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Science serves your farm.

H. R. Varney

SCIENCE SERVES YOUR FARM

Bulletin 357, Part 1 Fall September 1952

AGRICULTURAL EXPERIMENT STATION WEST VIRGINIA UNIVERSITY

SCIENCE SERVES YOUR FARM

Bulletin 357, Part 1 | Fall Issue | September 1952

Annual Report of H. R. Varney, Director
West Virginia University Agricultural Experiment Station
For the Period 1952-1953

IN THIS ISSUE

OCTOBER—

Demonstrational Feeder Calf Sales to be held in the following places:
1, Lewisburg
3, 16, Jackson's Mill
6, Marlinton
10, 17, Petersburg
13, Gassaway
15, Spencer
18, Lamberton
28, Annual Meeting of West Virginia Wool Marketing Association, Jackson's Mill
28-30, State 4-H Baby Beef Show and Sale, Jackson's Mill

DECEMBER—

11, 12, Clinic and Demonstration on Manufacture of Cottage Cheese and Cultures, Morgantown

JANUARY—

6-9, Dairy Short Course, Jackson's Mill

Cover

Pictured on the cover are two yearling steers grazing on well-fertilized pasture on a Station farm. The West Virginia Agricultural Experiment Station maintains several farms throughout the state.

New Publications

Bulletins

349. Part 3. Annual Report of H. R. Varney, Director, Science Serves Your Farm, June 1952.
356. A. H. Thompson, R. S. Marsh, and O. E. Schubert. A Leaf Analyses Survey of Apple Orchards in West Virginia. July 1952.

NUTRITIONAL STUDIES

by Faith Wolfe Chalmers

MANY school children in West Virginia may be living on diets that do not provide really good nutrition, studies of 491 third grade children in twenty-one different schools in the State indicate.

These studies were made by the West Virginia University Division of Home Economics, the Department of Agricultural Biochemistry, and the University Health Service. They are part of a cooperative research project undertaken by six agricultural experiment stations in the Northeast Region.

FAITH WOLFE CHALMERS is Research Assistant in Home Economics.

Under the sponsorship of the Monongalia County Public Health Department and the Monongalia County Board of Education, a research team was sent out by the University in the spring of 1951 and the fall of 1952. This team, consisting of one nutritionist, a biochemist, and a physician, made nutritional surveys in the schools in Morgantown and the surrounding area. In all schools each member of the team worked with each child individually.

The nutritionist interviewed the child every day for about a week. She asked what he had eaten during the past twenty-four hours, and obtained detailed information about the amounts of food he had eaten and the ways in which this food was prepared.

Blood Analyzed

At the end of this week of dietary study, the biochemist collected a small sample of blood from each child's finger. This blood was taken back to the laboratory and analyzed to see how much hemoglobin, vitamin A, carotene, and vitamin C it contained. Each child was then examined by the physician for physical signs of poor nutrition.

Forty-six per cent of the children studied lived in urban areas, 44 per cent in small industrial or mining communities, and 10 per cent in rural areas.

The parents of more than one-third of these boys and girls were coal miners, while parents of another one-fifth worked in other industries. About 20 per cent of the parents were engaged either in professional work or in private business, and another 10 per cent did various types of clerical work. Although 10 per cent of the boys and girls lived in rural areas, only six boys and girls listed farming as their fathers' chief occupation.

(Continued on Page 8)

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NEW DRUGS HELP PREVENT

Coccidiosis in Chickens

by T. B. Clark, J. O. Heishman, and C. J. Cunningham

IT PAYS to protect growing chickens from coccidiosis by feeding them sulfaquinoxaline or megasul, tests at the Reymann Memorial Farms Substation in Hardy County have shown.

Coccidiosis for years has menaced the health of growing chickens and caused losses to poultry growers. Although the cecal or bloody type causes the heaviest financial loss because it is more prevalent than any other type, the chronic or intestinal type has caused losses also

Practice has proved that sanitation was not enough to control this disease. Sulfa drugs and megasul were successfully used in England and at the Rhode Island Experiment Station during the last 10 years. They were found not only to control outbreaks of the disease, but also to allow chickens to build up an immunity against coccidiosis.

When the study here was begun, some growers of broilers and replacement stock objected to the continuous use of these drugs. The drugs were thought to be toxic, even though only a small amount, 0.0125 per cent, was fed to the chickens.

Therefore feeding trials were begun here to study (1) the effect of the drugs on uniformity of growth, (2) the effect of the continuous use of these drugs in conjunction with deep built-up litter, (3) the possibility of using lower concentrations, and (4) the value of such drugs when the disease is not severe.

Three Broods Used

The trials were conducted in a specially designed broiler house illustrated in West Virginia University Agricultural Experiment Station Circular 85. About 950 chicks were grown in each pen. Each chick was allowed about three-quarters of a square foot of floor space at the start. Three broods of broilers were used so as to cover climatic conditions encountered during different seasons of the year. The 24,000 or more New Hampshire chicks used in these trials were purchased from commercial hatcheries.

Sawdust was used for litter. The litter in one-half of the house was replaced after each brood was marketed. Litter in the other four pens was not removed during the experiment. The drugs were mixed in the mash and fed continuously in the pens indicated until the chicks were 12 weeks old. One pen in each half of the house received no medication. Each treatment was repeated in each half of the house. A postmortem examination was performed on all chicks that died.

Mortality Low

Averages for the three trials are given in Table 1. Apparently the number of coccidia present was very low, since the mortality from coccidiosis in the non-medicated or control lots was much lower than expected. Mortality was very low from all causes.

The medication aided in the prevention of coccidiosis, especially when either drug was fed at the rate of 0.0125 per cent or one-quarter pound per ton. The lower level of 0.0062 per cent was only a little less effective for the control of coccidia, but probably would have been too low under different litter conditions. This lower level is not recommended for commercial broiler production.

Average body weights are given for both sexes. Body weights as well as the high feed conversion are less than could have been expected if an antibiotic had been included in the ration. Even the lowest level of sulfaquinoxaline resulted in some response over the non-medicated lots. Medication had no detrimental effect on feed efficiency.

The built-up litter pens system had only a slight edge over the method of using fresh litter pens. Mortality from coccidiosis was 0.33 per cent in the built-up litter as compared to 0.65 per cent for the fresh litter. Lack of any difference in total mortality between the two methods of litter management suggests that the accumulation of the drugs in the built-up litter had very little, if any, effect on the general health of the broilers. There was a slight difference in average body weight in favor of the fresh litter. However, this may have been caused by the heavy accumulation of ammonia fumes from the built-up litter before additional ventilators were installed.

Increased Returns

Even though no severe outbreaks of coccidiosis occurred, the use of the drugs was justified by the increased returns. After paying for feed and medication, the total returns from three trials for each of the four lots in Table 1 were: (1) $1,600.48, (2) $1,717.27, (3) $1,652.83, and (4) $1,614.72. In all cases the returns from the medicated lots exceeded the returns from the non-medicated lot. There was a difference in the total pounds of chicken produced in the different lots. This probably was due to differences in total mortality.

These results show that even when small losses from coccidiosis are expected in a flock of growing chickens, it is economical to feed sulfaquinoxaline or megasul at the preventative level of 0.0125 per cent during the first 10 to 12 weeks. The results also prove that drugs at this level are not toxic and even allow slightly better growth.

Further experiments by the West Virginia University Agricultural Experiment Station showed that these drugs could be used at higher levels without danger of toxicity, provided litter conditions required the use of such high levels.

Table 1. Mortality, Body Weight, and Feed Efficiency to 12 Weeks of Age

Lots	Treatment	Percentage Mortality		Avg. Body Weight (lbs.)	Lbs. Feed/ Lb. Gain
		Coccidiosis	All Causes		
1.	No medication	1.15	6.10	2.95	3.76
2.	0.0125% sulfaquinoxaline	0.19	4.24	3.06	3.56
3.	0.0062% sulfaquinoxaline	0.40	5.95	3.01	3.76
4.	0.0125% megasul	0.22	6.29	3.05	3.71

T. B. CLARK is Associate Poultry Husbandman and Associate Professor of Poultry Husbandry. (Title of others on page 5.)

SIXTY-FIVE-YEAR-OLD oaks on an old iron-ore spoil bank. Larger trees originated soon after spoil bank was formed.

UNDISTURBED AREA close by the spoil bank. Trees on spoil bank (left) are growing fully as well as trees above.

Forest Cover For Spoil Banks

by E. H. Tryon

STRIP-MINING operations have left many barren areas in West Virginia in recent years. Though some of these areas still remain unproductive and unsightly, others are being turned back into pasture and forest land.

In the December 1951 issue of *Science Serves Your Farm* Professor H. A. Wilson mentioned that efforts in establishing pines and locusts on coal-stripped spoil banks have been very encouraging. Now we wish to go a step further and get some idea about how well these trees will grow on spoil banks after the first few years. Since all trees are young on the coal spoil banks because of the recent origin of the stripping, our information must come from a study of older trees now found on old spoil banks of a similar nature.

Ordinarily such spoil banks would be hard to find, but at one time the mining of iron ore was more important than coal mining in sections of West Virginia. Iron ore mined between 70 and 150 years ago was smelted in stone furnaces, some of which are still in existence. Iron industry strip mines were formed when the ore was removed. These strip mines were similar in many respects to strip mines recently formed by coal-stripping operations.

The Division of Forestry and the Department of Agronomy and Genetics of the West Virginia University Agricultural Experiment Station are studying the growth of trees on these old iron-ore spoil banks. This study will give us a better understanding of what may be expected in the growth of trees on present-day coal spoil banks.

Old Banks Studied

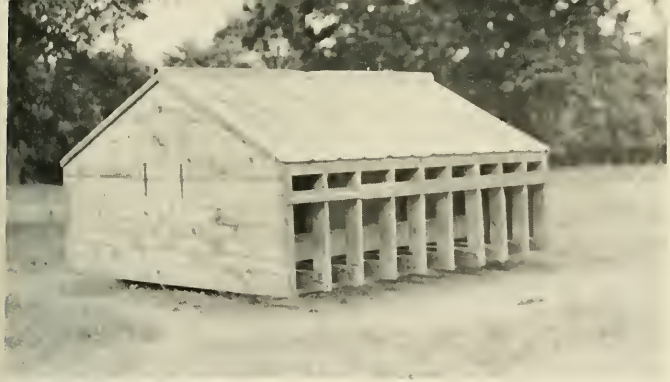
Selected for study were forested iron-ore spoil banks about a century old. On these banks, the kinds of trees, their ages, and rate of growth were studied. Similar studies were made on near-by areas that had not been stripped. The trees were found to have grown as well on the spoil banks as they had on the undisturbed areas. This was true for trees in an age range of 18 to 65 years.

The most interesting iron-ore spoil studied was a small one in Preston County having a stand of mixed oaks in which the large oaks varied in age from 57 to 68 years. These oaks were growing somewhat faster than other oaks of the same age on a near-by undisturbed area.

The studies show that trees have grown as well on the iron-ore spoil banks as they have on undisturbed areas having similar conditions of climate and elevation. This similarity in growth holds for trees over 50 years of age as well as for much younger trees.

Now that it appears that trees can grow satisfactorily on iron-ore spoil banks, how may this information be applied to the growth of trees on coal spoil banks? Results obtained from this study of tree growth on the old spoils cannot be applied absolutely to the newer coal spoils because some differences do exist in spite of many points of likeness. It seems likely, however, that when trees suitable to the spoil and locality are established on these banks they should grow as satisfactorily as forest stands. Also, they should grow to a far greater age than any stand existing on coal spoil banks in West Virginia today.

E. H. TRYON is Associate Silviculturist and Associate Professor of Silviculture.



THIS CREEP was used in the West Virginia Station trial. It is designed so that it can be moved about easily. No fence is required to keep the cows out.

better feeder calves with Creep Rations

by G. C. Anderson, C. J. Cunningham, J. O. Heishman, E. A. Livesay

A GOOD creep ration will increase the weaning weight of calves, improve their grade, and make weaning easier. The additional nutrients supplied by a creep will help calves to grow at a maximum rate and increase the return realized from the cow herd.

The cheapest gains are made by young animals since they consume more feed per hundred pounds of live weight and make more efficient gains than do older animals. For this reason many livestock men have long recognized the value of providing additional feed to suckling calves.

Creep Feeding Pays

A good creep ration will keep your calves growing at a maximum rate. This will mean more dollars to you at market time. The value of creep feeding increases as the calf's suckling period advances. At first the cow usually produces enough milk to keep the calf growing at a maximum rate. As the suckling period advances, however, less milk becomes available to the calf—less milk at a time when the calf actually needs more nutrition to make maximum gains in weight.

A recent trial at the West Virginia University Agricultural Experiment Station points out the value of creep feeding. Two groups of fifteen cows and their calves were used in this test.

Recent Trial Held

Both groups grazed similar well-fertilized pastures. One group of calves depended entirely on their mother's milk and pasture. The other group had access to a creep ration of six parts coarsely cracked yellow corn and one part soybean oil meal by weight. Although the creep feeding was started when the calves were about two months old, they did not eat very much until after they were four months of age.

The chart included on this page shows that the creep fed calves were considerably heavier than the calves that did not receive the additional feed. Creep fed calves also graded higher as feeders and weaned with greater ease and less loss of weight.

Additional feed supplied in the creep increased the value of each calf as a feeder by $41.77. Even when feed costs were deducted, the calves returned $23.33 more per head than did the calves that did not have access to the creep. Each calf consumed an average of 388 pounds of corn and 65 pounds of soybean oil meal during the 140 days of creep feeding. Almost 75 per cent of this feed was eaten during the last two months of the trial.

Advantages Vary

Of course, the advantages of creep feeding will vary depending particularly upon the milking ability of the cows and the quality of pasture. Calves suckling heavy milking cows on excellent pasture will not benefit from creep feeding as much as will calves whose dams are only fair to poor milkers or are grazing on poor quality pasture.

Study the chart below. It shows that creep feeding can mean more profits for you.

The Value of Creep Feeding Calves on Good Pasture

	Creep Fed		No Treatment	
	Steers	Heifers	Steers	Heifers
Number of Calves	9	6	5	9
Average Weaning Weight	493.9 lbs.	428.3 lbs.	388.0 lbs.	406.1 lbs.
Feeder Grade				
Fancy	2	0	0	1
Choice	7	6	2	3
Good	0	0	3	4
Medium	0	0	0	1
Average Selling Price per Head	$215.57	$167.86	$158.86	$152.91
Increase Value from Creep Feeding	$41.77			
Cost of Feed Consumed per Head*	$18.44			
Net Return per Calf from Creep Feeding	$23.33			

*Calves consumed a total of 5,817 lbs. of corn ($230.15) and 975 lbs. of soybean oil meal ($46.47). One and one-half acres of pasture per cow and calf. Average age of calves at weaning was 207 days. Feeder calf values are based on the average price for grade from all sales held in West Virginia in 1951.

G. C. ANDERSON is Associate Animal Husbandman and Associate Professor of Animal Husbandry. C. J. CUNNINGHAM is Assistant Animal Husbandman. J. O. HEISHMAN is Associate Animal Pathologist. E. A. LIVESAY is Animal Husbandman and Professor and Head of Animal Husbandry.

be careful when you feed your cows

THYROPROTEIN

by H. O. Henderson

FEEDING of thyroprotein to dairy cows can be compared to the opening of the draft in a furnace! It ups the production of milk over short periods of time, but the cow needs more fuel in the form of feed to keep going at this increased rate of production.

Results of tests at the West Virginia University Agricultural Experiment Station have shown that feeding of thyroprotein to dairy cattle will increase the yield and the fat percentage of the milk produced for a short time. These increases, however, are not so pronounced over longer periods. In fact, increases in production were hardly sufficient to pay for the cost of the extra feed that was required. When thyroprotein was fed as is generally recommended, starting about forty days after freshening and continuing until the sixth month of pregnancy, the milk production over the entire lactation was not greatly increased.

Cows Compared

In one test two lots of cows were compared. One lot received thyroprotein, while the other was fed a normal ration. Those fed thyroprotein produced more milk with a higher butterfat test than did the cows that were fed normally. However, when the thyroprotein was discontinued at the sixth month of gestation these cows dropped off very rapidly in their milk flow and soon went dry. The normally fed animals continued to milk until the normal time for drying off. The amount of milk that the normally fed animals produced over the thyroprotein-fed animals during this period almost, if not entirely, made up for the lesser amount that was produced during the thyroprotein feeding period. When the cost of adding 10 per cent more feed is considered, it is evident that the feeding of thyroprotein was not economical.

Also, when the cows were fed thyroprotein they lost weight. This was true even though the cows were fed at a rate of about 110 per cent of the Morrison Feeding Standard. Other stations have observed that the body weight can be maintained if the nutrients are increased about 25 per cent over the Morrison Standard.

More Feed Required

Since the feeding of thyroprotein speeds up metabolism, requiring more feed, it is reasonable to assume that such cows would need a good constitution to stand this increased activity and production. Some cows are unable to stand this extra load.

In the West Virginia herd, for example, one Jersey that seemed to be healthy was put on the trial. When she was fed thyroprotein her heart beat and respiration rate were greatly increased and she lost over 200 pounds and developed lung trouble. She became so ill that the thyroprotein diet was discontinued for four weeks and she seemingly recovered. However, when the feeding was started again the trouble reappeared and the cow eventually died.

Three Jerseys that had never had any trouble with mastitis developed this disease when fed thyroprotein. Although the Holsteins on trial did not develop mastitis, they did seem to take much longer to settle with calf than they had previously. Although the numbers of cows used were too small to draw any definite conclusions, results pointed to the fact that cows fed thyroprotein were more likely to have their weaknesses appear than when they were normally fed.

Since breeders of dairy cattle are interested in increasing longevity in their herds, it would not seem wise to make the feeding of thyroprotein a permanent practice. There may be times when it is profitable to feed thyroprotein to some of the cows for short periods, for example, when milk is in strong demand or when market bases are being established, but its continued use may not be wise.

There are many safe, sound, reliable, but still unused methods of improving herds through better feeding, management, and breeding practices that we should use before turning to stimulants, the full and final effects of which have not been determined.

H. O. HENDERSON is Dairy Husbandman and Professor and Head of Dairy Husbandry.

Prepartum Milking

by R. A. Ackerman

SEVERAL YEARS ago many dairymen began milking their cows ten days or more before their expected calving date. It was believed that this practice would reduce udder congestion, bring the cows into production more rapidly, and make them less susceptible to milk fever. This procedure was called prepartum milking.

The advantages and disadvantages of prepartum milking have often been discussed in recent years. In an effort to evaluate this practice the West Virginia University Agricultural Experiment Station has undertaken a comprehensive study of prepartum milking. The work is being conducted by the Dairy and Agricultural Biochemistry departments.

More than 100 cows, comprising three dairy breeds, Ayrshire, Jersey, and Holstein, were milked once each day for 10 to 21 days before their expected calving date. If production reached five pounds per day, the animals were milked twice daily. Cows that were not milked before calving were used as controls for comparison. There were large differences in the amount of prepartum milk that was obtained from individual cows. Some of the cows did not produce any appreciable milk before calving, whereas others produced 30 pounds or more per day. With the Ayrshires and Holsteins, about one-third of the cows did not produce any appreciable amount before calving, about one-fifth produced between 2 and 10 pounds, one-fifth between 10 and 20 pounds, and another fifth produced 20 pounds or more on the day before they calved.

There were no real differences in the amount of milk produced during lactation between the two groups. The cows in both groups reached their highest production during the

R. A. ACKERMAN is Assistant Dairy Husbandman and Assistant Professor of Dairy Husbandry.

fifth week. Prepartum milking did not, as was commonly thought, bring a cow into peak production more quickly than one not so milked. On the average, the animals producing large amounts of prepartum milk produced more milk during the lactation period than did those which did not produce much before calving.

No differences were found in the incidence of milk fever, retention of afterbirth, length of gestation, days to conception of the next calf, or difficulty in calving between the prepartum group and the controls.

Results of Tests

Results of these tests show that, although there were great variations between animals within each group and between individual animals from one lactation to another, almost twice as many animals of the prepartum groups had moderate to great udder congestion as did the control group. The same results were observed with regard to the edema or swelling in front of the udder.

