Kentucky FARM AND HOME Science

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In This Issue

The Cover

Symbolic of the harvest season in Kentucky is this picture of workers on a Jessamine county farm as they haul in cut burley from the field on a crisp October morning.

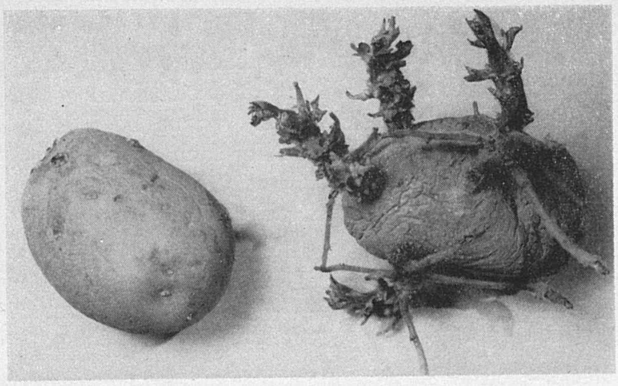
Chemical Prevents Potato Sprouting

Maleic hydrazide effectively controls sprouting of 8 varieties grown commercially in Kentucky; large losses prevented

By CLYDE SINGLETARY and JAMES HERRON

Sprouting during winter storage is the cause of one of the greatest losses in stored potatoes. The Kentucky Agricultural Experiment Station, along with other experiment stations, for many years has been experimenting with methods for preventing potato sprouting during storage. Several methods have been proven to be successful, including cold storage; however, since cold storage is expensive and very few farmers have access to temperature-controlled storage rooms, methods for use in common storage rooms have been tested.

Immediately following the war years, several of the plant hormones were found to delay sprouting of tubers in storage when sprayed on actively growing potato plants a few weeks before harvest or dusted on freshly dug potato tubers. However, the results were frequently erratic.



These two potatoes illustrate the effectiveness of maleic hydrazide in controlling sprouting during winter storage. The plant which produced the tuber on the left was sprayed with the chemical 3 weeks before harvest; that which produced the other tuber received no spray application.

During the early 1950's a chemical, maleic hydrazide, was found to act as an inhibitor of plant growth. The first experimental tests with this chemical to control potato sprouting were encouraging. Following favorable reports from several agricultural experiment stations, the chemical was tested at the Kentucky Agricultural Experiment Station in 1955. The experiment here was set up to test the effectiveness of the chemical in controlling sprouting of the potato varieties grown commercially in Kentucky. Those included in the test were Cobbler, Kennebec, Cherokee, Katahdin, Merrimac, Saco, Teton and Delus.

Sprayed 3 Weeks Before Harvest

The potatoes for the experiment were planted in mid-July. Three weeks before harvest, or on Sept. 20, 4,000 parts per million (PPM) of maleic hydrazide in water was applied with a power sprayer to the potato plants. The potato tubers were harvested in early October and stored in an unheated basement until February 1956, when they were removed to a room where the temperature was controlled at 55° to 65°F. When the tubers were examined in May 1956, those from unsprayed plants of all varieties had sprouts ranging in length from 1 to 4 inches. The sprouts on the tubers which were harvested from treated plants were less than 1/4 inch long (see illustration). Many tubers had no sprouts. There was no difference in sprouting among the varieties.

Treated Tubers Sound and Edible

The sprouts were removed from both the treated and untreated tubers, and the weight of the sprouts per bushel of tubers was obtained. More than 2 1/2 pounds of sprouts were removed from each bushel of untreated potatoes, whereas less than 2 ounces of sprouts were obtained from each bushel of treated tubers. In addition, the untreated tubers were shriveled and soft and, in most instances, unfit for table use. The treated tubers were still sound and edible after 8 months' storage.

Kentucky dairy workers report on basic research on

Factors Affecting Use of Frozen Semen

By W. M. JONES, J. R. PERKINS and D. M. SEATH

One of the more recent phases of artificial breeding has been the use of frozen semen. Frozen semen refers to semen which has been frozen at sub-zero temperatures and stored until ready for use.

Frozen semen offers several advantages over freshly extended semen. One advantage is that service from any given bull would be on call at all times. There could also be a bank of semen from outstanding sires that might be drawn from, long after the sires were dead. From the economic standpoint, fewer bulls would be necessary for a given cow population.

