

# California

# AGRICULTURE

Progress Reports of Agricultural Research, published by the University of California College of Agriculture, Agricultural Experiment Station

Vol. 1

SEPTEMBER, 1947

No. 10

## Stone Fruits On Peach Root Resist Bacterial Canker

Leonard H. Day

Stone fruit growers should consider the use of peach roots in areas where bacterial canker—commonly known to growers as Sour Sap and bacterial gummosis—is a major problem.

To be considered are the compatibility of the peach root with the desired fruit variety and whether the soil and other conditions prevailing are favorable.

### Bark Cankers

The most conspicuous phase of the disease is the development of bark cankers on scaffold branches or on the trunks above the graft unions, with or without copious exudation of gum.

When a branch or trunk is completely girdled by the disease the parts above soon wilt and die.

That type of the disease without copious gumming is commonly called Sour Sap by the growers.

The cankers do not progress downward more than an inch or two below ground, and the infections seldom begin in the rootstocks.

In case of susceptible rootstocks, and with the graft union well above

(Continued on page 3)

## Leased Farm Lands In California Now Less Than In 1940

Arthur Shultis

Extract of talk given before the California Chapter, National Institute of Farm Brokers, Davis, June, 1947.

Much of California's leased land, particularly rice, grain, and grazing land, is farmed by part-owners who own farms and lease additional land.

Tenants who lease all the land they farm, declined from 19% of our total farm operators in 1940 to 12% in 1945.

In 1940, 41% of our total land in farms was rented and this declined to 34% in 1945—the lowest since 1925.

### Decline In Leasing

The decline in leasing is the result of good farm incomes during the war years, which enabled more farmers to buy their farms or to buy additional land that was formerly rented.

Farms formerly held by financial institutions and rented temporarily have practically all been sold to farm operators.

The relocation of Japanese farmers in 1942 may also have contributed somewhat to this decline in tenancy.

There also has been considerable purchase of California farms by newcomers and new farmers from other occupations.

### Land Values Leveling Off

It is probable that leasing of farm lands in California is at its lowest point for some time.

Land values are about at their peak and are expected to decline somewhat with the expected decline in prices of farm products. Buyers will wait in a declining market.

Some of the farms recently purchased may become distressed through heavy indebtedness or improper operation and come back in the market for sale or leasing.

Even with some decline, land values will remain high and young farmers will find it easier to rent rather than to buy.

### Leasing Worthwhile

As practiced in California, leasing of agricultural land is a worthwhile device for the gradual transfer of

(Continued on page 2)

## Yield And Quality Of Raisins Improved By Harvesting When Grapes Are At Full Ripeness

H. E. Jacob

The most advantageous time to pick raisin grapes for sun drying represents a compromise between two considerations: (1) The larger yields and better quality obtained from

whereas at 24° Balling, 547 pounds may be expected—a difference of 91 pounds, or 20%.

In California the average yield of Thompson Seedless grapes is about

Well-ripened grapes not only give greater yields of raisins than unripe grapes, but the quality of the raisins is also better.

It can be said for natural sun-dried



Turning grapes on wood trays. An empty tray is placed upside down over a full one, then both are "flipped" over as illustrated. (Photo by Laval)

well-ripened fruit, and (2) The more favorable drying conditions early in the season.

The main constituents of ripe grapes are water and sugars. Other substances—acids, cream of tartar, proteins, fats, minerals, aromatic compounds, fiber and other insoluble materials—are present in smaller amounts.

Water constitutes 70% to 80% of the grape. Sugars, mainly dextrose and levulose constitute about 15% to 25%. As maturity of the grapes advances the sugar content increases, and the water decreases.

When grapes are dried into raisins, from 90% to 95% of the water in the fresh fruit evaporates, but nearly all of the sugars and other solid materials remain in the raisins.

Dry raisins contain only about 15% water, and from 62% to 72% sugar according to the variety of grapes and the method of drying used in making the raisins.

### Sugar Content and Yields

The approximate sugar content of fresh grapes is usually measured by means of an hydrometer test of the juice pressed from the fruit.

The hydrometer—Balling or Brix—is calibrated to read "per cent sugar," but since all dissolved substances affect the reading, the result is more properly termed "degree Balling" or "degree Brix" or per cent soluble solids. It is always from one to two degrees higher than the true sugar content of the grape juice.