Although this data has not been analyzed statistically, it indicates that prepartum milking fails to relieve the congestion of the udder.

During a part of the experimental period, as soon as enough prepartum milk could be obtained, each cow's milk was analyzed daily to within four days after calving, or until the milk became normal. It was discovered that as the amount of prepartum milk increased, it gradually lost its colostral qualities. When the animal was giving 20 pounds or more on the day before the calf was born (or a total of 60-80 pounds during the entire prepartum period), the milk was apparently normal at the time the calf was dropped. This indicates that the colostral materials are gradually accumulated in the udder during the dry period and are "washed" out of the udder when the cow comes into production.

The practice of milking a dairy cow for a period before calving fails to decrease the amount of udder congestion, bring the cow into production more rapidly, or increase the total amount of milk produced.

Prepartum milking does not result in more difficult calving, retention of placenta, length of gestation, or interfere with the next pregnancy.

Calves from cows milked prepartum grew fully as well as the control calves.

some customers pay no attention to

BRUISES ON APPLES

by W. W. Armentrout

IT HAS LONG been assumed that consumers prefer, will seek, and possibly pay a premium price for apples of high quality. Continued improvement in quality has been advocated as a means by which orchardists may recapture a profitable market for their apples. The degree of bruising is an important factor in apple quality.

In 1948 the Department of Agricultural Economics began some controlled experiments in retail stores to learn how much more, if any, consumers would pay for Stayman Winesap apples relatively free from bruises than for the same kind of apples with more bruises. Apples from the same orchard were divided into two lots. One lot was handled according to the usual practice of the orchard. For purposes of the experiment, these apples were designated "regulars." The other lot was packed in a special container and handled carefully to prevent bruising as much as possible. This lot was designated "specials." When the apples were displayed for sale in the retail store there was little difference between the two lots in the number of shallow bruises less than one-half inch in diameter, but when deep bruises under one-half inch in diameter and all bruises one-half inch and over were counted together, the "regulars" had five times as much bruising as the "specials." The larger amount of bruising on the "regulars" was clearly evident when the two lots were put on display.

The two lots were offered for sale side by side in a large Philadelphia store in 1949. They were self-service in that the customer selected the apples and gave them to a clerk to be weighed. The regulars were offered at the going retail price for Staymans. The specials were offered one day at one cent per pound premium, 2 cents per pound premium the second day, and at the same price per pound as regulars the third day. On Monday, Wednesday, and Friday the "specials" were placed so that the customer approached them first. On Thursday, Friday, and Saturday the customer approached the "regulars" first.

Location of Displays May Effect Purchases

During the first three days of the week when the "specials" occupied a "favorable" location the reactions of the customers were different than when the "regulars" occupied the "favorable" location. On Wednesday, when the two lots were offered at the same price per pound, with the "specials" occupying the "favorable" position, there were 59 sales of "specials" and only 18 sales of "regulars," but on Friday when the two lots were offered again at the same price with the "regulars" occupying the "favorable" position there were 183 sales of "regulars" and 144 of "specials." Can it be that location, even though the displays are side by side, has more effect on consumer purchases than either price or observable differences in quality? During the first three days of the week when the "specials" occupied the "favorable" location there were 131 sales at an average price of 10.6 cents per pound and 83 sales at an average of 9.6 cents per pound, but on the second three days of the week when the "regulars" occupied the "favorable" position there were 353 sales of "specials" at an average of 10.6 cents per pound and 476 sales of "regulars" at an average of 9.6 cents per pound.

Experiments in two stores in Washington, D. C. in 1948 and in the same Philadelphia store in 1950 yielded very similar results. The experiment needs to be repeated with larger volumes of apples and in more stores before conclusions are justified, but results to the present cast some doubt on the ability of the orchardist to recover the additional costs required to put apples on the retail market relatively free of bruises.

W. W. ARMENTROUT is a Station Economist and Professor and Head of Agricultural Economics.

BLACKPATCH, a relatively new disease—the chief factor in low seed yields in the eastern part of West Virginia.

Red Clover Failure

by J. G. Leach

MANY farmers in West Virginia have had difficulty in obtaining uniformly good yields of red clover. This has been the case especially in the Eastern Panhandle where farmers for many years have produced their own seed and have grown the same varieties. Erratic yields of seed have been very common in this region. In the past, much of the clover failure in this and other states has been attributed to the growth of poorly adapted varieties from seed produced elsewhere. Since much of the failure in West Virginia has been with adapted varieties grown from locally produced seed, other explanations had to be sought.

In 1948 the West Virginia University Agricultural Experiment Station began an investigation of clover failure in the State. Results of the study are published in Experiment Station Bulletin No. 351T by E. S. Elliott entitled *Diseases, Insects, And Other Factors in Relation to Red Clover Failure in West Virginia.*

In this bulletin the various factors influencing yields of clover, including soil, weather, insects and diseases, have been evaluated. Although many of the well-known insects and diseases are present in the State and occasionally cause heavy losses, none of them could account for the observed failures in seed production. A relatively new disease that had never been studied extensively was found to be the principal factor in low seed yields in the eastern part of the State. This disease, known as blackpatch, is caused by a fungus that, unlike most fungi, does not produce any spores. It was found to be seed transmitted. It causes a seedling blight and spreads slowly through the field on older plants by aerial mycelium. By the time the seed crop is forming, the fungus is widespread in infected fields and invades the blossoms and destroys the flowers before the seeds are formed or before they become mature.

The damage caused by the disease has been overlooked, partly because affected fields appear to be ripening early and the injury has not been recognized as a disease.

The disease requires high humidity for its development. In dry seasons the humidity is provided by the heavy dews that prevail in the mountain valleys in this section of the State.

Available evidence indicates that the disease does not live over in the soil. It may survive the winter on infected first-year plants or may originate from infected seeds either planted or remaining in the soil from previous crops.

Limited experiments on seed treatment and field dusting have not been entirely successful in controlling the disease. In view of the severity of the disease in this locality and the amount of seed infection, farmers interested in seed production might well consider planting some of the newer varieties such as Kenland, using seed grown in a region where blackpatch is not prevalent. Since the blackpatch fungus may live over in the soil on hard seeds from previous infected crops, crop rotations of as long a period as possible should be followed.

Further experiments on control are in progress.

J. G. LEACH is Plant Pathologist and Professor and Head of Plant Pathology, Bacteriology and Entomology.

NUTRITIONAL STUDIES

(Continued from Page 2)

The data collected in these nutritional surveys have not been completely analyzed, but it is apparent that many children were living on diets that did not supply the recommended amounts of proteins, vitamins, and minerals.

Diets Low in Vitamins

Diets of these children were particularly low in calcium, vitamin A, and vitamin C. Only about one-tenth of the children had blood concentrations of hemoglobin, vitamin A, and carotene that could be rated as "excellent." Less than one-half of these children were rated "excellent" in blood levels of vitamin C.

More milk and dairy products, leafy green and yellow vegetables, citrus fruits, raw cabbage, and tomatoes in their diets would have given these children the minerals and vitamins they were lacking for good nutrition.

Although the lack of good nutrition will not necessarily make these boys and girls invalids, it may give them serious trouble in later life. The child who consistently gets along on a poor diet will have reduced vitality, be more susceptible to colds and infections, and be hindered in growth and development.

Other Studies

Editor's Note: The West Virginia University Agricultural Experiment Station also has studied the nutritional status of college students. For a comprehensive report on this study see Station Bulletin No. 352, *Nutritional Survey of West Virginia University Students,* June, 1952.

APPLE BULLETIN

State apple growers will be interested in obtaining a copy of West Virginia University Agricultural Experiment Station Bulletin 356, *A Leaf Analyses Survey of Apple Orchards in West Virginia,* July 1952.

This 12-page bulletin and other West Virginia Station publications can be obtained from your county agricultural agent or by writing to the West Virginia University Agricultural Experiment Station, Morgantown.

SCIENCE SERVES YOUR FARM

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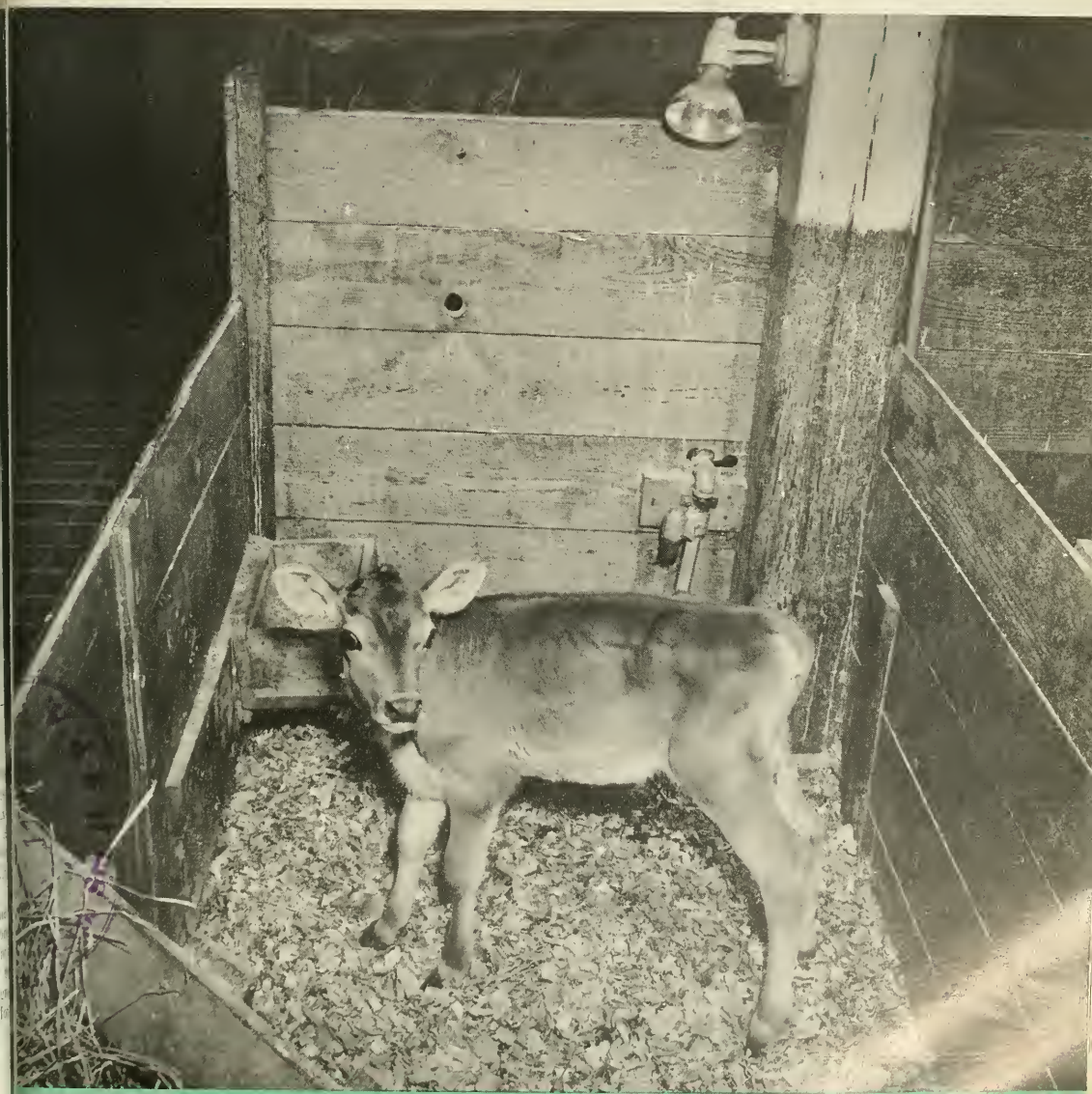

AGRICULTURAL EXPERIMENT STATION WEST VIRGINIA UNIVERSITY

SCIENCE SERVES YOUR FARM

Bulletin 357, Part 2 | **Winter Issue** | **December 1952**

Annual Report of H. R. Varney, Director
West Virginia University Agricultural Experiment Station
For the Period 1952-1953

IN THIS ISSUE

HEAT LAMPS FOR CALVES

Although the baby calf on our cover seems to wonder what it's all about — the photographer and all the fuss, its start in life will be made a little easier because of the heat lamp at the top of the pen.

Successful use of infra-red heat lamps for brooding chicks and baby pigs moved the West Virginia University Dairy Department to use them for baby calves. The lamps are used during the first week following the calf's birth, and the warmer, drier pens seem to get the calves off to a good start by reducing the incidence of scours and respiratory troubles.

One 250-watt reflector type infra-red heat lamp, with a heavy duty adjustable socket, is used in each calf pen. The socket is mounted about four and one-half feet above the floor in a corner where it is least likely to be damaged, with the lamp pointed toward the center of the pen. Be sure to use an insulated, heat-resistant cord, or cable, containing at least No. 18 wire. If as many as four lamps are to be used on one circuit, use No. 14 wire, and if more than four lamps are to be on one circuit, No. 12 wire should be used. Make sure that the lamp is never closer than 18 inches to any hay or bedding material.

The use of heat lamps appears to be an inexpensive means of giving baby calves a better chance for a healthier start in life.—*R. A. Ackerman, assistant dairy husbandman.*

ON THE CALENDAR

January—
- 6-9, Dairy Short Course
- 20-23, Ornamental Horticultural Schools—Charleston (20); Huntington (21); Parkersburg (22); Wellsburg (23)
- 28-29, Feed Dealers' Short Course, Morgantown

February—
- 3-27, Garden Schools—Berkeley (3); Mineral (4); Hardy (5); Barbour (6); Gilmer (10); Doddridge (11); Wirt (12); Pleasants (13); Wyoming (17); Mingo (18); Wayne (19); Mason (20); Tyler (24); Marion (25); Taylor (26); Tucker (27)
- 5-6, Winter Meeting of Nurserymen's Association, Clarksburg
- 5-7, West Virginia Horticultural Society Annual Meeting, Martinsburg

March—
- 3-13, Garden Schools—Pocahontas (3); Webster (4); Braxton (5); Lewis (6); Monroe (10); Summers (11); Fayette (12); Boone (13)
- 7-15, National 4-H Club Week
- 12-13, West Virginia University Chick and Egg Show, Morgantown
- 20, West Virginia Potato Growers' Association Meeting, Elkins
- 26-27, State 4-H Ham and Bacon Show and Sale, Clarksburg

April—
- Second week, Farm Electrification Conference, Jackson's Mill

Personnel Changes

J. L. Cartledge, Professor of Genetics and Geneticist, died January 25, 1952 at Barbizon Plaza Hotel while attending the Northeastern Corn Conference.

C. V. Wilson, animal husbandman, retired June 30, 1952.

New appointments within our research staff since July 1, 1951 include D. C. Alderman, horticulturist at Kearneysville; Mildred Jean Davis, assistant in home economics; Robert S. Dunbar, Jr., associate dairy husbandman; John Fulkerson, plant

(Continued on Page 13)

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LIQUID MANURE IS VALUABLE

by A. D. Longhouse, J. T. Reid, O. J. Burger, I. D. Porterfield

A GREAT majority of our farmers allow the liquid portion of manure to flow down the drains unused. Most of them feel that the value of liquid manure does not compensate for the cost of conserving it.

During the winter of 1951-52, the Departments of Agricultural Engineering, Agronomy and Genetics, and Dairy Husbandry at West Virginia University began a study to determine the value of liquid manure and to develop equipment and methods for its storage and utilization.

This article is primarily a progress report on the work conducted thus far.

A. D. LONGHOUSE is Station Engineer and Professor and Head of Agricultural Engineering. J. T. REID is Instructor in Agricultural Engineering. O. J. BURGER is Assistant Agronomist and Assistant Professor of Agronomy. I. D. PORTERFIELD is Associate Dairy Husbandman and Associate Professor of Dairy Husbandry.

As a background, let us look at the distribution of the plant food elements of average farm manure listed in Table 1.

TABLE 1. DISTRIBUTION OF PLANT FOOD IN FARM MANURE*

TYPE	NITROGEN	PHOSPHORIC ACID	POTASH
	per cent	*per cent*	*per cent*
Solid	55	100	35
Liquid	45	Trace	65

*Lyon, T. L. & Buckman, Ho. O. *The Nature and Properties of Soils,* The MacMillan Co., 1949.

Regardless of the figures in Table 1, the apparent advantage of the solid manure is offset by the ready availability of the constituents carried by the urine giving the liquid an agricultural value about equal to the solid portion.

Table 2 shows the composition of fresh animal excrement, as reported by L. L. Van Slyke.

In addition to these major plant food elements, farm manures contain calcium, magnesium, sulphur, and all of the trace elements. The

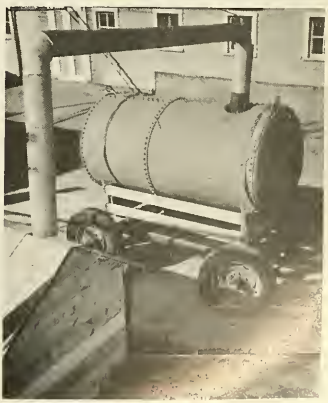
(Continued on Page 13)

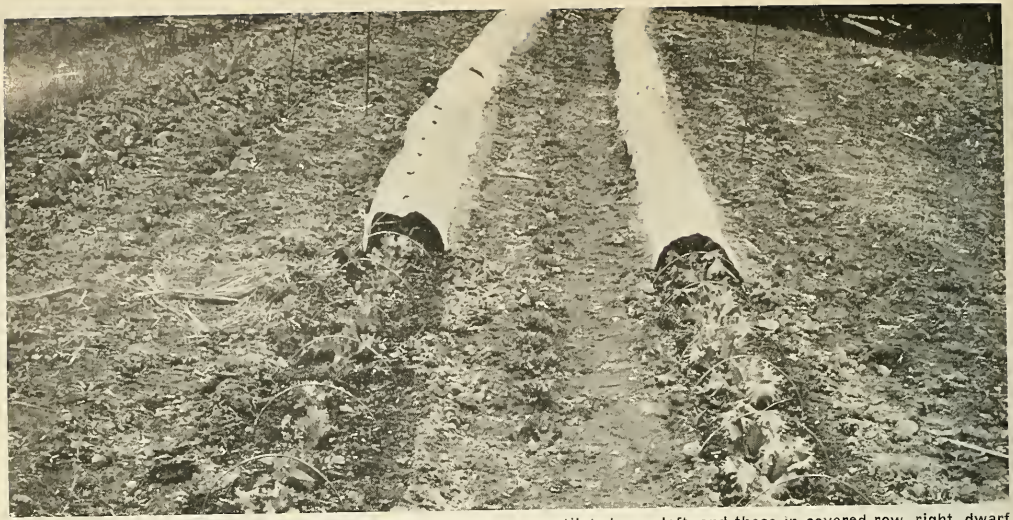
TABLE 2. COMPOSITION OF FRESH COW MANURE*

EXCREMENT PERCENTAGE	WATER H_2O	NITROGEN N	PHOSPHORIC ACID P_2O_5	POTASH K_2O
	per cent	*per cent*	*per cent*	*per cent*
Urine 30%	92	1.00	Trace	1.35
Solid 70%	85	0.40	0.20	0.10
Whole Manure	86	0.60	0.15	0.45

*Van Slyke, L. L. *Fertilizers and Crop Production,* Orange Judd Publishing Co., Inc. New York, 1932.

THREE TYPES of tanks have been used to distribute liquid manure on the fields. At left is a 500-gallon oval wood tank of 2-inch fir. Homemade tank, center, is made from two 55-gal. oil drums. 600-gallon steel tank at right.





HEAD LETTUCE plants get a head start when they are covered with paper in early spring. Plants in covered-ventilated row, left, and those in covered row, right, dwarf uncovered plants, center. Covered plants produce earlier.

Cover Your Lettuce Plants!

by W. H. Childs

WEST VIRGINIA lettuce growers would gain a higher return for their crops if they could get their lettuce on the market two or three weeks earlier than they now do.

Studies at Morgantown have shown that Great Lakes head lettuce plants started in the greenhouse in late January and set in the field during the fourth week of March produce salable heads about the first of June. For about a month previous to this, head lettuce is high in price and low in quality in the State. But by the early part of June, good shipped-in lettuce also becomes available, and State growers must sell most of their crop on a falling market.

