1-1-1954

Science serves your farm.

A. H. VanLandingham

Follow this and additional works at: https://researchrepository.wvu.edu/wv_agricultural_and_forestry_experiment_station_bulletins

Digital Commons Citation

VanLandingham, A. H., "Science serves your farm." (1954). *West Virginia Agricultural and Forestry Experiment Station Bulletins*. 363.
https://researchrepository.wvu.edu/wv_agricultural_and_forestry_experiment_station_bulletins/359

This Bulletin is brought to you for free and open access by the Davis College of Agriculture, Natural Resources And Design at The Research Repository @ WVU. It has been accepted for inclusion in West Virginia Agricultural and Forestry Experiment Station Bulletins by an authorized administrator of The Research Repository @ WVU. For more information, please contact ian.harmon@mail.wvu.edu.

Digitized by the Internet Archive
in 2010 with funding from
Lyrasis Members and Sloan Foundation

<http://www.archive.org/details/scienceservesyou363west>

SERVES YOUR FARM

Bulletin 363, Part 1

Fall

September 1953

WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION

Science

SERVES YOUR FARM

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

IN THIS ISSUE

ON THE CALENDAR	2
NEW PUBLICATIONS	2
BLACK WALNUT VARIETIES	3
CORN SILAGE VS. LEGUME-GRASS SILAGE	4
ROUGHAGES FOR WINTERING CATTLE	4
POULTRY MEAT	5
MAGNESIUM IN WEST VIRGINIA SOILS	7
IRRIGATION	8

Annual Report, Parts Published Quarterly
by
AGRICULTURAL EXPERIMENT STATION
West Virginia University
Morgantown, W. Va.

Acting Director,
A. H. VANLANDINGHAM
Editor JOHN LUCHOK
Assistant Editor GLENN D. BENGTSON
Photographer DAVID R. GAZEL
Publications Committee: H. L. BARNETT,
G. C. ANDERSON, and O. J. BURGER. SCIENCE
SERVES YOUR FARM will be sent free to
any resident of West Virginia in response
to a written request to the Director, Agri-
cultural Experiment Station, West Vir-
ginia University, Morgantown, W. Va.

on the calendar . . .

OCTOBER—

27-29—Fall Extension Meeting, State For-
age and IFA Baby Beef and Fat Lamb
Showing Sale, Jackson's Mill.

NOVEMBER—

5-6—Joint Meeting of SCS and ASAE
State Sections, Romney.

15-19—Eastern National Livestock Show.
Meat judging team and Livestock judg-
ing team, Intercollegiate judging show,
Animal Husbandry Department will
exhibit eight Aberdeen-Angus and
Hereford fat steers at this show, Tim-
onium, Md.

20-21—Cumberland Shenandoah Fruit
Working Conference. West Virginia
host to the States of Delaware, Penn-
sylvania, Maryland, Virginia, and
North Carolina, and USDA workers
Martinsburg.

29-Dec. 5—International Livestock Expo-
sition, Chicago.

29-Dec. 5—National 4-H Club Congress
Chicago.

JANUARY—

5-8—Dairy Short Course, Jackson's Mill.

on our cover

In May, 1944, these fine heifers were turned out to pasture at the Reymann Memorial Experimental Farms at Wardensville. After being bred, they were divided into two groups for feeding trials designed to compare corn silage with grass-legume silage. Results of this five-year experiment are given on page 4.

Research in agriculture, as it is conducted by the West Virginia University Agricultural Experiment Station, is State-wide. Walnut varieties were tested in Upshur county. Oak-wilt research may be done anywhere in West Virginia forests. Hybrid corn varieties are tested on private farms in many counties. Soil-development processes are being studied at century-old iron-ore spoil banks. And occasionally, researchers will visit homes and schools to ask the housewife how she prefers to buy chicken, or to check the health of her children.

Experimental farms and sub-stations play an important role in this State-wide research program. The Ohio Valley Station, located in Mason County, is a testing ground for new varieties of field crops. In eastern-most Jefferson county, the Kearneysville Experimental Farm is a center for research in poultry, fruit, and small grain production. The Reymann Memorial Farms, Hardy County, is the scene of research in livestock production, irrigation, poultry housing, and plant diseases. Garden vegetables, forage crops, and floriculture are studied at the Reedsville Farm.

Bulletins

357, Part 4. Annual Report of A. H. Van Landingham, Acting Director, Science Serves Your Farm, June 1953.

Current Reports

5. S. J. Weese and J. E. Fike. Some Aspects of Every-Other-Day Milk Delivery August 1953.

IMPROVED VARIETIES OF BLACK WALNUTS for West Virginia

by Maurice Brooks
Forester

HARVESTING, cracking, and marketing black walnut kernels has become an important local industry in some sections of West Virginia. Thus a forest resource, frequently neglected, is now becoming a cash crop. And as the black walnut tree grows naturally over a large portion of the State, there are opportunities for the expanding of this industry.

Black walnut trees, as they grow in the fields and forests, vary widely in many respects. Some will produce good kernels, while others will not. Some grow fast, others slow. Some begin to bear nuts at an early age, while others will not bear nearly so soon. Individual trees also vary in their ability to produce a crop of nuts every year, and in resistance to diseases.

Part of this variation in individual trees is due to the seeding characteristics of the black walnut. The majority of the wild trees grew from seedlings sprouted from fertile kernels. Each fertile kernel represented a cross between its parent and another tree. Thus each new tree growing in the forest is different

from its parent. Desirable characteristics possessed by a parent tree are frequently not passed on to its offspring.

A new walnut variety is established when someone selects a single tree growing in the wild and gives it a varietal name. Usually this tree exhibits outstanding characteristics as to kernel quality, cracking ease, disease resistance, and other desirable qualities. It is propagated through budding, grafting, or topworking. After testing, such superior varieties become available from commercial nurseries.

Some twenty years ago, four varieties of black walnut trees were tested on a farm at French Creek, Upshur County. Ten trees each of Thomas, Ohio, Stabler, and Ten Eyck were planted on land where seedling black walnuts were growing naturally. No commercial fertilizers were applied, and no care given the trees outside of mowing around them for the first few years after planting.

The Thomas variety has been by far the most successful in the Upshur County tests. The trees grew

rapidly, developed excellent form and vigor, began bearing when 8 to 10 years old and produced excellent kernels with good cracking characteristics.

The Thomas trees did fail to bear during some years, but these failures occurred in years of general walnut failure. The Thomas trees were superior in their resistance to *Nectria canker*, with only two trees developing this fungus disease which attacks black walnut trees in much of western West Virginia.

The Ten Eyck trees, despite vigorous growth, were the last to reach bearing age. But after bearing began, crops of good-quality nuts were produced regularly. Their vigorous growth made them fairly resistant to canker, and they appear to be second-best suited to planting in central West Virginia.

The Ohio variety was the first to bear nuts, and these nuts were thin-shelled with superior cracking qualities. But they grew slowly and became infected with canker. They

(continued on page 6)

COMPARISON OF FOUR SELECTED VARIETIES OF BLACK WALNUTS

Named Varieties of Black Walnut	Rate and Vigor of Growth	Age at First Bearing	Quality of Kernels	Cracking Qualities	Resistance to Canker	Regularity of Bearing
THOMAS	Excellent	8-10 years	Good	Good	Excellent	Fair
OHIO	Poor	7-8 years	Excellent	Excellent	Poor	Fair
STABLER	Poor	10-12 years	Good	Good	Poor	Good
TEN EYCK	Good	11-13 years	Good	Good	Good	Excellent

SILAGE: Corn or Grass-Legume?

for wintering beef cows

by E. A. Livesay, Animal Husbandman and C. J. Cunningham,
Associate Animal Husbandman

IN five years of comparative feeding trials, animal husbandmen at the West Virginia University Agricultural Experiment Station have found that legume-grass and corn silages are nearly equal—on a dry-matter basis—for wintering breeding cows. The trials were made to compare corn silage with grass-legume silage from the standpoint of the development of the cows and weight of the calves at weaning time.

In early December, 1944, 30 yearling bred heifers at the Reymann Memorial Experimental Farms were divided evenly into two groups. Group 1 was wintered for five years on a ration in which corn silage made up two-thirds of the dry matter, and Group 2 was wintered for the same period on a ration in which grass-legume silage made up two-thirds of the dry matter. The remaining one-third of the dry matter in the rations of both groups came from hays—usually legume-grass hays off the same field from which the grass-legume silage was made.

Both groups of cows were grazed on the same pasture. The type of silage fed during the winter was the only difference in the feed consumed by the two groups over the five-year period.

The amount of each type of silage fed varied slightly from year to year. Moisture contents of the silages varied slightly, and as the cows developed they were given larger amounts of silages and hay. Rations for Group 1 varied from 30 to 37 pounds of corn silage and from 6 to 8 pounds of hay, while Group 2 received from 20 to 33 pounds of grass-legume silage and 6 to 8 pounds of hay. The differences in silage weights are due to differences in dry-matter content—each group received equal amounts of dry matter in the silage and equal amounts of hay. During four out of the five winters the moisture content of the corn silage was much higher than for the grass-legume silage, and consequently more corn silage had to be fed.

The average winter gain for the corn silage group was 94.2 pounds and for the legume-grass silage group was 79.8 pounds.

The development of the cows during the five-year period was satisfactory and there was no practical difference between the two groups. Group 1, on corn silage, averaged 806.6 lbs. in weight at the beginning of the experiment, and 1163.7 lbs. at the finish, an average gain of 357.1 pounds. Group 2, on grass-legume silage, averaged 788.9 pounds at the beginning and 1143.2 lbs. at the finish, for an average gain of 354.3 lbs.

Table 1 gives the weights of the calves at weaning time, adjusted to 180 days of age. Five-year average weights of the steer calves are almost identical. The heifer calves from the grass-legume silage group averaged slightly heavier at birth and also at weaning. No satisfactory explanation can be given for this difference.

TABLE 1. WEIGHT OF CALVES* AT WEANING

LOT	FIRST YEAR		SECOND YEAR		THIRD YEAR		FOURTH YEAR		FIFTH YEAR		FIVE YEAR AV.	
	STEERS	HEIFERS	STEERS	HEIFERS	STEERS	HEIFERS	STEERS	HEIFERS	STEERS	HEIFERS	STEERS	HEIFERS
Corn Silage Group	353.66	343.52	414.90	312.77	380.11	376.10	409.30	363.23	358.00	346.52	388.36	348.54
Legume-grass Silage Group	374.78	344.83	390.70	395.50	377.76	367.63	397.88	378.53	384.82	357.30	385.67	370.00

*All calves were sired by the same bull.

Note: Corrected for age differences to 180 days.

Roughages For Wintering Cattle

suggestions to help you stretch feed supplies

by G. C. Anderson, Associate Animal Husbandman

THE inadequate supply of animal feeds in West Virginia is a problem to farmers having cattle to winter. Both grains and roughages are in short supply, and cattlemen the nation over are going to be affected by the problem.

By striving for the utmost in feeding efficiency, farmers may stretch their winter feed supply without injuring the potential productivity of their young animals or their breeding herds.

Research workers in animal husbandry at the West Virginia University Agricultural Experiment Station have made several suggestions which the farmer may find useful in stretching his winter feed supply. They are listed below.

- Estimate the roughage supply available on the farm, and the amount needed for winter feeding. Figure one and a half tons of hay per cow for the season—or about 20 lbs. per head per day.

- Cull the cow herd if necessary. Sell irregular breeders, poor producers, and aged animals. Often several inefficient animals may be culled from a cow herd without seriously affecting future income of the herd. These animals waste feed.

- Feed the better roughages to the cattle which profit most from them. In feeding better quality roughages, first consideration should

(Continued on page 6)

POULTRY MEAT - -

what homemakers think

by

Norman Nybrotten

Agricultural Economist

MORE THAN 2,000 homemakers gave views on chickens to station workers.

CONSUMER preference—and the factors which influence consumer preference—must always be foremost in the minds of those who produce and market food products on the competitive retail market.

The most successful producers are those who continually meet the preferences of the consumer. In order to provide maximum satisfaction to his customers, the producer must know what their preferences are and then market a product that will fulfill these preferences.

Since the average urban homemaker in West Virginia buys more than one hundred pounds of chicken each year, her preferences are of utmost importance to the poultry industry. For this reason, agricultural economists at the West Virginia University Agricultural Experiment Station have recorded and studied the "consumer preferences" of more than two thousand homemakers who buy chicken for use in their kitchens.

Each housewife was asked to describe the basis upon which she selects the chicken she buys. Twenty-nine per cent said they felt plumpness was most important, and 26 per cent selected their birds on the basis of skin color. For 15 per cent, cleanliness was the most important factor, and 13 per cent wanted a "good, fresh appearance."

Although 4 per cent of these homemakers rated a pliable breastbone as the number one criteria, none seemed to worry about crooked bones. This does not mean that housewives will tolerate crooked

bones in the chickens they buy, but the Station researchers do not feel that this condition is a problem as regards present-day consumer preferences.

The homemakers were asked if they had a preference for either frozen or fresh chicken. More than 60 per cent preferred fresh chicken, and less than 3 per cent stated a preference for the frozen product. Approximately one-third of the homemakers had no preference in regard to a frozen or a fresh bird.

Homemakers also were asked if they preferred, when buying an entire chicken, to select a bird and have the butcher cut it up, or would they purchase a bird that had been cut up and packaged prior to being placed on display? Less than 4 per cent were indifferent to this matter, and 55 per cent said they would rather select the whole bird and have it cut up. Whether or not housewives would pay a premium for this privilege was not determined in this study.

