VOLUME 14, NO. 4 WINTER 1967

HIGHLIGHTS

OF AGRICULTURAL RESEARCH

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY

GOOD PRODUCTION . . .
requires high grain levels
with Coastal hay, see page 3

HIGHLIGHTS *of* Agricultural Research

A Quarterly Report of Research Serving All of Alabama

VOLUME 14, NO. 4 WINTER 1967

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.

Bul. 370. Fertilization of Loblolly Pine on Two Alabama Soils reports effects of fertilizing young loblolly pines on Piedmont and Coastal Plains Soils.

Cir. 147. Diseases of Small Grains in Alabama describes damaging diseases of oats, wheat, barley, and rye and gives control measures.

Cir. 150. Directed Growth of Ornamental Plants with Chemicals tells how growth of plants may be regulated with chemicals.

Cir. 157. Potting Mixtures and Fertilization Practices for Container Grown Ornamental Plants compares various growing mixes and fertilizer rates.

Leaf. 72. Performance of Peach Varieties for Commercial Production in Central Alabama gives detailed variety information.

Leaf. 75. Goar Tall Fescue presents performance data on the new fescue that furnishes more winter grazing than other available varieties.

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

for GOOD MILK PRODUCTION FEED HIGH LEVELS *of* CONCENTRATES *with* COASTAL

J. A. LITTLE and G. H. ROLLINS
Department of Dairy Science
E. L. MAYTON, *Piedmont Substation*

SATISFACTORY MILK production can be obtained from cows fed Coastal bermudagrass hay (CBG) provided the hay is supplemented with a high level of concentrates.

This result is from a study at the Piedmont Substation, Camp Hill, Alabama, concerned with evaluation of production performance of dairy cows fed certain harvested forages common to the area. Previous investigations had shown that Coastal bermudagrass provides high yields per acre when correctly fertilized, is dependable as a source of forage, and has growth characteristics suited to harvested forage programs. However, lactation performance of dairy cows had not been satisfactory in an earlier experiment in which long Coastal hay as the only source of forage was fed to supply 50% of the total digestible nutrients.

To evaluate long Coastal hay with different levels of supplemental concentrate, two tests (1965, 1966) were conducted using high-producing grade Holstein cows from the Substation herd. Cows in each test were divided into groups according to production level and randomly assigned to the test rations.

The following rations were compared in 1965:

Ration I – CBG + 1 lb. concentrate for each 1.8 lb. fat-corrected milk (FCM) 1:1.8.

Ration II – CBG + concentrates 1:2.4.

Ration III – CBG + concentrates 1:3.0.

Ration IV – Corn silage + concentrates 1:3.0.

In 1966 several treatments were used but only those in which Coastal hay was the forage offered is given here along with the control ration.

Ration I – CBG + concentrates 1:1.8.

Ration II – CBG + concentrates 1:3.0.

Ration III – Corn silage + concentrates 1:3.0.

Coastal forage, purchased for the first test but grown on the Substation for the second trial, was group fed free choice, whereas the concentrate mixture was fed individually. Concentrate allowance was based on FCM production during a 2-week preliminary period before each test. The allowance was reduced 5% each 28 days. The corn silage ration served as a check in each group.

The Coastal hay fed in both 1965 and 1966 tests was relatively low quality as indicated by the low crude protein (6.2 and 9.0%) and high crude fiber (32.7 and 30.0%) contents. Apparent dry matter digestibility of the Coastal hays, determined with steers, averaged 55.3 and 58.2%, respectively. On the other hand, the corn silage fed in each test was of high quality, being relatively low fiber content (25.6 and 20.8%) and high in digestible dry matter (70.7 and 65.9%).

Animal performance data are given in the table. Intakes of Coastal hay were inversely related to quantities of concentrate consumed, decreasing as the level of concentrate was increased. Daily concentrate consumption by cows on Coastal hay plus concentrate at the 1:1.8 level averaged 22.5 and 25.1 lb. of grain, respectively, during the 1965 and 1966 tests. At this level of concentrate, about 75% of the total energy requirement of cows was supplied by the grain mix. The groups of cows fed Coastal and those fed corn silage and supplemented at the 1:3.0 level obtained approximately 51.0 and 45.5% of their energy requirement from the concentrate portion of the rations.

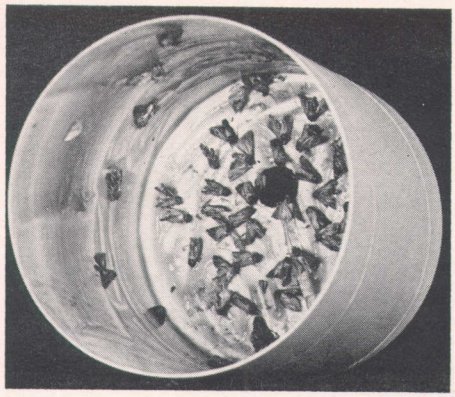
Milk production (FCM) by cows fed Coastal hay rations increased as the level of concentrates fed was increased. Production levels and persistency of milk production by cows on Coastal and concentrates at the 1:1.8 level were equal to those of cows on the corn silage ration. The rates of decline in milk persistency by cows fed Coastal hay and concentrates at the low and intermediate levels were excessive. Milk fat was not significantly affected by treatment. Accordingly, average daily weight changes by cows on the respective treatments were similar within tests.

When long Coastal bermudagrass hay is fed as the only source of forage to high-producing dairy cows, sufficient concentrates should be provided to supply about 75% of the cows' total energy requirement to maintain normal milk persistency.

PERFORMANCE OF DAIRY COWS FED COASTAL BERMUDAGRASS HAY WITH DIFFERENT LEVELS OF CONCENTRATE, PIEDMONT SUBSTATION, CAMP HILL, ALABAMA, 1965-66

Treatment[1]	Daily feed intake[2]		Energy supplied by concentrate	Lactation response			Av. daily weight change
	Concentrate	Forage		FCM	Persistency	Milk fat	
	Lb.	*Lb.*	*Pct.*	*Lb.*	*Pct.*	*Pct.*	*Lb.*
1965 test							
CBG + concentrates 1:1.8	22.5	14.0	75.1	43.3	97.7	4.08	1.1
CBG + concentrates 1:2.4	17.2	22.4	58.9	39.2	88.4	3.99	1.0
CBG + concentrates 1:3.0	13.7	26.0	51.3	38.5	86.9	4.04	0.9
CS + concentrates 1:3.0	13.4	22.2	45.1	42.4	95.6	4.14	1.1
1966 test							
CBG + concentrates 1:1.8	25.1	15.5	74.8	44.5	91.2	3.77	0.8
CBG + concentrates 1:3.0	13.9	24.8	51.0	38.7	88.6	3.73	0.5
CS + concentrates 1:3.0	13.8	19.7	45.7	45.1	93.3	3.97	0.5

[1] CBG = Coastal bermudagrass hay; CS = corn silage.
[2] Feed intake expressed on dry matter basis.



Cabbage looper males lured to synthetic sex attractant.

Sex Attractant for Insects

ROBERT S. BERGER
Dept. of Zoology-Entomology

Sex attractants may result in death of insects that menace farm crops!

Insects' reproductive instincts are being exploited by entomologists. Potent chemicals produced by insects to stimulate and attract their opposite sexes are being investigated as potential agents for their control.

Growing public concern over pesticide contamination of food, feed, soil, air, and water and increasing resistance of insects to insecticides have caused researchers to explore possible safer and more effective controls.

One approach taken by entomologists and chemists is the search for chemicals highly attractive to insects that might be used to lure them to their destruction. Among the more promising ones are compounds produced by the insects themselves that are known as sex attractants or sex pheromones. These extremely active compounds are generally produced and released by one sex of the species to excite and attract the other sex at mating time. The substances are attractive to individuals of only one, or in some instances, a few closely related species. Unfortunately they are present in very minute amounts and the identity of most of them is unknown. For them to be used on a practical basis, the sex attractants must be identified and the synthetic compounds produced. Thus far, seven of these substances have been identified.

Research at Auburn University Agricultural Experiment Station during the last 3 years has resulted in identification and synthesis of one of these compounds, the sex attractant for the cabbage looper moth. The larvae or loopers of this insect are common pests found feeding on leaves of vegetables, cotton, soybeans, and other crops.