Frost injury to the young plants probably is the chief factor that prevents West Virginia growers from reaching the much more profitable earlier market. Even though well-hardened young head lettuce plants will withstand considerable cold, weak plants will be killed and stronger ones definitely retarded in forming heads if subjected to temperatures in the low twenties.

W. H. CHILDS is Associate Horticulturist and Associate Professor of Horticulture.

For some years celery growers in Michigan have been using a transparent parchment paper (Weathermaster Tent Paper) to protect early outdoor celery plantings from frost injury. In 1951, Mr. Paul Stevens of Fairmont, West Virginia, tried this paper on head lettuce plants. He felt that covered plants gave salable heads about ten days earlier than those not covered.

Materials and Methods

In 1952 an exploratory study was made by the West Virginia University Agricultural Experiment Station for the purpose of comparing covered and uncovered plants. Great Lakes head lettuce plants were started in the greenhouse in late January, and 1,100 of these were set in the field on March 26. A complete fertilizer (5-10-10) at the rate of 3,000 pounds per acre had been disked in prior to setting the plants. Eight rows, totaling 693 plants spaced 1 foot apart in the row, were used in the study. Every other row was covered with Weathermaster Tent Paper* on March 28. The paper was 24 inches wide. Hoops 27 inches long were made from No. 11 wire and placed at 18-inch intervals. The paper was rolled out the length of the row over these hoops, and the margins were covered with soil to hold it in place. All plants were side-dressed with sulfate of ammonia on March 28.

On April 11, holes about 2 inches in diameter were cut at 2-foot intervals in the paper over one row of 100 plants. It was very humid under the non-ventilated plants with droplets of water on the inside of the paper most, if not all, of the time.

Results

When the paper was removed on April 28, it was found that the non-ventilated plants were at least twice as large as those not covered, and the ventilated plants were about half way between the covered and uncovered ones in size. The leaves of the protected plants were a pale green and considerably thinner than leaves of those plants that had not been protected. There was a fairly heavy growth of weeds under the paper, but not enough to interfere with plant growth.

(Continued on Page 16)

*Donated by the Kalamazoo Vegetable Parchment Company, Kalamazoo, Michigan.

IN THE FOREGROUND is an old iron-ore spoil bank that has been grazed. Bluegrass and clovers are abundant.

UNDISTURBED area near spoil. Poverty-grass, cinquefoil, redtop are in abundance. Cage protects experimental plots.

Pasture Cover For Spoil Banks

by E. H. Tryon

A STUDY of old iron-ore spoil banks in the Monongalia-Preston county area of West Virginia is providing much valuable information that will be useful to farmers and landowners who wish to reclaim coal spoils located on their land.

These old spoils, similar in many respects to present-day strip mine spoils, may give us the answer as to what kinds of vegetation will grow best on spoil banks.

The ability of forage plants to grow on these old banks is now being studied by the Division of Forestry and the Department of Agronomy and Genetics of the West Virginia University Agricultural Experiment Station. In the September 1952 issue of *Science Serves Your Farm* the satisfactory growth of trees on these old spoils was discussed. Now let us look at the growth of forage plants on old grassland spoils.

Two spoil banks, which were suitable in all respects for study, were found in Preston County. These banks were formed between 70 and 80 years ago when the iron ore was mined and smelted in furnaces operating during that period. Adjacent to the spoil banks were undisturbed areas, also in grassland, and like the spoils never had been limed or fertilized to our knowledge. On these two spoils, and on adjacent areas, the forage material was studied so that the ability of the spoils to produce such vegetation could be determined.

The first method used to determine the productivity of the spoils was to count the different plant stems on selected spots on the spoil and on the adjacent fields. Then the numbers of desirable forage plants, which include clovers, bluegrasses, redtop, and timothy, found by the count were compared. This comparison is shown in Table 1.

The total amount of desirable forage species, as given in the last line of Table 1, is somewhat higher on the spoil of the first area, but is considerably higher on the spoil of the second area than on the undisturbed field.

The second method used to study the ability of the spoils to produce forage material was by obtaining the actual weight of the plants growing there. Small wire cages were placed on the spoils and fields in order to protect the vegetation from grazing. Twice during the year, July and November, the plants within the cages were clipped at the groundline. This material was then thoroughly dried and weighed. The values obtained

(Continued on Page 16)

TABLE 1. DESIRABLE FORAGE PLANTS FOUND ON AREA STUDIED

PLANTS	FIRST AREA		SECOND AREA	
	UNDISTURBED FIELD	SPOIL	UNDISTURBED FIELD	SPOIL
	per cent	*per cent*	*per cent*	*per cent*
Kentucky bluegrass	29	26	5	23
Canada bluegrass	2	1	—	3
White clover	1	6	3	23
Low hop-clover	—	—	3	—
Redtop	8	23	13	21
Timothy	—	1	—	—
Total	40	57	24	73

E. H. TRYON is Silviculturist and Professor of Silviculture.

FARM PONDS often attract many species of wildlife. Wildlife food species were planted around margin of ponds during Station tests.

our game will benefit from good

Wildlife Management Practices

by Maurice Brooks

IT seems apparent that every standard soil conservation practice is beneficial to wildlife. Better use of the land provides a greater variety of food and cover crops, and water becomes more readily available to the wildlife. Healthier wild game result from an increase in soil fertility, just as do healthier domestic livestock.

For this reason a study of wildlife management practices has been conducted by the West Virginia University Division of Forestry in the Tygart Valley Soil Conservation District in Barbour, Upshur, and Randolph counties. Selected farms in the area were used for the study.

The study consisted of (1) planting shrub borders for wildlife food and shelter, (2) censusing game populations by live-trapping and other methods, (3) keeping game kill records on representative farms, (4) making an intensive study of the effect of red fox on rabbit and other game populations, and (5) establishing a controlled hunting area through cooperation of local landowners.

MAURICE BROOKS is Forester and Professor of Wildlife Management.

Wildlife plantings were made of mountain ash, silky dogwood, black haw, flowering dogwood, and multiflora rose on woodland borders. Spot plantings of conifers were made to provide winter shelter for game, and game lanes were established along fencerows. Wildlife food species were planted around the margins of farm ponds.

It seemed that winter cover is a major limiting factor for game in many areas. The region under investigation had few natural stands of coniferous trees. However, the spot plantings of conifers were heavily used by game, particularly during deep snows. So much snow was held up by the branches of tightly planted conifers that game animals could find feed under this cover when it was completely hidden outside.

From the studies conducted it is evident that game populations have maintained themselves on areas under management, despite heavy hunting pressure.

Cotton-tail rabbits, the most hunted game in the area studied, were censused for a five-year period by live-trapping on selected farms. Trapped rabbits were marked so that movements of individuals could be checked. Bobwhites and other game species also were censused.

On sixty farms, five-year records were kept of all game and predatory species killed. Cooperating landowners were asked to estimate the population trends of each major species.

During the period of this investigation, red and gray foxes became abundant in the region. To measure the effect of high fox population on cotton-tail rabbits, two similar areas about three miles apart were studied. On both areas rabbits were live-trapped intensively. On one area foxes were rigidly controlled by hunting and trapping. No control was attempted on the other area. Removal of foxes from the one area of approximately 1,000 acres seemed to cause no increase in rabbit populations.

On one watershed of approximately 1,000 acres near French Creek Upshur County, a controlled hunting area was established to determine effectiveness of control o

(Continued on Page 11)

station animal pathologists are studying

Respiratory Diseases In Poultry

by N. O. Olsan

NEWCASTLE disease is still the most important respiratory disease that West Virginia poultrymen have to contend with. It has been found more frequently than any other respiratory disease in studies being conducted by the West Virginia University Agricultural Experiment Station.

These studies are a part of a general study on Newcastle disease and allied respiratory diseases undertaken by the Northeast Region. The work at this Station has been concerned with spread and diagnosis of the respiratory infections.

The Station Animal Pathology laboratory has found several other respiratory diseases in West Virginia. These are, beginning with the most frequently diagnosed: infectious bronchitis, chronic respiratory disease (air sac colds), infectious sinusitis of turkeys, and infectious coryza.

New Disease

Chronic respiratory disease is relatively new to the broiler industry. It did not show up until Newcastle disease became prevalent. In most instances either Newcastle disease or infectious bronchitis has been associated with the chronic respiratory disease. The relationship between these two diseases is not clear at the present time, but there is some indication that Newcastle disease or infectious bronchitis acts as a trigger mechanism that starts off the chronic respiratory disease. Further research is needed to clarify this point.

Early work with Newcastle disease indicated that the disease might be spread through the hatching egg since the disease appeared in very young birds and spread rapidly throughout the United States.

To determine the possibility of egg transmission of Newcastle disease, 198 laying hens were vaccinated with a live virus Newcastle disease vaccine, using the wing web method. Eggs from these hens were collected daily for thirty-seven days and incubated at weekly intervals. Chicks that hatched from these eggs were placed in isolation cages and were observed daily for the presence of Newcastle disease. The chicks remained normal during an observation period of three to five weeks.

Since the chicks did not take Newcastle disease, it was important to determine if any of the eggs laid contained the Newcastle disease virus. Also, all infertile and fertile dead eggs that were found in the incubator were examined. The results are tabulated in Table 1.

Newcastle and Eggs

Results of this experiment point out that when the Newcastle disease virus is present in the egg, the embryo is killed and the egg does not hatch. Hatchery transmission, therefore, is not likely to occur. The eggs laid during a Newcastle disease outbreak should not be used for hatching purposes, for some of them that contain the virus might become broken at hatching time thereby exposing the newly hatched chicks to Newcastle disease.

Since hatchery transmission is not a factor in the spread of Newcastle disease, what are some of the ways that the disease can be spread? Several sources have been responsible for outbreaks of Newcastle disease. They are as follows:

1. The purchase of started chicks that are in the incubative stages of the disease.
2. The exposure of baby chicks in transit to diseased chicks.
3. The bringing of contaminated catching coops on the farm to remove part of the birds.
4. The addition of diseased males to a breeder flock.

These four factors have been responsible for several outbreaks of Newcastle disease. In other cases, no source of the outbreaks have been found, but in some of these cases, visitors, trucks, wild birds, and contaminated feed sacks have been incriminated as the cause.

Treatments for respiratory infections, with the exception of streptomycin for infectious sinusitis and sulfathiazole or sulfamethazine for infectious sinusitis, are not satisfactory.

Vaccines Available

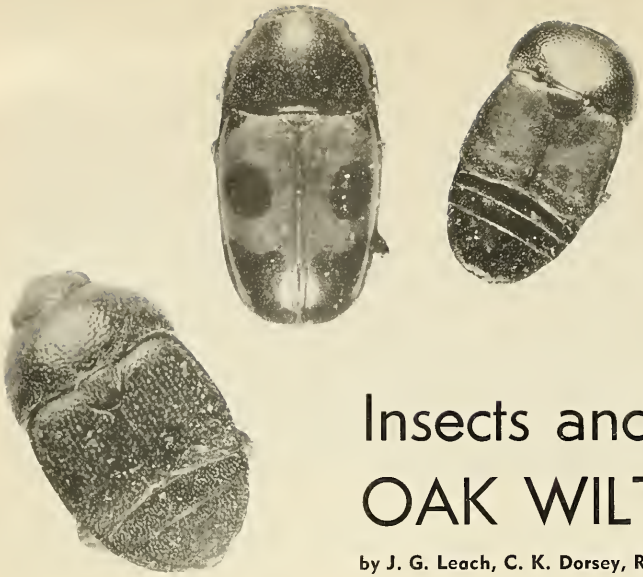
Commercial vaccines are available for Newcastle disease control and are of two types, the intranasal and the wing web live virus vaccines. The killed Newcastle disease vaccines are not recommended at the present time. The poultryman should use every effort to prevent the introduction of Newcastle disease into his flock by eliminating known sources of infection.

It is advisable to consult your veterinarian before using poultry remedies on your flock.

Table 1. Positive Virus Isolation from Eggs Laid Following Newcastle Wing Web Vaccination in 116 Birds, 8 Months of Age, and 82 Birds, 18 Months of Age

Age of Birds	Days Following Vaccination	No. Eggs Incubated	No. Days Incubated	No. Eggs Positive for Newcastle Disease Virus	Condition of Eggs
8 months	15	27	4	4	infertile
	20	30	4	1	infertile
	22	25	18	3	fertile dead
	24	26	4	2	infertile
	25	17	4	2	infertile
	26	17	4	1	infertile
	27	16	4	2	infertile
	28	17	18	2	fertile dead
	29	11	5	1	infertile
	29		9	1	fertile dead
	31	9	9	1	fertile dead
18 months	15	10	4	2	infertile
	16	5	4	3	infertile
	19	6	4	1	fertile dead
	20	2	11	1	fertile dead

N. O. OLSON is Animal Pathologist and Professor of Animal Pathology.



THREE SPECIES of sap beetles (Nitidulids) associated with oak wilt fungus. Since these beetles come in contact with both conidia and ascospores and are known to visit moist wounds in healthy oaks, they are under suspicion as possible agents of spread of oak wilt. Definite proof has not been obtained.

Insects and the OAK WILT FUNGUS

by J. G. Leach, C. K. Dorsey, R. P. True, and H. L. Barnett

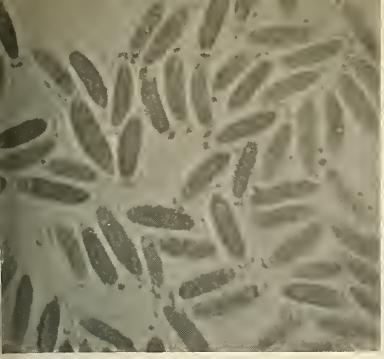
RESEARCH on oak wilt at the West Virginia University Agricultural Experiment Station has revealed an interesting relationship between the wilt fungus and certain insects.

The fungus that causes oak wilt produces two kinds of spores, endoconidia (1) and ascospores (2). The endoconidia are short-lived spores that are readily killed by drying. The ascospores are much more hardy and are decidedly resistant to drying.

The endoconidia are the first to be formed. They are produced in abundance on the young mycelial colonies. The ascospores are formed later and may not be produced at all on some colonies of mycelium. The ascospores are produced in special flask-shaped fruiting bodies known as perithecia (3). The ascospores and the perithecia in which they are formed are the results of a sexual process and are not formed unless sexual fertilization has taken place. The sexual process in the oak wilt fungus is somewhat like that in some varieties of apples. In these varieties the flowers are perfect, that is they have both pollen and ovaries. The flowers, however, are self-sterile in that the pollen will not fertilize the flowers of the variety on which it is produced. The flowers can be fertilized only by pollen from another variety. In the oak wilt fungus there are two kinds of mycelium. These are designated as A and B. The endoconidia of the fungus are comparable to the pollen of the flowers and the perithecia and ascospores are comparable to the ripened fruit. Both the A and B types of fungus can form perithecia and ascospores but only if they are fertilized by endoconidia from the other group. Thus the A type of mycelium forms perithecia and ascospores only after it has been fertilized or "spermatized" by the endoconidia from the B type and vice versa. Both forms produce endoconidia but neither can be fertilized by

(4) FUNGUS CUSHIONS formed by fungus between the wood and bark of trees killed by oak wilt. Wood on the left and bark is on right. Growth pressure exerted by these cushions crack the bark as shown in (5). About actual size.

J. G. LEACH is Plant Pathologist and Professor and Head of Plant Pathology, Bacteriology, and Entomology. C. K. DORSEY is Professor of Entomology. R. P. TRUE is Associate Plant Pathologist and Associate Professor of Plant Pathology. H. L. BARNETT is Mycologist and Professor of Mycology.



(1) ENDOCONIDIA, right. These spores may cause infection if inoculated into a susceptible oak. They also serve as male sex cells comparable to the pollen of flowering plants. (2) ASCOSPORES, above, are formed only after a mycelium of the fungus has been "spermatized" or fertilized by endoconidia produced by a mycelium of the opposite compatibility type. (3) PERITHECIUM in which the ascospores are produced, lower right. These are found imbedded in a mat of mycelium. Ascospores come from tips of perithecia in white sticky masses shown in (6). (1), (2), (3) highly magnified.

its own endoconidia. Cross fertilization is necessary.

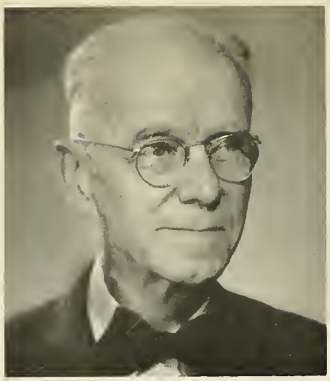
In nature the fungus grows as mats of mycelium underneath the bark. Some of the mats are of the A type and others are B. Both produce endoconidia in abundance, but since they are covered with bark the endoconidia of one type do not have easy access to the mats of the other type. The fungus has solved this difficulty through cooperation with certain insects.

As soon as the mats are formed underneath the bark two thick fungus cushions are formed near the center of each mat. One is attached to the wood and one to the bark immediately opposite (4). As the cushions grow and increase in thickness, sufficient pressure is exerted to

(Continued on Page 16)

(5) CRACK in bark of oak killed by wilt, showing cushion that caused crack. Insects attracted by odor of fungus enter cracks and become contaminated with endoconidia. Some insects leave the cracks when conditions become unfavorable and enter new cracks, carrying endoconidia with them. In this way they spermatize the mycelium, stimulating production of perithecia and ascospores. Natural size. (6) ASCOSPORES oozing from beaks of perithecia. Magnified.

SERVE 73 YEARS



L. M. PEAIRS

C. V. WILSON

COLLEGE of Agriculture and Experiment Station staffs this summer lost two faculty members with a combined service of 73 years at the University. Dr. Leonard M. Peairs, Station entomologist and professor and head of entomology, and Charles V. Wilson, professor of animal husbandry and Station animal husbandman, both retired this June.

Dr. Peairs began his 40 years at the University in 1912 when he was appointed associate professor of entomology and Station entomologist. Later he became professor of entomology, and then head of the Department of Entomology. He is a member of Alpha Zeta, honorary agricultural organization; Sigma Xi, national honorary research society, and is a fellow in the American Association for the Advancement of Science and the Entomological Society of America. A member of the Association of Economic Entomologists, he served as vice-president of this organization in 1931 and editor in 1940. Aside from these duties, Dr. Peairs also has written several books on insect pests and entomology.

Born in Kansas, he received his early education there and his Bachelor of Science and Master's degrees in agriculture from Kansas State College. He received the Doctor of Philosophy degree in entomology in 1925 from the University of Chicago. Before coming to West Virginia University, Dr. Peairs was assistant to the state entomologist, University of Illinois, and instructor and assistant professor at the University of Maryland.

Mr. Wilson started his 33 years at the University in 1919 as instructor in animal husbandry. A native West Virginian, he received his early education in Greenbrier County schools and attended what is now Greenbrier Military School. For two years he was a student at Virginia Polytechnic Institute and was farm manager of the Wilson Brothers livestock farm at Lewisburg for seven years. He then entered the University and received his Bachelor of Science in Agriculture in 1919. The same year he was appointed instructor in animal husbandry from which job he rose to professor and Station animal husbandman. In 1922 he received his Master's Degree in animal breeding from Iowa State College.

A member of Alpha Zeta, Sigma Xi, and the American Society of Animal Production, Mr. Wilson also found time to make many talks throughout the state and write a number of articles and bulletins on research in sheep and beef cattle production, breeding, and marketing.

New Publications

Bulletins

357. Part I. Annual Report of H. R. Varney, Director, Science Serves Your Farm, September 1952.

Current Reports

2. M. E. Marvel. Cauliflower Seedbed Fumigation with Methyl Bromide. October 1952.

Scientific Papers

436. J. G. Leach, E. S. Elliott. The Blackpatch Disease of Red Clover and Other Legumes in West Virginia. *Phytopathology*, 41: 1041-1049. December 1951.

437. M. B. Timnick, V. G. Lilly, H. L. Barnett. The Effect of Nutrition on the Sporulation of Melanconium fuligineum in Culture. *Mycologia*, 43: no. 6, Nov-Dec. 1951.

