California AGRICULTURE

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California's Farm Products Affected By Foreign Trade

M. R. Benedict

A condensation of an address delivered before the Western Farm Economic Association Meeting in Berkeley, October 3, 1947.

There is no one simple and easy solution to the international trade problem.

Under present conditions of world-wide conflicts in ideologies, it would be foolish to base international trade policies mainly upon the possibilities of temporary gain or loss to this or that group within agriculture, labor, or business.

Whether we can maintain peace and reasonable opportunity for private business activity will depend very much on what happens economically and politically in the whole group of nations interested in maintaining democratic institutions.

If peaceful solutions fail, the ultimate cost in dollars, to say nothing of moral values and human lives, will be so vast as to make any temporary gains or losses seem microscopic.

This is not to say that dollar gains or losses can or should be ignored, but merely to point out that we need to be on guard against overlooking things of major importance as we concern ourselves over local problems and those of our own particular groups.

We here in the United States have such a great diversity of resources that we can satisfy from within our own borders a very large part of our needs. Many, perhaps most, of the other nations have economies that are built upon special kinds of pro-

(Continued on page 3)

Liquid Manure—Pumps, Tanks and Application Method

John B. Dobie

The three inch centrifugal pump, designed to handle up to 40 per cent solids without clogging, is widely used in handling liquid manure.

In one type of installation the pump body is located near the edge of the storage tank and a suction pipe with a foot valve is extended into the sump. A discharge pipe is provided from the pump to the delivery point.

Another type of installation has the pump runner housing submerged in the bottom of the pit and driven by a long drive shaft which projects upward through a casing. The shaft runs in bearings in the shaft housing and is lubricated by a drip cup oiler. There is no suction pipe or foot valve on this type pump and the unit is self-priming. The discharge pipe is extended from the pump up over the side of the pit to the desired point of delivery.

Power

The electric motor is a most satisfactory source of pumping power. It is available in a range of power and speed for all sizes of manure pumps.

A three-inch pump requires a two to three-horsepower electric motor which can be handled by any rural electric power line. The motor should be equipped with a good magnetic switch as a protection against overloading.

The Storage Tank

The size of the storage tank varies according to the ideas of the individual owner.

Installations for the use of liquid

(Continued on page 2)

Low Cost Control Measure For Wireworms Made Possible By New Chemicals For Soil Application

W. Harry Lange, Jr.

Some of the newer types of chemicals make possible the economical control of wireworms.

These yellowish, wirelike worms are the active, larvae stages of click-beetles and live for several years. They are especially hungry in the spring of the year when they feed on germinating seeds, or bore into the underground portions of plants.

Several years of experimental work and observations have been accomplished with the new chemicals for soil application but their full effects on all types of plants—their lasting qualities and their possible penetration within the plants and movement in the soil—are not fully known at this time.

Growers contemplating the use of such chemicals should contact their local agricultural authorities for recommendations.

(Left) Applicator for applying soil fumigants. A series of drills are mounted on the front tool bar.

(Right) Results of soil treatment. Foreground, the check; background, soil treated at the rate of approximately 400 pounds of D-D per acre; far background area is another check strip.

Ethylene Dibromide

Ethylene dibromide dissolved in naptha thinner has proved outstanding for the control of wireworms.

In 1947, aproximately 25,000 acres of wireworm and nematode infested soil, to be planted to large limas, were treated in southern California.

Ethylene dibromide is a colorless liquid, usually of 10% or 20% strength —on a volume basis—in thinners. It is best applied by an applicator which drills the liquid into the soil six to eight inches deep, at 12 inch spacings.

The dosage using the 10% material is two milliliters—one fluid ounce is 29.6 milliliters—injected into the soil at 12 inch spacings. The dosage of pure ethylene dibromide used for wireworm control is 2.5 gallons per acre but may be varied occasionally to suit particular soil conditions.

Ethylene dibromide is best applied before a crop is planted and a period of seven to 15 days should elapse before planting.

Beans, corn and lettuce are particularly tolerant of the chemical, but tomatoes or certain other solanaceous plants—the plant family to which the potato belongs—may be injured if planted too soon following application.

The soil should be adequately tilled to allow for the pentration of the gas to a depth below the drill points and should be in a condition ready for planting—not too wet or too dry. Under certain conditions a rail or roller should be pulled behind the applicator to fill up the furrows. The treatment should be made at temperatures of from 45° F. to 70° F.

The cost of material and application will run from $20 to $30 an acre depending upon the amount of material used, the type of applicator used, and the number of acres to be treated.

One treatment usually continues to give a partial control the second year and occasionally into the third year.

