

# Western Flower Thrips Management on Desert Produce

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## **Distribution and Host Plants**

This native thrips species is a serious pest to all leafy vegetables grown in the desert. Western flower thrips (WFT) are most important in head, leaf, romaine and baby mix lettuces, cabbage, and spinach because of the cosmetic scarring they cause to leaves and contamination of harvested plant parts. WFT have a wide host range and occurs on several other vegetable crops, including cucumber, onion, pepper, potato, lettuce, and tomato. Field crops on which WFT are commonly found in the desert includes melons, alfalfa, cotton, Sudan grass and wheat. Numerous weeds serve as good hosts for WFT including black nightshade, cheese weed, dandelion, jimson weed, lambsquarters, lantana, pigweed, and prickly lettuce but numerous other species also can serve as hosts.

## **Description and Seasonal Development**

WFT thrives in moderately warm and dry conditions. They can be present season long in leafy vegetables but are usually most abundant on spring crops after temperatures begin to increase. They can complete a single generation in as little as 20 days; average temperatures of about 86°F are optimal for population growth. WFT life cycle is between simple and complete consisting of the egg, two larval stages, prepupae, pupa, and adult stages. Small white bean shaped eggs are laid into plant leaves, petioles and fruit and generally hatch in 2 to 7 days. Immature thrips go through two larval instars, which are foliage feeding stages, followed by non-feeding prepupal and pupal stages. Larvae resemble adult WFT except for their smaller size, lack of wings, and are pale yellow in color. Larval development time may require 9-12 days in the field depending on temperature. Larvae and adults are somewhat gregarious, often feeding together in small groups. At maturity, the larvae drop to the ground to pupate. The prepupal and pupal stages require about 4-5 days to develop under ideal conditions. The prepupa resemble the larvae but have short-wing pads and erect antennae. The pupae have long wing pads, and their antennae are bent backwards along the head. Prepupae and pupae do not feed and complete development in the soil or ground litter beneath the plants. The adult WFT have fully formed fringed wings. Adult females WFT range in color from light yellow, yellow with brown blotches on the body, to dark brown. Male western flower thrips are light yellow. WFT have reddish orange ocellar pigmentation and eight segmented antennae. Adults generally live for 3-4 weeks. Females may mate or reproduce parthenogenetically. Egg production by females will vary with crop.

## **Economic Damage**

Although WFT can be found on most commercial vegetables and melons grown in the desert, they are considered serious economic pests of leafy vegetables. WFT have a great potential for causing cosmetic damage to head lettuce throughout the growing season, and particularly at harvest if not managed properly. Romaine and leaf lettuce types are even at higher risk, where thrips damage to harvestable

leaves can result in excessive trimming and reduced plant weights due to both adult and immature feeding. WFT have piercing-sucking mouthparts and feed by making a hole in the epidermis with a single mandible, puncturing cells with the piercing stylets, and sucking the plant exudate. Adults and nymphs feed on both upper and lower leaf surfaces, in the leaf folds, and in protected inner leaves. Feeding on the mid-ribs will cause scarring, leaf discoloration (bronzing) and distortion. High populations of thrips can result in a significant number of cosmetic blemishes on marketable leaf portions. Such damage may turn into larger necrotic lesions in postharvest storage and transit. The presence of live thrips can contaminate the harvested product. Baby spinach crops are susceptible to thrips damage on the young terminal growth because as leaves expand and elongate, they become scarred and distorted. Thrips can also vector some plant viruses, including tomato spotted wilt virus, which can be a serious problem. Recently, Impatiens Necrotic Spot Virus (INSV), a tospovirus transmitted by western flower thrips, has become a threat to desert lettuce. INSV can cause significant damage to lettuce leaves and can result in significantly yield reduction if infection is widespread throughout fields. The long-term impact of tospoviruses like INSV on desert lettuce production is unknown.

## Management of WFT

**Monitoring/Sampling:** Like aphids, thrips can disperse onto leafy vegetables at anytime, thus it is important that fields be monitored regularly. WFT can generally be found throughout the plant, feeding on the undersides of leaves, but prefer to hide in complex plant parts and other folded tissues where they are difficult to detect and reach with insecticides. There are several methods for sampling for WFT on leafy vegetables. Sticky traps (yellow or blue) placed on field margins can indicate when adults begin to disperse into fields from adjacent vegetation. Adults fly when temperatures exceed 63-65 °F during the day and when light intensity is moderate to high. Although they are not to be good flyers, wind currents can carry them considerable distances.

Direct observation of whole plants is the most accurate method of sampling for WFT. This involves careful examination of plant parts for the presence of WFT and feeding scars. It can be done when sampling for aphids and other pests. Care should be taken to carefully examine folds in leaf tissue near the base of the leaves for immatures. Experience has shown that if 3-5 thrips are found on a small plant, there is probably 10 times as many hidden within folds in the leaves or that had dispersed from the plant. Dislodging is another method that involves beating or jarring plants to dislodge adult and larvae onto sheet or sticky surface where they can be counted and identified. It should be done during the morning when adults are less active. This method can be time consuming and does not measure actual numbers, but rather provides a relative estimate of WFT abundance.

**Natural / Biological Control:** Natural enemies, including predaceous mites, minute pirate bugs, predatory thrips and lacewings, can be found feeding on WFT. However *on desert crops, these natural enemies are not capable of suppressing WFT populations below economic levels.* Several common entomopathogenic fungi such as *Beauveria bassiana* have been formulated but have only shown marginal levels of WFT suppression under field conditions.