Grapes are usually harvested for raisins when the juice tests somewhere between 20° and 24° Balling.

A ton of fresh Thompson Seedless grapes at 20° Balling will make 456 pounds of natural sun-dried raisins,

6.5 tons of fresh grapes per acre.

If the grapes were harvested at 24° Balling, the yield of raisins from an average acre of vineyard would be about 591 pounds greater than if they were harvested at 20° Balling—the difference of 91 pounds multiplied by the average yield of 6.5 tons.

At the 1942 raisin price level of \$113.00 per ton—the \$312.00 price of 1946 is now only a memory—the increased yield would be worth about \$33.39 an acre.

### Drying Time

As the season advances, the days become shorter, the temperature becomes lower, and occasional damaging rains are more probable.

At Fresno, the mean temperature for August is about 79.5°F; for September, 72.0°; and for October, 62.3°.

Average Thompson Seedless grapes will dry in about 12 days with a mean daily temperature of 80°F; but at 70° about 20 days are required. At 60° about 40 days are needed for drying. These figures apply only to the natural sun-drying process. Dipped grapes dry more rapidly. Muscat grapes require about a half-longer time to dry than Thompson Seedless.

Thompson Seedless grapes picked in early September may be expected to dry in two to three weeks. Those picked in late September are likely to require four to six weeks, and any grapes picked in October are likely to be damaged by rain if they are sun-dried.

In the 24 years of 1913 to 1946, inclusive, the earliest rain apt to cause serious damage to raisins in the Central San Joaquin Valley, occurred on September 19, 1939. Eight of the 34 years had rain by September 30th and 14 years had rain by October 10.

raisins not damaged by rain, that the riper the grapes the better the quality of the raisins.

Raisins made from grapes of less than 20° Balling, are nearly always inferior or substandard in quality. Raisins made from grapes of 21° to 23° Balling, are usually of average or standard quality. Those made from grapes over 23° Balling, usually are of superior quality.

Raisins dried by other processes, such as "golden bleached," do not always follow the rule for naturals that the riper the grapes the better the quality of raisins. In "golden bleached" raisins, the color of the raisins assumes great importance, and overripe grapes which may have some partially dried berries will produce raisins of nonuniform color.

For such raisins, a uniform yellow color of the fruit is probably the best index of maturity, so far as quality of the raisins is concerned.

Yields of "golden bleached" raisins follow the degree Balling of the fruit, not the color.

### General Rules

On the basis of the information now at hand, several general rules regarding the time to harvest raisin grapes may be formulated:

(1) Grapes of less than 20° Balling should not be dried for raisins except as a salvage operation to avoid loss.

(2) Grapes for natural sun-dried raisins should reach 23° or 24° Balling, if such maturity can be attained by September first or soon thereafter. Picking should start soon after the grapes reach 23° Balling or September first, whichever is the earlier.

(3) All Thompson Seedless grapes for natural sun-dried raisins should

(Continued on page 3)

## Suggestions For Grazing Lambs On Irrigated Pasture

Robert F. Miller

The fattening of lambs on irrigated pastures is not without its problems.

There have been some heavy losses due to a feed reaction when lambs were first turned into rich clover fields, trouble from parasites, particularly coccidiosis, from overstocking and possibly from bloat.

### Suggestions

Experience in the handling of lambs on irrigated pasture is important.

Following are a few helpful suggestions in grazing lambs on irrigated pastures:

(1) Provide ample forage at all times. Do not overstock—10 to 12 lambs per acre is generally about right.

(2) Thrifty, fleshy feeders averaging about 70 pounds do best. Thriftiness is more important than size.

(3) Maturity of forage is important. Clover blossoms are high in nutritive ingredients. Short, immature clover lacks fiber for proper digestion and is also low in nutrients.

(4) In rotation grazing, change fields frequently. Keeping the feed uniform eliminates feed reaction.

(5) Sort lambs at the end of two

(Continued on page 4)

## Present and Future Research In Dairy Industry Problems

The following abstract is from an address given before the Quarterly Meeting of the Dairy Institute of California at Eureka, August 21, 1947, by E. L. Jack, Chairman of the Division of Dairy Industry, College of Agriculture.