Any attempt to determine an ideal marketing weight for birds, on the basis of information obtained in this study, would be very difficult. Individual preferences among homemakers varied considerably because several factors had to be considered in arriving at a preferred weight.

Most important factor in determining the weight of bird desired was the method by which the housewife intended to cook the bird. Average figures indicate that for frying, homemakers desire a two and one-half pound bird; and for roasting, birds weighing over four pounds were wanted. The choice of the homemaker also was influenced by the number of people in her household.

Table 1 gives detailed information concerning preferences as to weights for different types of cooking and different sizes of households.

Nearly three-fourths of the homemakers stated that frying was their

(continued on page 6)

TABLE 1. AVERAGE CHICKEN WEIGHTS PREFERRED FOR FRYING, ROASTING, STEWING OR BROILING BY HOMEMAKERS IN HOUSEHOLDS OF DIFFERENT SIZES

NUMBER OF PEOPLE IN HOUSEHOLD	READY-TO-COOK CHICKEN WEIGHT PREFERRED FOR DIFFERENT WAYS OF COOKING			
	FRYING	ROASTING	STEWING	BROILING
1	2.3	4.1	3.3	1.8
2	2.5	4.1	3.7	2.3
3	2.5	4.2	3.7	2.4
4	2.6	4.3	3.9	2.3
5	2.7	4.4	4.0	2.5
6	2.7	4.4	4.2	3.4
7 and over	2.7	4.6	4.2	3.9
Average	2.5	4.2	3.8	2.5

ROUGHAGES

(continued from page 4)

be given to weanling calves and bred heifers, since they cannot utilize poor quality roughage as efficiently as mature cattle. The good quality roughage that is available for mature cattle should be parceled out through the winter so that they receive some each day.

- If it is necessary to purchase hay, contract the purchase early so as to get the best quality legume or legume and grass hay available. Poor hay costs just as much to truck in as good hay, and good hay goes farther for the amount of money invested.

- Make maximum use of low quality roughages such as corn stover, straws, and mature or weathered hays. Mature cattle will winter satisfactorily on these feeds if they are properly supplemented with protein and minerals. To supply these important nutrients which are lacking, each mature cow should get one and a half pounds of a good protein supplement daily. Soybean or cotton seed cake is recommended. The meals may be fed if silage is available, but they are difficult and waste-

ful to feed with dry roughages. If commercial protein supplements are to be used, purchase a cubed or pelleted mixture which contains at least 32 per cent protein. For cows with calf, the supplement should be fortified with vitamin A, or each cow should be fed at least 2 pounds of leafy legume hay each day in order to supply enough of this vitamin so important in reproduction. If enough good quality legume hay is available—8 to 10 pounds per cow per day—the protein supplement can be reduced to one pound per head per day.

Some livestock men will find it necessary to winter growing cattle on low quality roughages. The protein supplements listed above should be increased at least one-half pound per head per day for growing cattle. Remember that bred heifers or calves should be fed enough to hold their weight or gain about fifty pounds during the wintering period.

Allow cattle free access to a good mineral mixture, such as one of the following: steamed bone meal mixed equally with salt, or di-calcium phosphate mixed equally with trace-mineralized salt.

These protein and mineral supplements make it possible for cattle to make efficient use of low quality roughages.

Don't forget molasses. Cattle will do a better job of cleaning up low quality roughages if it is sprinkled with a 50-50 mixture of molasses and water. Molasses is at present a very cheap source of energy and its use will not only increase the palatability of roughages but will also supply needed energy.

- Spray or dust all cattle with a good insecticide to control lice, mange, and grubs. Lousy, mangy, and grubby cattle winter poorly, and will not use feed efficiently. Use benzene hexachloride or lindane for lice and mange control, rotenone for grubs. And be on the lookout for foot rot and other livestock ailments. Healthy cattle require the least amount of feed.

At best, wintering a herd of cattle in West Virginia is going to be a tough job this year. By following these suggestions, livestock men may be able to stretch their roughage supplies and reduce hazards to livestock health and production that accompany short and unbalanced rations.

POULTRY MEAT

(continued from page 5)

favorite way of preparing chicken. Roasting was favored by about 8 per cent, stewing by about 6.5 per cent.

Figure 1 gives the weight preference of housewives who buy chickens for frying.

PERCENTAGES OF HOMEMAkers PREFERRING FRYERS OF DIFFERENT READY-TO-COOK WEIGHTS

WALNUTS

(continued from page 3)

were removed from the plantation to protect the other trees.

The Stabler made the poorest showing of the four. Although kernel quality was satisfactory and cracking fairly easy, the trees grew slowly and were late in bearing. They failed to set crops regularly, and frequently produced no crops when the other trees were bearing. These trees, too, were removed before the twenty years had passed because of canker infection.

The chart on page 3 summarizes the growth and production characteristics of the four varieties tested in the Upshur County plantation.

Commercial cracking plants possess data which show kernel weight of selected variety nuts to be 20 to 30 per cent greater than kernels from run-of-woods nuts. Kernels from selected varieties mean more money on the cash market.

Since black walnuts do not come true to seed, it is practically impossible to secure seedlings of uniform high quality from nuts. But any grower who can graft, bud, or top-work can introduce scion wood*

(continued on page 7)

Magnesium in West Virginia Soils

by G. G. Pohlman and W. R. Ross

MAGNESIUM deficiency is not common in West Virginia soils. This element, which is essential for plant growth, usually exists in sufficient quantities to supply plant needs.

Chemical analysis of rocks and soils in the State show that the magnesium content of these materials is comparatively low. So it is possible, with more intensive farming, for magnesium deficiency to become a problem. Plants do not require large amounts of magnesium, but it is essential to their proper growth and development.

In order to determine specifically the magnesium content of some common West Virginia soils, agronomists at the West Virginia University Agricultural Experiment Station have collected and analyzed samples of 40 surface soils. These soils were collected from 12 counties, and represent 26 soil series.

Samples Selected

Care was taken to choose samples from areas where no commercial fertilizer had been applied. However, some of the soils tested had been limed, and it may be that the limestone contained some magnesium.

The researchers found that exchangeable magnesium, which is the magnesium that is available to plants, was low or very low in over half of the soils tested. Eighteen samples tested low, with between 100 to 200 lbs. available magnesium per acre; and 8 samples tested very low, with less than 100 lbs. per acre. On the other hand, 7 soil samples

tested medium with 200 to 300 lbs. available magnesium per acre, and the remaining 7 showed over 300 lbs. per acre. Although these figures are not conclusive due to the small number of samples studied, the trend (more than one half of the samples low or very low) may be worth noting.

Influencing Factors

In reviewing the factors that may have influenced the available magnesium content of the various soil samples, the Station workers noted that soil acidity seemed closely related to magnesium availability. Table 1 shows the pH of the soil samples and its relationship to magnesium content.

The soils that were most acid contained the least available magnesium. The 26 low or very low samples all were of pH less than 5.0. These samples were taken from land that had been neither limed or fertilized, and are somewhat indicative of the exchangeable magnesium content of West Virginia shale and sandstone soils.

The sample showing a pH of above 5.0 was from soils that had

probably been limed. Most of the agricultural limestones used in West Virginia contain some magnesium, and may be partly responsible for the increased content of the soils with higher pH.

Parent Material Important

Parent material seemed to have some influence on the amount of exchangeable magnesium. Two sandstone soils, Clymer and Lehigh, were generally lower in magnesium content than soils derived from finer materials. In general, samples taken from terrace soils tested low in magnesium.

From the results of this study, it appears that magnesium deficiency may not be expected commonly in West Virginia soils that are limed to pH values optimum for common field crops. It may appear in very acid soils, or in soils limed with agricultural limestone that is low in magnesium.

G. G. POHLMAN is head of Department of Agronomy and Genetics and Agronomist. WILLIAM ROBERT ROSS was a graduate assistant in agronomy at West Virginia University and is now with the Soils Department, University of Florida.

TABLE 1. MAGNESIUM CONTENT IN RELATION TO SOIL ACIDITY

pH	NO. SAMPLES HAVING EXCHANGEABLE MAGNESIUM CONTENTS				
	0-100*	100-200*	200-300*	300-400*	400-500*
3.90-4.95	8	10	2		
5.0-5.95		6	4	3	1
6.0-6.95		2	1	2	1

*Pounds per acre.

WALNUTS

(continued from page 6)

from superior varieties onto native walnut root stock. High quality trees are available from commercial nurseries.

Higher yields, improved kernel quality, more disease resistance, and a superior tree in general indicate the value of selected varieties in increasing the profit of the black walnut industry in West Virginia.

Editor's Note: Scion wood is taken from the growing tips of limbs of the desired tree. Normally it will be about lead-pencil size. This wood carries the buds which will

grow into superior walnut-producing limbs.

Scion wood may be introduced onto root stock at ground level, or onto branches in the tree top. Ordinary grafting methods, familiar to orchardists, are used in either case.

Budding introduces only a single bud onto the root stock. This process is easier than grafting.

Budding, grafting, and top-working permit a walnut grower to grow tested varieties of nuts on old trees that are healthy and well established. Persons desiring more information about budding, grafting, and top-working may write to Director, Agricultural Experiment Station,

West Virginia University, for a copy of USDA Farmer's Bulletin 1567, entitled "Propagation of Trees and Shrubs."

Current Report No. 5

Some Aspects of Every-Other-Day Milk Delivery reports on the keeping qualities of bottled milk in homes that receive milk only every other day. Factors causing milk deterioration are discussed, and suggestions made for preventing such deterioration. Write for your copy to Director, Agricultural Experiment Station, West Virginia University.

SUCTION HOSE takes water from stream or farm pond.

WATER

... can mean survival for thirsty plants in a hot dry summer like the last. The effects of this drouth, in terms of feed for livestock, will be felt all winter long.

Prime requirement for an irrigation system is plenty of water—usually obtained from a flowing stream or farm pond. Pumping units are usually centrifugal pumps powered by gasoline engines or electric motors. Light-weight aluminum pipe is the best way to get water to the field.

Shown below are test plots of a bluegrass-clover forage mixture growing at the Reymann Memorial Experimental Farms. The bluegrass and clover have disappeared completely from the non-irrigated plot.

PUMP UNIT pushes water through sprinklers.

NON-IRRIGATED

IRRIGATED

IRRIGATION can mean life for legumes and grasses.

SPRINKLER IRRIGATION is usually the best way to water thirsty crops on rolling West Virginia farm land.

Sprinklers in action at the Reymann Memorial Experimental Farms at Wardensville - July '53

Science

SERVES YOUR FARM

Bulletin 363, Part 2

Winter

December 1953

WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION

Science

SERVES YOUR FARM

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

IN THIS ISSUE

ON THE CALENDAR	2
PERSONNEL CHANGES	2
PORTABLE STONE CRUSHER	3
POTASSIUM NEEDS OF SOILS	4
DECIDUOUS HOLLY	5
GARDEN LILY RESEARCH	6
CONTROL OF OAK WILT IN 1953	7
HEMORRHAGIC CONDITION IN CHICKS	8
GROWING GOOD PULLETS	9
COW STALL STUDIES	10
BACTERIAL WILT OF SWEET CORN	11
LIST OF STATION PROJECTS	12
NEW PUBLICATIONS	13
STAFF OF STATION	14
FINANCIAL STATEMENT	15
NEW LILY VARIETIES	16

on the calendar . . .

FEBRUARY

- 11, 12-13—State Horticulture Society Meeting at Martinsburg, West Virginia
- 25—Meeting of the Upper Ohio Valley Horticulture Association at Wheeling, West Virginia.

MARCH

- 23—The West Virginia Potato Growers Association at Elkins, West Virginia.
- 25-26—State 4-H Ham & Bacon Show at Clarksburg, West Virginia.
- 29-30-31—Farm Electrification Council Meeting at Jackson's Mill, Weston, West Virginia.

APRIL

- 13-14-15—Livestock Round-up and Subject Matter Meeting at Jackson's Mill, Weston, West Virginia.

personnel changes

H. R. Varney, Director, accepted a position as Chief of Staff for the Senate Committee on Agriculture and Forestry, Washington, D.C., for the period Feb. 1, 1954 to Feb. 1, 1954.

A. H. VanLandingham, Assistant Director, was appointed Acting Director in Varney's absence. Robert H. Black, Associate Animal Husbandman, was appointed Acting Assistant Director for the same period.

The following staff members receive promotions since Nov. 1, 1952: O. J. Burg, Assistant Agronomist to Associate Agronomist; W. H. Childs, Associate Horticulturist to Horticulturist; John Luchok, Act. Editor to Editor; O. E. Schubert, Assistant Horticulturist to Associate Horticulturist; and E. H. Tryon, Associate Silviculturist to Silviculturist.

(continued on page 15)

on our cover

"Dark Princess," a new lily distinguished by its dark-purple spots and dark border, is one of nine new varieties developed cooperatively by the West Virginia University Agricultural Experiment Station and the Division of Ornamental Plant Crops and Diseases, USDA, Beltsville, Maryland. Other new lilies are shown on page 16.

The "Dark Princess," and the other new lilies released, passed their hardiness tests by growing under trial in practically all the geographic areas of the country. Now they are being released for propagation by commercial lily bulb growers.

So that West Virginia gardeners may see the "Dark Princess" and the other new lilies this summer, they have been planted in the gardens of the Huntington Park Service and at Oglebay Park, Wheeling. They also are being tested by the Kanawha Garden Council in Charleston.

The lily research program here at West Virginia University Agricultural Experiment Station, which includes a study of cultural practices as well as the breeding of new varieties, will benefit both the commercial bulb grower and people who like to grow lilies in their gardens. Varieties which florists may grow in greenhouses during the winter months are being developed.

