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SOME IMPORTANT ENTOMOLOGICAL FEATURES IN THE CITRUS GROWING REGIONS OF THE UNITED STATES

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FLORIDA.

It is generally known that the entomogenous or beneficial fungi are the most characteristic entomological feature in Florida. For many years a large part of the citrus growers have depended wholly upon them for controlling the pests attacking citrus trees and the rest of the growers so plan their spraying as to supplement the work of these fungi. In fact it can scarcely be conceived how citrus culture in Florida could continue without these natural and inexpensive aids. There is not an important pest attacking citrus trees that does not have some fungus attacking it.

It looks as if Florida is the only large commercial citrus growing region that has these natural advantages and this is due no doubt to the similarity in climate to that in Southeastern Asia, the original home of citrus trees.

SOUTHERN ALABAMA.

Owing to the similarity in climate to that of Florida, about the same insect pests are present and these are attacked by entomogenous fungi. The purple mite (*T. citri*) one of the red spiders on citrus in Florida causes considerable damage to satsumas in winter and late spring. No doubt this is partially due to the satsuma being a favorite or preferred host plant.

LOUISIANA.

The climate with reference to the distribution of rainfall is quite similar to that of Florida and the same insect pests and beneficial fungi are present. The growers rely almost entirely on the entomogenous fungi to keep down the white flies and scale insects.

TEXAS.

The citrus growing region of Texas extends along the Rio Grande Valley from Mission to Brownsville, a distance of over 75 miles. It is a semi-arid region requiring irrigation only about 2 or 3 months in the summer time. Even then rains might occur at any time. In winter the rains are quite frequent. Owing to this lack of heavy and regular rainfall during summer the entomogenous fungi do not thrive. These have been introduced on nursery stock from Florida thousands of times but have never become established. Such diseases as scab and melanose do not thrive there either. Scale insects have been introduced from both California and Florida and in some instances cause much damage. As a whole these do not cause the injury that one would expect since the beneficial fungi are not present.

In one grove near Brownsville owned by Mr. H. H. Banker no spraying or fumigation has ever been done since the trees were planted, about 15 years ago. The insects and mites are present in only very limited numbers and no commercial damage is caused by them. The grove is uncultivated except a little hoeing or cutting of weeds. Irrigation is practised and the ditches in the grove are permanent—not rebuilt after each application of water. No explanation can be given for the lack of insects in this grove and this should be made the object of special study.

ARIZONA.

There are two sections where citrus is being cultivated viz., in the Salt River Valley near Phoenix and on the Mesa near Yuma. The first trees in the Phoenix district originated from seedlings planted many years ago—perhaps 50. These now are over 35 feet high. The recent plantings were mostly from home grown trees but some trees were planted from Florida and California nurseries.

The most outstanding entomological feature in Arizona, if not in the entire citrus growing sections of the United States, is the total absence of scale insects, white flies and mites on the trees and fruit. During three days search not a scale insect, white fly or rust mite was found. There were only a few specimens of *Tenuipalpis californicus* present. The rust mite has been recorded as being present in Arizona but I did not see one specimen. If present at all it is indeed very scarce. Some years the citrus thrips appear but only rarely does this occur.

The factors which prevent the multiplication of insects and

mites may be attributed to the heat and lack of humidity. The maximum temperature sometimes reaches 120°F. and frequently from 100 to 108°F. The humidity is very low. It is the opinion of some people that scale insects and white flies have never been permitted to enter the state. The quarantine measures may have interrupted thousands of cases but I dare say some of the insects were introduced prior to 1909 when the regulations were set up. In regard to the rust mite it is invariably introduced from place to place on young trees in Florida in spite of washing with various remedies to kill scales etc. For one from Florida to see citrus trees without pests is certainly a most astounding sight.

CALIFORNIA.

Aphis:

From a Florida standpoint the presence of the citrus aphid (*A. spiraecola*) in California for many years is of great interest. This is mainly because it has not killed trees nor to any appreciable degree affected adversely the citrus industry as a whole. It is confined to the section along the coast on low, cold locations and some years with cold springs it invades some of the groves on the higher lands and does much damage for short periods of time.

Resistant scale:

In the district around Ontario the black scale appears to have developed a resistance to cyanide fumigation. There is considerable evidence to support this contention and practically all citrus growers and entomologists believe that such is the case. There is also a belief that the red scale in certain localities has likewise become resistant to fumigation. If these two pests have really become resistant to fumigation after 30 or 35 years it opens up an entirely new field not only in insect control but in the entire biological field. It indicates that artificial control of insects may be comparatively short lived. It also indicates that species may change their structure, habits or reactions in a short time.

Pest free section:

In East Highlands there is a section that is almost as free of insects as the Salt River Valley. Scales are either entirely absent or so scarce as to be of no economic importance. In fact no insects or diseases attack the trees or fruit. This condition is well known to the citrus growers and entomologists but no one has suggested any factor that would prevent insects from infesting citrus trees in this section.