The lasting effect of one treatment is based on a rather complex set of factors and for the reason a carry-over effect to a second year cannot be predicted definitely.

D-D

The fumigant, commonly known as D-D, **Dichloropropane-dichloropropene mixture**—has been used successfully for wireworm control, and in cases where both wireworms and nematodes are a problem in the same field.

It is a dark colored liquid applied in the same manner as ethylene dibromide. The material can also be used in hand applicators applying 3.5 milliliters per shot at 12 inch intervals.

The dosage necessary for wireworms is 400 pounds to the acre which is more than is ordinarily recommended for nematode control.

As with ethylene dibromide this material should be applied prior to planting a crop, and because of its lasting ability in the soil a period of 14 to 25 days should elapse before planting.

In certain cases where it is applied during low soil temperatures or high moisture conditions, a longer waiting period may be necessary.

This chemical has been most successfully used for wireworms affecting lettuce in the Salinas Valley, particularly as a fall treatment. The addition of 35 pounds anhydrous ammonia applied with the fumigant in the fall has given outstanding results by increasing the yield.

D-D has been used very successfully where sugar beets are to be planted.

The neccessary soil preparation is similar to fumigating with ethylene dibromide. A temperature above 50° F. is desirable.

Benzene Hexachloride

Benzene hexachloride is one of the most promising of the newer materials for wireworm and garden centipede control.

It kills the worms chiefly by contact action over a period of several months. Unfortunately it is of little value for the successful control of nematodes.

The chemical is a white to brown powder with a very pungent, earthy

(Continued on page 3)

Small Size Citrus Fruits May Be A Genetics Problem

Robert W. Hodgson

The production of undesirably small sizes of citrus fruits is a problem currently of great importance in California and occasionally so in Florida.

The average size of fruit attained by the crop of any given citrus tree appears to be the result of a number of factors, of which the following are known to limit or affect fruit size: (1) variety, (2) rootstock, (3) nutrition, (4) weather.

Variety

Among commercial orange varieties considerable inherent variation exists as to average fruit size. In Florida the small fruit size problem is concerned only with the Hamlin variety and in California primarily with the Valencia variety.

Rootstocks

Certain rootstocks tend to reduce fruit size, others to increase it, and still others apparently have no affect.

Sour orange, at least under certain conditions, seems to exhibit the tendency to reduce the average fruit size but to a lesser degree than does the trifoliate orange.

The small fruit size problem in Florida is confined to Hamlin trees on sour orange rootstock. While information as to the rootstock situation is not available, it is certain that a large part of the Valencia orange trees in the California districts where this problem is most acute are on sour orange rootstock.

Mineral Nutrition

The mineral nutrients most commonly deficient in Florida are magnesium and the so-called trace ele-

(Continued on page 4)

Shot-hole Borer Control Problem One of Management

Leslie M. Smith

Late in the fall, in dry years, trees injured by the shot-hole borer are bedecked with large masses of gum which have been accumulating throughout the summer. The gum masses reach their greatest total just at the start of the fall rains.

As long as the trees hold their leaves the gum is not conspicuous; but as soon as the leaves fall, growers are suddenly and forceably aware that something is wrong.

Heavily gummed trees are especially conspicuous when viewed against a setting sun. Each mass of gum acts as a lens to focus the light to a bright point.

With the advent of the fall rains, the gum masses soften, dissolve, and drop from the tree, and to the casual observer, the trees again appear to be in good health.

Recognition of the Shot-hole Borer

The pest can be recognized as small, dark brown beetles, about one-tenth inch in length. Their cylindrical bodies resemble a small segment of pencil lead. The adult beetles crawl rapidly over the bark of affected trees, with a nervous, jerky gait.

In the fall, the female, often accompanied by a male, is found chewing a hole into the twig at the base of a bud.

Egg-laying Habits

It sems probable that the adults feed on the wood as they bore into the twigs, and it is also probable that they would lay eggs in the tunnel so constructed but the tree begins

(Continued on page 3)

Small Size Citrus Fruits May Be A Genetics Problem

(Continued from page 1)

ments—zinc, copper and manganese. In California they are zinc and possibly manganese.

One of the important aspects of the widespread elimination of these deficiencies in Florida in recent years has been a substantial increase in average fruit size.

A not inconsiderable part of the sharp increase in yield, which has resulted from the use of the new fertilization and nutritional spray program, is to be attributed to increase in fruit size rather than to increased number of fruits, though the latter has also occurred.

Organic Nutrition

For trees not suffering from lack of mineral nutrients, adequacy of organic nutrition almost certainly is concerned primarily with carbohydrate supply per fruit.