438. M. B. Timnick, H. L. Barnett, V. G. Lilly. The Effect of Method of Inoculation of Media on Sporulation. *Mycologia*, 44: 141-149, Jan.-Feb. 1952.

443. R. R. Booth, J. H. Hare, A. H. VanLandingham. The Glycine Content of Poultry Ration Components. *Proceedings of the West Virginia Academy of Science*, Vol. 23, 69-75, 1951.

444. H. L. Barnett. A Rapid Method for Determining Oak Wilt. *Phytopathology*, 42: no. 1, January 1952.

446. C. A. Flanders. Amino Acid Composition of the Fat Globule Membrane Protein of Milk. *Arch. Biochem. and Biophysics*, 35: 421-424, 1951.

447. C. A. Flanders. Hemicellulose Fractions of Some Hays and Straws. *Arch. Biochem. and Biophysics*, 36: 425-29, 1952.

448. E. H. Tryon, C. A. Myers. Periodic Precipitation Affects Growth of Yellow-poplar on a West Virginia Hillside. *Castanea*, Vol. 17, June 1952.

450. J. H. Hare, D. P. Schwartz, S. J. Weese. The Amino Acid Composition of the Fat Globule Membrane Protein of Milk. *Journ. Dairy Science*, 35: 615-619, July 1952.

451. M. E. Gallegly. Physiologic Races of the Tomato Late Blight Fungus. *Phytopathology*, 42: 461-462. August 1952.

457. H. L. Barnett, J. M. Staley, R. P. True. Mycelial Mats of Cholera Quercina on Killed Oak Trees as a Potential Source of Perithecia in Nature. *Phytopathology*, 42: no. 10. October 1952.

458. J. G. Leach, R. P. True, C. K. Dorsey, A Mechanism for Liberation of Spores from Beneath the Bark and for Diploidization in Cholera Quercina. *Phytopathology*, 42: no. 10. October 1952.

Relation of Fungus Physiology To Study of Plant Diseases

by

H. L. Barnett and V. G. Lilly

FUNGUS PHYSIOLOGY is the study of the activities of *living fungi*. Such studies involve basic research on the nutritional needs for growth and reproduction of the fungi and how they respond to differences in the environment, such as temperature and light. For nearly thirty years research work in this field has been under way at the West Virginia Agricultural Experiment Station. This phase of research is not well known to the layman since the discoveries made may not be of immediate practical value.

But why study these activities of the fungi? How are the fungi important? In nature many fungi are responsible for the bulk of decomposition of plant remains and in the formation of humus, while others cause diseases of plants and animals. We take advantage of the peculiar habits of certain other fungi and cultivate them for the production of antibiotics, such as penicillin, and other commercially important products.

At the West Virginia Station the emphasis in this study is placed on the fungi that cause plant disease. The plant pathologist studying a new disease encounters many questions regarding the growth and the life cycle of the causal fungus. If possible, the fungus must be grown in pure culture. The natural media in common use are not always the most suitable for growth or reproduction. If the nutritional requirements of the particular fungus are known, a better medium for the specific purpose may be chosen.

The response of a fungus to temperature, light, and other environmental factors also must be studied before its activities in producing a disease can be completely understood. Such studies are especially necessary when an abundance of spores are needed for inoculation purposes on the host plant, for the conditions which favor reproduction are not always the same as those which favor growth.

The techniques and experience which have been developed in the last 25 years of research on various fungi have made it possible to take time-saving short-cuts in the study of serious pathogenic fungi. For example, the research on the oak wilt fungus at the West Virginia Station has been greatly speeded by the development of special media that are particularly favorable for the production of the spore stages and for the diagnosis of the disease.

The research on fungus physiology at the West Virginia Station, as well as that in other laboratories, has been helpful in the formulation of new theories of parasitism and in understanding theories already proposed. It is believed that some fungi attack only certain plants that furnish specific foods that they need for growth. Fungi may be unable to attack certain plants that contain antibiotic substances. The strain of the late blight fungus on potato is believed to be able to adapt itself readily and then be able to also attack tomato.

The fungi are not static. They frequently undergo changes through mutations and adaptations to new conditions. Physiologically the changes may be so great that the fungus can no longer be controlled by the same methods formerly used, or the fungus may be able to attack new hosts. The basic concept of the ever-changing nature of the fungi has developed from the knowledge gained from the study of living fungi. It also emphasizes the need for careful, detailed research on the genetics and the physiological activities of the fungi that cause plant disease.

H. L. BARNETT (see p. 8). V. G. LILLY is Physiologist and Professor of Physiology.

FARM PONDS

FARM PONDS are growing more popular each year. More than 3,000 West Virginia farmers already have ponds on their farms. You also can have a pond on your farm; the cost can be surprisingly low!

A good farm pond gives you:

1. Good fishing.
2. Plenty of drinking water for your livestock.
3. A ready water supply for your orchards and truck crops.
4. Plenty of water for use in protecting your buildings from fire.
5. Swimming and boating facilities.

A good farm pond is useful in many ways. Perhaps you should check up on how to get a pond on your farm. The cost really isn't great; most ponds cost somewhere between $100 and $1,000. Most ponds will pay for themselves before they are more than a year or two old.

If you are interested in building a pond on your farm, you should see your county agricultural agent for complete details. He also can give you a copy of West Virginia University Agricultural Experiment Station Circular 84, *Farm Fish Ponds in West Virginia*. This circular gives up-to-date information on many questions you may have about farm ponds.

If you can't get around to see your county agent in the near future, you can obtain a copy of Circular 84 by writing to the Director, West Virginia University Agricultural Experiment Station, Morgantown. *R. Franklin Dugan, assistant forester.*

WILDLIFE

(Continued from Page 6)

hunting by local landowners. Resident landowners cooperated in a plan to limit the number of hunting permits a landowner could issue. Formerly some landowners had issued permits to anyone applying for them.

A major difficulty arose in policing the area adequately. There was not enough acreage to justify hiring a special enforcement officer, and local landowners were unwilling to do police work on the lands of another. Some help was secured from the county conservation officer, but actually there was little control over hunting. Unless there is full agreement on adequate enforcement of regulations, this scheme seems to offer very little to farmers in the State.

These station projects were active in the year 1951-52

(Abbreviations for funds supporting projects: A—Adams; BJ—Bankhead-Jones; NE—Northeastern Region Research and Marketing; NEM—Northeastern Region (marketing), Research and Marketing; RM—Research and Marketing; P—Purnell; SCS—Soil Conservation Service; S—State; USDA—United States Department of Agriculture.

Administration

Planning Cooperative Research under Title I of the Research and Marketing Act (RM 11)

Agricultural Biochemistry

Isolation, purification and determination of some of the hemicellulose constituents found in the nitrogen-free extract of feeds and foods (A-12)
Unidentified growth factors in proteins (A13)
Ascorbic acid metabolism (PUBLICATION ONLY) (BJ 48; coop. Home Economics)
Factors needed to supplement rations for satisfactory growth, reproduction and lactation (BJ 51)
Miscellaneous chemical investigations (S 5)
Gylcine content of poultry feeds (S 68)
Broiler rations for high efficiency (P 57; coop. Animal Husbandry)
Human nutritional status studies in W.Va. (RM 7, NE 4; coop. Home Economics)

Agricultural Economics

Custom rates for farm jobs (BJ 60)
Taxation in W.Va. (BJ 63; coop. Bureau of Agricultural Economics)
Effect of consumer choice on egg marketing (S 62; coop. USDA)
Wholesale produce marketing facilities in Huntington, W.Va. (S 64; coop. USDA)
A survey of a stranded town: Elk Garden, W.Va. (S 67)
Seasonal milk production on W.Va. farms (P 48; coop. Dairy Husbandry)
Some factors affecting the vitality of 4-H club work in W.Va. (P 52; coop. Extension Division)
Marketing W.Va. eggs (RM 2, NEM 5)
Marketing economies and consumer benefits from an even milk production in W.Va. (RM 3, NEM 1)
Inter-market price relationships for milk and dairy products in W.Va. (RM 17, NEM 1)
Techniques for measuring consumers' choice (RM 25; coop. Bureau of Agricultural Economics)
Marketing livestock in W.Va. (RM 28)
An appraisal of the economic efficiency of marketing Shenandoah Valley apples in fresh fruit markets (RM 29)
Lowering milk marketing costs in W.Va. (RM 32, NEM-1)
Consumer preferences and demands for poultry and poultry products (RM 36, NEM-5)
Marketing forest products in W.Va. (RM 38, NEM-6; coop. Forestry)

Agricultural Engineering

Design and construction of a pasteurizer of commercial capacity for nut meats (S 57; coop. Horticulture)
Study of the design and operating characteristics of a grain conveyor using fluidization principles (S 63; coop. Engineering Experiment Station)
Preliminary and exploratory investigations pertaining to agricultural engineering (S 97)
Determination of factors influencing the drying rates of grains (P 55; coop. Engineering Experiment Station)
Investigations to determine the optimum stall for dairy cows (RM 5; coop. Dairy Husbandry)
To determine the most efficient and economical methods of removing manure and litter from dairy barns (RM 6; coop. Dairy Husbandry)
Design, construction, and testing long hay blowers (RM 15)
Study of the design and operating characteristics of a barn baled hay drier using supplemental heat (RM 21)
A study of some of the factors involved in using supplemental irrigation on W.Va. pastures (RM 24; coop. Dairy Husbandry, Agronomy)

Agronomy and Genetics

Corn genetics and breeding (BJ 3; Reymann Farms, Ohio Valley Farm, University Experiment Farm, N. E. Corn Conference, W.Va. Extension Service)
Reclaiming eroded soils (BJ 17; coop. Forestry, Reymann Farms, SCS, USDA)
The effect of fertilizer treatments and cropping systems on the yield and quality of tobacco (BJ 19; coop. Ohio Valley Farm, USDA)
Selection and breeding of superior strains of red clover for W.Va. (BJ 43; coop. Plant Pathology, Extension Service, USDA)
Barley breeding and testing (BJ 54)
The interrelation of soil fertility, planting rate and geometry of spacing in relation to yield of various hybrid corn varieties (BJ 58)
Field crop variety testing (S 6)
Soil survey work in W.Va. (S 8)
Alfalfa investigations (PUBLICATION ONLY) (S 10)
Crop rotation experiments (S 11)
Crop responses to various fertilizers (S 14)
Changes in condition following a mine sealing, tile draining and surface treatment in soil acidized by run-off mine water (PUBLICATION ONLY) (S 40)
Road-bank stabilization (PUBLICATION ONLY) (S 50)
Killifer furrows in eroded black shale for run-off (S 58; coop. Reymann Farms)
Characteristics of flow from a large spring (S 59; coop. Reymann Farms)
The establishment and testing of grass and legume species and strains for soil conservation (S 87; coop. Nursery Division, SCS)
Preliminary investigations in soil science (S 94)
Studies on W.Va. pastures (PUBLICATION ONLY) (P 30-1; coop. USDA)
Plant nutrient availability studies—foliar nitrogen, phosphorus and potassium interactions as influenced by fertilization and soil nutrient supplies (P 45)
The phosphorus and potassium supplying and fixing power of several important W.Va. soils (P 58)
The influence of fertility and management on several Ladino clover-grass mixtures (P 59)
The lime requirements of a number of W.Va. soil types (P 60)
Maintaining profitable stands of alfalfa (RM 10; coop. Plant Pathology)
Weed control in corn (RM 22; coop. Reymann Farms)
Forage crops varieties, strains, and species for W.Va. (RM 26, NE 10)

Animal Husbandry

Effect of selection in cross breeding on broilers within certain heavy breeds of chickens (A 7; coop. Reymann Farms)
Improving marketing value of turkeys by cross breeding (PUBLICATION ONLY) (BJ 5)
Selection of breeders in relation to longevity of progeny in S. C. White Leghorns (PUBLICATION ONLY) (BJ 13)
Breeding efficiency of dairy cows (BJ 42; coop. Dairy Husbandry)
The effects of thyroid stimulants and depressants on growth and fattening of swine (PUBLICATION ONLY) (BJ 47)
Effect of heredity and environment on keel deformities in White Leghorns (BJ 53)
Effect of prophylactics and therapeutics for controlling coccidia in chickens (BJ 55; coop. Reymann Farms)
Legume grass silage vs. corn silage for wintering beef cows (S 53; coop. Agricultural Biochemistry, Reymann Farms)
Coccidiosis and Newcastle disease (S 88)
Exploratory or preliminary investigations on diseases, feeding, and management of farm animals (S 89)
Floor space requirements of broilers in a centrally heated house (S 93; coop. Reymann Memorial Farms)
Fat calf vs. feeder calf production in W.Va. (S 95; coop. Reymann Memorial Farms)
Silages for cattle and sheep (PUBLICATION ONLY) (P 34; coop. Agricultural Biochemistry)
Methods of feeding growing pullets (P 39; coop. Reymann Farms)
Comparison of native and western ewes for production and longevity (P 41; coop. Reymann Farms)
The relation of birth weight within breeds to growth rate of purebred mutton type lambs (P 50)
Nutritional requirements of swine for growth (P 62)
Breed as a factor in the production of ewes retained for flock reproduction and for the production of market lambs and wool (P 63; coop. Reymann Memorial Farms)
Some chemical and physical analyses of the blood of dairy cows (RM 8, NE 1; coop. Dairy Husbandry)
Improving the reproduction performance of turkeys (RM 9)
Transmission and immunity of vaccine strains of Newcastle disease in chicks following adult vaccination (RM 23, NE 5)
Causes of sterility in cattle (RM 30, NE 1; coop. Dairy Husbandry, W.Va. Artificial Breeders' Coop.)

Dairy Husbandry

The feeding of thyroprotein to dairy cattle (BJ 38; coop. Agricultural Biochemistry, Animal Husbandry)

(Continued on Page 14)

LIQUID MANURE

(Continued from Page 3)

latter are extremely important in many cases.

Collection, Storage, Distribution

An underground concrete collection and storage tank was built on the University Dairy Farm. It holds approximately 2,000 gallons (16,660 pounds). This tank collects the liquid portion of manure through underground drains from stall gutters, and the outside covered solid manure pit. Normally a herd of seventy cows is housed in the barn.

An all-purpose non-clogging manure pump manufactured by the Parma Water Lifter Company, Parma, Idaho, was installed in the storage tank. This pump, with a capacity of 300-400 gallons per minute, is driven with a three-horsepower electric motor and is used to fill the tank wagons.

Smaller pump units that could be used for small herds are available, or even hand pumps could be used. In many installations the storage tank could be located on the side of a hill so that the wagons could be filled by gravity flow from the storage tank to the wagon.

To carry the liquid to the field and distribute it, we have used three different pieces of equipment. The first was a 600-gallon steel tank fitted with a homemade valve and mounted on a 4-wheel wagon. This steel tank worked satisfactorily but was not standing up under the corrosive properties of the liquid manure.

We are now using a 500-gallon oval wood tank of 2-inch fir. It is equipped with two baffles to prevent sloshing and to add strength, and fitted with two, 2-inch molasses valves. The valve lever is operated from the tractor seat and can be closed at any time, for turning or moving to another field.

For a smaller capacity, low-priced unit, two 55-gallon oil drums were connected together and fitted with valves. This unit can be used on a utility carrier adapted to most tractors or mounted on a small trailer.

All three tanks were equipped with a distribution apron to spread the liquid. Each large wagon covers a 6-foot swath, while the smaller tanks cover 4-foot.

The cost of the oval wood tank was about $225.00 without the wagon; cost of the small unit was about $30.00.

Field Application and Harvest

A field that had been seeded to alfalfa, ladino clover, and orchard grass in March, 1949, was selected as the test area. The field was divided into three plots. One area of 2.84 acres was treated with liquid manure; another area of 2.96 acres was left untreated, and an area of .93 acres was divided into small plots.

Sixty-four 12 by 30-foot plots were laid out on the .93 acres. Sixteen treatments representing various rates of liquid manure, commercial fertilizer, and water and check plots were repeated four times. Preliminary data from the small plot area indicated that the application of sixty pounds of nitrogen per acre as liquid manure more than doubled the yield.

Table 3. Treatment Given to the Large Treated Area

Month	Liquid Manure	Nitrogen
	lbs. gals.	lbs.
Nov. 1951	40,155 4,821	52.52
Dec. 1951	19,195 2,304	31.11
Jan. 1952	13,500 1,621	39.96
Feb. 1952	19,835 2,381	32.90
Total	92,685 11,127	156.49

Samples were taken each time the storage tank was emptied and it was found that the nitrogen content of the liquid was only about 10 per cent of what we had reason to expect. A thorough check of the tiles draining into the storage tank revealed that the rain water falling on one side of the barn drained into the tank. This explains the high volume collected in November.

Even after this was corrected, the nitrogen content only came up to about 30 per cent of that given in Table 2. We are not sure of the reasons for the low analysis. Among the reasons advanced here are, (1) the bedding (sawdust, shaving and straw) may have absorbed some of the nitrogen, (2) the nitrogen, in the form of ammonia, may have evaporated into the air, and (3) the age and condition of the animals and their feed may have caused a lower than normal per cent of nitrogen.

The entire area was harvested as grass silage during the week of May 22. The crop was mowed, windrowed, and allowed to wilt in the windrow. A field forage harvester with pick-up attachment was used to pick up the windrow, chop and blow it into a truck.

Each load was weighed just before it was blown into the silo. Our weights gave the yields shown in Table 4.

Table 4. Yield of Grass Silage from the Two Large Plots

Area	Total Lbs.	Tons/Acre (Green Weight)
Treated (2.84A)	33,970	5.98
Untreated (2.96A) ..	21,350	3.61
Difference	12,620	2.37

In addition to the increased yield, the treated area began growth earlier in the spring, had a darker green color, and larger heavier plants. It also was noted that the treated area suffered less damage from plant aphids.

Summary

Our analysis shows that we applied 156.49 pounds of nitrogen to the area. This is equal to 978 pounds of 16 per cent nitrate of soda, or 344 pounds of nitrate of soda per acre. In addition we applied the equivalent of 155 pounds of 48 per cent potassium sulfate per acre. This was found by estimating that the per cent potash recovered in the liquid was equal to the per cent nitrogen saved.

This additional fertilizer gave us an increased yield of 2.37 tons per acre. The time required to load and apply the liquid manure amounted to about ten hours.

The field to which the liquid was applied was located approximately one-fourth mile from the collection or storage tank.

The results of this project are considered to be of sufficient value to warrant additional work which is planned for the coming year.

PERSONNEL CHANGES

(Continued from Page 2)

pathologist at Kearneysville; William L. Haltiwanger, assistant agronomist; Carlton B. Lees, assistant ornamental horticulturist; Samuel N. Little, assistant in agronomy; Clifford A. Myers, Jr., assistant forester; D. A. Munro, assistant animal pathologist; Dale Allen Ray, assistant geneticist; Charles Sperow, assistant in agronomy; Orville L. Voth, assistant biochemist; and James A. Welch, assistant animal husbandman.

During this same period the following resigned: Torkel Holsoe, forester and silviculturist; William L. Kjelgaard, assistant in agricultural engineering; Leo Kotchek, assistant animal pathologist; F. J. Nisbet, assistant ornamental horticulturist; Martha A. Plonk, assistant in home economics; J. J. Price, assistant in agricultural biochemistry; Stanley J. Nels, assistant editor; Joseph F. Silbaugh, editor; and A. H. Thompson, horticulturist at Kearneysville.

Staff of Station

November 1, 1952

ADMINISTRATION
Irvin Stewart, LL.B., Ph.D., LL.D., President of the University
H. R. Varney, Ph.D., Director
A. H. VanLandingham, Ph.D., Asst. Director

AGRONOMY
G. G. Pohlman, Ph. D., Agron.
Robert L. Bond, B.S., Grad. Asst.
O. J. Burger, Ph.D., Asst. Agron.
D. R. Browning, M.A., Asst. Agron.
H. W. Fairchild, Ph.D., Asst. Agron.
S. L. Galpin, Ph.D., Hydrol.
William L. Haltiwanger, Ph.D., Asst. Agron.
Samuel N. Little, M.S., Asst. in Agron.
C. W. Neal, B.S., Asst. in Genetics.
B. J. Patton, A.B., Soil Scientist
Dale A. Ray, Ph.D., Asst. Geneticist
Charles Sperow, B.S. Agr., Asst. in Agron.
Isaac Swisher, B.S. Agr., Grad. Asst.
Collins Veatch, Ph.D., Assoc. Agron.