By collecting about 10,000 of the sex attractant-producing glands located on the tip of the abdomen of female cabbage looper moths, approximately 10 mg. (a small drop about the size of a millet seed) of the pure attractant was obtained. The chemical structure of the pleasant smelling, oily attractant was determined to be *cis*-7-dodecenyl acetate by various chemical procedures. With this knowledge, several ounces of the attractant was synthesized. Laboratory tests showed it to be identical in all respects to the natural sex attractant. A study of the chemical structural requirements necessary for biological activity involving a series of compounds incorporating various structural changes indicated that the parent substance was by far the most active.

Several other species of moths, which are in the same subfamily as the cabbage looper, are also attracted by the compound. These, along with the host plants on which they are usually found, are listed in the table. All species except the alfalfa looper occur in Alabama.

Studies are currently underway at Auburn and in several other states to determine how the attractant might be used for practical control of cabbage loopers. One method would be to apply the attractant in combination with conventional insecticides as localized treatments to only a portion of a field. The insects would be attracted to this small treated area and be killed. It would not be necessary to apply insecticide to the remainder of the field. Since beneficial parasites and predators of the pest would not be attracted, they would be spared.

An intriguing approach has been to distribute the attractant in the field to the extent that it masks attractant being given off by unmated moths. Males become confused and are not able to find the females.

Another application where the attractant has shown considerable promise is in combination with light traps. Placement of the attractant on light traps has increased the number of males caught in the traps as much as 20-fold. Apparently the attractant stimulates the moths to fly, getting them up out of the plant where they see the light and are attracted to it.

The use of chemical attractants fits in well with other new approaches to insect control that are being investigated by scientists. Considerable effort is being devoted to development of compounds known as chemosterilants that will sterilize insects. If a bait containing the attractant and a chemosterilant were placed in the field, the male moths would be attracted to the bait and rendered sterile. Any females with which these sterile males mate would produce infertile eggs. This represents a sort of "do-it-yourself" variation of the sterile-male technique, which was used to eradicate the screwworm from the Southeastern United States. In this program, screwworm flies were reared in the laboratory, sterilized with nuclear irradiation, and released in the field. Success of this sort of program depends upon flooding the population with sterile males to minimize the effect of fertile indigenous males. With insects such as the cabbage looper where the number of insects reach tremendous proportions, it is impractical to rear and release sufficient numbers of sterile males to achieve control. Therefore, the males in nature are the ones that must be sterilized and can be through the use of a good attractant.

Sex attractants of other insects and arthropods are also being investigated at Auburn, including those of the Southwestern corn borer, the cotton bollworm, the cotton leafworm, and three species of ticks.

Looper Species Known to be Attracted by Sex Attractant, *cis*-7-Dodecenyl Acetate

Common name	Scientific name	Usual host
Cabbage looper	*Trichoplusia ni*	Vegetables, cotton, soybeans, legumes
Alfalfa looper	*Autographa california*	Legumes
False cabbage looper	*Pseudoplusia includens*	Soybeans, cotton
Mint looper	*Rachiplusia ou*	Clover
None	*Autographa biloba*	Vegetables

At left, unburned pine plantation. Note ground cover is mostly woody vines and pine litter. Center, annually burned pine plantation. Quail food plants are abundant here. At right, annually burned pine plantation that received one application of basic slag 3 years before. Quail food plants are dominant ground cover here.

Development of Good Quail Habitat In Piedmont Pine Woods

DAN W. SPEAKE, *Cooperative Wildlife Research Unit*

STANDS of native perennial legumes can be established and maintained in Piedmont pine stands by controlled late winter burning.

Most species of native legumes that respond to burning are important fall and winter quail food plants.

Burning pine woods helps quail in ways other than improving seed-bearing legumes. Seed produced are available to quail because fire has removed accumulated litter, and undesirable woody vegetation is kept down. The result generally is an open pine woods situation with a ground cover of mostly legumes and grasses.

Long-term study of the effects of annual winter burning on quail populations and quail habitat was conducted near Auburn and Camp Hill by the Alabama Cooperative Wildlife Research Unit. Average fall quail populations on three Piedmont region study areas, similar except for burning history and amounts of bicolor lespedeza present, are shown in the table.

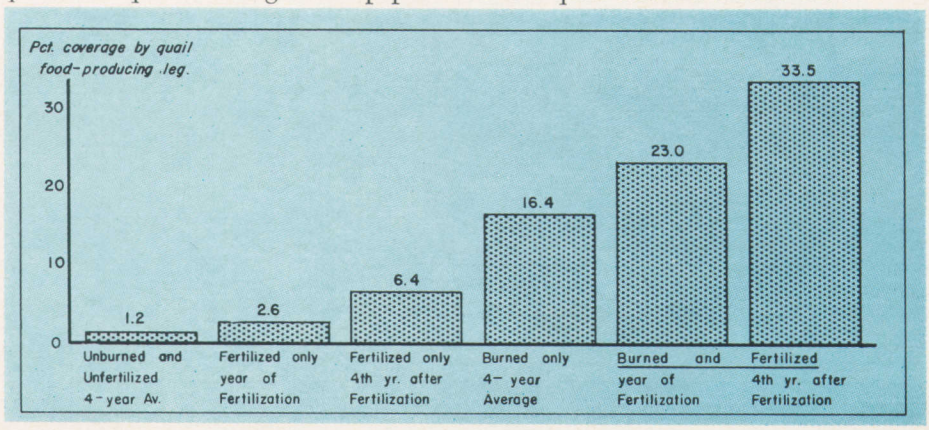
The mentioned study areas were mostly covered by young pine forest with small amounts of old field cover. In the table No. 3B is the quail population expected to be on unmanaged land, No. 3A is that expected with the addition of bicolor patches of normally recommended size and No. 2 is a situation not found normally. The large acreage of bicolor was originally planted as a seed source and planted in such large blocks that hunting was very difficult. The burned area, No. 1, was kept open by fire that produced good conditions for quail and quail hunting. The population level attained here is considered high by quail preserve standards.

In addition to measuring quail population on study areas, ground coverage by quail food plants in pine woods was measured by the line intercept method on burned and unburned areas and on plots fertilized with basic slag on the burned and unburned areas. A total of 45 quail were collected on the burned area and examined for food habits analysis.

Controlled burning increased coverage of quail food plants about 14 times over the unburned area. When basic slag was broadcast at the rate of one ton per acre on burned area, there was a long-time effect that approximately doubled legume coverage over the area burned only, see chart. Ground conditions on the unburned, burned only, and burned and fertilized areas are shown in the photographs. About three-fourths of the total volume of food found in the craws of 45 quail collected on the burned area consisted of native legumes, which would have been scarce without fire, and bicolor lespedeza a planted legume. Native legumes comprised 40% of the quail diet and bicolor 34%.

FALL QUAIL POPULATIONS ON THREE ALABAMA PIEDMONT STUDY AREAS SIMILAR EXCEPT FOR FIRE HISTORY AND AMOUNTS OF BICOLOR

Ar.	Size	Treatment	Av. fall pop., birds/ 100 A.	No. yr. av.
1	124.2A	Burned annually plus about 10A. bicolor	50	(6)
2	133.4A	Unburned plus about 40A. bicolor	27	(3)
3A	200.0A	Unburned with one 1/10A. bicolor patch per 24A.	13	(3)
3B	200.0A	Unburned no bicolor	11	(4)



Effects of controlled burning and fertilizing on coverage by quail-food-producing legumes of the forest floor in young pine stands of the Alabama Piedmont are shown here.

It is recommended that on regularly burned areas attention be given to improving stands of native legumes with basic slag. Until more research is done on specific nutrient requirements of the important species on various soil types, more specific fertilizer recommendations cannot be given; however, N should not be used.

Precautions for controlled burning:

(1) Fire be used only by experienced persons.

(2) Do not use fire in loblolly and slash pine less than 10 ft. tall.

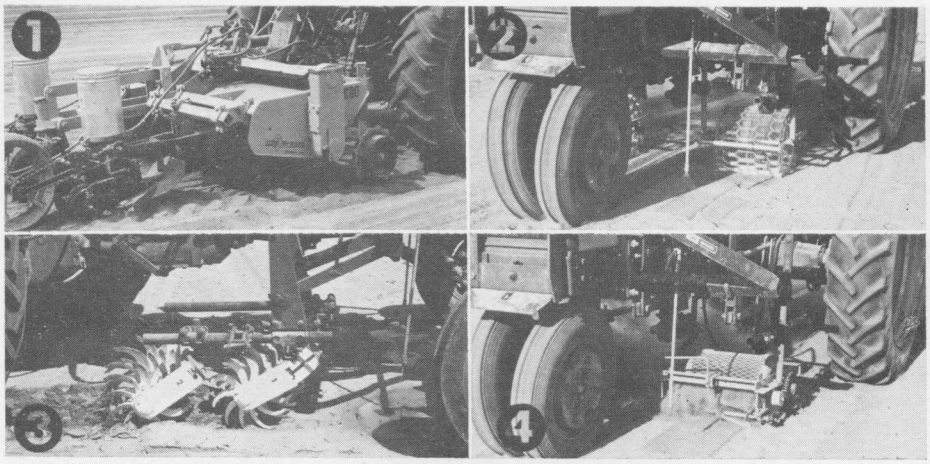
(3) Burn only during February and March, use light winter backfire first.

