percent oil emulsion. Differences in soluble solids content of the juice in favor of the parathion treatments averaged approximately .5° Brix.

From the experiments conducted in 1949 there has been no evidence of detrimental effects to internal quality as a result of the use of parathion sprays. Since there is no adverse effect on fruit quality, it would appear that the timing of parathion sprays may be more nearly regulated to give optimum scale control.

Reinfestation of Scale Insects and Mites Following Parathion Sprays.—At the present time there has been no indication that abnormal infestation of scale insects follows sprays containing parathion. In three different blocks parathion has been sprayed on the same tree for two years. Where either an oil emulsion or parathion was applied in 1948, the reinfestation of purple scale and Florida red scale in 1949 had developed to about the same degree regardless of the materials used. However, there are some indications that purple mites become more numerous following parathion sprays than where it was omitted.

Conclusions
Purple scale and Florida red scale infestations were reduced on an average of 89 and 90 percent with 1½ pounds to 2 pounds of a 15 percent parathion material per 100 gallons compared to an average of 92 percent reduction with 3½ pounds which indicates that the smaller amounts are sufficient to control the two species of scale most commonly found on citrus. A satisfactory initial control was obtained during any month of the year except November and December, but the most satisfactory time to control scale with one application was during the summer months.

There were no indications that parathion sprays caused any shock to the trees in that no excessive leaf drop occurred and no abnormal amount of dead wood developed following sprays that were applied where the trees were in a weakened condition resulting from a heavy infestation of purple scale or where the applications were made during periods of dry weather. Parathion sprays did not adversely affect the internal quality or retard the coloring of grapefruit and oranges.

LITERATURE CITED

MODERN QUARANTINE PROBLEMS IN FLORIDA CITRUS

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Florida and its citrus industry have grown up. It was not a few years ago when a small Florida industry was riding along in the wake of a much larger California industry and was well isolated from contact with other citrus areas due to poor transportation. Today things have changed, and the struggling citrus industry of the early 1900's has become the major citrus industry of the United States, and the relatively isolated Florida citrus area has become a clearing point for travel.
problems as well. The unfortunate thing is that it carries with it a certain very definite hazard because bugs can ride in cars and airplanes and air conditioned trains on the same schedules that carry people. At times, people may even connive at their transportation without realizing the hazard that they are entailing upon the citrus industry. In the early days we imported many varieties of citrus from various places on the globe, but these importations always involved extensive study and preparation. It was no casual matter to bring budwood or plant material from distant areas in a satisfactory condition so that it could be propagated in Florida and, consequently, the number of introductions was relatively small. Yet in spite of the fact that only more or less expert people were handling these importations, we managed to import canker and probably most of our other major citrus diseases and insects from other areas because apparently very few of them were native to Florida. With the better realization of the hazards involved we have laid down quarantines to reduce this hazard by prohibiting importation of citrus plant material, such as bud sticks or potted plants from other areas of the world. Today the problem has become the casual, though illegal, bringing in of material by people who see something interesting while visiting another area or the incidental transportation of insects in various types of transportation. Probably our greatest hazard today lies in the bringing in of bud sticks from other areas by unthinking people who might cut them casually in California, Texas, Cuba, or some more distant point, wrap them in a bit of wax paper and bring them in in their pockets, not with the idea of deliberately eluding the law but with little or no understanding of the problems that may be involved. It is difficult for a citrus fancier to realize that a stick of budwood from an apparently healthy and vigorous tree having no visible lesions might harbor the quick decline virus that could wipe out our sour orange stock groves in the matter of a few years.

We should remember at this time that while we have built up the world’s greatest citrus industry, at the same time we have opened the doors to things that may prove to be tremendous hazards. The same transportation that lets us visit distant areas with so much ease can also help us to bring in immigrant insects and diseases which could wreak havoc within our citrus industry. What these things can mean is evidenced by the fact that the tristeza virus presumably was brought from Australia to Argentina in citrus nursery stock budded on rough lemon stock and several million trees on sour orange stock were wiped out within the space of about 15 years. However it was brought to Brazil, it did an equally efficient job there. Experiences like this point up the hazards, and they are not the only ones. Black fly brought from the Orient put Cuba out of the citrus business for a number of years until it was brought under control. Citrus canker also brought in from the Orient, wreaked havoc in our own citrus area, and the oriental fruit fly brought in from the Orient to Hawaii is now wrecking much of their horticultural industry.

With this changing situation it behooves us to revalue our own situation. I want, in a dispassionate way, to review the diseases and insects which lie without our boundaries but which could easily be brought into this state in the form of live insects moving by the normal means of transportation, such as planes, boats or trains or which may be brought in by travelers who do not realize the importance of their importation to the future of the citrus industry.

The Louisiana area can probably be omitted from this discussion as it has the same diseases and insects in general that we have here. It does represent a point of danger, however, because of the possibility of importation of insects and diseases and their establishment there entirely too close to us.