ANIMAL HUSBANDRY
E. A. Livesay, D.Sc., An. Husb.
G. C. Anderson, Ph.D., Assoc. An. Husb.
R. H. Black, M.S., Assoc. An. Husb.
J. K. Bletner, M.S., Asst. Poult. Husb.
T. B. Clark, M.S., Assoc. Poult. Husb.
C. J. Cunningham, B.S. Agr., Assoc. An. Husb.
Billy N. Day, B.S. Agr., Grad. Asst.
J. O. Heishman, D.V.S., Assoc. An. Path.
H. M. Hyre, M.S., Assoc. Poult. Husb.
John A. Mason, B.S. Agr., Grad. Asst.
N. O. Olson, D.V.M., An. Path.
D. R. Munro, D.V.M., Asst. An. Path.
James A. Welch, B.S., Asst. An. Husb.

BIOCHEMISTRY (AGRICULTURAL)
W. R. Lewis, Ph.D., Agr. Biochem.
Edmond R. Cole, B.S., Grad. Asst.
J. H. Hare, Ph.D., Assoc. Biochem.
Orville L. Voth, M.S., Asst. Biochem.
C. E. Weakley, Jr., M.A., Assoc. Biochem.

DAIRY HUSBANDRY
H. O. Henderson, Ph.D., Dairy Husb.
R. A. Ackerman, M.S., Asst. Dairy Husb.
Robert S. Dunbar, Jr., Ph.D., Assoc. Dairy Husb.
James E. Fike, B.S., Asst. in Dairy Husb.
A. E. Freeman, B.S. Agr., Grad. Asst.
John T. Godfrey, B.S. Agr., Grad. Asst.
I. D. Porterfield, M.S., Assoc. Dairy Husb.
S. J. Weese, M.A., Assoc. Dairy Husb.

ECONOMICS (AGRICULTURAL)
W. W. Armentrout, Ph.D., Agr. Econ.
J. H. Clarke, M.S. Agr., Assoc. Agr. Econ.
H. C. Evans, M.S., Asst. Agr. Econ.
W. S. Hutson, B.S., Asst. in Agr. Econ.
Norman Nybroten, Ph.D., Agr. Econ.
W. F. Porter, Jr., Ph.D., Asst. Rural Sociol.
G. E. Toben, M.S., Assoc. in Farm Mgt.

ENGINEERING (AGRICULTURAL)
A. D. Longhouse, Ph.D., Agr. Engr.
D. P. Brown, M.S., Asst. Agr. Engr. (On leave 1952-53).
R. E. Emerson, M.S., Asst. Agr. Engr.
J. T. Reid, B.S.A.E., Asst. in Agr. Engr.

FORESTRY
W. C. Percival, Ph.D., For.
M. G. Brooks, M.S., For.
J. B. Byers, BSF, Asst. For.
R. F. Dugan, M.F., Asst. For.
A. W. Goodspeed, M.F., For.
R. O. Gustafson, M.F., Assoc. For.
Christian B. Koch, MSF, Asst. in For.
Clifford A. Myers, Jr., M.F., Asst. in For.
William H. Reid, MSF, Assoc. For.
E. H. Tryon, Ph.D., For.
John R. Warner, M.F., Asst. in For.

HOME ECONOMICS
Faith Wolfe Chalmers, M.S., Res. Asst. in Home Ec.
Mildred Jean Davis, M.S., Asst. in Home Ec.

HORTICULTURE
R. S. Marsh, M.A., Hort.
W. H. Childs, Ph.D., Assoc. Hort.
A. P. Dye, M.S. Agr., Asst. Hort.
Charles O. Leavitt, B.S. Agr., Grad. Asst.
Carlton B. Lees, M.S., Asst. in Hort.
Mason E. Marvel, M.S., Asst. in Hort.
O. M. Neal, Jr., B.S., Asst. Hort.
R. W. Pease, M.S., Asst. Hort.
O. E. Schubert, Ph.D., Asst. Hort.
K. C. Westover, Ph.D., Hort.

PLANT PATHOLOGY, BACTERIOLOGY, AND ENTOMOLOGY
J. G. Leach, Ph.D., Plant Path.
H. L. Barnett, Ph.D., Mycol.
J. F. Fulkerson, M.S., Plant Path.
M. E. Gallegly, Jr., Ph.D., Asst. Plant Path.
Francis Gough, B.S. Agr., Grad. Asst.
Frederick F. Jewell, M.S., Grad. Asst.
V. G. Lilly, Ph.D., Physiol.
C. R. Orton, Ph.D., Plant Path. (On leave until April 1, 1953).
Robert Pristou, B.S., Grad. Asst.
Mary Alice Ryan Sands, M.S., Asst. in Bact.
Douglas K. Shumway, B.S., Grad. Asst.
John Staley, BSF., Grad. Asst.
R. P. True, Ph.D., Assoc. Plant Path.
H. A. Wilson, Ph.D., Assoc. Bact.
William S. Woodrow, B.S., Grad. Asst.

MISCELLANEOUS
D. R. Creel, Photog.
John Luchok, B.S.J., Acting Editor
Martha R. Traxler, Chief Clerk

Projects of Year

(Continued from Page 12)

The use of type and production records as a basis for a dairy cattle improvement program (BJ 45; coop. Agricultural Economics, Ayrshire Breeders Assoc.)
Methods of feeding and rumen inoculation as they affect the growth and development of young dairy calves (BJ 62; coop. Animal Husbandry)
Preliminary or exploratory investigations on diseases, feeding, and management of dairy cattle (S 86)
Miscellaneous investigations of dairy products (S 90)
The transmission of milk and butterfat production and body conformation by dairy sires (P 14; coop. USDA)
The keeping quality of milk in home refrigerators (P 49)
Prepartum milking of dairy heifers (P 51; coop. Agricultural Biochemistry)
Some chemical and physical analyses of the blood of dairy cows (RM 8, NE 1; coop. Animal Husbandry)

Forestry

Mobile circular sawmill for farm woodlots in W.Va. (BJ 44)
Efficient forest management practices for W.Va. cut-over and burned-over hardwood forest lands (BJ 49; coop. Conserv. Comm.)
Animal repellents on hardwood forest plantations (BJ 56)
Influence of various degrees of thinning on the growth rate of residual yellowpoplar trees (BJ 57)
Growth of vegetation and rate of soil development on old iron-ore spoil banks (BJ 59)
Improvement of farm game and wild life conditions of the soil conservation district (S 42)
Plantings of forest trees and shrubs at Greenland Gap (S 56)
Determination of optimum growth of W.Va. hardwoods (S 60)
Test specimens for wood adhesives (RM 16)
Management of forest land for sustained-yield, mine timber production (RM 19; coop. Forest Products Association)
Timber management for the market demands in southern W.Va. forests (RM 31)

Home Economics

Space, facilities, and structural requirements for activities relating to the business of the farm and home in W.Va. (RM 27, NE 7; coop. Agricultural Engineering, Extension Service)

Horticulture

Improvement of potato varieties for W.Va. (A 11; coop. Plant Pathology)
Selection, breeding, and propagation of the lowbush blueberry vaccinium vaccillans (BJ 12)
Effect of certain chemicals on color, finish and maturation of apples (BJ 61)
Miscellaneous horticultural investigations (S 27)
Variety tests of tree and small fruits (S 29)
Variety and strain studies of vegetables (S 31)
Production, development, and marketing of hillculture products in W.Va. (S 49)
Lily bulb production trials (S 61; coop. USDA)
Nutrition of apple trees in W.Va. (S 65, also P 56; coop. University Experiment Farm, Entomology, Plant Pathology)
Effect of new growth substances on the preharvest drop of apples (S 66; coop. University Experiment Farm, Entomology, Plant Pathology)
Chemical thinning of apples and peaches (S 69; coop. University Experiment Farm)
Apple and peach insect control (S 91; coop. University Experiment Farm, USDA, Bureau of Entomology and Plant Quarantine)
Improvement and selection of ornamental plants (S 92)
On-the-farm production of ornamentals indigenous to W.Va. (S 96)
Propagation and selection of edible nut-bearing trees suitable to W.Va. (S 98)
Improvement of apple juice (P 61; coop. Agricultural Biochemistry)
Selection of nursery crops and propagation methods (RM 35)

Plant Pathology, Bacteriology, and Entomology

Effect of environment upon growth, reproduction, and parasitism in fungi and bacteria (A 6)
Anatomical and histological changes in diseased plants (A 10)

Financial Statement for the year July 1, 1951, to June 30, 1952

Classification of Receipts and Disbursements	Hatch	Adams	Purnell	Bankhead-Jones	Bankhead-Jones Sec. 9 Research & Marketing 9b1-2	9b3	Title II	Non-Federal Funds	Total
RECEIPTS									
Received from the Treasurer of the U.S.	$15,000.00	$15,000.00	$60,000.00	$65,794.28	$71,963.07	$31,015.00	$1,800.00	....	$260,572.35
State Appropriations									
Main station	....	....	....	....	....	....	....	$144,730.00	144,730.00
Substations	....	....	....	....	....	....	....	72,750.00	72,750.00
Special	....	....	....	....	....	....	....	10,332.00	10,332.00
Special grants, etc.	....	....	....	....	....	....	....	15,813.73	15,813.73
Sales	....	....	....	....	....	....	....	176,527.18	176,527.18
Miscellaneous	....	....	....	....	....	....	....	1,045.00	1,045.00
Balances forward					27,399.20	5,719.53		109,637.63	142,756.36
Total Receipts	$15,000.00	$15,000.00	$60,000.00	$65,794.28	$99,362.27	$36,734.53	$1,800.00	$530,835.54	$824,526.62
DISBURSEMENTS									
Personal services	$8,700.00	$11,242.40	$49,427.50	$53,820.48	$73,326.54	$25,102.31	$1,800.00	$179,134.61	$402,553.84
Travel	473.90	13.72	349.53	1,839.00	6,313.83	2,130.16	....	5,264.32	16,384.46
Transportation of things	....	....	2.50	4.42	3.59	20.39	....	1,017.43	1,048.33
Communication service	....	....	....	....	....	30.00	....	1,105.46	1,135.46
Rents and utility service	354.11	....	....	7.46	125.40	....	....	10,998.98	11,485.95
Printing and Binding	2,909.21	....	....	437.08	2,728.67	659.58	....	277.07	7,011.61
Other contractual services	8.40	5.10	323.44	110.85	976.30	148.56	....	34,220.77	35,793.42
Supplies and materials	2,551.83	1,826.77	6,191.35	6,115.91	9,022.65	3,287.30	....	95,277.98	124,273.79
Equipment	....	1,912.01	3,705.68	3,457.08	6,330.70	5,356.17	....	48,847.91	69,609.55
Lands and structures (contr.)	....	....	....	....	534.59	....	....	69,395.88	69,930.47
Total Disbursements	$14,997.45	$15,000.00	$60,000.00	$65,792.28	$99,362.27	$36,734.47	$1,800.00	$445,540.41	$739,226.88
Unexpended Balances	2.55			2.00		.06		85,295.13	85,299.74

Nutrition of fungi and bacteria with especial reference to substances which induce, stimulate, or inhibit growth and reproduction (BJ 2)

Spray injury and fungicidal efficiency of orchard spray as influenced by the weather (BJ 6)

Testing new fungicides with particular reference to their application to potatoes and vegetable crops (BJ 32)

Forest tree diseases, Sub-2, chestnut blight (S 18; coop. Forestry, Horticulture)

Miscellaneous plant disease investigation (S 19)

Miscellaneous insect and insecticide studies S 24)

Apple measles (P 19)

Black rootrot of apples (P 21)

Control of loose smuts of wheat and barley through centralized hot-water seed treatment (PUBLICATION ONLY) (P 40; coop. Agricultural Engineering, Agronomy)

Microbiology of strip mine seepage water in relation to plant growth and soil conditions (P 53; coop. Agronomy)

Decay as a factor in sprout reproduction of yellowpoplar (P 54; coop. Forestry)

Storage and market diseases of tree fruits (RM 13; coop. Agricultural Economics)

Cause and remedy for red clover failures in W.Va. (RM 14; coop. Agronomy)

The toxicity of cumulative spray residues in soil (RM 18; coop. University Experiment Farm, Bureau of Entomology and Plant Quarantine)

Oak Wilt (RM 33; coop. SCS)

Improvement of tomato varieties for W.Va. (RM 34; coop. Horticulture)

NUTRITION BULLETIN

WEST VIRGINIA University Agricultural Experiment Station, in cooperation with five other state agricultural stations of the Northeast Region, recently published a bulletin entitled *Cooperative Nutritional Status Studies in the Northeast Region. III. Contributions to Dietary Methodology Studies.*

This is a technical bulletin intended for the use of nutrition workers who wish to evaluate human nutritional status by survey methods or for the research nutritionist. The bulletin includes a review of the literature, a comparison of results obtained from dietary histories, seven-day diet records, and 24-hour recall records. It also reports studies to estimate the size and kind of food portions, and of the determined vs. calculated amounts of eight nutrients in one day's food intake for 21 subjects.

Procedures are suggested for use in studies which involve either the intake of individuals, the intake of groups, or pilot studies.

Anyone interested may secure a copy of this bulletin by writing to the Agricultural Experiment Station, West Virginia University, Morgantown.

Editor's Note: The West Virginia University Agricultural Experiment Station also has studied the nutritional status of college students.

For a comprehensive report on this study see Station Bulletin No. 352; *Nutritional Survey of West Virginia University Students*, June, 1952.

LETTUCE

(Continued from Page 4)

The non-covered plants had been dusted with 5 per cent DDT and fertilized with sodium nitrate on April 18. This was repeated for all plants on April 29. Counts made on April 30 showed that 25 plants had been lost of 349 uncovered ones, and 18 lost of 344 covered ones. Two or three days after the paper was removed, plants were almost as dark green as those that had not been covered. A light frost (33° F.) on May 2 did no apparent damage.

May was very wet — rain on 25 days—and heads were rather slow in forming. The first 3 heads were harvested from a "covered non-ventilated" row on May 31. By June 4, 15.7 per cent of the covered and 4.0 per cent of the non-covered plants had produced salable heads. By June 7, the respective figures were 39.1 per cent and 15.5 per cent, and by June 10, 64.6 per cent and 46.7 per cent. After June 10 the differences in percentage of salable heads from covered and uncovered plants practically disappeared (see Table 1). However, it should be noted that the covered plants produced much more salable heads during the earlier market period.

Table 1. Salable Heads of Lettuce Harvested from Plants Set

Date	Covered	Non-covered
	per cent	*per cent*
June 4	15.7	4.0
June 7	39.1	15.5
June 10	64.6	46.7
June 18	72.2	71.6
June 23	74.2	73.6

Conclusions

This year (1952) was not characterized by as severe frosts in late March and early April as is often the case. Despite this, covered plants produced heads sufficiently before uncovered plants for the procedure to have probable practical value to commercial lettuce growers in West Virginia. If the ground can be prepared earlier, and plants started and set two or three weeks sooner, a wider spread may be possible in time of marketing. This not only would permit a grower to reach the market when prices are high, but by growing some plants without protection, he could spread his marketing over a longer period and handle a greater volume without hiring additional help.

The paper used for covering the plants is relatively inexpensive. When bought in rolls of 2,100 feet, the cost is about one cent per plant. Ventilation did not appear necessary in 1952, but it is not impossible that it might be in some years. Since one cannot side-dress covered plants with nitrogenous fertilizers at 2-week intervals as is recommended, it might be well to apply both nitrate of soda and sulphate of ammonia prior to covering to give some spread in availability.

SPOIL BANKS

(Continued from Page 5)

represent the dry weight of forage produced during the growing season, and are shown in Table 2, on an acre basis.

These results show that the amount of forage material produced on the spoil of the first area was slightly higher than on the near-by field. However, a considerable difference exists on the second area, with the spoil being much more productive than the field. It may be noticed from the tables that the relative differences obtained by the two methods are quite similar.

The old spoils appear to be fully as capable of producing forage material as are the adjacent untreated fields. A layer of lime occurred above the iron zone, and when the areas were stripped, lime became incorporated in the spoil. This lime has contributed to the good growth on the spoils, especially the spoil of the second area.

These spoils, which are composed largely of shales and have pH values of 4.8 and 5.9, are similar in many respects to the majority of young spoil banks in the State that have resulted from coal stripping operations. The good growth of forage material on the old iron-ore spoils suggests that many of the younger coal-stripped banks will, in time, also produce satisfactory grazing conditions. The number of years that will elapse before a good forage crop becomes established by natural seeding is not known, but undoubtedly will vary between spoil banks in different areas of the State.

Recent experiments by the Department of Agronomy and Genetics have shown that grasses and legumes, suitable for grazing purposes, can be established within a year on young coal-stripped spoils by artificial seeding and proper application of fertilizers and lime.

Table 2. Dry Weight of Forage Produced Per Acre on Spoils and Adjacent Undisturbed Fields

Area	Condition	Dry Weight of Forage Material (Lbs.)	Difference in Lbs. (Spoil-Field)
First	Undisturbed field	6,374	
	Spoil	7,131	757
Second	Undisturbed field	4,019	
	Spoil	6,212	2,193

OAK WILT

(Continued from Page 9)

crack the bark and separate it from the wood (5). As soon as the cracks are formed they are invaded by several species of sap beetles known as Nitidulids. These beetles are attracted by the characteristic odor of the fungus. The beetles crawling over the fungus mats become contaminated with endoconidia. Since the bettles are active and move from crack to crack and from tree to tree they transport endoconidia from A to B and from B to A, spermatizing the mats so that perithecia and ascospores are formed. Perithecia and asospores have never been observed in nature on a mat that had not been exposed to the insects. Thus these insects transport the endoconidia and serve as agents of spermatization for the fungus just as bees transport the pollen of self-steile flowers from tree to tree and flower to flower.

When perithecia are formed on the fungus mats the ascospores ooze from the tips of the perithecia in sticky masses (6). Since the insects also come in contact with these resistant ascospores they are under suspicion as agents of transmission of oak wilt in overland spread. Because the method of overland spread of oak wilt is not known, extensive experiments have been started to determine whether these insects do transmit the diesase.

SCIENCE SERVES YOUR FARM

Bulletin 357, Part 3 Spring March 1953

AGRICULTURAL EXPERIMENT STATION WEST VIRGINIA UNIVERSITY

SCIENCE SERVES YOUR FARM

Bulletin 357, Part 3 | Spring Issue | March 1953

ANNUAL REPORT OF A. H. VANLANDINGHAM, ACTING DIRECTOR
WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION
FOR THE PERIOD 1952-1953

IN THIS ISSUE

1953 W.V.U. DAIRY DAY—JUNE 30

Pictured on the cover is a scene from last year's West Virginia University Dairy Day. Since 1948 more than 6,000 people have attended this annual event.

Dairy Day is held to provide people in West Virginia who are interested in dairying an opportunity to visit their University Dairy Farm, to see firsthand the results of experimental work, to see the progress made from year to year in research, to keep abreast of new developments, and to see the three herds of registered dairy cattle.

Dairy Day has been a cooperative undertaking. It would have been almost impossible for the Dairy Department to have put on this event without the assistance of other departments. The Agricultural Engineering and Agronomy and Genetics departments have cooperated each year in demonstrating and showing new labor-saving devices and varieties and seeding rates of forage crops. Many of the leaders and guides who have taken part in the programs are members of other departments.

June 30 has been designated as Dairy Day for 1953. Each year's program has a different theme. This year the theme will be farm and herd management. Each year an outstanding speaker is brought to the campus for this event. This year George Bulkley, Carnation Company, Los Angeles, will be the principal speaker.