In contrast to the advantages there are disadvantages also in the use of frozen semen. At the present time the additional expense involved in processing and shipping is a prohibitive factor to most organizations. The fact that fewer sires could be used is also a disadvantage in that there would be a tendency to concentrate breeding to only a few bulls. This might have adverse effects if the wrong sires were selected.

First Use in England

The first successful use of frozen bovine semen was reported by workers in England. In that country, semen which had been stored for 2 years has been used with good results.

In order to keep abreast of the current trends, some basic research has been conducted at the Kentucky Agricultural Experiment Station concerning the best methods of processing to insure adequate survival of spermatozoa.

Recently, a project was completed in which various glycerol levels, freezing rates and extenders were compared in order to secure optimum results. These findings would help Kentucky get started properly if its dairy leaders should decide to start using frozen semen.

Semen was collected from a bull once weekly for 10 weeks, and a total of 27 treatment combinations were compared on each collection. The factors studied were the use of three glycerol levels of 7, 10 and 15 percent by volume, three extenders, chemical milk, heated milk and egg yolk-citrate and three freezing rates of 2°, 4° and 6° F per minute. The results from the 27 different treatments are given in Table 1.

The treatment combination having the highest survival percentage (85.1) was chemical milk extender with 10-percent glycerol, frozen at a rate of 4° F per minute.

The comparative tests showed that the 7-percent glycerol level, with an average spermatozoa survival of 76.9 percent after 2 weeks storage at –110° F, was significantly more satisfactory than the other two levels. As may be observed from Table 1, the 15-percent glycerol level failed to give satisfactory results. The chemical milk extender gave the highest average survival (82.4 percent). This is a thioglycolic acid extender developed at the Kentucky Station.

Faster Freezing Rates Best

The faster freezing rates of 4° and 6° F per minute were found to be superior to the slower rate of 2° F per minute.

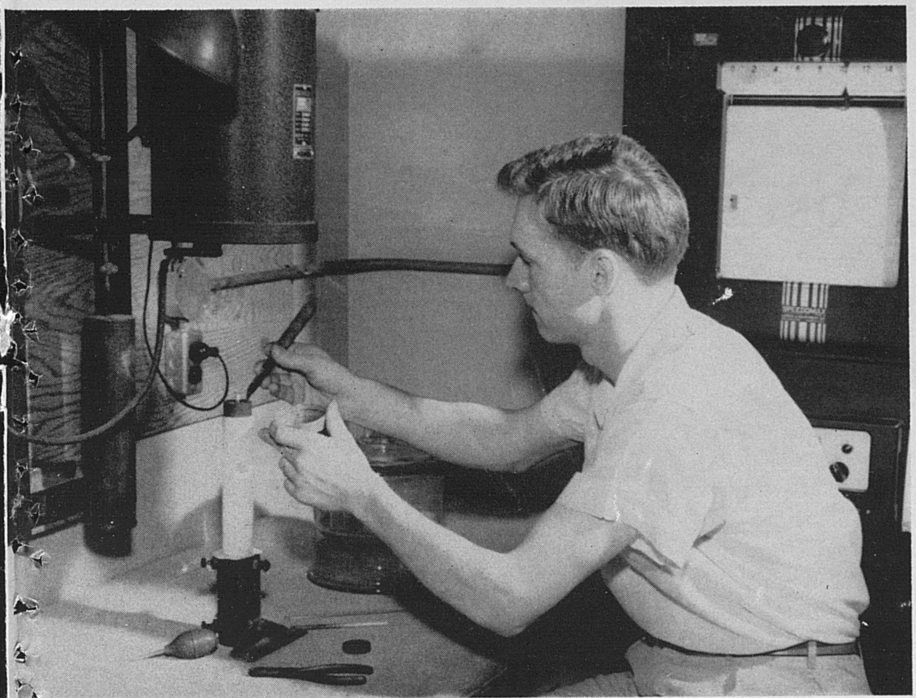
A highly significant difference was found among the various collections from the same bull taken on different dates. Other preliminary work at Kentucky and the published work from other stations indicate a marked difference in the freezability of sperm from different bulls.

With this basic research as a background, if Kentucky dairy leaders should find it desirable to go to partial use of frozen semen they would be able to select the treatment best suited for each bull.

More work is needed, particularly in the field where breeding results could be obtained, before frozen semen can replace freshly extended semen in routine artificial breeding. At present in Kentucky, the cost of storing and shipping would make it impracticable to launch a state-wide program using frozen semen.

