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MITE COUNTING IN APPLE PEST MANAGEMENT

Introduction

Systematic sampling of mite populations in orchards is a useful method for determining mite levels and trends during the growing season. Mite count information can be used to determine the potential for control by predators or the need for a miticide, and can be useful in preventing surprises in mite population development. Mite counts are also useful in determining more precisely the effectiveness of a miticide application on orchard mites and in evaluating the impact of other pesticides on predatory mites.

Although mite counts have been most used in integrated programs on apples, they can also be useful in monitoring mite populations on all tree fruits.

A series of counts at intervals during the season is desirable to determine current populations, and also changes in relative numbers of mites and predators. For routine monitoring in orchards where integrated mite control programs are fairly well established, start mite sampling in late June or early July and continue through August or until mite levels subside.

In orchards with a heavy carryover of McDaniel mites, or where rust mite populations have reached very high levels, begin sampling early in June in order to clearly establish population trends.

Sampling at two-week intervals has generally provided sufficient information except during critical periods when weekly sampling is desirable because of rapidly changing mite and predator populations.

Yearly records of mite counts are valuable sources of information in succeeding years. They can serve as a basis for determining the need for a miticide when similar conditions exist and tend to reinforce one's observations and decisions.

Counting Procedure

Commercial mite counting services are available in some fruit-growing areas in Washington. Although instructions for collecting and handling leaf samples may vary in different areas, procedures are generally very similar.

When the counting service receives the sample, the leaves are brushed with a mite brushing machine. The mites are then examined on a grid area under a dissecting microscope. The numbers of mites of each species are tabulated and recorded as "total number of mites per sample," or more commonly, "average number of mites per leaf." These include the McDaniel and twospotted spider mite, European red mites, rust mites, and the predatory mite, *Metaseiulus occidentalis*. Some also will include counts of the small ladybird beetle predator of mites, *Stethorus picipes*.

Leaf Sampling

Mite counts are useful only if the leaf samples are representative of the area being sampled. There is no fixed number of samples for a given acreage; rather one should rely on past mite population experience. Be certain to sample different tree fruit varieties separately. Sample separately areas along dusty roads, areas with shallow or rocky soil, or any area where abnormal conditions exist.

Each sample should consist of 50 leaves. For mature, standard-size trees, collect 10 leaves from each of 5 trees. For young trees, semi-dwarf or dwarf, collect 5 leaves from each of 10 trees.
Sample spur leaves only and pick both from outside and inside the trees. On large, standard-size trees, walk through and under, picking leaves as you go. Do not intentionally pick severely infested leaves as this will bias the count.

Mark sample trees so that successive samples can be taken from the same trees. Otherwise, there may be too much sampling variability to give meaningful information.

Sample Handling

Use sample bags provided by the mite counting service or use small paper bags. Do not use plastic bags. Kraft paper lunch sacks are ideal for collecting samples. Be certain that each sample is properly identified as to location, variety, date, etc.

Keep samples cool until they can be delivered to the mite counting service. Styrofoam ice chests are ideal for collecting and storing leaf samples. Leaves that have been allowed to dry cannot be brushed and counted.

Interpretation of Mite Counts

Although there is still insufficient scientific data to predict at what level mites cause economic damage to tree fruits in Washington, we can predict with fair accuracy at what population level it is necessary to spray in order to prevent mite populations from reaching levels that result in visible leaf injury.

One should bear in mind that the real objective of sound, integrated mite control is prevention of economic injury, not eradication or total destruction of mite populations. The mere presence of mites is not a threat of economic injury. On the contrary, low populations of mites are essential for sustaining predators.

The decision on whether or not to spray should not be based solely on mite counts. Frequent and careful inspection or orchards is necessary to determine the distribution of mites and extent of foliage injury. Critical mite levels will vary according to variety, tree age, and tree vigor.

McDaniel Spider Mites (see EB 1244)

McDaniel mites and European red mites are primary targets in integrated mite control. Typically, few McDaniel mites or predators are present in orchards during May and June. Red mites may be present in large numbers however. During July and August, McDaniel mite populations develop rapidly while predators tend to lag in development. An average of 20 or more McDaniel mites per leaf during July and August is a critical population level, particularly if populations are increasing rapidly. If there are no predators present, or other unfavorable conditions exist, the critical level may be as low as five active mites per leaf. However, if there is an average of one or more predators per leaf and the predator population is increasing rapidly, the trees may be able to tolerate more than 20 mites per leaf.

It is common for mite populations to reach 50-60 mites per leaf for short durations without causing noticeable leaf injury. A series of mite counts, along with frequent and careful observation during critical periods, is important in order to follow rapid population changes.

European Red Mites

European red mites are usually most abundant in spring and early summer. Predators can often control red mites in late season but are normally unable to in early season. If a dormant spray is applied, summer control is usually not necessary. However, if the dormant spray is omitted or fails to give adequate control, a miticide spray may be necessary.

An average of five or more active mites per leaf during May and early June is a critical population level. During late June, July, or August, 20 or more active mites per leaf may be tolerated.

Egg counts are also useful in predicting European red mite outbreaks. An average of 20-30 eggs per leaf is indicative of an increasing red mite problem.

Apple Rust Mite

Keep apple rust mite control measures to a minimum, as this mite serves as an alternate food source that sustains predator mites when McDaniel or European red mite populations are low. If rust mite populations develop rapidly during the early season, it may be necessary to apply a spray to suppress them to nondamaging levels.
However, rust mite populations normally decline during prolonged hot weather.

An average of 50 rust mites or more per leaf in May or 250 mites per leaf in late June would be considered a critical population level.

**Predator Mites**

The predatory mite, *Metaseiulus occidentalis*, is the most important factor in regulating populations of McDaniel and twospotted mites. Predator populations will fluctuate in accordance with numbers of prey. If there are few McDaniel mites or rust mites, predator populations will normally average 0.0–0.2 per leaf.

When McDaniel mite populations increase, there is normally a corresponding increase in numbers of predators. An average of 1.0–2.0 predators per leaf will, under normal conditions, prevent McDaniel mites from reaching injurious levels without a miticide application.

It is during this critical period, when mite populations are increasing rapidly, that frequent and careful observation is most important. A series of mite counts at weekly intervals will aid in determining whether or not a miticide is necessary, or whether predators can handle the situation.

For more complete discussion of integrated mite control, see mite sections in EB0419, *Spray Guide for Tree Fruits in Eastern Washington*. 

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