This year's program will feature many things of interest to dairymen and farmers. Watch your local newspapers for additional details. *A. D. Longhouse, agricultural engineer, and I. D. Porterfield, associate dairy husbandman.*

ON THE CALENDAR

APRIL—
- 7, 8, 9—Farm Electrification Conference, Jackson's Mill
- 10—Career Day for Home Economists, Pittsburgh, Pa.
- 14, 16—State Livestock Round-Up, Jackson's Mill
- 16, 17, 18—Home Demonstration Agents' Conference, Morgantown
- 24—3rd Annual Little Eastern National Livestock Show, Morgantown
- 27-30—Sheep Shearing Schools
- 27-May 1—State Farm Women's Leadership Training Conference, Jackson's Mill

MAY—
- 1, 2, 3—West Virginia Home Economics Association, Jackson's Mill
- 1-16—Sheep Shearing Schools
- 4, 5—German Women visit the University
- 28-31—Cooperative Wool Marketing Program

JUNE—
- 1-5—Guernsey Club Field Days
- 1-6—State Conservation Camp, Camp Caesar, Webster County
- 1-30—Cooperative Wool Marketing Program
- 4—Agronomy Field Day, Ohio Valley Experiment Station, Point Pleasant
- 8-12—Jersey Club Field Days
- 15-19—Holstein Club Twilight Field Meetings
- 30—Dairy Day, University Dairy Farm, Morgantown

JULY—
- 1-6—Regional 4-H Demonstration Contests
- 16—Animal Husbandry and Poultry Field Day, Wardensville
- 17—Ram Sale, Bardane

New Publications

Bulletins

357. Part 2. Annual Report of H. R. Varney, Director, Science Serves Your Farm, December 1952.

(Continued on Page 8)

Annual Report, Parts Published Quarterly by
AGRICULTURAL EXPERIMENT STATION
West Virginia University
Morgantown, W. Va.
Acting Director,
A. H. VANLANDINGHAM

Editor ..... JOHN LUCHOK
Photographer ..... DAVID R. CREEL

Publications Committee: OSCAR E. SCHUBERT, H. L. BARNETT, and G. C. ANDERSON.
SCIENCE SERVES YOUR FARM will be sent free to any resident of West Virginia in response to a written request to the Director, Agricultural Experiment Station, West Virginia University, Morgantown, W. Va.

Late Blight Fungus

Races-Resistance

by M. E. Gallegly
Assistant Plant Pathologist

FIGURE 1.—FIELD REACTION of late blight susceptible Cobbler variety (left) and late blight resistant Kennebec (right). The plants were not sprayed with a fungicide.

LATE blight is the most serious disease on the potato and tomato in West Virginia. The fungus *Phytophthora infestans* that causes the disease on both crops does most of its damage when the weather is cool and moist. Such conditions are usually present every year in the mountainous terrain of West Virginia. In addition to the high average rainfall, fogs and heavy dews are frequent, and these increase the severity of the disease.

Potato.—A search for potato varieties resistant to late blight was started about 1845 immediately after the disease destroyed the potato crop in Ireland. Although some tolerance to the disease was found in *Solanum tuberosum*, the commercial potato, true resistance of a high degree was not found until *Solanum demissum*, a wild potato introduced from Mexico, was used.

This source of resistance is being used by potato breeders in Europe and in the United States. In this country, potato breeders at Cornell University, Pennsylvania State College, and the United States Department of Agriculture are using the *demissum* type of resistance. When progeny from crosses of the wild potato and the commercial potato were planted in the field, they remained free of the disease for a few years. It soon became apparent, however, that the resistance in many of these seedlings was not holding up. The reason for this was not clear at the time. Later it was shown that the fungus that causes the disease has the ability to change. The common race of the fungus thus changes to form races with the ability to attack these resistant seedlings. By using these different races of the fungus, Pennsylvania and New York workers found that the original *Solanum demissum* had three dominant genes for resistance. In progeny evolving from this parent, it was found that the genes had scattered so that most of the resistant seedlings had only one gene for resistance. The six different fungus races found in this country were labeled A, B, C, D, BC, and BD. Race A is the common field race that attacks such varieties as Cobbler, Katahdin, Pontiac, Green Mountain, and the older varieties. Essex, Kennebec, and most of the new varieties released as resistant to late blight have only the D gene for resistance. Consequently, they are susceptible to races D and BD and resistant to races A, B, C, and BC. However, this resistance will protect the plants against severe injury in most years. Figure 1 shows the susceptible variety Cobbler and the resistant variety Kennebec growing in the field without the protection of a fungicide. Several unnamed low-yielding varieties possessing resistance to all races are being used in a breeding program. Selections for resistance to the known races and for higher yields have been made from these crosses.

In Scotland and Holland, much the same story can be told except that four genes for resistance have

(Continued on Page 8)

FIGURE 2.—REACTION of Marglobe, No. 19, 36, 106 when inoculated with common tomato race of late blight.

FIGURE 3.—REACTION of Marglobe, No. 19, 36, 106 when inoculated with a second race of the tomato late blight

Potato Varieties for West Virginia

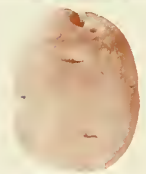
by K. C. Westover
Horticulturist

EACH season potato variety trials are in progress at the Reedsville Experiment Farm of the West Virginia University Agricultural Experiment Station. Varieties of particular interest are compared with the established varieties in the State in an effort to increase production efficiency and enhance the desirable qualities of the crop. In addition to the adaptability of the new varieties to our varied growing conditions as shown by yielding capacity, the varieties are also evaluated for tuber type and cooking quality as indicated by starch content, resistance to disease and insect pests, and storage performance.

Table 1 gives the yields of marketable No. 1's, a brief description of the tuber, and general information concerning ten of the high-yielding varieties under test during the last three seasons. In addition to the varieties cited here, other new varieties have been grown, but because of inconsistent performance or the lack of other desired qualities they are not included.

YIELDS AND GENERAL INFORMATION OF HIGH-YIELDING VARIETIES FROM REPLICATED POTATO TRIALS.

REEDSVILLE EXPERIMENT FARM, 1950-52, inclusive

Potato	Yields of No. 1's in bu. per acre				Tuber Description	Remarks
	1950	1951	1952	Average		
 ESSEX	731.3	469.1	674.9	625.2	White. Round, blocky, and somewhat flattened in shape. Eyes medium in number and depth.	Erect growing — vigorous. Sets many tubers. Requires adequate and well-distributed water supply. Late to mature. Adapted to higher areas of State. Does well on lighter soils. Highly resistant to late blight. Quality fair to good. Good keeper.
 PONTIAC	513.4	389.6	603.1	503.0	Red. Round to oblong in shape. Eyes medium deep and fairly numerous. Flesh is crisp white.	Very vigorous grower. Well adapted to the upper altitudes. Matures late in season. Not resistant to pests but stands dry weather well. Does particularly well on loose soils. Quality is good. Stores well.
 KENNEBEC	588.4	374.8	543.6	502.3	Creamy buff. Elliptical to oblong in shape. Irregular in shape when large. Eyes few and shallow.	Very vigorous grower. Well adapted to upper altitudes. Matures late in season. Space closely on good soils to control tuber size. Highly resistant to ordinary late blight and somewhat to mild mosaic. Tubers are easily freed from vines at harvest. Quality is good to excellent. Stores well.
 ASHWORTH	571.1	399.7	538.9	503.2	White skin. Oblong to blocky and irregular in shape. Quality is good.	Vigorous plants. Medium late in maturity. Well adapted to the higher altitudes. Highly resistant to ordinary late blight. Keeps well.

Potato	Yields of No. 1's in bu. per acre				Tuber Description	Remarks
	1950	1951	1952	Average		
 HOUMA	406.7	371.5	518.8	432.3	Dark buff and smooth skin. Nearly round in shape with few and shallow eyes.	Matures in midseason and is adapted to the intermediate altitudes. Withstands heat and drought well. Does best on fertile, loose, well-drained soils. Highly resistant to mild mosaic. Quality is good.
 COBBLER	498.7	344.7	495.5	446.3	White, smooth skin. Shape is square with rounded shoulders. Many and deep eyes.	Most widely used early variety. Grown at all altitudes in West Virginia. Does best on loose, well-drained soils of high fertility. Has little or no resistance to common pests. Quality is good to excellent. Stores well.
 KATAHDIN	333.9	299.2	492.5	375.2	Skin smooth and dark buff in color. Tubers smooth, short elliptical to roundish with few and very shallow eyes.	Plant is very vigorous and well adapted to conditions in the medium and upper altitudes. Medium late in maturity. Plant sets tubers high. Cover well when crop is "layed by" to prevent greening. Resistant to mild mosaic. Quality is fair to good. Stores well.
 MENOMINEE	534.3	434.6	449.8	472.9	Skin flaky to russetted. Tubers cubical or blocky and slightly flattened. Eyes medium in depth and number.	Plants vigorous and late to mature. Well adapted to upland West Virginia. Highly resistant to common scab and somewhat to late blight. Quality is fair to good. Stores well.
 SEBAGO	513.3	406.2	387.2	435.6	Skin is bright white. Tubers are oval and rounded with very few being off shape.	Vigorous growing. Matures late. Adapted to wide range of soils if in good tilth. Resistant to late blight, particularly the tubers, which resist soil rots. Suggest use of variety on soils apt to be moist in late season. Quality is fair to good. Keeps well.
 CHIPPEWA	438.6	323.1	376.4	379.4	Skin smooth and dark creamy buff in color. Tubers smooth and elliptical to oblong in shape. Few and very shallow eyes.	Midseason variety. Well adapted to middle altitudes. Very productive and attractive when grown on light, deep and fertile soils. Highly resistant to mild mosaic. Quality is good.

Vegetable Variety Trials, 1952

by Mason E. Marvel

Assistant in Horticulture

EARLY Prolific Hybrid, a medium early variety, produced the highest total yield of marketable fruit in the 1952 tomato variety trials conducted by the West Virginia University Agricultural Experiment Station. This variety also produced large fruit consistently throughout the season.

The 1952 trials consisted of thirteen varieties, with six early varieties and Rutgers as a check and seven midseason and late varieties in another block. Each variety was replicated seven times.

The trials also showed that Break O'Day is still a good early variety for the market gardener. This variety produces good fruit size.

Largo and Big Boy were the best producers among the late varieties. Big Boy produced large, firm fruit of very good color, with most of the fruit harvested marketable. Vines of this variety are very large and vigorous. Largo produced medium large, well-shaped, firm fruit of excellent color, with 91 per cent of the fruit harvested marketable. The vines are vigorous and afford sufficient cover of the fruit to prevent sunscald.

Results of the 1952 tomato trials are listed in Table 1.

Sweet Corn

Twenty-five varieties of sweet corn were planted May 28, 1952, at the Reedsville Experiment Farm. These ranged from extremely early maturing varieties to extremely late maturing ones. Results of this trial are given in Table 2.

The varieties were replicated and each variety in a replicate consisted of one row of fourteen hills with three stalks in a hill.

For extremely early corn Seneca 60 is the only variety that matured in 67 days. The corn has good flavor. The ears, however, are very small and the stalk is also short. In areas where skunks and ground hogs are a problem this variety would be destroyed.

Other early varieties found to be good in 1952 were Seneca Dawn, Gold Rush, improved Carmelcross, and Northern Cross.

Golden Cross NC, Golden Cross Bantam, Seneca Chief, Pilgrim, and Iochief were good midseason varieties. Iochief was the outstanding variety in this group.

Snow King is a white variety with high quality and large well-filled ears. Growers who prefer white corn should try this variety.

TABLE 1. RESULTS OF 1952 TOMATO VARIETY TRIALS

VARIETY	MARKETABLE YIELD PER ACRE		AVERAGE FRUIT WEIGHT	TOTAL YIELD MARKETABLE
	EARLY	TOTAL		
	Tons	*Tons*	*Lbs.*	*Per cent*
EARLY				
*Early Prolific Hybrid	1.08	19.5	.36	89.6
Early Delicious Hybrid	1.95	13.6	.27	72.2
Burpeeana	1.91	13.3	.26	65.6
Rutgers	1.20	16.5	.32	86.5
*Early Wonder	2.60	12.9	.32	81.8
Break O'Day	1.40	13.7	.34	87.3
Valiant	1.65	13.0	.29	81.3
LATE				
*Largo	.82	16.98	.36	91.0
Breeders Hybrid	.93	15.17	.34	88.4
Stokes Cross 4	.81	14.91	.32	87.8
Rutgers	.67	14.32	.33	87.6
*Big Boy	.62	18.01	.43	93.6
Queens	.99	12.65	.33	86.7
Sunnybrook F_2	.98	14.76	.32	87.1

*Outstanding

TABLE 2. RESULTS OF 1952 SWEET CORN VARIETY TRIALS

VARIETY	EAR			PER CENT MARKETABLE	AVERAGE DAYS TO FIRST PICKING	HEIGHT FROM GROUND	
	LENGTH	BUTT CIRC.	TIP CIRC.			STALK	EAR
	Inches	*Inches*	*Inches*			*Inches*	*Inches*
*Seneca Dawn	6.1	5.5	3.6	88.0	70	66.0	23.0
*Gold Rush	6.4	5.4	3.8	82.9	69	64.3	16.8
Golden Glory	6.9	4.9	3.4	72.6	80	81.8	25.7
*Snow King	7.6	6.2	4.8	**	89	85.2	28.3
*Seneca Chief	6.4	4.7	3.4	75.0	81	77.3	23.2
Golden Crown	7.6	5.0	4.1	72.6	81	79.7	23.7
Seneca Market	7.5	5.0	4.1	61.4	84	81.2	23.7
*Golden Cross Bantam	7.0	4.8	4.1	78.6	84	81.0	23.3
*Golden Cross NC	7.1	4.8	4.1	80.9	84	75.8	23.0
Calumet	7.54	4.9	3.8	**	84	92.8	30.8
Golden Security	6.1	5.3	4.1	**	84	86.7	27.5
Erie	7.5	4.9	3.8	**	84	81.7	25.9
Golden Cross Select	6.2	4.8	4.1	61.9	81	78.2	20.5
Golden Jewel	6.2	5.3	3.6	66.2	75	69.0	16.0
*Pilgrim	7.2	5.6	3.7	77.4	80	83.3	23.2
Narrowgrain Evergreen	6.6	5.7	4.5	60.7	91	95.5	34.2
Seneca 60	5.5	4.6	3.5	60.2	67	50.0	15.0
FM Cross	6.5	5.3	3.7	70.2	77	76.3	21.7
Iroquois Golden	7.0	5.4	3.9	**	84	82.8	27.2
*Improved Carmelcross	5.3	5.0	3.6	72.1	72	68.0	16.3
Northern Cross	6.5	5.5	3.9	79.8	75	67.7	18.3
Double Duty	6.6	5.1	3.9	**	84	90.3	26.2
North Star	5.7	5.8	3.6	69.0	69	64.0	13.7
Early Golden	4.4	4.8	3.8	49.5	70	60.0	19.0
Iochief	6.5	5.5	4.5	88.1	82	76.5	26.5

*Outstanding.
**Incomplete harvest.

Nut Tree Orchards

by Roger W. Pease
Assistant Horticulturist

NUT tree culture is increasing in West Virginia, and inquiries about establishing nut tree orchards frequently come to the West Virginia University Agricultural Experiment Station. Usually the inquirer intends to grow black walnuts, shagbark hickories, or Chinese chestnuts from seed. However, with nut trees as with peaches, seedling stock is undesirable because its fruit varies from tree to tree in size, quality, and yield. Even seedlings from proven horticultural varieties such as Elberta peach and Thomas black walnut may bear fruit quite different from that of the parent trees.

On the other hand, fruit from grafted trees is like that of the trees from which the scionwood was taken. For example, Figures 1, 2, and 3 show groups of nuts selected at random from three black walnut trees. Groups B and C are from mature grafted stock of known horticultural varieties. Group A is from a vigorous mature seedling. Figures 1 and 2 show that a large hull does not always cover a large nut. Figure 3 shows the kernels obtained from the three groups. The large, plump pieces in Group B weighed 17 grams; the smaller, thinner pieces in Group C weighed 16.5 grams. On the other hand, the kernels from the seedling trees, Group A, weighed only 8.7 grams. The two grafted trees also bear more heavily and regularly than does the seedling.

Use Grafted Stock

The higher yield and kernel weights of the grafted trees indicate that the annual kernel crop from either of them may be twice as large as that from the seedling. Proportionately, one acre of the grafted trees would yield as much as two acres of the seedlings. The quality of kernels also should be considered: those from variety B would bring the highest price per pound because large plump pieces sell at a premium. The logical conclusion is that a nut tree orchard should be established from grafted stock of proven varieties.

However, there are at least two objections to planting grafted stock of black walnuts and hickories. First, the trees are expensive. Purchased in small lots, three to four-foot grafted whips cost approximately $2.50 to $5.00 each, about twice as much as apple whips of the same size. Second, walnuts and hickories, especially the latter, are difficult to transplant, and after being successfully transplanted, they tend to stand idle for several years before making active growth.

New Investigations

In an effort to solve the problem, the Station has under investigation a method for reducing the initial expense of grafted nut trees and for overcoming the period of rest that often follows transplanting. The project has four phases.

First, grafted nut trees of selected varieties are being grown under observation. Superior varieties suited to West Virginia conditions will be selected. Second, several kinds of nuts are being planted in nursery rows. Techniques for grafting and budding the resultant seedlings will be tested without removing the seedlings from the soil. Third, different kinds of nuts will be planted in hills located in proper position for a permanent orchard. Then, probably in the second year, wood from tested varieties will be budded or grafted on the resultant seedlings, using the technique previously selected as most practicable. Fourth, the surviving grafted or budded seedlings will be thinned to one in each hill, and their subsequent growth will then be compared with that of grafted transplants of the same varieties.

Project Aims

It is hoped that the project will show that by planting hills of nuts in proper position for a permanent orchard, and by budding or grafting the seedlings without disturbing the roots, superior varieties of black walnuts, shagbark hickories, and perhaps other species, can be established at comparatively low cost; and that these little trees will show better early growth than do corresponding transplants.

THREE GROUPS of black walnuts, from hull to kernel. The two bottom groups, B and C, are from mature grafted trees of two selected parents. Upper group is from mature seedling tree.

WEED CONTROL IN CORN

by Collins Veatch
Associate Agronomist

THE ideal weed control in corn production is a treatment at planting time that would control weeds until harvest without reducing the yield. Under favorable weather conditions this has been achieved. Under wet conditions weeds are more difficult to control.

The West Virginia University Agricultural Experiment Station trials on the control of weeds in corn at Point Pleasant, Reedsville, and Wardensville have produced some interesting results. Some of the best corn yields were from plots where the weeds were controlled with a hoe, as given in the results reported from Point Pleasant and Reedsville in 1950.

The influence of the past cropping on the weed problem was well illustrated by the trials at Reedsville in 1950. Here the check treatment without any weed control produced 79 bushels per acre, or almost as much as where the weeds were controlled. These trials were on newly broken sod. Weeds were so scarce that control measures were not necessary.

In other trials pre-emergence applications of 2,4-D and dinitro compounds have been quite successful in controlling weeds throughout the season as indicated in the Point Pleasant and Reedsville trials for 1950 and the Reedsville and Wardensville trials for 1952. In some cases pre-emergence treatments have given as good yields as cultivation.

Weather conditions have a vital influence on the effectiveness of any weed control measure. During wet years, even if possible, cultivation is not very effective. Excess rain immediately after application of a chemical reduces the chemical's effectiveness or may completely nullify its action. This is especially true of chemicals applied as pre-emergence treatments before the corn comes through the ground. In fact, heavy rains immediately after pre-emergence applications may not only dilute the chemical in the surface layer of the soil but also may leach it into the soil where it may contact and kill the germinating corn. This is apparently what happened at Wardensville in 1950, and at Point Pleasant in 1952. The previous four years trials at Point Pleasant gave good results from the use of 2,4-D applied as a pre-emergence spray. On the other hand, at Wardensville pre-emergence sprays have not generally been satisfactory, while post-emergence sprays have been effective in controlling susceptible broad-leaved weeds. At Reedsville on a heavier type soil and with heavier rainfall at planting time good results have been secured with either pre- or post-emergence sprays.

Annual grasses may be controlled with pre-emergence sprays of 2,4-D or dinitro compounds. Post-emergence sprays have little effect on annual grasses. If annual grasses are a problem, cultivation will be required for their control unless an effective pre-emergence spray has been applied. As previously suggested, excessive rain may nullify the action of a pre-emergence spray. In this case, it may be necessary to apply a post-emergence spray or to cultivate.

