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Preservative Treatment of Lodgepole and Aspen Fence Posts

Lodgepole and Aspen Provide Cheap Posts When Treated to Prevent Decay

By RAYMOND R. MOORE

THE large areas of native juniper in Utah have provided millions of fine, decay-resistant fence posts for farmers and ranchers. Good juniper posts are still available, but are becoming increasingly difficult to find and, consequently, more expensive.

The thousands of acres of lodgepole pine, alpine fir, and aspen in Utah could provide excellent fence post material to supplement the supply of juniper. Although wood from these trees is not naturally resistant to decay organisms, by inexpensive preservative treatments it can be made decay-resistant and, therefore, capable of long service as fencing material. The wood of the native juniper is resistant to decay because of the natural deposition of toxic oils in the heartwood. The lighter colored sapwood of juniper is not decay-resistant.

A number of chemical wood preservatives have been used to protect wood when placed in the soil where wood decay is active. Zinc chloride can be used, but since it is a water-soluble salt it will leech out of the wood. Bichloride of mercury is a toxic salt and useful as a wood preservative, but it is extremely poisonous. Solutions of coal-tar creosote are effective wood preservatives; however, because of their heavy nature, heat or pressure must be used to get satisfactory penetration in the wood. Pressure equipment is not practical for a rancher to own; and treatments which require heat to get good penetration are hazardous. However, a relatively new preservative—pentachlorophenol—has been introduced, which experimental tests have shown can be applied easily and effectively with a minimum of time and equipment. This preservative will not readily leach out of the wood since it is in an oil solution; it is not poisonous to livestock; the solution will not burn the hands; but it is toxic to wood-destroying fungi; it is relatively cheap and easy to apply. This preservative is available commercially as a concentrate or as a ready-mixed solution and is sold under the following trade names: Laxton, Dowicide, Duricide, Timbertox, Penta, and Permawood. The price ranges from $1.85 to $5.50 per gallon depending on quantity purchased and distributor. The treating solution is prepared by diluting the concentrate with fuel or diesel oil at the rate of 9 or 10 parts of oil to one of concentrate. The resulting 5 percent solution is an effective wood preservative.

None of the wood preservatives gives effective protection if it is merely brushed on the posts. A soaking period varying from 12 to 24 hours is required to obtain an effective treatment.

During the summer of 1947, experimental treatments of lodgepole pine and aspen posts were carried on by the Utah Agricultural Experiment Station to determine the most practical method of effectively treating posts of these native tree species with the pentachlorophenol preservative. A properly treated post should have an outer shell of decay-resistant wood extending from the bark peels readily from the wood. Completely peel the posts and remove every trace of inner bark, particularly on the lower 36 inches of the post where the treatment is to be applied. If seasoned in the woods, permit them to season at least twelve weeks. Soak a 36-inch length of the portion of the post which will go into the ground in 5 percent pentachlorophenol preservative solution for a 24-hour period. Maintain the level of the solution in the drum. Each 3-inch diameter post will absorb from 1.5 to 2 pounds of solution at the rate of 4 to 5 pounds per cubic foot. The minimum depth of penetration will exceed one half inch at the 30-inch level. A shell of wood one half inch deep at this point will be uniformly permeated by the preservative solution. The average cost per 5 inch diameter post will be approximately 11 cents. A 55-gallon gasoline or oil drum is satisfactory as a container for soaking the posts.

ASPEN POSTS

Cut the posts in June or July when the bark peels easily from the wood. Remove all traces of inner bark on the area to be submerged in the treating solution. Cross-pile and season for eight weeks. Make a saw cut one-half inch deep around the post at a point 10 inches above the butt. Soak the post in the pentachlorophenol solution for 18 hours. The solution should be maintained at a level a few inches above the one-half inch saw cut. Each post will absorb approximately 4 to 5 pounds of preservative at the rate of 10 pounds per cubic foot; the minimum depth of penetration will exceed one-half inch. The average cost per post will be 31 cents for the preservative solution.

(Continued on page 19)
Dr. Samuel W. Edgecombe, (top, left) the new head of the Department of Horticulture, comes to Utah State with a rich background of experience in his field. He first worked as extension horticulturist in Iowa, and then became research professor in horticulture for the experimental station. In 1942 he was appointed head of the Department of Horticulture at the University of Manitoba. In 1944 he became vice president and director of research for the Burpee Seed Company with headquarters in Philadelphia. He came from that position to the U.S.A.C. Dr. Edgecombe received his B.S. degree from the University of Manitoba and his M.S. and Ph.D. degrees at Iowa State. Robert K. Gerber, (right) assistant professor, received both his B.S. and M.S. degrees at Utah State and has worked toward his doctorate at Iowa State. He was a member of the botany staff before going into the Horticulture Department. Odeal Kirk, (bottom) in charge of the experimental farm at North Ogden, is a graduate of the B.Y.U. and was in charge of an experimental farm belonging to the Utah Copper Company before taking over his present position.

RESEARCH in horticulture was started with the organization of the Experiment Station in 1888. A horticulturist was one of the first four staff members. The first work had to do with introducing and testing varieties of apples, peaches, cherries, pears, and apricots to find those best adapted to Utah conditions. The first varietal test orchard was planted in 1890 on the college campus. It included over 300 varieties of hardy tree fruits.

A new variety testing orchard was planted on the experimental farm at Farmington in 1927 with peach varieties, plums, cherries, and apricots, and a major part of the work was moved to Davis County.

During the past few years the horticultural work has been completely reorganized and generally extended. The center of the research work has been moved to the new horticultural farm at North Ogden where extensive plantings of 116 varieties of peaches have already been made. The peach orchard includes all the standard and new varieties recently introduced by the leading peach breeders of the United States. It is planned to make similar variety plantings of apples, pears, apricots, cherries, plums and prunes, strawberries, raspberries, and grapes. From these plantings Utah fruit growers should be able to determine if the varieties now grown are equal to or inferior to the newer introductions.

In addition to the variety studies, soil management and fertility studies in peach and cherry orchards are also being conducted on this farm, along with contour farming to prevent erosion, and orchard irrigation studies.

Other projects now under way at Ogden include peach pruning methods. An experiment started this year will obtain data on four methods of pruning. These are the usual methods of pruning peach trees in northern Utah, the severe pruning practiced in Washington County, the thinning out and no heading back method which has been found productive in Utah County, and finally, the so-called corrective method which the Missouri Agricultural Experiment Station has reported to be more profitable than the more severe methods usually used in commercial orchards.

All of the research in horticulture is not conducted at the North Ogden farm. Rootstock trials for various tree fruits, especially cherries and apples, are being made at the orchards in Logan. Here it is hoped to find rootstocks that will result in longer-lived trees, more resistant to drought and winter temperatures, as well as being more productive.

Spraying studies to determine the value of old and new insecticides are carried on in the orchards of cooperating farmers throughout the state, as are studies of the use of hormone sprays for fruit setting. With the introduction of the newer sprays such as DDT and parathion, and the prospect of other newer insecticides within the near future, the spray studies are of new interest to fruit growers.

Much of the research in horticulture is cooperative with other departments of the Experiment Station. Virus diseases of tree fruit is a major problem being studied by the Department of Botany and Plant Pathology, orchard fertilizer and soil management problems are studied cooperatively with the Agronomy Department, insect problems and sprays are attacked cooperatively with the Entomology Department, and irrigation problems, cooperatively with the Department of Irrigation and Drainage.

In addition to the expanded fruit research program, the Station plans to initiate research in the general field of floriculture. In both these programs the fundamental objective is to determine those varieties and cultural practices that will result in the largest net return in income or satisfaction to the people of Utah.

RESEARCH PAYS IN INCREASED PROFITS TO FARMERS

Just one example of what the research program in agriculture means in dollars and cents to the farmers of the state is illustrated by the recent work on fertilizers for dry land wheat. As the result of experimental tests on Station plots, dry land wheat growers were advised that they could get increased yields of wheat, testing higher in protein content, by application of nitrogen fertilizer. One farmer in Cache Valley, applying the recommendations increased his wheat yields by 20 bushels per acre, and increased the protein content of the wheat so that it graded enough higher to pay for the 125 pounds of ammonium nitrate fertilizer. The extra 20 bushels yield was profit over and above the regular yield. Fertilizer treatments applied to the 200,000 acres of dry farm wheat land in the state would result in increased value of wheat in excess of one million dollars per year.

Farm and Home Science
Cost of Producing Peaches in Utah, 1947

By EARNEST M. MORRISON

PEACH production in Utah is an important farm enterprise. Preliminary estimates place Utah's 1947 peach crop at about 933,000 bushels, valued at about one and two-thirds million dollars. According to the 1945 census of agriculture, peach trees were reported on 5,071 farms and in all counties of the state except three. The concentration of peach production, however, is in Washington County and along the Wasatch foothills in Box Elder, Weber, Davis, Salt Lake, and Utah Counties, where about 95 percent of the trees are located.

The cost of producing peaches on 103 farms in 1947 was $1.66 per bushel with an average yield of 177 bushels per acre. This means that under conditions of 1947, the producer must receive $1.66 per bushel of peaches in order to pay the costs of production, allowing 5 percent for the use of his own money invested in the peach orchard or interest to his creditor, and allowing himself and his family 84 cents an hour for the time spent. Since this was the average condition, some of the 103 growers had costs exceeding $1.66 per bushel, and others had less than that figure (table 1).

The average price received by the growers included in the study was $1.74 per bushel. This left a net return of 8 cents per bushel, or about $14.16 per acre. Production per acre was exceptionally good for 1947.