Now under way in the Division of Dairy Industry are technological researches endeavoring to improve processing techniques in the following products: control of flavor defects in market milk, processing methods to improve the nutritive value of cottage cheese, the use of carotene as a coloring agent for butter, the improvement of flavor and color in evaporated milk, improved processing methods for dry milk, the control of physical defects in ice cream, and the correct usage of water softening and cleansing agents.

### New Basic Knowledge Sought

In addition to the above researches on specific dairy products we are seeking new basic knowledge with respect to the effect of heat on milk proteins, the chemistry and nutritional value of milk fat, the nature and mode of action of milk enzymes, and the chemistry and interaction of lactose and the milk salts and proteins.

### Cooperative Studies

In cooperation with the Department of Home Economics studies are being made of the food uses of milk proteins, particularly dry milk.

With the Division of Agricultural Engineering we are studying the bulk handling of milk from ranch to factory.

The Division of Animal Husbandry and the Division of Dairy Industry are cooperating on problems of animal physiology related to milk quality.

The Division of Chemistry is cooperating on physico-chemical problems in frozen dairy products.

Cooperative studies with the Division of Poultry Husbandry are being made of the problems in food acceptance and nutritional values.

(Continued on page 2)

## Oil Fractions And Their Toxic Effect On Plants When Used As Weed Killing Sprays Explained

A description of oil fractions and their toxic effects on weeds, extracted from the Agricultural Extension Service Circular No. 137, General Contact Weed Killers, issued by the University of California College of Agriculture. The complete circular may be obtained without charge by addressing a request to the College of Agriculture, Berkeley 4, California.

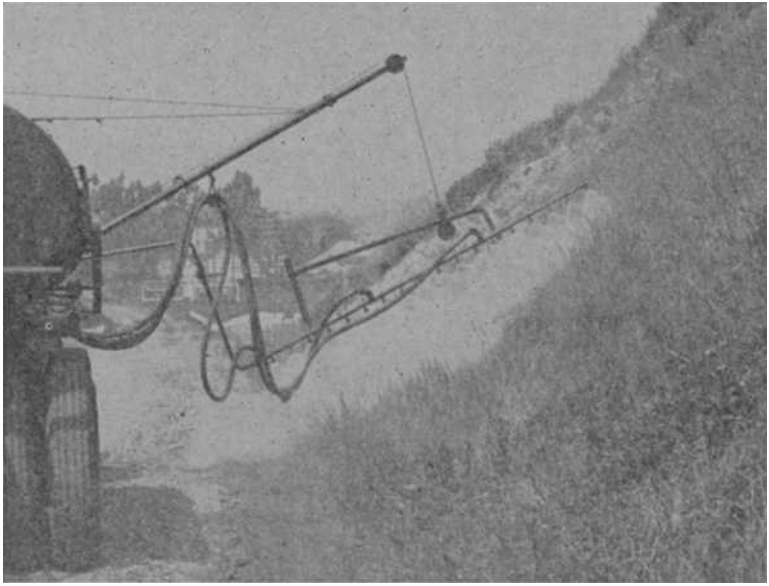
### A. S. Crafts

In contrast to sprays in water solution, oils wet plant surfaces readily and tend to spread as thin films and run down the stems. They penetrated the crown of grasses where growing tissues that form new shoots are located. If an oil spray wets the tops of grasses thoroughly, the film may creep from four to six inches down the stems and kill all tissue from which new shoots might grow. This accounts for the satisfactory results

condense later. Thus each batch of crude oil contains some gasoline, some stove oil, and some Diesel fuel, etc., and each fraction may be removed within its own boiling range.

### Distillates

The liquid oil fractions resulting from distillation are called distillates. Not all the materials in crude oil can be distilled; tars and asphalt are left. The distillates are not pure compounds but contain a mixture of all



Spraying diesel oil as general-contact weed killer on roadside growth to form a fire control strip. The oil should wet the tops of the growth thoroughly so a film of oil may creep down the stems to a depth of four to six inches to kill all tissue from which new shoots might grow.

usually obtained with Diesel and smudge-pot oil sprays, both of which are standard materials for weed killing.

### Properties of Oils

To use oil sprays in weed control, the grower must know something about oils and their effects on plants. In this way he will be able to choose the best oil for his own needs.