Virtually without exception, investigators have shown that fruit size—or weight—increases with increase in number of leaves, up to a maximum, beyond which no further increase in fruit size occurs, regardless of the number of leaves.

There are conditions under which an excessively large crop of small sized fruit on normal healthy trees may be reflected in undesirably small sizes in the following crop, even though it is considerably smaller in amount.

Trees lacking in vigor, irrespective of cause, are characterized by reduction in both amount and size of leaves. In many cases, impairment of leaf health occurs.

In such trees the supply of organic nutrients is undoubtedly sharply reduced—to the point where it becomes limiting in relation to fruit size.

There is much speculation and difference of opinion as to the causes which have led to the development of the current small fruit size problem in California.

One factor which probably has played an important part, in certain areas, is cumulative injury from the long continued use of oil sprays. It is both interesting and puzzling to note that this effect seems not to have occurred in Florida, where oil sprays have been used even longer than in California. Presumably the environmental conditions there are not favorable to the absorption of oil.

Among the other possible causes which have been suggested are:

(1) That trace element deficiencies are much more widely prevalent and important than hitherto appreciated.

(2) That the influence of soil reaction (pH) on the availability and intake of mineral nutrients is much more important than hitherto realized.

(3) That a gradual accumulation of salines has occurred which is increasingly interfering with the intake of water and mineral nutrients.

(4) That nematodes or other soil organisms have built up to the point where root growth and activity are increasingly curtailed.

In view of the importance of the situation, research work already under way on these hypotheses has been materially expanded and all of them, and other, are now under intensive study.

Weather

Adequacy of heat during the growing period is unquestionably the aspect of weather most closely related with fruit size problems.

Variety for variety, all citrus fruits average much larger in Florida than they do in California.

The effect of heat on fruit size appears to be influenced by atmospheric humidity, which if low tends to restrict attainment of maximum size.

Only in the hottest districts of California do the Valencia orange and Marsh grapefruit ripen by the beginning of the next growing season.

Elsewhere, part of the growing succeeding season is required to bring the fruit to maturity. The small fruit size problem is rarely of importance in the former but all too frequently so in the latter, and notably so in the late coastal districts.

That the past four or five years have comprised a period of pronounced deficiency in total heat is generally recognized and readily demonstrable and, significantly, it has witnessed the most acute occurrence of the small fruit size problem in many years.

There is evidence that time of bloom and favorableness of temperature conditions during the early part of the growing season may be of special importance in relation to fruit size. Thus in districts or seasons of earlier than average bloom the crops are usually characterized by better than average fruit size.

The earlier bloom which irrigation produces in Florida, following warm, dry winters, is doubtless mainly responsible for the large sizes and earlier maturity which have been attributed to irrigation there.

Other Factors Studied

Since, for healthy trees, heavy crops is the factor common to the small fruit size problem in both states, and usually the most important, ways and means by which the number of fruit increased, would seem to afford the greatest promise for its solution.

Unfortunately, the limited evidence and experience accumulated thus far are not very reassuring.

Fruit Thinning

The fruit thinning experiments conducted to date all seem to have increased fruit size somewhat, but the reduction in crop and the costs of the operation have rendered it highly unprofitable.

In most comprehensive and best conducted experiment reported thus far, it was found that the effect of a thinning carries over into the succeeding crop. One thinning increased fruit size in the current crop, though at the expense of amount of crop, and at the same time increased fruit size in the succeeding crop, even though as large or larger than the thinned crop.

This practice, if applied to Valencia orange trees in the "on-crop" years, might conceivably give a response sufficient to make it profitable. It seems worthy of further study.

Girdling

Among the results reported from girdling experiments have been increased fruit sizes, though the use of this practice, in California at least, has been primarily for the purpose of increasing fruit set.

It seems probable that the time of treatment should be different for the two objectives.

While not considered promising, and likely to be depressing to tree health and vigor, it seems desirable to give this practice more study.

Blossom-thinning Sprays

Perhaps the most promising field for study in this connection is the use of blossom-thinning sprays, of which a number of kinds are now available. The use of such sprays is receiving widespread attention in connection with experimental work on the problem of alternate or biennial bearing in the temperate zone fruits.

Tree Vigor

There is much disagreement as to the causes for the widespread lack of tree vigor in some districts, which almost certainly is related to the small fruit size problem.

The evidence is strong that in certain districts, a contributory, if not causal factor, is the cumulative effect of the long continued use of oil sprays. This can not be the sole cause, however, for this condition exists over wide areas where oil sprays have been comparatively little used.

There is much reason for concluding that some general condition exists which is interfering with the normal intake of mineral nutrients directly, or indirectly.

