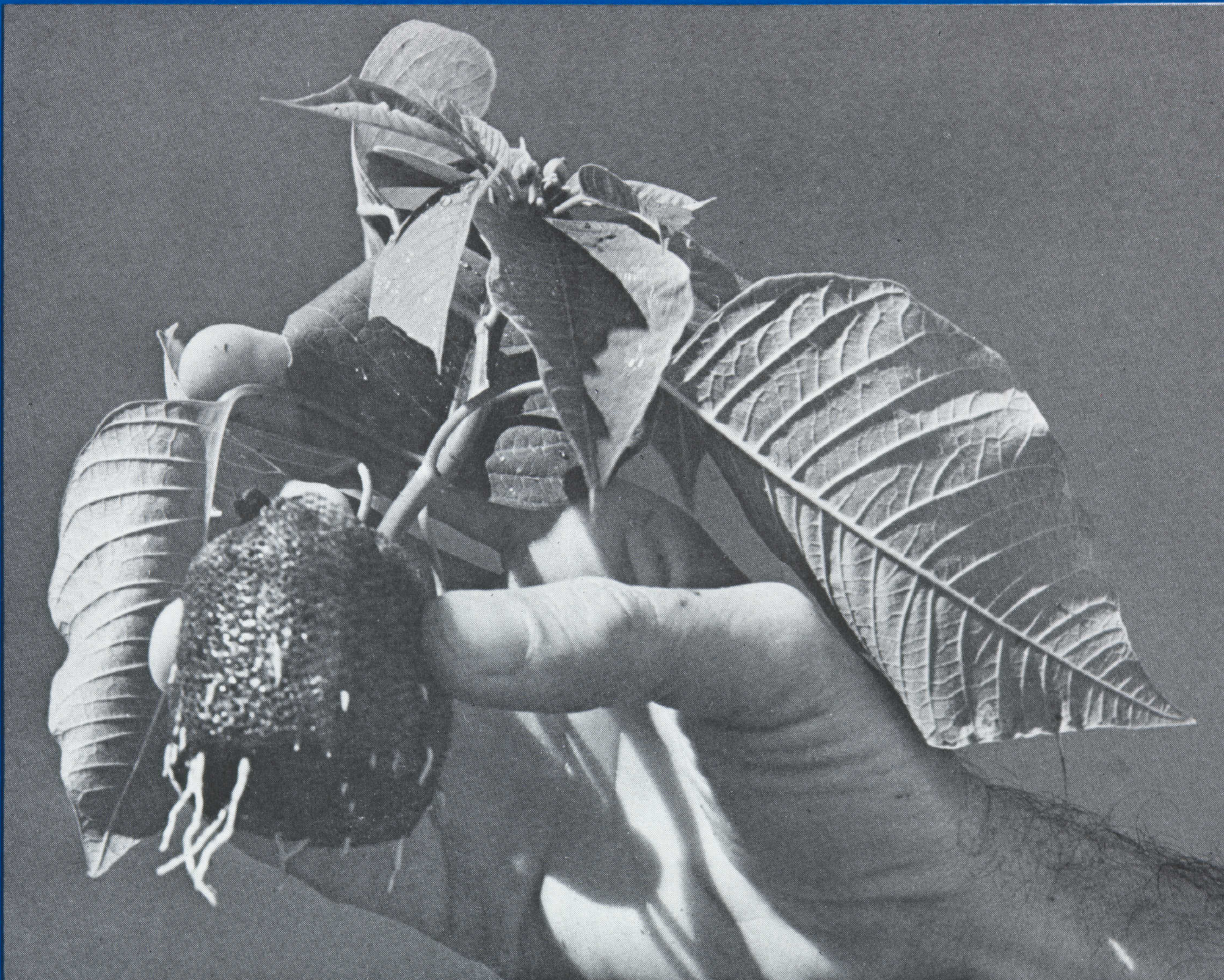

VOL. 21, NO. 4/WINTER 1974

HIGHLIGHTS

of agricultural research

AGRICULTURAL EXPERIMENT STATION/AUBURN UNIVERSITY
R. Dennis Rouse, Director
Auburn, Alabama

DIRECTOR'S COMMENTS

AT THIS WRITING, Alabama farmers are engaged in perhaps the most bounteous harvest in history. Peanut yields are exceptional. Soybean yields are average but acreage being harvested, just under 1 million, is the largest on record. Soybean prices are inconceivable when compared to those of a couple of years ago. Corn yields are also high and price per bushel is good. The picture of the cotton farmer is not so bright. Yields are not high and prices are low compared to last year. Beef cattle producers have little to rejoice about. Cattle numbers and feed prices are at an all time high but beef prices are unbelievably low. Inputs in poultry, dairy, swine, and catfish production are high and more than offset prices being received. A reflection on these changes brings amazement at the changing outlook of agriculture.

R. DENNIS ROUSE

On October 1, I attended a briefing by Secretary of Agriculture Earl Butz. He told us the Nation's agricultural policy is to promote all-out production and to support a policy of unrestricted exports of agricultural products – let supply and demand determine price. The same weekend, President Ford asked that two large sales of grain to Russia be stopped. This was certain to have a depressing effect on price of feed grain. One can argue the pros and cons of President Ford's action but it emphasizes one of the dilemmas facing the farmer. This Government or other governments can with a word make decisions that override the normal law of supply and demand when months of decisions and investments are required to produce the supply and create the demand. This combined with the uncertainties of weather and pests certainly seem to be a sufficient challenge for the farmer.

I am told that Japan's national policy is to have a 3-week food reserve on their land for their 100 million people with another 3 weeks afloat on the way. Any mention of export restrictions by the United States causes great concern among other countries and to provide a hedge against export restrictions is perhaps the primary reason Japanese businessmen are acquiring land and beginning farming operations in both North and South America. Most nations that depend on United States grain expect the U.S. to maintain a reserve to meet their need. People of other nations should expect to share costs and responsibilities of this reserve in such a way that the United States producer can realize a more reasonable return on his investment.

Our national leaders should know that agricultural products are a symbol of national strength. Whether we, a democratic government with a compassion for our fellow man, can use it at the bargaining table is questionable. We do know that other nations could and perhaps will when the opportunity arises. Therefore, we as a Nation have to be concerned about how other countries use grain we sell to them.

This Nation is fortunate with its vast acreage of good agricultural land and a climate favorable for production of crops and livestock. However, we can never be an island unto ourselves nor should the world depend on us to provide an ever increasing percentage of its food needs. The world cannot support unlimited population growth. It can, however, provide for many more than currently if we are willing to pay the cost and can afford the cost. As we develop a national agricultural policy of all-out production and unrestricted exports, we must do so as stewards of the soil and ensure that the fertility of our soil is not decreased nor our national resources exploited unnecessarily.

may we introduce . . .

Dr. Kenneth C. Sanderson, associate professor of floriculture, reports on one phase of his Auburn research in the article on page 3. A member of the research and teaching staff of the Department of Horticulture, he deals with various phases of propagating and growing ornamental plants for pleasure and profit.

A native of Woodbury, New Jersey, Sanderson came to the Auburn faculty in 1965 from Louisiana State University where he was assistant professor. He also had worked as greenhouse manager at University of Maryland and managed a retail florist shop for 2 years in his home town.

Sanderson graduated from Cornell University, receiving the B.S. degree in 1955. He holds both M.S. and Ph.D. degrees from University of Maryland, where he specialized in floriculture and plant pathology. His major was horticulture.

A member of Pi Alpha Xi, national ornamental horticulture society, as an undergraduate, Dr. Sanderson was instrumental in establishing a chapter at Auburn University earlier this year. He now serves as faculty advisor to that chapter. He holds membership in Sigma Xi and Gamma Sigma Delta at Auburn, and is active in the American Society for Horticultural Science.

HIGHLIGHTS of Agricultural Research

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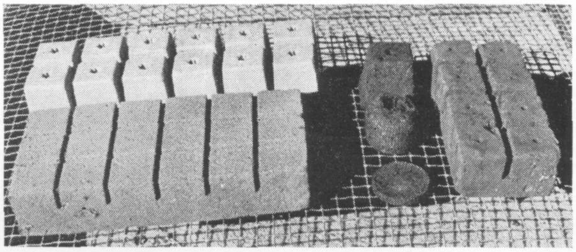
ON THE COVER. Plants rooted in individual synthetic media units can be transplanted without damage or loss in growing time.

Solid State, Synthetic Growing Media Show Advantages in Auburn Tests

KENNETH C. SANDERSON and WILLIS C. MARTIN, JR., *Dept. of Horticulture*



Different types of solid state, synthetic growing media were evaluated at Auburn.

SOLID STATE synthetic growing media can take the drudgery out of starting new plants. These products eliminate soil storage, measuring, mixing, fertilizing, disinfesting or "sterilizing," and potting. Seed or cuttings are sown directly by hand or machines into a clean, sterile, uniform unit which serves both as a medium and a container.

Units are lightweight, easy to handle, compact to store, economical to ship, and suitable for mechanical transplanting. Transplanting is done directly into the field with no wilting, damage, transplanting shock, or loss in growing time. Seeds and cuttings of all plants that are usually started in peat, clay, or plastic pots may be started in solid state synthetic media.

Commercial Products Tested

Trademark products that were satisfactory in Auburn University Agricultural Experiment Station tests were BR-8, Jiffy 7, Kys-Kube, Oasis 902, and Quikee Sure Start. These were compared with peat pots filled with a loose synthetic medium of peat moss and vermiculite (Jiffy Mix) for rooting and subsequent growth of azaleas and poinsettias.

BR-8's are made from soft kraft, wood pulp stabilized with an acrylonitril resin. A new BR-8 now available is light brown in color with the wood fibers arranged in a hairpin design to prevent fracturing. The original BR-8, which was off-white, fractured easily because the wood fibers were laid down in a single horizontal plane. BR-8 blocks are available in cakes of 12 or 18 units with five hole sizes to accommodate different size seeds, cuttings, and plant species. Limestone, trace elements, and enough nitrogen, phosphorus, and potassium to sustain a cutting for 3 weeks are added to the block.