In the oil trade, all oils are described by sets of specifications. These are either required by law or used by the manufacturer as a standard of quality for his own products. Every product must meet the specifications which its manufacturer has set up for it. These standards are intended to show a product's ability to do the job for which it was made. Certain oils now being tested as weed-killing sprays were not really intended for this use. Thus specifications listed for these oils do not necessarily show how well they will act as weed killers. There are no specifications for weed-killing oils. The only sure way to find out if an oil is useful as a weed killer is by tests in the field. Hence, in buying oils for weed killing, the grower will have to rely on the ability of the oil dealer to supply a satisfactory product.

This circular lists some of the words commonly used to describe oils and oil sprays, and tells what they mean. It also gives a simple account of the way in which oil is refined. The list should be helpful to the grower when choosing his oil sprays.

### Refining

Two main processes are involved in oil refining: distillation and separation. An example of simple distillation is the boiling of a teakettle. The water in the kettle is heated to boiling temperature. At this point it turns to steam or vapor. If the steam touches a cold surface, it condenses. This condensed steam is a distillate. Since water has only one boiling point, the condensed steam is the only product resulting from the boiling of water.

Unrefined—crude—oil, on the other hand, is made up of many parts—fractions—which have different boiling points. The oil is put into a container, or tower, and heated. The fractions which have the lowest boiling point—gasoline—vaporize first and the vapors rise to the top where they condense. These fractions which evaporate quickly are the light—more volatile—ones. Other, less volatile fractions, such as stove oil and Diesel fuel, have higher boiling points, and

compounds which turn to vapor during distilling. Some of these are called unsaturated compounds. There are more of these unsaturated compounds in an oil such as Diesel fuel, than there are in kerosene or spray oils that have received more treatment. When a refined oil is wanted, some or all of the unsaturated compounds may be separated from the oil by use of chemicals. Sulfur dioxide is one commonly used for this purpose.

It is the unsaturated compounds which are important in weed-killing oils. They determine, in part, how well the oil will kill plants.

### Gravity

The gravity, or density of an oil has to do with its weight. It is expressed in degrees A.P.I. because the gravity of oils in the United States is determined by tests set up by the American Petroleum Institute. The gravity of an oil is found by use of an instrument called a hydrometer. This is a glass tube with degree markings on the side and a bulb at one end. The bulb floats in the oil sample to be tested, and the depth to which it sinks, as indicated by the marks on the tube, is a measure of the gravity of the oil. The bulb does not sink so far in heavy oils as in light ones. The degrees are marked on the tube in such a way that gravity readings of heavy oils are lower than those of light ones.

Gravity is important in choosing a weed-killing oil. Heavy oils, which fall below 38° A.P.I., will kill crop plants as well as weeds. For use as a selective herbicide on crop plants, therefore, a weed-killing oil should not fall much below 38° A.P.I.

### Flash Point

Flash point is a measure of the inflammability of an oil. One of the means for testing the flash point is the Pensky-Martens closed cup test. The oil is heated in a closed container, or cup. A slide covers a small opening in the cup. This is opened at definite intervals, and a flame is passed over the oil. The temperature at which the oil ignites is its flash point.

Highly volatile oils ignite at fairly low temperatures. All gasolines flash at ordinary temperatures—for instance, 70° F.—; in fact, they will flash at freezing temperature for water. From the standpoint of safety for the operator, it is dangerous to use gasoline for weed spraying. Only less volatile fractions such as some of the

## Newly Developed Insecticides For Pest Control

### Robert L. Metcalf

Scientific research by commercial and governmental interests has resulted in an unprecedented development of new materials showing great promise as insecticides. Intelligent evaluation of their potentialities will offer big dividends in improving the efficiency of present day pest control practices.

### DDD or TDE

DDD or TDE is 2,2-bis-(p-chlorophenyl)-1,1-dichloroethane,  $(ClC_6H_4)_2CHCHCl_2$ . It is generally somewhat less effective than DDT to household insects such as the German roach and bedbug but is more effective as a mosquito larvicide. It has a decided advantage of being from about one-fifth to one-tenth as toxic as DDT to mammals.

This material can be formulated in sprays, dusts, wettable and emulsion concentrates exactly as in DDT. Doubtless it will be utilized extensively in household and livestock insecticides and may be preferred to DDT on agricultural crops wherever treated products are intended for human consumption.