To collect the data reported above, detailed information was obtained from the peach growers on the physical quantities and prices of the various items that go into the production of peaches. By summarizing the data obtained, the cost factors in the production of peaches in Utah have been determined. The study included producers in Washington, Box Elder, Weber, and Utah Counties. They operated 563 acres and produced 99,726 bushels of peaches.

It was found also that of the various groups of cost items, labor was the most important and represented about 43 percent of the total costs. Within this cost group about 52 percent of the labor was performed by the operator and his family. The other 48 percent was hired. The average wage paid per hour was 84 cents. It was found in the study that the amount of time required to produce a crop of peaches from an acre of orchard was to some extent dependent upon the yield of peaches. However, for an average yield of 177 bushels per acre, an average of 151 man-hours of labor were expended in the production processes.

Of the various operations performed by labor, the picking of the fruit was the most time consuming, requiring about 28 percent of the labor spent. For the average of the study it required about 14 minutes to pick a packed-out bushel of peaches. The amount of time required for this operation seemed to be governed as much by the size of the tree and the amount of pruning that had been done as by the yield or the number of bushels that had to be picked.

The second most important operation performed by man-labor as a cost item was that of pruning the trees and disposing of the brush pruned away. This accounted for 19 percent of the man-labor. The third largest time consuming operation was irrigating, which required about 12 percent of the time. Other important operations as cost items were sorting and grading, thinning, hauling the fruit from the orchard, applying fertilizers to the orchard, spraying the growing fruit, and hauling the peaches to market.

The operations most frequently performed by hired labor were picking, spraying, sorting and grading the fruit, and pruning the trees.

Overhead costs ranked second as a cost group and represented 29 percent of the total cost of production. Overhead costs include interest on the money in the crop; interest on the capital invested in the peach orchard and in equipment and buildings connected with the orchard; repair and depreciation expense on the equipment and buildings; depreciation of the orchard investment from ageing of the trees; land, water, and drainage taxes. Of the overhead cost items, interest on the capital invested in the orchard was greatest, depreciation on the trees was next, with tax cost...
RESEARCH PAYS DIVIDENDS IN AGRICULTURAL PROSPERITY

PERIODICALLY the governmental agencies appropriating funds for the experiment stations, as well as the citizens of the state, ask for a justification for the money appropriated. A review of Station research gives ample evidence of just how valuable such a program is to the agricultural industry.

A brief statement of results from a few of the research projects is given here.

Range Seeding
Artificial seeding of range lands has been a major range management project for ten years. During this period, methods have been developed whereby seeding of an estimated five million acres within Utah appears economically feasible. During the spring grazing period of 1947 on twenty-eight 100 acre experimental pastures it took only 1.27 acres for one animal month or an average of 21 cattle grazed 66 days on 100 acres. On native range it takes from 5 to 10 acres of pasture for one animal month of grazing. For two consecutive years cattle on the seeded crested wheatgrass pastures gained an average of 2.28 pounds per head daily, while cattle on native range gained 1.42 pounds. Spring range is critically short in the West. Crested wheatgrass leaves in the seeded pastures were 5 to 7 inches long compared to 1 inch for cheatgrass when grazing started April 20. On the average seeded range is ready to graze 22 days before native range. Seeded ranges are also grazed two weeks longer than native range. This extends the grazing season approximately five weeks which conserves hay and shortens the grazing on forest lands. Also certain new species now being studied have a longer growing season than any arid land species now in use. The use of these species gives promise of extending the dry-pasture grazing season as much as six weeks.

Improved Sugar Beet Management Practices
Fall plowing and early seeded preparation, use of nitrogen fertilizers in addition to manure, and adequate irrigation during the early growing period of the sugar beet can materially increase sugar beet yields in Utah. Yields over a third higher have been produced in experimental studies where these practices were observed.

Fall plowing permits early planting which provides a longer growing season. Soil moisture relationships are more favorable for seed germination and seedling growth early in the season. Early seeding also gives the beet seedling a better chance to compete with weeds. Nitrogen and phosphorus fertilizers in addition to manure were also important in increasing yields as was adequate irrigation water in the early part of the season to keep the beets moist and growing rapidly. When sugar beets are well established their growth appears to be affected much more by

(Continued on page 17)
HYBRID CORN FOR ENSILAGE
When Used for Silage Corn is One of Highest Yielding
Field Crops for Irrigated Lands in Utah
By R. W. WOODWARD and H. B. PETERSON

CORN grown for silage is one of the highest yielding feed crops for irrigated lands of Utah, but if only the grain is utilized, barley and wheat produce more feed units per acre than corn. Each year from 26,000 to 30,000 acres of corn are grown in Utah. Most of this is put into silos.

Corn has several characteristics that make it a desirable crop in Utah. It fits well into the rotation plan since it can be planted rather late in the spring and can follow almost any crop. It is easy to cultivate and care for with a minimum of hand labor. Most annual weeds are easily controlled by cultivation. Some noxious weeds such as morning-glory can be sprayed with 2,4-D and controlled without serious injury to the corn.

During the past 15 years there has been a rapid shift from open pollinated varieties to corn hybrids. In several states almost all the corn grown is hybrid. In Utah about 60 percent of the corn acreage is planted to hybrids.

What Are Corn Hybrids?
Corn hybrids are the result of some 30 years of laborious research. The procedure now consists in self-fertilizing individual plants of certain open pollinated varieties to corn hybrids. In several generations. This results in pure lines comparable to wheat and barley varieties which are naturally self-fertilized, but in corn the inbred lines, as they are called, have low vigor and yield.

During the process of inbreeding many lines carrying defective plant characters may be lost by their inability to reproduce themselves. This purges the corn of its poor and defective heredity. During many years of such work at numerous stations only a few inbreds have shown promise in combination.

Out of the large number of inbred lines produced, various crosses are made. These single crosses, as they are called, are tested for yields, maturity, resistance to disease, stiffness of stalks and other characters. Pairs of the best single crosses are mated producing seed for the commercial corn hybrids which are generally made up of four inbreds and known as double crosses. Some hybrids are produced from a single cross by an inbred and are called three-way crosses. In any event, it is necessary continually to self-fertilize the inbred parent lines, then to mate them in the order that will give maximum yield to the farmer. The process of producing hybrids is a specialized, expensive one requiring skilled technicians, and considerable land and equipment. Only limited numbers of states or seed companies have gone into this business. These are largely in the corn belt.

Little of this work has been done in Utah, so hybrids from the corn belt or from seed companies in adjoining states must be relied on.

Seed from a current year's crop of hybrid corn should not be replanted the following year because a variable group of plants of reduced yielding power will usually be obtained.

Advantages of Corn Hybrids
Only a few of the good hybrids on the market are really adapted to this locality. It is, therefore, necessary to make comparable tests of many hybrids in an area before making recommendations. Farmers should consult their county agents or experiment station specialists before purchasing untried hybrids.

On the average, increased yields ranging from 15 to 30 percent can be expected from properly selected hybrids. The crop is much more uniform, may have stronger stalks, more resistance to diseases, bigger ears, and a higher percent of dry matter. Uniformity of height or ripening helps in harvesting the crop.

Problems in Making Recommendations
For nearly 15 years corn hybrids have been tested in Utah. Early tests were conducted in many counties but more recently tests have been limited to fewer locations which appear to be representative of acreages where corn can be grown.

DR. R. W. WOODWARD works on cereal breeding for the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering in cooperation with the Utah Station. DR. H. B. PETERSON is associate professor of soils.

Taking yield tests on corn hybrids in test plots at North Logan

With the varied topography and climatic conditions of the state it is impossible to recommend any hybrid that may be grown generally. Even in the individual valleys such as Cache, Bear River, Salt Lake, and Sevier, great differences in the frost-free growing season exist depending upon elevation, air drainage, and wind movements. Some years from three to six weeks longer season may be found along the bench lands than on the valley floor. These factors make recommendation of varieties difficult. Farmers and specialists must, therefore, work together to find the best hybrid for each situation.

New and better corn hybrids are continually being produced in the corn belt states. By the time they have been sufficiently tested in Utah some of them are already discarded in their place of origin. Several recommended hybrids have been dropped from Utah lists because the seed is no longer available. U.S. 52 is soon to be discontinued for this reason. While Minnhybrid 301 has been nearly eliminated in its home state in Minnesota, it is now being grown in Idaho and seed will continue to be available.

The relative value of corn hybrids cannot be judged by their height, tillering tendencies, ear size, or other characters. What really counts is the actual feed units produced. These must be measured by carefully planned and controlled experiments. Such a process is

(Continued on page 14)
The Improvement of Range Sheep and Sheep Management Practices on Southern Utah Ranges

Columbia Sired Lambs Heavier, More Open-Faced, More Desirable in Mutton Conformation Graded Higher, Produced Heavier Fleeces with Coarser and Longer Stapled Wool with Lighter Shrinkage than Rambouillet Sired

T. D. BELL, L. L. MADSEN, M. A. MADSEN

Comparisons of the production of range sheep sired by Columbia, Rambouillet, and Targhee rams in an experimental study conducted at Cedar City during 1947 show that: Columbia sired lambs were heavier at weaning time than Rambouillet sired lambs; Columbia and Targhee sired lambs were more open faced, more desirable in mutton conformation, and graded higher in condition than Rambouillet sired lambs; Columbia sired sheep produced heavier fleeces with coarser and longer stapled wool having a lighter shrinkage than sheep sired by Rambouillet.

