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Progressive Agriculture IN ARIZONA

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Should I Line That Irrigation Ditch?

(See Page 7.)

Arizona's 1951 Weather

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By H. V. Smith

A report of 1950's weather and agriculture appeared in this magazine a year ago. For editorial reasons the month of December was not included. Because the weather was so unusual during that month, its summary will be given here.

The mean temperature at the University of Arizona for December 1950 was 7.2° above normal while the state average was 5.9° above normal, the highest for the month since 1895.

Compilations from U. S. Weather Bureau reports reveal some interesting facts concerning Arizona's agriculture as affected by the 1951 weather. The table at the bottom of this page shows a comparison of the state's normal temperature and precipitation with the weather for 1951 as far as state values are available.

Ranges Were Poor

While the state precipitation through September is only about a quarter-inch below normal, monthly distribution has been poor. As a result, ranges for the most part have been poor. January and April storms gave temporary improvement to the ranges in March and April, but supplemental feeding was resorted to during most of the early part of the year.

Precipitation in August, 4.14 inches—the greatest precipitation for any month since July 1921—has restored the ranges to good condition in most parts of the state. The August rain, together with unusually good rains in October and November, should keep the ranges in good shape for the remainder of the year.

Reservoirs which had been critically short of water until the August storms, with the exception of the San Carlos, received appreciable quantities of water. The following increases were reported as a result of the storm: Agua Fria, 102,000 acre feet; Salt River System, 143,000 acre feet; Verde River System, 66,000 acre feet; and the San Carlos Reservoir, 8,000 acre feet. These amounts assure adequate water to finish out the present cropping season.

Some cotton replanting was necessary as a result of cool nights and rains during the middle and late spring months.

No Trends Shown

Precipitation records at the University of Arizona made since 1892 do not show any rhythmic or regularly occurring cycles. Several times during the last 59 years three or four wet or dry years have occurred together, but there has been nothing regular about their occurrence.

The longest dry spell was of 6 years' duration and extended from 1899 to 1904. It preceded the wettest year on record when 24.17 inches of precipitation fell in 1905. According to the law of averages 1951 and 1952 should have better than normal precipitation because the years 1947-1950 were far below average.

Temperatures were higher than normal in December 1951, which reduced the quality of the January-harvested lettuce in the Yuma Valley. Broccoli, cabbage, and carrots were harvested in the Salt River Valley in January. Carrots were frosted and had to be marketed without tops. January frosts reduced the Salt River Valley citrus crop by about 10 percent. Temperature conditions, however, were favorable for the planting of spring vegetable crops.

Normal and 1951 Precipitation and Temperatures (Arizona)

Month	Precipitation (In.)		Temperature (°)	
	Normal	1951	Normal	1951
January	0.99	1.32	40.5	41.9
February	1.26	0.48	45.0	45.0
March	0.98	0.50	50.4	49.7
April	0.65	1.42	56.7	57.3
May	0.32	0.54	65.8	65.7
June	0.34	0.00	74.4	72.3
July	1.57	1.40	80.2	81.7
August	2.11	4.14	78.3	77.3
September	1.39	0.53	72.7	73.3

Early Frosts Heavy

Early melons which were planted late in February, and other tender crops, were not damaged because they were protected from frosts occurring late in the month. Frosts occurring on March 3 and 4 affected most of the state. Unprotected crops in the Yuma Valley were frosted but spring lettuce harvest was completed.

Cotton which was planted before the 4th was frosted and some had to be replanted. In Maricopa and Pinal counties climatic conditions were favorable for preparing ground for cotton planting. In April, cool weather in the Salt River Valley hindered the development of cotton and melons but was favorable for lettuce.

During the middle of May, cotton planting was hindered by cool nights and precipitation. Some cotton had to be replanted. During the middle of the month ,cotton growth and cantaloup maturity was delayed by cool weather. July weather was favorable for the harvest of cantaloup as well as other melons but mid-month showers deteriorated their quality so much that many were not harvested.

In Coconino County, pinto bean yields were below average because of dry weather and in some instances small grains were not harvested because the crop was so short it could not be threshed.

The weather in August was unique. Precipitation was unusually heavy and crop damage severe, especially in the vicinity of Litchfield. But the benefit of the rains was much greater than the losses caused by the storms.

—H. V. Smith is Associate Agricultural Chemist.

KEEP 'EM HEALTHY

Prevention Is Important Factor In Diseases of Feed-Lot Cattle

By W. J. Pistor

Hemorrhagic septicemia, shipping fever, pneumonia and colds are all very similar diseases affecting the respiratory and digestive systems of cattle. These diseases, usually regarded as one, cause the majority of losses of feeder cattle in Arizona feeding operations. The use of the newer drugs has materially reduced death losses but feeders still suffer large economic losses during the period of sickness.

Most of the costs of treatments and weight losses can be avoided if feeders would consider prevention by controlling the contributing causes that make their cattle susceptible to these diseases. The organisms that cause these diseases seldom attack healthy animals but weakened cattle are easily infected. The contributing causes are the conditions that lead up to the weakening of the cattle.

Contributing Causes

1. Weaning calves and shipping them before they become adjusted to the changed diets and environments weakens calves.
2. The use of bacterins (vaccines) just before shipment makes cattle more susceptible to the disease. It usually requires at least 5 days for a bacterin to build up sufficient resistance to protect the animal against infection.
3. The shipping of cattle by truck or rail in crowded quarters and irregular feeding weakens them.
4. The sudden changes in feeding from dry range grasses to irrigated green pastures causes digestive upsets that weaken cattle.
5. Cattle originating from droughty areas are usually stunted and weakened.
6. Cattle originating from certain areas are infected with internal parasites which drain heavily on their resistance.
7. Cattle passing through poorly regulated auction yards frequently pick up infections by direct or indirect contacts.
8. The general practice of branding, dehorning, and castrating cattle as soon as they arrive in the feed lots or pastures further weakens cattle.

Control Contributing Causes

1. Calves should be carefully weaned and adjusted to the changes in diet before shipment. If shipping distances are short, the calves can be adjusted to the new feeding when they arrive at the feed yards or pastures. These feeding changes should be made slowly and calves should not be forced too rapidly on green alfalfa pastures or concentrates. The use of dry hay with green pastures will help calves.

2. The use of biologicals (vaccines) will increase the resistance of calves to colds, shipping fever or hemorrhagic septicemia. There are two general products, and each has a definite use.

