitamins + 0.01% methionine	171	5.4	53.6	4.7	92
7. Full feeding every other day + grit and oats	167	5.8	58.7	5.5	101

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