The Rio Grande Valley in Texas has a number of diseases and insects that we do not have here. Rio Grande gummosis, the cause of which is not known, is a type of gum disease or wood decay that we do not have here and which has caused tremendous damage in the Valley and is going to be a big factor in the
rate of recovery of groves damaged by the freeze of the past spring. In addition they have the Morelos or Mexican fruit fly (Anastrepha ludens (Loew)) at certain times of the year, and larvae of this might be imported in fruit brought from Texas or adults might conceivably come in by car or plane. This insect has been controlled in Texas by cleaning up all host fruits when it migrates in from Mexico during the spring, thus attaining a host-free period. This would not be possible in Florida, and it might do much more damage here than it has ever done in Texas. Also, they have the true California red scale (Aonidiella aurantii (Mask.) and on this point I wish to make some remarks. It has been the assumption for many years that we have in Florida the California red scale and that it does not thrive due to climatic conditions. Recent studies along this line, however, indicate that what we have is the yellow scale which is much easier to control than the California red scale and presents much less of a hazard.

Our looking into this matter was occasioned by the fact that we found that California red scale when brought into Argentina thrived enormously in a climate almost identical with ours and was much more difficult to control than Florida red or purple scale, both of which were present there. In fact as many as four or five oil emulsion sprays applied in one year failed to give control; whereas, one or two oil applications gave control of the other scale insects without difficulty. Until this matter is further examined here to see whether we actually have the California red scale and it is being controlled by biological factors, or, whether we have only the yellow scale we had better be careful about California red scale and consider it a potential enemy. They also have in Texas a leaf hopper that appears to be giving increasing trouble and probably some strains of Psorosis not present in Florida.

Across the border and into Mexico about 100 miles, you find the black fly (Aleurocanthus woglumi (Ashby)) which is now spreading in the direction of the Texas citrus area. While the Mexican government is maintaining quarantine stations along the roads and trying to delay its spread and while the U. S. D. A. maintains quarantine inspection on the bridges crossing the river, the fact remains that once the insect has gotten into border towns like Matamoras and Reynosa wind drift would probably carry it into Texas. The parasites and predators which have effectively controlled the black fly in Cuba have failed in this area, and the spread of the insect has been rapid and its net effect is to put groves out of production shortly after they become infested. It had been our belief that the parasites which controlled black fly so successfully in Cuba would probably work in Florida if we ever got the fly established here, but the failure of these parasites in Mexico throws doubt on this assumption. Travelers going further into Mexico would find the Mediterranean fruitfly (Ceratitis capitata (Wied.)) and possibly some insects and diseases that are not here listed and with which we are not yet familiar.

Passing on to California we find Quick Decline which may or may not be the same as Tristeza, but which in any event would have disastrous effect upon trees budded on sour orange in Florida. This disease is caused by a virus, and bud sticks or plants would be the prime method of importation and these bud sticks would not necessarily have to come from trees on sour orange stock but might come from infected though apparently healthy trees on sweet orange or some other tolerant stock. The tendency of growers to believe that any tree that appears healthy, is healthy, does not hold in this case because trees on other stocks than sour orange become infected but show no visible effects of the disease. In addition to Quick Decline there is California red scale subject to the remarks that have already been made concerning it; several types of mites, including the bud mite (Aceria sheldoni (Ewing)) which causes deformed fruits and leaves and which is difficult to control; some strains of Psorosis that we do not have and which are extremely virulent and a leaf hopper that causes a green spotting of the fruit. A non-stop plane hop across the Pacific from California is the Oriental fruit fly (Dacus dorsalis)
which is causing enormous damage in Hawaii. It is much more virulent and destructive than the Mediterranean fruit fly and California is extending every effort to keep it out and we hope they are successful.

Turning to the south of Florida, we have Cuba very close at hand. A few years ago it was an overnight boat trip, and the boats ran on regular schedules and quarantine inspection could be careful and thorough. Now, Cuba is just a short flight away by plane, a little over two hours from Tampa or one hour from Miami. The result is that enormous numbers of people are making the trip to Cuba and, with improved roads in the island as well as plane service to various points of interest, they are traveling more in Cuba than they ever did before. In Cuba, we have the black fly, previously mentioned, though at present it is well controlled by parasites imported through the cooperation of the State Plant Board of Florida and the U. S. Department of Agriculture with the Cuban government. Also, they have some species of the West Indian fruit fly and in addition a few less publicized things, one of which is the blue-green beetle which causes damage on fruit very similar to damage caused by katydids and grasshoppers and results in much disfiguration of the fruit. There is also a moth (Gonodonta sp.) which has a proboscis so tough that it can pierce the rind of an orange and which occasionally, finding its natural food short, invades citrus groves puncturing the rind of the fruit and causing them to leak out their juices. This moth is found damaging citrus at various times in the West Indian Islands, but Cuba is the closest point where it has been a problem.

