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Thrips Management Alternatives in the Field

PEST MANAGEMENT TECHNICAL NOTE

Abstract : *Thrips attack a number of vegetable, fruit, and flower crops, causing considerable economic damage. Their population levels may be monitored using sticky cards and by direct examination of plant parts using a hand lens. Several cultural control options are available, including avoiding planting thrips-susceptible crops following small grains, managing vegetation in the fields and field edges, using colored mulches, and avoiding high nitrogen levels. Some cabbage and onion varieties are somewhat resistant to thrips attack. Several beneficial insects suppress thrips levels. Organically-acceptable pesticides are available for thrips control.*

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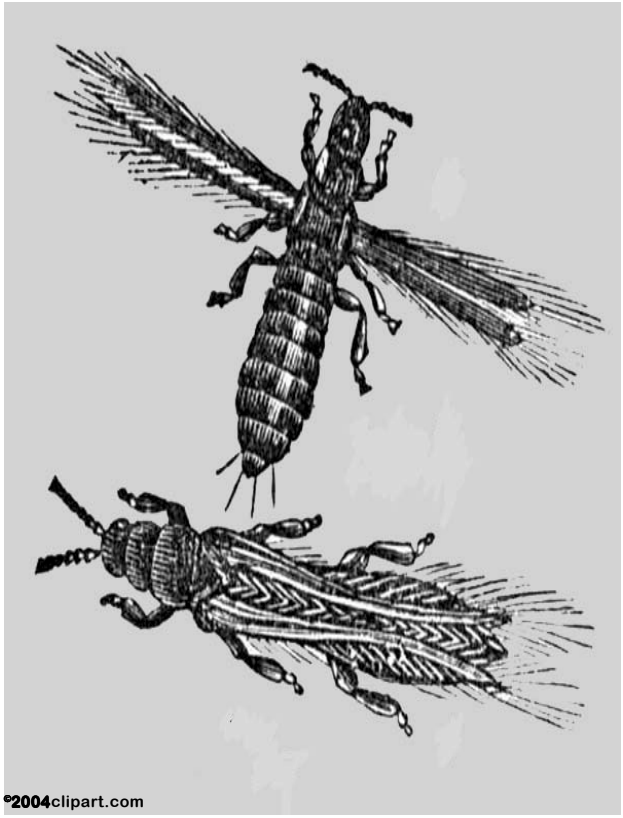

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Introduction

Thrips are known to be serious pests on a wide range of fruit, vegetable, flower, and agronomic crops. Thrips are members of the order Thysanoptera, which contains a number of genera and species. For example, there are at least two species of thrips that attack onions: onion thrips (*Thrips tabaci*) and western flower thrips (*Frankliniella occidentalis*). Both species have a wide host range, including cereals and broadleafed crops.(1) The information contained in this publication is largely generic and applies broadly to most kinds of thrips. Onions are often emphasized, however, since much research has been directed to thrips control in this crop.

Thrips feed by rasping the leaves and other tissues of plants to release the sap, which they then consume. This feeding reduces the plant's abil-

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ity to produce food and interferes with transportation of foliar nutrients to the bulb. The resulting damage is usually measured as an overall reduction in bulb size and weight of onions and flower corms produced. There may also be effects on the number, size, and appearance of flowers. The injury caused by thrips' rasping of the leaves enables various plant pathogens to gain entry, thus increasing disease problems. In addition, thrips carry plant pathogens on their mouth parts from one plant to another. In onions, entire fields can be destroyed, especially in dry seasons. In fruit crops, thrips damage may also result in the scarring of fruit and significant loss to culling.

The stage of growth when an infestation occurs seems to determine the extent of yield loss. In onions, it appears that early and late-season infestations diminish yields less than those occurring in mid-season during the bulbing stage.(2)

For more basic information see the THRIPS computerized knowledge database at <http://www.gladescropcare.com/tech-thrips.html>. THRIPS covers nine species of thrips occurring in the U.S. and a major thrips predator, the minute pirate bug. The site provides detailed information on identification, biology, scouting, life cycles, and control using pirate bugs.