Pulmonary mixed infection serum or anti hemorrhagic septicemia serum are used when *immediate* protection is desired. These serums are used on calves that are shipped soon after weaning or on cattle that reach their destination under adverse weather feeding conditions. Serums will protect calves against colds or shipping fever for about two weeks.

Pulmonary mixed infection bacterius or hemorrhagic septicemia bacterius are used on calves that can be held at least a week before shipping or have settled down at their destination. It requires at least 5 days for a bacterius to give much protection to the vaccinated animal.

It is also important to understand that cattle are more susceptible to these diseases for a few days after the use of a bacteria.

3. Cattle should be fed and watered regularly during shipments. They should be protected as much as possible from adverse weather so that they will not arrive at their destination in a fatigued condition.

4. Extreme care should be taken to put new cattle on a well balanced diet. Since the converting of feeds to products that a cow can utilize to maintain her health is done primarily by the bacteria and other microorganisms in the paunch, it is necessary to make changes gradual so that this organ can properly adjust itself to new feeds.

5. Cattle should be examined for possible internal parasites and if found infected they should be treated immediately.

6. All cattle originating from areas where they might have come in contact with disease should be kept isolated, watched for any evidence of disease and treated immediately. This period of isolation should be for at least two weeks.

7. If cattle have to be marked, sufficient time should be allowed for them to quiet down and become adjusted to the new conditions before dehorning, branding and castrations are done.

Treatments

Since it may be impossible to follow all of the control suggestions, it may be necessary to treat infected cattle. Cattle on arrival should be carefully watched for any respiratory or digestive changes and soon as detected they should be treated. Treatments are much more successful if applied early in disease and before too much destruction to tissues has occurred.

The sulfa drugs given by injections or by mouth and the antibiotics have given very good results in treating these diseases. These drugs have to be administered properly and feeders should avail themselves of the local veterinarian if they are not trained in their usage.

—W. J. Pistor is Head of the Animal Pathology Department.

Irrigation Of Alfalfa

2 Light Applications Better Than 1 Heavy

By Karl Harris

During the past 10 years, Arizona farmers have been cutting alfalfa hay from approximately 213,000 acres annually, or about 26 percent of the irrigated lands of the state. This acreage is second only to cotton, which during the same period has been cropped on about 28 percent of the total irrigated lands.

Large Acreage in State

If we add the alfalfa acreage cut for hay to that used exclusively for pasture, we get a total alfalfa acreage equal to or exceeding that of cotton.

Alfalfa, along with small grains, can be grown in practically every community in the state. Its adaptability to various climates, and types of water and soil, enables it to adjust itself to a wide range of environmental conditions.

Alfalfa is one of the most beneficial crops that can be used in a rotation system. Its importance is two-fold.

(1) Crops which are grown on lands following alfalfa produce much higher yields than those grown on lands treated any other way. This is true because alfalfa improves the physical condition of the soil; also, since alfalfa is a legume, it can increase the nitrogen content of the soil.

Moisture Penetration
March 1—4 Feet
June 16– 1½ Feet

Moisture Penetration
March 1—6 Feet
June 16—4 Feet

Of prime importance in obtaining a good yield of alfalfa is good moisture penetration. The pictures above were taken in Maricopa county on June 16, 1947, on adjoining borders.

Effective Use of Water

(2) Alfalfa makes it possible for the farmer to utilize his water supply to a greater advantage. If, during a period of shortage, water is needed on a crop having a greater economic return than alfalfa, or on a crop that would be permanently injured if deprived of an irrigation, the water could be taken from alfalfa to relieve these situations.

Many times alfalfa is treated as the stepchild among crops on the farm. It is often irrigated only when other crops do not need the water.

An irrigation practice which will bring the greatest economic return is the ultimate desired by most farmers. Where the cost of water is high or the supply limited, the yield per acre foot of water may be more important than the yield per acre. With this principle in mind, an alfalfa irrigation test was started in the fall of 1946 at the University of Arizona farm near Mesa.

Tests Made on 24 Plots

Hairy Peruvian alfalfa was planted on 24 plots on this farm in November 1946. During the season of 1947 all plots were irrigated the same, each being given an adequate amount of water. The differential irrigations were started during the winter of 1947 and 1948. The following is an outline of the experiment:

Treatment 1. Twelve acre inches of water given during the winter months, and one 5-inch irrigation between each cutting, or a total of 30 acre inches per acre.

Treatment 2. Eighteen inches of water given during the winter months, and two 5-inch irrigations between each cutting, or a total of 54 acre inches per acre.

Treatment 3. Twelve inches of water given during the winter months and two 7½-inch irrigations between each cutting, or a total of 72 inches per acre.

Treatment 4. Twenty-four inches of water given during the winter months and three 5-inch irrigations between each cutting, or a total of 78 inches per year.

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Treatment Number	Applied in Winter (Ac. Ft. Per Ac.)	No. Irrigations Between Cuttings	Amt. Each Irrigation (Ac. Ft. Per Ac.)	Total Amt. Applied (Ac. Ft. per Ac.)	Total Yield Dry Hay Per Acre (In Tons)	Yield Dry Hay (Tons Per Ac. Ft. of Water)
			1948			
1	1.58	1	0.71	4.43	7.6	1.72
2	2.18	2	0.66	7.46	9.2	1.23
3	1.50	2	0.70	6.81	8.7	1.28
4	3.19	3	0.69	11.51	10.3	0.90
			1949			
1	0.99	1	0.45	2.79	5.6	2.00
2	1.52	2	0.42	4.88	9.5	1.95
3	0.99	2	0.63	6.03	9.4	1.56
4	1.79	3	0.42	6.83	9.4	1.38
			1950			
1	1.09	1	0.45	2.89	4.9	1.70
2	1.70	2	0.37	4.66	7.6	1.63
3	1.09	2	0.53	5.33	7.5	1.41
4	1.70	3	0.45	7.1	6.1	0.86

Eating is Fun At Nursery School

Children Learn to Accept And Enjoy Routine Actions

By Alice Books

Nursery school children at the University of Arizona enjoy their lunch hour as shown above.

Helping children to accept nursery school routines is a worthwhile part of the University Nursery School program. Student teachers offer the children no choice in certain routines, since good management precludes individual choice.

Routines Are Accepted

Nursery school routines, for which there is no choice, are simply stated as such. "Time to wash up," "Time for lunch," are accepted as matter of fact announcements, while "Are you ready to rest now?" or "Are you ready for lunch?" lead to needless complications.

