

Quick Decline

experiments seek control of virus-caused disease of orange trees

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A brief report of a joint discussion before the California Fruit Growers Exchange meeting in Los Angeles.

ORANGE TREES affected with quick decline develop symptoms which follow one of two courses.

The first and most common course is: 1. A heavy set of small fruit which colors prematurely; 2. The older leaves become grayish green or bronzed; 3. Reduced amount of new growth during normal growth flushes; and 4. A further yellowing and dropping of foliage.

These above-ground symptoms are accompanied by: 1. A sloughing-off of the feeder rootlets; 2. Rotting of small roots, from their outer ends inward, and 3. A reduction in amount or complete disappearance of stored starch in the roots.

After losing most of their foliage and varying proportions of smaller twigs, such trees usually reach a stage in which some new top and root growth takes place. Many trees remain alive for a period of several years in a condition of poor growth and production.

The second and most striking type of symptom is that described as "collapse."

Trees that appear quite normal may suddenly wilt. Within a period of a few days the trees may be dead or appear dead while still retaining nearly all the dry leaves and fruits.

Many collapse trees die. A few may later develop short, upright, leafy twigs along the upper surface of those limbs that do not die completely. Such trees rarely are able to maintain themselves and frequently die later during a stress period of high temperatures.

Rootstocks Studied

Research is being carried out to determine which rootstocks are not susceptible to the virus.

Results of experiments started 20 years ago indicate that besides sour and sweet orange there are four or five other types

of stock which will produce a good orange orchard.

One of these rootstocks is the Cleopatra mandarin. Trees on this rootstock are somewhat smaller than those grown on sweet root but it is thought that by planting them somewhat closer a very good orchard might be attained.

Cleopatra mandarin is used successfully as rootstock for oranges in Brazil, Argentina, Florida, and to a very limited extent in Texas.

One hundred and twenty-five lots of seedlings have been grown and budded with sweet orange. In the spring of 1948 these will be moved to the quick decline area and experimentally infected with the virus of the disease to determine which rootstocks are not susceptible. These experimental trees include all the species, varieties, and hybrids of citrus obtainable.

An attempt to salvage decline trees is being made by the use of inarching and bridge grafting. As yet, sufficient time has not elapsed to prove whether the methods will be successful.

Special Plantings

At present, between four and five thousand trees have been planted for use in the studies of quick decline. For the most part these are budded trees—Valencia on sour root. It appears that seedling trees will not develop symptoms of quick decline even though certain varieties will, in

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COMMERCIALIZED FARMING

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spreading into and reducing the acreage of commercial farming in this state.

A comparison of size classifications by acreage and value of product between the 1940 and 1945 census provides little data on the trend in number of farms of adequate commercial size.

Since the United States Census of Agriculture counts as farms all over three acres, or with \$250 or more value of product if smaller than three acres, and since value of products in California in 1944 was almost three times that of 1939, more small noncommercial farms would have been counted.

The 6,259 more farms counted in 1945 are largely in the small farm group. In fact, farms of less than 10 acres increased by about that same number.

If allowances are made for changes in price level, it would appear that the number of farms of less than adequate commercial size in California has increased in each census since 1930.

These small farms will contribute little to our total agricultural production. Their

principal product will be better lives than their occupants might enjoy elsewhere. They may provide a considerable supply of regular and seasonal labor for nearby farms operating on a modern commercialized basis.

Land Tenure

The renting of farms and farm lands decreased during the war.

In California, full tenant farmers fell from 19% in 1940 to 12% in 1945, and all land rented, from 41% to 37%.

The high capital requirement and lower postwar profits from farming may reverse this trend.

Some observers believe newer forms of tenure, such as operation by management for the account of the owner, may replace much renting. This practice is more prevalent among orchards in California than renting.

The problem of transferring ownership and managerial responsibility from one generation to the next is becoming more complicated. New types of father-son partnership, profit sharing and leasing agreements, especially made to fit each case, are called for.

The greater values involved in a going farm business also require sound and equitable transfers in both sale and inheritance.

Net Farm Income

It is generally accepted that the next ten years will bring a reduction in farmers' profit margins even if we escape a severe depression.

Product prices are expected to decline more than costs. Cash costs will make up a larger and still increasing part of total costs.

Net farm income is the result of the wise and productive employment of management, capital, and labor. Management in the selection of land and what to produce, as well as in administration of the production process, must be good if there is to be any net income.

Farmers who have avoided excessive debt, who have adequate capital and size of business, and who operate sound farm units at high efficiency, will usually be able to make a reasonable return.

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IRRIGATION

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a depth of about six feet, the trees and vines probably will come through the season without serious damage, but the current season crop may be reduced.

We suggest that the first irrigation be applied now if the rainfall has not been enough to wet the soil to a depth of about six feet.