An experimental range sheep unit was established at Cedar City during 1943-44. The objectives of the project are as follows: (1) Starting with a herd of white-faced range ewes of average quality, and through the use of high quality rams, (Columbia, Rambouillet, and Targhee) to determine the feasibility of developing superior types of sheep having a smooth body, open face, long staple, and producing a high fleece weight of clean wool and a large market lamb on southern Utah ranges. (2) To study factors affecting the percentage lamb crop and determine the feasibility of increasing this percentage under range conditions. (3) To determine the practicability and economic value of good spring and fall farm pastures and supplemental feeds during the fall, winter, or spring months in the range sheep enterprise.

Nine-hundred yearling ewes were purchased in the spring of 1944. These ewes were predominantly of Rambouillet breeding. Each fall since that time the ewes have been divided and one group bred to Rambouillet rams and one group to Columbia rams. The lambs resulting from the Rambouillet mating to the original ewes are referred to as "first cross Rambouillets" or "R-1," and the ewes are designated as "first cross" while the Columbia crosses on the original "Columbia" or "C-1."

Table 1. Average lambing and weaning data based on number of ewes bred and alive at lambing, 1947

<table>
<thead>
<tr>
<th>Breeding group</th>
<th>Ewes bred and alive at lambing</th>
<th>Ewes lambing</th>
<th>Lambs dropped</th>
<th>Lambs weaned</th>
<th>Weaning weight per ewe</th>
<th>Production per ewe</th>
<th>Fat</th>
<th>number</th>
<th>percent</th>
<th>percent</th>
<th>percent</th>
<th>pounds</th>
<th>pounds</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st cross 2 yr. olds bred to Targhee rams</td>
<td>48</td>
<td>97.9</td>
<td>112.8</td>
<td>95.8</td>
<td>89.0</td>
<td>85.3</td>
<td>47.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st cross 2 yr. olds bred to Columbia rams</td>
<td>53</td>
<td>92.4</td>
<td>100.0</td>
<td>94.3</td>
<td>89.8</td>
<td>84.7</td>
<td>32.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Columbia first cross 2 year olds</td>
<td>101</td>
<td>95.0</td>
<td>105.9</td>
<td>95.1</td>
<td>89.4</td>
<td>85.0</td>
<td>39.6</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Rambouillet first cross 2 yr. olds bred to Rambouillet rams</td>
<td>111</td>
<td>96.4</td>
<td>101.8</td>
<td>79.3</td>
<td>83.2</td>
<td>66.0</td>
<td>11.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Mature range ewes Columbia bred</td>
<td>332</td>
<td>92.5</td>
<td>138.6</td>
<td>122.0</td>
<td>85.5</td>
<td>104.3</td>
<td>21.7</td>
<td></td>
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<td></td>
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<tr>
<td>Mature range ewes Rambouillet bred</td>
<td>364</td>
<td>98.0</td>
<td>123.9</td>
<td>109.1</td>
<td>84.2</td>
<td>91.9</td>
<td>15.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>All sheep</td>
<td>908</td>
<td>96.6</td>
<td>124.4</td>
<td>108.6</td>
<td>85.2</td>
<td>92.5</td>
<td>19.1</td>
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</tbody>
</table>

Table 2. Grease weight, staple, grade, and shrinkage of wool clipped from experimental sheep, 1947

<table>
<thead>
<tr>
<th>Breeding group</th>
<th>Grease weight</th>
<th>Staple length</th>
<th>Distribution wool grades</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>pounds</td>
<td>inches</td>
<td>Fine</td>
</tr>
<tr>
<td>Range ewes bred to Columbia rams</td>
<td>10.1</td>
<td>2.22</td>
<td>71.6</td>
</tr>
<tr>
<td>Range ewes bred to Rambouillet rams</td>
<td>9.9</td>
<td>2.31</td>
<td>78.2</td>
</tr>
<tr>
<td>1st cross Rambouillet 2 year olds</td>
<td>9.65</td>
<td>2.43</td>
<td>61.7</td>
</tr>
<tr>
<td>1st cross Columbia 2 year olds</td>
<td>10.3</td>
<td>2.78</td>
<td>6.1</td>
</tr>
<tr>
<td>1st class Rambouillet yearlings</td>
<td>8.6</td>
<td>2.38</td>
<td>56.9</td>
</tr>
<tr>
<td>Range fed</td>
<td>7.6</td>
<td>2.42</td>
<td>48.4</td>
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<tr>
<td>1st cross Columbia yearlings</td>
<td>10.2</td>
<td>2.81</td>
<td>0.0</td>
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<tr>
<td>Range fed</td>
<td>8.8</td>
<td>2.74</td>
<td>3.7</td>
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Table 3. Shipping and slaughter data on experimental lambs, 1947

<table>
<thead>
<tr>
<th>Lamb groups</th>
<th>Lambs</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number</td>
<td>pounds</td>
</tr>
<tr>
<td>C-1</td>
<td>55</td>
<td>102.9</td>
</tr>
<tr>
<td>R-1</td>
<td>34</td>
<td>101.1</td>
</tr>
<tr>
<td>T-1</td>
<td>14</td>
<td>100.0</td>
</tr>
<tr>
<td>C-2</td>
<td>10</td>
<td>108.6</td>
</tr>
<tr>
<td>R-2</td>
<td>8</td>
<td>97.3</td>
</tr>
</tbody>
</table>

* Based on Los Angeles weight

DR. T. DONALD BELL is professor of animal husbandry and in charge of the animal husbandry research at the Branch Agricultural College at Cedar City. DR. L. L. MADSEN is head of the Department of Animal Husbandry. M. A. MADSEN is assistant professor of animal husbandry and is a specialist in sheep production and wool technology.
The “C-1” ewes were separated into two groups and bred in 1946 to Columbia and to Targhee rams. The lambs from the Columbia “C-1” crosses are designated as “T-1.” All of the first cross Rambouillet ewes were bred in 1946 to Rambouillet rams and the offspring designated as “R-2.” Careful records of wool and lamb production are kept for each ewe in the experiment.

Lambing and Weaning Results 1947

The heaviest average weight of lambs at weaning came from the Columbia first cross two-year-old ewes, with little difference shown in average weaning weight between those lambs sired by Targhee rams and those sired by Columbia (table 1). The lambs from the Rambouillet first cross two-year-olds averaged 6 pounds lighter than those from the Columbia first cross ewes, two-year-olds. The production per ewe (average pounds of lamb weaned for each ewe bred and alive at lambing time) was 18 pounds greater for the Columbia first cross two-year-olds than for the Rambouillets of the same age. This was caused by two factors. First, the Columbia cross lambs were heavier and, in addition, the Columbia cross ewes weaned a higher percentage of lambs.

The weaning weights of lambs sired by the Columbia rams out of mature ewes were slightly heavier than those sired by Rambouillet rams. This is in agreement with the findings of the previous years of the study, although the difference was less in 1947 than in preceding years.

Nearly one-half of the Targhee cross lambs were judged ready for slaughter by a packer buyer when they came off the summer range. The Columbia crosses had the next highest percentage of fats while the Rambouillets were lowest in condition.

Lamb Scoring

All of the lambs were examined individually at the time of weaning. Two or three men working independently rated each lamb for the amount of wool covering on the face, the number of wrinkles on the body, for desirable body type, and for condition. Length of wool on the side was also measured. The scores were then averaged for each lamb.

In general the Targhee and Columbia crosses were more open faced, graded higher on body type, were freer from wrinkles, and graded higher in condition. The second cross Colombias had the longest wool staple, followed by Targhee crosses, first cross Columbia, and Rambouillet. There was no appreciable difference between the first and second cross Rambouillet scores.

Shearing

All of the sheep were shorn on March 18, 19, and 20. Comparative grease weights, length of staple, and

(Continued on page 19)
New Varieties of Alfalfa

New Wilt-Resistant Varieties of Alfalfa Recommended for Planting in Utah

By R. J. EVANS and JOHN W. CARLSON

The wide-spread distribution of bacterial wilt is making many alfalfa fields in Utah unproductive after the third or fourth year of cropping. Common varieties, which have served so well in the agriculture of the state since the early days of settlement, are no longer adapted to present prevailing conditions. Utah Common, Grimm, Ladak, Cossack, and Hardigan are all unable to resist the ravages of wilt and are being replaced by new varieties developed in the breeding programs of the various agricultural experiment stations.

Most prominent among the new alfalfas are Ranger and Buffalo. These by reason of their greater wilt-resistance are rapidly gaining favor among alfalfa growers everywhere. In addition to being wilt-resistant, Ranger is winter-hardy and, like Grimm, is able to withstand the hard winters of northern regions. But when conditions other than bacterial wilt reduce the stands, the superiority of the new varieties may not be of so much vital concern to alfalfa growers. Such conditions, however, are relatively rare and the need for wilt-resistant varieties is practically state wide. Only in short crop rotations, where alfalfa is not left in production more than three years, will the old varieties continue to give satisfactory yields of forage.

History and Origin of New Alfalfas

Ranger alfalfa is a synthetic variety produced through the cooperative efforts of the Nebraska Agricultural Experiment Station and the United States Department of Agriculture. It has been widely tested under the auspices of the Alfalfa Improvement Conference; in addition, some of the members of the International Crop Improvement Association have materially assisted in the production of foundation seed. Thus, it has been possible through the cooperation of several state and federal agencies to determine rather carefully the adaptation of this variety and at the same time to increase the seed supply.

