

COVER CROPS FOR CITRUS

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Selecting Green Manure Crops for Arizona Citrus Groves; Points To Consider In Growing And Turning Under A Cover Crop

THE improvement of citrus orchard soils through a systematic fertilizer program has received increased attention during recent years. In the light of extensive investigations as to soil conditions in the Southwest, it is now believed that the chief value of a fertilizer lies in its nitrogen and organic content. However, the only fertilizer program to consider is one that allows for a degree of variation due to wide differences in soil type and treatment.

The methods of soil improvement which have been used successfully include the use of barnyard manures, commercial fertilizers, and green manure crops. A combination of the above three methods has been found to be satisfactory in most cases. However, it often happens that the greatest benefit is not derived from the green manure crop.

Selecting the Green Manure

In producing a green manure crop a few fundamental facts should be kept in mind. First, that the crop is for the benefit of the tree and, as such, should not be allowed to compete with the tree for plant food and moisture at any time. Second, that a large part of its value depends on turning it under at the proper time. This allows for a complete decomposition of the material added within a short time, and the subsequent addition of large amounts of the plant food elements at critical periods in the development of the trees.

An important point to consider in the selection of the green manure crop is the type to be used. As one of its principal functions is to add to the nitrogen supply of the soil, it should, therefore, be a legume. In addition, it should have other characteristics which make it desirable from the practical standpoint. Some of these are as follows: First, a rapid growing crop; second, a crop producing large, succulent stems and leaves, with the roots containing a large number of nodules; third, a crop which is either heat resistant or cold resistant (depending upon its use either as a summer or winter green manure); fourth, the seed should be moderately priced and easily obtained.

Green manure may be incorporated with the soil with a disc harrow, or



A Heavy Green Manure Crop at the Proper Stage to Turn Under

by turning under with a plow. Plowing is preferred, as the disc leaves a large part of the organic matter in the first few inches of soil, which encourages a shallow root development. A successful method of applying organic matter at greater depths in the soil is a problem yet to be solved.

Types of Green Manures

At the present time there are three types of green manure crops used in Arizona. These are commonly known as the spring, summer, and winter types. As the conditions of growth for each of these differ, a special green manure crop for each is necessary.

The spring green manure crop should be of a rapid, growing type, capable of producing a fairly heavy growth between the time of fruit setting and before the fruit begins to size up. It should be planted from March 15 to April 1, and turned under about June 15. By this method the crop is turned under before it begins to compete with the tree for plant food. Also a large quantity of plant food elements are made available at a time when the tree can best use them. Annual white sweet clover is one of the best plants for the spring

cover crop. Difficulty is sometimes had in obtaining a stand, so cowpeas also may be used. As the spring crop is of short duration, it is not in general use in Arizona.

The summer green manure crop is used extensively throughout the citrus districts of the state. The current practice is to allow a good crop of weeds to grow during the months of July, August, and September, plowing them under when they reach maturity. This type of green manure usually competes quite heavily with the trees before it is turned under, and often if does more harm than good. The summer green manure crop should be planted between June 15 and July 15 and plowed under while it is still succulent and before it has begun to compete with the trees. Either cowpeas or tepary beans are satisfactory for this purpose. Extreme care should be taken with this type of green manure that sufficient water be supplied and that the crop be turned under at the proper time. If these two factors are neglected, little value will be obtained from the crop and actual harm to the fruit may result.

The winter green manure is the
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**FLOUR BEETLES
AND COCKROACHES**

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only virtue he has. They are both obnoxious pests of the kitchen, however, and on that basis are the common objective of the perpetual clean-up campaign.

The most common roach in the Southwest, by far, is the American cockroach,— a large reddish-brown insect an inch and a half long. Able to run swiftly with his six strong legs, a person must look quickly when he turns on the light in a darkened room to know whether it is an insect or a mouse that disappeared under the furthest corner of the ice chest.

Occasionally, a house becomes infested with a smaller species of cockroach, known in some localities as the croton bug or German cockroach. In habits, however, it is similar to the American and they can be treated together. When the croton bug becomes established in a place it well makes up in numbers what it lacks in size; and the writer has seen it in the kitchen of a \$25,000 home in the Salt River Valley where the color of the paint could not be determined due to the abundance of the roaches swarming over the wood-work.

They prefer moist conditions and an equitable warm temperature; consequently are found most numerous around the piping, shelves, and cupboards in kitchens and store rooms, where food is also available.

The female cockroach lays her eggs in bunches; she carries them around with her for some time before depositing them, in a little case that looks like "a miniature gladstone bag without handles." There are about sixteen eggs in a case and she may drop in a year as many as a dozen of these cases. When the young hatch they are small copies of the adults, but lack the wings. In this respect they differ very greatly from the confused Flour Beetle, the young of which are so widely different in every way from the parents. In southern Arizona the young cockroaches are rarely seen. They grow by successive molts like all other insects; however, growth is not a slow even increase in insect stature, but proceeds by jumps, each sudden increase in size is the period immediately following the casting of the old skin.

Always alert, and uncanny in their

ability to escape capture the older roaches defy most poison methods. Consistent placing of poison pastes may make them migrate to a neighbor's house, and he may be able to send them back by the same method. In either case, it usually results in very few dead cockroaches. All human foods are to their liking, and to these they add dead animal matter, other insects, each other, leather, corks, book bindings and covers. And what they do not eat they defile for they are filthy animals, probably only out-classed in the insect brotherhood by the house-fly.

Since their intelligence has made the common methods of poisoning difficult it has been necessary to try and discover some way in which to outwit them. This has been found in the use of commercial sodium flouride. They will not eat it voluntarily; but in running through the powder the feet are irritated, and to relieve the burning they wipe their feet in their mouth and so feed themselves the poison.

The sodium flouride should be scattered somewhat freely along baseboards, under cupboards, iceboxes,— anywhere the pests are in a habit of running. The powder gives off no poisonous gas, but irritates the moist skin, and is toxic if taken into the mouth. For this reason it should be kept away from children and pets. A satisfactory practice where danger exists is to put the powder out at night and sweep it up and burn it in the morning.

This method of ridding a house of rockroaches is entirely successful, and in several instances has not only succeeded in clearing a place of these pests, but mice and scorpions at the same time.

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most important for the Arizona citrus growers. It is produced during the rest period of the tree, so there is practically no competition for plant food. The Canada field pea has been used quite successfully as a winter green manure crop. It is adapted to varied conditions succeeding wherever it has been grown. It has no equal for making growth during cool weather. The root system is very extensive, consisting of a central tap-root with many radiating laterals. As it is a deep rooted plant, it is used by some growers to break up "plow sole." The chief objections to field

peas are that they are easily damaged by tramping during picking time, and the pea aphid will cause considerable damage, and will necessitate turning them under February 15. Field peas should be planted prior to Oct. 15 at the rate of 150 pounds per acre. This means a good stand and a heavy crop, yielding from seven to eight tons of green matter per acre.

Other winter green manure crops are vetch and sour clover. Both of these crops do not make as rapid growth during the winter months as does the field pea so would not especially recommended.

The importance of supplementing the regular orchard fertilization program with a green manure system has long been recognized in Arizona. However, by improving methods now used the cost of maintaining fertility can be reduced and at the same time the citrus groves will be placed in a healthier and more productive condition.

Ventilation is poor in a crowded brooder-house. When chicks are 10 weeks old, they are moved to a free range or to the laying houses.

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