Just south of Cuba is the island of Jamaica which is a favored winter resort area for many of our people and which is just a short airplane flight from Florida. There we have the Fiddler beetle which is a relative of the Fuller's rose weevil and which attacks not only the foliage of the trees but also eats the bark off the roots. This makes it necessary for most of the grove owners in Jamaica to keep the dirt pulled away from the crown roots of citrus trees out to the spread of the branches in order to confine the ravages of this insect to the smaller roots, so that the trees will not be killed.

Dropping a little further, we arrive at South America where so many of our people are visiting at the present time. There we have a lot of insects and diseases which we have reason to fear and which might conceivably be brought in by the methods of transportation now in use, either by the travelers themselves or as insects carried within the body of the plane or in crevices in its covering. Tristeza, about which a good deal has been written in the last few years and which has caused the loss of millions of trees in Argentina and Brazil, is known to be in Argentina, Uruguay, Paraguay and Brazil. Recent correspondence and contact indicates that it is quite probably in Colombia. From here it can come up through Central America into Mexico or be transported by relatively slow stages or more likely in an innocent appearing piece of budwood in some travelers pocket. In both Argentina and Brazil we have the California red scale, and in Argentina the Delta scale (Mesolecanium deltace). Lepra Explosiva which may be the same as our old enemy scaly bark, a form of canker which may or may not be the same as the citrus canker that we have eradicated in this state; several mites which cause severe damage to citrus but which have not been reported here; blind pocket which apparently was brought from South Africa or Australia to Argentina and Brazil; sweet orange scab which causes the same sort of damage to oranges that lemon scab causes to grapefruit; stem pitting and Xyloporosis.

I want to make a point here that up until recently Argentina had quite a free importation of citrus nursery stock and budwood. As a result they have brought in a great many things and these have become established and are making the growing of citrus very difficult in that country. The tristeza virus and California red scale and possibly blind pocket and stem pitting were probably brought in in nursery stock purchased in Australia or possibly in nursery stock purchased in South Africa. The nursery stock was in the main on rough lemon but this did not prevent the trees
from being infected with the tristeza virus even though they showed no effect and wherever these trees were planted, tristeza rapidly wiped out the neighboring trees on sour orange stock. California red scale, known there as Australia red scale because it came in with the Australian nursery stock, has gone all over the Argentine citrus belt and has become a terrific problem because the methods of control that they have at their disposal and which have been successful with Florida red and purple scales have been complete failures in most citrus groves. The canker which they have there and which they call Cancrosis B and which primarily attacks lemons but occasionally attacks oranges was probably imported also. The black citrus aphid (Aphis citricidus (Kirk.)) which transmits the tristeza virus was probably brought in on some shipments from the Orient. The Mediterranean fruit fly has recently spread into other than citrus growing areas through importations of infested fruit from Brazil and is becoming a major problem throughout the fruit growing area of Argentina. While a great many people have objected vigorously to the strict restraints placed on the importation of fruits, nursery stock and budwood by the State Plant Board, what can happen when these restraints are let down is readily visible in Argentina which has been free until recently of such quarantine restrictions and where nursery stock has been imported from all over the world and almost all of the world's citrus pests with it.

South Africa and Australia are far away and not on easy airline communications. Apparently the diseases which they have, such as tristeza, blind pocket, etc., have already been transported to South America where they are much closer at hand as far as transportation and travel are concerned. We have relatively little information about the present distribution of insects and diseases in the Mediterranean areas, but apparently they are about the same as ours with the exception of Mal Secco. Also, airlines going to and from that area come in at the northern ports and the chances of transportation are not as easy as they would be from South American countries.

This has not been an attempt to be a complete, highly accurate survey of the diseases and insects in various countries. I have tried to mention only in the short time at my disposal some of the most important ones that I have had a chance to observe in other countries and which I believe might thrive in Florida. It is not an attempt to arouse fear or panic among citrus growers here, but rather to give them some picture of what is going on in the way of insect and disease problems in other citrus areas which are so close to us by plane now that you can reach them quicker than we used to be able to go from Gainesville to Ocala in bad weather. The old ideas about boundaries and quarantine are rapidly passing away. If we are to protect ourselves, the growers themselves must think about these problems and by word of mouth educate others to realize the hazards of carelessness in bringing in budwood and other plant material. The problem is no longer strictly a problem for the Bureau of Plant Quarantine and the Florida State Plant Board. There is no way within the bounds of ordinary financing that every road in West Florida from California, Texas and Louisiana could be policed. There are simply too many roads and too many byways. The growers of Florida themselves must become alert to the difficulties of the situation and educate their thoughtless neighbors. The Plant Quarantine agencies are doing a magnificent job and if the growers did as well we would be relatively safe.