Ranger may be called a multiple strain variety, having been synthesized from five selections originating from the varieties Cossack, Turkistan, and Ladak. Some of the original strains of Turkistan entering Ranger were brought directly from that country by the late H. L. Westover, explorer for the United States Department of Agriculture. In morphological characters, Ranger exhibits considerably variability in habits of growth and flower color; only occasionally are yellow flowers exhibited. The plants vary in growth from decumbent to upright. They recover more quickly after cutting than do those of Ladak and Cossack, being similar to Grimm in this respect. Ranger is slightly more susceptible to leaf and stem diseases of alfalfa than Grimm and Common, but this characteristic has not proved a handicap under the low-rainfall conditions of the western states. Ranger, however, is distinctly superior to Turkistan alfalfas in seed production, being about equal to Grimm and Common alfalfa in this respect. Its outstanding characteristic, however, is its resistance to bacterial wilt, which enables it to remain in profitable production long after the stands of the older varieties of alfalfa have been reduced and rendered useless.

Buffalo alfalfa was produced at the Kansas Agricultural Experiment Station in cooperation with the United States Department of Agriculture. It is a selection from an old line of Kansas Common alfalfa traceable back as far as 1907. During the process of selection, while not inbred, it was closely bred with particular attention given to such characters as bacterial wilt resistance and seed and forage productivity, and at the same time selecting the superior characteristics of the original Kansas Common strain.

It has been found well adapted to the central states, but not too well adapted for the northern tier of states, owing to its lack of winter-hardiness. This deficiency is shown in a report from Saskatchewan, Canada, where 72 percent of the stand was killed out during the cold winters. But since it has been developed especially for wilt resistance in central zones of alfalfa production, there seems to be no question as to its value in this respect. Morphologically, it exhibits the same characteristics as Kansas Common, Utah Common, and other alfalfas that were formerly well adapted to the conditions of Utah. It appears also to be fully equal to Com-

Fig. 1. Relative height of Ranger (left) and Utah Pioneer (right) alfalfas in third year of cropping for hay at the Dairy Experimental Farm, Utah Agricultural Experiment Station, Logan. Average yield: Ranger, 2.32 tons per acre; Utah Pioneer, 1.40 tons per acre.
A word as to the origin and history of other alfalfa varieties may be of interest. Practically all varieties and strains of Turkistan alfalfa are known to be winter-hardy and partially resistant to wilt. There are, however, many reasons why these alfalfas are not more strongly recommended for use by farmers. One is that they are relatively poor seeders, and another that the plants are not well adapted to the humid eastern regions because of susceptibility to leaf and stem diseases. One should, therefore, not be misled by the relatively good showing of the Turkistan alfalfas in the present tests. While Orestan, Hardistan, Turkistan 86696, and others appear to be equal in productivity to Ranger and Buffalo, their inferiority soon becomes apparent under less favorable climatic conditions than are usually found in Utah and Idaho.

Another alfalfa of Turkistan origin is Nemastan. In tests in Utah and Nevada this strain has been outstanding in survival where the soil is infested with stem nematode. In some sections of these states the stem nemata are so severe that alfalfa growing has become hazardous, if not an impossibility. It was, therefore, decided to increase the seed of this strain of this variety, which otherwise is not a desirable alfalfa. It is recommended only for areas heavily infested with stem nematode. Atlantic alfalfa was produced at the New Jersey Agricultural Experiment Station. It has been a consistently good forage producer, and in seed yield has been above the average. But one serious deficiency of Atlantic is its susceptibility to bacterial wilt. It cannot, therefore, be recommended for use in the alfalfa growing regions of Utah and Idaho.

Seed Increase of New Alfalfas

An extensive program directed toward the increase of seed of Ranger and Buffalo alfalfa is at present underway in Utah. Under the rules and regulations of the Alfalfa Improvement Conference, the seed is being grown in the regions to which the varieties have been found to be best adapted. Seed of Ranger alfalfa is, therefore, being grown mostly in northern Utah, Montana, and in Idaho, while the production of Buffalo seed is restricted largely to the central and southern seed growing areas of Utah and in Kansas. In this way it becomes possible for alfalfa growers within the region of adaptation of a variety to utilize it in the production of seed and in the production of hay.

Three zones of alfalfa seed production in the United States have been defined in relation to the regions in which alfalfa varieties are best adapted, namely: (1) northern, (2) central, and (3) southern. The line marking the boundary between the northern and central zones cuts Utah in two parts near the southern limits of Utah County. Since Ranger is adapted to the states of the northern zone, seed of all generations, including foundation and registered seed, may be grown in all states within this region. For similar reasons, seed of Buffalo alfalfa is produced in the states of the central zone. Thus, production of Buffalo seed is being channeled into regions south of Utah County, while Ranger seed is being produced in the regions north of this point. A few exceptions occur owing to a lack of rigid control during the initial stages in the development of this program.

Inasmuch as the new and improved alfalfas cannot be identified by visible characters, such as is possible with varieties of other field crops, seed must be certified and marked with the official

(Continued on page 15)
CONTROL OF CURLY TOP

Curly top disease affecting sugar beets, tomatoes, beans, squash, and cucumbers, and transmitted by the beet leafhopper may be controlled by

1. Reducing areas of desert host plants especially Russian-thistle, by reseeding to grass.

2. Planting early so that plants may become well established before leafhopper movements.

3. Planting curly-top resistant beets.

4. Planting two tomato plants to a hill, or by covering plants with cheesecloth covers until after the leafhopper movement.

METHODS OF REDUCING LOSSES FROM CURLY TOP

By HOWARD E. DORST

The most consistent cause of reduced yields of sugar beets and tomatoes has been large numbers of beet leafhoppers spreading curly-top disease. The actual loss to farmers and sugar processors from the reduction in beet yields during the bad curly-top years of 1917, 1919, 1924, 1926, and 1930 averaged about $2,000,000 each year. The use of resistant varieties of beets has materially reduced this loss. However, in the bad leafhopper year of 1940, the resistant beet crop suffered a loss of about $1,000,000. Tomato growers lost over 20 percent of their crop in 1937, which amounted to about $150,000 and in 1940 the loss was about $350,000.

The beet leafhopper is the only insect which carries the curly-top disease of beets and western yellow blight of tomatoes. This leafhopper transmits curly-top to sugar beets, to tomatoes, beans, squash, cantaloupe, other vegetables, and many ornamental plants. Curly-top, sometimes called blight, stunts the growth of beets. Western yellow blight actually kills the tomato plant. In years of high yield of sugar beets and tomatoes, the beet leafhopper population has generally been small and curly-top damage slight. However, all low yields of these two crops are not the result of curly-top disease. Lack of irrigation water and poor cultural practices also affect yields.

The beet leafhopper is primarily a desert insect. It prefers young, sparsely growing plants, such as Russian-thistle, alfalfa, plantain, and the wild mustards, but it does not live on grasses. These host plants are found in desert areas of high temperature and little water.

This insect does not overwinter in the cultivated areas. Infestations of the cultivated crops result from leafhoppers moving in the spring from the overwintering quarters.

Leafhoppers reproduce from eggs laid in the plants. The young, or nymphs, are wingless; however, the adults are winged and capable of flying great distances. As the spring food plants mature on the desert, the leafhopper must seek other plants on which to live. These plants may be close at hand or many miles from the winter quarters. As the leafhoppers seek suitable food, cultivated crops become infested and inoculated with the curly-top virus. Fortunately, all the leafhoppers do not reach the cultivated areas and, of those that do, not all carry the disease. The number carrying the disease varies from year to year.

A study of the breeding grounds shows that leafhoppers that infest cul-

Farm and Home Science
tivated crops west of the Wasatch Mountains in Utah come from two sources. The southern breeding area extends down the drainage of the Virgin and Colorado Rivers from St. George, Utah, to Needles, California, and the northern, or local breeding area, consists of eleven small grounds adjacent to Utah and Great Salt Lakes.

The southern breeding area is populated each fall by beet leafhoppers that move from two large areas of Russian-thistle. One of these areas is in the Escalante Desert, which includes much of Iron, Beaver, and Millard Counties in Utah, and the other is in the northern portion of Mohave County in Arizona. From 350,000 to 500,000 acres of Russian-thistle grow in these two areas. The leafhopper overwinters in the southern breeding area. Since the winters are mild, the insect breeds and feeds throughout the winter. During April and May, the desert plants in this area mature and the leafhoppers move on to the cultivated area of northern Utah. This is called a long-distance movement and it occurs at the time when the sugar beets are in the seedling stage.

Russian-thistle also plays an important part in the leafhopper's life in the northern breeding area. In the fall, the leafhoppers move from the Russian-thistle to weeds that will survive the winter. Many hoppers die in the winter, but enough remain to produce a new generation of leafhoppers which moves in the spring to infest the cultivated crops. This movement from the northern breeding area occurs in late May and June and is called the local movement. The local movement is of particular importance to tomatoes.

In both the southern and northern breeding areas, Russian-thistle is the outstanding plant on which the leafhopper thrives. If Russian-thistle could be eliminated, the leafhopper would not be such a serious problem. Russian-thistle grows chiefly in disturbed or overgrazed land. Any method which will reduce the growth of this and other weeds and promote the growth of grass will reduce the leafhopper menace (fig. 5).

Sugar beet varieties resistant to curly top have given satisfactory yields even under severe leafhopper outbreaks. Early plantings of these varieties, however, supplemented by early and careful irrigation and good cultivation, will reduce losses from curly top.