Jiffy 7's are highly compressed pellets of sphagnum peat moss encased in a plastic net. Compact to store, the pellets must be expanded by saturating with water prior to use. While only one size is available, Jiffy 7's are amended with various amounts of limestone, trace elements, nitrogen, phosphorus, and potassium to produce three types of pellets: No. 700 for seeds and seedlings, No. 703 for flower cuttings, and No. 705 for nursery cuttings.

Kys-Kubes are individually compressed cubes of peat moss and vermiculite which resemble an inverted square peat pot. Almost any size cutting or seed can be wedged into the cube since it has a large diameter, shallow hole, with a wedge shaped slit at the bottom. Initially, Kys-Kubes are difficult to wet.

Oasis 0-902 loafs are made of a cellular phenolic foam similar to the material used to hold flowers in flower arrangements. Molded into pre-punched units of 8 blocks, 0-902 loafs are lightweight, pathogen free, fragile, non-splitting, and water absorbent.

Essentially Quickee Sure Start looks and has the same characteristics as Oasis 0-902. Expanded phenol-formaldehyde plastic foam is used to form Quickee Sure Start into 8, 18, 36, or 72 units ranging in size from 1 to 2½ in. The units are not prepunched, but the soft texture of the foam facilitates seed or cutting insertion.

ACIDITY AND CHEMICAL CONTENT OF TEST MEDIA

Media	pH	Soluble salts (1:5 dilution)	Element (p.p.m.)			
			NO_3	P	K	Ca
Original BR-8	5.5	40	25	25-30	20-40	100
Jiffy-7 No. 700	6.0	45	25-50	10-15	20-40	100
Jiffy-Mix	4.5	28	25	5	5	100
Kys-Kube	6.1	18	2	5-10	10-20	100
Oasis 0-902	6.6	0	0-2	5-10	0	0
Quickee Sure Start	5.2	40	10	0-1	0	0-40

The pH, total soluble salts and Spurway analysis of nitrates, phosphorous, potassium, and calcium of the media tested were determined, see table.

Cuttings Rooted Satisfactorily

On September 16, cuttings of the poinsettia cultivar Rochford were propagated under mist in the various solid state media. All cuttings rooted satisfactorily and were potted in a medium of equal volumes soil, peat moss, and perlite to determine any subsequent effects on growth. Data taken at flowering revealed that cuttings propagated in Kys-Kubes produced the tallest plants with the largest flower bracts, as shown here:

Media	*Height, in.*	*Bract diameter, in.*
Original BR-8	12.0	13.8
Jiffy 7	11.8	14.2
Kys-Kube	13.4	14.7
Oasis 0-902	10.7	12.6
Peat pot with Jiffy Mix	12.1	14.3
Quickee Sure Start	10.3	12.8

Cuttings of 'Kingfisher' azaleas were propagated under mist on November 11 using the various media. Approximately 8 weeks later rooting and plant appearance were rated on 0 (poor) to 5 (excellent) scale and the cuttings were potted into sphagnum peat moss. At potting and 3 months later, the number of plants surviving was recorded. All media blocks were potted at the soil surface level. Quickee Sure Start propagated cuttings had the highest scores for rooting, appearance, and plant survival, as shown here:

Media	*Rooting score*	*Plant appearance*	*Plant survival, pct.*
Original BR-8	2.8	1.8	43
Jiffy-7 No. 700	2.4	1.8	63
Kys-Kube	2.7	1.5	48
Oasis 0-902	3.4	1.8	78
Peat pot with Jiffy Mix	3.5	1.6	68
Quickee Sure Start	3.8	2.3	80

COLD TOLERANCE IN CENTIPEDEGRASS

W. J. JOHNSTON and RAY DICKENS
Department of Agronomy and Soils

THOSE WARM WINTER DAYS that we all enjoy may be killing your centipedegrass lawn. Although well adapted to much of the lower South, the use of centipedegrass has frequently been limited by its lack of winter hardiness. Research on this problem determined the relative cold tolerance among centipedegrass selections and the ability of centipedegrass to acquire or lose cold hardiness.

Field Evaluation

A field test for winter survival was conducted at Auburn, with six selections. At establishment in June, 1972, each plot was fertilized with the amount of potassium fertilizer necessary to produce a high soil test K value and 1 lb. per 1,000 sq. ft. of N applied as ammonium nitrate. One-half of each plot received 1 lb. of N per 1,000 sq. ft. per month in early August, September, and October. The remaining one-half of each plot received no N. During 1973, N was applied monthly from June through October using the same N source and rate. Winter damage was evaluated in late April, 1973 and 1974, when all selections had initiated spring growth, but had not produced sufficient growth to mask the effects of winter kill.

There were only minor differences in cold tolerance among the centipedegrass selections. P11A showed the least amount of winter kill, Mississippi II the most, and remaining selections were intermediate when data were averaged over the 2-year period, see table. Nitrogen fertilization had no effect on winter kill, however, results from another experiment at Auburn indicate that N applied on a mature centipedegrass sod during September and October significantly increased winter kill.

Environmental Chamber Investigations

Centipedegrass sprigs were grown in a sand culture, cold hardened, and exposed briefly (4-hour period) to subfreezing temperatures. Plants were then placed in a greenhouse and top-kill of leaves and stolons was rated after 1 week and plant survival was observed after 3 weeks.

These environmental chamber studies indicated that no selection had a superior ability to survive a low-temperature exposure, see table. Although of less importance than overall survival value, amount of top-kill did vary among selections. Selections could be placed in two general groups: Those showing the least top-kill were Mississippi 1, Tennessee Hardy, Oaklawn, and FC-2 and those showing the most top-kill were P11A, Mississippi II, and FC-8.

COLD TOLERANCE OF CENTIPEDEGRASS SELECTIONS

Selection	Field winter survival[1]			Environmental chamber	
	1973	1974	2-year av.	Survival	Top-kill
				Pct.	*Pct.*
Tenn. Hardy	----	----	----	63	53
Oaklawn	5.2	4.2	4.7	66	52
P11A	5.3	5.9	5.6	64	58
Miss. I	4.8	4.5	4.7	67	48
Miss. II	3.3	4.5	3.9	61	58
FC-2	3.8	5.2	4.5	60	51
FC-8	4.3	5.0	4.7	59	69

[1] Winter survival rated 1 through 10; 10 = best survival.

Centipedegrass exposed daily to a 12-hour light-dark regime with a 60°F day and a 40°F night was found to acquire maximum cold hardiness in a period of 10 days, Figure 1. Cold hardening periods longer than 10 days did not improve hardiness. Also, unlike some grasses, a long night alone does not appear to induce cold hardiness in centipedegrass. Only a combination of a long, cold (40°F) night, such as occurs during late fall and winter, can ensure maximum low temperature resistance in centipedegrass.

Although centipedegrass has the ability to become cold hardy in 10 days under favorable hardening conditions, the brief 2-day period of suitable growing conditions causing total loss of hardiness is possibly of greater significance, Figure 2. This rapid loss of cold hardiness is thought to be an important cause of winter injury to centipedegrass in the Southeast where winters are often interrupted by brief periods of mild weather.

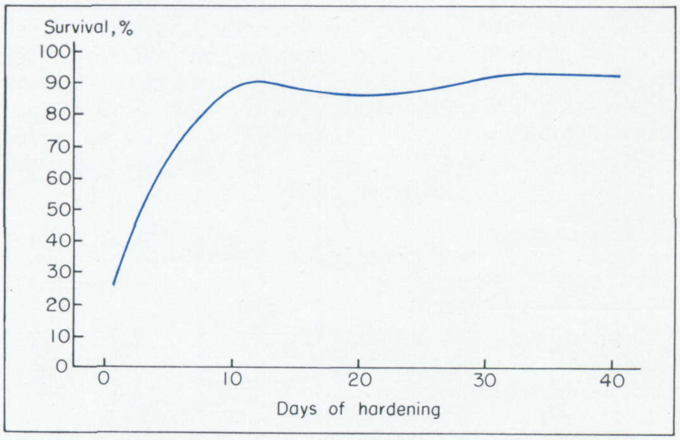


FIG. 1. Length of cold period needed to develop cold hardiness.

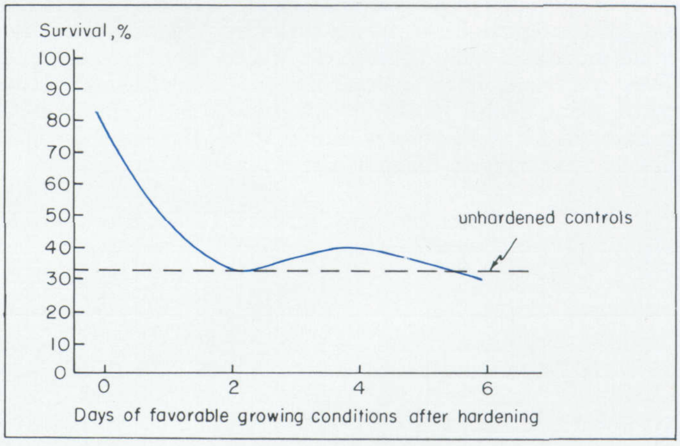
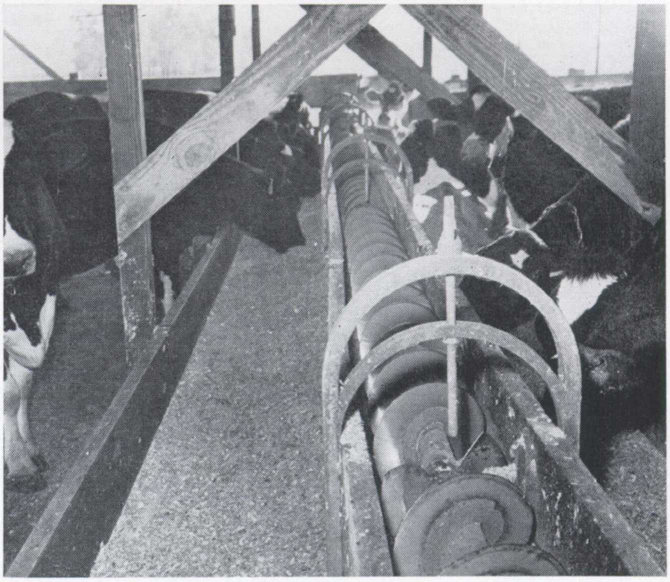


FIG. 2. Effect of favorable growing period on loss of cold hardiness.