Table 1.— Percent Survival of Spermatozoa, By Treatments, After 2 Weeks Storage At –110° F
(Average for 10 collections)

Glycerol Level	Freezing Rate per Minute	Extenders: Chemical Milk	Extenders: Heated Milk	Extenders: Yolk Citrate	Average: Freezing Rate	Average: Glycerol
		%	%	%	%	%
	2° F	79.2	75.7	70.5	75.1	
7%	4° F	83.0	78.0	74.9	78.6	76.9
	6° F	84.5	78.3	69.0	77.2	
	2° F	78.1	65.4	48.1	63.8	
10%	4° F	85.1	70.5	67.7	74.4	70.6
	6° F	84.6	73.3	63.5	73.8	
	2° F	.6	.5	.6	.5	
15%	4° F	.9	4.6	7.1	4.2	3.3
	6° F	.7	6.5	6.8	4.6	
Average		55.2	50.3	45.4		50.3



Differential thermal analysis is a well known method of identifying the minerals in soils. As shown in the picture, the operator (the author) places a small amount of soil in the sample holder to be heated. Reactions that occur during heating are recorded by the equipment. Certain soil minerals are identified by reactions that occur at particular temperatures. The amount of each mineral present is estimated from the size of the reaction. This method is used in conjunction with the x-ray diffraction method.

X-RAY AND OTHER EQUIPMENT USED IN

Identifying Minerals in Soil Samples

By JOE B. DIXON

The ability of soils to supply nutrients to plants is largely determined by the kind of minerals present. These soil minerals play an important role in determining the availability of nutrients that are applied to the soil as chemical fertilizers. They are also important as sources of nutrients which are released by the break-down of the minerals themselves in the soil.

Most of the minerals found in the clay (fine) size fractions of soils are called "clay minerals." They are important in determining the ability of the soil to hold nutrients in a form which is available to plants. The approximate relative nutrient-holding capacities of some important clay minerals are as follows:

Mineral	*Relative Nutrient-holding Capacity*
Kaolinite	7
Halloysite	22
Montmorillonite	92
Illite	20
Chlorite	20
Vermiculite	100

The clay minerals present are also important in determining the amount of lime or fertilizer necessary to supply plants with a given amount of nutrients. For example, it takes more lime on a soil containing montmorillonite, illite or vermiculite as the predominating minerals to supply the same amount of calcium to the plants than where kaolinite or halloysite are the predominate minerals. A knowledge of the minerals present in soils permits fertilizer and lime recommendations to be made on a more exact basis than is possible without such information.

X-ray diffraction and differential thermal analysis equipment recently installed at the Kentucky Agricultural Experiment Station permits accurate identification of the minerals present in soils by recording the X-rays that are reflected from the soil sample and the reactions that occur as the sample is heated. These two methods are used in conjunction for identification

(Continued on Page 12)

Variation in yield and quality of tobacco grown on different plots reveals

Importance of Soil Structure

By WILLIAM G. SURVANT

It is probable that deteriorated soil structure is limiting the income received from many Kentucky farms. Recent studies at the Kentucky Agricultural Experiment Station have shown that yield and quality of tobacco are lowered when structure and related physical properties of soil have deteriorated. These studies also reveal that intensive use of land for row crops results in less favorable structural conditions in soils.

On the Experiment Station Farm at Lexington, comparisons were made of yields and acre-value of tobacco grown on a soil when structure and related physical properties varied. There was a close correlation of yield and quality of tobacco with such soil properties as permeability (rate at which water moves through the soil) and degree of aggregation (proportion of the fine soil particles formed into stable crumbs or granules). The data in Table 1 show these relationships.

Good yields of high quality tobacco like this require favorable physical conditions in the soil in order for the plant to use the supply of nutrients effectively.

Table 1.— The Response of Burley Tobacco to Variations in Degree of Aggregation and Permeability of a Maury Silt Loam Soil

Degree of Aggregation	Permeability to water	Burley tobacco Yield	Burley tobacco Acre-value
65.6%	4.62 inches/hr	2266 lb	$1333
42.9%	4.01 "	1888 "	1082
29.5%	2.63 "	1757 "	714
16.5%	1.32 "	1201 "	474

The intensity of use of land for row crops influences the physical properties of soil. The extent of deterioration of structure and related properties was determined on plots used for burley tobacco. These plots included: (1) tobacco after a bluegrass sod over 50 years old; (2) tobacco grown in a rotation with small grain and orchard grass with red clover; (3) tobacco where this crop had been grown each year for 18 years with a cover crop after each crop of tobacco; and (4) tobacco where this crop had been grown each year for about 50 years with a cover crop after each crop of tobacco. The influence of these cropping programs on some physical properties of the soil is shown in Table 2.

