Oregon's Agricultural PROGRESS

Flea-Free Pup At OSC

Rogue River Pear Decline Yielding to Research

New Clues for Mastitis Prevention

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OREGON'S AGRICULTURAL PROGRESS will be sent free to Oregon residents upon request. Address requests to Bulletin Clerk, Industrial Building, Oregon State College, Corvallis, Oregon, or see your County Extension Agent.

COVER STORY: Pups at OSC are first to sample a flea controlling dog food. Chemicals mixed with food also reduced stomach worms. Development of flea toxicant will help prevent diseases, human and animal, carried by fleas.
Photo: Bill Reasons

MID YEAR FINDS the national economy running at a high rate—but with many dents.

June employment broke all-time records for any previous month. At the same time, unemployment gained more than seasonally to the highest level since February 1959. But as usual for June, most of the increased employment came on the farm, and most of the unemployment was accounted for by teenagers without work experience.

People spending at record rates kept much of the "starch" in the economy and offset slumps found elsewhere in some business lines. Retail sales seem well on the way to new highs. Incomes, too, are at record highs, both on a total and per person basis. And, barring any downturn in the last half, 1960 should be a "high plateau" year.

Steel shows up as one of the biggest economic dents this year with output down sharply. Construction also lags behind a year ago. New private housing starts were stepped up considerably during the second quarter with more favorable weather, but are still below last year. But the new rediscount rate, lowered from 4 to 3½%, may serve as a boost here.

On the farm, income picked up in the second quarter, but not enough to bring net farm income during the first half of the year up to last year's level. Cash receipts from sales are down, nationally, with a slight price decline only partly offset by higher marketings. Oregon's receipts from sales during the first half of the year are about the same as last. Production expenses continue to climb. Wage rates are higher, taxes are up, and interest rates have increased. In general, farmers are paying more for industrially-produced items, less for farm-produced —particularly feeder livestock.

When all of this year's crops are harvested, total output may match the all-time high of the past two years, in spite of a slow and backward season.

Wheat

Meanwhile, the wheat pile grows larger as another huge supply develops. This year's national output is estimated at 1.3 billion bushels—second only to the 1.5 billion bushel crop of 1958. Carryover of old-crop wheat on

Plenty of hay for livestock this year . . . feed grain supplies heavier . . . prices for fruit and berries higher . . .

Farm Outlook

By Agricultural Economist Elvera Horrell

the nation's farms and warehouses, mostly held by CCC, is also estimated at 1.3 billion bushels—the same as this year's production. This, plus a small allowance for imports, mostly for feed and seed, adds up to a total supply of more than 2½ billion bushels —the highest on record. And prospects for whittling down the carryover at the end of the current marketing year appear slim. Best guesses at this time on the amount of wheat we can dispose of in the coming year would still leave more than 1.4 billion as carryover on July 1, 1961—in turn a new record.

In contrast to the national picture, both Oregon and the Northwest look for smaller wheat crops. There is some disease, especially in Washington, which tends to lower yields. Stocks of wheat were pared in Oregon but up elsewhere in the Northwest. On the whole, total supplies in this area are not much different from a year ago.

Feed grains

Feed grain supplies are heavier this year with a somewhat smaller expected harvest more than offset by a larger carryover from the 1959 crop. Grain consuming animal units are also down. With heavier feed supplies and fewer grain-consuming animal units, prices of feed grains are expected to lag below last year.

The national corn crop this year, based on July 1 conditions, is expected to turn out second only to last year's record high. But adding this year's increased stocks makes for a larger supply. Grain sorghum supplies are also expected to top last year. The higher estimated supplies of corn and grain sorghums more than offset estimated lower supplies of barley and oats.

Here in Oregon, a record high corn crop is expected, 2½ times the average of the past 10 years. Barley and oats output, on the other hand, may fall below last year. Adding in last year's feed grains still on Oregon's farms and warehouses, we come up with a total feed grain supply in this state 15% below last year but half again as large as average.

Hay

Livestock will have plenty of hay. Oregon looks for a tonnage only slightly below the all-time record of 1943. Even with the depleted farm stocks, Oregon hay supplies look to be 5% above last year and 10% more than average. Idaho has about the same amount of hay this year as last. Washington's 24% lower stocks leave total supplies in that state down a trifle, but about average.

Fruits

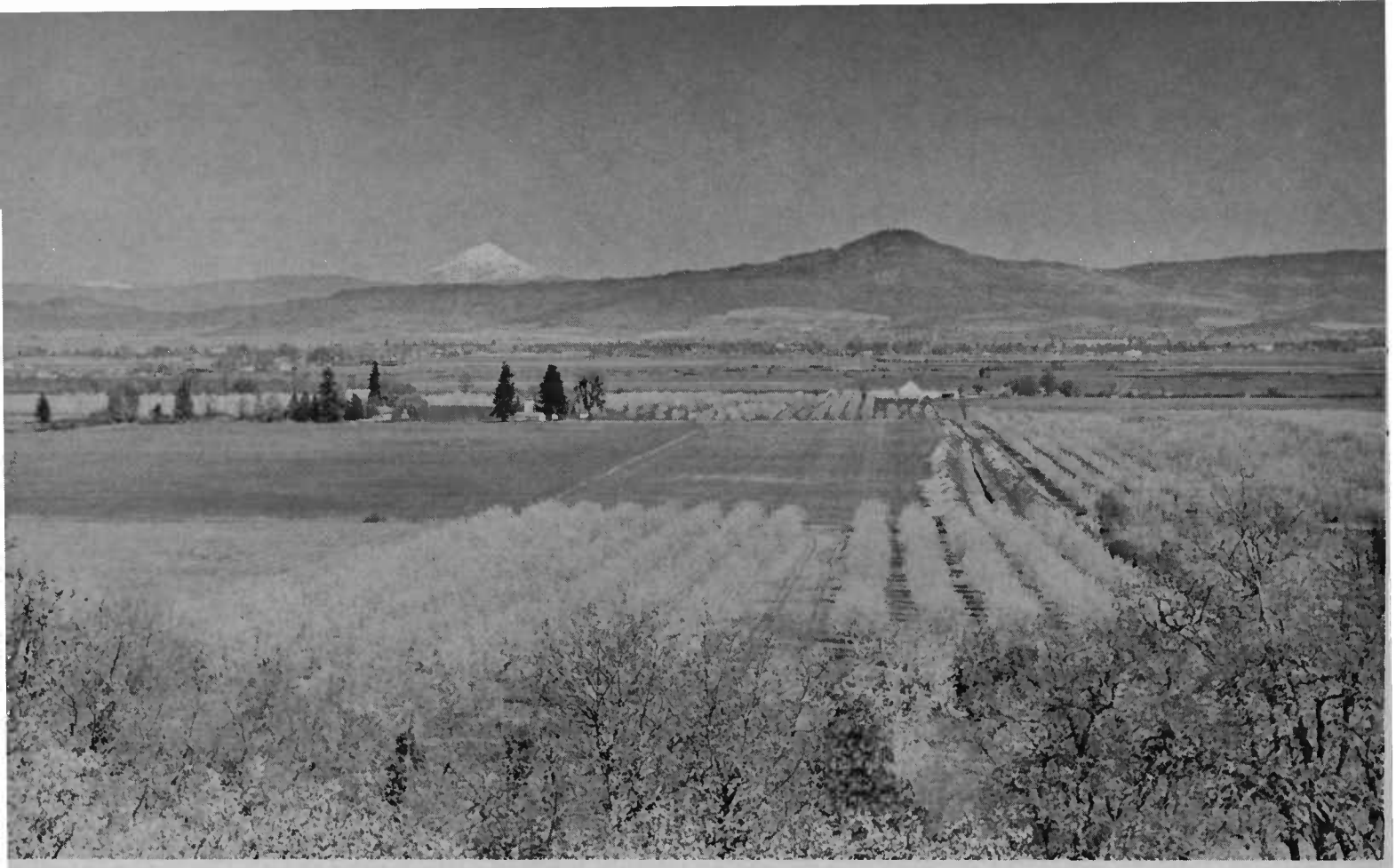
Oregon growers can look for higher prices on their reduced fruit and berry supplies. Production of most fruit crops is down, both in Oregon and nationally, and cold storage stocks are below mid-year 1959. The main exception in Oregon is apples. Present prospects point to an apple crop in this state more than 4% above last year. And with a smaller Washington crop in the making, Oregon apple growers can expect higher prices from this year's crop.