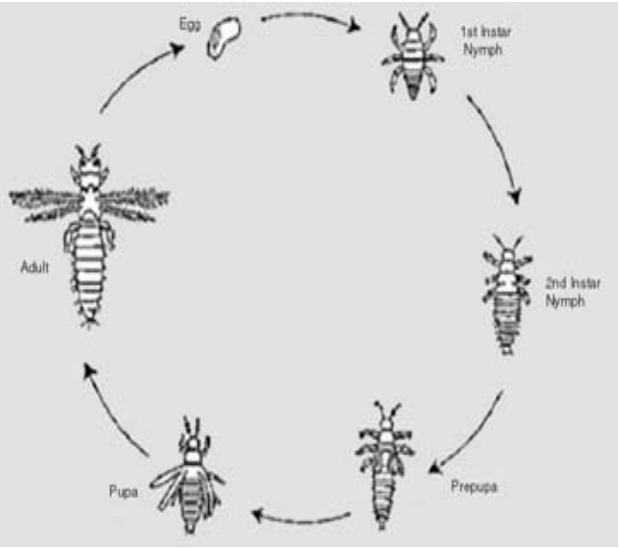

Figure 1. Thrips life cycle.
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Monitoring Thrips

Monitoring to identify when thrips arrive and to determine population levels is helpful in designing an appropriate control strategy. In onions, thrips generally migrate into a field when plants in surrounding areas begin to dry, so monitoring efforts should be timed accordingly.

Thrips numbers should also be determined. The University of California recommends sampling at least five (onion) plants from four separate areas of each field. Leaves should be pulled apart and examined carefully with the assistance of a hand lens, and all thrips counted.(1) The numbers present can be used to determine action thresholds for applying pesticides. In corm-propagated flowers, blue sticky cards are sometimes used for trapping and monitoring thrips populations.(3) However, research at the University of California has indicated that hot-pink sticky cards outperform blue-colored traps for this purpose.(4)

Coviello et al.(1) note that reliable treatment threshold levels for onions are speculative. They are, in the least, variable, depending on whom you ask. In California, a threshold of 30 thrips per plant at mid-season has been used successfully for dry bulb, fresh market, and drying onions, using conventional, synthetic pesticides. This number would be adjusted downward for very young plants and upward for larger, mature plants. In New York State a conservative action threshold of three thrips per leaf has been suggested, and one thrips per leaf for Spanish and green bunching onions.(5) Georgia entomologist David Riley suggests an initial treatment threshold of one thrips per plant and then waiting until they have reached five thrips per plant for a second treatment.(6)

When considering appropriate action threshold levels, it is important to remember that no single number will always be a reliable guide. Climate is a factor. Hot and dry conditions favor thrips damage, and cool rainy weather hinders it. In drier years fewer thrips per leaf can be tolerated before yield losses result.(2) In onions, thrips must be controlled before the crop reaches the early bulbing stage, so that populations do not exceed manageable levels.(1)

Plant architecture can also influence thrips population levels. In onions, cultivars with flat-sided leaves and a compact growth point (where the leaves are closely compressed) protect thrips from natural enemies, weather, and insecticides. Conversely, round, openly spaced leaves reduce thrips' hiding places.(2)

Cultural Control Methods

The choice of cover crops can affect the number of overwintering thrips. Thrips-susceptible crops should not be planted following wheat or rye, which provide excellent over-wintering sites for thrips. Oats is a better choice, but requires later fall planting than rye or wheat—a factor that constrains its use as a cover crop in colder regions.(7)

Weed destruction in the field and surrounding margins can help to reduce thrips populations, since these areas serve as overwintering and re-infestation sites. Growers should take care, however, that vegetation management does not conflict with strategies designed to reduce soil loss (through maintaining soil cover), to increase biodiversity, and to make the farm system more sustainable.

Drought stress increases the susceptibility of onions to thrips damage. Adequate irrigation throughout the growing season is a critical factor in minimizing damage.(2)

The fact that thrips are color-sensitive suggests that colored mulches may be effective in their control. Louisiana researchers conducted a study to see whether aluminum-coated mulch would repel the pest.(8) Black plastic was spray-painted in the field with aluminum paint. The reflective mulch repelled 33 to 68% of the thrips. Ultaviolet-absorbing plastics—used to build walk-in field tunnels—have proved effective in protecting crops from western flower thrips, as well as sweet potato whitefly, cotton aphid, and the diseases they vector.(9)

Soil fertility management may also affect thrips infestation and damage. According to one source(10), a lack of adequate soil calcium may invite higher populations of thrips. Another writer suggests that nutritional balance can reduce thrips attack. High nitrate levels will invite thrips, and the effects of excessive nitrate are compounded by shortages of potassium, sulfur, boron, and manganese. Foliar applications of soluble calcium and kelp will balance the excess nitrogen. These nutrient levels can be monitored on a weekly basis, using plant tissue analysis, to make accurate adjustments.(11)

In iris, gladiolus, daylilies, and other vegetatively propagated flowers, severely infested plant parts should be cut away and destroyed. Dig corms early in the fall and cut off the tops before thrips move down into them. Destroy the remaining debris.(3)