(4) Burn after a rain when there is a light, steady wind from the northwest.

(5) Use fire breaks or other fire barriers on the boundary of the area to be burned and within the area so 100 or 200 acres can be burned at once.

(6) Notify beforehand the State District Forester, adjacent landowners and others who might become alarmed.

(7) Have enough help to patrol fire breaks and "mop up" smouldering logs near fire breaks after the fire is out.



Incorporating machines used in the cotton weed control study were (1) Sidewinder, (2) Gandy, (3) Lilliston, and (4) Yellow Devil.

Incorporating Herbicides Gives Good Results

W. T. DUMAS, *Department of Agricultural Engineering*

INCORPORATING HERBICIDES into the soil has become a major farm practice. This application method minimizes herbicide loss from rapid volatilization, inactivation by radiation from the sun, and from water and wind erosion.

Since development of herbicides requiring soil incorporation, some 30 firms have begun marketing incorporation equipment. To provide information on how to best use such equipment, field tests were developed to study engineering aspects of herbicide incorporation for weed control in cotton.

The tests were designed to evaluate depth of incorporation and incorporating tools. Treflan at the recommended rate was used in all tests at two research units of Auburn University Agricultural Experiment Station. Evaluations were made on the basis of weed control results.

Five tools were used to incorporate Treflan into the soil. The Yellow Devil, Lilliston, and Gandy were mounted on the front cultivator frame with planter mounted on rear of tractor. The Sidewinder and tandem disk harrow were rear mounted. All tools were operated at 3.5 m.p.h. and were ground driven, except the Sidewinder was a power driven rotary tillage tool. Test soils were a clay loam at the North Auburn Agricultural Engineering Unit and a loamy sand at the Marvyn Mechanization Research Unit.

How depth of incorporating Treflan affected weed control, stand, and yield of cotton was studied on the loamy sand at Marvyn. Treatments included Treflan applied to the soil surface and incorporated ½, 1, 2, 3, and 5 in. deep. The Sidewinder power driven rotary tiller was used for incorporation.

All tools were equally effective except the Gandy on the clay loam soil failed to stir the soil enough to incorporate the Treflan. This resulted in a treatment similar to the surface-applied check, and weed control was about equal for the two.

On the loamy sand soil, all tools were equally effective during the 3 test years. In addition, there was some weed control from Treflan applied to the soil surface.

Weed counts indicate that incorporation at all depths tried was superior to surface application. Incorporating from 1 to 5 in. deep gave better weed control than the ½-inch depth. There were no apparent benefits from incorporating to depths greater than 1 in., nor were there any detrimental effects.

The 3-year results indicate that 1 in. should be the minimum and 5 in. the maximum depth of incorporating Treflan. This gives good weed control without affecting stand or yield of cotton. In addition, surface application provides some weed control.

Degree of incorporation necessary for good weed control was found to be influenced by atmospheric and soil conditions at time of application.

Nutsedge and coffeeweed were not affected by the Treflan, and these weeds were not included in counts reported in the tables.

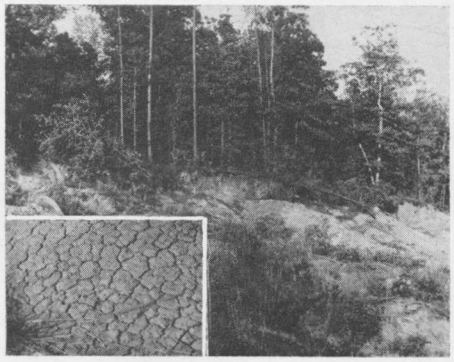
TABLE 2. EFFECT OF INCORPORATION DEPTH ON WEED CONTROL FROM TREFLAN, 1964-66 AV.

Depth of incorporation	Weeds/75 ft. of row	
	Broadleaf	Grass
	No.	*No.*
Surface applied		
Soil stirred 1 in.	17	59
Not stirred	11	47
½ inch	5	16
1 inch	4	5
2 inches	5	2
3 inches	3	1
5 inches	6	2
Check (no treatment)	59	277

TABLE 1. EFFECT OF DIFFERENT INCORPORATION TOOLS ON WEED CONTROL FROM TREFLAN

Incorporation tool	Weeds per 75 feet of row			
	Clay loam, 1965-66 average		Loamy sand, 1964-66 average	
	Broadleaf	Grass	Broadleaf	Grass
	No.	*No.*	*No.*	*No.*
Yellow Devil				
Treflan incorporated	21	43	6	4
No Treflan	40	2,598	107	281
Lilliston				
Treflan incorporated	30	59	6	4
No Treflan	78	2,780	74	223
Gandy				
Treflan incorporated	22	594	14	4
No Treflan	57	2,247	132	196
Sidewinder				
Treflan incorporated	40	86	4	3
No Treflan	50	2,439	74	219
Disk harrow				
Treflan incorporated	28	67	7	7
No Treflan	64	1,480	88	237
Check				
Treflan on surface	45	500	45	63
No Treflan	99	2,125	123	200

A dallisgrass pasture in a landscape setting typical of the Black Belt is at right. At right below, trees felled by slump of the road bank show the fluid property of soils that contain large amounts of montmorillonite. The cracks, inset, are a characteristic feature of montmorillonite clays.



Clay Mineralogy, Chemical, and Physical Properties of Black Belt Soils in Alabama

JOE B. DIXON, *Department of Agronomy and Soils*

STICKY, PLASTIC, CLAYEY SOILS in the prairie of central Alabama, commonly referred to as the Black Belt, are different from most soils in other regions of the State.

Research at Auburn has shown that almost two-thirds of the clay in these soils is montmorillonite (a soft clay mineral composed of very fine particles).

Difficult To Plow

The large amount of montmorillonite clay causes Black Belt soils to be sticky when wet and very hard when dry. One indication of their stickiness is the large amount of power required to plow them. Data in the table show that it takes three or four times as much power to plow Houston or Oktibbeha clay soils of the Black Belt as Norfolk or Lakeland sand of the Coastal Plains. Sumter clay, an extensive soil in the Black Belt, is less sticky and plows easier than Houston or Oktibbeha soils because it contains a large amount of lime.

Soils high in montmorillonite form hard clods when dry. Large clods in a seedbed can be avoided by harrowing immediately after plowing.

POWER REQUIRED TO PLOW 8 INCHES DEEP AT 3 M.P.H. WITH A MOLDBOARD PLOW

Soil	Specific draft* lb./sq. in.
Houston clay	24
Oktibbeha clay	17
Sumter clay	12
Norfolk (Lakeland) sand	6

* Data from Randolph, J. W. and I. F. Reed. 1938. Tests of Tillage Tools II. Effects of Several Factors on the Reactions of Fourteen-Inch Moldboard Plow. Agr. Engr. 19: 29-33.

Poor Bases for Foundations

Black Belt soils are poor bases for foundations because moisture changes cause shrinkage and swelling of the montmorillonite clay. Construction on these soils should be avoided if possible. Chalk beneath Black Belt soils is more stable than the soil material. Reinforced foundations and building designs that permit shrink-swell without structural damage may be employed where it is necessary to build on these soils. Montmorillonite causes Black Belt soils to slump badly on steep slopes of ditches and roads.

Soils Are Erosive

Black Belt soils are erosive because they occur on long slopes and have a slow rate of water entry. During rainy periods the montmorillonite clay swells and closes cracks caused by drying out thereby reducing water entry. Conservation measures are necessary to prevent excessive soil loss by erosion where cultivated crops are grown.

Acid Black Belt soils require more lime to raise the pH a given amount than do sandy or clayey soils that do not contain large amounts of montmorillonite. They also require more available potassium to meet plant growth needs than do most other soils. For example the available potassium level of a soil testing "medium" for corn and grasses is 80 to 160 lb. per acre for acid Black Belt soils and 60 to 120 lb. per acre for clay soils of the Coastal Plains. Plant nutrients do not leach from Black Belt soils as they do from sandy soils of the Coastal Plains.