Students learn that when a choice is offered, the child is permitted to choose and, in fairness to the child, his decision must be accepted. No choice is offered for such routines as washing the hands before lunch, relaxing for a 12-minute period after play, sitting in a circle to hear a story, and eating lunch together. Children like to do these things together, and even the child who resists routines at home generally accepts them wholeheartedly at school.

The University Nursery School was organized in the spring of 1931 as a part of the home economics course in child development. During the intervening twenty years the school has served the students in this course as a laboratory for the study of children.

Food Habits Shown

Lunchtime at nursery school discloses many differences in food habits among the children. By the time he is about three years of age the child has had a long history of eating experiences which may have helped him to build good food habits and positive attitudes toward eating. Such a child comes to the school lunch with a hearty appetite. He eats and enjoys a wide variety of nutritional foods. He shows an interest in and willingness to try new foods.

Because of past experiences, however, a child may have developed poor eating habits and attitudes during this important three-year period. This child may display such a poor appetite that mealtime has become a time of using every device he has learned to effectively resist eating.

Food dislikes may have grown to a point that the child rejects most vegetables, meat, eggs, and anything else he may suspect of containing a vitamin or a mineral. Such a child automatically greets any new food with resistance. Rejection of food will be loud or silent, depending upon his past experiences with the success of either technique.

Other Problems

Some of the poor-eating habits in evidence at nursery school may be symptoms of deeper problems. Jealousy, past illness, or negativism may be the cause of the trouble. A child who was denied the pleasures of touching, handling, feeling foods in earlier days may display beautiful table manners and converse charmingly with people at his table, yet reserve his eating for between-meal snacks when it is possible to convey food to mouth via fingers rather than forks.

Another child may have been subjected to new flavors, textures, or temperatures too rapidly or too early during the early months of his life. One child may have been forced to eat against his will, another may have been cajoled too much, or lectured regularly upon the virtues of food. Many children have, as models for eating, parents who themselves have poor food habits.

Student Is in Charge

The student who is scheduled for the lunch period at nursery school finds this part of the program interesting and her efforts contribute to the well-being of the children who share her table. She creates and maintains an atmosphere of calm at her table. She encourages the children to eat independently but is ready to give help if needed. She directs wandering interest back to the business at hand.

No arbitrary rule is made concerning clean plates and dessert, since the child may conclude that dessert is more important to the adult than the main part of the meal, and he may regard dessert as a reward rather than simply the end of the meal.

—Alice Books is Instructor in Home Economics

Routine activities such as "time to wash up" as are an important part of the University of Arizona Nursery School experience.

Six-Inch Spacing Ups Cantaloup Yield

Wider Spacings Showed Lower Yields In Tests at University Research Farm

By W. D. Pew

In commercial cantaloup production direct seeding in continuous rows has rapidly replaced hill planting, except where capping is practiced. Thus, the determination of a plant spacing which will give maximum yields is of utmost importance. Obviously the proper distance between individual plants is important in getting the highest production of high-quality melons of desirable size.

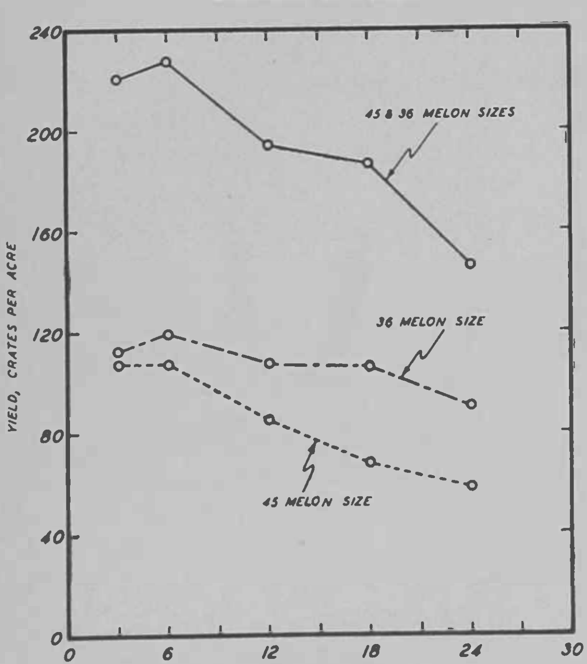
To accomplish maximum production the number of cull melons and melons of the less important sizes must be kept at a minimum since each melon, whether cull or marketable, makes a certain nutrient requirement on the vine.

Growers have expressed different opinions about plant spacing within the row. In commercial fields now, as well as in the past, where continuous row planting procedures have been used, there are almost as many different spacings as there are growers of the crop. These range from 6-inches to as high as 24 to 30-inches.

With variations of this nature, much can be gained in standardizing the spacing practice which will give maximum yields. For experimental purposes, spacing intervals were selected which included the usual commercial range of variations. These were extended beyond these limits to include an additional spacing on each end of the scale. The experimental range included individual plant spacings of 3, 6, 12, 18, and 24-inches.

The plant population, determined by individual plant spacings, had a direct and highly significant influence on the total marketable melons produced. (See graph at lower left.) It also had a direct bearing on the ratio which could be expected between the various marketable sizes.

INFLUENCE OF PLANT SPACING ON CANTALOUPE YIELDS



Six-Inch Spacing Best

Although the plants in the 3-inch spacing consistently produced the greatest total number of marketable melons, these yields were not significantly greater than the yield obtained from plants of the 6-inch spacing. Further, it should be pointed out that the plants spaced 6-inches apart significantly outyielded plants of the other spacings—3, 12, 18, and 24-inches—in 36, and 45 combined with 36 melons-per-crate sizes.

Yields from the two wider spacings were significantly lower than those for the other three spacings. Not only did the wider spaced plants produce fewer melons but also produced a larger percentage of the less desirable larger sizes compared to the medium sizes which are preferred by consumers.

The closer the spacings, the greater the total number of cull melons were produced. This would seem to agree with what may be expected, since the closer the spacing used, the greater the number of plants per acre produced. However, the number of culls was not proportionate to the increase in total plant population.

That is, calculating on the basis of culls per plants it was found that plants spaced 3-inches apart averaged .27 culls per plant while plants of the 24-inch spacing averaged .70 culls per plant. The intermediate spacings provided points when connected which resulted in an almost perfect straight line between the two extremes. (See graph at right below.)