Genetic Resistance

Among onions, varietal resistance in some sweet Spanish types is noted in the literature. It is suggested that these may be older cultivars with more open canopy growth.(5) There is also some genetic resistance among cabbage cultivars: Masada, Brutus, Galaxy, and Amtrack are reported to be highly resistant; Fresco, SuperElite, Satelite, Protector, Bartolo, and Supergreen demonstrate moderate resistance. (12)

Biological Control

Many beneficial organisms work to suppress thrips. These include lady beetles, minute pirate bugs, ground beetles, big-eyed bugs, lacewings, hover flies, predatory mites, and spiders. (5) Unfortunately, these predators and parasites may be hampered by the fact that thrips feed under close-fitting leaves and down in the leaf sheaths where they are difficult for predators to find. Insecticides, even those cleared for use in organic production, also tend to work against beneficial predators and parasites. They should be used minimally and applied with caution.

On occasion, thrips populations may explode, as large numbers migrate from nearby vegetation that is mowed, harvested, or drying up. In such circumstances, in-field populations of beneficial predators and parasites may not be adequate. The grower can increase the numbers of predatory and parasitic insects and

arachnids on the farm by providing protective habitats for them. These habitats—often called *refugia*—can be integrated into crop rotation planning, and can supplant "weedy" field borders and waste areas. For more details on *refugia*, ask for the ATTRA publication *Farmscaping to Enhance Biological Control*.

Naturally occurring fungal diseases can also devastate thrips populations.(5) Limiting the use of foliar fungicides by using forecasting systems and cultural controls helps to protect beneficial fungi and maximize this natural control mechanism.

Alternative Pesticides

Several alternative pesticides are available for controlling thrips. Sulfur, insecticidal soap, and diatomaceous earth have all demonstrated efficacy in suppressing thrips in several crops.(3, 13, 14) Being contact pesticides, however, their effectiveness in onions would probably be limited, because the thrips can hide between the leaves. In contrast, three applications of superfine sulfur are recommended at monthly intervals in fruit crops for spring thrips control. Lime sulfur has also been suggested as an alternative.(14)

Spray formulations of the biological agent *Beauvaria bassiana* (e.g., Naturalis-O®, BotaniGard®, Mycotrol®) are also useful for thrips control. The agent is a fungus that grows and reproduces in the host; therefore, effective control may not be observed until 7 to 10 days after application. *B. bassiana* is most effective when used early, before large thrips populations have built up.(14)

The botanical pesticides garlic, rotenone, ryania, pyrethrum, neem, and nicotine have been suggested for thrips control.(10, 16, 17, 18) Another botanical presticide, sabadilla, also has a record of controlling thrips and is suggested when other botanicals fail.(3) Organic growers should be aware that nicotine and other tobacco-based pesticides are prohibited in organic production. The formulations of many other botanical products are also prohibited, and organic producers are encouraged to consult their certifier before purchasing them.

Noted organic proponent J. Howard Garrett recommends use of a homemade botanical spray formulated from garlic and pepper.(17) Garrett's garlic/pepper tea is made by liquefying two bulbs of garlic and two cayenne or habañero peppers in a blender 1/3 full of water. Solids are strained out, and enough water is added to make one gallon of concentrate. Garrett mixes ¼ cup concentrate with two tablespoons of vegetable oil and enough water to make 1 gallon of ready-to-use spray mix.(18) A commercial product called Hot Pepper Wax®, containing capsaicin (the active ingredient of cayenne pepper), is also recommended for thrips control.(19) A highly refined horticultural oil can be used during the growing season for control of thrips and several other insects.(20)

Spinosad (e.g., Conserve®)may also be useful in controlling thrips in the field. Spinosad is a recently discovered insecticide, derived from the fermentation of Actinomyces bacteria commonly found in the soil.(21) The National Organic Standards Board has recommended that spinosad be allowed in organic production. Organic growers should consult their certifier before using.

Surround™ Crop Protectant is labeled for suppression of thrips and several other insects for apples, stone fruits, citrus, small fruits, and onions. Surround is a kaolin clay film sprayed onto the crop as a barrier to insect pests. Supplemental control measures may be needed in addition to Surround. ATTRA has more information on the use of Surround in fruit crops, available on request.

Always follow label instructions when using any pesticide, and keep in mind that the decision to use a pesticide should be made only when other approaches to pest management fail to provide adequate crop protection. Again, be aware that some "natural" pesticides may be unacceptable or limited in certified organic production. Check with a certifying agent before purchasing or using any such products.

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