Both Acid and Alkaline

Acid and alkaline soil types of the Black Belt often occur in the same field. Samples of soils taken for soil tests must be taken with care to avoid mixing of contrasting soil types. The red and yellow soils of the Black Belt are usually acid. There are important exceptions that occur mostly where red and yellow soils are thin and in small bodies. Mixing of acid soil and alkaline substratum may occur as a result of plowing in eroded fields. Field observations indicate that washing of lime from up-slope alkaline soils to the lower lying acid soils converts acid Oktibbeha and Vaiden soils to near-neutral material particularly in the surface layer of soil.

Produce Good Yields

Black Belt soils produce good yields of forages and other crops when fertilized according to soil tests and managed properly. With powerful farm tractors now available these soils can be plowed more effectively and show greater promise for the production of row crops.

What Causes Fat Loss When Cows Are Fed Pelleted Concentrates?

G. E. HAWKINS, *Dept. of Dairy Science*

FEEDING PELLETED concentrates to dairy cows has been widely studied in the United States. Reports of this research have revealed varying effects on rumen metabolism and milk fat percentages.

Several studies have been done at Auburn University Agricultural Experiment Station to learn the variables that determine how fat percentage is affected by pelleted concentrates. Variables that have been studied include (1) starch content of concentrate mixture, (2) percentage of pelleted concentrates fed in the total ration, (3) percentage of roughage in total ration, and (4) type of roughage fed to cows getting pelleted concentrates.

Corn Had Most Effect

In the first study it was found that milk fat was depressed more by feeding pelleted corn than by feeding pelleted oats. (Corn is high and oats intermediate in starch content.) In addition the reduction in fat was greater when the ration included 49% pelleted corn, 21% cottonseed meal, and 30% alfalfa hay than when it was 35% pelleted corn, 15% cottonseed meal, and 50% alfalfa hay. (See table.)

Another test evaluated ground corn and corn distillers dried grains (CDDGS), a feed low in starch, fed in pelleted and nonpelleted forms. Cows fed the ground corn concentrate produced milk containing 3.6% fat, as compared with 3.1% fat when they were fed the pelleted corn concentrate. In contrast, milk from cows fed CDDGS analyzed 3.7 and 3.6% fat, respectively, for nonpelleted and pelleted rations. (See table.)

Results of these studies suggested that the starch content of concentrates determined the effect that pelleting would have on milk fat depression. Consequently, an additional trial was made in which rations fed were 50% roughage and 50% ground corn with 0, 40, 70, and 100% of the corn being pelleted. Percentage of milk fat decreased steadily with increasing proportions of pelleted corn in the ration.

In one study the response to pelleted concentrates was measured with cows fed different roughages. One group got a ration of 25% alfalfa hay, 25% corn silage, 40% pelleted corn, and 10% cottonseed meal. This ration was compared with one in which the corn silage was replaced by immature oat pasture. Those receiving corn silage and the pelleted corn produced milk containing 0.2% more fat than cows grazing oat pasture and fed pelleted corn.

Relationships Found

Among pelleted concentrates there was a negative relationship between amount of pelleted dietary starch consumed and milk fat percentage, with fat percentage dropping as content of starch increased in the pelleted ration. With nonpelleted rations, increasing the starch content had no significant effect on milk fat percentage.

It appears from these results that the reduced milk fat percentage that occurred with feeding of some pelleted concentrates was associated with changes in the starch during pelleting. Thus, using low-starch feed ingredients in pelleted feed mixes would be an effective way to prevent or minimize the fat loss that has been associated with feeding pelleted concentrate rations. This would be something for feed manufacturers to consider, since they usually select ingredients for mixtures.

The depression of milk fat percentage from feeding pelleted starchy concentrates was greatest when roughage intake was lowest or when high quality pasture was supplying at least 25% of the ration. Therefore, dairymen may reduce the effect of feeding starchy concentrates by (1) increasing the proportion of harvested roughage in the ration, and (2) restricting the amount of high quality grazing to provide less than 25% of the total ration.

The pelleted starchy concentrates produced their milk fat depression by changing fermentation in the rumen. The change resulted in the production of a smaller proportion of acetic acid in relation to propionic acid.

DIFFERENCES IN MILK FAT PERCENTAGES ASSOCIATED WITH FEEDING PELLETED CONCENTRATES TO DAIRY COWS

Ration ingredient	Milk fat content	
	Nonpelleted	Pelleted
	Pct.	*Pct.*
Experiment 1		
49% corn	3.7	2.7
35% corn	3.5	3.2
49% oats	3.1	3.4
35% oats	3.6	3.6
Experiment 2		
40% corn*	3.6	3.1
50% CDDGS	3.7	3.6

* An additional 10% of concentrates was supplied as cottonseed meal.

SOIL INOCULANTS FAIL TO IMPROVE CROP PRODUCTION

A. E. HILTBOLD and J. T. COPE, JR.
Department of Agronomy and Soils

INOCULATING SOIL with cultures of bacteria to improve the soil and increase crop production has had recurring appeal down through the years. But there has been little scientific evidence to support use of such practices.

Farmers and home gardeners want soils that are easily worked and that will supply moisture and nutrients for good crop growth. It is generally recognized that microorganisms are important for soil productivity. Some release nutrients from organic matter, some bind the clay particles into granules, and some bring in nitrogen from the air. It seems reasonable that adding these microorganisms should improve poor soils and make good soils better.

Since the discovery of nitrogen-fixing bacteria about 70 years ago, enterprising businessmen have marketed various bacterial cultures for inoculation of the soil. In recent years the Russians have inoculated millions of acres with *Azotobacter* in hopes that this would end the need for nitrogen fertilizer.

Soil inoculation materials occasionally appear on the market in Alabama. Claims are made that a particular product will restore the balance of nature, revitalize the soil, and make better soil and crops. One such inoculum was tested in 1966 by Auburn University Agricultural Experiment Station.

Field experiments were conducted on Marlboro fine sandy loam at the Gulf Coast Subtation, Fairhope; on Decatur silty clay loam at the Tennessee Valley Substation, Belle Mina; and on Lucedale sandy clay loam at the Prattville Experiment Field. For the experimental treatment, the liquid culture was sprayed on the ground at 20 gal. per acre ahead of planting. Comparison plots were handled the same except that the culture was omitted. Soybeans and corn were grown at Fairhope and cotton and corn at the other two locations. Fertilization, cultivation, and insect control practices were carried out as recommended for best crop yields.

Dry weather reduced corn production at Belle Mina, but good yields were made there with other crops. All yields were good at other locations. No differences in crop growth were apparent between inoculated and uninoculated plots during the growing season or in final yield. Like most previous attempts to improve the soil and increase crop production by adding microorganisms to the soil, this inoculation was wasted effort.

Considerable research has shown that microbial population of the soil is determined by soil physical and chemical conditions and not by inoculation, whether intended or by chance. This is based on the almost universal distribution of microorganisms through the air and by other natural movement. This means that in any soil, bacteria or fungi will appear whenever conditions are suitable for their growth.

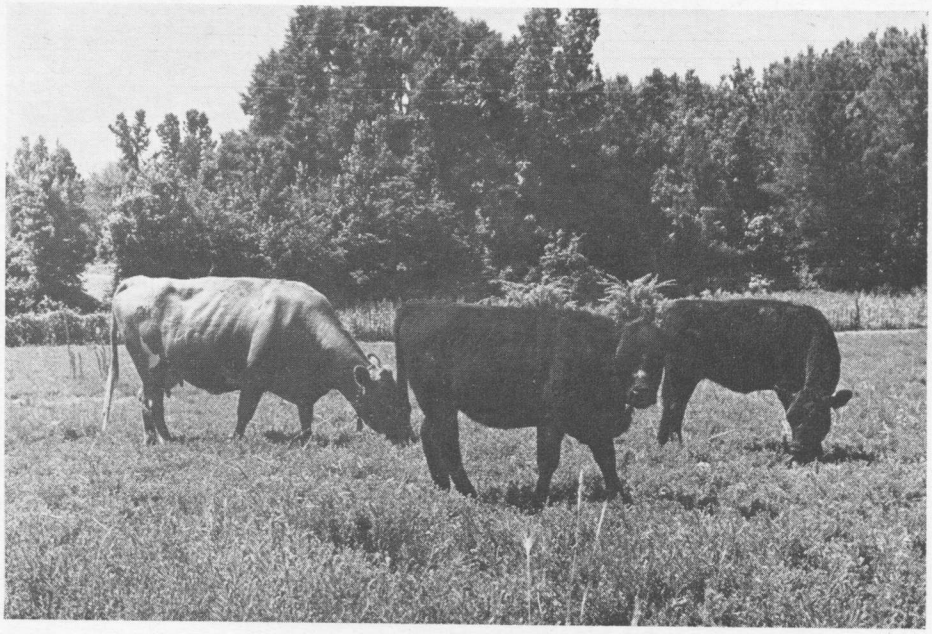
Humus formation, release of plant nutrients, and improvement of soil structure are benefits of microbial activity in soil. To get these benefits it is necessary first to have proper fertilization, liming, tillage, moisture and erosion control, and other factors of good crop management. Under these conditions soil inoculation is unnecessary, and without these conditions such inoculation is of no value.