Table 2.— The Influence on Degree of Aggregation and Permeability of a Maury Silt Loam Soil of Different Intensities of Cropping

Cropping System	Degree of Aggregation	Permeability to water
Tobacco after 50-yr. old bluegrass sod	65.6%	4.62 in./hr.
Rotation of Tobacco-small grain-sod	42.9%	4.01 in./hr.
Tobacco each year for 18 years	29.5%	2.63 in./hr.
Tobacco each year for 50 years	16.5%	1.32 in./hr.

Changes in fertility resulting from the cropping system are not entirely responsible for differences in yields after sod crops. This was indicated by comparing the response of the tobacco crop to different fertility levels on plots having unfavorable physical conditions resulting from intensive use with the response of the crop on unfertilized land on which physical conditions were favorable. Table 3 summarizes the data from this comparison.

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Fig. 1.— This shows the tunneling of cranefly larvae in the top 2 inches of soil. A dime shows the relative size of larvae and the tunnels.

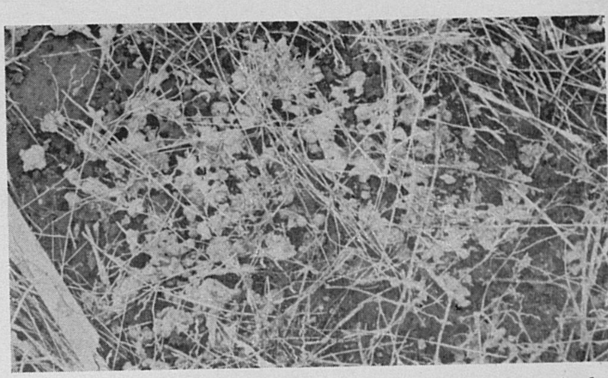

Fig. 2.— Muddy trails which dry into a hard crust mark the surface activity of cranefly larvae. This activity occurs at night.

To prevent damage to lespedeza stands, entomologists seek

Cranefly Larvae Control Measures

By J. G. RODRIGUEZ

Kentucky farmers should be alert in the fall to detect signs of the swarming craneflies, particularly in lespedeza fields. The flies lay eggs during October and November, which later hatch into maggots that may seriously affect lespedeza stands.

Craneflies have generally not been considered serious economic pests, and few references can be found in the literature of economic entomology. In scattered instances, however, real infestations have arisen; a notable example of this is the range cranefly which has sometimes appeared in California ranges, pastures and grain.

In Kentucky, reports of cranefly larvae (sometimes referred to as "leather-jackets") doing damage to lespedeza had been scattered in frequency until a heavy infestation occurred in Graves county in the early spring of 1953. The larvae, identified as *Tipula cunctans* Say, generally were found in lespedeza fields or in such fields where spring oats were seeded in old lespedeza fields. The organic matter from the previous season had formed a thin, rotting mat on the soil surface, and the larvae were tunneling and honeycombing the top several inches of soil (Fig. 1). Considerable damage also occurred as the result of their habit of churning the surface of the soil; their muddy trails dried into a hard crust (Fig. 2). All of this activity prevented the lespedeza from germinating. Direct feeding also occurred, as revealed by close examination of plants and the stomach contents of larvae.

Insecticide Sprays

A small plot test was conducted in a uniformly infested 7-acre lespedeza field. Population counts of 85 to 100 larvae per square foot in the top 2 inches of soil were common. On March 27 plots 0.01 acre in size were sprayed, using a compressed air sprayer equipped with a flat pattern "Teejet" nozzle and applying 50 gallons of spray mixture per acre. The results of this test are presented in Table 1.

Table 1.— Control of Cranefly Larvae Infesting Germinating Lespedeza

Treatment and dosage (actual material per acre)*	Total larvae examined in 3 samplings— 1 sq. ft. each	Percent mortality 3 days after treatment
1. Toxaphene, 45% EM, 2 lb	102	7
2. BHC, 10% WP, 0.3 lb	196	65
3. DDT, 50% WP, 3 lb	213	46
4. Chlordane, 40% WP, 2 lb	221	64
5. Parathion, 15% WP, 0.225	185	86
6. Parathion, 15% WP, 0.45	177	98
7. Check—no treatment	176	0

* Application of emulsion concentrate (EM) and wettable powder (WP) made to plots 0.01 acre in size at the rate of 50 gallons per acre on March 27. Temperature means for test period: Max., 61°, Min., 38° F. Total precipitation for 3-day period: 0.13 inch.