Field Trials Successful

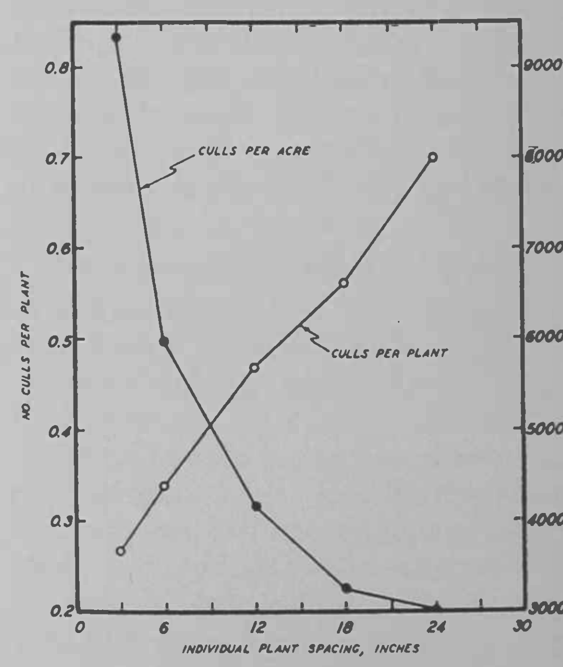
During the past year certain commercial growers have tried the 6-inch spacing and have significantly improved their yields. These increases are undoubtedly the result of the greater number of plants which can be maintained properly because of improved cultural and fertilization methods. Where band placement of fertilizers is used, individual plants spaced 6-inches apart are better arranged for maximum utilization of the applied fertilizers than are plants of wider spacings or those planted in hills.

The soil used in this investigation is classified as Sunrise clay loam, which is a rather heavy soil type. This should be considered when evaluating the data, since melons grown on lighter soils quite likely would require slightly wider spacings.

In these tests, plants spaced 6-inches apart in the row and grown under good cultural and fertilization practices produced the largest and most economical melon crop.

—W. D. Pew is Assistant Horticulturist, University of Arizona Vegetable Research Station.

INFLUENCE OF PLANT SPACING ON NUMBER OF CULL MELONS



Should I Line That Irrigation Ditch?

Dollar Return on Capital Expenditure Is Important Consideration for Farmer

By Rex D. Rehnberg

The job of the farm manager—and that of any other business manager—is getting the largest net returns possible with the land, labor and capital at his command. This requires daily decisions as to how much money can be spent profitably on certain production items.

An error in judgment as to how much seed to plant and how much fertilizer or water to apply will be reflected in that year's income and can easily be corrected in the following year. However, an error in judgment as to how much can profitably be spent on capital improvements such as buildings, fences and irrigation systems, will lower incomes during the life of the installations.

A careful cost-benefit analysis in decisions involving capital expenditures, therefore, is important. Capital expenditures can be analyzed best by viewing them as a purchase of future income. If the future returns fail to equal the present cost, then the advisability of making such an investment is questionable.

Must Consider Returns

Applying the cost-benefit analysis to concrete ditch lining, under varying conditions, shows that there are ditches in Arizona where the money invested in ditch lining would be quickly recovered. There also are conditions under which the benefits from lining will never pay the cost of lining.

To simply assume that every ditch in Arizona should, or should not, be lined is to disregard one of the greatest opportunities managers have to exercise the management function; that is spending each dollar where it promises to yield the greatest return.

The benefits, or savings, from ditch lining are realized year by year during the life of the installation. In order to make a direct cost-savings comparison, the cost also should be on an annual basis.

Suppose a farmer is trying to decide whether or not to line a particular 1/4 mile section of ditch. The lining will cost about $1,200 of which $400 will be refunded in the form of conservation payments by the Production and Marketing Administration. An inspection of similar ditches in the area reveals that they can be expected to last 30 years with about $10 maintenance cost per 1/4 mile per year.

He thinks that lining the ditch will make about 1/5 of an acre of land available for cultivation that is now occupied by the old ditch, reduce weed control costs on that ditch section by about $10 per year and decrease the costs of irrigator's labor by $10 per year. This section of the ditch has an average annual flow of about 250 acre feet and he values his water at $5 per acre foot. Should he line this ditch?

Estimate Annual Costs

The three major annual costs of the lined ditch will be interest, depreciation and repairs. During the life of the ditch it will depreciate from the original value to practically 0, averaging about 1/2 the original cost during its useful life. Interest can, therefore, be computed at 5 percent (or whatever interest rate the farmer can secure funds) on the average investment or 2 1/2 percent on the original investment.

If the ditch lasts 30 years the annual depreciation rate will be 3.3 percent per year with an annual repair cost of $10. These costs are summarized in the accompanying table. From it the annual cost of $56.40 is determined.

The benefits are the use of 1/5 acre of land at $50 per acre plus a reduction of $20 annually in the cost of weed control and irrigator's labor. The total savings, excluding water, is about $30. This leaves a cost of $26.40 that must be covered by a saving in water. With water valued at $5 per acre foot a saving of 5.3 acre feet of water, or slightly over 2 percent of the average flow in the ditch section would yield a large enough saving to make ditch lining a sound investment under these conditions. There are many cases in Arizona at the present time where more than 2 percent of the water has been saved by ditch lining.

ON THE COVER is a photo of a lined irrigation ditch near Tucson.

COST-BENEFIT ANALYSIS

1/4 Mile Concrete Lined Ditch

Cost of lining		$1,200
Less Government Payment		400
Net Cost to farmer		$ 800
Annual Costs		
Interest @ 2½%	$20.00	
Depreciation 3.3%	26.40	
Repairs	10.00	
Total Annual Cost		$56.40
Benefits (savings)		
Land 1/5 A @ $50	$10.00	
Weed Control	10.00	
Irrigator's Labor	10.00	
Total Annual Savings (excluding water)		$30.00
Remaining cost (to be paid by savings in water)		$26.40
Value of Water $5 A.F.		5.3 A.F.
Average annual flow through ditch section		250 A.F.

Seepage loss per ½ mile requires to equal

$$5:3 \text{ A.F.} = \frac{5.3}{250} = 2.1\%$$

Check These Factors

Although the figures used in this illustration may not apply to any one particular farm in Arizona, they do bring to mind the factors that influence the advisability of ditch lining. On the cost side, the original cost of the lining, the amount of government payments, the interest rate at which funds can be secured, and the expected life of the ditch are all factors to consider.