CORN-UREA PREMIXES FOR DAIRY COWS

GEORGE E. HAWKINS
Department of Animal and Dairy Sciences



UREA SUPPLEMENTATION of dairy rations has given both satisfactory and unsatisfactory results. Concentrates containing more than 2% urea have been unpalatable to dairy cattle. Reduced feed intake because of low palatability possibly explains some unsatisfactory results from feeding high-urea concentrates to lactating cows.

Urea Use Studied

Possible use of urea supplementation was investigated in a study at Auburn University. Urea-corn premixes in both meal and pelleted forms were evaluated as the only protein supplement in basic low-protein blended rations for lactating dairy cattle.

Eighteen dairy cows in mid to late lactation and producing 26 to 62 lb. (average = 38.4) of milk daily were used in the experiment. Average body weight of the cows was 1,184 lb. These cows had been consuming urea in their feed for several weeks and were standardized 1 week on a blended ration consisting of 2 parts corn silage and 1 part 18% crude protein concentrate mix that included 2% urea.

After standardization the cows were assigned to test rations to compare these protein supplements: (1) a 17% urea-83% corn premix (55% crude protein) as meal (UCM); (2) the same urea-corn mix, but pelleted (UCP); and (3) cottonseed meal (CSM). The supplements were combined with ground yellow corn, citrus pulp, dicalcium phosphate, and trace mineralized salt to form the three concentrates. The concentrate mixtures (33 parts) and corn silage (67 parts) were blended and fed free-choice during a 40-day experiment. The blended rations were designated UCM, UCP, and CSM to identify the kind of supplement.

Dry matter percentages in blended rations as fed were: CSM, 45.3; UCM, 44.1; and UCP, 43.0. Crude protein and sulfur percentages (dry matter basis), respectively, of rations were: CSM, 12.8 and 0.15; UCM, 12.8 and 0.14; and UCP, 12.5 and 0.12. The sulfur levels were adequate to meet minimum requirements of rumen microorganisms for synthesis of protein from urea nitrogen.

PERFORMANCE ASSOCIATED WITH RATIONS[1]

Performance measure[2]	Ration designation		
	CSM	UCM	UCP
Milk per cow daily, lb.	35.1	31.4	31.7
Milk composition			
Fat, pct.	3.60	3.02	3.03
Protein, pct.	3.46	3.31	3.21
Total solids, pct.	12.96	11.77	12.62
Body weight change/day, lb.	0.60	−0.56	1.42
Dry matter intake/day/100 lb. body wt.,[3] lb.	2.98	2.17	2.38

[1] Averages for 6 cows per ration.
[2] With the exception of weight change, all performance values were adjusted to take into account initial cow variations.
[3] Cows were individually fed.

Feed Intake Depressed

Daily feed intake (dry basis) per 100 lb. of body weight was greater by cows fed the CSM ration than by cows fed the UCM or the UCP ration, see table. Blending of urea into the complete rations did not overcome the palatability problem, but pelleting of the urea-corn premix seemed to slightly improve intake.

As shown in the table, cows fed the CSM ration produced slightly more milk containing higher percentages of fat and total solids than cows fed the UCM and UCP rations. The loss in body weight and the low feed intake indicate that energy was the first nutrient limiting milk production by cows fed the UCM ration. Since cows fed the UCP ration gained weight, it seems that their depressed milk production was due to poor utilization of urea as a protein supplement. Also, the high ammonia levels in the rumen fluid of cows fed UCM and UCP rations suggest an inefficient conversion of urea nitrogen to protein by rumen microorganisms.

Problems and Potential

Results of the Auburn trials reported point to definite problems associated with urea in dairy rations. Blending of urea into the complete ration did not overcome its depressing effect on feed intake. However, a combination of pelleting the urea-corn premix and blending it with the complete ration appeared to have a slight beneficial effect on feed intake. Milk production was lower by cows fed the urea-containing rations than by those fed the CSM supplemented ration. Nevertheless, some feed price situations may make it profitable to use urea to provide a limited portion of a ration's protein equivalent.

PROMISING CROPPING SYSTEM:

small grain-clover grazing double-cropped with soybeans

R. R. HARRIS, *Department of Animal and Dairy Sciences*
N. R. McDANIEL and J. E. BARRETT, JR., *Gulf Coast Substation*

AUBURN RESEARCH clearly established that growing out stocker cattle on cool-season annual grazing crops can be an excellent program. In recent years, soybeans have been in a favorable market position because of world demand. Therefore, growing winter grazing and soybeans in sequence so that a given land area would produce one crop of each annually could offer opportunity for increasing return per unit of land. Such a double-cropping system looked good during 1972 and 1973 testing at the Gulf Coast Substation, Fairhope.

Cropping Procedure

Soybeans were planted in early June and harvested during early October. Following soybean harvest, the land was disked two or three times and a pasture mixture of rye, ryegrass, and clover seeded as soon as practical. Grazing began 50 days after planting in 1972 and 20 days post-planting in 1973. After pastures were stocked, cattle had continuous access to the test sward until around May 1.

An early season variety of soybeans (Davis) was seeded at the rate of about 60 lb. per acre. Rye was seeded at 90 lb., ryegrass at 15 lb., and Yuchi arrowleaf clover (with inoculum) at 7 lb. per acre.

Mineral fertilizer was applied according to soil test recommendations. Approximately 30 lb. each of P and K were applied prior to planting soybeans, with 60 lb. of each used before seeding the ryegrass-clover. Commercial nitrogen was not applied to soybeans, but the winter pasture received about 90 lb. N per acre.

A pre-emergence herbicide (Treflan) was used for soybean weed control and the crop was sprayed with an insecticide (Sevin) three times during the growing season. An infestation of army worms in one year required spraying with Sevin to prevent damage to the rye-ryegrass-clover.

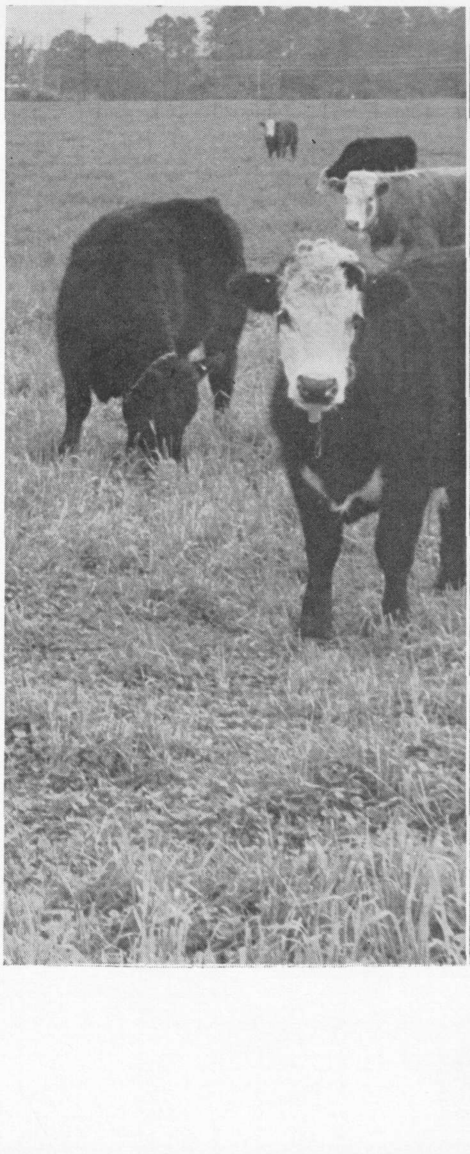
Even though stocking rates differed between years (1.06 and 1.57 steers per acre), approximately the same total animal weight was initially placed on the 8.5-acre pasture area each year. Steers averaging 600 lb. were stocked in 1972, whereas those for the 1973 test averaged 440 lb. when going on pasture.

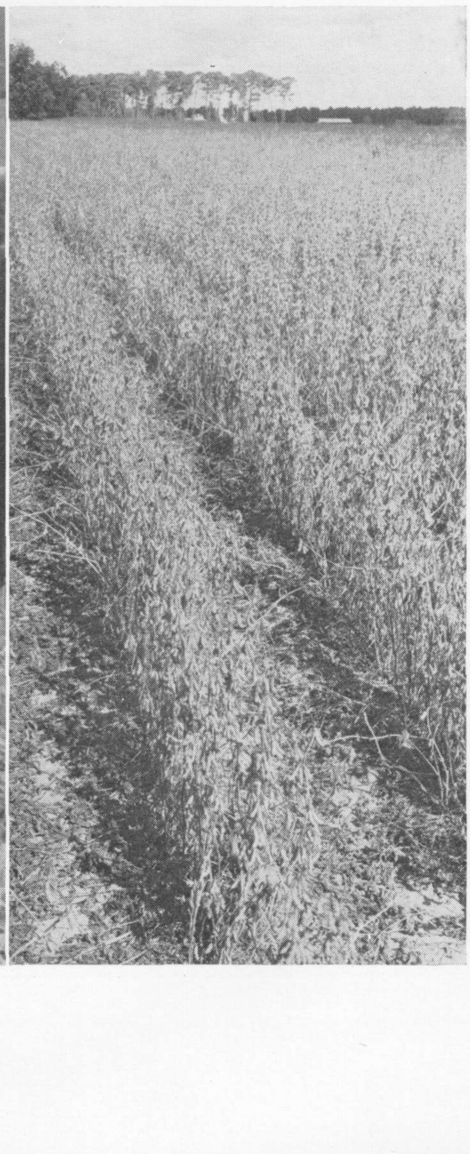
Results Encouraging

Soybean yields averaged slightly over 36 bu. per acre during the 2-year test — 39.3 bu. in 1972 and 33.5 bu. in 1973. This is about average for early season varieties at Fairhope. Late season beans generally produce more (around 45 bu. per acre), agronomic research reveals, but such varieties mature too late to fit into a double-cropping sequence with small grain grazing.

