

Managing Insect Pests in New England Orchards

Yellow Mites, Green Pug Moth, and Rose Leafhopper

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Yellow Spider Mites

I've noticed several orchards in Rhode Island with pest spider mites that look like two spotted spider mites, but don't have spots. These mites are in fact a different species: yellow spider mites, *Eotetranychus carpini borealis*. The reason you should care about which species of spider mite you have is that the timing of the life cycle is different for TSSM and yellow mites. Both mites overwinter as adult females, but TSSM overwinter in the ground cover and yellow mites probably overwinter right on apple trees. So where we don't usually see TSSM until well into the summer, we can find yellow mites on apple leaves in the end of April or early May. I've seen large populations of yellow mites in early June.

Yellow mites cause the same kind of damage as TSSM. Spider mites feed on plants by piercing the leaf tissue with their mouthparts and sucking out cell contents. Injured leaves have lower rates of photosynthesis, increased transpiration, and lower chlorophyll contents. The injury causes mottling of the leaves and if the damage is severe enough, the leaves turn brown. The mites usually feed on the underside of leaves, near the main leaf vein, so damage is usually first seen along the mid-vein.

Yellow mites are a pest in the Pacific Northwest. There the mites attack many tree fruits including apples, peaches, nectarines, and pears. In the Pacific Northwest, yellow mites also attack raspberries; TSSM and yellow mites are the two most important mite species that attack raspberries. Yellow mites were reported for the first time feeding on raspberry leaves in 1992 in Washington state. So in only a few years, yellow spider mites have become a common problem in the Northwest.

Yellow mites have been found on apples in Rhode Island, Connecticut, and southern Quebec. Other researchers in New England and New York have not reported finding yellow mites, but it seems likely that they either could be there, or could be there soon. I have not found them on raspberries in Rhode Island, but I have looked in only a couple of raspberry plantings.

Predator mites that typically feed on TSSM and European red mites also feed on yellow mites. Speaking of predator mites, don't confuse yellow mites with *Zetzellia mali*, the predator mite. *Zetzellia mali* nymphs are bright yellow and the adults are yellowy-orange. The pest yellow mites are very pale.

Yellow mites seem fairly easy to control with miticides. I've seen yellow mite populations controlled with Acramite or Apollo as well as with Vendex mixed Tactic. In the Pacific Northwest they recommend using Agri-Mek, Acramite, Pyramite, Apollo, Savey, Kelthane, or Vendex, against yellow mites or TSSM on tree fruit.

Green Pug Moth

You have probably heard of green pug moth before, but since it is still a relatively new pest I want to review it. Green pug moth, *Chloroclystis rectangulata*, is a small moth native to Europe and Asia. It was first detected in North America in Nova Scotia in 1970. Since then it has spread throughout New England, New York and New Jersey. It was found in Maine in the

early 1980's and spread to Connecticut by 1997. I found it in Rhode Island in 1998. It also occurs in the Pacific Northwest.

For a new pest, this isn't such a bad one. Even though the caterpillars feed directly on apple and pear buds and flowers, the feeding causes the flowers to abort rather than deform the fruit. The only economic damage that could be caused by green pug moth is if the insect is present in very high numbers and aborts too many flowers. I must admit that I've seen what I thought was a scary amount of damage during bloom, but it really didn't amount to too much loss in fruit set. Consider all the fruit you usually want to thin.

The green pug has one generation per year. The insect overwinters as eggs on the bark of twigs of apples and pears and at least 30 species of trees. The eggs hatch in April and the pale, green caterpillars feed upon buds, flowers, and developing leaves. The caterpillars bind flower parts or leaves together with silk to make a shelter. The caterpillars complete their growth by petal fall, at which time most large caterpillars have a burgundy stripe down their backs. The caterpillars grow up to 3/8-1/2 inch in length. Caterpillars pupate under loose bark of trees or in soil under trees. Two to three weeks later, small gray moths emerge and lay eggs for overwintering. The moths don't look very green and are not easily seen. I have seen green pug moths in only one orchard, though I've found larval damage in nearly every orchard I've scouted.

The caterpillars move in inchworm fashion and make small holes in developing flower clusters. During the pink bud stage, you may see small holes on petals and when you pull open the petals you find chewed up flower parts. A green pug moth caterpillar has eaten away at the anthers and pistil of the flower, sometimes completely hollowing out the flower. One caterpillar can damage several flowers. Often, when the culprit is actually found, it is inside the developing bud feeding on the anthers, well protected by the closed flower petals.