In some parts of Arizona the ditch should be written off in 10 years instead of 30 because of the uncertainty of future water supplies. This change alone would nearly triple the annual cost of the ditch.

On the savings side, the amount of the additional land that can be put into cultivation, the savings in weed control and ditch maintenance costs and the decrease in irrigator's labor requirements determine the water

(Please turn to Page 11)

← *Two-spotted mites and their webbing enclosing the tip of a cluster of alfalfa blossoms. Note the dried florets at lower left. (Greatly enlarged.)*

Fight Continues on ***Two-Spotted Mite***

By L. A. Carruth
and G. D. Butler, Jr.

During the past few seasons mites have become increasingly important pests of Arizona crops. This seems largely due to the recent introduction of a number of organic insecticides which have been effective in destroying beneficial parasitic and predatory insects and mites as well as the injurious species for which they were intended. Of the various mite species found in the state, the two-spotted mite, *Tetranychus bimaculatus* Harvey, is probably the most injurious to crops.

Many Crops Infested

Serious infestations have been found on alfalfa, cotton, castor beans, seed lettuce, and melons. This pest also attacks other agricultural crops as well as many ornamental shrubs and flowering plants. Even such weeds as Johnson grass and puncture vines may become infested.

Injury is caused by the removal of plant juices following the puncturing of plant tissues by the paired mouth stylets. This causes a blotching or stippling of plant surfaces and continued feeding may cause plants to become defoliated or devitalized.

The two-spotted mite is not an insect, but is more closely related to ticks and spiders, although much smaller in size. The average body length seldom exceeds 1/40 of an inch. This mite is named from the two dark spots usually found on the upper surface. These spots may vary in size and the general body coloration may range from brick-red to yellowish to rusty-green.

The life cycle is often very short, permitting a generation to develop every two weeks in the warmer months. In the milder areas of Arizona, mite activity may continue at a reduced level even during the winter months. Mites are spread from plant to plant by their own crawling movements, by air currents, or by irrigation water.

Mites Increasing

Effective and economical mite control may frequently be exerted by such natural enemies as thrips, predatory mites, lady beetles, lacewings, and predatory bugs, but at times chemical control measures may be necessary. Since the introduction of such organic insecticides as DDT and benzene hexachloride, for example, mites seem to have become more abundant.

These insecticides, usually directed against other pests, have often had little or no direct effect on the two-spotted mite although the predators of this mite have been seriously affected. The severe mite infestation recently experienced may thus be partly explained by the ability of the mites to reproduce in greater numbers in the absence of predators destroyed by insecticides.

When severe mite infestations occur and an insecticide seems necessary, sulfur is the material most commonly recommended although its speed of action is relatively slow. It may be used alone or in combination with other insecticides when other pests must also be controlled.

Sulfur dusts, correctly applied in adequate amounts, have successfully controlled mites on most crops in the past without seriously affecting insect predators and pollinators. The present sulfur shortage, caused by the national defense emergency, presents a serious problem to Arizona agriculture.

New Chemicals Tested

Because of the desirability of securing a more rapid kill of mites than that produced by sulfur, particularly when heavy infestations are present, and because of the apparent appearance of sulfur-resistant strains of mites in some areas, a search for more effective miticides is now in progress. Several new chemicals were tested by the Arizona Agricultural Experiment Station in the Yuma area against the two-spotted mite in cotton and alfalfa during 1951.

The results, although promising in some cases, were not sufficiently conclusive to justify unqualified new control recommendations. These tests will be continued during the 1952 season.

In general, for such materials as parathion, the degree of control is dependent upon the equipment used, the care exercised, and the density of the foliage. The apparent effectiveness of parathion is tempered by its high toxicity to predators which, when killed, allow the remaining mites to rapidly increase to numbers often exceeding those present at the time of treatment. Such applications may also prove hazardous to warm-blooded animals, including man, and to beneficial pollinating insects.

Other less-hazardous miticides are being sought and promising materials will continue to be tested by University of Arizona Experiment Station entomologists under Arizona conditions.

—L. A. Carruth is Head of the Department of Entomology. G. D. Butler, Jr. is Assistant Professor of Entomology.

Dwarf Pima COTTON

Better Variety May Be Developed

This photo shows the relative boll size of Pima 32 and Dwarf Pima. 11 bolls of Pima 32, front row. 8 bolls of Dwarf Pima, rear row.

By W. I. Thomas

Egyptian or Pima type cotton was first grown in Arizona at the Territorial Experiment Station in 1900 at Phoenix, Arizona. The finding of superior plants and subsequent development of varieties of merit led to the development of a Pima cotton growing industry in Arizona which had its heyday about the end of the first World War.

At that time Pima lint sold for a dollar a pound. (Remember too—the inflationary forces were not so strong then as now, the Indians wore expensive bright silk shirts while working the crop, and upland cotton planting was discouraged.)

A collapse in the price of Pima cotton at the end of the first World War led to the adoption of upland cottons, and by the time the second World War began, upland cotton had almost eliminated Pima cotton from the field.

Better Varieties Sought

The development of better varieties by R. H. Peebles of the U. S. Field Station at Sacaton, Arizona, and the necessity of having cotton of this character for military purposes led to considerable planting of this crop during the second World War. But as soon as the war was over, farmers returned to planting upland cotton since it was more profitable.

Now once more it may be necessary to raise a certain amount of Pima or Egyptian cotton for domestic and military uses. Approximately 100,000 bales of this kind of cotton have been used annually in this country in the past.

Objections Are Many

Some of the reasons why farmers object to raising Pima or Egyptian cotton are: It has a very small boll that pickers dislike. It makes a big tree-like plant that is too hot to pick in, or, if it falls over, makes a tangled mass of branches that is hard to pull a pick-sack through. The lint percentage of the harvested cotton is low (30 percent or less) which further adds to the cost of the crop.

This cotton also requires a long season of growth, is comparatively low yielding, and is not easily harvested by mechanical pickers. These undesirable characteristics, combined with keen competition from other countries, plus the difficulty in obtaining labor in the United States in recent years, seem to call for a new Pima cotton.

One of the University of Arizona strains of Pima cotton known as 126-S 1 developed by Professor W. E. Bryan from a cross between Pima and Tanguis (a Peruvian cotton) further intercrossed with Sea Island and upland cottons may help overcome many of the objections to old Pima cotton.