Cattle grazed the test swards an average of 156 days per year. Their average daily gain was 1.66 lb. and gain per acre averaged 355 lb. Steers with continuous access to rye-ryegrass-clover grazing from November until May gained 261 lb. each.

Animal performance on grazing in the double-cropping sequence was similar to that obtained at the same location when cool-season pasture was the only crop grown for the year. In addition, results from a Black Belt Substation study indicate that double-cropping production of wheat-ryegrass grazing and soybeans on the same land area is feasible. Since the actual mechanics of this dual land use system are practical, it appears that some farmers could increase their returns to land and management by adopting this intensive program.





COTTON or SOYBEANS for 1975 ?

SIDNEY C. BELL
Department of Agricultural Economics and Rural Sociology

A BIG QUESTION for farmers who wish to maximize profits during 1975 is whether to produce cotton or soybeans.

In the past cotton has generally been more profitable than soybeans on most farms. Also cotton acreage was restricted, thus in many cases farmers planted all their cotton allotment (in some cases rented additional allotments) and planted the balance of their row crop land in soybeans or corn.

There have been changes in this situation such as: (1) Increased price of nitrogen, (2) decrease in cotton price, and (3) increase in soybean prices. These have made soybeans more competitive with cotton.

Farmers with the problem of comparing cotton and soybeans should make an enterprise budget for each crop – cotton and soybeans.[1]

The first major consideration is to determine expected yield. In a cotton budget, 700 lb. of lint cotton and 1,300 lb. of cotton seed were used. The next step is to determine expected price. Forty cents per lb. for lint and $54 per ton of seed as long-run expected prices were used.

TABLE 1. BREAK-EVEN YIELD OF COTTON WHEN COMPARED TO 30 BUSHELS OF SOYBEANS

Price of cotton (lint)	Break-even lint yield at specified soybean price						
	$3.00	$4.00	$5.00	$6.00	$7.00	$8.00	$9.00
Cents	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
38	391	459	527	600	668	736	804
42	356	419	482	549	612	674	737
46	331	389	447	505	563	622	680
50	305	359	413	468	522	576	630
54	286	336	387	438	486	536	587
58	265	313	361	409	456	504	552
62	250	296	341	383	428	473	518

These enterprise budgets are based on improved management practices. This means following the latest recommendations as to seed, fertilizer, and insect control. The yield of 700 lb. per acre and price of 40¢ per lb. give total receipts of $315.10 (including value of seed).

The next item is cash expenses. When preparing budgets, use estimated quantities and prices for these items. Cash expenses in this budget total $140.97.

There are other important items to consider, as non-cash expenses. These are depreciation, housing, taxes, interest, and insurance for machinery and equipment. These total $35.64 in the cotton budget, leaving a net return to land, operator's labor, and management of $138.49. All items are included except a rent for land, a charge for operator's labor, and management.

Let us now take a look at an enterprise budget for soybeans, to see how, under good management practices, they compare with returns for cotton.

In the soybean budget, an estimated yield of 30 bu. per acre with an expected price of $6 per bu. are used, giving gross receipts of $180 per acre. Cash expenses were $61.37 and the non-cash expenses were $11.40, leaving a net return to land, operator's labor, and management of $107.23.

When comparing the two enterprise budgets, cotton has $31.26 higher return than soybeans. However, there are other items to consider before making a decision to plant cotton or soybeans. One of these is the availability of gins and markets in your area. Another is storage facilities if markets are not nearby. Also an important factor is the risk of producing a fairly good crop each year.

The two budgets discussed were based on one estimated yield and price for cotton and soybeans. It might be these yields and prices do not fit your circumstances, therefore, two tables are included that should be helpful in making a decision.

Table 1 indicates the yield of cotton required under various prices of soybeans and cotton to have the same net returns as 700 lb. of lint cotton per acre.

To use this table, first estimate your expected price of cotton and soybeans. For example, estimate cotton prices at 50¢ per lb. and soybeans at $7 per bu. Come down the left hand column under price of cotton to 50¢, then locate column with $7 per bu. for soybeans. Draw a line over from price of cotton and a line down from price of soybeans and where these lines meet will indicate the yield of cotton, 522 lb., required to produce the same net return as 30 bu. of soybeans.

Another way, Table 2, of comparing these two crops, if soybean yield was 32 bu. per acre you would need to receive $8 per bu. in order to equal 700 lb. of cotton at 42¢ per lb. Both tables are based on cotton and soybean budgets discussed.[2]

You interpret your answers of which crop you should produce in terms of whether you think your cotton or soybean yield will be above the yield required to break even as indicated in the table.

[1] Enterprise budgets for cotton and soybeans are available through your local County Extension Office.

[2] Detailed break-even production level tables for wide ranges, yields, and prices for soybeans, cotton, and corn are available at your local County Extension Office.

TABLE 2. BREAK-EVEN YIELD OF SOYBEAN WHEN COMPARED TO 700 POUNDS OF LINT COTTON

Price of soybeans	Break-even soybean yield at specified cotton price						
	38¢	42¢	46¢	50¢	54¢	58¢	63¢
Dol.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
3.00	75	84	94	103	112	122	131
4.00	56	63	70	77	84	91	98
5.00	45	51	56	62	67	73	79
6.00	38	42	47	52	56	61	66
7.00	32	36	40	44	48	52	56
8.00	28	32	35	39	42	46	49
9.00	25	28	31	34	38	41	44

CULTIVATION OF YOUNG PINE PLANTATIONS

L. E. DeBRUNNER, *Department of Forestry*
W. J. WATSON, *Lower Coastal Plain Substation*

A COMMON PROBLEM associated with the establishment of pine plantations on old agricultural fields is rapid envelopment of these fields by various weeds. Since weed control efforts in these farmed fields are usually ended before the trees are planted, the residual fertilizer provides favorable growth conditions for the many weed species and encourages them to occupy the site completely, resulting in difficult competition for pines. This extreme competition restricts the growth of pines for several years, though it rarely affects their survival rate to any extent.

Method of Study

In order to alleviate this problem, a study was initiated in 1968 by the Lower Coastal Plain Substation and the Department of Forestry to evaluate mechanical cultivation and chemical weed control in a newly established loblolly pine (*Pinus taeda*) plantation. The plantation site selected was on land in Wilcox County under lease to MacMillan-Bloedel from H. H. Wilkerson, who are cooperators in the project. The planting was carried out during the 1967 planting season, and treatments were begun in the spring of 1968. Treatments included: Atrazine applied in April at a rate of 3 lb. per acre (3-ft. band sprayed on each side of the planted rows); Simazine applied in April at the same rate and in the same manner; 2,4-D applied in May as a foliar spray in similar bands, at a rate of 1½ lb. (acid equivalent) per acre; disking in April with a 1,000-lb. bush and bog disk arranged to cultivate strips approximately 3-ft. wide on each side of the rows of planted trees; disking in May; disking in June; and disking in July. In 1969, half of each plot was retreated.

Research Results

At the end of six growing seasons, survival percentages were considered acceptable, with no serious differences among treatments. Although there was fear that the chemical treatments would seriously decrease survival, no detrimental effect was caused by the weed control chemicals or the disking operation.

Diameter growth response to early weed control was the primary goal of this study. One can see in the table that an appreciable increase in diameter is associated with the treatments, particularly the Atrazine spraying. The 14% advantage over no treatment exhibited by the Atrazine treated trees is promising. When one considers that volume increases with the square of diameter, the 14% diameter increase translates to almost a 30% volume increase.

The height growth results were unexpected, but desirable. Most studies reported have indicated that height growth is controlled more by inherent site quality than by density or competition. However, the Atrazine treated stands showed a 12 to 16% height growth advantage over the check plots (no treatment).

Although there was a relatively consistent advantage in height shown for 2 years of treatment compared with a single-year treatment, the differences were not great. Considering the cost of treatment, it is doubtful that the second-year treatment was worthwhile.

Conclusions

Economic evaluation is not yet possible because the trees are only beginning to reach merchantable size. However, these preliminary results certainly indicate a favorable economic potential. This promise is enhanced by the fact that all treatments were applied with lightweight and relatively inexpensive farm equipment.

SURVIVAL, AVERAGE DIAMETER, AND AVERAGE HEIGHT OF LOBLOLLY PINE BY SEVERAL CULTIVATION METHODS 6 YEARS AFTER PLANTING

Treatment	Survival	Av. DBH	Av. ht.
	Pct.	*In.*	*Ft.*
Atrazine, 1968 only	73	4.1	19.3
Atrazine, 1968-69	76	4.2	20.0
Simazine, 1968 only	79	3.8	18.2
Simazine, 1968-69	79	3.9	15.5
2,4-D, 1968 only	69	3.6	17.1
2,4-D, 1968-69	73	3.9	18.1
April disking, 1968 only	72	3.7	17.3
April disking, 1968-69	78	3.6	16.9
May disking, 1968 only	77	3.6	17.4
May disking, 1968-69	81	3.9	17.9
June disking, 1968 only	75	3.6	17.1
June disking, 1968-69	70	3.8	18.1
July disking, 1968 only	59	3.9	17.9
July disking, 1968-69	73	3.8	17.9
No treatment, 1968 only	63	3.6	16.7
No treatment, 1968-69	73	3.6	17.2

What About
FALL APPLICATION OF N FOR SPRING CROPS?

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Lengthening the period during which nitrogen can be applied for spring crops – without loss of efficiency – could have considerable advantages. Both fertilizer dealers and farm producers could make better use of time and machinery if N could be applied other than in the busy spring season. Although it is generally believed that much of fall applied N is lost, specific study of this question was needed.