Pears

Pears, Oregon's major fruit, may be more than a tenth below last year's slightly below-average crop. Oregon's

(Continued, page 16)

WHILE national wheat pile grows larger, Oregon looks for smaller crop this year, and total supplies in this area will not be much different than a year ago. National output for 1960 is estimated at 1.3 billion bushels. Carryover of old-crop wheat, held mostly by CCC, will be about same amount.



INTENSIVE research is under way to save the 10,000 acres of pears in the Rogue River Valley from mysterious pear decline. Some $20 million is invested in Medford's pear industry, and 18% of the country's fresh eating pears are grown in Jackson County. Specific causes of decline are unknown.

Several Causes for Pear Decline?

OSC scientists believe pear decline is caused by one or a combination of cultural practices, a fungus disease which may damage and kill young feeder roots, and a graft union disorder which may be a virus disease.

DECLINE—that mysterious disease which is threatening Oregon's most important orchard crop—may be yielding to an intensive research program.

That's the report of Horticulturist Henry Hartman and his team of scientists.

Pear decline in the Rogue River Valley probably is caused by one or a combination of several things . . .

¶ Faulty cultural practices . . . probably too much water and/or too much fertilizer.

¶ Fungus disease *phytophthora cinnamomi* . . . which damages and kills young roots.

¶ A graft union disorder which may be a virus disease . . . sometimes called "brownline."

True decline hard to diagnose

Researchers are now working to pin down the exact relationship of each one of these reasons to the declined trees in Jackson County. Hartman points out that all sick pear trees aren't necessarily in decline—many other causes damage trees, and true decline is sometimes difficult to diagnose.

A detailed study of cultural practices used in declined orchards during 1958-59 revealed . . .

¶ All orchards or trees stricken with decline had a history of heavy nitrogen fertilization combined with frequent and heavy saturation irrigation.

¶ In some orchards, decline began to appear shortly after heavy late spring or summer application of nitrogen was followed by flood irrigation.

¶ No cases of epidemic decline were found in orchards where a moderate program of fertilization and irrigation had been the standard practice.

Hartman classifies decline which sweeps through an orchard, damaging many trees swiftly, as epidemic decline. Decline which afflicts widely separated trees in a spotty fashion, and over a period of time, he calls sporadic decline.

Recommendations listed

As a result of these discoveries, Hartman and Jackson County Agent Cliff Cordy recommended, in 1959, that growers with severe cases of decline . . .

1. Apply no mineral nitrogen during the 1959 season.
2. Apply no organic matter aside from that provided by cover crops or natural cover.
3. Discontinue irrigating with waste water in early spring.
4. Abandon flood irrigation.
5. Avoid saturation of soil at all times during the growing season and limit application of water to minimum requirements of the trees.
6. Do everything possible to drain off surface water left by winter and early spring rains.

Results of these recommendations in 10 orchards suffering severely from epidemic decline showed . . .

¶ Seven orchards had striking and pronounced recovery.

¶ Three had no recovery but at least held their own.

¶ Very few new cases of decline occurred in any of the blocks.

These results certainly don't answer all the questions about decline in the Rogue River Valley—but they do point to cultural practices as a probable cause of at least one type of decline.

The fungus disease *phytophthora cinnamomi* is the second prime suspect in the pear decline mystery. OSC Plant Pathologist H. R. Cameron, working with Hartman and Cordy, points out that while this fungus has been found on many hosts—apples, peaches, strawberries, for instance—it has never before been found on pears.

Cameron believes there may be some correlation between occurrence of this fungus and sporadic decline. Soil beneath isolated declined trees frequently contains the fungus.

Trees are damaged when the fungus invades the roots, kills the root tips, and damages the water conducting system. No good control is yet available for *phytophthora cinnamomi* though fungicides are being developed which, in a few years, may be helpful.

A virus disease or some other disorder which strikes at the graft union of pear trees is the third villain in the story of pear decline.

Pear growers in Washington state have been plagued with the same or a similar virus for several years. A brown line, sometimes thin as a light pencil mark, sometimes an eighth of an inch thick, shows up under the bark at the graft union and is thought by some scientists to be the indicator of this virus.

Diagnosing "brownline" is simple—the mark is easily visible to the naked eye—and Cordy has found it to be most common on Oriental rootstocks though trees on French roots have not been afflicted.

Additional research on these three possible causes is needed to save the 10,000 acres of pears in the Rogue Valley. Some $20 million is invested in Medford's pear industry, and 18% of the country's fresh eating pears are grown in the area.

Diagnosis and control of pear decline are vital to the survival of the Jackson County pear industry—and all research so far points out that diagnosis alone is a difficult thing. Accurate diagnosis and specific controls are the aims of the research team.

For instance, Hartman's evidence indicates that saturation irrigation and heavy fertilization contribute to tree decline. But, to test this out scientifically, lab experiments are now under way at OSC.

Nitrite was applied to young trees growing in gallon cans. The trees quickly developed decline symptoms when 16 parts per million of nitrite were added to soil which remained saturated for 3 days. No injury was noted when nitrite was added to well aerated soil.

Nitrites accumulate

Soil scientists and bacteriologists point out that nitrite accumulates in the soil because organisms, which usually work on the nitrogen fertilizer and enable it to go about its business of helping plants grow, fail to complete their job.

One set of soil organisms changes ammonia to nitrite and the second changes the nitrite to nitrate. If the second group falls down on the job nitrogen stays in the form of nitrite.

Known causes for the failure of the second group of organisms to do their job are (1) lack of aeration because of saturation or compaction of soil, (2) high soil temperatures, and (3) extremes in soil acidity and alkalinity.

(Continued, next page)

PEAR DECLINE probably occurs because one or a combination of things hinders normal growth. Faulty cultural practices, a fungus disease which damages the roots, or a graft disorder are suspect.

Hartman points out that while this laboratory research does not prove, beyond doubt, that nitrites in the soil are directly associated with decline, it does show that pear roots are highly susceptible to damage from nitrites.

Plant Pathologist Cameron is investigating susceptibility of various rootstocks to *phytophthora cinnamomi.* Also, this fungus is considered a water mold—and the possibility of its spread by irrigation should be checked scientifically.

Causes checked out

Other causes which are being checked out by the research team include . . .

Age of tree . . .seems to have no relationship to decline. Young pear trees often go into sudden collapse if watered heavily during hot weather, but the percentage of decline is frequently no greater among young trees than among old ones.

Root sprouts . . .Trees having lots of root sprouts at their bases do not go into decline. This is true not only in the Rogue Valley but in pear growing areas around the world. In Israel, for example, growers are now advised to permit root sprouts to grow—even though removal of sprouts has been the practice for generations.

Scientists are still not completely clear on the reasons for this relationship between root sprouts and pear decline. French rootstocks are known for their habit of sending up sprouts, while Oriental stocks, as a whole, lack this tendency.

ROOTSPROUTS, common on healthy trees, are examined by OSC Horticulturist Henry Hartman.

Hartman points that in his observations of decline among Medford trees on French stocks all serious cases of decline have been found on trees lacking root sprouts.