Nova Scotia fruit researchers recommend applying an organophosphate insecticide at tight cluster to early pink if you're finding six or more green pug moth larvae per 100 fruit clusters.

Leafhoppers

I think everyone knows that we deal with two species of leafhopper that look nearly identical, white apple leafhopper, *Typhlocyba pomaria*, and rose leafhopper, *Edwardsiana rosae*. It seems as though we always had white apple leafhoppers attacking apple trees, but then rose leafhopper started becoming a problem as well. In Rhode Island, it was 1992 when we decided something was different about the leafhoppers we were finding in orchards. I believe other New England states started noting a difference about the same year. It's difficult to say why rose leafhoppers started causing problems in orchards recently. Rose leafhoppers could have always been there, but in low numbers. It could be that there is more multiflora rose on more abandoned pastures now which has allowed more rose leafhoppers to develop. It doesn't appear to be a newly introduced species because rose leafhopper was found to be a pest of Northeast apple in the early 1900's.

I want to review these species because I think confusion still exists and it's important to understand the differences in the two species so that proper decisions can be made. Both species cause the same type of damage, stippling or chlorosis of leaves, and the spotting of fruit by the excrement of nymphs and adults. Nymphs feed more than adults and cause more damage. Another problem with leafhoppers, and perhaps the most significant, is that adult leafhoppers are a nuisance to apple pickers.

White apple leafhopper overwinters as eggs just beneath the bark on 1-5 year old wood. Hatching begins around late pink and is completed by petal fall. The pale, white nymphs feed on undersides of leaves and cause the typical stippling damage. The nymphs develop into adults by mid June and lay eggs for the second generation. The second generation eggs do not hatch until mid to late August; the nymphs develop into adults just in time for harvest and lay overwintering eggs.

Rose leafhopper overwinter as eggs on roses, primarily multiflora rose. Eggs hatch in early spring, nymphs develop into adults and then migrate to apples as well as other plants such as pear, peach, hawthorn, and raspberry. The migration takes place in early to mid June, so that the rose leafhoppers are arriving in orchards at about the same time as white apple leafhoppers are maturing into adults. Rose leafhoppers do not pause between generations as white apple leafhoppers do. The adults lay eggs that quickly hatch to start the next generation. There is a third generation that develops into adults just in time for harvest. These adults migrate back to roses to lay overwintering eggs.

You've probably heard that you can tell the difference between the two species when nymphs are mid to large size. The rose leafhopper nymphs have rows of small, dark spots on their backs. You need a hand lens to see the spots.

You might say 'so what, what does it matter which species I have?' I think it's helpful to know which species you have so you know what to expect in your orchard and make more informed decisions. If leafhoppers appear well controlled at petal fall, but then you find adults in June, does that mean rose leafhoppers have emigrated into your orchard or that you missed controlling the white apple leafhoppers?

In mid June if you find many leafhopper adults, these could be from either species, but you can't tell which one. At this time you should look at the foliage. If the adults you are finding are white apple leafhoppers there will be leafhopper stippling damage on the oldest foliage. The nymphs developed on the trees and the damage will be there for you to see. If mid June leafhopper adults are present and there isn't any foliar damage, the leafhopper is rose leafhopper which has recently emigrated to your trees. So if you decide the leafhoppers are rose leafhoppers and you don't treat them, you'll be plagued with leafhoppers all summer long. If you decide they are white apple leafhopper, once the adults die you won't find them again until August. Of course, there is always the possibility that you have both species.

Rose and white apple leafhoppers are resistant to organophosphate insecticides. Pesticides that do control leafhoppers include Sevin, Thiodan, and Provado. Agri-Mek used at first cover against leafminers will also control leafhoppers. Sevin used as a thinner will control white apple leafhoppers nymphs, provided it is used at the higher rate. I had always heard that sprays should be aimed at small leafhopper nymphs because they are easier to kill at this stage. They probably are easier to control at this stage, but the larger nymphs and adults are not difficult to control with the proper insecticide. Recently, researchers from New York have been recommending controlling the adults just before harvest. Since the damage by leafhoppers is primarily a nuisance to pickers, it may be better to wait until close to harvest and apply Sevin or a low rate of Provado. For a low rate, New York is recommending 1/2 ounce per 100 gallons. Also, it may be that attacking the adult stage of insects with insecticide, rather than the immature larval or nymphal stage, is a technique to reduce insects becoming resistant to insecticides. Perhaps knocking down the adults just before harvest is a good method to get rid of the nuisance of leafhoppers and also reduce the chance they'll develop resistance to the chemicals that do control them.