An Auburn University Agricultural Experiment Station project was initiated to determine if a slow release N source applied in fall would compare favorably with N applied in spring. Sulfur-coated urea (SCU), a development of the Tennessee Valley Authority, was the slow release source used. Composed of urea, it has a coating of sulfur and wax, the thickness of which determines rate of N release. The thicker the coating the slower the N is released. Several SCU formulations having a wide range of N release characteristics have been formulated. The one used in the test contained 36% N with a coating weight of 22% and a dissolution rate in water of 21% for the first 5 days and 29% for the first 14 days.

Fall applied SCU was compared with SCU and ammonium nitrate applied in spring. Rates were 0, 45, 90, 180, and 360 lb. of N per acre applied once for a rotation of corn for grain, rye for forage, and corn for grain. There were three of these rotations – one each beginning in 1970, 1971, and 1972 – all on Lucedale sandy loam. Urea and ammonium nitrate also were compared for fall and spring application at the 180-lb. rate.

Where 90 lb. or more N from SCU were applied in the fall, yields of corn grain the first crop after N was applied were similar to those obtained with the same rates of spring applied SCU or ammonium nitrate, Figure 1. When applied in the spring at the 45-lb. N rate, ammonium nitrate produced more grain than SCU. Apparently the delayed release of N from spring applied SCU resulted in a lower yield at this rate of N.

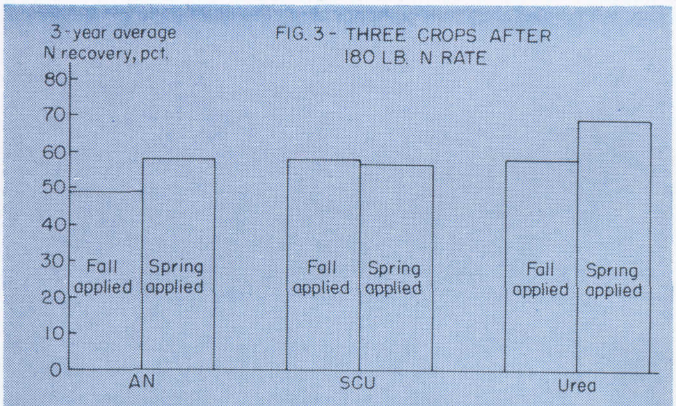
The residual N from the 45- and 90-lb. rates from both SCU and ammonium nitrate had no effect on rye yields following the first crop of corn. Plots getting these rates produced no more than 500 lb. of dry forage per acre, about the same as the no-nitrogen plots. With the 180-lb. N rate, yield jumped to about 1,000 lb. of dry rye forage from SCU fall or spring applied and ammonium nitrate spring applied. There was a further forage yield increase from 360 lb. N – to 2,200 lb.

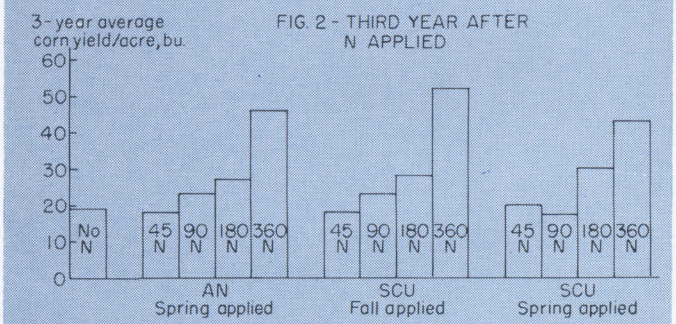
In the third crop after N was applied, the 360-lb. N rate applied 18-22 months before harvest made considerably higher yields than lower rates, Figure 2. This was true for both SCU and ammonium nitrate. While N should be supplied to meet needs of the current crop, these data show that some N applied in excess of these needs may be recovered by following crops. This could occur because of low crop yields that do not use all available N or because of N applied in excess of crop requirements.

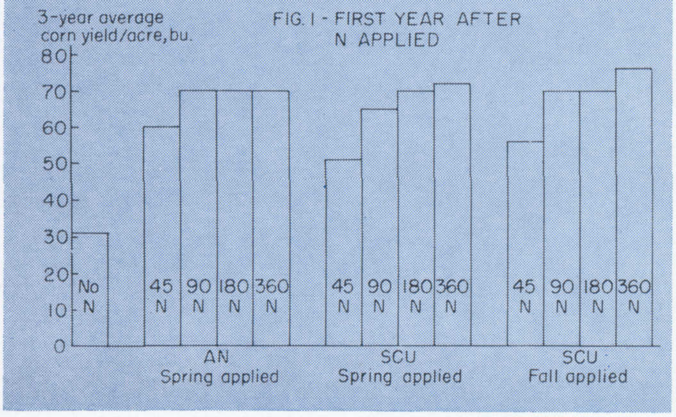
Nitrogen recovery data from three sequences of the rotation show how nitrogen from soluble sources is lost when applied in fall. With the soluble ammonium nitrate and urea, less nitrogen was recovered from fall applications than from spring applications of the 180-lb. rate, Figure 3. It was different with SCU, however, which showed the same N recovery from fall and spring applications.

These data show the inefficiency of fall applied soluble sources of N for spring crops under high moisture and temperature conditions of the Southeast. The remarkable result is the finding that so large a portion of applied soluble sources of N remained in the root zone through the winter. A considerable portion of the N contained in the second and third crops after N was applied probably was recycled in the crop residue returned to the soil.

In summary, it can be stated that applying soluble sources of N in the fall for spring crops is inefficient. The slowly soluble sulfur-coated urea was equally effective for spring crops whether applied in spring or fall. While N should be applied to meet current crop requirements, there is some carryover when amounts greater than current crop needs are applied. This residual may be utilized by following crops.







CONTRACT MARKETING of COTTON

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CONTRACTING between farmers and first buyers of raw farm products has become an established practice in many areas and with several commodities. Fruits and vegetables are good examples.

Only in recent years, however, has this practice come into widespread use with major commodities such as cotton, wheat, and corn. Federal farm programs represent one important reason for producers and buyers not using contracts for these commodities earlier. Provisions were such that prices of cotton, wheat, and corn were relatively stable, and were supported at a level near or slightly above the price in the open market. Results were that producers, particularly those growing wheat and cotton, obtained loans from the Commodity Credit Corporation (CCC), and grain and cotton were placed in government-rented warehouses from which large volumes were never redeemed by growers. These accumulated stocks served as a dependable source of supply for processing firms that needed raw materials.

Provisions of the Food and Agriculture Act passed in 1965, and continued in amendments and in the Agricultural Act of 1970, changed the method of supplementing incomes of cotton producers. The guaranteed price was lowered to a level below the world market price and growers were paid direct cash payments. Those provisions that were intended to bring about a decrease in production and to reduce the volume being acquired by the CCC have had the intended effects, see table. Annual average production after 1965 was 44% less than the annual average for the 4 years just prior to 1965. Cotton acquired or pooled by the CCC was reduced by 83%. However, producers found that they again had to contend with fluctuating market prices, and buyers discovered that there was no longer a dependable reserve supply of raw cotton. Reduced total production and increased exports added to the problems associated with variable prices and insecure supplies. Both producers and buyers searched for a means that would bring about great security in their operations, and contracting was one of the methods chosen.

Because of the increasing proportion of cotton being marketed in this manner, a study of contract operations was initiated in seven Southern States. This was an attempt to determine the different types of sales contracts used, and the effects contracting was having on producers, cotton merchandising firms, and the cotton marketing system.

In Alabama, 44 growers and representatives of 9 buying firms (contractors) cooperated in the study. For 43% of the growers, 1973 was the first year they had signed a marketing contract. Thirty-two and 39% had contracted at least part of their crop in 1972 and 1971, respectively. Only one grower had used this method prior to 1970.

Principal advantages of contracting to growers were protection against price drops and knowing early in the season the price that would be received. A knowledge of the price was a help to some growers when seeking operating loans, and in making decisions during growing and harvesting seasons. Among disadvantages, the fact that growers could not share in price increases was named by 75% of those interviewed. Slightly more than a third of the growers felt that buyers were in a position to make a better evaluation of anticipated future prices than were growers because of the more adequate market information buyers had.

Growers desire a contract that specifies acres because of variable yields resulting primarily from changeable weather conditions over which there is no control. However, those who bought from growers had to sell to firms that were interested only in bales. These buyers reported that some modification of contract provisions was needed because they could not continue to "buy acres" and "sell bales," as was the case in Alabama in 1973. Only one grower was found to have a contract that specified the number of bales to be delivered. This contract was made in late August and well after the crop had "made." Therefore, the farmer did not have to worry about a yield problem to supply the amount of cotton contracted.

Most growers realized there was a cost involved in carrying the risk of price changes. The amounts they were willing to pay ranged from 2¢ to 25¢ per lb., and the average was 7¢. Half the buyers reported that contracting had resulted in increased cost to them. More time was required, and interest and margin payments increased.

Only one grower had experienced difficulty with a contractor not wanting to accept delivery of contracted cotton, whereas two-thirds of the buyers had experienced problems in getting growers to comply with contracts.

With respect to future use of forward contracts with cotton, approximately three-fifths of the growers reported that they planned to continue the practice; 38% did not plan to continue. Buyers had varied opinions about the extent to which forward contracting would be used in the future. One-fifth felt that contracting would continue, one-fifth thought there would be an increase while an equal proportion foresaw a decrease, and the remainder said that future use would depend on the type of government program in effect for cotton.

TOTAL PRODUCTION AND QUANTITY OF COTTON ACQUIRED BY THE COMMODITY CREDIT CORPORATION, UNITED STATES, 1962-63—1971-72

Year	Total production	Acquired or pooled by CCC	
		Quantity	Proportion
	1,000 bales	*1,000 bales*	*Pct.*
1962-63	14,864	4,744	32
1963-64	15,290	6,029	39
1964-65	15,149	4,853	32
1965-66	14,933	5,344	36
1966-67	9,562	1,405	15
1967-68	7,439	53	1
1968-69	10,917	2,785	25
1969-70	9,937	1,069	11
1970-71	10,112	12	.1
1971-72	10,229	0	0

FUNGICIDE-NEMATICIDE SEED TREATMENT COMBINATIONS:

Results and Potentials

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To CONTROL NEMATODES, row crop farmers in the Southeast routinely apply nematicides as a separate operation at planting time. In addition, peanut farmers apply systemic insecticides in planting furrows for thrips control. The development of a technique for the simultaneous application of nematicide, insecticide, and fungicide-treated seed would reduce farm operations and resultant soil compaction. This report will deal with efforts to consolidate these operations by combining systemic nematicide-insecticides with standard seed fungicides. If such a treatment is developed it could provide a means of seedling disease, early-season insect, and nematode control that requires a minimum of operations and chemical use.