### Methoxychlor

Methoxychlor, is correctly named as 2,2-bis-(p-methoxyphenyl)-1,1,1-trichloroethane,  $(CH_3OC_6H_4)_2CHCCl_3$ .

This material gives a much more rapid knockdown of flies than does DDT, is more toxic to the German roach and is equally toxic to the bedbug. It is less effective against the human body louse, mosquito larvae, and the American roach.

Methoxychlor is only 1/25 to 1/50 as toxic as DDT to mammals, but is expected to be several times more

thinners and solvents, are fairly safe to use. However, the spray operator must remember that all these products are inflammable. The spray mist and surrounding air may ignite and burn with great heat.

### Viscosity

This relates to the flowing quality of an oil. To find the viscosity, 60 cc—about 2 ounces—of oil are put into an instrument called the Saybolt Universal viscosimeter. The oil is heated to 100° F. It is then timed as it runs through a small opening in the instrument.

The viscosity of an oil to be used as a spray determines somewhat the amount of pressure needed, and the size of the spray orifices. The heavier oils will not break up into drops easily, nor flow as fast as will the lighter ones. Viscosity is also a factor in determining how much of the oil soaks into the plant surfaces. A heavy oil will stay on the plant longer than will a lighter, more volatile one. Thus it may soak in in larger amounts and be more toxic. For use as a weed spray, an oil's viscosity should be about 50 seconds or less.

### Toxicity

An oil's toxic effect on plants depends in part on how volatile it is and on the amount of unsaturated compounds it contains. Oils vary in their toxicity. Some kill all plants; some are selective, and kill only weeds, leaving certain crop plants undamaged. Light unsaturated compounds cause a rapid burning of leaves called acute toxicity. Heavy unsaturated compounds injure the growing parts and cause a chlorosis—yellowing of leaves. This injury comes on much more slowly and is called chronic toxicity. Very light unsaturated compounds, such as those from gasoline stock, cause burning of the leaves. Injury is not complete, however, if the spray incompletely saturates the plant, because these oils may evaporate before all tissues are killed.

Unsaturated compounds of medium weight are very toxic to grasses and most weeds. They do not kill plants of the carrot family except at high concentrations. They are usually found in unrefined petroleum distillates such as stove oil, at concentrations between 20 and 30 per cent. Heavy unsaturated compounds, such as those in Diesel and other heavy fuels, kill plants slowly by chronic toxicity. Crop plants as well as weeds are killed by such oils.

A. S. Crafts is Professor of Botany and Botanist in the Experiment Station, Davis.

## Leasing Of Farm Lands In State Thought To Be At Low Point Now But Increase Is Anticipated

(Continued from page 1)

ownership from one generation of farmers to the next.

Young farmers find it a way to expand their operations and earnings more rapidly than through ownership.

Truck and crop specialists may shift their operations more readily where they lease a large part of the land they farm.

### Rental Arrangements

Rents naturally increased considerably in recent years with increased profit opportunities but face early adjustment to changing price conditions.

Although supply and demand for land to rent largely determine rents, the ability of the tenant to pay must be considered.

expensive than DDT. It may find considerable use, especially in agriculture, because of its very low toxicity to warm blooded animals. This material can be formulated identically with DDT.

### DFDT

A German household insecticide not yet available on the American market, but which is of interest experimentally is DFDT or 2,2-bis-(p-fluorophenyl)-1,1,1-trichloroethane,  $(FC_6H_4)_2CHCCl_3$ .

This material has proven much more toxic than DDT to the German cockroach, ants and many other insects but is less toxic to lice and bedbugs. It is especially remarkable for its rapid action, giving knockdown of flies and mosquitoes in from one-fifth to one-tenth the time required by DDT. It is somewhat more toxic to mammals than is DDT.

The DFDT has a much higher vapor pressure than DDT, giving it some fumigant action and it does not possess long residual life. This may be an advantage in the case of agricultural applications.

### Benzene Hexachloride

Benzene hexachloride or gamma-hexachlorocyclohexane,  $C_6H_6Cl_6$ , as pure material has proven from 10 to 20 times or more as effective as DDT to such pests as the housefly, human body louse, ants, bedbugs and various species of cockroach. It is slightly more toxic than DDT to mammals.

