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Bamboo Spider Mites

Biology and Management in the Pacific Northwest

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Bamboo spider mites belong to the family Tetranychidae and are related to the common twospotted spider mite, *Tetranychus urticae*. Bamboo spider mites are cosmopolitan and found virtually everywhere bamboos exist. Two species of bamboo spider mites infest bamboo in the Pacific Northwest, *Stigmaeopsis celarius* (*Schizotetranychus celarius*) and *Stigmaeopsis longus* (*Schizotetranychus longus*). Bamboo spider mites have been reported in the United States as far back as 1917 by Nathan Banks, who first discovered *S. celarius* in Florida (Banks, 1917). These mites can be easily spread by humans, are difficult to control and cause irreparable damage to ornamental bamboo leaves. As the popularity of bamboo grows, so does the spread of bamboo spider mites.

Biology

Bamboo spider mites are easily recognized by their characteristic webbing, primarily found on the underside of bamboo leaves. These web nests are large and densely woven, unlike the loose chaotic webs produced by twospotted spider mites. Identification of individual bamboo spider mite species, however, is much more difficult and based on the location and length of minute dorsal setae.

Bamboo spider mites initially infest leaves along the midvein or edge of the leaf where a linear depression is typically found. This depression provides the proper nest building site. In some bamboos such as Sasa, multiple prominent veins provide an abundance of building sites and are highly susceptible to spider mite attack (Fig. 1). Conversely, some bamboo appears to be resistant to bamboo spider mite. It is widely speculated that leaf pubescence may play a role in resistance, perhaps interfering in the web nest construction, but it is not the only factor.

A newly formed web nest is composed of a single translucent layer and the mites can be seen beneath the webbing. Bamboo spider mites spend most of their time under this webbing but occasionally venture out and scuttle about on the underside of the leaves. Eventually all life stages exist beneath a single web nest (Fig. 2). As the colony ages, successive overlapping sheets

Figure 1. *Sasa veitchii* severely infested with bamboo spider mites.

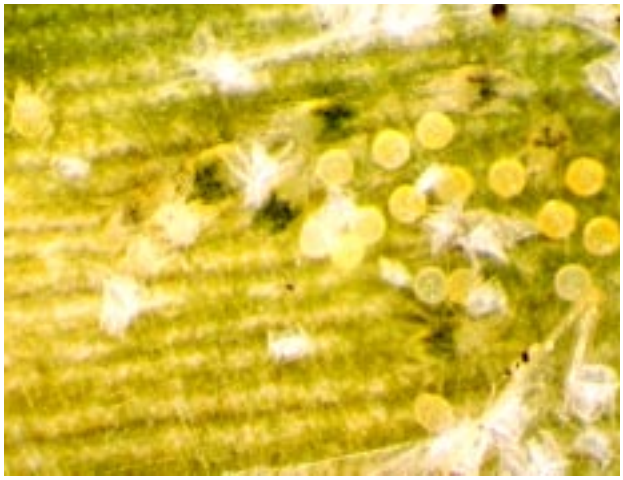

Figure 2. A bamboo spider mite colony with some webbing removed.

of webbing are added to the canopy resulting in a shiny, opaque, protective nest. This dense webbing is the main reason that bamboo spider mites are difficult to control.

Bamboo spider mites pass through 5 stages: egg, larva, protonymph, deutonymph and adult. Following each of the motile stages, the immature mites pass through an inactive stage, called quiescence. During quiescence, the mite remains still and appears cloudy as it prepares to molt to the next motile stage. The average generation time for *S. celarius* is 26 days with females producing an average of 85 eggs during her lifetime (Y. Saito and J. Ueno, 1979).

Bamboo spider mites are active during the warm months of the year and have been reported from greenhouses year round. Red-colored adult bamboo spider mites have been observed in September in Portland, Oregon. This suggests outdoor populations may overwinter as adults in a diapause state in protected sites and resume activity in the spring when day length and temperatures become optimal.