Seed Coating Hazards

The principle of coating seed with nematicides and insecticides has several hazards. Foremost among these is the fact that the seeds are coated with toxic products and must be treated as hazardous. Also, most insecticides and nematicides are somewhat phytotoxic, therefore, caution should be used in rates applied to seed, and the interval between treatment and planting should be reduced.

Soybean and Peanut Tests

Initial tests were conducted with 'Lee' and 'Hood' soybean varieties. Seeds of each were treated with fungicides and fungicide-nematicide combinations and compared for field emergence. Furadan, a systemic insecticide-nematicide, was chosen for initial testing because it was already labeled for use on many row crops and had low phytotoxicity. Rates per cwt. of seed were calculated so that the seeding rate (1 bu. per acre) would deliver approximately ½ lb. Furadan per acre. Seed were planted 1 week after treatment with treatments replicated 10 times. Emergence was evaluated 21 days later, Table 1. Soil samples were taken 45 days after planting and nematode populations determined using the molasses flotation-sieve technique. Seed treatment with Furadan in combination with five standard seed fungicides resulted in minor depression of seedling emergence when compared with those receiving fungicidal seed treatments alone. However, nematodes were significantly reduced, even after 45 days.

Similar tests were conducted on Florunner peanuts in 1973 and 1974, Table 2, but were expanded to include several new systemic nematicides or insecticides. Again, treatment rates were adjusted to deliver infurrow rates of approximately ½ lb. per acre using the seed as the vehicle. Furadan and Nemacur depressed emergence only slightly, and peanuts in general, Table 3, showed less phytotoxicity to Furadan than did soybeans. Although nematodes were not a problem in the peanut test area, thrips damage was assessed and found to be sharply reduced in the presence of Orthene or DS-15647, Table 3. For both chemicals, however, higher levels of phytotoxicity were observed than for Furadan.

Conclusions

These data indicate that nematicides can be coated on seed without excessive damage to seed and seedling, and that biologically active rates of nematicides can be coated onto the seed and still be compatible with seed treatment fungicides. These studies have revealed treatments that are good nematicides and others that are good insecticides. As yet, the combination effect has not been achieved.

TABLE 2. EFFECT OF FUNGICIDE-NEMATICIDE COMBINATIONS ON PEANUT SEEDLING EMERGENCE

Nematicide used, rate/acre	Pct. emergence 1973	1974
Fungicide only	58.5	56.0
Furadan 75, 225 g.	54.6	52.2
Nemacur 95% tech., 250 ml.	53.3	52.5
DS-15647, 160 ml.	----	47.3
Orthene 80 SD, 132 g.	----	38.5

TABLE 3. EFFECT OF NEMATICIDES IN COMBINATION WITH SEED FUNGICIDES ON SEEDLING EMERGENCE, NEMATODE POPULATIONS, AND THRIPS DAMAGE IN FLORUNNER PEANUTS

Nematicide used, rate/acre	Pct. emergence	Total nematodes[1]	Thrips[2]
Fungicide only	56.0	187	4.3
Furadan 75, 225 g.	52.2	131	3.8
Nemacur tech., 250 ml.	52.5	86	3.2
Orthene 80 SD, 160 ml.	38.5	147	1.4
DS-15647, 132 g.	47.3	145	2.0

[1] Total nematodes per pint of soil from root region.
[2] Severity rating from 1 = no damage to 5 = severe leaf cupping and chlorosis.

TABLE 1. EFFECT OF FURADAN IN COMBINATION WITH SEED FUNGICIDES ON SEEDLING EMERGENCE AND NEMATODE POPULATIONS IN TWO SOYBEAN VARIETIES

Treatment	Hood			Lee		
	Pct. emergence	Nematodes[1] Stubby	Stunt	Pct. emergence	Nematodes[1] Stubby	Stunt
Fungicide only	64.7a	2.7a	2.5a	73.4a	2.4a	2.6a
Furadan, 75-225g.	48.0b	1.6b	1.3b	58.0b	1.4b	1.4b

[1] Nematodes per pint of soil.
[2] Treatments in the same column followed by different letters are significantly different at the 5% level using Duncan's Multiple Range Test.

Sodium Azide As A Soil Bed Fumigant In Forest Nurseries

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PRODUCTION OF top-quality pine seedlings in intensively managed forest nurseries year after year depends upon the economical control of diseases, insects, nematodes, and weeds. One way that has been used to reduce incidence of these pests is by pre-plant fumigation of nursery bed soil with methyl bromide every third or fourth growing season. Such treatment has been effective, but little is known about the long-term ecological effects on non-target soil organisms in general. This study was conducted to determine the effects of sodium azide, a relatively new granular compound, on soil microbial populations and to compare these effects with those resulting from methyl bromide.

Research Methods

Sodium azide (NaN_3) at rates of 20, 60, and 120 lb. per acre was incorporated into plots at the Auburn Forest Nursery with a tiller. These plots were either sealed by wetting (water sealed) or by covering with polyethylene sheets (plastic sealed) for 10 days following azide incorporation. Controls consisted of untreated plots that were either plastic-sealed or water-sealed, and other plots fumigated with methyl bromide. Azide and methyl bromide were applied during the first week of April.

The first soil samples were collected 10 days after application; other samples were collected at 2, 6, 10, 18, 26, 38, and 50 weeks after the initial sampling. Soil samples were processed for total numbers of fungi and bacteria by a soil dilution-plate count technique. In addition, fungal colonies in the genera *Trichoderma* and *Penicillium* and in the Order Mucorales that appeared on the dilution plates were counted.

Test Results

Total numbers of fungi decreased with increasing amounts of azide. This pattern was consistent throughout the study with the greatest reductions in numbers occurring in the first four samples. Fungal populations in methyl bromide-treated plots were as low or lower than those in plots receiving the highest rate of azide.

In contrast, total numbers of bacteria increased with increasing azide rates after the first sampling. Plastic-sealed plots contained higher numbers of bacteria than did water-sealed plots. Highest numbers of bacteria were recorded from methyl bromide-treated plots.

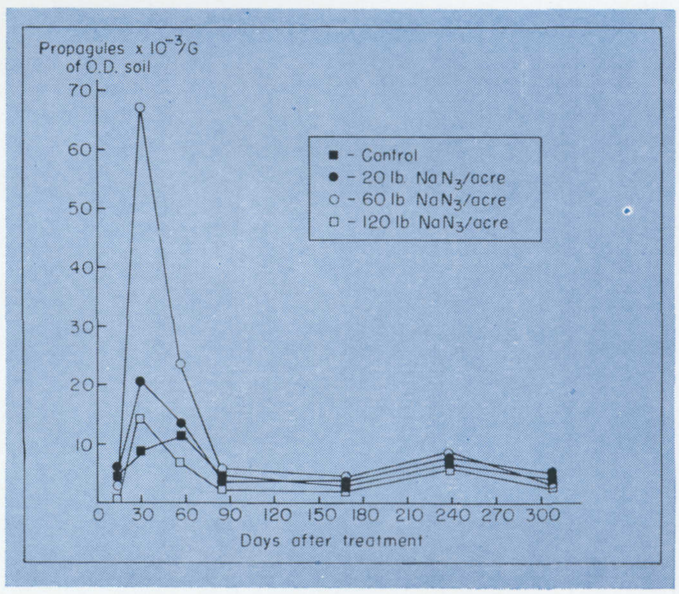
Except for plots with 20 lb. per acre azide, colonies of *Trichoderma* spp. were initially less in azide-treated plots than in the controls; this reduction was proportional to the amount of azide added. However, with time this situation changed, so that after the fourth sampling the number of *Trichoderma* colonies in all azide-treated plots was generally higher than in control plots, see figure. Most drastic reduction in numbers of *Trichoderma* colonies occurred in methyl bromide-treated plots, and, although a recovery in numbers was observed after the second sampling, highest populations for any one sampling was never much greater than corresponding control. A similar pattern was observed for fungi in the Order Mucorales.

The reinfestation pattern for *Penicillium* spp. differed markedly from the above two groups. Numbers of colonies declined sharply in direct proportion to the amount of azide added. This pattern was generally true for all samplings and in both plastic-sealed and water-sealed plots. Lowest numbers of Penicillium colonies were observed in methyl bromide treated plots.

Conclusions

These results suggest that reinfestation of azide-treated soil is restricted to fast-growing fungi that can tolerate bacteria and their by-products induced by treatment with this material. Since many species of *Trichoderma* and the Mucorales are well known antagonists of soil-borne plant pathogens, results obtained with azide indicate that this water-soluble material has a long-lasting effect by favoring reinfestation by these antagonists. Consequently, the action of azide is interpreted as a three-step process, (1) direct toxic action against soil-borne organisms, (2) reinfestation by bacteria (mostly gram-positives) with a subsequent accumulation of bacterial by-products, and (3) utilization of these by-products by fast-growing antagonistic fungi. The final result is a long-term antagonistic shield that protects against introduction of plant pathogens.

The effect of azide contrasts with that of methyl bromide in that the latter depresses fungi, particularly antagonists, for long periods of time, possibly leaving the soil open to invasion by plant pathogens. When exceptionally high rates of azide are used the azide begins to behave as does methyl bromide, i.e. unduly retarding reinfestation by antagonistic fungi.