Soil inoculants are not to be confused with legume seed inoculants. Commercial legume inoculants are recommended and widely used. These *Rhizobium* bacteria are specific for their host plant, and their growth and distribution in the soil is largely dependent on the presence of the host plant. Thus, when a legume crop is planted in a soil for the first time, it is necessary to ensure the presence of *Rhizobium* known to be effective nitrogen fixers in that crop. This is easily accomplished by seed inoculation with selected strains of commercially prepared inoculum. Such inoculation is recommended for satisfactory growth of legume crops, enabling them to fix atmospheric nitrogen.

EFFECT OF SOIL INOCULATION ON CROP YIELDS, 1966 AVERAGES*

Location	Per acre yields, three crops					
	Corn		Cotton		Soybeans	
	Inoculant	None	Inoculant	None	Inoculant	None
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*
Prattville	67.6	66.3	2,163	2,192	-----	-----
Fairhope	86.3	85.7	-----	-----	46.3	49.8
Belle Mina	32.9	29.6	1,738	1,687	-----	-----

* There were no differences that could be attributed to the inoculation.



Cattle grazing on Serala at the Piedmont Substation, Camp Hill.

SERALA SERICEA as a GRAZING CROP for Beef Cattle

W. B. ANTHONY and R. R. HARRIS, *Department of Animal Science*
C. S. HOVELAND, *Department of Agronomy and Soils*
E. L. MAYTON, *Piedmont Substation*
J. K. BOSECK, *Tennessee Valley Substation*

SERALA SERICEA LESPEDEZA is superior to common sericea because it has finer and softer stems and more stems per plant.

This variety was developed by Dr. E. D. Donnelly, Department of Agronomy, and released by the Station in 1962.

Serala Tested

In 1964, Serala was tested as a grazing crop at the Piedmont Substation. Coastal bermudagrass was also tested in this experiment. Coastal received annually 100 lb. N. per acre. Mineral fertilizers were applied according to soil test. Beef cows and their calves grazed the test crops.

At the Tennessee Valley Substation, Serala was also established in 1964 in a 4-acre grazing paddock. Rye was overseeded on the Serala in the fall. Mineral fertilizer was applied by soil test and rye received 50 lb. N. per acre. A comparable area (two 2-acre paddocks) was in Coastal with rye overseeded each fall. The Coastal received mineral fertilizer by soil test and nitrogen at the rate of 100 lb. per acre annually. The paddocks were grazed by yearling steers.

Results

The grazing test at the Piedmont Substation is still in progress. Carrying capacity and cow and calf live weight gains are given in Table 1. Serala furnished more grazing days than Coastal 2 of the 3 years tested. Calf gain produced per acre was slightly greater each year on Coastal, averaging 13 lb. per acre over the 3-year period. Calf average daily gain was slightly higher for Coastal.

Table 1. Beef Cattle Performance on Serala Sericea and Coastal Bermuda at the Piedmont Substation

Year	Cow days per acre for the season		Calf gain per acre for the season lb.	
	Serala	*Coastal*	*Serala*	*Coastal*
1965	144	144	239	248
1966	90	67	112	126
1967	166	114	180	195
Av.	133	108	177	190

Serala sericea, in addition to providing a longer grazing season, did not require the 100 lb. per acre of N applied to Coastal. Therefore, Serala was almost equal to Coastal for beef cows nursing calves and pasture fertilizer costs were lower for Serala.

Longer Grazing Season

In the Tennessee Valley area, with better soil and moisture relationship than exists in the Piedmont, Coastal produced more grazing days and live weight gain per acre than Serala, Table 2. However, in contrast to performance of nursed calves on Serala at the Piedmont Substation, yearling steers made greater daily gain on Serala than Coastal. Overseeded rye made possible earlier grazing on Coastal and Serala. Rye forage, in part, accounts for the longer grazing season on Serala and Coastal at the Tennessee Valley Substation than was obtained for these crops at the Piedmont Substation.

Serala Potential Grazing Crop

These data clearly show that Serala sericea is a potentially valuable permanent pasture crop. In comparison with Coastal, Serala would require less investment in nitrogen fertilizer. For the Piedmont area, data suggest carrying capacity may be as great on Serala sericea as it is on Coastal bermuda. Based on this and other work at the Piedmont Substation, Coastal has not made the production it has at other locations in the State. The very satisfactory daily gain by yearling steers on Serala at the Tennessee Valley Substation indicate the forage is palatable and nutritionally adequate.

Table 2. Performance of Yearling Steers on Serala Sericea and Coastal Bermuda at the Tennessee Valley Substation

Year	Steer days per acre for season		Steer live weight gain per acre for season lb.		Daily gain per steer for season lb.	
	Serala/rye	*Coastal/rye*	*Serala/rye*	*Coastal/rye*	*Serala/rye*	*Coastal/rye*
1965	244	441	384	561	1.52	1.28
1966	183	210	264	532	1.39	1.38
1967	214	330	295	349	1.29	1.07
Av.	214	327	314	481	1.40	1.24

SOIL COMPACTION OFTEN LIMITS COTTON YIELDS *in* ALABAMA*

ZANE F. LUND**

COTTON YIELDS in Alabama are often limited by shallow rooting even in years when rainfall is above average.

Frequently as much as 90% of the cotton roots are concentrated in surface 6 or 7 in. of soil. (See photo.) Such a shallow root zone can store only a few days' supply of moisture. Plants growing under these conditions may suffer moisture stress, while untapped moisture lies only a few inches below in the subsoil.

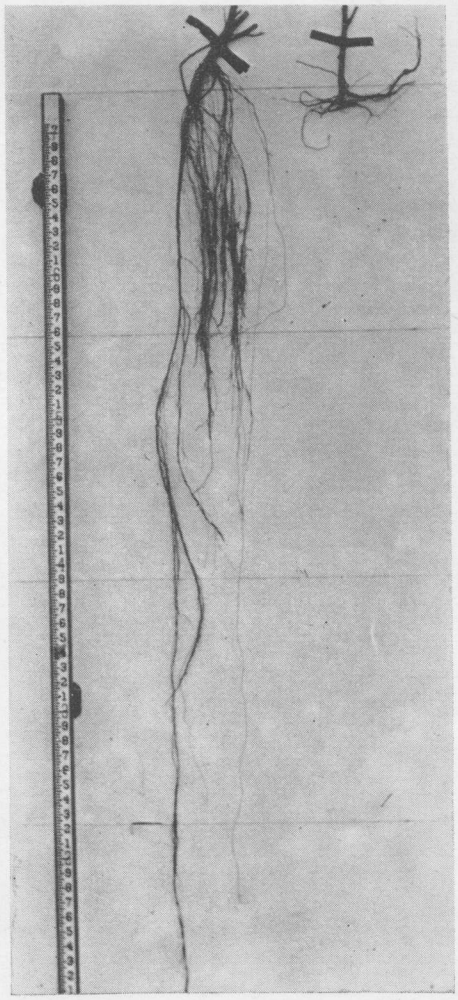
Soil compaction may be a prime factor in limiting root penetration. Compaction restricts root growth by increasing mechanical resistance to root penetration or by limiting aeration. Roots cannot penetrate rigid soil pores that are smaller than the root tip in diameter. When root growth is impeded by a soil pan, the roots tend to spread or become a matted dense layer in the surface soil. Sometimes a root will penetrate a crack or wormhole through the pan and then spread into the less dense subsoil below the hard pan.