The control of weeds in corn should not be confined just to the year in which corn is grown but should be concerned with the crop rotation as a whole. Most tillage practices are directly concerned with weed control. The use of chemicals should be considered as an aid in weed control and not the complete answer to all weed problems.

LATE BLIGHT

(Continued from Page 3)

been found along with ten different pathogenic races of the fungus. The different races appearing in this country and in Scotland and Holland are being compared. It is necessary to know how many different genes for resistance exist and how many pathogenic races have appeared before breeding for resistance can be successful.

Tomato.—Although it has been noted that some tomato varieties are not diseased as much as others, it was not until recently that a true resistance to tomato late blight was found.

A search for resistance to tomato late blight started in West Virginia in 1950 with a small planting of wild tomatoes imported from South American and other countries. In 1951 more than 600 different wild tomato lines were screened for resistance, and several of them did not become diseased. These lines were saved and found to be resistant to the common tomato race of the late blight fungus. Figure 2 shows the reaction of three resistant lines and the commercial variety Marglobe when inoculated with the common tomato late blight race. Varieties possessing this resistance have been used in crosses with several commercial varieties, and the resistance was found to be inherited in a dominant manner. A second backcross is now being made, and selections for resistance along with good horticultural characters will be started in the summer of 1953.

Although these wild tomatoes are resistant to the common tomato race, it recently has been found that some collections of the late blight fungus are able to attack them. Thus, as with the potato, different races of the fungus are appearing which will overcome the resistance carried in the wild tomatoes. Figure 3 shows the reaction of the same varieties shown in Figure 2 when inoculated with another race of the tomato fungus.

So far, only one major gene for resistance to tomato late blight has been identified, but a search for additional resistance is being continued.

NEW PUBLICATIONS

(Continued from Page 2)

358. W. W. Armentrout and Tyler F. Haygood. Property Tax Assessment in West Virginia. March 1953.

Current Reports

3. R. P. True. Studies on Sprout Reproduction of Yellowpoplar as Related to Decay. January 1953.
4. W. L. Haltiwanger, C. W. Neal, and R. J. Friant. Results of Hybrid Corn Yield Trials in West Virginia, 1952. March 1953.

Director Varney on Leave

H. R. Varney, Director of the West Virginia University Agricultural Experiment Station, and Dean of the College of Agriculture, is now on a year's leave of absence. Director Varney departed for Washington on February 1 to become chief of staff for the Senate Committee on Agriculture and Forestry.

A. H. VanLandingham, Assistant Director and Dean, has been appointed Acting Director and Dean.

Robert H. Black, Associate Animal Husbandman and Associate Professor of Animal Husbandry, has been made Acting Assistant Director and Dean.

SCIENCE SERVES YOUR FARM

Bulletin 357, Part 4 Summer June 1953

AGRICULTURAL EXPERIMENT STATION WEST VIRGINIA UNIVERSITY

SCIENCE SERVES YOUR FARM

Bulletin 357, Part 4 **Summer Issue** **June 1953**

Annual Report of A. H. VanLandingham, Acting Director
West Virginia University Agricultural Experiment Station
For the Period 1952-1953

IN THIS ISSUE

1953 W.V.U. AGRONOMY DAY

Pictured on the cover is a scene from the 1953 West Virginia University Agronomy Day. Many farmers attend this annual event to see the latest in crop production research as it is carried out by the University.

The 1953 Agronomy Day was held at the Ohio Valley Agricultural Experiment Station near Point Pleasant. The level fields and fertile soils of this station are ideal for testing crop growth and performance.

The farmers on the cover are inspecting test plots for barley and wheat varieties. Variety testing of these two plants has been carried on for many years, and now barley hybrids developed at West Virginia University are being tested against the old standard "Wong" variety. This year two of the WVU hybrids are outyielding "Wong," and are demonstrating the value of selecting and testing plants particularly adapted to West Virginia climate and soils. Fourteen wheat varieties are being tested, and again a hybrid developed at WVU is outyielding the other test varieties. "Thorne" is the old standard variety used for testing comparisons.

To the left, back of the road, are the soybean variety plots with the new plants just starting their growth. Behind them are the tobacco beds for testing tobacco treatments. Agronomy Day visitors also were shown the results of chemical weed control experiments, spittle bug control, forage and pasture mixtures, and nitrogen top dressing of wheat.

ON THE CALENDAR

JULY—

16—Animal Husbandry Field Day at Wardensville, West Virginia.
17-21—State Convention and Leadership Training Conference of the West Virginia Association of Future Farmers of America, Jackson's Mill.
29-31—West Virginia Poultry Convention at Moorefield, West Virginia.

AUGUST—

3, 4—Dairy Products Association Convention at White Sulphur Springs, West Virginia.
15—Forestry Field Day at Camp Wood.
18-20—State Dairy Show at Jackson's Mill.
19—State 4-H Health Program and Coronation, Jackson's Mill.
20, 21—State 4-H Round-up at Jackson's Mill (including 4-H Public Speaking, 4-H Vegetable Judging and Identification, 4-H Demonstrations, State 4-H Style Review.)
24-29—State Fair of West Virginia, Lewisburg, West Virginia.
27-29—State Purebred Stud Ram and Ewe Show and Sale, Jackson's Mill.

SEPTEMBER—

20-24—State 4-H and Future Farmers of America Livestock Round-up, Jackson's Mill.

New Publications

Bulletins

357, Part 3. Annual Report of A. H. VanLandingham, Acting Director, Science Serves Your Farm, March 1953.
359T. H. L. Barnett. Isolation and Identification of the Oak Wilt Fungus. April 1953.
360. E. H. Tryon and Rudolfs Markus. Development of Vegetation on Century-Old Iron-Ore Spoil Banks. June 1953.
361T. M. J. Babcock and others. Cooperative Nutritional Status Studies in the Northeast Region. VI. Correlations. June 1953. (Northeast Regional Publication No. 13.)

(continued on page 12)

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Publications Committee: Oscar E. Schubert, H. L. Barnett, and G. C. Anderson. Science Serves Your Farm will be sent free to any resident of West Virginia in response to a written request to the Director, Agricultural Experiment Station, West Virginia University, Morgantown, W. Va.

Bird Control In Blueberries

by W. H. Childs
Horticulturist

SECOND-HAND tobacco cloth used to protect blueberries from bird damage. Cloth has disadvantages.

CONTROL of bird injury is one of the most serious problems encountered in carrying on a blueberry breeding project at the West Virginia University Agricultural Experiment Station. At the Horticulture Farm in Morgantown, robins, which outnumber other birds possibly as much as 10 to 1, come in estimated flocks of 200 to 300 and will consume almost every blueberry as it matures if some method is not used to guard against them.

When there were only about twenty blueberry plants to be protected, enclosing the row in one-inch mesh poultry wire was quite satisfactory, but as the number of plants increased, a cheaper method was sought. Michigan Circular Bulletin 160, published in 1937, indicated that an acetylene exploder had helped decrease bird injury in a sweet cherry orchard to about one-tenth that in adjoining orchards. This machine can be set to make an explosive noise at regular intervals from as often as four times per minute to as infrequently as once in ten minutes. One of these exploders was tried on the Horticulture Farm in 1939, but the robins soon became accustomed to it and would even perch near the machine while it was exploding.

The next method investigated was the use of stuffed owls and hawks. About the middle of the harvest season in 1946 an owl was placed on a platform in the center of a quarter-acre blueberry planting. This repelled birds quite satisfactorily for the rest of that season. However, when the method was tried again in 1947, crows tore the stuffed specimens to pieces within a few days.

In early 1948 a report was seen on the use of bronze owls in repelling starlings from certain buildings. It was decided to try these, and two were purchased. It was soon evident that they were not going to be satisfactory since robins would perch on the owl's head while deciding which blueberry to eat next.

In 1949 the first feasible method of control, from a practical viewpoint, was found. Used tobacco cloth was purchased in strips 33 feet wide and of the desired length. The planting was covered by this as soon as the first berries began to color, and was kept covered during the harvest season. An occasional bird

(continued on page 10)

SPIROLUM WHIRLERS in a small planting of experimental blueberries.

AYRSHIRES

Production Report on WVU Dairy Herds

by H. O. Henderson, Dairy Husbandman

THE three herds of dairy cattle, Holsteins, Jerseys, and Ayrshires, owned by West Virginia University, continue to bring honor and recognition to the State by their high production of milk and butterfat. The cows are milked twice daily, and records are kept on each milking animal. Most of the animals are being used in the research program and so cannot always be fed and handled in such a way as to obtain the maximum production. For example, no female in the Ayrshire herd can be sold until she has completed at least one record. This prevents the culling of animals that look as if they would not be good producers.

Holstein Herd

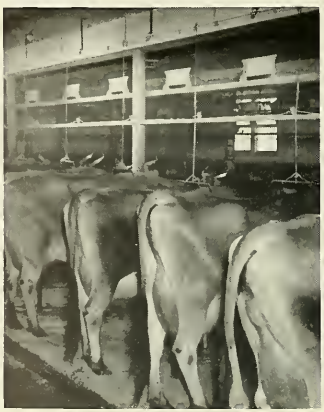
The fourteen cows in the Holstein herd bred on the West Virginia University Dairy Farm made the remarkable record of an average of 13,076 pounds of milk and 545 pounds of butterfat during 1952. The test of the milk averaged 4.2 per cent butterfat. This is the highest production ever made at the University Farm for any herd, and we believe that it is the highest ever made in the State. The herd also was classified for type with an average score of 84.7 and has won its seventh consecutive Progressive Breeders' Award, which is the highest award given by the Holstein-Friesian Association of America. The average production of this herd during the last five years is 12,207 pounds of milk and 496 pounds of butterfat with a butterfat test of 4.06 per cent.

Jersey Herd

The twelve cows in the Jersey herd averaged 7,657 pounds of milk and 425 pounds of butterfat for the past year. Their butterfat test averaged 5.5 per cent. The average classification score was 84.2. The herd won its seventh Constructive Breeders' Award, the highest award given by the American Jersey Cattle Club. This herd has averaged during the last five years, 7,480 pounds of milk and 416 pounds of butterfat and has an average butterfat test of 5.56 per cent.

(continued on page 10)

JERSEYS



HOLSTEINS

Pasture Seedings for Dairy Farms

by O. J. Burger, Associate Agronomist, and I. D. Porterfield, Associate Dairy Husbandman

THE dairyman is primarily interested in producing the most milk at the lowest possible cost. A good pasture mixture or a combination of mixtures will furnish feed nutrients at the lowest possible cost and at the same time produce large yields of high quality feed. The seed mixture should not only produce vigorous plants that maintain a stand over a period of several years, but should also maintain uniform plant growth throughout the grazing season.

A pasture program for livestock must be designed so as to fit an animal's needs, which vary for different kinds of grazing animals. For example, fattening cattle and beef cows producing fat calves require an increasing quantity of feed for each successive month throughout the summer, and a dairy herd requires a fairly constant amount throughout the pasture season. It must be kept in mind that an attempt to control the variation in the supply of summer forage will increase total costs. These increased costs must be paid for by the increased returns of a more uniform distribution of summer forage.

Different pastures have different carrying capacities. Factors such as fertility treatment, management, and weather will influence productivity. Table 1 shows the approximate number of acres of a particular pasture it would take to support one cow. The basic unit used is the standard cow-day taken as that animal consuming sixteen pounds of total digestible nutrients per day.

Table 1 shows that well-fertilized, permanent bluegrass pasture has a high carrying capacity during May and June. With early nitrogen fertilization—usually March application is recommended—the carrying capacity of this type of pasture can be increased during April. If a dairy farmer is to maintain a high uniform flow of milk from pasture during July, August, and September, he must depend on tall legume-grass pasture as the source of feed nutrients. Many of the other types or kinds of pasture listed above will fill the pasture needs. Other mixtures that will meet these needs are as follows:

1. 10 lbs. alfalfa, 1 lb. Ladino clover, and 5 lbs. orchard grass.
2. 1 lb. alfalfa, 1 lb. Ladino clover, and 8 lbs. bromegrass.
3. 12 lbs. alfalfa, 4 lbs. timothy.
4. 4 lbs. alfalfa, 4 lbs. timothy, 2 lbs. alsike clover, 4 lbs. red clover (if this mixture is to be used exclusively for pasture, then substitute 4 lbs.

(continued on page 12)

TABLE 1. NUMBER OF ACRES OF VARIOUS PASTURES NEEDED TO SUPPORT ONE COW

PASTURE	ACRES TO SUPPORT ONE COW*							
	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
Permanent Bluegrass Pasture-Treated	5	2	2	8	9	6	5	8
Red Clover-Timothy, Rotation Pasture No Hay	—	1	1	2	5	3	4	—
Red Clover-Timothy, Rotation Pasture Hay, 1st cut	—	—	—	4	2	3	4	—
Alfalfa Mixture or Tall Legume Grass Mixture—No Hay	10	1	1	1	3	2	3	—
Alfalfa Mixture—Hay, 1st cut	—	—	—	2	1	1	2	—
Sudan Grass	—	—	—	2	1	1	2	—
Wheat and Rye	—	1	—	—	—	—	—	—
Sweet Clover	—	1	1	2	4	4	2	—

* The feed nutrients required for a 1,200-pound cow producing 20 pounds 4% milk per day equals a standard cow-day.

TABLE SAW pictured here was developed by Agricultural Engineers at WVU Station. The saw is easy to use, easy to build, and is very practical.

Table Saw

for farm & home

by

Roy E. Emerson

Assistant Agricultural Engineer

WEST Virginia University Agricultural Engineers have developed a table saw that can be used for practically all types of sawing jobs that may be encountered in the home or on the farm.

The saw has a large table top, 36 inches by 40 inches. This makes it easy to handle either large pieces of lumber or sheets of plywood and similar material. The saw shown in the accompanying pictures was mounted on rubber tired wheels for easy transportation from one location to another about the farm. The saw blade is 10 inches in diameter and at its uppermost position extends 3¼ inches above the top. A 1 h.p. motor is recommended for the saw, but the tool is so constructed that a 12-inch blade may be used. If this blade is used, a 1½ h.p. motor is best. The motor is mounted so that when the blade is raised or lowered it also moves. This stops any belt slippage or misalignment of pulleys and belts. The blade may be easily raised and lowered by a crank which is readily accessible to the operator. The machine also can be used for ploughing grooves or slots in wood by using a dado head, or moldings may be cut using a molding head on the mandrel. By using an abrasive disk, light metals can be cut readily.

Sow Construction

The saw is constructed of ¾-inch and 1-inch pipe, angle iron, round and flat steel, all of which are readily available in the average community. Used pipe and iron can be used, thus reducing the cost of the tool. The table saw is not difficult to construct since it does not require the use of machine tools such as a metal lathe, shaper, or milling machine. The only power tools needed are a light duty electric welder, and a ½-inch capacity electric drill. The hand tools needed are those commonly found in most ordinary tool boxes. The saw mandrel is of the ball bearing type with a ⅝-inch shaft and is available either at the local hardware store or may be ordered from a mail order house. With the exception of the motor, mandrel, V-belts, and pulleys, the entire saw can be fabricated at home, if the power tools, mentioned before, are available.

Cost Reasonoble

Using new materials throughout, the cost of the saw, less motor, is between 30 and 40 dollars, but if used materials are available this cost can be reduced materially.

Detailed plans will soon be available together with a description telling how to construct the tool, from the Department of Agricultural Engineering, West Virginia University, Morgantown.

Editor's Note: Plans for other farm and home devices and buildings are available from your State Agricultural Experiment Station. You can obtain them by writing to the Director, West Virginia University Agricultural Experiment Station, Morgantown.

If the plans you want are not on the drawing board, Station workers will pass along other information that will be of help to you.

EASY TO OPERATE

EASY TO MOVE ABOUT

How Much Floor Space For Broilers?

by T. B. Clark, J. O. Heishman, and C. J. Cunningham*

THE optimum amount of floor space for the production of broilers is a controversial question in the broiler industry. Now that coccidiostatic drugs are in general use and vaccines are available for the control of Newcastle disease, is crowding the broilers a profitable practice? Credit agencies generally prefer to hedge against heavy losses in case of poor markets or outbreaks of uncontrollable diseases by restricting the number of birds per pen. The objective of the study reported here was to obtain information on the effects of floor space upon such broiler qualities as growth, mortality, market grade and utilization of feed.

In 1950 some controlled experiments were started at the Reymann Memorial Farms Substation. A broiler house, described in West Virginia University Agricultural Experiment Station Circular 85, has been used. It has eight pens, each about 31 by 41 feet. The forced air heating system is designed so that the air can be recirculated within the house, or so that all of the air can be replaced every few minutes. In the first two trials the entire house was heated by forced hot air. In the following two trials, one-half of the house was heated with L. P. gas brooders to remove the effect of circulating the air. Since both heating systems gave about the same results, only the effects of floor space are reported here.

New Hampshire chicks purchased from West Virginia hatcheries were used. They were vaccinated for Newcastle disease by the intranasal method. Sawdust was used for litter, and a drug to prevent coccidiosis was fed continuously at a preventative level. Each trial was conducted for 12 weeks.

*T. B. Clark is Associate Poultry Husbandman. J. O. Heishman is Associate Animal Pathologist, Wardensville. C. J. Cunningham is Associate Animal Husbandman in charge of Reymann Memorial Farms, Wardensville.

The original plan of the experiment called for a study of floor space ranging from .4 to 1.5 square feet per broiler. However, only the pens with .5, .75, and 1.0 square feet are discussed here. The number of birds started under each category is given in Table 1. Trial 1 was started in October, 1950 and Trial 4 in May, 1952, so that the effects of all seasons of the year were included. The averages given below are for the four trials.

The results in Table 1 show that as the floor space per bird decreased and the number of birds per pen increased, a greater poundage of chicken was obtained. Average body weight was affected in the opposite direction. This increased as more space was allowed each bird. The average body weights of all trials were 3.02, 3.13, and 3.17 pounds for the .5, .75, and 1.0 space allotments, respectively.

The utilization of feed per pound of broiler followed the same trend as that for average body weight. As the space became larger the feed was utilized more efficiently so that the average values were 3.66, 3.58, and 3.54 pounds of feed consumed per pound of broiler produced per pen.

Mortality was relatively low in all four trials. Contrary to experiments reported from the Delaware Agricultural Experiment Station, crowding did not increase mortality in these trials. The average percentage mortalities in the four trials for the .5, .75, and 1.0 square-foot per bird pens were 6.2, 7.1, and 7.3, respectively. The differences probably are not significant but they do suggest that crowding had little or no effect either way. In fact, crowding may have prevented loss from cannibalism. Outbreaks of chronic respiratory disease (air-sac colds) occurred, but this disease did not seem to affect one pen more than another. A 6-foot alley divides the house in half the long way. This wide alley has been suggested as providing more volume of air per bird and having a beneficial effect upon the birds in the crowded pens. Ventilators in the highest point of the roof probably had more effect than the alley by allowing a continuous exchange of air.

Crowding had little or no detrimental effect on quality as indicated by market grade. The broilers in Trial 2 were dressed at the killing plant in Moorefield, West Virginia, and graded by a competent grader. The percentages of birds in the top grade for the .5, .75, and 1.0 square-foot per bird pens were 90.87, 93.23, and 91.35, respectively. Crowding did not increase the number of birds in the inedible grade since there was 0.57 per cent from the .5 square-foot pen and 1.65 per cent from the 1.0 pen.

The effect of floor space on labor income is summarized in Table 2.

(continued on page 12)

TABLE 1. TOTAL POUNDS OF BROILER PRODUCED AT 12 WEEKS OF AGE AND SELLING PRICE

FLOOR SPACE (SQ. FT.)	NO. BIRDS PER PEN AT START	TOTAL POUNDS OF BROILER TRIALS			
		1	2	3	4
.50	1400	3921	4033	3835	3870
.75	933	2743	2780	2763	2605
1.00	685	2078	2031	1985	1971
Selling Per Pound (Cents)		26	29	29	22

TABLE 2. EFFECT OF FLOOR SPACE ON LABOR INCOME TO 12 WEEKS OF AGE

FLOOR SPACE (SQ. FT.)	NO. BIRDS PER PEN AT START	LABOR INCOME (DOLLARS) TRIAL				TOTAL
		1	2	3	4	
.50	1400	20.86	210 10	125.99	—102.63	254.32
.75	933	—14.33	140.03	69.51	— 91.44	103.77
1.00	685	6.02	88.65	52.02	78.98	67.71

INFECTED OAK

OAK WILT

Control it now ?

by R. P. True
Associate Plant Pathologist

THE question "Why should we try to control oak wilt now?" is one that must be satisfactorily answered before we urge our State agencies to undertake on a large scale a task that is likely to prove difficult.