Life history studies, made during 1953 and 1954, revealed that the adult flies mate and lay eggs in October and early November. The eggs hatch in 1 to 3 weeks, and the larvae develop rapidly in the spring when they do their damage. They reach full growth in the middle of the summer when they form cells 4 to 12 inches below the surface and remain inactive

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Highest early tobacco plant production when workers use

Methyl Bromide to Control Weeds

By FRANK BORRIES

Methyl bromide, a gas fumigant used to kill weed-seed in burley tobacco beds, showed the best results in the spring, and permitted highest early-plant production, according to tests this year at the Kentucky Agricultural Experiment Station.

In the fall and spring tests, methyl bromide, vapam, calcium cyanamide (granular form), cyanamide solution, and allyl alcohol were used, says J. F. Freeman, associate agronomist and weed-control specialist. He supervised the tests.

(Continued on Page 9)

Fig. 2.— Methyl bromide soil fumigant was used to treat this bed the day before the tobacco seed was sowed. Nearly perfect weed control was obtained. Fall treatment is recommended, though poorer weed control can be expected. A gas-tight plastic cover was used to confine the fumigant to the bed during treatment.

Fig. 1.— Fifty-six weeds per square foot were hand pulled from this untreated plant bed after it was photographed. Almost as many tobacco plants were produced here as in the drench-treated beds but they were stunted and late.

Fig. 3.— Allyl alcohol, in sufficient water to drench the plant bed thoroughly, was applied 4 weeks before seeding. It gave excellent control of weeds, and the tobacco plants grew vigorously.

Fig. 4.—Vapam, applied in the fall, produced 90 percent control of weeds in this bed, and an abundance of tobacco plants were grown.

Freeman pointed out that although methyl bromide had the best spring-use results, fall treatment still is a "very useful" process. Soil conditions and temperatures frequently are more favorable. "The small difference noted in weed-control in fall and spring tests is more than offset by the better treatment conditions prevailing in the fall," he said, "as well as the better wildfire control on fall-treated beds."

Vapam (used as a drench 4 weeks ahead of seeding beds) was close to methyl bromide in control, Freeman said. It accounted for 94.7 percent of weeds. Methyl bromide got 98.5 percent.

Using vapam, 34 usable (transplantable) plants per square foot were removed from test beds at the first two pullings. Methyl bromide, however, allowed 42 per square foot. Doubling the application rate of vapam resulted in "slight improvement" in the usable plant total, Freeman noted.

Allyl alcohol, at the same rate as vapam, gave slightly better weed control, but "slightly fewer usable plants."

Vapam and allyl alcohol in the fall showed a 6-percent reduction in weed-control effect and did not change the usable-plant percentage. Freeman said the fact methyl bromide is not effective on dry weed-seed (worked into the soil just ahead of autumn treatment) was clearly shown by the poor weed-control (42 percent) obtained in this test. In other experiments, where dry weed-seeds were not present, fall treat-

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Superphosphate application rates on tobacco beds changed owing to

Chemical Action In Weed Killer

By FRANK BORRIES

Two to four pounds of superphosphate on each square yard of tobacco plant beds treated with calcium cyanamide produced the most plants in a recent Kentucky Agricultural Experiment Station test.

The experiment, conducted by Agronomy Department staff members, was to check effects of the weed-killer, calcium cyanamide, on tobacco-plant growth. The chemical's decomposition in bed soil gives out weed-killing ammonia; but if the ammonia persists, it kills tobacco. Superphosphate, however, nullifies this tobacco-killing effect.

In the 2- to 4-pound superphosphate beds, 29,700 to 30,600 plants 4 inches high or more were produced in two "pullings." These totals are based on standard tobacco plant beds 100 feet long and 9 feet wide, i.e. 100 square yards. About 20,000 plants per bed (two pullings) is considered a satisfactory yield.

Previous recommendations for superphosphate on beds was three-quarters of a pound per square yard where calcium cyanamide was the weed-killer. But the success of the experiment at the 2- to 4-pound rate makes agronomists think the 2-pound rate, for instance, is considerably better than the old rate.