**Cultural Practices:** Cultural management can have an impact on WFT populations by taking advantage of their ability to rapidly disperse from native vegetation, weeds and adjacent crops. As a first line of defense, growers should disc under lettuce crop residues immediately after harvest of fall and winter crops. These post-harvested lettuce crops can serve as a significant reservoir for thrips and tospovirus. Clean culture is also important for preventing potential virus infections. WFT outbreaks are

often associated with fields heavily infested with weedy mustards or fields near commercial plantings of mustard, alfalfa or wheat. Research has shown that several common weed species we find growing in the desert serve as hosts to both WFT and tospovirus. More importantly, little mallow (aka, Malva, cheeseweed) is a key host of INSV and can be found throughout the desert during the winter. WFT also reproduce prolifically on little mallow. So, maintaining thorough weed control in and around crops can help prevent WFT buildup and dispersal, and potentially the spread of INSV should it become established in the desert. Keep those ditch banks clean. Crop placement can help if growers avoid planting vegetable crops near grain fields, weedy drains or fields and grassy areas. Overhead sprinkler irrigation has been shown to suppress WFT numbers in romaine and spinach by as much as 50%, but insecticide treatments are generally still necessary, particularly in late spring when WFT adult dispersal is high.

**Insecticidal Control:** Because cultural management has only an indirect impact on WFT populations, and control with insecticides is often the only viable management alternative to prevent economic damage. Insecticides can be applied to the leafy vegetables to minimize feeding and contamination. The following points should be considered when attempting to chemically manage populations in leafy vegetables. First, there are no defined action thresholds for WFT on leafy vegetables, but experience suggests that insecticides should be applied when presence of larvae and scarring on young leaves is first observed. Remember, the key to preventing cosmetic damage by WFT is to maintain larval populations at low levels. The cryptic or *thigmotactic* behavior of thrips often makes them difficult to find on lettuce plants. Research has shown us that if you can see a few adults and larvae on the plant, it likely means that as many as 10-fold more thrips are actually on the plant (hiding near the base of the plant between midribs). This behavior also means that spray coverage is important, particularly with contact insecticides. If possible, apply treatments during the mid-morning when adults are most active. Several products are available that when used in combination will provide efficacy with varying residual activity (Lannate, acephate, endosulfan, Radiant, pyrethroids, dimethoate).

Frequency of applications will depend on residual of products and immigration of adults from surrounding vegetation. Plants should be sampled at 2-3 day intervals following treatment. Experience has shown that the most effective insecticides essentially maintain WFT populations at constant levels, and only reduce numbers temporarily. This should be taken into consideration when determining when to treat. Plant size and temperature may be important factors contributing to the efficacy of insecticides. The larger the plant, the more difficult it is to obtain good coverage underneath the leaf and near the base of the plant. Also, higher temperatures drive WFT development, but may also influence their activity to more readily come in contact with the insecticides. An updated chart of insecticides showing activity against WFT adults and larvae is shown below.



Adult



Larva



Plate 1. A) WFT adult and damage to lettuce leaf, B) WFT damage to baby romaine leaf , C) Adult WFT feeding on pollen in cantaloupe bloom, D) WFT larvae and adults infesting lettuce head



Plate 2. A) WFT damage to head lettuce leaves, B) WFT damage to romaine plants

**Relative Efficacy Index For WFT**

Product	IRAC MOA	Adult	Larvae	Comments*
Lannate	1A	•••	•••	Tank mix with pyrethroid for best thrips control; PHI: 10 d on lettuce at rates > 0.5 lb. ; 7 d on spinach
Acephate	1B	•••	•••	Tank mix with pyrethroid for best thrips control, has aphid activity PHI: 21 d on head lettuce
Dimethoate	1B	••	••	Tank mix with another product for enhanced thrips and aphid activity; PHI: 14 d on leaf lettuce; 48 hr REI
Pyrethroids	3	••	••	Tank mix with Lannate or Orthene for best performance; use high labeled rates; PHI: varies with products
Assail	4A	•	••	May provide thrips suppression when sprays are targeted for aphids. Use at high rates (4 oz for Assail 30SG); PHI: 7 d on leafy vegetables.
Radiant/Success	5	•••	•••	Stand alone worm, leafminer, and thrips control; Use of pyrethroid can improve adult knockdown activity, PHI: 1 day ; Apply at 7 oz.
Abamectin	6	••	••	Use a penetrating adjuvant; use higher rates for thrips activity; performs better when tank-mixed with a pyrethroid; PHI: 7 days on leafy vegetables.
Torac	21A	••	••	Not as efficacious as Radiant or Lannate, but more consistent activity than other alternatives. Can provide fair knockdown of adults when used alone , Best when tank mixed with Lannate or Movento; PHI: 1 d on Leafy veg
Movento	23	•	••	Can provide thrips larvae control when sprays are targeted at aphids; use a penetrating adjuvant at 0.25%v/v or ; PHI: 3 d for Leafy Veg (group 4)
Exirel	28	••	••	Can provide suppression; use at high rate 20 oz; PHI: 1 day on leafy vegetables
Minecto Pro	28+6	••	••	Can provide suppression; use at high rate 10 oz; PHI: 7 days on leafy vegetables
•••		Good knockdown and residual control		
••		Fair knockdown and residual control		
•		No control		

**\* always consult the label before applying any of these products on leafy vegetables or cole crops**