It is hoped that research now under way will soon clarify this situation and provide the information necessary for its correction.

Nitrogen Fertilization

In view of the long known and utilized effects of nitrogen fertilization on yield, some growers have resorted to the use of extra nitrogen in the hope that it would improve fruit sizes. No convincing evidence has been reported to date in support of this conclusion. Not infrequently the heavier crop which results from increased applications of nitrogen actually causes a decrease in average fruit size.

The best conducted experiments, in which the extra nitrogen has been made available after fruit-set has ended, have failed to show an appreciable effect on fruit size.

Plant Breeding

A permanent solution to the small fruit size problem in California undoubtedly can be provided only by an adequate plant breeding program with larger-fruited varieties as its objective. It would appear highly important that such a program be got underway as early as practicable.

Robert W. Hodgson is Assistant Dean of the College of Agriculture, Professor of Subtropical Horticulture, and Subtropical Horticulturist in the Experiment Station, Los Angeles.

Spring Pruning And Fertilizing Of California Live Oak Trees Cause Increase Of Tip Mildew

P. A. Miller

The tip mildew or "witches broom" disease of the California Live Oak trees is increased by early spring pruning and fertilization. These are common practices which should be discontinued or avoided.

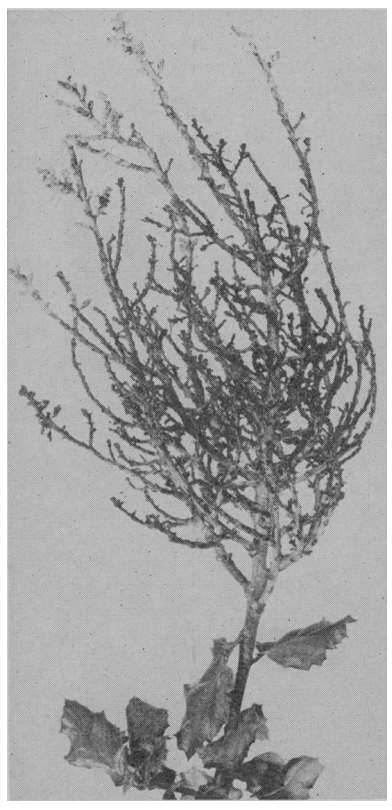
Trees of this kind may appear to be weak or in poor condition in January or February if the tip mildew disease had attacked them severely during the previous year. The leaves which were produced during the previous spring, fall or are shed normally at this time. The only mature leaves remaining on the trees are those which grew during the summer or were produced during the shorter, less active growth period of the preceeding fall.

Due to the severe mildew attack, "witches brooms" may be abundant throughout the trees. At this time, they are mostly dry, brown, dense masses of stunted, distorted shoots and leaves. In the active stage they are enlarged or swollen and covered with a powdery white growth of fungus. They may comprise the terminal growth of normal shoots or may involve part or all of the growth from an old "broom." Many entire shoots or suckers originating from the trunk or main limbs of the tree may be stunted and distorted into "witches brooms."

Spring Pruning A Mistake

The thin foliage, the apparent lack of normal growth and the many clearly visible "witches brooms" give the impression that these trees are lacking in vigor.

Pruning to improve their appearance and feeding to promote growth would seem to be logical recommendations for the treatment of such trees. Removal of the old "brooms" in pruning would seem to eliminate some sources of mildew infection.



Typical "witches' broom" growth of California Live Oak shoot.

Spring pruning of trees severely affected by tip mildew may sometimes be recommended in the mistaken belief that the removal of the old diseased growth will materially reduce the disease on the new growth which develops later. The application of high nitrogen fertilizers is advocated to promote growth at that time and restore the vigor and health of the trees.

The California Live Oak trees normally produce their greatest flush of growth during February and March. The mildew fungus attacks only the tip growth of new shoots and leaves. Weather conditions of temperature and humidity are most favorable for the infection of this new growth at this time of the year. Ample soil moisture for sustained growth during the spring months may be provided by late rains during some years or by irrigation or drainage water.

Severe pruning or liberal applications of high nitrogen fertilizers result in increased growth of young shoots and leaves susceptible to infection by the mildew fungus.

Oak trees susceptible to this disease if pruned or fertilized at this season will have more infected leaves and tip shoots than trees which had been neither pruned nor fertilized. Those which are both pruned and fertilized at this time will be most severely attacked by the mildew fungus.

Fire May Promote Growth

Much evidence of the relation of pruning and fertilization to the severity of tip mildew of oak trees was obtained by observations in the field. Forest, brush or grass fires sweeping through native stands of these trees may not kill them. Only the foilage and twigs may be burned or heat-scorched. The damage to the trees in such cases would be roughly equal to severe pruning.