Some soils are more subject to compaction than others. On sandy loam, which is probably the easiest soil to compact, the rear wheels of a tractor in one trip over a field may cause sufficient compaction to severely restrict root growth. A disk harrow will also severely compact soil.

Several studies have been conducted at Auburn to define the values of mechanical impedence limiting root growth, and the interaction of compaction and moisture in limiting root penetration into subsoils. Also it would be desirable to know whether some mechanical soil measuring device, such as a penetrometer can be used to predict how much a hard layer will restrict cotton penetration.

Soil from a compacted layer in a field at the Wiregrass Substation, Headland, Alabama, was dried and screened. Cores of varying degrees of compaction and moisture content were made and used in growth-chamber studies to evaluate the measuring device and root penetration of cotton.

Soil density ranged from a loose soil of 87 lb. per cu. ft. to compact soil of 118 lb. per cu. ft. Since a moisture range was used at each density level, the effect of moisture could be determined. A needle penetrometer (about four times the size of a cotton taproot tip) was pushed through the soil cores and the force recorded. To evaluate root penetration, cylinders containing a fertile surface soil were taped to the test cylinders. Seeds were planted in the surface soil. After 6 days the cores were opened and penetration into the test core was measured.



Root pattern of cotton plant grown under near ideal soil conditions as compared with that of a plant grown in a severe traffic pan.

Moisture was extremely important at all compaction levels. Essentially there was no root penetration when the soil was compacted to the density found in the field. At intermediate densities, the soil had to be quite wet before root penetration was satisfactory (table). Data obtained with the penetrometer indicated that this instrument could be used to determine whether roots would penetrate the soil.

Field studies are underway to determine various methods of preventing or modifying compaction. It is necessary to keep traffic to a minimum to prevent pan formation. The practice of chiseling the soil at planting time has shown promise as a remedy. This practice allows the roots to penetrate the restricting zone before it again seals over. Substantial increases in yield were found in some tests on sandy soils, but the treatment was of no benefit on heavy soils this past year.

EFFECT OF COMPACTION AND MOISTURE LEVEL ON THE LENGTH OF COTTON TAPROOTS

Soil moisture	Taproot length at compaction levels*				
	1	2	3	4	5
Per cent	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
10.5	3.00	2.68	2.48	1.26	.47
9.5	2.28	1.85	.59	.08	.31
8.5	.63	.55	.16	.16	.12

* Compaction level 1 is poured in a cylinder, vibrated, pressed lightly. Compaction level 5 is slightly below the highest density level found in a field. Compaction levels 2, 3, and 4 are intermediate.

* Contribution from the Soil and Water Conservation Research Division, Agricultural Research Service, USDA, and Auburn University Agricultural Experiment Station, Auburn, Alabama.

** Research Soil Scientist, Soil and Water Conservation Research Division, ARS, USDA, Auburn.

Plot at left shows obvious differences between the unfertilized trees in front of observer and the MAP treated trees in next row to the left. Needles on trees in plot at right receiving MAP were longer and appeared more vigorous than on unfertilized trees.

RESPONSE of SLASH PINE To SLOWLY AVAILABLE FERTILIZER

MASON C. CARTER and EDWIN H. WHITE
Department of Forestry

THE IDEAL FERTILIZER for a long-lived crop such as forest trees is one that can be applied once during a rotation and remain in the soil, releasing nutrients slowly as needed by the tree crops.

The search for such fertilizers has long been pursued by agronomists and horticulturists, and now foresters have joined the search. Several materials show promise on cultivated crops, but in general, periodic applications of readily available fertilizers have proved superior to single applications of slowly available fertilizers.

Several slowly available fertilizers have been tested on forest trees by Auburn's Department of Forestry and recently one material has given promising preliminary results.

In February 1963, slash pine seedlings were machine planted on a "wildland" site in northeast Baldwin County. The sandy Eustis soil was prepared for planting by bulldozing and windrowing. Two weeks after planting, 40 seedlings were given an application of magnesium ammonium phosphate (6% N, 13% P) and 40 others were treated with ferrous ammonium phosphate (5%N, 11% P). Four ounces of the chemical were placed in a dibble hole made 6 in. from each seedling. Care was taken to place the fertilizer in the trench made by the planting machine since previous observations indicate that extensive root growth occurs in the planting trench. Forty additional seedlings were tagged and left untreated.

TABLE 1. AVERAGE HEIGHT OF SLASH PINE FOLLOWING FERTILIZATION AT PLANTING TIME

Treatment	Height ft.[1]		
	1 yr.	2 yr.	3 yr.
Unfertilized	0.9	2.1	4.0
FAP—4 oz./tree	1.0	2.3	4.2
MAP—4 oz./tree	1.2	2.9	5.0

[1] Differences significant at 5% level each year.

The beneficial effects of the magnesium ammonium phosphate (MAP) appeared after the first growing season and continued through the third year. Ferrous ammonium phosphate (FAP) did not significantly affect height growth. Unfertilized trees were 4 ft. tall; FAP were 4.2 ft. and MAP were 5.0 ft. after 3 growing seasons. Previous studies on similar soil indicated that very high rates of readily available fertilizers, mainly nitrogen, were necessary to promote increased height growth of slash pine. The readily available fertilizers were applied broadcast while the MAP was placed in the soil. Hence, a direct comparison cannot be made.

At the end of the third growing season, foliage samples were collected and N, P, and Mg levels were determined. No significant effect could be attributed to fertilization. These findings are in contrast to those observed with readily available fertilizers where application of N and P increased the levels of these elements in the foliage.

Clearly MAP improved the growth of slash pine in these studies. However, the mechanism of the beneficial effect is not clear. The MAP may have stimulated root growth the first year and subsequent increased height growth resulted from the larger root system. Or the MAP may have continued to supply nutrients for the first 3 years and the effect was not apparent in the foliar analysis as a result of the increased amount of foliage on the MAP treated trees.

A 2-acre pilot test of MAP has been established to further verify these preliminary results and additional information should be forthcoming in the future.

TABLE 2. NUTRIENT CONTENT OF NEEDLES OF SLASH PINE FOLLOWING FERTILIZATION[1]

Treatment	Average needle wt.	N	P	Mg
	mg	*Pct.*	*p.p.m.*	*p.p.m.*
Unfertilized	41.5	1.00	756	1031
FAP—4 oz./tree	41.9	0.93	812	1050
MAP—4 oz./tree	39.2	0.95	778	1036

[1] Fertilizer applied at planting; samples taken after three growing seasons. None of the differences are significant.

CONTROLLED ENVIRONMENT— New Avenue to Preventing Poultry Diseases

D. F. KING, *Department of Poultry Science**

DISEASES ARE COSTLY to the broiler industry, so effective control measures are vitally needed.

Drugs have been widely used for disease control, but they are inadequate as the sole defensive measure. In addition, drugs are costly, usually effective only when given early and at high levels, do not eradicate the infection from the premises, and have no direct action on true viruses. It is usually necessary to use a specific drug for a particular disease.

Recommended treatments frequently fail since disease-producing organisms often become resistant to drugs that are used frequently or for extended periods. Even if the drug destroys the disease agent, it may fail to eliminate lesions, making it ineffective in reducing poultry condemnations.

Prevention by Management

Since disease prevention with drugs is not completely satisfactory, there has been growing interest in use of management methods to overcome disease problems. In the past when birds were housed in open shelters and often ranged on contaminated soil, it was impossible to prevent many diseases by management alone. Recently, however, fan ventilated, windowless houses have been accepted as economically feasible because of improved performance of birds. Such houses lend themselves to a disease prevention program, as shown by test results at Auburn University Agricultural Experiment Station.

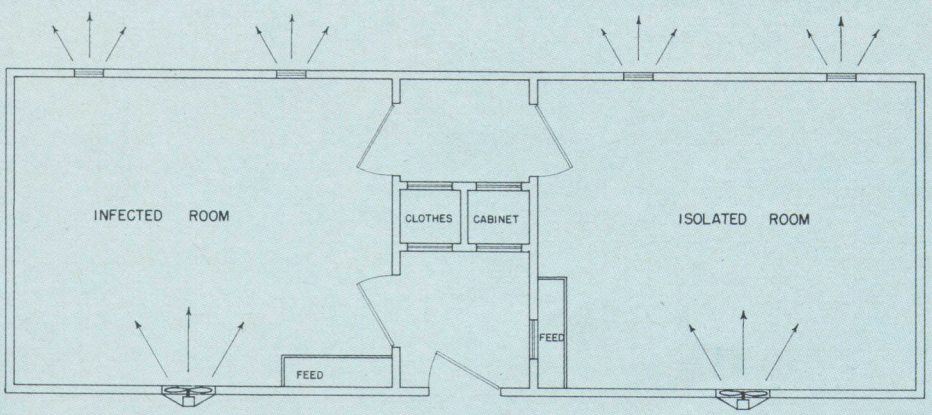
Two brooder rooms joined by a vestibule (see sketch) were used in the Auburn study. An infected room was used to maintain diseased birds so there would be adequate exposure of birds kept in the second (isolated) room.

