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A Guide For Biological Control Of Twospotted Spider Mites In Strawberry Production

Visiting a strawberry farm to buy “pick-your-own” or “we-pick” berries has become a very popular spring time activity in SC. As this trend continues to grow, strawberry production will increase. Increased production will result in more insect and disease management problems for growers. A major pest growers will have to control is the twospotted spider mite *Tetranychus utricae*. Uncontrolled outbreaks of twospotted spider mites can reduce strawberry yield by more than 50%.

Presently, growers rely entirely on chemicals to control this pest. This practice is expensive, time consuming and the mite has developed varying levels of resistance to some miticides. This is environmentally risky, increases human health hazards and is harmful to beneficial insects and honey bees. This strategy also affects harvesting schedule of the crop and raises food safety issues.

As the EPA Food Quality Protection Act (FQPA) removes more chemicals from the market, growers will have to adapt viable alternative control practices to manage this pest. Work conducted in Charleston County from 1998-2000 strawberry growing seasons and in Florida showed that the predatory mite *Phytoseiulus persimilis* was effective in controlling and maintaining twospotted spider mites populations below damaging levels in strawberries.

This fact sheet is prepared to serve as a guide to growers for using predatory mites to control twospotted spider mites.

Twospotted Spider Mites

Description: Twospotted spider mites are tiny and difficult to see with the naked eye. They have a yellowish or pale green color with two dark spots on both sides of their body. Spider mites live and feed on the underside of the leaf and are very difficult to control. To see spider mites in the field, growers should use a 10x or 14x magnifying hand lens.

During warm weather their feeding and multiplying activity increase significantly. Spider mites become dormant during cold weather, and females develop a reddish orange color. Their eggs are round and clear in color.



Fig. 1. Twospotted Spider Mite
(*Tetranychus utricae*)

Damage Symptoms

1. Stunted plant growth.
2. Reduced fruit size and yield.
3. Distorted and drooping leaves with yellowish or purplish discoloration that turns brown.
4. Leaves may develop yellow speckling on the upper side.



Fig. 2. Symptoms of twospotted spider mite damage

Scouting Procedures

Effective control of twospotted spider mites will depend on an accurate scouting program, for both chemical or

alternative measures. A good sampling program will give the grower an excellent idea of the presence and amount of spider mites in the field. Without a good scouting program, a grower might not realize that he has an outbreak of spider mites until it's too late.

At each sampling, randomly select 100 leaflets (a leaflet is one section of the strawberry leaf which has three parts), use a magnifying hand lens and inspect the underside of each leaflet for spider mites and eggs. If present, record adult spider mites and eggs as (+), if absent record as (-). Select leaves which are close to the plastic and avoid new leaves. Pay special attention to plants at the edge of the field.



Fig. 3. Strawberry leaf; leaflet; handlens

Use flags to mark "hot spots" areas where there are a build up of spider mite population. It is very important to use different walking patterns each time a field is sampled (see walking patterns below). A field should be sampled at least 1 time per week.

Bare rooted transplants with leaves must be inspected for spider mites, check 100 plants from each batch of transplants. If 10% of the transplants have spider mites, make a miticide application about 3 weeks after planting. If warm weather conditions exist, start scouting fields as soon as leaves are developed.

If a release of predatory mites is made, resume sampling 2 weeks after the release. It is not unusual to just find a few predatory mites after their release. Continue weekly sampling for another 3 - 4 weeks.

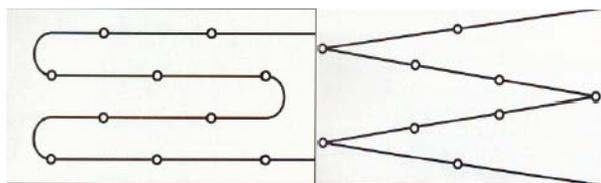


Fig. 4. Suggested walking patterns for sampling fields for twospotted spider mites.

Threshold/Release Decision

Counting twospotted spider mites in the field is difficult and time consuming. Researchers in Florida developed a relationship between the number of leaves infested and the density of spider mites per leaf.

Table 1: Relationship between % number of infested leaves and density of spider mites and ordering predators.

% infested leaves	Avg. density of mite per leaf	Grower Decision
1 - 5	2 - 4	Order predatory mites
6 - 10*	5 - 9	Release mites
11 - 15	10 - 13	Use miticide
16 - 20	13 - 15	Use miticide

* Do not use predatory mites to control twospotted spider mites if more than 10% of leaves are infested. This is very important for growers to observe.