PORTABLE STONE CRUSHER

by

A. D. Longhouse, Agricultural Engineer
and K. C. Westover, Horticulturist

THE PORTABLE STONE CRUSHER attached to tractor.

WHAT to do with field stones and large rocks that clutter up otherwise tillable fields is a problem facing many farmers. Loading the stone on wagons or skids and hauling them to fence rows merely adds to the problem later on when new farm practices may require larger fields and the subsequent removal of these stones. Changing agricultural practices invariably are hindered by field stone which interfere with modern machinery regardless of whether the crop is being planted, cultivated, or harvested. Many fields in West Virginia will remain untillable until something can be done with the stones they contain.

Field stone and large rocks protruding above the surface of the ground were a serious problem in rebuilding the Reedsville Sub-Experiment Station Farm. Breaking up the large boulders that protruded above ground was partially accomplished by dynamite and an air

hammer. The next problem was what to do with the stones. Just hauling them over to ditches or hedge rows did not seem to be the best answer, especially when this material, if broken up, could be used in building the many thousands of feet of road needed about the farm.

It was decided to construct a portable stone crusher which could be used on the farm during periods when work was scarce. This would help balance the farm labor requirements throughout the year, and at the same time make the stone littering the fields serve a useful purpose.

Purchase of a new crusher was economically out of the question. Therefore, it was decided to try to purchase a used crusher that could be mounted on a trailer and be powered by an engine used on some farm machinery. It was not difficult to locate a used stone crusher that would handle stone up to 7 by 12

inches in size. This is not a large machine as stone crushers are built, but it is ample for most farm operations. It is true that some of the stone must be broken up by hand with a sledge, but it is more economical to do this than pay the price of a larger crusher. Total cost of the portable crusher ready for use was about \$1,100.

Construction Details

The trailer for the stone crusher is a heavy-duty rig with steel wheels and I-beam bed pieces on which are mounted the engine and crusher. The over-all length of the trailer is 9 feet. The crusher is mounted on the rear end of the trailer with the throat toward the rear, so that stone may be placed in by workmen standing at the back. As the stones are crushed they fall through the throat just ahead of the rear axle on to a

(continued on page 13)

REMOVING CRUSHED STONE

LAYING THE ROADBED

POTASH FERTILIZER made a big difference in this clover. Fertilizer used in pot at left, none in pot at right.

Potassium Needs Of Different W. Va. Soils

by

H. W. Fairchild, C. B. Sperow, S. N. Little
N. M. Baughman, and G. G. Pohlman

A project to study the potassium status of several soil types in West Virginia was started by the West Virginia University Agricultural Experiment Station in the spring of 1951. Primary aims were:

To estimate the natural ability of several soils to supply potassium to growing plants.

To discover if and what soils would produce increased yield of Ladino clover upon the addition of potassium fertilizer.

To find out how long the effect of one application of potassium fertilizer lasted in soil.

Ten major soil types were selected for study. Bulk samples of each type were secured in different areas and brought to Morgantown for greenhouse study. They were dried, screened, lined to pH 6.5, and potted in quart cans. Phosphate fertilizer at the equivalent rate of 1,500 pounds per acre of 0-20-0 fertilizer was added to insure good phosphate nutrition of the plants. Three rates of potassium fertilization were established—zero, seventy-one, and 142 pounds per acre. In late March, 1951, the cans were seeded with inoculated Ladino clover seed. Six harvests of hay were taken over a period of more than a year. Each plant sample was air dried, weighed, and analyzed for potassium content.

Table 1 shows the performance of the ten soil types in supplying potas-

sium to Ladino clover plants at three levels of potassium nutrition.

Differences in Soils

Without potassium fertilization, Upshur clay supplied about eight times as much potassium as Frederick loam; emphasizing the great differences that exist in the natural fertility of West Virginia soils. The soils tested differed greatly in their ability to release potassium, which had been applied as fertilizer, to the Ladino clover plants. When potassium fertilizer was applied at the rate of 71 pounds per acre, plants growing on Tilsit loam recovered only 18 pounds of K_2O , while plants growing on Clymer loam recovered 63 pounds. The plants growing on Cavode clay loam

showed 98 pounds of K_2O recovered, indicating that they had used all of the 71 pounds applied, plus an additional 27 pounds from some other source in the soil.

Percentagewise, in the six harvests of Ladino clover, less potassium was recovered from soils fertilized at a rate of 141 pounds than at 71 pounds. This indicates greater efficiency of potassium assimilation from soil at the lower level of potassium fertilization.

Yield Response to Added Potassium

On nine out of ten soils, Ladino clover responded to 71 pounds of potassium fertilizer. This is about

(continued on page 13)

TABLE 1. POTASSIUM REMOVED (IN POUNDS OF K_2O PER ACRE) BY LADINO CLOVER PLANTS GROWING ON 10 WEST VIRGINIA SOILS

SOIL TYPE	SAMPLE A ¹	SAMPLE B ²		SAMPLE C ³	
	LSB. REMOVED	LSB. REMOVED	% RECOVERED	LSB. REMOVED	% RECOVERED
Frederick loam	87	120	46.5	139	36.6
Monongahela loam ..	95	156	85.9	168	51.4
Zoar loam	100	124	33.8	188	62.0
Cookport loam	111	152	57.7	214	72.5
Tilsit loam	113	131	25.3	160	33.1
Rayne loam	124	186	87.3	212	62.0
Clymer loam	132	195	88.7	206	52.1
Cavode clay loam ..	434	532	138.0*	451	12.0
Dekalb loam	563	614	71.8	595	22.5
Upshur clay	799	847	67.6	886	6.13

*Probably due to experimental error.

¹Sample A received no fertilizer treatment.

²Sample B received an application of 71 lbs. K_2O per acre.

³Sample C received an application of 141 lbs. K_2O per acre.

H. W. FAIRCHILD is Assistant Agronomist
C. B. SPEROW is Assistant in Agronomy.
S. N. LITTLE was formerly an Assistant
in Agronomy. N. M. BAUGHMAN is
Assistant Agronomist. G. G. POHLMAN
is Agronomist and Head of Agronomy and
Genetics.

Deciduous Holly

A New Ornamental Crop

by

O. M. Neal, Assistant Horticulturist

DECIDUOUS HOLLY prunings help make attractive table arrangement. Also used for other decorations.

WEST Virginia has several native plants which show much promise as a source of income to nurserymen and farmers, and for use in landscaping home grounds.

Ilex verticillata, the Virginia winterberry, is one of the most promising of these. This is a red-fruited native, deciduous holly, which holds its berries in a bright red condition from the time the leaves fall in October until sometime in December or January, depending on the weather. Although usually found growing in damp soil, its use is not limited to such sites, so that it can be used satisfactorily for landscaping purposes. However, its principal value and use at the present time is for the prunings used by florists in wreaths, table arrangements, and other decorations from October until after Christmas. The demand for these prunings is supplied at present from limited nursery plantings and collections in the wild. The supply often is inadequate, of poor quality, and sometimes nonexistent because the shrubs fail to set fruit. Quality is determined by the berry load, so desirable plants selected from the wild should set fruit heavily.

Since this plant had not been studied intensively, little was known about its culture, the reason for periodic crop failures, etc. However, it was known that hollies are dioecious (only male or only female flowers borne on the same plant) and that both male and female plants must be present if berries are to be produced. Because of its potential value to West Virginia nurserymen and farmers, horticulturists at the

West Virginia Agricultural Experiment Station decided to make a study of the species.

In the fall of 1946, a particularly heavy-fruited clone of this holly was observed growing in a swampy area of the Reedsville Experiment Farm. Nurserymen and florists agreed that they had never seen such heavy-fruited prunings. During the summer of 1947, a male plant was marked. On April 4, 1948, portions of both the male and female selections were dug, divided, and set in two short bigamous rows, four females to each male. The plants were set six feet apart in the rows with twelve feet between rows, on a site adjacent to the original plants. The space between rows has since been reduced to six feet by additional plantings.

Growth was poor during the first three years because it was not possible to give the plants proper care; however, growth has been excellent the last three years. The first crop was harvested this fall, and twelve pounds were obtained from eight plants. Yield varied between plants from one-fourth pound from the lowest yielding plant to six pounds from the highest yielding plant. There were two reasons for the different yield between plants. First, some plants were larger than others, and, second, half the plants were pruned heavily and half lightly to determine how much wood can be removed annually without decreasing succeeding crops. Prunings were sold for \$.30 per pound. It is to be expected that all plants will ultimately be larger than the heavily pruned plant that yielded six

pounds. If the annual yield should prove to be as low as two pounds per mature plant however, cultivation of Virginia winterberry would be commercially feasible, as there would be over 1,000 plants per acre.

Observation over this seven-year period has shed some light on the reason for crop failures in certain years. Three possible causes were considered: (1) Alternate bearing, as in some varieties of apple, like the York, in which such a heavy crop is borne one year that little food reserve can be stored for the next year, resulting in a very heavy crop one year and a very light crop the next. This reason appears logical, as deciduous holly bears a very heavy crop of berries. (2) Another explanation advanced is poor weather for pollinating insects when the plants are in flower. If it is cold and wet, insects will work the flowers little, and pollination will be poor. (3) The third explanation and perhaps the most common reason for any fruit crop failure is late spring frosts. During the seven years the plants have been under observation the crop failed only once. This would tend to rule out alternate bearing as an explanation, as four heavy crops were borne in succession. The plants flower in late June or early July when the weather is usually warm and fair, resulting in active insects and good pollination. This late flowering date, nearly two months after the peach is through, would tend to rule out frost injury as well. However, it was noted that the flowers are borne on current season's growth.

(continued on page 11)

Garden Lily Research in West Virginia

by S. L. Emsweller, O. M. Neal, and R. N. Stewart

THE lily breeding and production program now being conducted at the Reedsville Experiment Farm in Preston County is designed to develop improved varieties of garden lilies and to determine the best cultural practices for their production under West Virginia conditions. This work is cooperative between the West Virginia University Agricultural Experiment Station and the United States Department of Agriculture.

The hybridization work is carried out in the field at Reedsville and in the greenhouses of the Plant Industry Station of the United States Department of Agriculture at Beltsville, Maryland. The seedlings are grown for 1 or 2 years at Beltsville and then planted in field plots at Reedsville. Final selections are made at Reedsville, the selected plants are then propagated at Beltsville, and the planting stock is returned to Reedsville for increase in the field.

Results

Results so far attained indicate that good quality garden lily bulbs can be produced at the Reedsville farm at an elevation of about 1,700 feet. At present experiments are

being conducted on methods of propagation outdoors, on spacing of planting stock, and yields that may be expected from planting stock of various sizes.

Garden lilies are rapidly becoming of greater importance in gardens than formerly and there is an increasing demand for bulbs. It is believed that here is a crop that may eventually be of interest to West Virginia farmers located in the higher altitudes and with small acreages of level tillable land available. Lilies thrive best where days and nights are cool, and such conditions do exist in many areas of West Virginia.

Lilies Graded

Lilies are graded by the circumference of the bulb and bulbs of many varieties, 6 inches and over are regarded as salable. In a small-scale experiment conducted at Reedsville, three kinds of lilies were used. They were the Aurelian Hybrids, the Potomac Hybrids, and *Lilium speciosum rubrum*. The bulbs were graded for size. It was found that 3-inch bulbs of all these varieties produced a high percentage of salable sizes in 2 years.

Much work must still be done on

cultural practices before recommendations can be made. Many garden lilies are grown from seed and work is now under way at Reedsville to determine the optimum time for planting seed. Since named varieties do not come true from seed, however, they must be propagated asexually. This is best done by scaling the bulb. Lily bulbs are composed of segments called scales. These are attached to the base of the bulb much like the segments of a globe artichoke. When these scales are removed from a lily bulb and planted about 1 to 2 inches deep, they soon form small bulblets at the base. These bulblets develop into large bulbs that are identical with the bulb from which they came. The time required to grow salable bulbs from scales varies with varieties, and the proper time to scale and subsequent methods of handling under West Virginia conditions also remain to be worked out.

Future Work

There is little or no information available on fertilizers for lilies, and work along this line will be done at Reedsville as sufficient uniform stocks of lilies become available.

Since lilies are a relatively new crop much work is needed to determine optimum planting dates, spacing and depth of planting. As this information is acquired it will be made available through Experiment Station publications.

S. L. EMSWELLER is Head, Division of Ornamental-Plant Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Service, USDA, Beltsville, Maryland. O. M. NEAL is Assistant Horticulturist. R. N. STEWART is Geneticist, Division of Ornamental-Plant Crops and Diseases, Bureau of Plant Industry, and Agricultural Engineering, Agricultural Research Service, USDA, Beltsville, Maryland.

AURELIN HYBRID—This 16-inch bulb (circumference) differs from the onion and other bulbs in that its scales are not enclosed. The bulb must be kept moist until it is planted. Also, the roots should be kept alive until the bulb is planted.

Editor's Note: An excellent story of USDA research at the Beltsville Station was published in the August, 1953, issue of *National Geographic* magazine. Page 207 of this magazine shows a full-color photograph of Dr. Emsweller and several of the lilies with which he has been working. These lilies were developed from the same parent as the Potomac hybrids.

Black and white pictures of these parent plants, auratum and speciosum, may be seen on page 14 in the September, 1950 issue of *Science Serves Your Farm*.

Control of Oak Wilt Disease in 1953

by R. P. True and F. Waldo Craig

IN 1953 more than 100 new oak wilt trees were found in West Virginia. The disease has now been found in 26 counties, but the progress of the program and the comparatively small number of known diseased trees suggests that the idea of controlling oak wilt is a practical one.