Soil . . . as a rule, orchards situated on deep, well-drained adobe soils have remained free of epidemic decline. But several cases have appeared in Tolo loam and in Coleman gravelly clay loam—particularly where these soils are shallow and thus easily saturated.

Acidity affects decline

Acidity of soil also seems to have an effect on decline. Soil around declined trees was generally about 10 times as acid as that around normal trees.

Rootstocks . . . Hartman's research has not, so far, found a single case of true decline among trees having the combination of Old Home trunks and Old Home roots. Most of these trees are healthy, vigorous, and productive.

Old timers in the Valley will remember that Old Home trees were susceptible to fungus cankers during the first 2 to 8 years after planting—but this problem can now be controlled by one application of a copper spray in early fall.

Old Home trunks and roots would be highly desirable in case of orchards just being planted or in replants made among established trees.

Pyrus communis, common French seedlings, appear to be the best stock for the Rogue Valley, aside from Old Home, according to Hartman. While these trees suffer from both epidemic and sporadic decline, Hartman's research indicates that this stock is the most resistant.

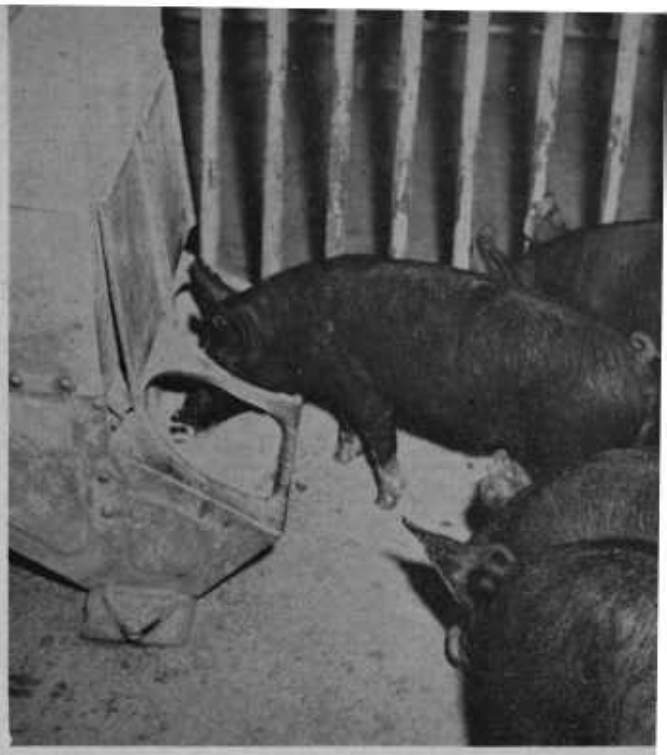
Pyrus serotina and *Pyrus ussuriensis* appear to be the most susceptible stocks in the Valley—particularly to epidemic decline.

"BROWNLINE," a graft union disorder which may be a virus disease, is easy to locate. Found often on Oriental roots, has not occurred on French roots.

EXAMINATION of graft union usually shows trees suffering from this disorder have a brown line, sometimes an eighth of an inch thick, under bark.

Recent swine feeding trials with corn, milo, and barley show . . .

Barley Is Better When Supplemented



CORN is still the best ration for swine, but OSC tests show that barley, properly processed and supplemented, also is good.

PIGS STILL DO BEST on corn—but barley and milo are also efficient and economical in rations.

That's the report of Animal Husbandman J. E. Oldfield who has just completed a series of swine feeding trials at Corvallis.

Barley has long been the standby of the Oregon hog producer, but high prices—brought on by yellow dwarf virus disease—may force growers to turn to other rations for their herds.

Corn has been consistently superior to barley in OSC tests, Oldfield points out. Also, local supplies of corn probably are on the increase because of extended irrigation.

Pigs gain best on corn

Swine on corn rations gained a quarter of a pound more per day than swine on barley in one recent OSC trial. Animals on corn required only 3½ pounds of feed per pound of gain while the barley-fed animals needed 4 pounds.

This advantage of corn over barley has shown up in all succeeding tests, according to Oldfield, though the difference sometimes isn't so marked when various supplements are used.

Milo was compared with barley during 1959—because of low barley supplies—and results showed that milo could be included in rations as a satisfactory substitute for barley. A trial with weaner pigs showed . . .

Ration	Avg. Daily Gain	Feed Required Per Pound of Gain
	Lbs.	*Lbs.*
Milo	1.5	3.56
Barley	0.96	4.30

Oldfield emphasizes that the barley used in this experiment was poor quality—and results showed that barley lots can vary considerably in nutritive value and can greatly influence animal performance.

Barley rations can be improved in two major ways, according to Oldfield. First, the grain can be supplemented to make up for lack of needed nutrients. Second, barley can be processed in different ways to enhance its value.

Barley is short in protein, both in quantity and quality, so Oldfield has been investigating the use of protein-rich supplements with barley to make up a balanced swine ration. Tests show . . .

Ration	Avg. Daily Gain
	Lbs.
Barley plus 2% herring meal plus 10% soybean oil meal	1.73
Barley plus tankage plus soybean oil meal (to similar protein level)	1.47

Amount of protein varies between lots of barley. For example, samples of barley received at OSC tested from 9% to 11% crude protein. High protein barley would require less expensive protein supplement to balance the ration.

While adding antibiotics to barley doesn't increase the nutritive value of the grain, it does improve the general health and welfare of the animals—so they gain faster. Results of station experiments show . . .

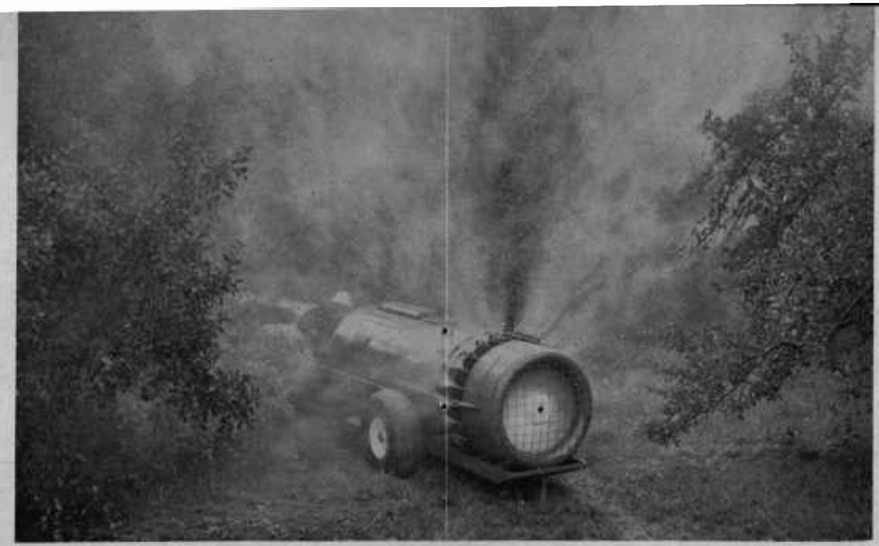
Ration	Avg. Daily Gain
	Lbs.
Barley	1.48
Barley plus 20 mg. procaine penicillin per ton of feed	1.67
Barley plus 20 mg. aureomycin hydrochloride per ton of feed	1.99

Pelleting is the big news in processed barley. Oldfield suggests pelleting is more beneficial with lower quality, higher fiber grain than with high quality rations. Also, a major advantage of pelleting is reduction of feed wastage by animals. Tests with pelleted barley show . . .

Ration	Avg. Daily Gain
	Lbs.
Barley in meal form	1.44
Pelleted barley	1.58

Finding Safe Chemicals for Farm Use

Consumers are protected by scientists who study crop samples for chemical residues.



AGRICULTURAL CHEMICALS—pesticides, insecticides, fungicides, herbicides—are essential to modern agriculture. Fruit being sprayed here will not be wormy or misshapen by disease. Scientists find ways to safely use chemicals.