Farmers Name New Variety

Pima strain, 126-S 1 (Bryan), does not grow as tall as old Pima or even Pima 32. This variety, shown at University farm field days, has been named by farmers "Dwarf Pima." It staples the same as Pima 32, and has quite large bolls for a Pima cotton. (See photo.)

The ginning percentage is considerably better than old Pima, but does not compare with upland except at the higher elevations. Whether it can be machine picked is not known, but this might be possible on the weaker soils where the plants do not get too large. The 1950 spinning test for this variety was quite satisfactory. Laboratory tests from earlier years also were satisfactory.

However, "Dwarf Pima" is still an experimental variety and seed stocks are not large. More extensive tests were conducted on this cotton in 1951 and should give a more adequate evaluation of its possibilities as a desirable long-staple variety.

—W. I. Thomas is Assistant Agronomist.

An outstanding row of Dwarf Pima showing its relatively short height and prolific set of large bolls. →

Utilization of Phosphorus From Barley Straw

Succeeding Crops Immediately Use Phosphorus From Crop Residues

By W. H. Fuller

Barley is one of the leading winter crops grown on irrigated land in Arizona. As a consequence, rather large quantities of barley residues, such as straw and roots, are added to the soil each year.

Residues of this nature are valuable in soil building. The return of such crop residues to the soil each year is one of the greatest factors responsible for the maintenance of soil fertility and productivity. Barley straw from one acre, for example, contains 40 to 60 pounds phosphorus as P^2O^5. Plowing under straw residues is like putting money in the bank.

Tracer Elements Help

Although it is known that plant food elements ultimately are released from crop residues for use by succeeding crops, the rate at which these elements become available to plants is not known. The production of radioisotopes by the Atomic Energy Commission as tracer elements in recent years has permitted an expansion of research work involving the identification of single plant food elements from two or more sources. An experiment was jointly supported by the University of Arizona Agricultural Experiment Station and the Atomic Energy Commission.

Radioactive barley materials of 3 stages of growth were chopped into small pieces and added to soils. The soils were planted to rye grass which was cut three times at intervals of four weeks for analysis of radiophosphorus.

Uptake Compared

Uptake of phosphorus from barley straw and root residues was compared to that of radioactive liquid phosphoric acid added to a duplicate set of pots.

The rate of utilization or absorption of phosphorus by rye grass from barley was shown to be directly related to the stage of maturity of the added residue. The rye grass absorbed a greater percentage of its phosphorus from the younger barley material than from the mature straw. Barley roots were found to be a poorer source of phosphorus than the hay or straw. Less phosphorus was absorbed from roots of mature barley than from the younger barley.

Liquid phosphoric acid, a wholly soluble and inorganic form of phosphorus, was a poorer source of phosphorus than young and medium mature barley hay, though its phosphorus was absorbed by rye grass to about the same extent as that of mature barley straw and to a greater extent than that of barley roots.

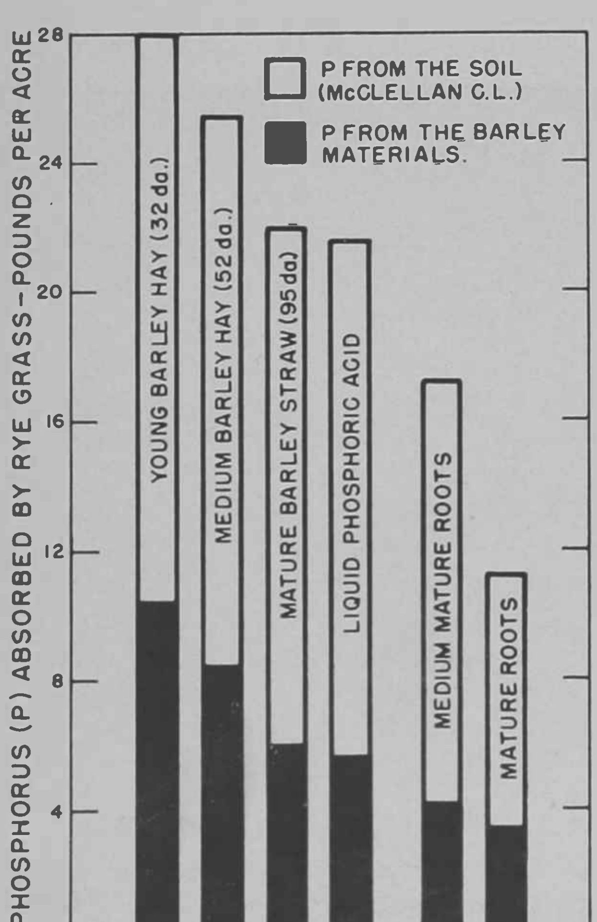
Total phosphorus derived from the barley residues, incorporated into cultivated McClellan soil, is shown in the graph at left below to be greater for the young than the mature material.

Soil Type Makes Difference

All soils do not supply phosphorus to plants to the same extent. The graph at right below shows that the total phosphorus absorbed from the mature barley straw differed with the different soils. The amount supplied to the rye grass by the soil is calculated as the difference between the total phosphorus found in the grass and the amount derived from the barley straw.

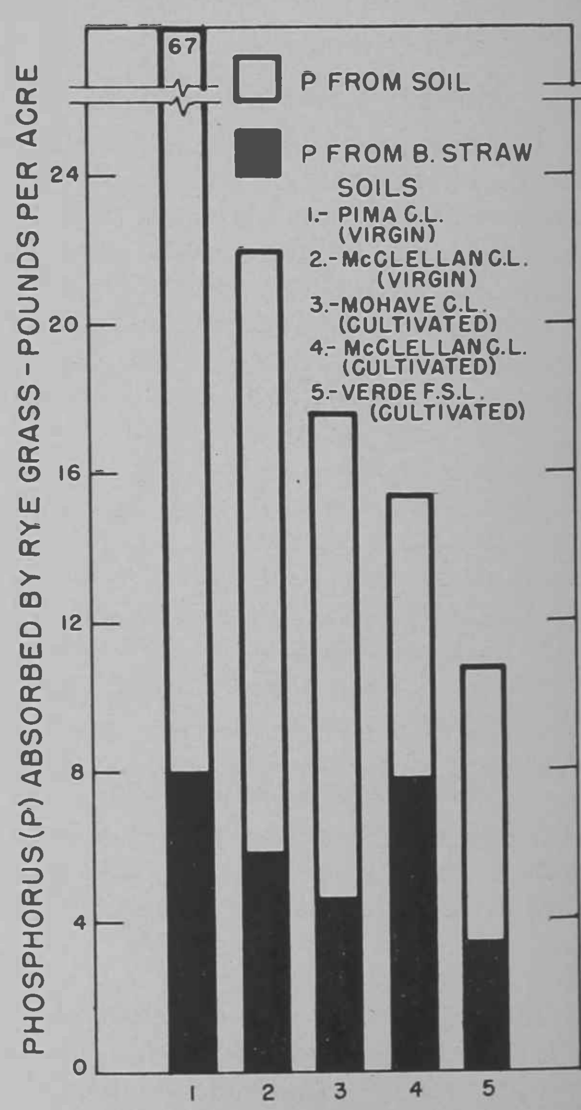
Perhaps the most important single discovery of this research is that succeeding crops begin to utilize phosphorus from crop residues such as barley straw immediately after they have been added to the soil.