These mites have surprisingly complex lives. They exhibit parental care, and may act defensive toward intruders such as predatory mites. Each colony has a communal toilet. These appear as regularly spaced dark spots on the underside of leaves particularly where colonies are numerous (Sato et al., 2003). Despite their minute size, these behavioral traits are evidence of sociality similar to that in ants, termites and bees (Saito, 1995).

Both bamboo spider mite species in the United States are specific for bamboos. This may change if *Stigmaeopsis miscanthi* enters the United States. Unlike the other species of *Stigmaeopsis*, this mite was discovered on a perennial grass, *Miscanthus sinensis*, in Japan and Okinawa (Y. Saito, 1990a).

Economic Injury

Spider mite feeding damage on bamboo is lighter in color than the surrounding leaf tissue, permanent and aesthetically displeasing. Feeding damage may first appear as light speckling or blotches on the upper leaf surface. As the leaf becomes more infested, damage may acquire a checkered pattern sometimes resembling leaf variegation (Fig. 3).

The mites pierce individual plant cells on the underside of the leaf and suck out the cell contents causing the discoloration on the upper leaf surface (Evans, 1992). Heavy infestations can cause green bamboos to appear yellow-green in

Figure 3. Variations in spider mite damage on bamboos.

color. Leaf damage can impair photosynthesis and reduce plant vigor (Meredith, 2001). Damaged plants may lose their leaves more frequently (Rosetta, 2001).

Management

Bamboo spider mites are a major concern in nursery and landscape industries where aesthetic injury can significantly reduce sales. It is unethical and illegal to transport infested bamboos across state lines. In addition, it is not known what affect these mites will have on native bamboos primarily found in the southern states.

The dense protective web nests constructed by the mites and the growth habit of bamboo (dense canopies, waxy leaves, clumping growth and heights of over 30 feet), reduce the chance of pesticides contacting the mites, making conventional control methods difficult. Specialized equipment may be required for adequate pesticide application. Washington State University is testing additional miticides for bamboo spider mite control and the results will be published in the *Pacific Northwest Insect Management Handbook*.

When chemical application is not feasible, infested plants can be cut down and infested debris disposed of properly to avoid reinfestation. Emerging foliage may then be chemically treated to kill any surviving mites (DeAngelis and Antonelli, 2004). Difficulty in controlling bamboo spider mites has renewed interest in the potential for using biological control. To be most effective, the predatory mites should invade the intact or broken web nests of spider mites. If the predatory mites are unable to find prey, they will leave the plants in search of food elsewhere. Fortunately in bamboo groves, web nests are often broken due to the rasping action of leaves moving in the wind.

In the United States, the predatory mite *Neoseiulus fallacis* has shown some success in managing bamboo spider mites (Pratt and Croft, 1999). The predatory mite *Amblyseius cucumeris* (Oudemans) has also exhibited some success against another bamboo spider mite species, *Stigmaeopsis nanjingensis*, in China (Zhang et al., 2000b). Both of these predatory mites are commercially available in the United States and will enter broken web nests, but intact webbing can impede their ability to reach the spider mites. In China, the native predatory mite, *Typhlodromus bambusae* evolved with *S. celarius* and can penetrate web nests (Saito, 1990b). Importation of this predatory mite for release on bamboo in the United States will be difficult due to tightened restrictions on importation of non-native species. Another predatory mite available in the United States, *Galendromus helveolus* (Fig. 4) is currently being studied to evaluate its effectiveness against bamboo spider mites. This mite is highly effective against Persea mite, a spider mite pest of avocados which produces web nests similar to those produced by bamboo spider mites.

Because of the low aesthetic threshold, growers should regularly monitor bamboo for the presence of bamboo spider mites and release predatory mites as soon as bamboo spider mites are discovered. Commercial bamboo growers must carefully consider the advantages and disadvantages of a biological control program or develop an integrated pest management (IPM) approach that best suits their needs. While some prey must be present for biological control to succeed, plants must be free of all mites prior to transportation from nursery.

Figure 4. Predatory mite, *Galendromus helveolus* attacking bamboo spider mite

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