EVER SIFT through a half-dozen haystacks looking for a particular needle? Not just any needle, mind you, but one painted a pale hay-color and with a peculiar sting on the tip?

That's the kind of a job done by some of OSC's chemists who spend most of their time looking for chemical residues in crops—and who know that peculiar sting on the needle's tip can be dangerous for consumers.

OSC scientists have been looking for these needles—and have found lots of them—since 1915, according to L. C. Terriere, chemist and residue researcher at Corvallis.

Chemicals necessary

Agricultural pesticides—insecticides, fungicides, herbicides—are all essential to modern agriculture. Few consumers or producers would want to go back to the days of wormy apples or blighted potatoes.

Yet these same chemicals, which have made our agriculture the most abundant in the world, may sometimes have a stinger—and the job of the residue chemist is to see that the stingers are kept under control.

Most crops treated

Most Oregon crops and animals are treated with some type of chemical during their production. One or more of the 100 or so basic pesticides, put together in nearly 10,000 different combinations, may be used on these crops. It is the chemist's job to check into the residue problems resulting from these various crop-chemical combinations. Modern laws prevent the use of a new pesticide until such studies have been made.

Terriere and his team of scientists also cooperate with commercial chemical producers to test safety of a product. Not long ago a chemical company financed an OSC experiment with a pesticide designed to be used on forage fed to dairy cows, beef animals, hogs, sheep, and poultry.

Intensive analysis done in the laboratory at the end of the feeding tests showed that residues of the compound were found in milk, meat, and eggs. Because of this research, the manufacturer cancelled further work on this use of the product.

Each year OSC chemists, frequently working with entomologists, plant pathologists, weed control specialists, and other scientists, analyze nearly 1,000 crop samples for residues.

Many of these analyses are sent to the United States Department of Agriculture and the Food and Drug Administration to help them decide what tolerances can be safely established—in other words, how much of the chemical should be allowed on a food crop.

Another job of the residue chemist is to develop methods of analysis. No reliable scientific work can be done until a specific method is worked out to the finest detail. This work often involves the toughest kind of chemistry. The scientist can't find the needle in his haystacks till he has worked out a way to identify that needle—and finding a way sometimes takes months.

Mosquito larvae used

One simple but particularly sensitive method developed at OSC doesn't require fancy equipment. It uses mosquito larvae (next stage after the egg) and can detect a fraction of an ounce of pesticide in 500 tons of a particular crop.

In addition to protecting the grower and consumer, the work of the residue chemist also protects the competitive position of Oregon farmers in the national or international market. Terriere points out that instances of prejudice against certain crops bearing spray residues already have occurred in some foreign countries. This could also happen with such Oregon specialty crops as mint oil or strawberries for ice cream flavoring. So OSC residue researchers attempt to keep up to date.

New pesticides analyzed

Within the past season several new pesticides were analyzed for Oregon growers. Cyprex, a new fungicide used experimentally on apples, pears, peaches, cherries, and gooseberries, was subjected to severe tests. Results showed that it could be used effectively against disease and still not leave a harmful residue on the fruit.

Tedion, a miticide used on hops, apples, and pears was tested. And a third new pesticide, sevin, which is used on cherries, apples, and pears was also measured. Results of all these tests will be used to establish safe recommendations for pesticides used by Oregon farmers in 1960 and the years ahead.

Ulo Kiigemagi, chief analyst in the residue lab, points out that each new compound tested at OSC goes through a certain procedure . . .

¶ Arrangements are made with pest control specialists—plant pathologists, entomologists, agronomists—for the necessary field test, and steps in the laboratory work are planned.

¶ Samples of the crop to which the chemical was applied are collected. Usually a series of samples, starting about one month before harvest, is used to help the scientists determine if, when, and how rapidly the residues disappear as the plant grows and weathers.

¶ Crop samples are extracted in the laboratory—that is, the pesticide is removed from the sample with a solvent. Along with the pesticide in the extract may come other pesticides and hundreds of other substances normal to plants—waxes, oils, sugars, and so on. This is where the scientist starts looking for the needle in the haystack.

¶ Other materials in the extract must be removed to keep them from interfering with detection of the target—the residue the scientist is seeking. This is called the cleanup.

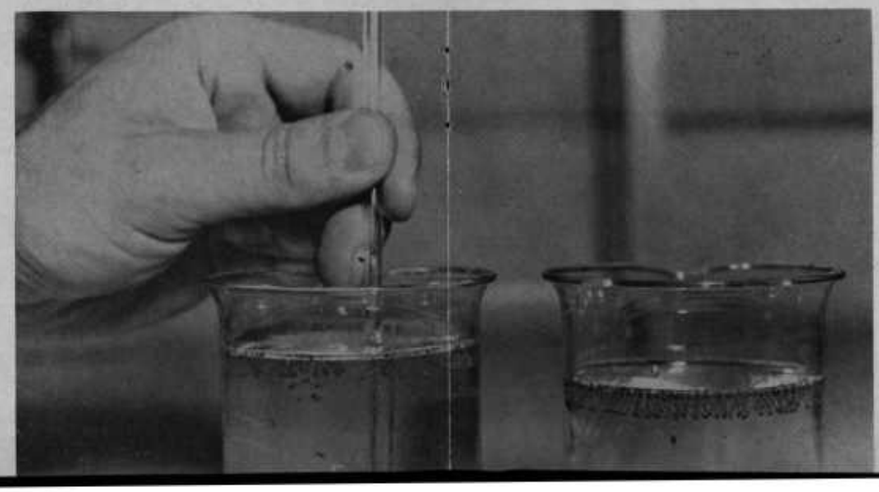
¶ Actual analysis is begun after cleanup. When mosquito larvae are used, the analysis consists of exposing different amounts of the extract to the larvae. A few hours later, larvae killed by the pesticide are counted and an estimate is made of the pesticide content.

¶ Cleaned up extracts are analyzed by a regular chemical method. This may be simple and require an hour. Or, more usually, it may be complex and take 8 to 12 hours. Each step is a danger spot where an error can be made, and 7 or 8 steps usually are involved.

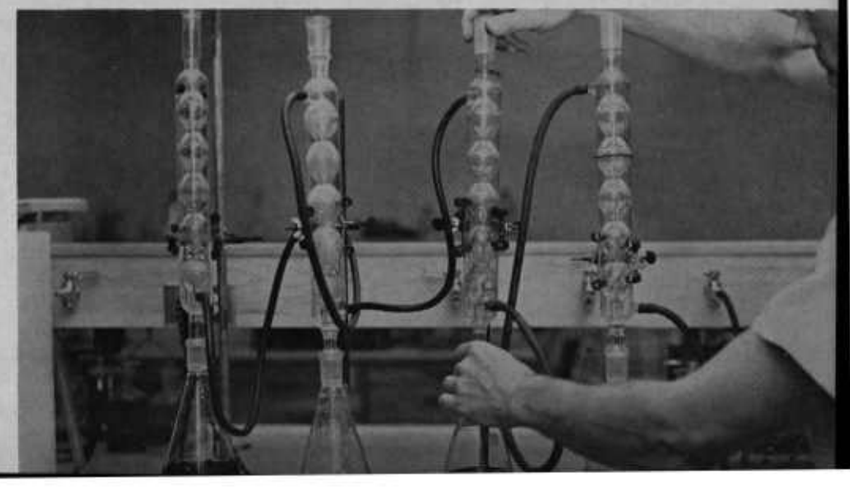
¶ Final step is writing a report describing methods used and the results obtained. This report is circulated to other experts for their evaluation and is used in establishing safe ways to use pesticides.

MOSQUITO LARVAE are used in one simple and inexpensive method, developed at OSC, for measuring chemical residues. Grown in the lab, larvae are sieved out of water, then used in residue test.