Tests in 8 Kentucky Counties

In fact, says Russell Hunt, Agricultural Extension Service burley specialist, bed tests are being run in eight Central Kentucky counties currently, trying out this rate of 2 pounds of superphosphate and 1½ pounds of calcium cyanamide. The counties are Boyle, Mercer, Garrard, Woodford, Scott, Bourbon, Clark and Fayette. The tests are in farm areas where burley-bed trouble has been experienced previously.

Dr. William Seay, soils specialist, said experimental beds were treated with varying rates of superphosphate. The calcium cyanamide rate, however, was kept the same, 1½ pounds per square yard of bed

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Superphosphate on Tobacco Beds

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area in all plots except one. This was a "control bed", where neither material was used.

Figures that follow are in this order: Phosphate rate per square yard; number of plants at first pulling (for a bed 100 feet long and 9 feet wide); number of plants at second pulling; and total number of plants.

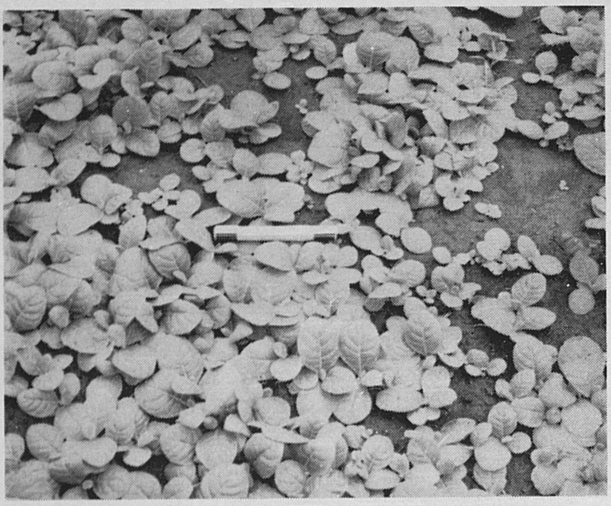

Fig. 1.— The plot shown above received 1½ pounds of calcium cyanamide and 2 pounds of 20% superphosphate per square yard. Both materials were applied in the fall. This plot produced plants at the rate of about 30,000 per hundred square yards in a bed of two pullings.

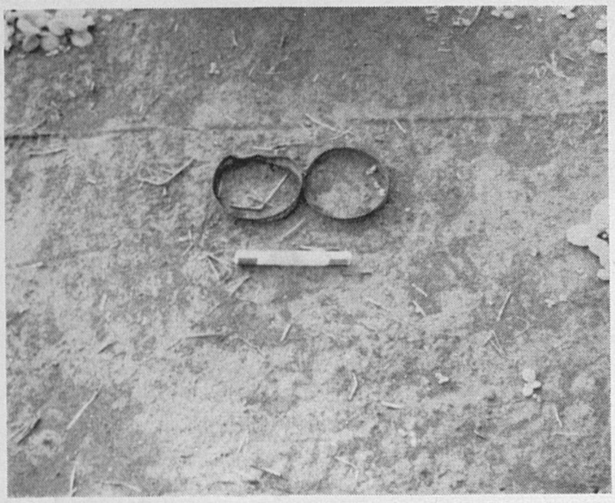

Fig. 2.— This plot received 1½ pounds per square yard of calcium cyanamide in the fall but did not receive superphosphate. Note that no plants were produced. The circles are 7-inch cylinders driven into the ground. Water was percolated through them to determine if toxic materials from the cyanamide could be leached from the soil. Unless superphosphate was present, this leaching was not successful.

One pound superphosphate, 3,780 plants and 11,700 plants, total 15,500; two pounds superphosphate, 17,600 plants and 12,100 plants, total, 29,700; three pounds superphosphate, 20,700 plants and 9,180 plants, total 29,900; and four pounds superphosphate, 18,400 plants and 12,200, total 30,600.

Control bed (no superphosphate or calcium cyanamide): No plants at first pulling, 2,520 at second, total 2,520.

Calcium cyanamide alone (no phosphate), 1,260 plants, 1,080 plants, total 2,340.

Seay said concentrated superphosphate was used on a separate test bed, calcium metaphosphate on still another, and calcium cyanamide on both. Results, however, were poor. The concentrated phosphate test plot show 1,080 plants the first pull and 5,220 the second, for a total of 6,300. On the metaphosphate bed, there were 540 plants the first pull, 2,520 the second, for a total of 3,060.

Seay said the experiment "indicates an increase in the amounts of superphosphate needed on tobacco beds." The experiment is continuing, he said, to check results further.