—W. H. Fuller is Associate Biochemist.



The absorption of phosphorus from different barley materials (hay, straw and roots) by rye grass in a cultivated McClellan clay loam compared to the absorption of phosphorus from liquid phosphoric acid. (Sum of two cuttings.)

The absorption of phosphorus by rye grass from mature barley straw added to five different soils. (Sum of two cuttings.)



Irrigation Of Alfalfa

(From Page 4)

During the season of 1948, more water was applied at each irrigation than was called for in the plan due to a mistake in measuring the size of the plots. The following table gives the irrigation data, yield of hay per acre and per acre foot of water, up to the present time.

It appears from the above data that the point of diminishing returns is not reached on alfalfa until about 5 acre feet of water per acre has been applied, i.e., about twice as much hay is produced per acre when 5 acre feet are applied as when only 2.5 acre feet are used. When amounts greater than 5 acre feet are applied, the yield per acre foot of water is reduced considerably.

On the Mesa farm, the water is delivered to the experimental plots through underground pipelines. The fields are leveled so there is no runoff. Under these irrigating conditions, a 100 percent efficiency is approached. However, under actual field conditions, where 70 percent effifiency is about the maximum that can be obtained, the point of diminishing returns would be reached when about 7 acre feet of water has been applied.

The yield on Treatment 4 was reduced each year, the big reduction coming in 1950. The stand on Treatment 4 had thinned out considerably by 1950, and grass was coming up in the bare spots. On soil as heavy or heavier than that of the Mesa Farm, an irrigation practice of 3 waterings between cuttings will start to reduce the stand after two years.

Light Irrigations Best

A study of the results of 1948, where much heavier irrigations were given than other years, shows that 2 light irrigations are better than one heavy irrigation. It is believed this is true because the cooling effect of irrigation water in the upper foot of soil produces a more favorable environment for growth of plant roots.

Under normal field conditions of about 70 percent efficiency, there is no appreciable decrease in yield per acre foot of water until 7 acre feet are applied. However, irrigations totaling more than 7 acre feet per acre will result in a reduction of yield.

In order to obtain the greatest utilization of water and to get the best economic returns, the ideal irrigation practice would be as follows: Apply 2 acre feet of water per acre during the winter months, and follow up with two 6-inch irrigations between each cutting, for a total year's use of 7 acre feet.

However, if either a cement-lined ditch or a pipeline is used for the delivery of water, and the land is prepared in such a way as to get a high efficiency, then the water applied could be reduced as follows:—A 1½-acre foot application during the winter months, followed by two 4½-inch irrigations between cuttings, or a total year's use of 5 acre feet.

These irrigation procedures are applicable only when a maximum crop yield of alfalfa is desired. However, under conditions of a limited water supply, irrigating for maximum production may not be possible. If this is true, the main benefit of alfalfa is not in its value as a cash crop, but as a soil builder resulting in a higher yield of subsequent crops.

—Karl Harris is Irrigation Engineer cooperating with the University of Arizona.

Should I Line That Irrigation Ditch?

(From Page 7)

saving necessary to make ditch lining a sound investment. The value of water per acre foot, the seepage loss in the ditch section and the amount of water flowing in the ditch section are the factors that finally determine whether or not ditch lining is a sound investment.

A similar approach can be used for underground pipe irrigation systems. This, along with a discussion of seepage losses and methods of valuing water are presented in Bulletin 137, "Irrigation Ditch Management on Arizona Irrigated Farms." A copy of this bulletin can be obtained from your County Agricultural Agent or by writing the University of Arizona, Tucson, Arizona.

—Rex D. Rehnberg is Assistant Agricultural Economist.

New Bulletins

Here are new circulars and bulletins available without cost from your County Agricultural Agent's office:

Agricultural Experiment Station

- General Bulletin 236—Part I. Establishing a High Egg Producing Strain of S. C. White Leghorns. Part II. The 365-Day Egg Production Equivalent Table.
- 61st Annual Report for Fiscal Year Ending June 30, 1950.

Agricultural Extension Service

- 4-H Club Girls' Room, Circular 193.
- Making Bound Buttonholes, Circular 194.
- Household Pests, Circular 195.
- Plan Your 4-H Meeting, Circular 196.

June In

Here's good farm and home radio listening! Don't miss these programs in your area.

Daily (Except Sunday)

KRUX, Glendale, 6:55 a.m.—Farm Front—Maricopa County Extension Agent.

Sundays

KOY, Phoenix, 8:45 a.m.—Demonstration Garden (County Agent) Program.

Mondays

KYMA, Yuma, 7:00 a.m.—On the Farm Front.

KCLS, Flagstaff, 8:45 a.m.—Your County Agent Reports.

KCLF, Clifton, 10:15 a.m.—The Homemakers' Program.

Wednesdays

KYUM, Yuma, 6:45 a.m.—Yuma County Agricultural Extension Service Radio Program.

Fridays

KCKY, Coolidge-Casa Grande, 4:30 p.m.—Pinal County Farm and Home Program.

Saturdays

KGLU, Safford, 1:15 p.m.—Stepping Along With the Agricultural Extension Service.

KOY, Phoenix
KYMA, Yuma
KTUC, Tucson
KSUN, Bisbee — 12:00 to 12:30 p.m.

Arizona Farm and Ranch Hour, presented by the Radio Bureau, University of Arizona, and the College of Agriculture.

Mondays and Fridays

KGPH, Flagstaff, 9:45 a.m.—Coconino County Farm and Home Program.