Diseases Given Intentionally

In each 8-week test chicks in the infected room were purposely given Newcastle, infectious bronchitis, Ascaridia, coccidiosis, and Salmonella. The first two diseases were given in the drinking water when chicks were 3 days old. Each flock in the infected room was given 10 times the normal dose in an effort to produce a disease condition.

When the birds were 5 days old, 10% of those in the infected room were given 3 times the normal dose of eight species of coccidia by mouth. These birds seeded the litter a few days later, causing remaining chicks in the infected room to develop the disease. At the age of 2 weeks, each bird was given 400 Ascaridia worm eggs by mouth. Salmonella typhimurium was given in the drinking water when chicks were 24 days old.

All birds got nonmedicated feed throughout the test, and no drugs were used to relieve any disease condition. Various laboratory tests and daily observations proved that all five diseases were present in the infected room. Thus, the only thing that prevented spread of the diseases to the isolated flocks was the system of precautions used.



In this experimental brooder house, birds in the infected room were purposely given diseases to evaluate measures used to prevent spread to chicks in the isolated room.

Effective Precautions

In each of the two tests chicks were grown on litter in the isolated room. This room could be entered only through the infected room, and this provided ample opportunity for disease spread. Precautions included: (1) the isolated room had a separate duct ventilating system, (2) there were double doors at the isolated room entrance, and (3) the attendant put on a clean laboratory coat, new plastic boots, and gloves in the vestibule each time after leaving the infected room before going into the isolated room.

In both flocks laboratory tests were made at 3, 6, and 8 weeks of age and there were daily observations and postmortem examination of all birds at 8 weeks of age to identify any disease present. These tests revealed that, except for coccidiosis, chicks in the isolated room remained free of all diseases present in the infected room throughout the 8-week growing period. In the first test coccidiosis was not found in the isolated room until birds were about 7 weeks old and it caused no problems. In the second test, however, it was found in the isolated room about 3 weeks after chicks in the infected room were inoculated and caused 4% mortality.

Since coccidiosis was spread from infected to isolated room in both tests, it is concluded that procedures followed and precautions taken were not adequate to prevent its spread. It appears doubtful if more strict or elaborate precautions against coccidiosis spread would be justified, since all other diseases were prevented and coccidiosis can be controlled well by feed medication. Commercial poultrymen would not have an exposure situation as extreme as that in the Auburn tests.

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* Professor Emeritus.

COWPEA VIRUSES in ALABAMA

ARTHUR N. HARRISON and
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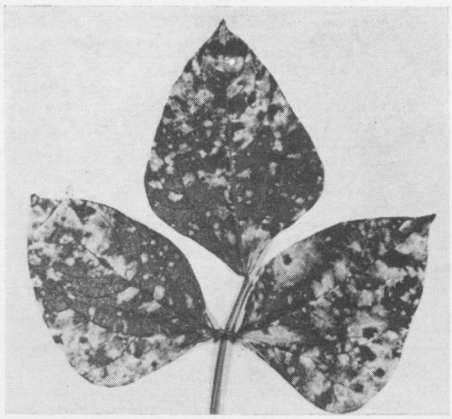
Dept. of Botany and Plant Pathology



Leaf from a cowpea plant infected with cowpea chlorotic mottle virus.

VIRAL DISEASES of cowpeas have long been known to occur in Alabama and neighboring states but all the causal viruses have not been identified.

Research[1] was recently initiated at Auburn to determine the incidence of viral diseases in major cowpea production areas of Alabama and to isolate and identify the causal viruses.

Three Viruses Identified

During the summer and fall of 1966, several cowpea fields in Baldwin, Chilton, Cullman, Houston, and Walker counties were surveyed for the presence of viral diseases. Leaves and stems were collected from plants suspected of having disease and returned to Auburn where they were ground and sap extracted. Sap from each plant was then inoculated into greenhouse indicator plants: pepper, coffeeweed, lambsquarter, tobacco, cowpea, and bean. Any virus or viruses originally present in field-collected cowpeas were identified by the characteristic reactions caused in the indicator plants.

Three different viruses were isolated and identified from Alabama cowpeas. These were: bean yellow mosaic virus (BYMV), cowpea chlorotic mottle virus (CCMV), and cucumber mosaic virus (CMV). Mixtures of two different viruses in the same plant were frequently detected. Collections from Cullman and Baldwin counties were predominantly infected with CCMV or CMV alone or as mixtures. BYMV or CMV alone and in mixed infections were the prevalent viruses from Chilton, Houston, and Walker county collections although CC MV was found in combination with BY MV in one instance in Chilton County. The most noticeable and striking symptom associated with any of the viruses was that caused by CCMV. Leaves of cowpea plants infected with this virus showed a brilliant yellow mottle, see photo.

Susceptibility of Cowpeas to the Viruses

Forty-one cultivars (cultivated varieties) of cowpeas were tested for susceptibility to different viruses isolated from Alabama cowpeas. Each virus was inoculated into primary leaves of 3-15 plants of each cultivar tested. Plants were observed for 2 weeks and reactions recorded as they occurred.

Reactions of the different cowpeas to each virus are summarized in the table. None of the cowpeas were completely insusceptible to any of the viruses tested. Some cultivars gave a systemic reaction indicating the virus multiplied and moved throughout the plant. In others a local response of spots or lesions of discolored or dead tissue developed on inoculated leaves and was later followed by systemic invasion throughout the plant. Some appeared insusceptible because no obvious symptoms developed; however, the virus involved was later recovered from all such cultivars. Cultivars that developed only mild symptoms when inoculated with the three viruses were: 'Blue Goose,' 'Bunch Texas Purple Hull,' 'Knuckle Purple Hull,' 'Running Texas Purple Hull,' and 'White Crowder.'

All cowpeas commonly grown in Alabama are apparently susceptible to the three viruses now known to occur in the State. The importance of the viruses in affecting yields of these cowpeas has not been determined. In greenhouse experiments at Auburn, the effects of BY MV, CCMV, or CMV singly and in mixed infections on production of seed, leaves, stems, and roots by 'Early Ramshorn' and 'Clay' cowpeas were studied. Only BYMV significantly reduced growth and yield in 'Early Ramshorn,' and none of the viruses had any significant effect on 'Clay.'

SUSCEPTIBILITY OF SOME COWPEAS TO BEAN YELLOW MOSAIC VIRUS (BYMV), COWPEA CHLOROTIC MOTTLE VIRUS (CCMV), AND CUCUMBER MOSAIC VIRUS (CMV)

Cultivar	Reaction*		
	BYMV	CCMV	CMV
Alalong	S	S	S
Black Crowder	S	SI	SI
Blackeye	S	S	S
Blackeye Crowder	S	S	S
Blue Goose	S	S	SI
Brabham	LL,S	S	SI
Brown Crowder	S	S	S
Brown Purple Hull	S	S	S
Bunch Purple Hull	LL,S	S	S
Bunch Texas Purple Hull	S	S	S
Burgundy Purple Hull	LL,S	S	S
Bushpinkeye	S	S	S
Calico Red Speckled Crowder	S	S	S
California Blackeye	S	S	S
California Blackeye #5	S	S	S
Certified California Blackeye	S	S	S
Clay	S	S	--
Cream #5	S	S	S
Cream #40	--	S	S
Combine	S	S	S
Dixie Lee	LL,S	S	S
Early Purple Hull	S	S	S
Early Ramshorn	S	S	S
Giant Blackeye	S	S	S
Knuckle Hull Crowder	LL,S	S	S
Knuckle Purple Hull	LL,S	S	S
Lady	S	S	S
Lady Cream	--	--	S
Long Pod Purple Hull	S	S	SI
Mixed	S	S	S
Pinkeye Bunch Purple Hull	S	S	S
Purple Hull White Crowder	--	--	S
Reseeding	S	S	--
Running Texas Purple Hull	S	S	S
Silverskin Crowder	S	S	S
Speckled Purple Hull	S	S	S
Texas Cream Conch	S	S	S
Turkey Crowder	S	S	S
Whipporwill	S	S	S
White Acre	LL,S	S	S
White Crowder	S	S	S

* S = systemic mottle, LL = local lesions, SI = symptomless, but infected, I = Insusceptible.