If water for only one additional irrigation is available, a second watering, for fruit trees, should be given about the latter part of June.

Our experiments show that it is best to keep the trees and vines supplied with water early in the season. Lack of water is more injurious in early season than in the fall, although a continuous supply of readily available water at all times is most desirable.

Economizing

Economy in the use of water by annual crops may also be obtained by applying the principle that satisfactory returns can be obtained by delaying irrigation until the soil moisture is reduced close to the permanent wilting percentage.

For example, in the Sacramento Valley it is possible to raise as large a crop of sugar beets with three irrigations of eight acre-inches each as with more frequent applications, provided the soil is wet to a depth of about six feet by rains.

Cotton usually is irrigated very frequently, but good crops may be obtained with one or two irrigations in addition to the preplanting irrigation.

Watermelons on deep loam or clay soils may not need irrigation if the soil is wet deeply before planting, but cantaloupes which are not so deep rooted as watermelons, probably will need irrigation during the growing season.

Tomatoes, a deep rooted crop, likewise may be raised with one or two irrigations on deep fine textured soil.

Suggested Practices

The suggestions made may be summarized briefly as follows:

Do not plant annual crops unless an assured supply of water is available.

Remove all weeds, but do not waste time and effort cultivating in their absence.

Put water on in one application to wet to the full depth of rooting rather than giving frequent applications with shallower wetting, thus reducing waste.

Delay irrigation until the soil moisture is reduced to about the permanent wilting percentage, taking into consideration the size of the stream available and the acreage to be irrigated.

With a limited supply of water, irrigate in the first part of the season to keep the

crops supplied with readily available moisture, because lack of water is more injurious in early summer than late in the fall.

Find out how much water in depth of application is required and how frequently it should be applied for each crop. Material savings may be made by reducing the frequency of irrigations.

Farm advisers have bulletins and detailed information concerning the depth of rooting and irrigation of various crops.

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all probability, be found to be carriers of the quick decline virus.

Progress has been slow because symptoms do not appear on one- to two-year-old trees until 15 months or longer after inoculation. Smaller trees are now being used in certain experiments. A sweet orange top is grafted onto sour orange seedlings having trunk diameters of from one-eighth to one-quarter inch.

Such trees can be prepared in a relatively short time and it is hoped that after being inoculated they will show symptoms quicker than the larger trees.

Seek Virus Carriers

In the late summer of 1946, graft-transmission experiments, started in June of 1945, showed conclusively that quick decline is a virus disease.

A study, commenced two years before it was known that quick decline was a virus disease, discovered that more than 225 different species of sucking insects were present in affected areas. Perhaps not more than one species will be found to be capable of transmitting the virus. Extensive experimental studies are thus necessary to determine the role of insects in the spread of quick decline.

In order to establish ideal conditions for experiments involving insect carriers of virus, the Riverside Experiment Station erected a "screen house" at one of the experimental plots within the quick decline area. The screen is small enough to filter out practically all insects that could cause infection. Controlled inoculation tests are now being conducted by entomologists of the Citrus Experiment Station.

Similar Disease in South America

Experiments in Brazil have indicated an aphid to be the virus carrier of the

disease, Tristeza, which is similar to the California orange tree quick decline.

An aphid closely related to the Brazilian carrier is present in California and efforts are being made to determine if this insect may be causing spread of the quick decline virus.

Other insects, particularly several other aphids and leaf-hopper species, are also being tested as carriers.

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PUNJAB FLAX

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Harvesting

To windrow the flax and later thresh with combine equipped with pick-up attachment, or to combine the standing grain direct, is a question on which there is divided opinion among growers and threshermen alike. Naturally, there are both advantages and disadvantages to each method. Both methods are extensively used. In many cases, circumstances force the decision, for if the flax contains any appreciable amount of green weeds it cannot be threshed standing.

Only clean fields of mature dry flax, or ones in which the weeds and flax are both dry, can be direct combined. If conditions are favorable to direct combining, the cost of windrowing is avoided. On the other hand, dry standing flax is susceptible to loss by wind damage which in many cases more than offsets the cost of windrowing.

If windrowed, the flax should be cut as soon as the seeds are botanically ripe. This occurs several weeks before the plants are dry enough to permit direct combining. At this stage, no loss of seed from shattered bolls will have occurred. Windrowing also permits harvesting early enough to destroy most summer-growing weeds before they mature their seeds to infest the soil. Other advantages of windrowing are the more favorable weather conditions—less humidity—for threshing early in the season, and earlier use of the land for the summer rotation crop.

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Improvement in the technology of preservation of fruit juices by freezing, particularly control of the enzymes responsible for the curdling of frozen juice, is under study by the Division of Food Technology.