LARVAE hang by their tails, head down, in the chemical solution. Strength of chemical residues can be determined by the number of these insects that survive. This is one instance when the mosquito helps scientists.



APPARATUS used to remove fats, oils, and other substances from samples of crop materials. This cleanup is necessary before the scientist can analyze amount of chemical residue left on the crop.



MINT FIELD shows damage done by wilt, as well as by nematodes and other pests, in above aerial photo. OSC scientists are working to find controls for wilt which has infected 40% of Oregon's 15,000 mint-growing acres. Oregon mint acreage has decreased steadily in years since 1956.

Mint Wilt Spreading Rapidly

In 1959 Oregon had 6,000 acres infested with mint wilt. Another 4,000 acres will go out in the next 4 years. Research suggests some controls.

OREGON MAY be on the way out as a source of peppermint oil—used as a flavor in toothpaste, chewing gum, and candy, unless scientists can find a way to control the spread of mint wilt.

That's the report of OSC Plant Pathologist C. E. Horner.

Over 70% of our national peppermint acreage is on the west coast—and the fungus causing mint wilt has already infested some 40% of Oregon's 15,000 mint growing acres.

The fungus to blame for all this—*Verticillium albo-atrum*—gets its start in a field with the introduction of infested soil or a diseased plant. When an infected plant dies, little black seed-like bodies of dormant fungus form in the dead plant parts and are deposited in the soil when the plant decomposes.

Mint leaves curl

These black seeds—called microsclerotia and barely visible to the naked eye—germinate when touched by the root of a new plant. On germination, threads of white fungus grow up into the plant's water and food conducting system and keep them from functioning properly. Then the plant dies, and more microsclerotia are deposited in the soil to wait for another healthy plant.

Mint infected with the fungus has one early and obvious symptom—leaves turn back toward the stem, and half the leaf will be curled and withered.

Other symptoms include dwarfed plants with bunchy, uneven, bronze colored top leaves. Evidence of wilt usually apears first in May or June, and symptoms become more severe during dry weather.

Horner points out that a mint grower whose fields become infested with wilt has two choices—move his crop to a new, uncontaminated area, or apply certain soil chemicals.

Most growers take the least expensive way out—and move their fields or discontinue growing mint. The supply

of fertile well-drained land is limited, however, and Horner points out movement to new fields cannot go on indefinitely.

Since 1956, Oregon acreage infested with wilt has increased steadily and alarmingly:

Year	Acreage infested with wilt
1956	1,500
1957	3,000
1958	4,000
1959	6,000

Another 4,000 acres of mint will probably go out of production in the next 4 years. While these lost acres will be replaced largely by new plantings in areas not now infected, Horner believes it is only a matter of time until the new plantings, in clean areas, also have the blight.

In an effort to combat this steady progress of mint wilt, OSC scientists have been working since 1957 on several possible angles of control.

Crop Rotation. Rotation with nonsusceptible crops—cereal grains, beans, peas, corn, carrots—has been used, with some success, as a weapon against mint wilt in the Midwest.

In addition to cutting down on the severity of the disease, rotation helps prevent build up of the microsclerotia in the soil. OSC scientists are working to find the **best** crops to use in an Oregon rotation plan, and to determine time limits for the rotation plan.

Results so far show no control of wilt from planting mint fields to nonsusceptible crops for 1 year. This is a long term project and final results will not be available for 3 or 4 years.

Chemical Soil Treatments. Lab tests show good control has been obtained with chemicals such as Mylone, Vapam, and Chloropicrin, applied at 30 to 40 pounds per acre—*when the chemicals were thoroughly mixed with heavily infested soil.*

Present field application methods require as much as 200 pounds of chemicals—at a cost of about $200 per acre. Since this expense often is too great, Horner suggests that new methods of field application and distribution of chemicals thoroughout the soil would help cut costs and make the chemicals more effective.

Cultural Practices. Results show that returning distilled mint hay to infested soil will, under suitably moist conditions, cause the fungus to grow and increase.

Since distillation kills the fungus on infected plants, it is safe to use the hay as organic fertilizer on *noninfested* fields.

Movement of infected plants and soil also increases danger of spreading the disease and increasing its severity.

Antibiotics and Fungicides. Lab tests show some antibiotics are partially effective, but as yet no material has been found which will give practical control.

A fungicide which would be absorbed into the plant's system and which could prevent or completely cut out possibility of fungus infection is the scientist's dream, according to Horner. He believes such a fungicide will eventually be developed.

Destroying Microsclerotia. Scientists are also searching for some way to force the little black seeds in the soil to germinate and expend themselves before a crop is planted.

Horner's research shows that the fungus survives best in moderately moist, cool soil but dies rapidly when soil temperatures are between 85° and 100°.

Flooding infected soils, particularly at these higher temperatures, also causes the fungus to disappear rapidly. (These results would probably be easier to apply in the Midwest, where the soil water table can be controlled, than in Oregon.)

Verticillium attacks other crops—potatoes, strawberries, all caneberries, and, in warmer climates than Oregon, cotton—but the particular strain Horner is investigating seems to affect only mint.

Mint growers and oil producers now have unique problems. Rapid spread of wilt has forced the industry to be migratory and has also contributed to unstable production, problems of oil quality, and fluctuating prices.

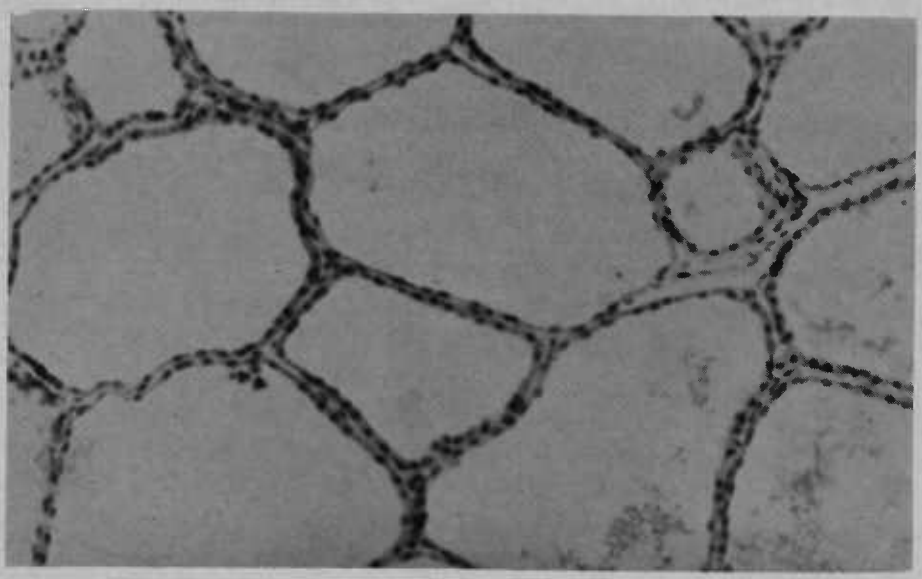
Combined efforts of applied and basic research are necessary to solve the mint wilt problem and to develop an effective control. A chemical control worked out in the next 3 years would help stabilize the west coast peppermint oil industry, Horner believes.

FUNGUS seeds, called microsclerotia, germinate when touched by the root of a new plant. Threads of white fungus then grow up into the plant's system.

MINT which is infected with the wilt fungus has an early and obvious symptom. Leaves turn back toward stem, and half a leaf will be curled, withered.