Control Burroweed With 2, 4-D

Tests Give Facts On Time and Amount

By Albert L. Brown

▲ *A mature burroweed plant. This poisonous half-shrub occurs on grassland ranges throughout southeastern Arizona.*

Southern Arizona ranchers will soon have a satisfactory method of controlling burroweed if further experiments are successful. Tests near Oracle Junction have shown that burroweed is susceptible to 2,4-D applied in the right quantity at the proper stage of growth.

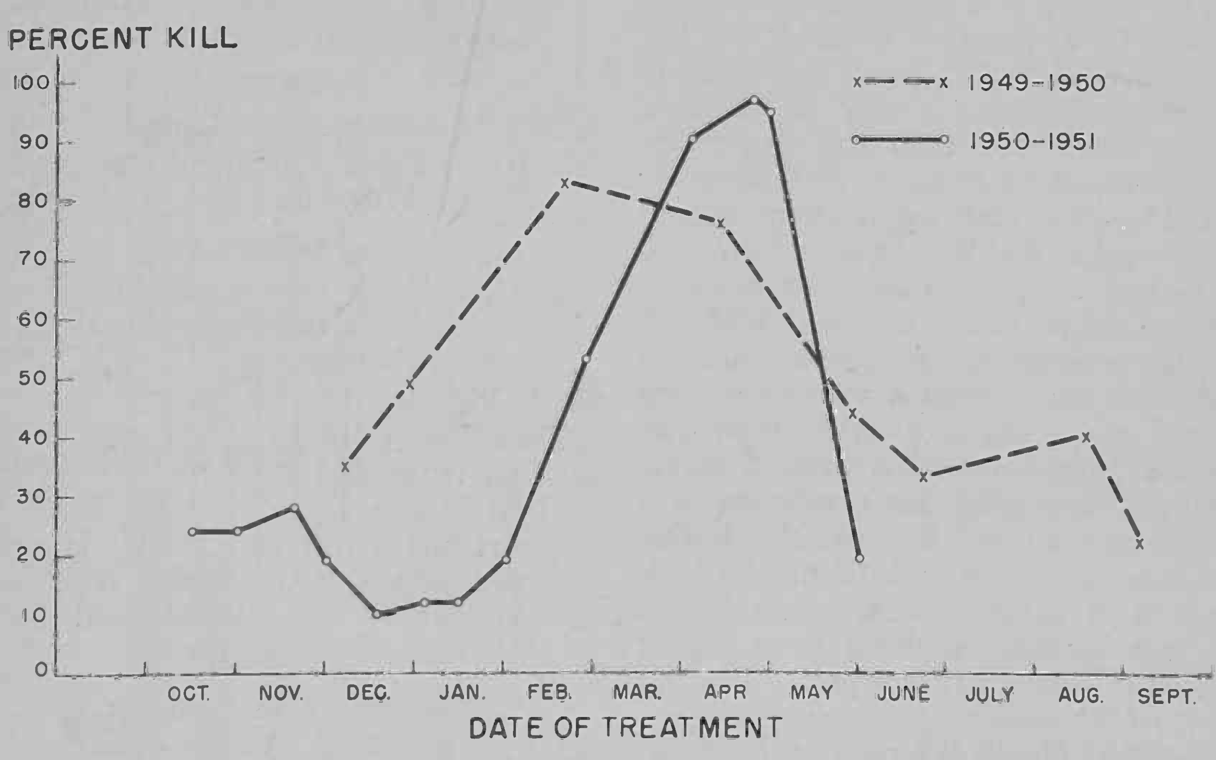
Burroweed (see photo) is a woody half-shrub that competes with range grasses and causes serious livestock poisoning. Its rapid increase in the 1920's led to development of many control methods, including hand-grubbing, mowing, and burning. All of these methods give satisfactory control, but are not universally applicable because of time required, expense, rough terrain, rocky soil, or lack of fuel.

Control with 2,4-D overcomes many of these objections. It is relatively cheap and can be applied readily to large range areas. A single properly applied treatment kills 80 to 95 percent of the plants.

Time of Year Important

Satisfactory control with systemic chemicals requires strict attention to plant condition at spraying time. Two years of date-of-spraying tests on the Page-Trowbridge Experimental Range indicate that burroweed can be killed between March 1 and May 1. (See graph at bottom of page.) April was the best month for spraying. During that month, the leaves become fully expanded, but have not had time to harden. Treatments from May through February were unsatisfactory, giving very low kills.

Plant condition depends on temperature and moisture as well as season. In 1950, March and April rains were low (0.37 inches compared to 3.74 inches in 1951), and burroweed was drying up by April. Kills were less in 1950 than in 1951, although still satisfactory.



Effect of date of treatment with 2,4-D on burroweed mortality. Natural mortality on check plots was ten percent over the two-year period.

Quantity and type of herbicide and quantity and composition of its carrier are important in getting satisfactory and economical control. At one pound per acre, 2,4-D ester was superior to other chemicals used. (See table below.) 2,4-D amine and 2,4,5-T ester were less effective, but gave satisfactory control. 2,4,5-T amine was poorest of the four chemicals.

Percent Kill of Burroweed Resulting From Different Formulations and Rates Per Acre Applied in April.

Formulation	Rate (Lbs. Per Acre) ½	1	1½	2
Ester of 2,4-D	91	97	97	98
Ester of 2,4,5-T	80	86	90	92
Amine of 2,4-D	69	86	91	93
Amine of 2,4,5-T	48	77	83	88

Higher rates (1½ and 2 pounds per acre) were only slightly better than the one pound rate. The only time heavier rates are superior is at the beginning of the spraying season (February and early March). At one-half pound per acre, 2,4-D ester was the only formulation that gave satisfactory control.

Carrier Needed

A carrier of 4 parts water to 1 part diesel oil, applied at five gallons per acre, was superior to straight water, and almost as good as straight diesel oil. Ten gallons of the 4:1 carrier per acre was no better than five gallons.

2,4-D can be applied by any boom-equipped ground sprayer capable of giving adequate plant coverage at low volume. On large acreages, airplanes can do a faster job. Although no airplane spraying tests have been conducted here, other studies have shown that a properly equipped and flown airplane can do as effective a spraying job as a ground rig.

Spraying in 1952 should be limited to small acreages, since this treatment has not been checked in other areas of the state. A recommended treatment for this year would be one pound (acid equivalent) 2,4-D ester in four gallons water and one gallon diesel oil per acre, applied when the leaves are almost fully expanded.

—*Albert L. Brown is Instructor in Botany and Range Ecology.*