Most formulations of benzene hexachloride on the market are crude mixtures containing about 10% active material, and are irritating to apply and possess an offensive odor. They should therefore be used with great caution around dwellings and business places. Benzene hexachloride is formulated in a variety of ways, as oil solutions, emulsion concentrates, wettable powders and dusts. It does not have as prolonged residual action as does DDT.

### Chlordane

Chlordane—This material is a chlorinated hydrocarbon with the formula  $C_{10}H_6Cl_8$  and is octachlorodihydrodicyclopentadiene.

Chlordane is several times as toxic as DDT for houseflies, mosquitoes, silverfish and carpet beetles, and is 10 to 20 times as effective to the German cockroach and to various species of ants.

It possesses considerable residual action but also has some fumigant properties. Its toxicity to mammals is about equal to that of DDT.

Chlordane can be formulated as sprays, dusts, wettable powders and emulsion concentrates. Because of its viscous oily nature it forms almost invisible residual films which stick very tenaciously to smooth surfaces, but are readily absorbed by porous surfaces. It is several times more expensive than DDT.

### Toxaphene

Toxaphene—This waxy material is probably a mixture of isomers of octachloro-camphenes  $C_{10}H_{10}Cl_8$ .

Toxaphene is stated to be of the same order of toxicity to mammals as is DDT. It has proven equally as toxic as DDT to flies and bedbugs and appears to be more effective against the German cockroach. It is highly effective against carpet beetles and clothes moths, and as a mosquito larvicide.

Toxaphene has long-lasting residual properties, and should be of interest because of the adhesiveness of its residual films. It is formulated

Rental arrangements need to be re-examined annually.

### Trends

New procedures need to be developed to facilitate the gradual passage of a farm from owner to son or potential purchaser with little capital.

New forms of profit sharing and partnership contracts for farm operation will supplement traditional leasing practices.

More devices to bring landlords and tenants together will be needed to handle the expected increase in farming on land owned by others.

Arthur Shultis is Specialist in Farm Management in Agricultural Extension and Associate on the Giannini Foundation.

### HETP

HETP—Hexaethyl tetraphosphate—probably  $OP[O(OC_2H_5)_2]_3$ —is completely miscible with water and rapidly hydrolyzes to other phosphoric acid esters, forming acid solutions which are non-toxic and somewhat corrosive to spray equipment.

HETP solutions should be applied as soon as possible after dilution and should not be used longer than 6 hours after mixing.

Although extremely toxic to many household insects HETP has almost no residual properties and is very toxic to mammals, being nearly as toxic as free nicotine. It should therefore be used with the utmost care.

### TEP

A material of very recent development is tetraethyl pyrophosphate or TEP,  $O[PO(OC_2H_5)_2]_2$ .

It possesses nearly the same solubility characteristics as HETP, but hydrolyzes more slowly in aqueous solution so that solutions one-day old still possess considerable insecticidal effectiveness.

TEP has proven 3 to 5 times as toxic to many insects as is HETP, but is correspondingly more toxic to mammals. It also possesses strong fumigant action. Because of its extreme toxicity to mammals it is yet to be determined whether or not it will have any place in the household insecticide field.

Robert L. Metcalf is Assistant Entomologist in the Citrus Experiment Station, Riverside.

## Present And Future Research In Dairy Industry Problems

(Continued from page 1)

It is our intention to expand the present researches and to initiate others as fast as qualified personnel and suitable housing can be obtained.

We expect to undertake work in the field of dairy bacteriology, to expand our frozen products and nutritional studies, and to initiate engineering studies on cleaning dairy equipment.

We also have much additional work of a basic nature in chemistry, engineering, and bacteriology to undertake in order to increase our store house of knowledge.

E. L. Jack is Associate Professor of Dairy Industry and Associate Dairy Technologist in the Experiment Station, Davis.

## CALIFORNIA AGRICULTURE

Established December 1946

Progress Reports of Agricultural Research, published monthly by the University of California College of Agriculture, Agricultural Experiment Station.

HAROLD ELLIS.....Director,  
Agricultural Information  
W. G. WILDE.....Editor

California Agriculture, progress reports of agricultural research, will be sent free to any resident of the State in response to a request sent to the University of California College of Agriculture, 331 Hilgard Hall, Berkeley 4, California.

Any part or all of this material may be used with or without credit