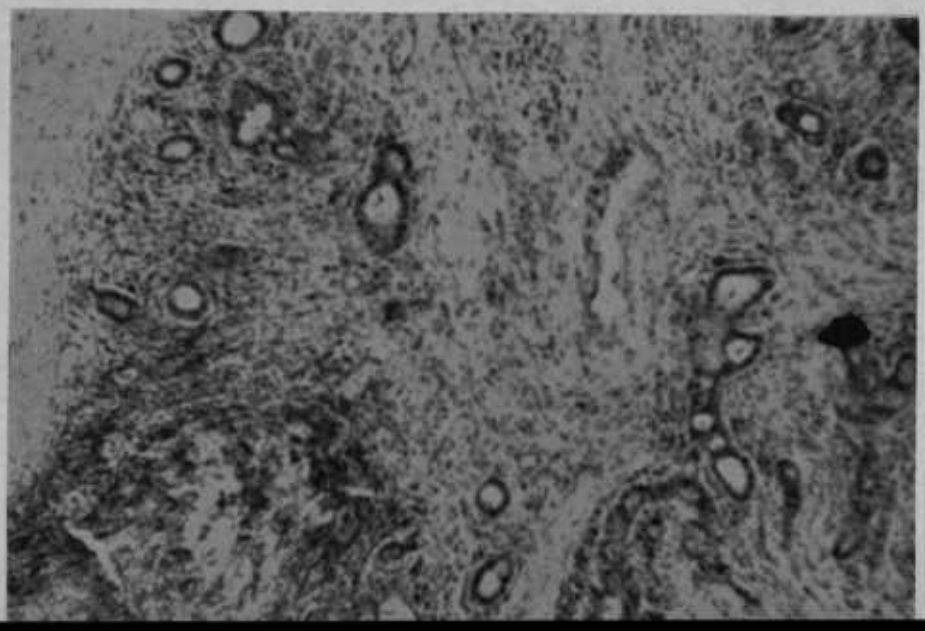
MASTITIS Can Be Prevented

Milking machines may encourage mastitis. But hints below will help avoid this disease in cows.



NORMAL MAMMARY cells which manufacture and secrete milk, surround large storage spaces which expand with milk storage. Mastitis is the inflamation of delicate mammary tissue of the udder.

INFECTED mammary tissue shows scar tissue caused by mastitis. Milk secreting tissue is destroyed, gland becomes hard and shrunken, and milk production is greatly reduced or may cease completely.



MASTITIS—an inflamation of the udder—exists in most Oregon dairy herds. But this disease, which is Oregon's most serious dairy cattle disease problem, can be controlled, according to Dr. K. J. Peterson, OSC veterinarian.

A long-range program to learn more about the specific causes and effects of this dairy disease is going on at OSC under Dr. Peterson's leadership, and results of this year's research point to several vital phases of dairy management.

Mastitis—a general term for inflamation of the udder—falls into two general classifications. Contagious mastitis, fairly widespread in other parts of the country but relatively rare in Oregon, is caused by a specific bacteria, capable of invading healthy mammary tissue, and spreading rapidly from cow to cow.

Constitutional mastitis common

Constitutional mastitis is caused by organisms *plus* any sort of stress or bruising suffered by the udder. This form of mastitis is most common in the Northwest.

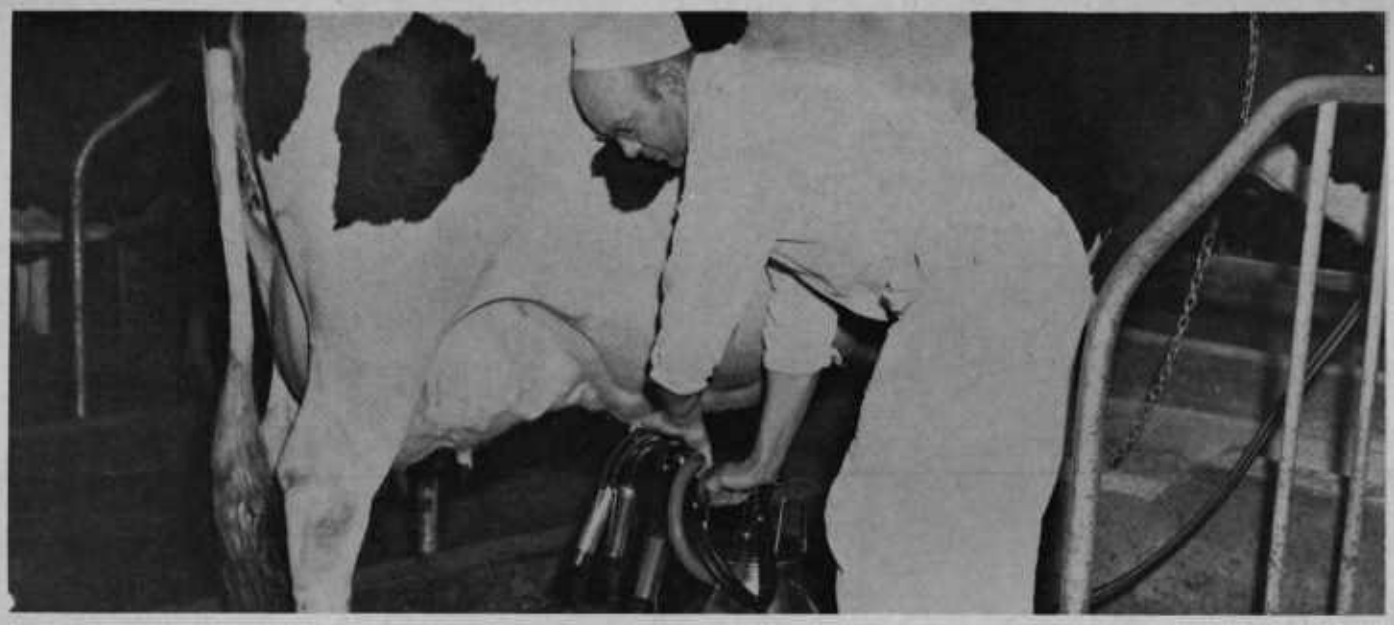
Since milking machines carry a large share of the blame for the high incidence of mastitis in dairy cattle, Peterson has been studying their operation.

Liners were tested on a herd of OSC cows this past winter, and results showed that less clinical mastitis occurs when narrow-bore stretched rubber liners are used. Animals on large-bore slack liners suffered from a greater frequency of clinical mastitis during the 6-month experiment.

Peterson also points out that a milking machine which is functioning improperly can create and aggravate mastitis. All vacuum points should be checked frequently, with a reliable guage, and repaired by qualified servicemen. Home grown "fixing" sometimes results in increased mastitis.

Faulty milking procedures such as placing teat cups on the cow before she is properly stimulated to let down her milk, leaving the milking machine on after she is milked dry, allowing the teat cups to suck in and damaging delicate udder tissue, and rough handling by the milker are all factors which may predispose the cow to mastitis.

Research emphasizes the necessity for care in the operation of a milking



MILKING MACHINES carry large share of the blame for high incidence of mastitis. Liners tested on OSC herd this past winter showed that less clinical mastitis occurs when narrow-bore stretched rubber liners are used. Animals on large-bore slack liners suffered from greater frequency of mastitis.

machine—it may sound all right, but it also may not be functioning properly.

While milking machines probably take the large share of the blame for mastitis, other causes are common. Stalls which are too short or too narrow, cold drafty barns and floors, general unsanitary conditions such as muddy corrals, any udder-bumping obstacle which a cow must step across, can all damage the delicate tissue of the udder and bring about inflammation, udder stress, and infection.

Prime reason for taking precautions against mastitis is economic. An infected cow gives less milk and frequently must be sold for slaughter prematurely. An animal which might be a profitable milker for as long as 10 years may last only 3 or 4 years. Replacement heifers come high, and treatments for mastitis are expensive.

Cows may suffer from two types of mastitis—acute and chronic. The acute type is relatively easy to diagnose. The udder is hot, hard, and tender. Milk is scanty and often is flaky, stringy or curdy, may contain blood clots and be either thick or watery. The cow often loses her appetite, becomes depressed and shows other signs of sickness. Considerable permanent damage to udder tissue often results even though treatment is started immediately. In spite of the best and most vigorous treatment, the animal may die or may later have to be sold for slaughter because of lowered milk production.