The value of oaks is generally recognized, but to West Virginians their importance is even greater because there are no comparable forest trees that could take their place here should they be lost to us. If the oaks should eventually go as the chestnuts have gone we should lose: (1) more than one-half of our standing saw timber, (2) three-quarters of the timber that now goes for use in the mines, (3) one of our best sources of food and shelter for a wide variety of game animals, and (4) the species which chiefly occupies and protects the surface of 50 to 70 per cent of the land area in 12 counties and 30 to 50 per cent of it in 23 additional West Virginia counties. With this at stake we must consider taking some appropriate action. We may consider the value of the crop when we are asked to pay the price of its protection.

The question of what is a fitting program to control the disease must be weighed first in terms of what is or is not possible, and then in terms of what difficulties the possible measures may be expected to involve.

The possibility of prompt, complete eradication of the disease must be considered because, if successful, it would justify even a tremendous initial expense in order to avoid the recurring costs of a protracted and perhaps indefinite program of control aimed primarily at keeping the disease at a level where no serious losses would occur. To be permanently effective, eradication would have to be carried out on a national basis to prevent the eventual reintroduction of the disease. The possibility of eradication would have to be supported by the evidence available. The failures of previous attempts to eradicate tree diseases and the evidence pointing to the difficulties involved in carrying out such a program in the case of this disease seem to indicate that at the present time complete eradication of the oak wilt disease is not possible.

An effective control program aimed at preventing a further build-up of the disease does seem to be possible, though difficult.

When additional research results are obtained and made available, difficulties of a program of oak wilt control may be shown to be greater or less than they at present appear. One objective of research on plant diseases is, however, to overcome problems involved in the control of the disease. Over a period of time, therefore, we may expect the difficulties in carrying out this control program to be reduced, the efficiency of control increased, and the cost lowered. Difficulties that now exist include the following:

(1) The lack of fundamental information such as: (a) The way the disease is spread overland—sometimes apparently for long distances; (b) The regularity and frequency with which root grafts occur between closely related oaks standing near together on West Virginia soils, and consequently, the importance of the part played by root graft transmission in spreading oak wilt here; (c) The way in which the fungus produces the disease in trees into which it is introduced. The answer to these and other questions might aid greatly in planning a control program.

(2) Difficulties involved in finding and recognizing individual oak trees that have the symptoms of the disease would be insurmountable in large forested areas were it not for the use of the airplane. The use of small, easily maneuvered planes that can fly with reasonable safety at slow speeds and low altitudes is essential in scouting for the oak wilt disease.

(3) Walking in to make a ground check on suspicious trees spotted from the plane may be very difficult and hazardous in mountainous areas far from passable roads. The expense of this work is much greater than for the use of the plane. When samples taken by the ground crew are cultured in the laboratory to determine whether the symptoms seen did actually indicate the presence of oak wilt, the ground must again be traversed in order to take down the tree and prevent it from serving as a center for future disease spread.

(4) Preventing spread from a known disease center at present consists of: (a) felling and burning the diseased tree as promptly as possible in the hope that it may be destroyed before overland spread from

(continued on page 11)

NITROGEN TOP DRESSING PROFITABLE IN 1952

by D. R. Browning, O. J. Burger, and G. G. Pohlman[1]

ON many soils and in many seasons the nitrogen applied at planting time is not sufficient to supply all the nitrogen needs of the crop until maturity. This is particularly true with perennial hay crops that are low in legumes, pastures where the legumes are not prevalent, and fall-seeded small grains. Last spring nitrogen top dressings were used on wheat, mixed hay, and good bluegrass pastures. The results with these crops are reported here.

Wheat

Thorne variety of winter wheat was planted at the Ohio Valley Experiment Station, Point Pleasant, in the fall of 1951. It was fertilized with 500 pounds of 5-10-10 fertilizer at seeding. In the early spring of 1952 plots of this wheat were treated with 25, 50, and 75 pounds of nitrogen. This was applied as ammonium nitrate at rates of 75, 150, and 225 pounds per acre. Applications were made at three dates—March 10, 26 and April 9. The effect on yields is shown in Table 1.

Results in Table 1 show a profitable increase in yield when 25 pounds of nitrogen was applied. This rate of application of nitrogen gave one bushel increase in wheat yield for each two pounds of nitrogen applied on March 10 (12.8 bushels for 25 pounds of nitrogen.)

The higher rates of application (50 and 75 pounds N) caused lodging of the wheat. This reduced the harvestable yield.

Later applications did not give quite as large an increase, but the increase was large enough in all cases to be profitable.

These and earlier results indicate that top dressing with nitrogen will pay if the expected yield, without top dressing, is below 30 bushels per acre and the soil has been well supplied with phosphorus and potash.

[1]D. R. Browning is Assistant Agronomist in charge of the Ohio Valley Experiment Station, Point Pleasant. O. J. Burger is Associate Agronomist. G. G. Pohlman is Agronomist and head of Department of Agronomy and Genetics.

Hay

Nitrogen top dressing was applied to four hay fields at the Ohio Valley Experiment Station in 1952. These represented hay fields with different mixtures, three of which were first-year crops of mixed grass and legume and one was a second-year crop consisting largely of timothy but containing a little alfalfa. All plots had been fertilized with 500 pounds of 5-10-10 fertilizer before seeding the hay crop. Nitrogen was applied on March 13, 26, and April 9 at rates of 25 and 50 pounds per acre. Applications were made as ammonium nitrate at 75 and 150 pounds per acre. The results are shown in Table 2.

There was no significant effect of date of applying nitrogen, so each value represents the average of the three dates.

Area No. 1 was a first-year stand of mixed clover, alfalfa, and timothy hay. Even with a good mixture of grasses and legumes, the application of 50 pounds of nitrogen increased the yield by one-half ton per acre. With ammonium nitrate at $78.00 per ton, the one-half ton increase was produced at a fertilizer cost of $6.00. At this price the increased yield was produced at about $12.00 per ton on this plot.

Area No. 2 was primarily timothy with very few legumes. Here 50 pounds of nitrogen increased the yield by almost a ton per acre. The cost of fertilizer to produce this increase was only about $6.00. Six dollars for a ton of hay is certainly low-cost hay production.

Area No. 3 had a poor stand, but was principally legumes (alsike and red clover and alfalfa). The nitrogen application was not profitable on this area.

Area No. 4 was a two-year-old stand of timothy containing some alfalfa. In this case, the increase was the same as on Area 1 (one-half ton per acre) and the cost of the fertilizer to produce the additional hay was $6.00.

The response to nitrogen was greatest where the hay was largely grass with only scattered legumes. But these results indicate that mixed grass legume hay may be profitably top dressed with nitrogen fertilizer in March or early April.

Bluegrass Pastures

It has generally been recognized that additional bluegrass pasture herbage can be secured by early spring as well as late summer applications of nitrogen. Nitrogen fertilization at these periods also makes possible additional grazing of from a week to two weeks at each end of the growth period of bluegrass.

Nitrogen fertilization work on bluegrass was conducted at the Reymann Memorial Farms, Wardensville, with the help of C. J. Cunningham, superintendent of the farm. Two rates of nitrogen fertilizer in the form of nitrate of soda were applied to permanent bluegrass pasture on March 26 and April 21, 1952. The two rates were 200 and 400 pounds, which represented 32 and 64 pounds of actual nitrogen per acre.

The results of yield and protein analyses are listed in Table 3.*

It is evident from Table 3 that the time nitrogen is applied does make a great difference on yield of bluegrass. Chemical consitiuents in the plant also are affected. The important result of this experiment is that 200 pounds of nitrate of soda applied on March 26 gave better response than 400 pounds applied on April 21. The response to the nitrogen continued to have a beneficial effect through the entire growing season.

Recommendations

Applications of nitrogen fertilizers as top dressing were made on wheat, mixed hay and bluegrass. Profitable increases in yield were obtained on the wheat and bluegrass and on three of the four test areas with

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*—Areas for analyses were harvested May 15.

NITROGEN TOPDRESSING

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mixed hay. The one area on which the yield increase was not profitable had a poor stand of mixed hay.

The earliest applications were most effective on the wheat and bluegrass plots, but time of application did not have any effect on mixed hay yields when the nitrogen was applied between March 13 and April 9.

Nitrogen top dressing of crops in the early spring (preferably in March) may be expected to give profitable returns where stands are good and where phosphorus and potash are not limited.

Table 1. Effect of Nitrogen on Yields of Wheat

Rate of Nitrogen Applied (Lbs/A)	Yield of Wheat (Bu/A) When Nitrogen Was Applied on		
	Mar. 10	Mar. 26	Apr. 9
None	21.6	21.6	21.6
25	34.4	30.5	30.8
50	33.8	32 9	30.7
75	28.0	28.2	28.2

Table 2. Results of Nitrogen Top Dressing on Hay Yields

Area No.*	Yield of Hay (Tons Per Acre) Topdressed With		
	No Topdressing	25 Lbs. Nitrogen	50 Lbs. Nitrogen
1	1.58	1.86	2.08
2	1.18	1.88	2.12
3	0.85	0.88	1.02
4	2.27	2.76	2.77

*See text for description.

Table 3. Results of Nitrogen Fertilization Work on Bluegrass Pastures

Date Applied	Rate	Yield	Increase Over Check	Crude Protein	Increase Over Check	42% Soybean Meal Equivalent
	lbs N/A	lbs/A	%	lbs/A	%	lbs
Check	0	1465	0	149	0	354.8
March 26	32	2195	49.8	281	88.6	669.0
March 26	64	2585	76.4	352	136.2	838.0
April 21	32	1730	18.0	212	42.3	504.8
April 21	64	1980	35.1	273	83.2	650.0

BLUEBERRIES

(continued from page 3)

would find its way in, but damage was negligible. The method has three chief disadvantages: (1) The tobacco cloth rests directly on the plants and the new growths are bent over somewhat. Hence they grow crooked instead of upright. (2) The labor of harvesting is increased slightly. The plants either must be uncovered while picking or pickers must work under the cloth. (3) The cost of the cloth, though not sufficient to keep one from using it, is greater than is desirable. When first purchased in 1949 it cost about 1½ cent per square yard, delivered. The price had increased slightly by late 1951 when the last was purchased. With care the cloth can be used two or more seasons.

With the hope of finding a cheaper satisfactory method, some Spirolum Whirlers* were tried in 1952. These are corrugated strips of aluminum-like material about four inches wide and of varying lengths. One end is fastened to a support, the Whirler is twisted, and the other end fastened to a second support. One side of the Whirler is silver colored and the other side either red, blue, or green. With any air movement, the Whirler is in constant motion winding and unwinding. Since light reflects from it, it also flashes almost constantly. Whirlers have been used for advertising purposes by used-car lots, filling stations, etc., and most people have seen them in action.

Robins were numerous in 1952 before sweet cherries began to ripen, and caused considerable damage to these. One Spirolum Whirler was placed beside one of the sweet cherry trees, and birds avoided that tree. When black raspberries began to ripen, birds were troublesome, and three Whirlers were put up over the planting. Birds caused no appreciable damage to the planting after that. By the time the blueberries began to mature, robins were no longer numerous. Whirlers were set up, and damage was light, but whether they would have repelled large numbers of fruit-hungry robins if there had been a sweet cherry failure (as happens at least half of the time at Morgantown) is uncertain. The study will be continued in 1953, and, since sweet cherries have been severely injured by frost, more definite results should have been obtained by the time the harvest season is over.

*Donated by Dazian's, New York 18, N.Y.

DAIRY HERDS

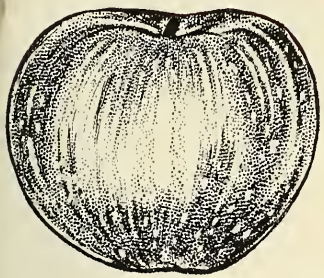
(continued from page 4)

Ayrshire Herd

The forty cows in the Reymann Memorial Ayrshire herd averaged during the past year 9,749 pounds of milk and 416 pounds of butterfat with an average butterfat test of 4.3 per cent. Many of these animals were first calf heifers and when the records were converted to maturity, the production was 10,452 pounds of milk and 446 pounds butterfat. This herd also was classified and has the remarkable average score of 86.2 for type. The herd won its ninth Constructive Breeders' Award. There are now only three herds in the United States that have won more Constructive Breeders' Awards than has the Reymann Memorial herd. This herd has averaged 9,598 pounds of milk and 423 pounds butterfat during the last 5 years. It has had a butterfat test of 4.4 per cent.

Make Excellent Records

These herds have made excellent records. That all three herds are able to win the coveted awards of the Breeders Association year after year is indeed noteworthy. We want the people of the State to know about their herds and to be proud with us of their accomplishments.



APPLE BLENDS

by Oscar E. Schubert, Associate Harticulturist and Walter R. Lewis, Agricultural Biochemist

ARREADY market for apple juice might easily be the deciding factor between a profitable or an unprofitable operation for many apple growers in the State. Apple juice as now marketed lacks flavor in comparison with other fruit juices. Too often it is prepared from the juice of Delicious, Rome, or some other bland variety. Since this juice is rather sweet, insipid, and lacking in aroma a consumer has little desire for apple juice. Delicious and Rome apple trees are being planted in such large numbers that a time may soon be reached when all these apples can no longer be sold at a profit on the fresh fruit market. If a tasty apple juice could be prepared to utilize sound apples when the market for fresh fruit is over-supplied, a service would be rendered to the apple industry.

With these problems in mind, a project to determine what could be done to improve the quality of apple juice was initiated two years ago in the departments of Agricultural Biochemistry and Horticulture at West Virginia University. Crab apple varieties selected by the late Dr. F. C. Bradford were planted at the Horticulture Farm to obtain crab apples with bitter and astringent flavors for blending with bland apple juices. These trees have not yet borne large enough crops for the preparation of experimental blends. In the meantime, juice from several standard crab apple varieties (Dolga, Hyslop, Transcendent, Virginia, and Young America) has been blended with Delicious juice. Taste panels composed of students and faculty in the College of Agriculture have indicated a definite preference for blends containing 10, 30, or even 50 per cent crab apple juice over juice made from Delicious apples alone. Fewer than one person in five preferred the unblended Delicious juice.

The degree of maturation of Delicious apples was found to be an important factor determining the palatability of the juice prepared. Juice from apples that were not fully mature had very little taste appeal. As the fruit became more nearly mature its juice became progressively better flavored until about two weeks past the usual time of commercial harvest. These observations agree with those of workers in the State of Washington. It also is important that only sound fruit be made into juice and that all presses and equipment be kept clean.

In another phase of this project the addition of certain chemicals, either those naturally occurring in plants or synthetic materials approved by Federal law, is being investigated. Small amounts of malic acid added to the juice increased its palatibility, as indicated by a three to one preference for Delicious juice which had been thus acidified to a pH of 3.35 as compared to the unacidified juice. Sodium benzoate added to the juice as a preservative so impaired the flavor that it is definitely unacceptable.

During the coming year it is planned to continue the study of the value of blending different varieties of crab apples with Delicious juice and also to determine the value of changing the astringency of the juice. The authors will welcome comments or suggestions concerning this work.

OAK WILT

(continued from page 8)

it carries the disease to other trees; and (b) poisoning the root systems of near-by closely related oaks before they can receive and pass on the fungus from the roots of the diseased tree. Transporting the equipment necessary for these procedures and carrying them out safely are difficult and expensive tasks under some West Virginia forest conditions. Until we know more about when and how the disease is spread overland we cannot be sure that we can expect complete prevention of spread even when all this has been done.

One reason why we need to begin to control the oak wilt now is that these procedures are difficult enough to carry out with the comparatively small number of oak wilt trees now standing, known and unknown, in our forests. Should this unknown total number be multiplied by ten or even five before control procedures are begun, the size of the task to be undertaken might discourage us from making a beginning. The time to start is now, and the best methods to use are the best we know.

Experience and research results will improve our methods of control and augment our knowledge of the disease so that the job can be done more effectively from year to year. Eventually we may be in a position to undertake complete eradication of the disease if we can prevent its further spread until researchers here and elsewhere have learned more about the disease and until our control agencies have perfected their control procedures.

Editor's Note: Land owners can help state agencies control the oak wilt by following up suggestions made in an article entitled "Oak Wilt" that appeared in the December 1951 issue of Science Serves Your Farm. Reprints of this article may be obtained from the Department of Plant Pathology, West Virginia University.

HOLLY

Shown at the left is an American holly tree growing in Upshur County.

American holly, often considered a nuisance in West Virginia, can be grown as a profitable cash crop under proper management.

The West Virginia University Agricultural Experiment Station recently published a circular which points out how American holly can be grown profitably. Circular 87 is entitled *Rooting American Holly from Cuttings—Cold-Frame Method.* It can be obtained free from your county agricultural agent or from the Experiment Station in Morgantown.

The circular contains 24 pages and is packed with information and pictures on how to grow holly. It also contains complete details, including drawings, on how to build a cold frame for the rooting of holly cuttings. A bill of materials needed also is included.

Authors of the publication are Roger W. Pease, Assistant Horticulturist and Assistant Professor of Horticulture; Earl H. Tryon, Silviculturist and Professor of Silviculture; and W. W. Steiner, Manager, National Observational Nursery, Soil Conservation Service, Beltsville, Maryland.

BROILERS

(continued from page 7)

The income values reflect the market price as well as the pounds of chicken sold from each pen. The income per pen decreased as the floor space per bird increased when the cost of production was below the selling price. The broilers from Trial 4 were sold on an unfavorable market; the selling price was below the cost of production. In this case more money was lost on the pens containing the larger number of broilers.

The investment in feed and chickens is greater with more birds per pen. A greater investment increases the possibility for loss from unfavorable market prices. In this study only growth and feed efficiency were adversely affected by crowding. However, these effects were not great and the total income from the first three trials more than offset the losses incurred in Trial 4.

Broiler producers should recognize that when the margin between the cost of production and the market price is wide, the labor income will be greatest when one-half square foot of floor space is provided. On the other hand, the loss will be lower from unfavorable prices with fewer birds per pen. Allowing .75 to 1.0 square feet of floor space per broiler is a means of hedging against the possibility of heavy loss on an unfavorable market and at the same time may produce better broilers in houses with poor ventilation. Thus, the optimum amount of floor space per bird for any broiler house can only be determined by trial.

DAIRY PASTURES

(continued from page 5)

of orchard grass for the timothy and add ½ lb. of Ladino clover).

5. (On poorly drained soils) 6 lbs. of reed canary grass and 2 lbs. of Ladino clover.

All of these seed mixtures are on a per acre basis.

Fills Forage Needs

As an example of how one of the above tall legume-grass mixtures can fill the pasture need of a dairyman, the authors would like to relate their experience at the University's Dairy Farm. A mixture of alfalfa, Ladino clover and orchard grass was established. This crop flourished and furnished a cutting for silage and hay while the herds were receiving ample forage from permanent bluegrass pasture. Around the first of July, when the bluegrass pasture production fell off, the second crop of the alfalfa mixture was ready for pasturing under the rotational system, and the extra forage was put up as hay. The third crop was also used for hay and pasture.

The success with any one of the above mentioned mixtures will depend largely on the fertility of the soil and the weather conditions. Before a pasture can be managed intelligently and successfully, the farmer must have some knowledge of the growth habits and requirements of the pasture plants with which he is dealing.

NEW PUBLICATIONS

(continued from page 2)

362T. H. L. Barnett and V. G. Lilly. The Utilization of Sugars by Fungi. June 1953.

Circulars

87. Roger W. Pease, E. H. Tryon, and W. W. Steiner. Rooting American Holly from Cuttings—Cold-Frame Method. May 1953.

88. T. B. Clark. Cannibalism in Poultry. June 1953.