The control of the oak wilt disease in West Virginia has been a shared responsibility. West Virginia University was chiefly responsible for learning basic research information on which a sound program of control could be established. The State Conservation Commission undertook to find the diseased trees within the areas where the formal survey was carried out. This they did with the use of an airplane and specially trained personnel who spotted and sampled the diseased trees and sent samples to the University for confirmation. To the State Department of Agriculture fell the responsibility for destroying or overseeing the proper safe utilization of the diseased trees found so that these trees would not serve as centers for further disease spread. The results of this joint endeavor as carried on in 1953 are reported here.

The chief research accomplishment of 1953 related to the control of the oak wilt disease was the simultaneous success of field experiments in West Virginia (2) and Iowa (5), which showed that various species of beetles belonging to the family *Nitidulidae* can carry the spores of the oak wilt fungus from sporulating fungus mats to wounds in healthy trees and so transmit the disease by overland spread.

If this should prove to be the only means of overland disease transmission, and it now seems likely to be the most important, it would indicate that diseased trees are not dangerous sources of inoculum for overland spread to distant trees, until and unless the fungus mats formed beneath the bark are opened to insects by the cracking of the bark by fungus pressure cushions. The importance and mode of operation of these cushions was first pointed out by West Virginia re-

searchers in 1952 (4). A control program, to be effective, must cause these trees to be properly utilized or destroyed before the bark cracks form, exposing the fragrant fungus mats below to which the nitidulid beetles are attracted.

More information is needed on how frequently diseased trees produce these mats, at what seasons and for how long they may serve as sources of inoculum. We think that under some weather conditions they may not form. They may form the same summer that the trees die, or during the following fall or spring. Some mats formed in the fall may persist during the winter. Curl (1) has found that in Illinois some fungus mats are exposed throughout the season, but that they are most abundant in spring.

Many West Virginia oak wilt trees have been found too far from other dead or diseased trees to have become infected through root graft transmission. A considerable number have had easily visible wounds to which nitidulid beetles might have been attracted. Wounds that bruise the bark and open an entrance into the moist cambium region between wood are especially attractive to these insects. The results to wounding studies in relation to insect transmission of disease in West Virginia (2) and elsewhere (3, 5) suggest strongly that wounds made during the spring months are more likely to become infected than those made at other seasons.

As these and other pertinent facts are established, they can be reflected in the nature of the control program which each year is based on the best information available at the time and may itself be a source of valu-

able information concerning the disease.

There were 106 oak wilt infected trees located in West Virginia during 1953 by the combined effort of the cooperating agencies and the assistance given by interested foresters and citizens. In addition, the survey located a few more oaks with oak wilt symptoms near diseased trees and inspected 75 locations where the disease had been found in 1951-52. In this latter case, only four new oak wilt trees were found.

The survey included airplane and ground observation. The plane covered all of Pendleton and Boone counties, the northern half of Logan County and a 10 per cent strip survey of the remainder of the State. The areas where oak wilt was known to occur in 1951-52 and the areas where the airplane spotted diseased trees in 1953 were scouted intensively from the ground. Many roads traveled by the personnel of the cooperating agencies were surveyed repeatedly during the summer.

Trees were processed by cutting and burning or safely utilizing the trunk and burning the stump and slash. The trunks used were sprayed with a solution of $\frac{3}{4}$ lbs. of benzene hexachloride (36 per cent gamma) in two gallons of kerosene.

There have been 211 oak wilt trees found since the survey started in 1951, 55 in 1952, and 106 in 1953. The more intensive survey of 1953 was surely responsible for the increase in the number of trees found, and the greater number of trees found should not be considered as an indication of a spread of the disease.

The 1953 oak wilt trees were con-
(continued on page 11)

TABLE 1. OAK WILT TREES PROCESSED IN WEST VIRGINIA IN 1953

TYPE OF OPERATION	NUMBER OF TREES		
	CONFIRMED OAK WILT	SUSPECTED AS HAVING OAK WILT	TOTAL
1953 oak wilt trees completely processed	51	22	73
1953 oak wilt trees cut and piled to be burned after the fire season	31	21	52
1951-52 oak wilt trees processed in 1953	46	6	52
Total trees processed in 1953 ..			177*

*Twenty-four 1953 oak wilt trees still remain standing, to be processed after fire season.

R. P. TRUE is Associate Plant Pathologist, F. WALDO CRAIG is Entomologist, West Virginia Department of Agriculture.

A Hemorrhagic Condition In Chicks

by J. K. Bletner, G. C. Anderson, C. E. Weakley, and J. H. Hare

HEMORRHAGES that caused high mortality in chicks were unexpectedly encountered during the course of nutritional studies at the West Virginia University Agricultural Experiment Station's chick nutrition laboratory two years ago. Since that time commercial broiler producers in widely separated areas have experienced losses due to hemorrhages in their chicks. The post mortem lesions in chicks from commercial flocks resemble closely those found in laboratory chicks, but other symptoms are different. The laboratory chicks are kept on wire floors. Most commercially grown broiler chicks are grown on solid floors and, thus, have access to their own droppings. This difference in the management of the flocks may account for some of the differences in the symptoms. However, results of experimental work conducted in the West Virginia laboratory may be of value in helping combat this condition in commercial flocks.

Many of the hemorrhages found in the laboratory chicks were large—particularly those found under the skin, between muscles, and in the body cavity. Smaller hemorrhages

were found in the covering of the brain, inside the intestines, and in various parts of the respiratory system. Hemorrhages in the brain and the respiratory system did not need to be large to be fatal.

In the study in which this condition was first observed the losses began when the chicks were about three weeks old. Total mortality was approximately 10 per cent during the next three weeks. In subsequent studies mortality from hemorrhage was noted as early as the end of the first week of the chick's life. Losses during the six-week experimental period ranged as high as 80 per cent in certain lots of chicks.

When the hemorrhages were first observed there was reason to believe they were caused by a deficiency of vitamin K. Support for this belief was obtained by determining the length of time required for the blood from experimental chicks to form clots. These chicks had much longer blood clotting times than chicks from the same hatch fed a more complex ration. A massive dose of vitamin K (10 milligrams of menadiolone) in corn oil was placed directly into the crops of the experimental chicks. Within 24 hours their blood clotting times were within the normal range. Since other investigators had used similar rations without

reporting any difficulty such as was noted here, it appeared that some of our feedstuffs might differ in quality from those used by other investigators.

The simplified basal ration used in these studies was composed of yellow corn meal, 60 per cent; solvent (hexane) extracted soybean oil meal, 35 per cent; steamed bone meal, 2.5 per cent; limestone flour, 1.5 per cent; iodized salt, 1 per cent; manganese sulfate, 0.03 per cent; fish liver oil concentrate, 0.2 per cent; crystalline riboflavin, 150 milligrams per 100 pounds of ration; and crystalline vitamin B₁₂, 750 micrograms per 100 pounds of ration. This ration supports good growth and feathering in battery-reared chicks to six weeks of age. It contains no feedstuffs that are considered to be rich in vitamin K and is somewhat low in fat (solvent extracted soybean oil meal usually contains less than 1 per cent fat).

Four different samples of solvent extracted soybean oil meal have been used. Two of the samples produced chicks with high blood clotting times and high mortality, while the other two produced chicks with high blood clotting times but with no mortality. A sample of soybean oil meal that caused mortality due to hemorrhage in one trial produced similar results when used in successive trials. This showed that the meal was a causative factor.

Whenever the chicks were fed the experimental ration supplemented with good sources of vitamin K, such as alfalfa meal, soybean oil expeller processed soybean oil meal, and either fresh or dried droppings, normal blood clotting times and no mortality resulted. The addition of menadiolone, a source of vitamin K, at recommended levels stopped mortality within 24 hours but did not consistently reduce blood clotting times to normal. Increasing the level of menadiolone further reduced blood clotting times.

Present-day broiler rations contain certain drugs to control coccidiosis and other drugs to stimulate growth. Some poultry authorities believe certain drugs or combinations of drugs are responsible for the appearance of the hemorrhages and the

J. K. BLETNER is Assistant Poultry Husbandman. G. C. ANDERSON is Associate Animal Husbandman. C. E. WEAKLEY is Associate Agricultural Biochemist. J. H. HARE was formerly Associate Agricultural Biochemist.

HEMORRHAGE IN BRAIN

HEMORRHAGE IN BREAST

(continued on page 11)

Growing Good Pullets

by J. K. Bletner, C. J. Cunningham and T. B. Clark

PULLET raising is not a complicated job, but a poultryman can easily be confused by the suggestions made by "the experts." The question of how a good, well-bred chick must be raised to insure that it will be capable of performing in the laying house to the full extent of its inherited ability is being debated wherever poultrymen gather. This is not a new question. It has been debated ever since commercial poultry raising came into being. Experiment stations have studied the problem for many years.

Poultrymen must review the general methods of growing pullets and make several decisions. First, should the pullets be grown in confinement such as in a large brooder house, or should they be grown on a range? Next, if the pullets are to be grown on a range, should they be full-fed or should a restricted feeding program be followed? Finally, if a restricted feeding program is followed, should they use a limited amount of feed or just reduce the ration to whole grains and minerals?

The West Virginia University Agricultural Experiment Station has grown pullets on all of the above listed methods and has studied variations of several of them. In this series of experiments all chicks were grown in a brooder house until they were at least eight to twelve weeks of age. They were then moved from the brooder house to the range or growing house. When the pullets were 26 to 28 weeks of age they were placed in laying pens. During the brooding period (the first eight to twelve weeks) and during the laying period, all lots in any one year were given the same feed and care. Records were kept on egg production, egg weight, body weight, feed consumed, mortality, and other factors. Twenty-seven different lots of pullets were studied during a six-year period.

Results of these experiments indicated that good pullets can be produced on any of the growing methods studied. Production figures for the year did not differ enough to indicate that any one method was superior to the others. The results

obtained for any one method were not consistent. The method that produced the best pullets in one year produced the poorest pullets in another year (Table I). Egg size varied with the length of time required for the lots to start laying. The earlier maturing lots usually laid the smaller eggs, whereas the late maturing lots laid the largest eggs. Restricting range grown pullets to about 76 per cent of the feed consumed by full-fed range lots or feeding only whole grains and oyster shells during the growing period delayed the start of egg production. Pullets fed in this way generally laid the largest eggs. Pullets confined to a house during the growing period were the first to come into production and laid the smallest eggs. Full-fed range pullets were usually intermediate in egg production.

Since pullets grown in confinement must be given all the feed they want, these lots consumed the most feed during the growing period. This usually was about 10 per cent more than full-fed range lots. The whole grain-oyster shell lots usually consumed about as much feed as full-fed

range lots but their feed cost less money than those fed a regular growing mash. Feed consumption in the laying pens appeared to be affected by many factors. The results were somewhat inconsistent. The method used for growing the pullets did not appear to have any effect on mature body weight or on mortality.

On the basis of these preliminary experiments it appears that a poultryman's choice of a method for growing pullets should depend on the following:

1. Type of pullet desired—early maturing with small eggs or later maturing with larger eggs.
2. Available buildings for confinement growing.
3. Available land for range—relatively free of predatory animals, uninviting to thieves, and so situated as to not create an excessive demand for labor.

More critical studies are being made of the more promising methods observed in the preliminary experiments.

TABLE I. PER CENT OF EGG PRODUCTION OF FLOCKS USED IN STATION STUDIES

Method used during growing period	Series I	Series II	Series III	Series IV	Series V ^{1,2}	Series VI ^{1,3}
Full-fed, range, mash and grain ..	51.46	52.53	44.63	55.35	54.56 ⁴	59.29 ⁴
Limited, 2 hours, 7 days per week ...	54.36	.....	.....	.....	.....	.....
Limited, 2 hours, 5 days per week ...	49.92	.....	.....	.....	.....	.....
Limited, morning feed only .....	.....	51.60	.....	.....	.....	.....
Limited, afternoon feed only .....	.....	50.11	.....	.....	.....	.....
Full-fed, 6 days per week .....	.....	.....	45.27	.....	.....	.....
Full-fed, all mash ...	.....	.....	47.23	.....	.....	.....
Full-fed, confined ...	.....	.....	49.87	56.99	50.77	48.35
Full-fed, reduced mash .....	.....	.....	.....	55.94	.....	.....
Full-fed, ground grain & minerals ..	.....	.....	.....	59.43	.....	.....
Full-fed, whole grains & minerals	.....	.....	.....	56.22	54.40 ⁵	55.14 ⁵

¹Average of two lots.

²All lots had Newcastle disease during January.

³Chicks were hatched 4 weeks earlier than confined lots.

⁴Chicks were banded 1 week earlier than confined lots.

⁵These chicks had an outbreak of epidemic tremors during the brooding period.

J. K. BLETNER (see page 8), C. J. CUNNINGHAM is Associate Animal Husbandman, T. B. CLARK is Associate Poultry Husbandman.

Cow Stall Studies

by

I. D. Porterfield
Associate Dairy Husbandman
and

A. D. Longhouse
Agricultural Engineer

EARLIER COW STALL studies revealed that it's easier for cows to rest in modern comfort stall. Cows kept in the comfort stall had fewer injuries, were cleaner, and produced more milk than those kept in tie chain stalls. In new studies the comfort stall is being compared with modified comfort stall and the stanchion stall.

WEST Virginia University Agricultural Engineers and Dairy Husbandmen are continuing to study various types of cow stalls at the University's Dairy Farm in Morgantown.

A four-year cow stall study, completed in 1951, revealed that cows kept in comfort stalls (Hoard-type) had fewer injuries, were cleaner, and produced more milk than those kept in tie chain stalls. The comfort stall is larger than the tie chain stall.