Diagnosis difficult

Chronic mastitis is more difficult to diagnose since there usually is no visible change in the milk and no swelling of the udder, yet infection is present. There may be occasional flare ups—called subacute mastitis—when visible alteration of the milk does occur and some swelling of the udder is evident. As this chronic condition progresses, milk-secreting tissue is destroyed and replaced by scar tissue. Milk production gradually declines until the cow is no longer a profitable producer and is eliminated from the herd.

Chronically infected cows are often responsible for the spread of the disease since the germ causing the infection is eliminated in the milk and contaminates hands of the milkers, teat cups, floors, and bedding. Calves fed this milk and allowed to suck other calves while the organism is still present in their mouths may spread the disease to these calves. Later these early infected animals, as first calf heifers, come fresh with mastitis.

Chronic mastitis can be detected by a number of tests applied to the milk. One of the best and most convenient is the California Mastitis Test which quickly enables the veterinarian and dairyman to detect infected quarters.

Peterson is also working with dairies around the state to investigate the amount and type of bacteria present in teat cups before they are applied to the cow. His results show that liners are usually badly contaminated, even though they have been dipped in disinfectant, and these bacteria may be a prime reason for the spread of mastitis.

Peterson's long range research will work toward development of an efficient, inexpensive, fool-proof method of disinfecting teat cups.

Peterson points out that a veterinarian called in to check a dairy herd for mastitis will probably go through a series of steps . . .

1. He will determine the incidence of the disease in the herd, and will single out infected animals—probably using the California Mastitis Test or a similar guide.

2. He will determine the type of mastitis present in the herd and the organisms which are causing the disease.

3. He will decide which drugs to use and when to use them. (Cows should be treated when dry as this gives the animal a better chance of recovery.)

4. He will help the dairyman detect predisposing causes—this may involve checking the milking operation, including machines, barns, corrals, or pastures for aggravating causes.

Research Briefs

Tall fescue plants can be bred for improved digestibility • Spraying of range weeds can triple forage production

Chemically Treated Dog Food Prevents Fleas

EVERY DOG has his day . . . and a couple of lucky pups at OSC are the first to sample a flea-proof dog food which may eventually make a dog's life worth living.

Fleas simply drop over dead, in droves, when they bite these OSC pooches.

This happy affair is an offshoot of work by Entomologist R. L. Goulding. Some of his results—testing sprays for cattle parasite control—suggested to him that certain chemicals mixed in dog food may better protect dogs from fleas.

Worked with veterinarians

During this project Goulding worked with Dr. D. H. Smith, OSC veterinarian, and Dr. S. E. Knapp, parasitologist for the Department of Veterinary Medicine.

Two chemicals, thoroughly tested and used as a food supplement in beef rations, were added to kibbled dog food. The pups ate the kibbles and were then exposed to a carefully counted number of fleas for 4 days.

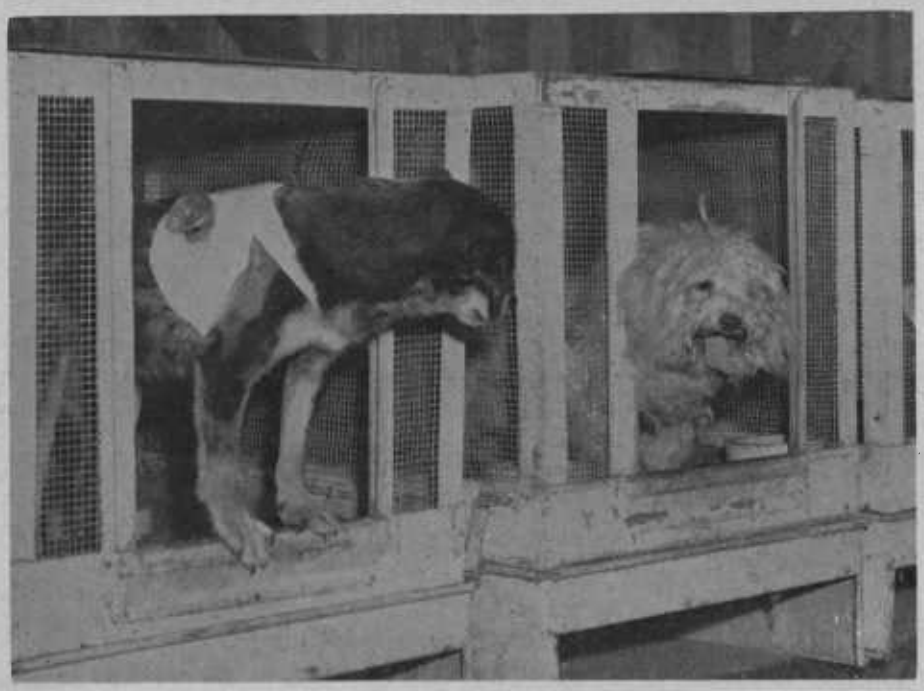
At the end of the trial period, 85% to 95% of the fleas were dead.

The dogs had another reason for being contented—veterinarians checking them discovered that the chemicals also markedly reduced stomach worms.

Development of a flea-preventative food, in addition to easing a dog's life, will increase the market for meat by-products since most pet foods are made of meat not sold on consumer markets.

Goulding points out that development of a chemical-food combination which will kill fleas also has another implication. Most rodents carry fleas of one variety or another and these fleas frequently are infected with disease.

An effective flea toxicant would give scientists a tool to use all over the world in the fight against plagues and diseases spread by flea-carrying rodents.



OSC PUPS fed treated dog food became toxic to fleas. Tape holds a small plastic capsule containing fleas. After 4-day trial, 85% to 95% of fleas were dead. Food also reduced stomach worms.

Research needed

Additional research needed includes . . .

¶ Intensive, long range study of effects of chemicals on dogs and establishment of levels safe for feeding.

¶ While most of the pups liked the treated food, several rejected it. Goulding suggests that the chemical taste might be masked, perhaps in a dog candy.

¶ Materials tested at OSC were combined only with dry, kibbled food. Different amounts, and perhaps even different chemicals, might be used effectively with other types of pet food.

¶ Amount of the chemical needed to be effective for a certain period of time needs to be definitely determined. Maybe a single piece of dog candy a week would provide needed protection from fleas.

¶ Expense of production and final cost to the buyer need to be worked out.

¶ Methods of marketing, through veterinarians or through grocery stores, need to be investigated. Shelf-life of the finished food would have to be checked.

Of prime importance is finding the taste combination which will appeal to most dogs. Pups are fussy about what they eat, according to Goulding, and have definite likes and dislikes. So scientists and researchers may have to develop several flavors to please particular pups.

Goulding emphasizes that all these angles need further research and investigation by scientists and producers before a flea-proof food can be perfected and marketed.

But tell your pup to cheer up—those flea-free days aren't far away.

CHEMICAL sagebrush control is helping scientists at Squaw Butte-Harney Branch Station develop best ways for ranchers to increase grass and beef production. Station herd grazes on improved range.

How to Triple Range Forage Production

FORAGE PRODUCTION on eastern Oregon ranges can be increased up to 3 times when chemical sprays are used to kill sagebrush in areas still thick with native bunchgrasses.

That's the report from W. A. Sawyer, superintendent of the Squaw Butte-Harney Branch Experiment Station near Burns. Sawyer and the team of scientists stationed at Squaw Butte are doing long range research to learn best ways for ranchers to increase grass and beef production.

Controls listed

Chemical sagebrush control is one of the methods being tested, and so far, researchers have learned . . .