The tomato is not a favorite food plant of the leafhopper. The insect feeds on it only incidentally. The practice of placing two tomato plants approximately 6 inches apart in each hill as shown in figures 3 and 4 has reduced losses from curly top in experimental plots. In the bad outbreak year of 1940, two plants were placed in each hill and compared with single plants in a test replicated 32 times in plots of 100 hills each. At the end of the season, after curly top had taken its toll, only 27 percent of the double-hills were destroyed by curly top compared with 73 percent in the conventional single-hills. The yield from two plants to the hill has not doubled that of a single plant to the hill, but the increase has been sufficient to pay for the extra plants in years of low leafhopper infestation plus an additional profit.

Double-hills have worked so well in experimental plots that some demonstration double-hill plantings have been made in commercial fields in the past two years. In 1947, strips 9 to 11 rows wide were planted with two plants per hill on the opposite side of harvest roads from strips of single plants. Yield records obtained from these fields throughout the tomato growing area showed increases of 4 to 6 tons per acre from double-hills.

Tomato plants can be covered with cheesecloth during leafhopper migration, as shown in figures 1 and 2, but this practice is too expensive except for early-market tomatoes.

Intensive research is being conducted by Department of Agriculture workers to develop a tomato resistant to curly top or western yellow blight. So far a commercial curly-top resistant variety has not been developed.

To aid the grower in timing the planting of his crop to reduce leafhopper damage, surveys are made each season of all breeding areas most responsible for destructive numbers of leafhoppers. By this means, it is possible to determine before planting time...
the leafhopper outlook for the approaching season. Two statements on leafhopper conditions are issued each year, in early April and in early May. These statements are circulated through the Extension Service to county agents, newspapers, radio, and other interested parties. By using information of this kind, sugar beet growers and canning people have been able to reduce their losses considerably.

These statements are based on the following factors: (1) Population of beet leafhoppers on Russian-thistle in desert breeding areas the previous fall, (2) date and quantity of fall precipitation which is required to germinate winter and spring annuals, (3) air temperature and its fluctuation during the fall and winter, (4) temperature of soil with and without snow cover, (5) population of overwintered beet leafhoppers, (6) adequacy of precipitation in late winter and spring for maintaining host plants, and (7) percentage of overwintering leafhoppers that carry the virus.

Summary

The curly top disease on sugar beets, tomatoes and other crops is transmitted by the feeding of the beet leafhopper. In Utah, two independent movements of the leafhopper occur each spring. The first is in April and May from the southern breeding area. The second, in late May and June, originates from the local breeding areas. The insect’s principal habitat is the desert. When the desert host plants mature and dry in the spring, the leafhopper moves into the cultivated areas and adjacent Russian-thistle for food. Elimination of extensive Russian-thistle areas adjacent to the breeding grounds will break an important link in the life cycle of the insect. Double-hill plantings with plants six inches apart in the hill have given substantial protection against the beet leafhopper on tomatoes in outbreak years in northern Utah and increased yields from 4 to 6 tons. Two statements of leafhopper conditions, one in early April and the other in early May, are published in advance of the growing season to advise growers of leafhopper conditions.

Food Poisoning

By KENNETH R. STEVENS

Food poisoning is a broad term which includes not only certain bacterial infections, but also conditions resulting from the consumption of naturally poisonous food substances: toadstools, poisonous fish, ergot-infected grain, and to the ingestion of foods containing certain chemicals. Food poisoning is usually associated with, and indicated by, acute gastrointestinal disturbances. Exceptions to this condition, however, are botulism poisoning which shows little, if any, gastrointestinal symptoms, and food allergy in which the food is wholesome but the consumer develops an abnormal reaction to it.

A distinctive feature of an outbreak of food poisoning is the sudden illness of several persons following a specific meal, and usually associated with a definite item in that meal. Characteristic symptoms of illness are one or more of the following: headache, nausea, vomiting, diarrhea, and abdominal cramping. In determining the true cause of food poisoning, an immediate investigation is essential, for a few hours’ delay after the symptoms appear may mean the loss of definite poisons in the vomitus and body discharges. The delay may also bring about definite bacterial changes in a perishable food product, thus altering its appearance, and composition since portions of it had been consumed.

Dr. Kenneth R. Stevens is associate professor of bacteriology.

Since man has learned to preserve foods by scientific methods based upon principles, great changes have taken place in his manner of living. Fresh fruits, vegetables, and meats are produced and shipped fresh or processed to distant markets any season of the year. There is a somewhat popular belief that food poisoning is associated with food decay in such foodstuffs during transportation, handling, and shipping; but deterioration of foods does not necessarily give rise to the production of poisonous substances found in food poisoning.

About sixty years ago, food poisoning was thought to be caused by the presence in food of poisonous substances called ptomaines, formed as a result of protein decomposition. Research work, however, has shown these compounds to be but weakly toxic. Also, it was found that ptomaines are not formed until foods have reached such advanced stages of decomposition that they are repellent to the senses of taste and smell. Since food poisoning results from the eating of food which is usually sound in appearance, there is no basis to speak of ptomaine food poisoning.

The infectious type of food poisoning is that kind in which bacteria of the Salmonella group are transmitted by the food to man’s body where they grow in the intestines and produce disturbances similar to, though milder than, typhoid fever. This kind of poisoning is associated mostly with meat and meat products.

A group of persons developed food poisoning as a result of eating meat from an emergency-slaughtered cow. One person died and the same germ was isolated from his body as from the meat. Several men were poisoned from eating sausage. A meat inspector examined the suspected product and found it satisfactory in appearance, color, and odor. He and four other men ate some of the meat. All became ill within a few hours, and the inspector died on the sixth day. Laboratory studies showed a member of the Salmonella group present in the vital organs of the dead man and the same species of organism was isolated from a sample of the sausage.

Foods become contaminated with Salmonella by using meat from emergency-slaughtered animals; from carelessness on the part of healthy persons whose feces carry the germ; from rats and other rodents as well as flies which may carry the organism in and about slaughter houses and meat markets; from allowing good meat to come in contact with diseased meat; or from instruments and tools used on diseased meat which are not properly sterilized before being used on healthy meat.

The prevention of this type of food poisoning will be associated with the recognition and understanding of the
above sources of contamination. Food inspection, health and cleanliness among human personnel, and proper conditions of food storage are among the most important items to observe.

In the toxic type of food poisoning, the organisms secrete a poisonous substance from their own bodies into the food. This occurs before the food is eaten and is responsible for the most common type of food poisoning. The symptoms appear quickly and the attack is of short duration. This type of poisoning is caused mostly by members of the Staphylococcus group of bacteria. These organisms are everywhere present and particularly on human skin and in the throat. They are able to grow in food without the food showing any signs of spoilage from the standpoint of appearance, taste, odor, or color; and yet the poisonous toxin may have been secreted and be present. Foods most responsible for this type of poisoning are meat, milk, pastries, puddings, gravies, especially when they have been left for a few hours at room temperature. This type of food poisoning accounts for large groups of individuals becoming ill after banquets, parties, and similar gatherings.

The prevention of this type of food poisoning may be effected by proper inspection of human personnel and the recognition that low temperatures inhibit the growth of the organism which secretes these toxic poisons. It is well to avoid holding prepared foods at room temperature even for a few hours' time prior to serving them.

Botulism poisoning is caused by the secreted poison produced during the growth of the botulism bacteria in improperly heated canned foods. These bacteria occur commonly in soils and are easily transmitted to foods by contact, as in the case of vegetables, and by dust on fruits and meat. No cases of botulism, however, have been traced to commercially canned foods since 1925. Home canned foods are still responsible for occasional outbreaks because some housewives fail to recognize the resistance of this organism in its spore form to heat. The spores of this organism are known to withstand a boiling temperature for six hours. The higher temperature obtained in a pressure cooker, in association with the periods of time recommended in government bulletins, is essential to the destruction of the organism in the spore form. If foods are properly processed, there is no reason why any home canned food product should carry the botulism toxin. If one suspects a food substance, however, even though it shows no changes in appearance or odor, as may happen in the presence of botulism organisms, the food can be made safe for use by boiling it for twenty to thirty minutes, preferably with stirring.

The symptoms of botulism food poisoning usually appear in one or two days after eating the food, and are characterized by disturbances in vision, and difficulty in speaking, swallowing, and breathing.

There is no evidence of poisoning ever having been caused by molds growing on or in foods.

Chemical food poisoning is not common compared with bacterial types, but a few examples may be cited to indicate possibilities. Arsenic and lead poisoning, usually associated with the result of spraying programs, are of minor importance. Such types of poisoning are more likely to be associated with occupations in which these chemicals are used. Cadmium coated ice trays, pitchers, and other utensils have been responsible for cadmium food poisoning when acid foods such as lemonade, or home made punch come in contact with them. Fluoride food poisoning is caused by the use of sodium fluoride, a white powder used as an insecticide, and often mistaken for baking powder, baking soda, or flour. Methyl chloride food poisoning happens when this substance is used as a refrigerant in home refrigerators and leaks develop in the system. This type of food poisoning is often mistaken for botulism poisoning, because of a similarity in symptoms. Tin poisoning is practically unknown, despite a common notion which people have that food spoils more quickly when standing in an open tin can than if removed from the can and placed in another type of container. Any spoilage occurring will be caused by bacteria and not by a reaction between the food and the tin coating on the sheet metal can.

Preventative measures for chemical food poisoning require a knowledge of the probable sources of the various chemicals which may be involved, and the exercising of extreme care in the use of products whose identity is not well known.

If the general fundamental principles associated with the prevention of food poisoning are properly practiced, there is little reason why poisoning should be a serious problem.

**COST OF PRODUCING PEACHES**

(Continued from page 3)

third. This group of overhead costs accounts for about 29 cents of every dollar of cost, and is too frequently left out of calculations when hurried cost estimates are made.