Two other types of stalls are now being compared with the comfort

stall. They are the modified comfort stall and the stanchion stall. The latter is familiar to most dairymen, but the modified comfort stall is relatively new. These stalls are the same width as the comfort stall (comfort stall measures 49 by 84 inches), however, they are one foot shorter in platform length.

Data measuring the performance of cows in these stalls are not complete. Information being obtained is similar to that taken in the original cow stall study. This includes information on production, injuries, amount of bedding used, time spent

lying down, and cleanliness. The Standard Equipment Company, Bel Aire, Md., is cooperating in the new study.

Dairymen visiting the University Dairy Farm are encouraged to see the stalls that are now being studied and seek the comments of Clark Taylor, Farm Superintendent, in regard to the performance of the cows in each stall.

A bulletin summarizing four years of research comparing the comfort with the tie chain stall is now being prepared. Results of new research will be reported when available.

A WORD ABOUT NEW PUBLICATIONS . . .

The Fluidized-Grain Conveyor—by A. D. Longhouse, Agricultural Engineer, and H. P. Simons, Chemical Engineer, West Virginia University Engineering Experiment Station, Bulletin 364, December, 1953. This bulletin contains results of research conducted in construction and operation of a fluidized-grain conveyor. Publication contains pictures and drawings showing the conveyor in detail. Bulletin includes sections on construction details, operation, application and uses of the conveyor, and power requirements.

Crossbreeding in the W.Va. Artificial Breeders Association—by J. T. Godfrey, former graduate assistant

in Dairy Husbandry; R. S. Dunbar, Jr., Associate Dairy Husbandman; and H. O. Henderson, Dairy Husbandman and Head of Dairy Husbandry, Circular 89, December, 1953. This Circular contains results of a study conducted jointly by the Department of Dairy Husbandry and the West Virginia Artificial Breeders Cooperative, Inc., to determine the amount of, and reasons for, crossbreeding being practiced in the dairy herds of the State and to obtain general information concerning the artificially bred herds in the State. Would be of interest to dairymen.

Growing Chestnuts from Seed—by

Roger W. Pease, Assistant Horticulturist, Circular 90, January, 1954. This Circular describes a method of growing chestnuts from seed that is suitable for the non-commercial grower. Describes in detail a method for fall planting of chestnuts. Contains sections on how to care for nuts prior to planting, treating nuts for worms, planting procedures, care of seedlings, and transplanting seedlings.

All Experiment Station publications are available to any resident of West Virginia. You may obtain copies by writing to the Director in Morgantown or from your county agricultural agent.

Bacterial Wilt of Sweet Corn

by Edward S. Elliott, Assistant Plant Pathologist

THE most destructive outbreak of bacterial wilt of sweet corn that has been observed in many years occurred in West Virginia and many other states in 1953. Bacterial wilt, also known as Stewart's disease, is most damaging to early varieties of sweet corn. Field corn is not ordinarily as susceptible to the disease.

The severity of the disease in any season is directly related to the coldness of the previous winter. A mild winter results in more bacterial wilt the following summer. A series of relatively mild winters allows the disease to become more destructive each year. The recent mild winters in this region allowed the disease to build up to epidemic proportions this past summer.

The bacteria which cause the disease are usually carried through the winter in the bodies of a tiny flea beetle which feeds on corn. Greater numbers of these adult flea beetles live through mild winters than through cold winters. They feed on germinating corn the following spring and in the process transfer

the bacteria which they have been carrying to the young plant. New generations of the beetles then carry the disease from plant to plant throughout the growing season.

Bacterial wilt is easily identified early in the season. The young corn is stunted and wilted by the disease. Long pale green or yellow streaks often appear on the leaves. As the plants grow, the disease is spread to healthy plants by the feeding insects. On the larger plants, bacterial wilt is not so easily identified; there it may cause only local narrow streaks. As the corn approaches maturity, the only indication of the infection may be many streaks of dead tissue in the leaves.

The use of sweet corn varieties resistant to the disease is the best means of controlling bacterial wilt. Resistant varieties will not eliminate the disease, but a much higher yield can be expected than if susceptible varieties are planted. Except for the past year the disease has not been a major problem since the 1930's, thus the testing of new resist-

ant varieties has probably not been as thorough as it should have been. Some of the recently introduced hybrid varieties are not wilt resistant. One of the first and still possibly the best resistant variety is Golden Cross Bantam. Other resistant varieties include Aristogold, Hoosier Gold, Marcross, Carmelcross, Iochief, and Ioana.

Most field corn varieties are relatively resistant. Infected plants rarely die before they tassel.

Seed of many non-resistant sweet corn varieties are on the market. If the winter is mild in this region, it would be profitable for anyone buying sweet corn seed in the spring to make sure that it is one of the good, resistant varieties, such as those suggested above.

The spread of the disease during the growing season can be controlled to some extent by making weekly applications of DDT or Methoxychlor to kill the corn flea beetles. Apply 1½ lbs. of actual insecticide per acre. Best method of control, however, is use of resistant varieties.

OAK WILT

(continued from page 7)

concentrated in three areas: the Eastern Panhandle, the southwestern counties of Kanawha, Boone, Mingo, Wayne, Lincoln, Cabell, and Putnam, and the counties of Marshall, Monongalia, Wetzel, Tyler, and Doddridge. Even within these areas, further concentration occurred. In Pendleton County, 52 oak wilt trees were located in the western half of the county and only three in the eastern half. There were no oak wilt trees found in the southeastern half of Boone County, but 15 were located in the northwestern half.

Literature Cited

1. Curl, E. A. "Studies on the Availability of Oak Wilt Inoculum in Illinois" (Abs.) *Phytopath* 43:469, 1953.
2. Dorsey, C. K., F. F. Jewell, J. C. Leach, and R. P. True, "Experimental Transmission of Oak Wilt by Four Species of Nitidulidae," *Plant Disease Reporter* 37:419-420, August 15, 1953.
3. Jeffrey, A. R., "The Relation of Oak Wounds Made During Spring Wood Formation to Transmission of Oak Wilt," *Plant Disease Reporter*, Nov. 15, 1953.
4. Leach, J. C., C. K. Dorsey, R. P. True, and H. L. Barnett, "Insects and the Oak Wilt Fungus," *Science Series Your Farm*, December 1952.

5. Norris, Dale M., "Insect Transmission of Oak Wilt in Iowa," *Plant Disease Reporter* 37:417-418, August 15, 1953.

HEMORRHAGIC CONDITION

(continued from page 8)

mortality. None of the drugs or combinations of the drugs studied have had any consistent effect on blood clotting times. Even combinations of extremely high levels of such drugs when included in the experimental ration containing 2 per cent alfalfa meal had no noticeable effect on clotting times.

Limited observations in West Virginia of commercially-grown broiler chicks having symptoms of a hemorrhagic condition have failed to reveal any chicks with prolonged blood clotting times. Workers in other states have sometimes obtained beneficial results from giving vitamin K to commercial flocks suffering from hemorrhages. Their results have not been consistent.

Thus, the exact relationship of the laboratory observations to the hemorrhagic conditions found in commercial chicks is not clear at this time. Laboratory studies of this problem are being continued.

DECIDUOUS HOLLY

(continued from page 5)

as with the grape, and that the buds are present many weeks before they open. In 1949, it was found that they are tender during this period. Heavy frosts on May 29 and June 9 that year killed the buds, and there was no fruit. It is believed that this is the reason for most crop failures.

Observations to date justify drawing several rather definite conclusions. These are as follows:

1. A 6 by 6-foot planting distance is satisfactory.
 2. Plantings containing both sexes on frost-free sites will seldom, if ever, experience a crop failure.
 3. A female plant and a male plant on the home grounds should provide enough prunings for decorating a home.
 4. This plant should be an excellent addition to the list of cash crops on relatively small acreages in West Virginia.
- Plantings can be obtained from many nurseries.

STONE CRUSHER

(continued from page 3)

3 by 3-foot plate, 1/8-inch thick, which provides a smooth surface for shoveling.

Power Requirements

The 7 by 12 crusher requires about 12 horsepower. It was found that the International Harvester Cub tractor engine with drive pulley as mounted on the International Harvester Baler is adequate for this job. It had to be mounted on the trailer with the drive pulley toward the front and the radiator next to the crusher. This gave a longer distance between centers for the belting so that tension adjustments could be made.

Alterations and Engine Control

It was necessary to make some changes in the throttle location on the cub engine because of the pulley drive and idler. The throttle was relocated on the opposite side of the engine. The linkage is simple, and the job of converting over was not difficult.

Mounting the idler pulley and its lever is a bigger problem, but standard International Harvester parts from the baler were used. This job is not too difficult, if the farmer has access to the usual farm shop tools and a welder.

Operating the Crusher

As seen in the accompanying photograph the crusher is hauled along the farm road by a tractor and the stones have been piled along the edge of the road prior to crushing. To operate the crusher at full capacity at least four or five men are necessary. One must feed the machine and one shovel away crushed rock from beneath the machine, while two or three are required to break up stone that are too big for the crusher. If all of the stones are small enough without breaking them up, then two men can feed while two are shoveling away. After the men had become acquainted with their duties it was possible to lay about eighty feet of road in six hours. This road averaged eight inches deep and twelve feet wide, or about thirty cubic yards.

Crusher Economical

Whether or not a farmer can justify building a stone crusher for his own use will depend upon his ability to find a second-hand stone crusher, the amount of stone he has to

crush, and the need for crushed stone for farm roads. The crusher has proved to be an economical investment on the Reedsville Experiment Station Farm. Stones are being cleared from fields that heretofore have never been cultivated, and are being broken up to form better roads. These operations utilize labor during the winter and fall months, when there is little or nothing else to do.

Plans for the portable crusher will soon be available from the Department of Agricultural Engineering, West Virginia University, Morgantown.

POTASSIUM NEEDS

(continued from page 4)

equal to the potassium in an application of 600 pounds of an 0-12-12 fertilizer, and certainly indicates that at least some soils in West Virginia require potash fertilizers.

Four of the soils gave lower yields of Ladino clover upon the addition of 142 pounds of potassium fertilizer than when no fertilizer was added. In all but one case, the highest rate of application of potassium fertilizer resulted in less yield than the smaller rate. No explanation can be given for this.

Table 2 shows the per cent increase in yield due to added potassium fertilizer.

TABLE 2. PER CENT INCREASES IN YIELD OF LADINO CLOVER DUE TO POTASSIUM FERTILIZATION (HARVEST 1 AND 2)

SOIL TYPE	POTASSIUM TREATMENT POUNDS K ₂ O PER ACRE	
	71 LBS.	142 LBS.
Zoar loam	-10	5
Clymer loam	5	-22
Dekalb loam	13	10
Cookport loam	20	71
Upshur clay	21	3
Monongahela loam	25	-1
Federick loam	28	-22
Cavode clay loam	37	0
Tiltsit loam	38	4
Rayne loam	40	7

Lasting Effect of Added Potassium

How long did the effect of one application of potassium fertilizer last? On most soils, the yield effects lasted for three cuttings. On Cookport loam, the soil most responsive to potassium fertilization, the increase in yield lasted through the sixth cutting. The effect of potassium fertilization in this experiment did not last beyond one cropping season.

new publications

Scientific Papers

459. J. M. Staley, R. P. True. The Formation of Perithecia of *Chalara quercina* in Nature in West Virginia. *Phytopathology*, Vol. 42: 691-693, December 1952.
460. J. H. Hare. Some Chemical Characteristics of West Virginia Black Walnuts. *Proceedings of the West Virginia Academy of Science*, Vol. 24, June 1953.
461. Georgia Amick, R. S. Marsh, C. F. Taylor, Walter D. Foster. Soil Applications of BHC Results in "Off-Flavor" in Canned Peaches. *American Fruit Grower*, Vol. 72: 17, September 1952.
462. Norman Nybrotten. Consumer Choice and Research in Standards for Consumer Grades. *Journal of Farm Economics*, Vol. 35: no. 1, February 1953.
463. Maurice Brooks. Ferns Associated With Black Walnut Trees. *American Fern Journal*, Vol. 42: no. 4, 124-130, December 1952.
465. J. K. Bletner, T. B. Clark, C. E. Weakley, Jr., A. H. VanLandingham. The Effect of Sulfaquinoxaline in Different Ration Formulations on Growth and Feed Efficiency of Coccidia-Free Chicks. *Poultry Science*, Vol. 32: 733-739, July 1953.
466. H. L. Barnett, John M. Staley. Isolation of Compatibility Types of Endonidiophora fagacearum from Oak Wilt Trees Naturally and Artificially Inoculated. *Phytopathology*, Vol. 43: no. 6, 341-343, June 1953.
469. C. C. Anderson, J. H. Hare, J. K. Bletner, C. E. Weakley. A Hemorrhagic Condition in Chicks Fed Simplified Ration. *Poultry Science*, Vol. 33: 291-298, January 1954.
470. C. K. Dorsey, F. F. Jewell, J. G. Leach, R. P. True. Experimental Transmission of Oak Wilt by Four Species of Nitidulidae. *Plant Disease Reporter*, Vol. 37: no. 8, 419-420, August 1953.
471. E. H. Tryon, R. W. Pease. Shading Effects of Natural Canopies on Holly Characteristics. *Castanea*, Vol. 18: no. 2, September 1953.
472. V. G. Lilly, H. L. Barnett, B. G. Anderson. The Effects of Allithiamine on some Thiamine-Requiring Organisms. *Science*, Vol. 1: 548-549, November 1953.
479. Roger W. Pease. The Response of Rooted Cuttings of *Ilex Opaca* to Overhead Irrigation in a Lath House. West Virginia Agricultural Experiment Station, December 1953.