The American Cyanamid Co., manufacturer of the weed-killer Cyanamid, furnished materials for the test and part of the funds for the investigation.

Methyl Bromide Controls Weeds

(Continued from Page 9)

ments of methyl bromide have resulted in almost as good control as those made in spring.

Granular calcium cyanamide used in the fall had 95.6 percent weed control—but only 12 usable plants per square foot at the first two pullings were obtained. Production of usable plants was greatly improved in other agronomy department experiments by supplementing the granular calcium cyanamide with two pounds of 20 percent superphosphate per square yard of bed.

The cyanamide solution in fall or spring was fairly effective, but residues from treatment retarded plant production somewhat. However, "usable-plant rate" was twice that of beds where granular cyanamide was used.

Methyl bromide was applied as a gas under a tight cover; the granular cyanamide was broadcast and worked into beds, while vapam, allyl alcohol and liquid cyanamide were applied directly as water-carried drenches.

Early Weaned Pigs Show Advantages

Early-weaned pigs had lower feed costs per pig and needed less feed per pound of gain in the testing of 21 spring litters and 20 fall litters by the Kentucky Agricultural Experiment Station animal husbandry section.

The early group was weaned at 3 weeks age, the late group at 8 weeks of age. The early-weaned group, however, consumed nearly 7 pounds more starter in the test, and ran about 4 pounds weight per pig behind the late-weaned group, the test showed, at 56 days of age.

Advantages of early weaning, the testers say, are the possibilities offered for brood sows. Sows can be rebred soon after weaning, fed for market, or carried on pasture until rebreeding at a future date. Early weaning also allows replacement, largely with pasture of the concentrates required by sows in the suckling period.

Comparative figures for the early and late groups follow in this order: Average 21-day weight, 11.8 and 10.9; average 56-day weights, 32.5 and 36.4; total starter consumed per pig, 45.2 and 38.4 pounds; feed per pound of gain, 2.18 and 3.61 pounds; and feed costs per pig, $3.84 and $5.35. Sows nursing the late group required a total of 67.3 pounds feed per pig, and gained an average of 18.5 pounds.

The researchers noted that better equipment is necessary for early-weaned pigs than usually provided for later weaning. Swine producers not equipped for 3-week weaning may find a 5-week program more suitable, the testers said.

Cranefly Larvae Control

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until the middle of September when they pupate. The pupal stage lasts 7-10 days.

In the spring of 1954, county agents reported infestations in eight Kentucky counties: McLean, Crittenden, Trigg, Carlisle, Graves, Lyon, Larue, and Hardin. Work in chemical control was continued in Graves County. Six materials at various rates were tested, using the same methods and equipment as in 1953. The results of this test are presented in Table 2.

It is noteworthy that a test made previously on March 19, using virtually the same materials and dosages was a failure from the control standpoint because a very cold and wet period followed the applications. The larvae were inactive during the low temperatures, the means of which ranged from 37 to 59 degrees F. Counts made 12 days after treatment showed parathion to have given the best kill under these conditions; it gave 60 percent reduction at 0.3 pound per acre.

Table 2.—Control of Cranefly Larvae, Graves County, Kentucky—1954

Treatment and dosage (actual material per acre)*	Total larvae examined in 3 samplings—1 sq. ft. each	Percent mortality 3 days after treatment
1. BHC, 10% EM, 0.25 lb	156	61
2. BHC, 10% EM, 0.3	123	57
3. Toxaphene, 60% EM, 1.5	176	74
4. Toxaphene, 60% EM, 3.0	158	90
5. Malathion, 50% EM, 0.5	95	15
6. Malathion, 50% EM, 1.0	72	50
7. Parathion, 25% EM, 0.2	103	97
8. Parathion, 25% EM, 0.3	155	99
9. Parathion, 15% WP, 0.3	97	99
10. Aldrin, 23% EM, 0.25	183	97
11. Aldrin, 23% EM, 0.5	95	98
12. Dieldrin, 15% EM, 0.15	71	96
13. Dieldrin, 15% EM, 0.3	67	94
14. Check—no treatment	144	0

* Application of emulsion concentrate (EM) and wettable powder (WP) made to plots 0.01 acre in size at the rate of 50 gallons per acre on April 20. Temperature means for test period: Max., 84°, Min., 56° F. Total precipitation for 3-day period: 0.68 inch.