As a group material costs constitute about 17 percent of the total cost of production. Material costs are composed of barnyard and commercial fertilizers, containers, spray, and other similar items. In this group the cost of containers was greatest.

Power costs constitute the remaining group of items and account for about 12 percent of the total costs. Tractor power accounts for 59 percent, truck power for about 35 percent, and horse power for the remaining 6 percent of the total power costs.

Of the various factors that would have an influence on the total success of the peach enterprise, yield per acre was the most important. It was directly associated with cost per bushel and hence net return. As yield increased, cost per bushel decreased significantly.

The yield per acre was associated with several factors. The age of the trees had some bearing on yield and hence the total profitability. Trees between the ages of 7 to 14 years had the greatest yield, and with cost and price levels of 1947, they were the most profitable. The amount of man-labor spent per acre maintaining the orchard was associated with yield. The greater amounts of time spent in the maintenance operations were accompanied by greater yields. This was particularly true with the completeness of the pruning operation. The data obtained were not sufficient to make detailed analysis of fertilizer treatment used, but a significant increase in yield resulted from the use of fertilizers.

The peach is a perishable farm commodity, and, therefore, must be marketed within a short period of time. Canning factories provide a market for a small portion of the crop, but the major part is marketed as fresh fruit through peddling from door to door, through the fruit and vegetable department of the grocery stores, through sell-
ing at roadside stands usually operated by the producer, or through out-of-state shipments usually handled by producers' marketing associations or produce brokers operating in the area.

Utah peaches in out-of-state trade go into Idaho, California, Arizona, Kansas, Nebraska, Oklahoma, Missouri, and Iowa. In some years a few peaches enter into the markets of Minnesota, Wisconsin, and Illinois. Utah peaches are competing on these markets with peaches from central and northern California, Colorado, Idaho, Arkansas, Illinois, and Indiana.

On the local markets Utah peaches find competition with peaches from Idaho, California, and Colorado. With this competitive nature of the market for peaches, it is necessary that producers keep fully abreast with all new methods and practices and know the economics of their production problems.

What about the outlook for the 1948 peach crop? While the price of peaches next fall cannot now be predicated with much accuracy, it may be safe to predict that most of the cost items will continue at a high level. To be on the safe side, the grower should see that his operations are performed with increased efficiency, that the essential operations are not neglected, and that

too expensive and time consuming for most growers to undertake. Experiment stations assume that responsibility and by proper randomization, replication, and statistical analysis arrive at an evaluation of the corn hybrids available. Final judgment is based on dry weight yields per acre, stage of maturity, strength of stalks, proportion of ears to stalks, and disease resistance.

Green weights are often deceptive as is height. Some hybrids produce 3 to 5 tons more green weight per acre yet yield no more in dry matter than do hybrids that are much shorter but more mature.

Recommendations
As a result of the testing program at the Utah Agricultural Experiment Station the following corn hybrids have been found adapted to substantial areas of the state:

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<td>16.0</td>
<td>5.00</td>
<td>87.8</td>
<td>96.6</td>
<td></td>
</tr>
</tbody>
</table>

A few of the above yields are from only one or two nurseries but most of them represent averages of 5 to 7 nurseries each year.
they local problems. Seedbeds should be prepared when the soil is at the proper moisture content and then worked just before seeding in order to kill the weeds. Corn can be planted one to two weeks before the last average spring frost date. A frost in the seedling stage is not nearly as harmful as one prior to maturity in the fall. Hybrids vary considerably in size of kernel, therefore, some difference in planting rates may prove profitable. The level of fertility and condition of seedbed also are factors that should help determine the rate of planting. Generally planting from 10 to 15 pounds per acre insures good stands. Under irrigation, rows 3 to 3½ feet apart have been recommended with plants averaging from 8 to 12 inches apart. Thicker stands can be supported on highly fertile soils but should be avoided on low fertility lands. Sufficient cultivation to keep down weed growth is usually enough to insure good tillth and aeration. Furrowing rather deeply, followed by light irrigations either in alternate rows or in all rows may be practiced. If the corn becomes deep green or the leaves commence to curl in the daytime, it is time to irrigate. Often two to three light irrigations will be sufficient for a productive corn crop.

Many corn fields receive more water than they need.

**Fertilizers for Corn**

In general, heavy applications of manure or ammonium sulfate or ammonium nitrate increase the profits in corn production. Usually sufficient phosphorus and potash are supplied by the soil, and no further additions are necessary for corn. Data in table 2 indicate the response to fertilizer in the experimental plots at North Logan.

It is best if the nitrogen fertilizer is drilled in bands at one side of the seed or broadcast prior to planting. Applications can be made after the corn has reached the height of several inches if desired. In no case should the concentrated fertilizers be applied at the time of planting with a drill that places the seed and fertilizer in the same opening. Such a practice results in low germination and an inhibited growth of the plants. Excessive amounts of irrigation water leach out the nitrogen and cause poor aeration of the soil.

**Harvesting**

When the corn reaches the hard dough or the glazed stage it should be put into the silo. Too early harvesting is followed by great losses of liquids from the silo. Freezing of the leaves is not too serious, but after such frost, it is well to harvest immediately. If frost damage has dried the leaves excessively, it is usually advisable to add water to the corn when it is put into the silo. This will aid in stimulating proper fermentation.

---

**Table 1. The yield of corn in relation to fertilizer practice—North Logan**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Acre yield of green corn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S. 52—1946</td>
</tr>
<tr>
<td>Control—no treatment</td>
<td>13.66</td>
</tr>
<tr>
<td>Treble superphosphate 200 lb./acre</td>
<td>14.34</td>
</tr>
<tr>
<td>Manure 10 tons/acre</td>
<td>17.00</td>
</tr>
<tr>
<td>Ammonium nitrate 200 lb./acre plus treble superphosphate 200 lb./acre</td>
<td>20.62</td>
</tr>
<tr>
<td>Same as 4 plus muriate of potash 100 lb./acre</td>
<td>20.12</td>
</tr>
</tbody>
</table>

**Table 2. Average forage yields by crops of standard varieties and improved strains of alfalfa at the Aberdeen Branch Experiment Station, Idaho Agricultural Experiment Station, for a 3-year period prior to the deterioration of stands caused by the wilt disease (App. 12% moisture) (Avg. 1942-1944, inclusive)**

<table>
<thead>
<tr>
<th>Variety and origin</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>General mean total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardistan</td>
<td>3.88</td>
<td>2.82</td>
<td>1.87</td>
<td>8.57**</td>
</tr>
<tr>
<td>Turkistan 86696</td>
<td>3.79</td>
<td>2.79</td>
<td>1.98</td>
<td>8.56**</td>
</tr>
<tr>
<td>Ranger</td>
<td>3.79</td>
<td>2.75</td>
<td>1.84</td>
<td>8.39**</td>
</tr>
<tr>
<td>Buffalo</td>
<td>3.50</td>
<td>2.58</td>
<td>1.84</td>
<td>8.32**</td>
</tr>
<tr>
<td>Turkistan 19300</td>
<td>3.54</td>
<td>2.63</td>
<td>1.78</td>
<td>7.96</td>
</tr>
<tr>
<td>A 174 Kansas (Synthetic)</td>
<td>3.39</td>
<td>2.61</td>
<td>1.92</td>
<td>7.92</td>
</tr>
<tr>
<td>Orestan</td>
<td>3.60</td>
<td>2.56</td>
<td>1.72</td>
<td>7.88</td>
</tr>
<tr>
<td>Kansas Common</td>
<td>3.38</td>
<td>2.59</td>
<td>1.82</td>
<td>7.79</td>
</tr>
<tr>
<td>A 8 Kansas (Synthetic)</td>
<td>3.12</td>
<td>2.80</td>
<td>1.80</td>
<td>7.72</td>
</tr>
<tr>
<td>Turkistan 15754</td>
<td>3.53</td>
<td>2.53</td>
<td>1.60</td>
<td>7.66</td>
</tr>
<tr>
<td>Cossack</td>
<td>3.62</td>
<td>2.39</td>
<td>1.53</td>
<td>7.54</td>
</tr>
<tr>
<td>Grimm (Idaho)</td>
<td>3.64</td>
<td>2.43</td>
<td>1.43</td>
<td>7.50</td>
</tr>
<tr>
<td>Turkistan 19302</td>
<td>3.27</td>
<td>2.49</td>
<td>1.68</td>
<td>7.44</td>
</tr>
<tr>
<td>Meecker Baltic</td>
<td>3.57</td>
<td>2.32</td>
<td>1.42</td>
<td>7.31</td>
</tr>
<tr>
<td>Ontario Variegated</td>
<td>3.42</td>
<td>2.27</td>
<td>1.32</td>
<td>7.01</td>
</tr>
<tr>
<td>Ladak (Idaho)</td>
<td>3.59</td>
<td>2.23</td>
<td>.98**</td>
<td>6.80—**</td>
</tr>
<tr>
<td>Hardigan (Michigan)</td>
<td>2.98</td>
<td>2.18</td>
<td>1.21</td>
<td>6.38—**</td>
</tr>
<tr>
<td>Utah Pioneer 152</td>
<td>2.51**</td>
<td>2.04</td>
<td>1.51</td>
<td>6.07—**</td>
</tr>
<tr>
<td>Means</td>
<td>3.47</td>
<td>2.50</td>
<td>1.62</td>
<td>7.60</td>
</tr>
</tbody>
</table>

Difference required for statistical significance:

1% point: .57 .57 .57 .43

Between means of crops:

.17 tons

Key to symbols:

* Statistically superior to the average at 5% point.
** Statistically superior to the average at 1% point.
*** Statistically inferior to the average at 1% point.
THE extensive program in breeding for resistance to disease in the tomato at the Utah Station has received a definite set-back in the untimely and sudden death of Dr. H. Loran Blood, March 8, 1948.