¶ Sagebrush spraying makes 3 times more grass. Spraying is most successful if done between the time sandberg bluegrass is heading and rapidly losing its green color—this is the same time big bunchgrasses are beginning to flower and shoot seed stalks. Sawyer and his team got 80% to 90% kill when they used 1½ pounds of butyl ester of 2,4-D in 5 gallons of water per acre.

¶ Low larkspur, plague of cattlemen, can be killed by the same treatment. Elimination of this pesky weed saves cattle and makes grazing possible in late April, May, and early June. Without spraying, ranges infested with low larkspur could be safely grazed only after mid-June.

¶ Rabbitbrush can also be licked by spraying late in the time range for sagebrush—but the rabbitbrush must have at least a 3-inch new twig growth, and this means that in dry or cold springs there may not be sufficient growth to permit good kill. Sawyer's team used 3 pounds of butyl ester of 2,4-D in 6 gallons of water per acre and reduced the hazard of rabbitbrush taking over after sagebrush spraying.

Scientists point out that in all this research low flying, during aerial spraying, is the key to success. Sprayers have to be sure the chemical reaches the ground and isn't left floating around in the air—where it won't reach the sagebrush and other weeds but may drift considerable distances and kill valuable plants elsewhere.

Safe thing to do is spray at 25 feet or lower. A Squaw Butte research project showed that this level killed 90% of the sagebrush on 600 acres treated and didn't leave swaths in the field. A test area sprayed by a plane flying more than 50 feet high still has nearly half its original sagebrush and already needs another spray job.

New chemicals which will give good kills from higher levels are the aim of researchers—but, right now, low flying is required to kill big sagebrush.

Tall Fescue Bred For Digestibility

EVER OCCUR to you that one tall fescue plant is worth more—in meat, milk, or animal energy—than another one?

New research shows that tall fescue plants are able to pass on characteristics of growth and digestibility to their offspring. So one tall fescue plant may be more nutritious than its neighbor.

This means that plant breeders can select the grasses with the best characteristics and breed these qualities into improved plants which can be more easily and more efficiently digested by animals.

Sheep fed forage

OSC Agronomist Ritchie Cowan and his research team have pinned down this hereditary characteristic by feeding individual plants, and their descendants, to sheep.

A single tall fescue plant, known to be highly digestible, was increased 3,000 times so enough forage would be available for a feeding trial. Forage from these plants was harvested at a certain stage of maturity and frozen in plastic bags. Sheep were fed the thawed forage and their digestive progress was carefully checked for 2 weeks.

Different plants were fed to the animals at different times, so the scientists could investigate differences in digestibility between the various grasses. All plants were harvested at the same stage of maturity.

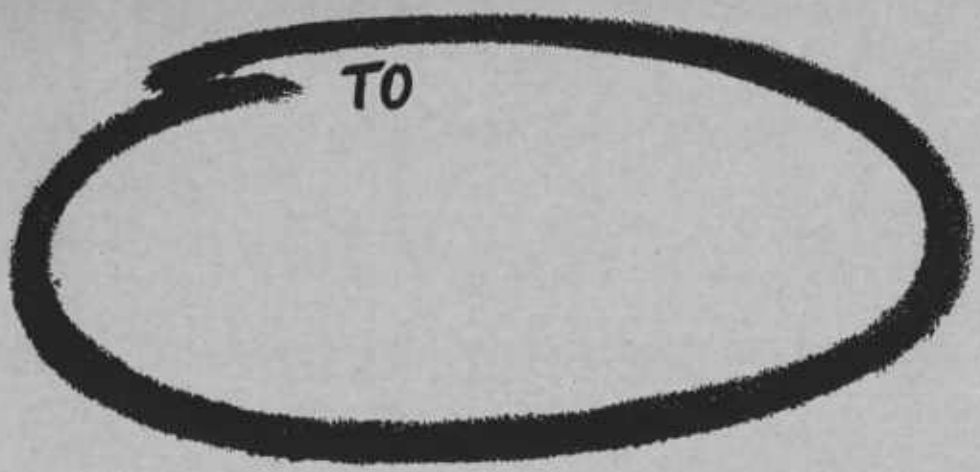
Results help plant breeders

Results of the feeding trials showed that the plant breeder will be able to develop more digestible varieties of tall fescue by using the hereditary factor.

Also, discovery of this hereditary trait in grass encourages the scientists to attempt to pin down similar hereditary factors in other forage crops.

Dr. Cowan points out that the next step in this research is to develop a laboratory method for determining if a certain chemical property is peculiar to plants having high or low digestibility.

If such a property can be detected, tedious and time consuming feeding trials will not be necessary, and plant breeders will have a valuable new tool for work with other crops.



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Farm Outlook

(Continued from page 3)

Bartlett crop is down nearly a fifth. Washington, too, expects a smaller Bartlett crop but California looks for more. Oregon and California expect fewer winter pears, but a higher tonnage is forecast for Washington. The total pear crop in the three coast states may turn out 6% below last year, with Bartletts responsible for the lion's share of the drop.

Prunes

A heavy prune loss is reported from Oregon, Washington, and Idaho. The crop from these three states looks to be only a fourth of last year and the smallest since records were started 41 years ago. Weather was unfavorable in both Oregon and Washington during and following the pollination period, resulting in an exceptionally small prune set. California looks for a prune crop only 7% below last year's output and 15% less than average.

Cherries, peaches, berries

Oregon's sweet cherry crop was off 36% this year but the national crop topped last year by 5%. There were fewer sour cherries and peaches, both in Oregon and nationally. Oregon's strawberry harvest fell below last year and hot weather is cutting into caneberry output. Prices are up from last year.

Nuts

Around 7,300 tons of filberts, about 95% of which are Oregon grown, are expected this year, based on July 1 conditions. If this condition holds, it would mean a 38% drop from last year. Walnut estimates top last year by 14%, in spite of a 35% decline in Oregon. California's almond crop is expected to be about a third less than last year.

Vegetables

The national vegetable picture, so far, is fewer for the fresh market but more for processing. In Oregon, a snap bean production second only to 1958's record is in the making. Other processing crops in this state are in a less favorable position. Poorer yields lowered output of peas for processing. Stocks of canned and frozen beans and peas are below a year ago. Beets and sweet corn for canning are both in poorer than average condition.

Meat animals

Cattle prices so far this year have been running below last year and the chances are they will continue lower for some time. More cattle were on feed on July 1 this year and more cattle will go to slaughter houses this summer and fall. Cattle raisers are favored by plentiful feed supplies.

Hog prices improved as the spring pig crop was cut sharply. Last fall's decline was wiped out in the first half of the year and prices should remain above last fall's lows for some months yet. But look for some temporary seasonal downturn as marketings pick up.

Pushing *lamb* prices lower are larger domestic lamb crops, continuing imports, and lower beef prices. Lambs have developed slowly in western Oregon this year and marketings are delayed.

Poultry

Last year was a rough one for poultry producers but 1960 promises to be better. Record high *egg* production resulted in sharp price declines. This caused farmers to cut back so sharply on replacement chicks that the number raised on Oregon farms this year was the smallest since records were started in 1924. With cuts extending to all regions, chickens raised on farms this year were fewest since national records were started in 1909. And, with the reduced supply, egg prices are again on the upswing.

Low *broiler* prices last year brought about the first interruption in the long-time upward broiler-production trend since 1946. This, in turn, improved this year's prices to growers.

Turkey prices lagged during most of 1959, but went up sharply toward the close of the year. It was this year-end rise that pricked the farmers interests, and intentions this year are for a crop 6% above last year's record high. Oregon growers plan a 12% increase.

Dairy

Milk production in Oregon turned upward following five years of decline. By mid-year total output was running as much as 4% above the first half of 1959. Prices each month have averaged the same or a trifle above the same months of 1959. Pastures on July 1 were in better condition than last year and about average for that date.