Serala Sericea Seed Production Affected by Cutting Management

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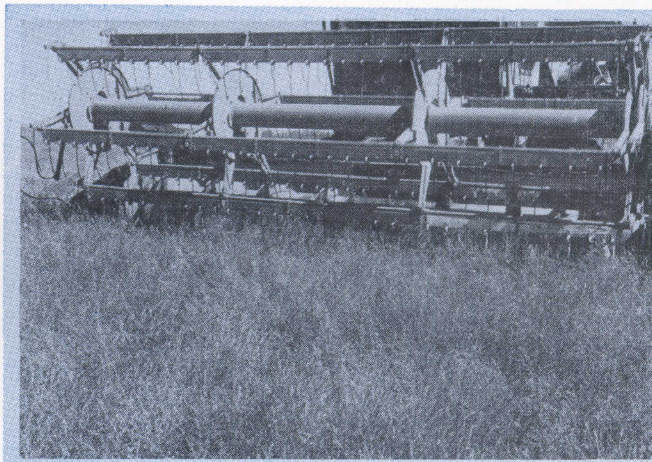
Department of Agronomy and Soils



INCREASED INTEREST in forage legumes as a result of rising nitrogen prices has greatly increased demand for seed of such crops as the Auburn-developed Serala sericea. Unfortunately, seed supplies of this variety are inadequate to meet the demand. Thus, there is a need for increasing production of Serala seed.

Recent research in Alabama established how cutting management affects yields of sericea seed. As reported in the last issue of HIGHLIGHTS (Vol. 21, No. 3), the short, high-tannin Interstate variety should not be cut for hay if maximum seed yield is expected. A May hay cutting reduced combine-harvested Interstate seed yields from 645 lb. to 312 lb. per acre over a 2-year period.

Since Interstate is grown mainly as a special ground cover plant, its use as a farm crop is mainly for seed production. Refraining from cutting hay might not be a problem with that variety, but it's a different story with Serala. Farmers who grow this forage variety may need to cut hay on their sericea, but would still like to harvest some seed. Therefore, an experiment at Auburn University Agricultural Experiment Station was done to investigate joint hay-seed production from Serala.

Cutting Management Evaluated

Different cutting management methods were compared in a 3-year experiment on an established stand of Serala at the Plant Breeding Unit, Tallassee. Forage was harvested at 3, 6, or 9-week intervals with stubble heights of 1½ or 4 in. Harvesting began in April and was terminated in June or August to measure effect on root carbohydrate storage and seed yields the following year. Seed harvesting was done in mid-October using a sicklebar mower and a small stationary thresher.

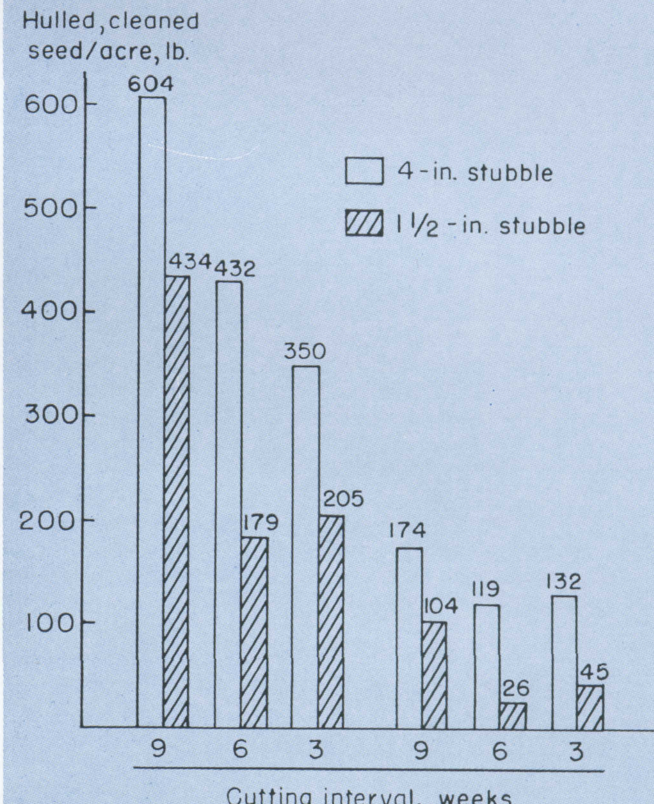
Seed yields were largely determined by cutting management, as shown by the graph. When forage harvesting continued to August, seed yields were only one-fourth to one-half of that made when cutting ended in June each year. Since only about 70% of the seed produced are recovered in combine harvesting, yields generally would be too low to justify harvesting sericea that had been cut for hay or grazed until August.

June Cutting, 4-inch Stubble Best

Highest seed yields, about 600 lb. per acre, were obtained by cutting sericea one time per year in early June to a height of 4 in. More frequent cuttings reduced seed yields. This indicates that grazing sericea during the spring probably would reduce seed yields more than taking a single cutting for hay in May or early June. This conclusion is supported by results of an earlier study showing that, when forage harvesting was terminated in June, cutting frequently to a short stubble had more effect on seed production than on forage yields (reported in HIGHLIGHTS, Vol. 20, No. 1).

Cutting forage to 1½-in. stubble height reduced seed yields regardless of cutting frequency. This was a result of reduced root carbohydrate storage with the 1½-in. as compared with the 4-in. stubble height.

Results of the project reported clearly establish that cutting Serala sericea for hay in May or June will reduce seed yields. However, 1½ to 2 tons of Serala hay can be harvested and still permit a good seed yield if the hay is cut to 4-in. stubble height. Harvesting seed will reduce total annual forage yield by 50%. Frequent and close defoliation in spring, as with grazing, can be expected to cut seed yields more than making a single hay cutting in May or early June.



Three-year average seed yields of Serala sericea cut at two stubble heights and three intervals. Yields on left are when cutting was terminated in early June and yields at right resulted when cutting was continued until early August.

COST of OVERWINTERING CATFISH in ALABAMA

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CONSUMER DEMAND for catfish exists year round. The supply from producers, however, has been highly seasonal.

Year-round production appears desirable because processors could utilize facilities more fully, and ensure a constant supply. Year-round production could result in a lower consumer price, and thus increase catfish sales. Before year-round operation is attempted, producers should give careful consideration to factors involved in seasonality of production.

Due to biological factors, catfish discontinue feeding when water temperature falls below 60°F. Since most Alabama producers raise catfish in open ponds, control of water temperature cannot be maintained. If catfish are kept overwintered in ponds, those that have not attained harvestable size at the beginning of cooler weather will require a holding period until the water is warmer and feeding resumes. Unless the fish are fed a maintenance diet during this period, a net loss in weight might ensue. The loss in feed efficiency, the additional labor, and the slower capital turnover represent costs to the producer.

Four major factors influence catfish production: feed, fingerlings, water, and labor. Costs of overwintering would be affected by each.

Catfish consume a relatively high protein diet. The price of feed during 1973 and 1974 increased with the shortage of fish meal and the increase in price of substitutes, especially soybean meal. Therefore, feed conversion has become crucial in catfish production. When feed costs exceed 50% of the market value of the fish, total returns may not cover total costs of production. Limited data available indicate catfish attain the optimum feed conversion ratios when water temperature is between 60° and 80°F. Since fish may lose weight during the winter even though fed a maintenance ration, feed costs are increased without corresponding increases in the value of the product.

Production of catfish fingerlings is geared to the natural reproductive cycle although spawning can be induced artificially at different times. The size of fingerlings is controlled by stocking rates. Under existing production techniques, 2 years are required to produce marketable fish. Normally, after spawning and hatching the fingerlings are overwintered and stocked in food fish ponds the following spring. Year-round harvest of food fish would require year-round supplies of fingerlings. Fingerling costs for year-round programs should not vary greatly although summer and fall stocked fingerlings may be slightly higher and have a greater risk of death loss.

Water is the one indispensable factor in fish production. With a natural watershed pond, draining and harvesting operations are predetermined by the season. If the pond is harvested in summer, restocking cannot occur until the pond is refilled by rainfall. With spring or well-filled ponds, time of harvest may be less crucial.

Harvest costs are increased during summer months since fish are more subject to oxygen stress. Conversely, with winter or cool weather harvest, less aeration is required in transporting fish. During colder weather catfish can be transported without water or aeration.

Fish production requires limited amounts of labor except at harvest. Whether ponds are drained or fish are seined from ponds, labor requirements at harvest are increased. With drained ponds, labor availability is crucial to prevent losses of fish due to oxygen stress. As a result, producers have attempted to harvest ponds at a time in least conflict with other farm enterprises. Traditionally, winter has been a time when labor was free from other production activities. This possibly has encouraged spring stocking on many Alabama farms.

Overwintering catfish thus incurs both additional cost and additional risk for open pond production. Data from two producers stocking the same size fingerlings but harvesting at different dates are shown in the table. Both producers fed floating feed, and the period between stocking and harvest was approximately

Stocking date	*Winter harvest April*	*Summer harvest September*
Pounds stocked/1,000*	60	60
Harvest date	February	July
Pounds harvested/1,000*	1,087	800
Production days	300	300
Net pounds harvested/1,000*	1,027	740
Feed efficiency	1.5	1.9

* Pounds per 1,000 fingerlings stocked.

the same. The summer harvest producer raised 287 lb. less fish than the winter harvest producer. The winter harvest producer had better feed efficiency and, assuming a feed price of $0.15 per lb. netted $0.225 per lb. over feed costs if fish sold for $0.45 per lb. If the production amounts were equal, summer harvest would require at least a $0.06 per lb. price differential above the winter market price to cover the difference in feed conversion ratios. However, since winter harvest also had a production differential, at least an additional $0.08 price differential would be necessary to equate returns for the summer harvest. In effect, summer harvested fish would require a sale price of $0.59 per lb. to equate net returns to winter harvested fish. Unless profit opportunities are increased for summer harvest, producers will continue the trend toward spring stocking and fall or winter harvest.

Catfish producers, like other farm operators, attempt to conduct their operations in the most efficient manner in order to maximize profits. To increase processing efficiency by year-round operation, seasonal price differentials great enough to overcome cost and risk differentials must be instituted. Higher prices for summer harvest catfish must be justified by higher consumer prices during the summer months. If consumer demand will not respond, then alternatives such as seasonal processing and storage should be considered.