Dr. Blood had spent his full time since 1928 in breeding a commercial tomato resistant to both the verticillium wilt and curly-top diseases, and in developing methods of disease control in the tomato. He developed the acid seed soak for the control of bacterial canker disease that is used extensively throughout the country. He made thousands of crosses in tomatoes, crossing wild disease-resistant varieties with commercial varieties in an attempt to find one that had the desirable qualities of both. In the curly-top program alone, Dr. Blood stated that in the ten years from 1930 to 1940, 1444 single plant selections from fields destroyed by the disease, 1250 varieties of wild, novelty, and commercial tomatoes, 7 species of green-fruit tomatoes, and over 300 inter-varietal and inter-specific crosses were tested for resistance to disease.

He maintained a fifteen acre trial ground at Hurricane where large numbers of single plant selections of strains, varieties, and species were tested for resistance to disease. Other plots were maintained in Weber and Davis Counties as well as in Logan where the behavior of promising selections made on the Hurricane trial grounds was observed.

Dr. Blood spent six months in South America, the original home of the tomato, hunting for wild varieties of the species that could be used in the breeding program in the hope of finding a variety that would prove resistant to these diseases and could be used as parent stock in the breeding program.

The problem of developing resistance to disease is a highly complicated one because so many factors, such as reactions to temperature, humidity, and available nutrients, plant transpiration rate, photosynthetic activities, translocation of nutrients, hydrogen-ion concentration of cell sap, and the age, vigor, and structure of the plant, influence the expression of the phenomenon in the tomato. When the additional genetic factors that play a part in the development of size, color, and quality in the tomato fruit are considered, the problem becomes extremely complex. All of these factors must appear together in the proper combination within the inherited makeup of an individual plant before it will express the desired degree of resistance and quality. That individual plant may be literally "one in a million." It is a recognized fact that if ten factors are involved in a desired combination between two parents, those ten factors will appear in the right combination in only one plant of a progeny of 1,048,576. It is evident, therefore, that large populations of material must be grown before the individual that is wanted may be found.

In spite of his long, painstaking efforts, for him the goal proved elusive. Size and disease resistance seemed antagonistic to each other. As soon as a hybrid showed size or desirable color it lost its disease resistance. A disease-resistant tomato of commercial quality must await further work by others. Dr. Blood's death has caused the temporary closing of the work, because at the present time there is no one available who can take over his work where he left off.

Dr. Blood was born in Kaysville, Utah, December 14, 1900. He received his B.S. degree at Utah State in 1926, his M.S. in 1928, and his Ph.D. from the University of Wisconsin in 1930. His entire productive life was devoted to the tomato breeding work, first as an assistant on the experiment station staff, and then as an employee of the U.S. Bureau of Plant Industry, Soils, and Agricultural Engineering working cooperatively with the Utah Station.

He wrote a number of articles published in technical periodicals as well as more popular articles on control of disease in tomatoes. He was a regular contributor to Farm and Home Science, having written three articles in the past volume.

Dr. Blood took an active part in church and community activities and was attending a church meeting at the time of his sudden death. He leaves a wife and four children.

ALFALFA VARIETIES
(Continued from page 15)
Agricultural Experiment Station, near Aberdeen, Idaho. Data are given in table 1 and statistically significant differences are marked by the appropriate symbols. Forage production of all varieties is reasonably high for the 3-year period immediately following planting; after which the stands became greatly reduced by wilt disease and yields declined rapidly. The earliest evidence of a reduction in stands was noted at the Aberdeen station in the third year of the tests (1944). Thereafter, evidence of wilt infestation became apparent in the plantings in Salt Lake County and in the Uinta Basin.

Ranger, Buffalo, Turkistan 86696, and Hardistan lead in the production of forage. Low yielding varieties are Ladak, Utah Pioneer, (a selection from Utah Common), Hardigan, and Ontario Variegated. Loss in forage production in the fourth year is attributable largely to poor stands resulting from wilt infestation. All varieties of Turkistan origin show high survival value. The varieties low in survival are Mecker Baltic, Utah Pioneer, Ontario Variegated, and Hardigan. High forage yields in the fourth year are thus shown to be closely associated with high resistance to wilt infection.

Summary
Plantings were made in 1941 of 18 varieties and strains of alfalfa in duplicate 1/4 acre plots at three sites in Utah and one in Idaho. Entries include most of the common standard varieties of alfalfa; the newly improved varieties, Ranger and Buffalo; several breeding selections which have not yet attained the status of new varieties; and a few introductions from the important alfalfa
of breeding area and other factors have been of great financial benefit to farmers not only in years of serious outbreaks, but in years of low insect populations by saving the cost of spraying or other treatment. In years when serious outbreaks of the insects are expected early predictions enable the farmers to take preventative measures such as spraying, cultural practices, or planting crops not attacked by the pests. In years when environmental factors are not conducive to high insect populations, the farmer need not waste either his time or his money in spraying or baiting operations. These predictions are especially effective for the beet leafhopper, the tomato fruitworm, and for grasshoppers and crickets.

**Magnesium Carbonate Grit**

Use of magnesium carbonate for grit in place of calcium carbonate has consistently decreased egg production in experimental studies at the Utah Station.

**Alfalfa Meal in Turkey Feeding**

Alfalfa meal of good quality is usually abundant in Utah and at a price from one to two dollars per hundred pounds less than the price of wheat and barley and at times as much as three dollars less than corn. As a result of experimental work at the Utah Station most of the large turkey growers in the area during the past three years have used growing mashes containing 20 to 40 percent of alfalfa meal instead of 5 to 10 percent commonly used. Replacing 15 to 20 pounds of grain with a similar amount of alfalfa meal has resulted in a saving of 20 to 60 cents on each hundred pounds of growing mash or from 10 to 30 cents in the feed cost of each turkey produced, or a saving of more than a quarter of a million dollars in feed costs in 1947 when 1,263,000 birds were marketed in the state.

**Revised Method of Grading Canning Peas**

Studies of quality in canning peas at the Utah Station have resulted in revised standards of grading and pricing by the canning industry in the state. The sieve method of grading was shown to be an unreliable standard of quality as there is little relationship between size and quality. For example the percentage of starch of sieve grades 1 and 2, as well as 3, increased within the grade as the peas advanced in maturity. Consequently, peas harvested at the end of the season in these grades were of poorer quality than those harvested during the first part of the season. Use of the tenderometer showed a much higher correlation. That is, as maturity advanced, the tenderometer value increased as did the starch content. This was true in all sieve grades. The tenderometer method has now been adopted by canning companies throughout the state. Canning companies have also revised their rate of pay so that growers get more on an acreage basis for better quality peas than for older peas.

**Canal Lining Studies**

Of the water used for irrigation in the arid West it is estimated that one-third is lost through seepage in conveyance from the place of storage to the farm. Earlier studies showed that these canals could be lined with inexpensive native materials and reduce seepage. Lining of two experimental sections with a layer of clay four inches thick covered by a thin layer of gravel saved 4.2 cubic feet of water per second or 1500 acre feet during the first season of six months alone. This water had a value of $2,000 or 2/5 the cost of lining the canal.

In an effort to find other inexpensive materials with which to line canals throughout the state and thus prevent seepage losses, the Utah Station built a laboratory where further experimental studies could be made. Data from these studies show (1) that the effectiveness of clay linings may deteriorate rapidly if they are subject to intermittent drying; (2) that sandy loam bentonite mixtures seem to be preferable to clay for exposed canal linings because they are less subject to cracking upon drying; (3) that earth linings should be protected by a layer of natural earth material, gravel, loose rock, or other material to reduce freezing and drying and to prevent erosion and eventual destruction of the lining; (4) that compaction at optimum moisture does not reduce the permeability of sandy loam bentonite mixtures or the equilibrium permeability of certain soils over that of moderate packing in the air dry state, and (5) therefore that materials for lining should be restricted to those which assume a low equilibrium permeability, irrespective of compaction, as insurance against increased permeability with use which might be expected to develop where the low permeability of a material is dependent primarily on its initial state of compaction.
Fig. 1. Most of the rice grown in Siam is transported to Bangkok, the capitol city, where it is milled and much of it prepared for export. In this picture Siamese coolies are shown carrying bags of polished rice from the mill to the steamship for export. Each bag of rice weighs 220 pounds. 2. Typical farmstead scene in Siam. The farmer's home and other buildings are built along the canal bank. As the rice is cut in the field, bundles of grain are brought into the farmyard and placed in stacks until threshing time. Threshing is all done by trampling by water buffalo. 3. Bundles of rice grain are transported from the fields to the farmstead on sleds pulled by water buffalo. Women work in the fields along with the men in the planting and harvesting operations in the growing of rice. 4. There are many varieties of rice, some of which are adapted to the upland areas where the rice must be irrigated. This picture shows the rice growing between two irrigation ditches. 5. Human labor is comparatively cheap in Siam. The coolie is dipping water out of the irrigation ditch with a bucket attached to a pole to irrigate soybeans. 6. Headquarters buildings at the Rangsit Rice Experimental Substation in Siam

DIRECTOR R. H. WALKER RETURNS FROM SIAMESE MISSION

Director R. H. Walker returned to Utah April 12 after spending three months as the head of an agricultural mission to Siam. The mission was sponsored by the Food and Agricultural Organization of the United Nations and was composed of nine agricultural specialists gathered from various parts of the world to advise with the Siamese government on ways of improving efficiency of production of food and agricultural products.