Bulletins

363. Part I. Annual Report of A. H. VanLandingham, Acting Director. *Science Serves Your Farm*, September 1953.
364. A. D. Longhouse and H. P. Simons. The Fluidized-Grain Conveyor. December 1953.

Circulars

89. J. T. Godfrey, R. S. Dunbar, Jr., and H. O. Henderson. Crossbreeding in the West Virginia Artificial Breeders Association. December 1953.

November 11, 1953

ADMINISTRATION

Irvin Stewart, LL.B., Ph.D., LL.D.,
President of the University
H. R. Varney, Ph.D., Director
(on leave Feb. 1, 1953 to Feb. 1, 1954)
A. H. VanLandingham, Ph.D.,
Acting Director
Robert H. Black, Ph.D.,
Acting Assistant Director

AGRONOMY & GENETICS

G. C. Pohlman, Ph.D., Agron.
N. M. Baughman, M.A., Asst. Agron.
V. L. Bolyard, B.S., Asst. in Agron.
D. R. Browning, M. A., Asst. Agron.
O. J. Burger, Ph.D., Assoc. Agron.
B. L. Coffindaffer, B.S., Grad. Asst.
Henry W. Fairchild, Ph. D., Asst. Agron.
Everett C. Fleisher, Jr., B.S., Grad. Asst.
S. L. Galpin, Ph.D., Hydrol.
William L. Haltiwanger, Ph.D., Asst. Agron.
Dale A. Ray, Ph.D., Asst. Geneticist
Charles B. Sperow, Jr., B.S., Asst. in Agron.
Collins Veatch, Ph.D., Assoc. Agron.

ANIMAL HUSBANDRY

E. A. Livesay, D.Sc., An. Husb.
G. C. Anderson, Ph.D., Assoc. An. Husb.
J. K. Blotner, M.S., Asst. Poult. Husb.
T. B. Clark, M.S., Assoc. Poult. Husb.
C. J. Cunningham, B.S., Assoc. An. Husb.
J. O. Heishman, D.V.S., Assoc. An. Path.
H. M. Hyre, M.S., Assoc. Poult. Husb.
Robert H. Ingram, Ph.D., Asst. An. Husb.
D. A. Munro, D.V.S., Asst. An. Path.
Norman O. Olson, D.V.S., An. Path.
J. A. Welch, Ph.D., Asst. An. Husb.

BIOCHEMISTRY (AGRICULTURAL)

W. R. Lewis, Ph.D., Biochem.
Lillie L. Chapman, M.A., Asst. Biochem.
Edmond R. Cole, B.S., Grad. Asst.
Damon C. Shelton, Ph.D., Assoc. Biochem.
William E. Nutter, B.S., Grad. Asst.
Orville L. Voth, M.S., Asst. Biochem.
C. E. Weakley, Jr., M.A.,
Assoc. Agr. Biochem.

DAIRY HUSBANDRY

H. O. Henderson, Ph.D., Dairy Husb.
R. A. Ackerman, M.S., Asst. Dairy Husb.
R. S. Dunbar, Jr., Ph.D., Assoc. Dairy Husb.
James E. Fike, M.S., Asst. in Dairy Husb.
I. D. Porterfield, M.S., Assoc. Dairy Husb.
S. J. Weese, M.A., Assoc. Dairy Husb.

ECONOMICS (AGRICULTURAL) AND RURAL SOCIOLOGY

W. W. Armentrout, Ph.D., Agr. Econ.
J. H. Clarke, M.S., Assoc. Agr. Econ.
Homer C. Evans, M.S., Asst. Agr. Econ.
W. S. Hutson, B.S., Asst. 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.
W. H. Dickerson, M.S., Assoc. Agr. Engr.
Roy E. Emerson, M.S., Asst. Agr. Engr.
J. T. Reid, M.S.A.E., Asst. in Agr. Engr.

FORESTRY

W. C. Percival, Ph.D., For.
John F. L. Bell, BSF, Asst. For.
Maurice Brooks, M.S., For.
J. B. Byers, BSF, Asst. For.
Kenneth L. Carvell, DF, For.
R. F. Dugan, M.F., Asst. For.
A. W. Goodspeed, M.F., For.

Norman D. Jackson, BSF, For. Supt.
Christian B. Koch, MSF, Asst. in For.
C. A. Myers, Jr., M.F., Asst. in For.
W. H. Reid, MSF, Assoc. For.
E. H. Tryon, Ph.D., Silviculturist

HOME ECONOMICS

Faith W. Chalmers, M.S., Asst. Nutritionist
Mildred Jean Davis, M.S., Asst. in Home Ec.
HORTICULTURE

R. S. Marsh, M.A., Hort.
D. C. Alderman, Ph.D., Assoc. Hort.
W. H. Childs, Ph.D., Hort.
A. P. Dye, M.S., Asst. Hort.
Carlton B. Lees, M.S., Asst. in Hort.
Mason E. Marvel, M.S., Asst. in Hort.
O. M. Neal, Jr., B.S., Asst. Hort.
Roger 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.
Robert E. Adams, Ph.D., Asst. Plant Path.
H. L. Barnett, Ph.D., Mycol.
William Black, Ph.D., Special Consultant
in Plant Pathology. (Dr. Black is from
Edinburg, Scotland.)
Foster L. Brown, Grad. Asst.
Maria H. Cartledge, A.B., Technician
C. K. Dorsey, Ph. D., Entom.
John J. Eichenmuller, M.S.,
Asst. in Plant Path.
Edward S. Elliott, Ph.D., Asst. Plant Path.
M. E. Gallegly, Jr., Ph.D., Asst. Plant Path.
Francis J. Gough, B.S., Grad. Asst.
Edwin Gould, B.S., Entom.
Frederick F. Jewell, M.S., Grad. Asst.
V. G. Lilly, Ph.D., Physiol.
C. R. Orton, Ph.D., Plant Path.
Robert Priston, B.S., Asst. in Plant Path.
David O. Quinn, A.B., Grad. Asst.
Gwendolyn Stewart, M.S., Asst. in Bact.
R. P. Tye, Ph.D., Assoc. Plant Path.
H. A. Wilson, Ph.D., Assoc. Bact.

MISCELLANEOUS
D. R. Creel, Photog.
Glenn D. Bengtson, B.S., Asst. Editor
Walter D. Foster, Ph.D.,
Assoc. Agr'l Statistician
John Luchok, B.S.J., 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)
The effect of water hardness on cleaners for dairy utensils (P 66)
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 trees (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)
Wood pins for mine roof support (S 102)
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 vacillans (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 ornamentals indigenous to W.Va. (S 96)
Propagation and selection of edible nut-bearing trees suitable to W.Va. (S 98)
Harvesting, handling, and packaging of peaches (S 100; coop. University Experiment Farm, Mt. Fruit Sales, Inc.)
Improvement of apple juice (P 61; coop. Agricultural Biochemistry)
Selection of nursery crops and propagation methods (RM 35)

Plant Pathology, Bacteriology, and Entomology

The relation of genetics and environmental factors to growth, physiology and reproduction of fungi (A 6, revised, 1952)

Financial Statement for the Year July 1, 1952, to June 30, 1953

CLASSIFICATION OF RECEIPTS AND DISBURSEMENTS	HATCH	ADAMS	PURNELL	BANK- HEAD JONES	BANKHEAD-JONES SEC. 9 RESEARCH & MARKETING			NON- FEDERAL FUNDS	TOTAL
					9b1-2	9b3	TITLE II		
RECEIPTS									
Received from the Treasurer of the U.S.	\$14,997.45	\$15,000.00	\$60,000.00	\$65,792.28	\$72,053.79	\$26,300.00	\$2,500.00	....	\$256,643.52
State appropriations									
Main station .....	....	....	....	....	....	....	....	144,730.00	144,730.00
Substations .....	....	....	....	....	....	....	....	55,350.00	55,350.00
Special .....	....	....	....	....	....	....	....	....	....
Special grants, etc. ....	....	....	....	....	....	....	....	11,300.00	11,300.00
Sales .....	....	....	....	....	....	....	....	223,664.60	223,664.60
Miscellaneous .....	....	....	....	....	....	....	....	370.00	370.00
Balances forward									
July 1, 1952	2.55	....	....	2.00	....	....	....	80,589.23	80,593.78
TOTAL RECEIPTS	\$15,000.00	\$15,000.00	\$60,000.00	\$65,794.28	\$72,053.79	\$26,300.00	\$2,500.00	\$16,003.83	\$772,651.90

DISBURSEMENTS									
Personal services	\$ 9,528.79	\$12,890.08	\$50,171.61	\$53,032.91	\$57,288.53	\$19,208.13	\$1,000.00	\$191,144.60	\$394,264.65
Travel	164.33	90.37	1,216.76	1,233.10	3,914.93	2,058.87	1,500.00	5,274.22	15,452.58
Transportation of things .....	....	....	....	6.30	....	....	....	1,161.14	1,167.44
Communication service .....	....	....	....	....	....	1.50	....	1,343.75	1,345.25
Rents and utility services	819.25	....	14.88	51.24	72.00	1.80	....	17,409.47	18,368.64
Printing and binding	2,714.01	....	....	3,525.73	253.74	569.43	....	2,375.50	9,438.41
Other contractual services ....	....	....	330.54	108.16	350.12	229.98	....	26,909.93	27,928.73
Supplies and materials	673.27	1,192.50	5,721.08	5,036.35	4,783.19	2,604.56	....	110,277.95	130,288.90
Equipment	1,100.35	827.05	2,545.13	2,800.49	5,391.28	1,623.11	....	34,014.20	48,301.61
Lands and structures (contr.) ..	....	....	....	....	....	....	....	....	....
TOTAL DISBURSEMENTS ..	\$15,000.00	\$15,000.00	\$60,000.00	\$65,794.28	\$72,053.79	\$26,297.38	\$2,500.00	\$89,910.76	646,556.21
REVERTED BALANCES						2.62		269.38	272.00
NON-REVERTED BALANCES AVAILABLE FOR 1953-54 ..								\$125,823.69	\$125,823.69

Anatomical and histological changes in diseased plants (A 10)
 Nutrition of fungi and bacteria with special 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 51; 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)

PERSONNEL CHANGES

(continued from page 2)

New appointments within our research staff since Nov. 1, 1952 include Robert E. Adams, Assistant Plant Pathologist; John F. L. Bell, Assistant Forester; William Black, Special Consultant in Plant Pathology (from Edinburgh, Scotland); Glenn D. Bengtson, Assistant Editor; Verlon L. Bolvard, Assistant in Genetics; Kenneth L. Carvell, Assistant Silviculturist; R. S. Dunbar, Jr., Associate Dairy Husbandman; John J. Eichennuller, Assistant in Plant Pathology; Edward S. Elliott, Assistant Plant Pathologist; Robert H. Ingram, Assistant Animal Husbandman; Norman D. Jackson, Forest Superintendent; C. R. Orton, Plant Pathologist (returned from leave of absence in Liberia); Dale A. Ray, Assistant Geneticist; Damon C. Shelton, Associate Biochemist; Gwendolyn Stewart,

Assistant in Bacteriology; and Orville L. Voth, Assistant Biochemist.

During this same period the following resigned: Genevieve C. Berg, Associate Plant Pathologist; Donald P. Brown, Assistant Agricultural Engineer; R. O. Gustafson, Associate Forester; J. H. Hare, Associate Biochemist; Donald G. Hebb, Forest Superintendent; V. K. Johnson, Assistant Animal Husbandman; C. W. Neal, Assistant in Genetics; Donald G. Rodeheaver, Assistant in Agricultural Engineering; and Mary Alice R. Sands, Assistant in Bacteriology.

DAIRY DAY, 1954

The Seventh Annual West Virginia University Dairy Day will be held at West Virginia University Dairy Farm, Morgantown, on June 30.

Each year, the WVU Dairy Day provides an opportunity for persons interested in dairying to view the latest developments in dairy research at the West Virginia University Agricultural Experiment Station.

NEW LILY VARIETIES

Lilies shown on this page were developed cooperatively by the West Virginia University Agricultural Experiment Station and the Division of Ornamental Plant Crops and Diseases, USDA, Beltsville, Maryland. In all, nine new varieties were developed. Baker and Adams are not shown here. Dark Princess is on our cover. At left is the Mountaineer variety.

Mountaineer variety plants range from 2 to 3 feet in height and bear dark-red outward-facing flowers that do not fade in full sunshine. The flowers are 3 to 4 inches in diameter and flat, the petals recurving slightly. The plants reproduce rapidly by means of both splitting of the mother bulb and numerous stem bulbets. The plants flower from early June to early July.

Descriptions of lilies on this page are based on plants growing in West Virginia and at Beltsville. Under other climatic conditions the plants may vary in height and time of bloom. It will probably be a year or so before these lilies will be generally available in large numbers.

CAVALIER—Plants range from $2\frac{1}{2}$ to $3\frac{1}{2}$ feet in height and bear upward-facing yellowish-orange flowers. Petals are spotted with dark-brown spots concentrated toward the base of the petals. Cavalier flowers are $3\frac{1}{2}$ to 4 inches in diameter and slightly recurved. The Cavalier variety is very floriferous and blooms from early June to late June.

SHASTA—Plants range from 5 to 6 feet in height and bear trumpet flowers that are white on the outer surface and yellow at the base of the inner surface of the petals. Flowers are about 6 inches long and $5\frac{1}{2}$ inches across the open trumpet. The plants are in bloom by July 15 to 25 and bear stem bulbils. Same parentage as Baker and Adams.