[1] The assistance of Dr. S. T. Jones, Department of Horticulture, in this research is gratefully acknowledged.

Homemakers' Meat Preferences *for* Special Meals

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Department of Agricultural Economics and Rural Sociology

"WHAT'S FOR DINNER tonight, Mom?" is a familiar question!

To the homemaker in the kitchen, the answer is backed up by her experience, knowledge of family preferences, and the dollars she can spend for food. If there are to be guests, other aspects such as whether they are close friends or acquaintances must be considered in planning the meal, purchasing the ingredients, and preparing the food.

Menu planning for many homemakers begins with meat, next the dessert, other components such as vegetables, salad, and beverage selected to complement the entire meal. Since food has many other functions apart from body nourishment, meals for guests are frequently more expensive or include foods seldom used for family meals. If homemakers were asked what the meat choice would be for a particular meal, it could indicate attitudes toward cost, guest prestige, and culinary ability.

Four meals selected for study were menus that had been experienced by most homemakers, namely: a typical family meal, an informal dinner for church friends, a birthday celebration for the husband, and a dinner for a business acquaintance. Meats were chosen from a list that included chicken as well as beef and pork in several forms. A total of 3,352 homemakers in three Alabama cities provided answers.

Chicken, which is almost entirely broiler-fryers nowdays, was most often selected as a suitable meat for the family meal or the informal occasion for church friends. Homemakers recognized that beef was certain to please men. Most often mentioned was steak as the meat for husband's birthday dinner or for entertaining a business friend. Beef roast accounted for a fourth of the total mentions in all meals except the birthday dinner, for which chicken was second.

If all forms are combined, chicken was chosen more often by homemakers than beef for the informal dinner. About half would use beef for the typical family meal or birthday party, and two-thirds would serve beef to the business friend. Homemakers were aware that at times cost was less important than prestige.

Chicken was served usually because it was economical and easy to prepare, and most people like fried chicken. Beef roast was usually chosen because cooking failure was almost impossible; beef was a prestige meat with distinctive flavor and aroma. Steak was served because it was certain to please men guests, and would bring compliments to the cook.

There was a relationship between meat choice and per capita income level of homemakers. (See table.) For example, if steak and roast beef were combined, a third of the lowest income respondents and three-fourths of the most affluent group would serve beef if men were the honored guests. In each of the four "study" meals, chicken and pork were most frequently mentioned by the lowest income homemakers.

That meat choices were based on practice and experience was shown by answers to questions about actual meat purchases. Low income homemakers were much more likely to use economical chicken twice a week, whereas higher income women used versatile broiler meat for variety. Broiler meat was a favorite with family members at all income levels. Whole broilers were usually purchased by lower income homemakers, whereas those with more to spend for food bought cut-up chicken or parts.

A listing of all meats used by the families the week before being interviewed showed that 95% had used pork, largely bacon and sausage, for breakfast. Beef and chicken, each, had been purchased by 82% of the respondents. Seafood had been used by 44%, cold cuts 15%, and lamb 2% of the families. About half the women selected meats for the special meals that had been served the previous week.

PERCENTAGE OF HOMEMAKERS, BY MEAT CHOICES FOR MEALS OF VARYING PRESTIGE AND PER CAPITA INCOME, 3,352 HOMEMAKERS, THREE ALABAMA CITIES, 1963-65

Meat choices for meals of varying prestige	Per capita income, dol.				Average
	Under 900	900-1799	1800-3199	3200 over	
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Family Meal					
Chicken	36	30	26	24	30
Roast beef	21	22	24	26	23
Hamburger	18	20	17	12	17
Steak	6	9	16	23	13
Pork chops, ham, roast	14	13	10	5	11
Other[1]	5	6	7	10	6
Husband's Birthday Dinner					
Steak	22	40	48	51	39
Chicken	39	26	15	14	24
Beef roast	10	16	19	17	15
Pork chops, ham, roast	18	9	7	7	12
Hamburger, other[1]	11	9	11	11	10
Church Friends Are Guests					
Chicken	53	47	41	43	46
Beef roast	17	22	28	30	24
Hamburger, steak	14	12	13	11	13
Pork chops, ham, roast	13	12	10	6	11
Other[1]	3	7	8	10	6
Business Acquaintance					
Steak	24	33	41	43	35
Roast beef	17	25	31	29	25
Chicken	30	22	15	16	21
Hamburger, other[1]	15	10	8	8	11
Pork chops, ham, roast	14	10	5	4	8

[1] Fish, seafood, lamb, miscellaneous.

SEED GERMINATION AND VIGOR OF LEGUMES MAY BE REDUCED BY WEED RESIDUES

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LEGUME STANDS may fail for a variety of reasons. New evidence indicates that weed residues present in the soil may be one reason.

Research on this problem was started when failures of crownvetch stands on roadside plantings often seemed related to other plant species or weed residues. In these studies fresh roots and tops of crop and weed species were ground and a 1:15 water extract prepared. These extracts were then used to moisten filter paper in petri dishes in which seed of crownvetch and crimson clover were germinated at 70°F.

Water extracts of such weeds as crabgrass, Virginia pepperweed, and evening primrose sharply lowered germination and sprout vigor of crownvetch and crimson clover, Table 1. Johnsongrass reduced germination and vigor to a lesser extent than the other three weeds. Bahiagrass and Kobe lespedeza extracts delayed seed germination slightly and reduced sprout vigor. Of the extracts tested, those from weeping lovegrass, tall fescue, and sericea lespedeza were the least toxic. In general, extracts from plant tops were more toxic than those from roots.

Since pepperweed extract was so toxic to crownvetch, it was tested on seed of several other crops. In the presence of pepperweed extract, seed germination of Kobe lespedeza was 41%, sericea lespedeza 6%, and ball clover 0%. Seedling vigor was sharply reduced in all species. Weeping lovegrass seed were tolerant to the pepperweed extract.

Even at dilute concentration, pepperweed extracts proved highly toxic to seed germination, Table 2. An extract of only 1 part pepperweed tops to 150 parts water reduced crownvetch germination and vigor. The toxic material was present in all parts of the pepperweed plant. It was found to be heat stable, even at above 240°F.

A greenhouse test revealed no evidence that pepperweed releases a toxic substance from living roots into the soil.

The next question is what effect pepperweed plant residues in soil may have on legume seed germination. Dried pepperweed tops at 1% and 2% by weight were mixed into well fertilized soil before planting crownvetch in the greenhouse. Seed germination was reduced only slightly. In another planting made on the same soil after an incubation period of 10 weeks, crownvetch germination was reduced 80%. This suggests that some breakdown of the pepperweed residues by soil-borne organisms was necessary before germination of this crop was reduced.

Results of these experiments cannot be directly applied to field conditions. It appears that certain weed residues could reduce legume stands, however, since extracts of Virginia pepperweed were found to be highly toxic to germinating seed and reduced sprout vigor even at dilute concentrations. A legume seeded into an area previously infested with pepperweed might suffer stand failure from delayed or reduced germination and seedling vigor. Evening primrose, crabgrass, and possibly other weeds may also be toxic to legume seedlings.

TABLE 1. GERMINATION AND SPROUT VIGOR OF SCARIFIED CROWNVETCH AND CRIMSON CLOVER AS AFFECTED BY WEED EXTRACTS

Extract	Crownvetch			Crimson clover		
	Germination at 3 days	Germination at 5 days	Sprout length	Germination at 1 day	Germination at 3 days	Sprout length
	Pct.	*Pct.*	*Mm.*	*Pct.*	*Pct.*	*Mm.*
Water	90	95	19	85	96	24
Johnsongrass	18	67	9	20	94	18
Crabgrass	3	10	4	1	87	6
Primrose	2	2	1	4	88	7
Pepperweed	0	2	1	1	86	5

TABLE 2. EFFECT OF DILUTING PEPPERWEED EXTRACT ON GERMINATION AND SPROUT VIGOR OF UNSCARIFIED CROWNVETCH

Ratio of pepperweed to water	Germination	Sprout length
	Pct.	*Mm.*
No pepperweed	74	24
1:150	45	13
1:60	28	9
1:30	8	6
1:15	0	--

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