FAO was organized in 1943 out of a wartime conference to implement hope for peace by affording assurance that all men in all lands may live out their lives in freedom from want. The conference, called by President Roosevelt, agreed on these points: (1) Two-thirds of the people in the world are ill-nourished. (2) Their health could be vastly improved if they were able to get enough of the right kind of food. (3) The farmers of the world, constituting two-thirds of its population, could produce enough if they employed methods known to modern science. (4) Through increased production and effective distribution full-time work for all could be provided and a process put in motion to stamp out want. (5) To attain these ends, the nations must act in concert.

The FAO is now composed of more than fifty member nations organized together to raise the levels of nutrition and standards of living of the peoples of all countries; to secure improvements in the efficiency of the production and distribution of all food and agricultural products; to better the condition of rural populations; and thus to contribute toward an expanding world economy.

The working staff of the organization, with headquarters in Washington, works with advisory committees of leading experts from all parts of the world in making studies, collecting information, analyzing data, and then facilitating the free and rapid exchange of this information throughout the world. FAO gives assistance to governments that ask for it. One form of this assistance is the sending of missions of agricultural experts to study the problems of these governments. After these missions make their reports, the FAO is prepared to follow up with technical aid in working out solutions to the problems.

The mission to Siam headed by Dr. Walker is the third sponsored by FAO. The first mission, which was sent to Greece in 1946, was headed by Dr. F. S. Harris, president of the Utah State Agricultural College.

Before returning to the United States the mission to Siam prepared a report on its findings with recommendations to present to FAO. This report will be printed in Siamese and English and given to the Siamese government for a guide in developing their agricultural program. The FAO will continue to assist the government in this program, especially in its international aspects.

A conference with representatives of the countries of southeast Asia has already met on the eradication of rinderpest disease. In addition to the report, individual members of the committee gave direct aid to the Siamese while they were still in the country. Among other things, direct assistance was given in the analysis of proposed irrigation schemes and structures, and also a program for research in the use of commercial fertilizers on rice fields was outlined.

The basis of Siamese agriculture is the production of rice, which is grown on approximately ten million acres, or
over 90 percent of the cropped area. Before the war approximately one million tons of rice were exported. Today the amount exported is much less. One of the major purposes of the mission was to recommend ways of increasing rice production.

In addition to rice, Siam also raises some cotton, sugarcane, soybeans, peanuts, and tobacco. There are many tropical fruits among which are bananas, mangoes, chikus, rambutans, oranges, pomeloes, mangosteens, durians, and litchis. Truck gardening is also practiced, especially around Bangkok, the capitol city. Some hevea rubber is also produced in the south.

While cattle are not used extensively as food, draft cattle and carabao are of great importance to the farm family as work animals. Some hogs are raised and nearly every household has a few native chickens. Fish are an important feature of the diet. Drying with salt and fermentation of smaller fish are the common methods of preservation.

**RANGE SHEEP**

(Continued from page 7)

percentage distribution by grade for the various groups are shown in table 2.

Yearling ewes wintered on the farm showed a response to their better feed conditions and sheared more wool than those maintained on the winter range. The Columbia crosses sheared more grease wool than Rambouillet crosses.

The wool from the various groups was sacked separately and core-tested for an estimate of shrinkage. The longer stapled wool from the Columbia crosses was lighter shrinking than the shorter Rambouillet wool.

**Shipping and Slaughter Data**

For the past three years the grass fat lambs as well as those fattened in the fields and feed lot, have been sold through the Cedar City stockyards to Swift and Company of Los Angeles. Shipping and slaughter data have been obtained from all these lambs. A summary of the 1947 data is shown in table 3.

The dressing percentages, based on "off-the-car" weights in Los Angeles, for the past three years have been 50 to 51 percent on the various groups of lambs. The 1947 lambs dressed slightly higher ranging from 50.3 to 54.1 percent.

The weight of preservative absorbed was determined by weighing the posts before and after treatment.

The measurements taken on the experimentally treated posts indicate little difference in the effectiveness of the hot-cold soak over the cold soak treatments. Both treatments gave a satisfactory preservative treatment when the posts had been properly peeled and air seasoned in the open sunlight for at least nine weeks. The absorption and penetration of the preservative from the two methods of treatment, and as a result of the different periods of seasoning are shown in table 1. Seasoning or weathering periods ranged from 1 day to 12 weeks.

The absorption was erratic for both methods of treatment in posts seasoned less than six weeks; however, all posts had a minimum absorption of three pounds per cubic foot. A period of soaking longer than 24 hours increased the absorption, and also increased the cost of treatment. It was apparent the moisture content of the wood did not materially affect absorption of the preservative. The volume absorbed was satisfactory even for posts seasoned only one day.

The minimum depth of radial penetration into the wood was in all cases greater than one-half inch when the

**Table 1. Absorption and penetration of pentachlorophenol with the hot-cold soak and the cold soak methods on posts weathered from 1 day to 12 weeks**

<table>
<thead>
<tr>
<th>Time of seasoning</th>
<th>Absorption of preservative*</th>
<th>Minimum depth of penetration†</th>
<th>Uniformity of penetration†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hot-cold soak</td>
<td>Cold soak</td>
<td>Hot-cold soak</td>
</tr>
<tr>
<td>weeks</td>
<td>lbs. per cu. ft.</td>
<td>inches</td>
<td>percent</td>
</tr>
<tr>
<td>1 day</td>
<td>6.24</td>
<td>3.89</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.96</td>
<td>3.11</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6.82</td>
<td>3.26</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4.62</td>
<td>4.48</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6.54</td>
<td>3.74</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2.94</td>
<td>5.53</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>6.54</td>
<td>4.24</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4.98</td>
<td>4.76</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3.97</td>
<td>4.36</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>5.44</td>
<td>3.92</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4.03</td>
<td>4.97</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>5.43</td>
<td>5.12</td>
<td></td>
</tr>
</tbody>
</table>

*Expressed in pounds per cubic foot of post section submerged in the preservative solution. All posts were submerged 36 inches. They averaged 5 inches in diameter at the 30-inch level.

†Measured on cross section of posts at a point 30 inches above the butt. Uniformity of penetration is the percentage of the outer half-inch ring of wood permeated by the solution.
posts were seasoned at least nine weeks. Those seasoned less than nine weeks contained areas of untreated wood extending to the surface of the wood. Blank spots in the outer shell of treated wood might permit entrance of decay into the post and render the expense of the preservative treatment a partial or total loss.

Posts treated after a minimum of nine weeks air-seasoning showed 100 percent penetration of the outer half inch shell of wood. No blanks were observed. Those treated by the 24 hour cold soak showed 100 percent penetration one week before posts treated by the hot-cold soak.

These data show that lodgepole pine posts will receive an effective preservative treatment if permitted to season or weather in the open sunlight for a period of at least nine weeks before a 24-hour soak in pentachlorophenol solution. The resin glaze on the surface of the posts affects the depth and uniformity of penetration to a greater extent than the moisture content of the wood at time of treatment. The nine weeks period of exposure or weathering is needed to break down the glaze and permit uniform penetration of the preservative solution.

The 24-hour cold soak treatment is recommended because of its effectiveness and simplicity. The cost of preservative absorbed per post for both the cold soak and hot-cold soak averaged 10.8 cents. This cost was based on 36 percent pentachlorophenol concentrate purchased at $3.50 per gallon, and fuel oil at 12.5 cents per gallon. The cost per gallon of the 5 percent treating solution is 47 cents. A gallon of solution weighs 6.9 pounds. The cost per pound is 67.5 cents.

Frequently, posts are available which have been seasoned for a year or longer, or may have been cut from dead timber. The 24-hour cold soak will provide an effective treatment for this material; however, these posts will absorb approximately twice the volume of preservative and increase the cost to an average of 24 cents a post. The soaking time may be reduced for this material. An oil soluble dye placed in the treating solution will enable the operator to check the depth and uniformity of penetration of the solution into the posts and so adjust the length of soaking. The check should be made at a point on the posts at least 6 inches above the ground line at which the posts will be set.

Aspen Posts

The experimental treatment of aspen fence posts showed that the wood of this species will not permit the penetration of the pentachlorophenol preservative radially, but does absorb the solution upward through exposed endgrain.

If posts are placed in a drum of the preservative and permitted to soak long enough, the preservative will creep upward through the wood fibers to the top of the post. An excellent preservative treatment will result but at an excess cost since the entire cross-section and length of the posts will be permeated with the preservative. All that is needed, however, is a shell of preserved wood at least one-half inch deep from the butt to a point at least 6 inches above the ground line. To reduce the cost and still provide an effective treatment, a saw cut one-half inch deep was made completely around the post at a point 10 inches above the butt end. Three inches of water were placed in the drum which, of course, settled at the bottom under the oil preservative solution. This prevented the full cross-section at the butt from sucking up the preservative. The exposed end-grain in the saw cut permitted the solution to be sucked up the post to provide a half inch deep shell of treated wood. The height the solution crept upward through the fibers exposed at the saw cut was dependent upon the soaking time. An 18-hour soaking period was required to permit the solution to rise and effectively treat the wood at the 30 inch level. If the saw cut were placed higher on the post than 10 inches, the effective treatment at the 30 inch level was possible after a shorter period of soaking. However, there is danger of mechanically weakening the post if the saw cut is placed too near the ground line.