POTOMAC HYBRID—Plants grow to a height of 5 to 6 feet and bear spotted pink flowers 6 to 8 inches in diameter. The flowers face outward and the petals form a flat surface with their tips slightly recurved. These plants retain their foliage throughout the growing season even when grown in full sunshine. The plants bloom about July 20.

MEGA—Plants range from 2 to 3 feet in height and bear light-canary-yellow flowers that face almost outward at about a 30° angle from the horizontal. Flowers are 3 to $3\frac{1}{2}$ inches in diameter. Variety blooms from early to late June.

BRANDYWINE—Plants range from 2 to 3 feet in height and bear light-yellowish-orange outward facing flowers. Petals spotted with dark purple spots. Flowers are 3 to 4 inches in diameter. This variety flowers from early to late June.

Science

SERVES YOUR FARM

Bulletin 363, Part 4

Summer 1954

WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION

Science

SERVES YOUR FARM

Annual Report, Parts Published Quarterly
by
AGRICULTURAL EXPERIMENT STATION
West Virginia University
Morgantown, W. Va.
Director
H. R. VARNEY

Editor JOHN LUCHOK
Assistant Editor GLENN D. BENGTSON
Photographer DAVID R. CREEL

Publications Committee: O. J. BURGER, H. L. BARNETT, 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.

ANNUAL REPORT OF H. R. VARNEY, DIRECTOR WEST VIRGINIA
UNIVERSITY AGRICULTURAL EXPERIMENT STATION
FOR THE PERIOD 1953-1954

IN THIS ISSUE

NEW PUBLICATIONS	2
SARVICEBERRY—AN EDIBLE ORNAMENTAL	3
O. M. Neal	
GRASS AND LEGUME SILAGE FOR SHEEP	4
J. A. Welch, E. A. Livesay, W. R. Lewis	
GROWING AMERICAN HOLLY	5
Roger W. Pease	
NARRAGANSETT—BEST ALFALFA	6
O. J. Burger	
SULFAQUINOXALINE PREVENTATIVE MEDICATION	7
J. K. Bletner, T. B. Clark, N. O. Olson	

on the calendar . . .

AUGUST—

16-19—State Dairy Show, Jackson's Mill

SEPTEMBER—

6,7,8—Curriculum Workshop, Staff of Division of Home Economics, Morgantown
14—State Dairy Cattle Sales, Jackson's Mill
15—State Dairy Cattle Sales, Jackson's Mill

on our cover

Under this spreading elm on the West Virginia University Agricultural Experiment Station Animal Husbandry Farm are some of agriculture's most profitable animals . . . yet, in West Virginia, their numbers have declined in the last twenty years. Considering present market prices and values, there should be many more flocks of sheep throughout the State.

Realizing the value of sheep production and the important role it should play in West Virginia farming, the West Virginia Agricultural Experiment Station is conducting research on problems confronting the sheep raiser. One study compares the western ewe with the native ewe to determine which is best for producing market lambs and wool. Another study deals in selecting the breed of ram which will best service a western ewe for producing replacement ewes. A study of lambs compares the weight at birth and the age at market weight for the Corriedale, Southdown, and Hampshire breeds, as well as for lambs within each breed. In the nutrition of sheep, a study is under way to compare the value of grass-legume silage with hay as a winter roughage. (A report on this study—see page 4.)

Visitors to the Experiment Station farms frequently ask "How do you keep pastures so clean?" The answer is sheep . . . rotated regularly on the pastures, they do a good job of cleaning up weeds and waste plants that other livestock refuse.

new publications

Bulletins

- 363, Part 3. Annual Report of H. R. Varney, Director, Science Serves Your Farm, Spring, 1954.
- 365T. C. K. Dorsey and M. E. Gallegly. A General-Purpose Garden Pesticide. June 1954.
- 366T. H. A. Wilson. The Effect of Certain Pesticides on Nitrification in the Soil. June 1954.
- 367. Norman Nybroten. Pricing Medium and Large Eggs Relatively for Maximum Value. June 1954.
- 368. Mildred Jean Davis and Mary Lane Swartz. Farm and Home Business Center Studies. June 1954.

Circulars

- 91. A. D. Longhouse and I. D. Porterfield. Dairy Cows Need Larger Stalls. April 1954.
- 92. Roy Emerson, Mildred Jean Davis, and Mary Lane Swartz. An Adjustable-Height Table for the Laboratory or Home. June 1954.
- 93. Collins Veatch. Spring Oats Trials in West Virginia, 1949-1953. June 1954.
- 94. Homer C. Evans and W. S. Hutson. Consumers' Reaction to Tree-Ripe Peaches. June 1954.

Serviceberry

An Edible Ornamental

by O. M. Neal, Assistant Horticulturist

FARM families have been harvesting wild fruit, both for home use and market, since the country was settled. Many of these fruits, such as the gooseberry, currant, persimmon, raspberry, blackberry, plum, cherry, grape, strawberry, and apple were cultivated and improved in the Old World before or as the New World was being settled. Selected clones were given varietal names and these varieties were brought across the Atlantic. Some of these varieties failed completely, while others were successful; but most of the varieties of these fruits which are now cultivated are the result of years of careful selection and breeding of the European varieties to obtain plants adapted to the new conditions. In some cases species of the New World were combined with varieties of the Old to obtain the desired result.

Only two cultivated dessert fruits, which are of considerable commercial value in the United States at the present time (the cranberry and the blueberry), originated entirely from native species. These two crops are produced on land which was of little value for other crops, but which became extremely valuable following the development of the cranberry and blueberry industry. In the case of the blueberry this dates only from the 1930's when named varieties of the highbush

blueberry (which first resulted from controlled crosses) became available.

Ornamental and Dessert

A third American fruit which appears to have possibilities both as a dessert fruit for home plantings and as an ornamental is the serviceberry. It is also known in various parts of the country as serviceberry, juneberry, shadbush, sugarplum, saska-

toon, and to botanists by its generic name, *Amelanchier*. This close relative of the apple and pear was an ingredient of pemmican, the K-rations of the Indians. The white man has found them palatable out of hand, with sugar and cream, and in pie, as well as following canning and freezing.

Apparently, the prevalence, productivity, and absence of diseases of

(continued on page 4)

SERVICEBERRIES can be preserved for winter use by canning or freezing. This jar of fruit is six years old.

OLD SPECIMEN of the largest species of Serviceberry found in West Virginia. *Amelanchier arborea* (Mich. f.) Fern.

Grass and Legume Silage for Sheep

by J. A. Welch, E. A. Livesay, and W. R. Lewis

INCREASED emphasis on grassland farming in West Virginia means that more farmers are interested in making silage from forage crops. Grass silage is an excellent roughage for cattle, but there is very little experimental information on the value of hay crop silages for sheep.

Silage made from alfalfa and grass mixtures has been fed to the breeding ewe flock at the West Virginia University Animal Husbandry Farm for several years. Hays and silages made from alfalfa and grass mixtures have given excellent results when fed together, but until 1952 no experimental comparison had been made to determine the relative values of hay alone and both hay and silage for wintering ewes.

In the fall of 1952, and again in 1953, the flock of purebred ewes was divided into two lots as equally as possible on the basis of breed and age. When barn feeding began in December, one lot of ewes received alfalfa hay both morning and evening and the other lot was fed alfalfa hay in the morning and silage made from first-cutting alfalfa in the evening.

Both lots were fed all the hay or silage they would clean up readily and each lot received equal amounts of grain. Both groups of ewes had access to bluegrass pasture whenever the weather permitted.

The ewes were weighed three times during each trial; at the beginning of the experiment in December, just before lambing began in early February, and just prior to

the end of hay and silage feeding, about the first of April. Lambs were weighed at birth and at two-week intervals thereafter. Fleece weights were taken on the ewes at shearing.

During both years, the average daily consumption of hay by the ewes fed only hay was about three and one-third pounds. The ewes fed hay and silage consumed about one and two-thirds pounds of hay per day and about four and one-quarter pounds of silage per day. Although the ewes getting silage were fed all they would eat, they did not consume enough silage to give them a dry matter intake as high as the ewes fed only hay. The hay-fed ewes consumed on the average one-third pound more of dry matter per head per day than the ewes in the silage-fed group during 1952-1953. Dry matter intakes have not been computed for 1953-1954, but a similar relationship is anticipated.

Performance Judged

The performance of the ewes was judged by changes in ewe weights during late pregnancy and during early lactation, by birth weights of lambs, by growth of lambs until barn-feeding stopped, and by fleece weights of ewes. No appreciable difference was noted between the two groups of ewes in any of the above measurements in either year.

It should be pointed out that about half of the hay fed during 1953-1954 was excellent quality sec-

ond-cutting alfalfa; the remainder of the hay was fair to good quality second-cutting alfalfa-grass mixture. The silage in both years was made from first-cutting alfalfa-grass mixtures and consequently was made of coarser material than the hay. Next year it is planned to feed hay and silage made from comparable forage, cut at the same time.

Results

The results to date show that silage made from first-cutting alfalfa-grass mixture is a valuable feed for wintering the breeding ewe flock. The fact that equal performances were obtained in the two lots, although those getting silage were fed less dry matter, indicates a more complete consumption and utilization of forage materials when they are ensiled.

It is generally recommended that some hay be fed with silage to breeding ewes because of the bulkiness of silage. This may be as little as one pound per head daily. The silage may be fed either in the morning or evening or both times, but we believe that it is better to feed silage when the ewes have plenty of time to eat it and hence we feed it at the evening feeding. If large amounts of silage are to be fed, it is necessary to feed it twice daily.

J. A. WELCH is Assistant Animal Husbandman. E. A. LIVESAY is Animal Husbandman and Head of Animal Husbandry. W. R. LEWIS is Agricultural Biochemist and Head of Agricultural Biochemistry.

SARVICEBERRIES

(continued from page 3)

sarviceberry in West Virginia, which are serious in other areas, has led former and present horticulturists at the West Virginia Agricultural Experiment Station to consider the sarviceberry worthy of evaluation and possible improvement as a fruiting ornamental. One of the six species which occur naturally in the State is found only in a few areas at high elevations, but the other five are numerous and wide spread.

The sarviceberry is striking in late April when covered by white flowers (about two weeks before the dog-

wood) and again as the fruit ripens during June. Some species have large flowers and small fruit, others small flowers and large fruit. Berry flavor varies from insipid to rich, and growth habit from long-lived shrubs two feet high to long-lived trees of forty feet. Some kinds will produce abundantly every year, both on frosty, poorly-drained bottomland and on dry hillsides. All species appear to be perfectly winter hardy, and their cultivation in the northern great plains has been encouraged for that reason. Their resistance to spring frosts is even more unusual than their winter hardiness. Plants

on extremely frosty sites in West Virginia have not missed a crop in fifteen years. Selections set at the Reedsville Experiment Farm in 1948 have borne annually, including 1949 when there were heavy frosts on May 28 and June 8, more than a month after flowering.

These excellent characteristics are desirable in an ornamental plant, but a fruit to be successful must also be productive. Although numerous reports of heavy yields of large fruits circulate every summer, no accurate records were available.

To obtain this information, two

(continued on page 8)

Growing American Holly for Ornamental Planting

by Roger W. Pease, Assistant Horticulturist

THE BROOKS HOLLY near French Creek.

THE demand for American holly for ornamental planting is increasing. There is also an increasing insistence that the trees produce berries while they are very young and that they grow rapidly in a compact, symmetrical form without the necessity of pruning.

Rooted cuttings from berry-forming or female holly trees produce berries early—often in their first year—provided they are in the presence of a non-berry-forming or male tree. They also inherit from the parent tree its natural growth habits. In May, 1953, the West Virginia University Agricultural Experiment Station, in cooperation with the National Conservation Nursery at Beltsville, Maryland, published Circular 87 describing a method for rooting softwood cuttings of American holly.*

Cuttings Studied

Rooting holly cuttings, however, is only one step in producing young trees of the type desired. Few female holly trees produce rooted cuttings which grow into upright, compact young trees without pruning. During the past three years the Station has conducted trials with two objectives: to select a female tree whose rooted cuttings have the growth habits desired, and to discover a method for growing the newly-rooted cuttings which will produce eighteen-inch plants in eighteen months.

The behavior of rooted cuttings from twenty-six female trees has been observed over a period of years, and the two producing the most upright and rapidly-growing plants were selected for trial. One, the Brooks holly, is a vigorous old tree growing near French Creek. The other was selected in Monongalia County and for convenience was called the Ridgeway. Twenty-five cuttings from each tree were taken on August 15, 1952, and treated as outlined in Circular 87. Ridgeway rooted 100 per cent and Brooks 96 per cent.

ROOTED CUTTING from Brooks holly 13 months after transplanting, showing spindly form and few lateral shoots.

In April, 1953, equal numbers of the rooted cuttings from Ridgeway and Brooks were transplanted to a shaded, well-drained cold frame equipped with overhead irrigation and to a cultivated plot without irrigation. The plants in the cultivated plot were mulched with four inches of peat moss but not watered during the growing season. In both cases about two pounds of a 5-10-10 fertilizer were added to every one hundred square feet of surface. In the unwatered block a supplementary application of cottonseed meal

(continued on page 7)

ROOTED CUTTING from Ridgeway Holly 13 months after transplanting. Has compact form, many lateral shoots.

*Can be obtained upon written request to Director, West Virginia University Agricultural Experiment Station, Morgantown, or from county agricultural agents.

NARRAGANSETT—

Best Alfalfa for West Virginia Farmers

by O. J. Burger, Associate Agronomist

ALFAFA is recognized as the most nearly perfect forage. As hay, it is unsurpassed for livestock feeding. As pasture, it has a high-carrying capacity and produces large gains when properly managed.