Fire-scorched trees in two areas which had burned over the previous summer were observed to be severely attacked by tip mildew the following spring. Much of the new growth consisted of large "witches brooms."

Spring Growth Stimulated

Many park, garden and roadside oak trees which have been severely pruned at this season of the year have been observed to be more seriously affected by this mildew than they were in previous years. The same results have been observed to follow spring fertilization of trees in the field.

The transfer of seedlings from crowded flats or nursery rows to fertile soils in pots or in the field will likewise provide stimulation of new growth and a consequent increase in mildew infection.

Experimental work upon the various possible control measures for this disease have been in progress since 1939. After two years trial, spring pruning was abandoned as an aid to mildew control. The results showed that the trees requiring much pruning to remove all of the old diseased growth or "brooms" had more mildewed tips and leaves during the following flush of growth than had been noted prior to pruning.

In the fall of 1939, a group of twenty trees about 14 years old were fertilized with a mixture containing 7.63% nitrogen. Each tree received about 1.1 pounds of nitrogen. During the eight months following this fall application of fertilizer no differences either in the amount of growth or mildew between the fertilized and the unfertilized trees could be detected. These results indicated that a light application of nitrogen at this season of the year had no adverse effect.

Fertilizer Tests

In February of this year, five young oak trees about five years old and approximately equal in their susceptibility to mildew were given application of ammonium sulfate. Each tree was given an amount equivalent to one pound of nitrogen per tree.

Counts of the mildewed tip shoots or "witches brooms" which developed during the spring flush of growth showed an average of 15 more "brooms" per tree than on a comparable group of five trees which had not been fertilized.

A similar group of five trees which had been pruned but not fertilized developed approximately the same average number of mildewed tips per tree as those that were fertilized but not pruned.

Both the pruning and fertilization of these trees should be deferred until late in the summer or early fall months. The weather conditions at that season are less favorable for the mildew fungus. Growth is less active and of shorter duration. There is less young growth of shoot tips and leaves exposed to mildew infection.

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ABSTRACTS OF NEW PUBLICATIONS

ARTICHOKE PRODUCTION

PRODUCTION OF THE GLOBE ARTICHOKE IN CALIFORNIA, by A. A. Tavernetti. Ext. Cir. 76, revised October, 1947. (20 pages).

In the commercial production of the globe artichoke, climate should be moist and cool in summer, as near frost free as possible in winter. A plentiful supply of irrigation water is essential. Soil should preferably be deep, fertile, and well-drained. Climate, however, is more important than soil fertility, and poor soil can be improved by fertilization.

Harvesting begins in the fall, and pickings are made weekly until April or May. Peak of production comes in early spring. Sorting and packing are done on the ranch rather than at a central packing-house, the better to utilize labor.

Growers may wish to plant a part of their acreage to other vegetables, since many artichokes move from California in mixed cars.

Field sanitation is the best known method for controlling pests of the globe artichoke. Aphids are controlled by nicotine sprays or dusts.

Climate and soil requirements, varieties, cultivation, harvesting, packing, and marketing are covered in this circular, which is now available at the College of Agriculture.

GROWING ASPARAGUS

ASPARAGUS PRODUCTION IN CALIFORNIA, by G. C. Hanna. Ext. Cir. 91, revised July 1947. (23 pages).

ASPARAGUS ECONOMIC STATUS

CALIFORNIA ASPARAGUS ECONOMIC STATUS 1946-47, by Sidney Hoos and H. Fisk Phelps. Cir. 373, September, 1947. (20 pages).

HAY HOISTS

THE ELECTRIC HAY HOIST, by John B. Dobie. Ext. Cir. 139, September, 1947. (11 pages).

AVOCADO ECONOMIC SITUATION

AVOCADO SITUATION IN CALIFORNIA 1947, by Wallace Sullivan. Cir. 372, September, 1947. (14 pages).

DONATIONS FOR AGRICULTURE RESEARCH

Gifts to the University of California for research by the College of Agriculture, accepted in October, 1947

BERKELEY

Allied Chemical and Dye Corp. Division of Plant Nutrition	$ 200.00
Sugar Research Foundation Division of Plant Nutrition	880.00
Sugar Research Foundation Division of Food Technology	750.00

DAVIS

Canners League of California Research on canning tomatoes	2,000.00
Cling Peach Advisory Board Division of Pomology	10,000.00
Members of Agricultural Extension Service Attending Conference at Davis Department of Home Economics	30.00

RIVERSIDE

California Fertilizer Association Division of Plant Nutrition	2,000.00