Predatory Mites

Description: *Phytoseiulus persimilis*, is reddish orange in color and is long legged. They are larger than the twospotted spider mite and do not have any spot on their body. The species is very mobile and aggressive in controlling spider mites.



Fig. 5. *Phytoseiulus persimilis*

Compatibility of Predators

Compatibility of the predator with chemicals used in strawberry production is critical. *P. persimilis* is compatible with several pesticides (see table) used in strawberry production. Although the predator might be compatible with a chemical caution must be exercised when predators are being used to control spider mites. Growers should use the lowest recommended application rate after a predator mite release is made. Some insecticides and fungicides are extremely poisonous to the predators. These chemicals have long residual effects and do not fit into a biological control program. For e.g. Kelthane can be used 1 week before the predators are released, but should not be used after a release of predators is made.

Table 2: Chemical compatibility with predators: **S** (safe); **I** (Intermediate); **P** (Poisonous)

Common Name	Trade Name	Effect
	Elevate	S
	Switch	S
Bacillus thuringiensis	Bt, Javelin, etc	S
Fenbutatin-oxide, Hexakis	Captan, Captec	S
Copper	Various	S
Sulphur	Various (at low rates)	S
Thiram	Thiram	S
Avermectin	Agri-mek	I
Diazinon	Diazinon	I
Malathion	Malathion	I
Mevinphos	Phosdrin	I
Methomyl	Lannate	P
Carbaryl	Sevin	P
Endosulfan	Thiodan	P
	Brigade	P
	Danitol	P
Benomyl	Benlate	P
Thiophanate-Methyl	Topsin	P
Dicofol	Kelthane	P

Ordering and Handling Predatory Mites

There are several suppliers of predatory mites. Growers should check with their extension agent for a listing of suppliers. Mites should be ordered immediately when the threshold is reached. It takes 1 week for the delivery of mites after they have been ordered.

Predatory mites should be checked for quality when they are delivered and before they are released. They are supplied either in 500 ml bottles of vermiculite or on bean leaves, each bottle contains 2000 mites.



To check mite quality, take a bottle of mites, gently rotate it for about 30 seconds, then pour about 1 tablespoon full of vermiculite in a coffee cup. Allow the cup to sit, after a few minutes, mites should start crawling up the side of the cup. If after 8-10 minutes no mites appear, this indicates that the mites are not the best quality and should not be released. **Do not use a foam cup to do this test.** Store mites in a refrigerator at 50°F. Do not store mites for more than

8 hours before release. When mites are stored, their quality will decline.

Table 3: Number of predators to treat one acre

Spacings	Plants/ acre	Predator mites/ acre
12 x 12 x 60*	17,400	12,000
14 x 14 x 60	15,021	10,000

*Double row of plants/bed

Release Procedure

Timing of the predatory mite release is very critical to ensure a quick establishment, population buildup and control of twospotted spider mites. Release will be affected by prevailing weather conditions and food supply. There must be an adequate food supply in the field to ensure the survival of predaceous mites. Mites should be released as soon as possible after they are received.

Walk down each plant row and pour about 1/4 teaspoon of vermiculite in the top of every 5th plant in each row on the bed. This is equal to about one predatory mite per plant. Empty bottles should be left in the field close to a plant. If the twospotted spider mite population is high, use a miticide which is compatible with the predatory mite to knock it back a few days before the release is made. It will take 1 individual about 3 hours to treat 1 acre.

Release should be made during early spring when average daytime temperature is above 60°F.

Do not release the mites if wind speed is greater than 3 MPH.

Do not release the mites if heavy rains are expected soon after the release.

Do not release mites if frost or a hard freeze is expected the morning following the release.

Do not release mites during the winter months.



Cost comparison of biological vs. chemical control

Under optimum conditions the cost for biological control should be a one time expenditure. The two main costs for biological control are costs of the predatory mites and labor to release them. Sometimes the cost for an application of a chemical might be required.

A conventional twospotted spider control program will require several applications of a miticide.

References

- van de Vrie M., and J. F. Price. 1994. Manual For Biological Control of Twospotted Spider Mites on Strawberry in Florida.
- Strand. L. L. 1994. Integrated Pest Management For Strawberry. Publication 3352. pp. 49-51.

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