It makes excellent silage if properly handled, and makes good feed when chipped or ground into meal. Its nutritive value is high, since it is an excellent source of carbohydrates, minerals, and vitamins.

When adequately fertilized with minerals, it is a soil-improvement crop and one of the most vigorous and economical fixers of atmospheric nitrogen.

Alfalfa plays an important part in United States agriculture, where pasture and hay furnish more than half the feed consumed by livestock. And it is highly important in West Virginia, where production of animal products is accomplished with the grassland system of farming. In the last forty years the alfalfa acreage in West Virginia has increased from 1,000 to 72,000 acres. Yield per acre, however, has not changed very much. Yield per acre can be increased if superior fertility and harvesting practices are used. Even so, good practices cannot overcome the effect of using poorly adapted varieties.

To determine the performance of the various alfalfas, the improved varieties were seeded in uniform nurseries at two West Virginia Experiment Station farms. They were evaluated as to yielding ability, disease and insect resistance, and growth characteristics.

Alfalfa varieties were seeded at Morgantown in April, 1950, and at Point Pleasant in July, 1951. Only named-varieties common to both tests will be discussed here.

Varieties

Many varieties of alfalfa are available in quantity. Varieties studied are as follows:

Buffalo—A selection from an old line of Kansas Common. It shows a higher stand survival than Kansas Common in the northern alfalfa areas of the United States. It recovers rapidly after cutting and is resistant to bacterial wilt.

Atlantic—A variegated alfalfa; that is, it is a result of a natural cross between purple and yellow-flowered species. It is a vigorous, high-yielding variety, adapted to Eastern states where bacterial wilt is not a serious factor. Atlantic was released by the New Jersey Agricultural Experiment Station.

Narragansett—A new variety of variegated alfalfa originated at the Rhode Island Agricultural Experiment Station. It is a vigorous and hardy hybrid that produces high yields. It is characterized by a spreading to upright growth habit and has a large, much-branched root system that resists heaving.

Williamsburg—A variety of common alfalfa developed at the Virginia Agricultural Experiment Station. It was developed from Kansas Common. It is resistant to Sclerotinia stem rot.

Grimm—A variegated alfalfa and is a descendant of the Grimm which

in 1857 was introduced into Minnesota from Boden, Germany, by Wendelin Grimm.

Yield

The greatest emphasis in evaluating the alfalfa varieties was placed on their forage production. All the varieties were harvested for maximum hay production. The yield performance of the varieties at Morgantown and Point Pleasant is shown in Tables 1 and 2.

At Morgantown, Narragansett and Williamsburg were outstanding with respect to productivity. Each acre yielded more than three tons of hay per year. Although Williamsburg appears to yield as well as Narragansett, the over-all performance of Narragansett makes it superior. Narragansett produces a finer type of forage and is more leaf-hopper resistant than Williamsburg. Narragansett would be expected to be more hardy since it is a variegated alfalfa, whereas Williamsburg is a common. More forage can be produced by growing these varieties with timothy or bromegrass. Both grasses are highly compatible with alfalfa.

At Point Pleasant yield data are available for only two years. The superiority of Narragansett is evident and quite remarkable. Although the yield of Williamsburg is only average and slightly less than Buffalo, it would still be preferred to Buffalo because of its breeding history.

The growth recovery of Williamsburg, Atlantic, and Narragansett varieties is shown in the accompanying photographs. It is evident that Williamsburg recovers more rapidly after cutting than does Narragansett, which in turn is superior to Atlantic in this respect. But, as mentioned earlier, the fineness of growth and resistance to leaf-hopper damage along with its superior har-

(continued on page 8)

Sulfaquinoxaline PREVENTATIVE MEDICATION—

Its Effect on the Subsequent Laying Performance of Pullets

by J. K. Bletner, T. B. Clark, and N. O. Olson

DRUGS suitable for use in preventing serious outbreaks of coccidiosis in chickens have been readily received and put to use by poultrymen. Such drugs when used according to recognized safe dosage levels will usually produce either a larger pullet or broiler. However, the producer of market or hatching eggs is most interested in the effect of drugs used during the growing period on egg production and mortality in the laying house. He is particularly hopeful that by preventing serious outbreaks of coccidiosis he will produce healthier, more productive pullets, but he is suspicious also of the possibility that a drug used during the growing period may have a detrimental effect that does not become apparent until after the chick has reached sexual maturity and is in the laying house.

Sulfaquinoxaline is one of the drugs that may be used to prevent outbreaks of coccidiosis in chicks. The effect of feeding preventative levels of this drug during the growing period on the laying house performance of pullets has been studied at the West Virginia University Agricultural Experiment Station.

Chicks Grouped

The study was begun using day-old White Leghorn chicks. They were grown on sawdust litter under electrically-heated brooders. During the first series of experiments the chicks were divided into eight groups. Four groups were fed a regular starter and growing ration to ten weeks of age. The other four were fed the same ration to two weeks of age, but for the next eight weeks their ration contained sulfaquinoxaline which was added at the rate of four ounces per ton of feed (0.0125%).

At about ten weeks of age the pullets were placed on a grass range where they remained until they were developed enough to go into the laying pens. After the tenth week no medication was used for coccidiosis and no attempt was made to keep the medicated pullets sepa-

rated from the non-medicated ones. This procedure was possible because the chicks were identified by wing band numbers. Egg production for each group was determined from trapnest records. Although this procedure made it impossible to obtain feed consumption data, it had the advantage of exposing both medicated and non-medicated pullets to the environmental conditions found in each laying house pen. Egg production was recorded over about a ten-month period.

The procedures used during the second series of experiments were the same as those used during the first series except that twelve pens of chicks were used.

Coccidiosis Appears

No major outbreaks of coccidiosis occurred during the first series of experiments. However, during the second series coccidiosis appeared in four of the six non-medicated pens. These four pens were treated with control levels of sulfaquinoxaline for two days, placed on non-medicated feed for three days, and again treated for two days. This was sufficient to control the outbreaks.

The results of the two series of experiments are summarized in Table

1. At ten weeks of age the pullets that were fed the medicated feed had a slightly heavier average body weight than those fed non-medicated feed. This difference is assumed to be due to the effect of the drug in controlling light infections of coccidiosis. The mature body weights were equal, indicating that the ten-week weight difference was unimportant in egg-producing flocks. Egg production and laying-house mortality were not affected. The large difference in egg production between the two years was due to an outbreak of Newcastle disease during the laying period of the second series of experiments.

These data indicate that under the conditions of these experiments the use of sulfaquinoxaline to prevent coccidiosis during the growing period had no detrimental effect on the laying house performance of the pullets. Had a more severe coccidial infection been present during the growing period, the non-medicated pullets might have been affected and shown lower egg production with higher mortality. Since coccidiosis frequently causes severe losses in growing chicks, the use of either sulfaquinoxaline or some other recognized coccidiostatic drug is advisable.

TABLE 1. THE AVERAGE EGG PRODUCTION, BODY WEIGHT, AND MORTALITY OF MEDICATED AND NON-MEDICATED PULLETS

TREATMENT DURING GROWING PERIOD	NUMBER OF PULLETS HOUSED	NUMBER OF EGGS PER PULLET HOUSED	AVG. BODY WEIGHT		MORTALITY IN LAYING HOUSE
			10 WEEKS	MATURITY	
			pounds	pounds	per cent
None					
Series I	175	204	1.60	4.11	7.21
Series II	217	159	1.91	4.23	5.82
Average	—	182	1.76	4.17	6.52
Sulfaquinoxaline					
Series I	211	203	1.69	4.12	4.63
Series II	243	158	2.00	4.24	9.38
Average	—	181	1.85	4.18	7.00

HOLLY

(continued from page 5)

was spread over the peat moss. As reported in *Scientific Paper 479* of the Agricultural Experiment Station, the irrigated cuttings of Ridgeway showed no mortality and a median height of 14.5 inches on September 29, and the irrigated cuttings

of Brooks showed no mortality and a median height of 13.5 inches. One Ridgeway plant grown without irrigation died, and the average height of those remaining was 5.0 inches. Without irrigation two of the Brooks plants died, and the average height of those remaining was 4.5 inches.

(continued on page 8)

J. K. BLETNER is Assistant Poultry Husbandman. T. B. CLARK is Associate Poultry Husbandman. N. O. OLSON is Animal Pathologist.

NARRAGANSETT

(continued from page 6)

diness gives Narragansett alfalfa a decided edge in over-all performance. In recent tests conducted throughout the Northeast Region, Narragansett proved to be superior to the other varieties tested.

Varieties Available

All of these varieties will be available to farmers in West Virginia for the 1955 planting season. Farmers should plan their seed needs early, and then have their seed dealer get them the variety they want. Seed should be ordered by variety name. At the present time, Narragansett is the best variety for most areas of

West Virginia. Alfalfa researchers at the West Virginia University Agricultural Experiment Station are constantly testing new varieties. If a certain variety should prove itself superior, it will be recommended through the Agricultural Extension Service.

Good alfalfa hay is always in demand. Yields need to be increased and they can be increased. Some of the essentials for successful alfalfa growing are (1) good drainage, (2) fertile soil, (3) adequate applications of lime, phosphorus and potash at the proper time, (4) correction of boron deficiencies, and (5) use of high-quality certified seed of the Narragansett, Williamsburg, Atlantic, or other adapted varieties.

propagation and to determine how long an improvement program might take. The first fruit was harvested in 1952, two years after seeding and several years sooner than had been expected. A number of these seedlings were selected for further observation, and the others were distributed in the fall of 1953 to 4-H Club members for trial in home plantings.

Horticulturists at the West Virginia University Agricultural Experiment Station feel that if the desirable growth, flowering, and fruiting habits of the different species can be combined by careful selection and breeding, varieties will be obtained which will be welcome, both as ornamentals and fruit plants.

TABLE 1. YIELD IN TONS DRY MATTER PER ACRE (ADJUSTED TO 12 PER CENT MOISTURE) OF SOME VARIETIES OF ALFALFA. AVERAGE OF FOUR REPLICATIONS (MORGANTOWN—THREE YEARS)

VARIETIES	1951 3-CUTS TONS/ACRE	1952 2-CUTS TONS/ACRE	1953 3-CUTS TONS/ACRE	AVERAGE 3-YEARS TONS/ACRE
Buffalo	2.82	2.86	2.49	2.72
Atlantic	2.98	3.46	2.87	3.10
Narragansett	3.69	3.86	3.03	3.52
Williamsburg	3.74	3.80	3.17	3.57
Grimm	3.29	3.35	2.77	3.14
Average	3.30	3.47	2.87	3.21

TABLE 2. YIELD IN TONS DRY MATTER PER ACRE (ADJUSTED TO 12 PER CENT MOISTURE) OF SOME VARIETIES OF ALFALFA. FIGURES ARE AVERAGES OF FOUR REPLICATIONS (POINT PLEASANT—TWO YEARS)

VARIETIES	1952 2-CUTS TONS/ACRE	1953 3-CUTS TONS/ACRE	AVERAGE TONS/ACRE
Buffalo	2.26	3.40	2.83
Atlantic	2.00	2.80	2.40
Narragansett	2.64	4.14	3.39
Williamsburg	2.17	3.34	2.80
Grimm	2.03	3.26	2.64
Average	2.22	3.41	2.82

SARVICEBERRIES

(continued from page 4)

plants were selected in the spring of 1950 and enclosed in one-inch mesh chicken wire. Both were in home plantings near the Reedsville Experiment Farm. One plant had been obtained from a nursery and planted on an old road fill. The other had presumably been selected from the wild, but had been owned by a family many years. Both were propagated from suckers. Neither had been pruned, fertilized, or given any other care after setting 8-15 years earlier. The larger plant yielded 19¾ quarts weighing 28 pounds in four pickings. The berries in the first picking were largest,

requiring only 143 to fill a cup. The cup count of the second picking was 148, the third 174, and the fourth 201. The berries were round, the largest having a diameter of 18/32 inch. The smaller bush produced 11¼ quarts weighing 16.8 pound in three pickings. The berries of this clone were smaller, the cup count rising from 178 to 212, to 229, and the maximum diameter being only 1½ inch. The yield of both plants was considerably higher than the owners estimated, and both compare favorably with other small-fruit production.

Seeds from this 1950 harvest were planted to determine the difficulties which might be encountered in seed

HOLLY

(continued from page 7)

Results

These results indicate that rooted cuttings from both Brooks and Ridgeway, when transplanted in rich, light, well-drained soil on a shady site, can be expected to grow about a foot the first season if the soil is kept moist. However, all of the young plants were spindly and had few, if any, lateral shoots.

In April, 1954, the plants were set in the field, fertilized with two pounds of 5-10-10 fertilizer to one hundred square feet, and mulched with four inches of ground corn cobs. About one pound of ammonium sulphate to one hundred square feet was spread over the corn cob mulch. On May 20, 1954, the new lateral shoots rising directly from the trunk of each plant were counted. The Ridgeway plants averaged eleven shoots each, and the Brooks plants two and one-third shoots. A typical Brooks plant with few new lateral shoots and a ragged appearance and a Ridgeway plant with many new lateral shoots are shown in the accompanying photographs. The Ridgeway is developing a symmetrical, compact form. Each of the illustrated plants was eighteen inches tall. Because the Ridgeway plants are comparatively uniform in appearance and height, it can be expected that they all will be at least eighteen inches tall and densely foliated by October, 1954, eighteen months after transplanting.

The performance of the Ridgeway holly indicates that it may prove to be an unusually desirable female parent tree, and that the performance of its rooting cuttings should be observed more fully.