Granular Insecticides

In the fall of 1954 the effect of granular insecticides on the cranefly larvae was studied. The materials tested were aldrin and dieldrin, 5 percent in 30-60-mesh granules and applied to a lespedeza field with a "Seed-caster." The plots were 0.01 acre in size, and application was made on November 8 at the rate of 0.5, 1.0 and 1.5 pounds of aldrin per acre and 0.25, 0.5, and 1.0 pound of dieldrin per acre. A heavy population of adults was in the air at this time and egg-laying was in progress. Five months later, on April 8, 1955, counts were made and the check plot produced an average of 7 larvae per square foot as compared with no larvae for aldrin-treated plots (1.5 pounds per acre) or dieldrin at any of the rates tested. Plots treated with aldrin at 0.5 and 1.0 pound per acre averaged 2.5 and 1 larvae per square foot, respectively.

The data, therefore, show that a number of materials will control the cranefly larvae. One of the most effective and practical, dieldrin as low as 0.15 pound per acre in sprays applied in the spring or at 0.25 pound per acre as granules applied in the late fall, gave effective control. Mild temperatures for 2 or 3 days after application are required for good control; when maximum temperatures are lower than 60° F, control is poor. Because trash remains are a barrier for good penetration of sprays in some fields, a light rain is very effective in enhancing control during the 2- to 3-day period after application.

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Importance of Soil Structure

(Continued from Page 6)

Table 3.— The Influence of Fertilizers and Manure on Physical Properties of the Soil and on Yield and Value of Burley Tobacco After 50 Consecutive Years of Tobacco

Fertility Treatment	Degree of Aggregation	Permeability to water	Burley Tobacco Yield	Acre Value
15 tons of manure/yr.	28.8%	2.03 in./hr.	1933 lb	$1014
600 lb K_2O + 150 lb N/yr.	30.7%	1.77 "	1510 "	699
None	16.5%	1.32 "	1201 "	474
50-year-old sod—no fertilizer or manure	65.6%	4.62 "	2266 "	1333

It should be noted that response of the tobacco crop to heavy applications of fertilizer is evidently limited by the deterioration of structure and related properties of the soil.

The results of the investigational work to date appear to justify the following generalizations:

1. Continuous or intensive use of land for row crop production, even when cover crops are grown each year, results in deterioration of structure and related soil properties.

2. Unfavorable structural conditions in soil reduce yield and acre-value of crops, even when the supply of plant nutrient materials are adequate.

3. Heavy applications of manure help to overcome the physical effects of intensive cultivation but are not so effective as sod crops for this purpose.

It is apparent that Kentucky farmers need to keep these principles in mind as they plan cropping systems and soil management programs. In general, the physical properties of soil may be maintained and improved by selecting crops and arranging cropping cycles so that the physical deterioration resulting from the growing of cultivated crops is offset by sod-forming crops that help to restore desirable physical properties to the soil. The use of systems of farming which continue to improve soil structure would insure sustained productive capacity of our soils and contribute toward a better balanced economy and a stabilized agriculture.

Identifying Soil Materials

(Continued from Page 5)

and quantitative estimation of the minerals present in soils.

The clay fractions of the surface horizons of four Kentucky soils have been studied. Vermiculite, kaolinite and quartz were found to be the predominating minerals in the Cookeville soil studied. The Cookeville soils are primarily in the southern part of the state, from near Russellville eastward approximately to Somerset. They are prominent in Simpson County. Cookeville soils occur on rolling land. They are brown to yellowish-brown silt loams in the surface horizons and reddish in the subsoils. They are well drained and moderately fertile.

Kaolinite, illite, quartz and an interstratified mixture containing montmorillonite were found in large amounts in the Loradale, Armour and Pembroke soils studied. The Loradale and Armour soils are in the inner Bluegrass Region near Lexington. They are fertile and well drained. The Armour soils have dark brown silt loam surface horizons, and reddish-brown silty clay loam subsoils. Armour soils are similar to Maury soils except that they have lighter textured subsoils. The Loradale soils are similar to the Armour soils except that they contain more clay and are lighter colored in the lower horizons and of lower phosphate content.

Pembroke soils are primarily in the southern part of the state, in a region extending from near Bowling Green approximately to Hopkinsville. Some Pembroke soils occur in a belt in the vicinity of Louisville. They are well drained and fertile. The surface soil is a dark brown silt loam. The subsoil is reddish and high in clay.

This study is preliminary. More work is in progress on samples of other important soils of the state.