ADVANTAGES of LIGHT DURING INCUBATION

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HUMIDITY, temperature, gaseous exchange, and light are environmental factors that influence the development of the chick embryo.

Stepped-up Hatch

Recent studies by the Poultry Science Department show that eggs incubated under light hatch approximately 1 day earlier than those incubated in normal dark conditions. Hatcherymen might consider this 'stepped-up' hatch a disadvantage since they operate on a systematic routine. However, there are some advantages to the use of light during incubation, such as reduced overall embryonic mortality, larger chicks at hatching, and a possible increase in growth rate of broilers.

Effects of Specific Gravity

Observation show that eggs incubated under light have fewer early embryonic deaths than those incubated in darkness. This is especially true of eggs that have poor shell texture. There is a definite relationship between specific gravity and embryonic mortality under light and dark incubation.

At both high and low specific gravities lighted incubation decreased embryonic mortality, while at mean specific gravity (1.074-1.080) there was no difference in embryonic mortality between light and dark conditions.

Death Rate in Light and Dark

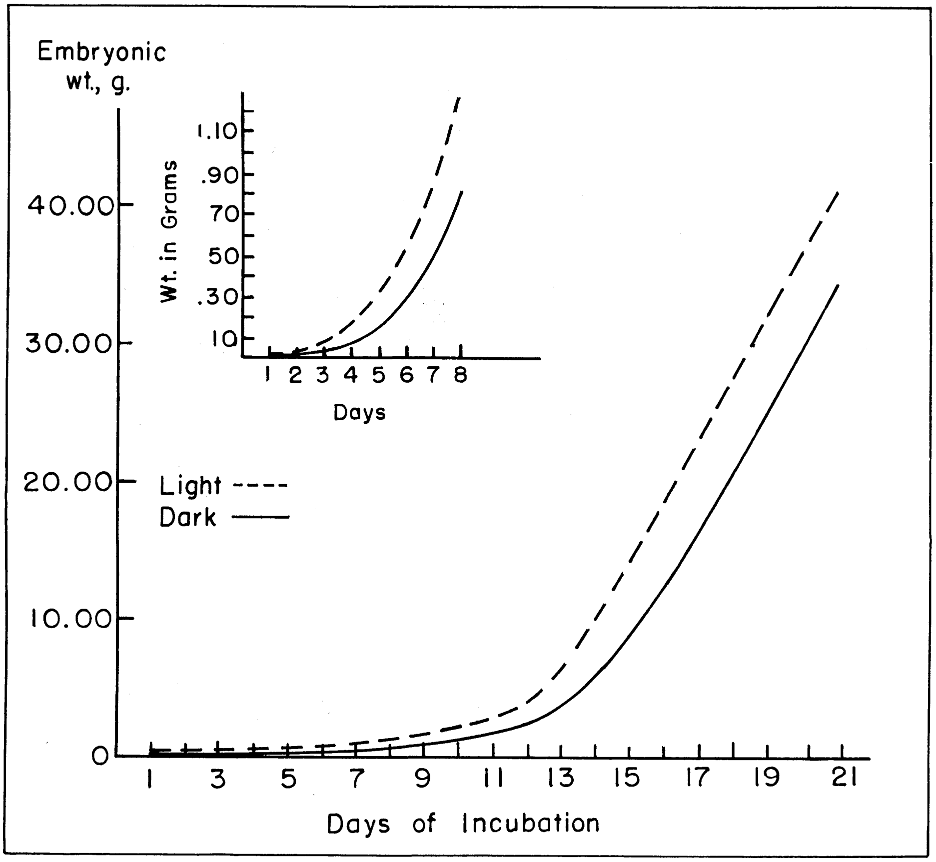
The table shows the time of death during embryonic development. It should be noted that these values are percentages and that there were fewer deaths in the light group than in the dark group. There was a higher percentage of deaths during the first day of incubation in the dark than in the light. The highest percentage of deaths in the light group occurred between 2 and 3 days of embryonic age.

Embryonic Growth Rate

The graph shows growth rate of embryos incubated in light and dark. Embryo weights from eggs incubated in the light were heavier than those incubated in the dark. The weight difference is noted as early as 3 days of incubation. In addition to the accelerated growth rate during incubation, the chicks hatched from the lighted groups are larger than the ones hatched from the dark groups. Limited data indicate that this accelerated growth rate may have a carryover effect during the 8-week growing period.

PERCENTAGE TYPES OF DEATHS FOUND AT END OF THE FIRST WEEK OF INCUBATION IN THE LIGHT AND DARK TREATMENTS

Specific gravity	Light treat.	Blood ring		
		1 day	Before 3 days	After 3 days
High (1.082-1.092)	Light	25	75	00
	Dark	30	30	40
Medium (1.074-1.080)	Light	00	95	05
	Dark	00	25	75
Low (1.056-1.072)	Light	40	40	20
	Dark	64	22	14
Total (1.056-1.092)	Light	19	67	13
	Dark	43	25	32



Embryo weights by day in the light and dark. Inset is for first week of development.

ENVIRONMENTAL EFFECTS of PLANT DISEASE

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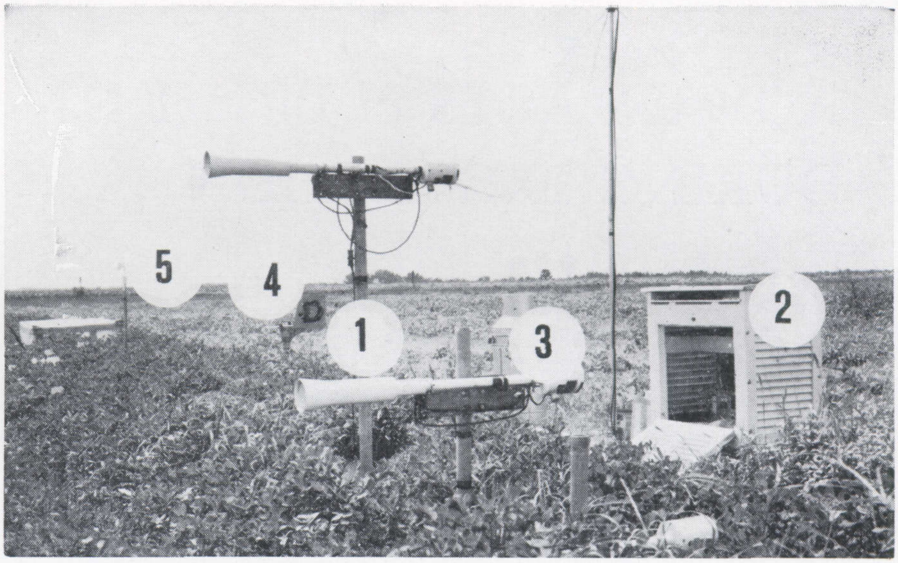

FIG. 2. Equipment used in monitoring environmental parameters at the Wiregrass Substation, Headland. Foreground: 1. air temperature sensors, 2. hydrothermograph in a ground-level weather shelter, 3. rain gauge; background: 4. volumetric spore trap, 5. aenometers.

A PLANT DISEASE epidemic may occur in a large population of susceptible host plants when environmental conditions are favorable for rapid development and spread of a virulent pathogen. Fortunately, such favorable conditions occur rather infrequently and disease epidemics are relatively rare.

The course of a plant disease is determined by a mutual interplay between the disease agent, the host, and the physical environment, Figure 1. In this fundamental triangle the interaction between agent and host is the key relationship, primarily a struggle between the virulence of causal agent and the capacity of a host to resist. The physical environment may tip the balance of the struggle one way or the other by its effects on both agent and host. The host itself also may have considerable influence on the environment, especially on the microclimate within the crop area. The effect of host upon environment differs from crop to crop and between cultivars of the same crop, depending on such factors as growth pattern (spreading or erect), foliage density, and total root mass.

Temperature and moisture are probably the most important environmental factors influencing both agent and host, and subsequently the development of many diseases. Cercospora leafspot of peanuts is a good example in the South. Whereas onion smut is absent in the southern onion-growing areas, it is a well-established disease in northern areas where temperatures for pathogen development are optimal.

Nearly all infections of above-ground plant parts are affected by moisture. Sporulation and spore germination of many fungal pathogens are associated with high atmospheric humidity, and dissemination of spores of many species is achieved by splashing raindrops. Examples are fire blight and scab of apple and pear, corn blight, pecan scab, and early blight and late blight of tomato. Other environmental effects on plant diseases include light, soil reaction (pH), nutrient availability, and wind. Two classic examples of the opposite effects of pH on disease development are common scab (*Actinomyces scabies*) of Irish potato and club root (*Plasmodiophora brassicae*) of crucifers, both of which are also strongly affected by soil moisture. Scab is most prevalent and severe in dry, alkaline soils, whereas club root disease becomes a problem in wet, acid soils.

To permit a better understanding of the mechanisms underlying development of plant diseases and the precise influence of various environmental factors, the investigator relies upon modern field devices for accurate measurement of these factors, Figure 2. Recommendations and proper timing for application of control measures can then be made, the expectant result being increased quantity and quality of plant products produced.

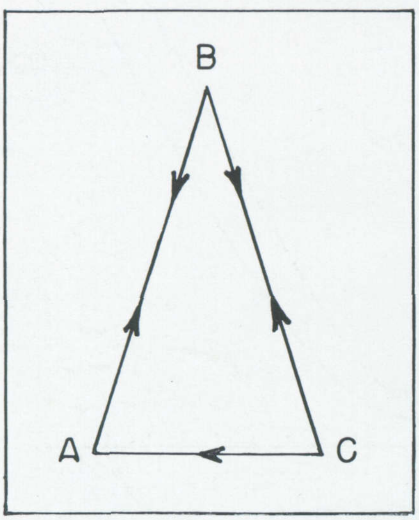

FIG. 1. A, the agent of disease (fungus or other pathogen); B, the host; C, the physical environment.

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