IPM FOR CONTROL OF:

THRIPS PALMI

VERSION 1.0 MARCH 2025

IRAC
Insecticide Resistance Action Committee

This short document outlines Integrated Pest Management (IPM) tactics for controlling *T. palmi* in different cropping systems, which can be helpful in relation to insect resistance management. Though IPM is not IRAC International's primary expertise, IRAC will, where appropriate, seek to enable the dissemination of information on IPM options developed by research institutions, academia, or government agencies for certain crop-pest situations through our outreach channels. IRAC International encourages IPM in the context of resistance management (RM).

IPM is an approach to manage pests in an economically viable, socially acceptable, and environmentally safe manner (Dara, 2019). IPM tactics are based on science and can be roughly characterized as combinations of cultural interventions, host plant resistance, the use of natural enemies and the use of synthetic pesticides based on economic threshold, or genetically modified crops (GMO), where appropriate.

Cultural Controls

Greenhouses should be sanitized from weeds and crop residues and left with all openings closed for at least 20 days to starve the adults to death before transplanting of new seedlings. Removing weeds and crop residues around the greenhouse or open field is also recommended because open side windows of the greenhouse can be entry points for airborne thrips and become a source of infestation. Weeds in the greenhouses should be removed frequently. After harvest, unneeded plants, seedlings, and residues should be eliminated as soon as possible. In the greenhouses infested with *T. palmi*, it is recommendable to disinfect the soil to kill pupae or adults in preparation of the for next cropping cycle.

Physical Control

Physical control measures include the use of interception, color, and the utilization of insect behavior. On one hand, openings of greenhouses can be covered with red nets, that thrips cannot see, to prevent immigration into greenhouses (Tokumaru, S. *et al.*, 2024).

On the other hand, *Thrips palmi* is known to be attracted to white and blue color with a peak in the light reflectance spectrum around 450 nm. Flying adults can be monitored or controlled to some degree, using white or blue sticky traps.

Another approach to utilize optics, is to place white or silver sheets on the ground which reflect sunlight. Adult thrips use ultraviolet rays as cue for flight orientation. When sunlight reflected by light-reflecting materials hits thrips adults from the ground, they seem to lose their sense of vertical direction. As a result, thrips adult cannot properly land on the crop leaves. However, the effect is limited to the range where light can reach, so the effect will gradually diminish as the crops grow thicker (Suzuki, H. & Miyara, A, 1983).

Crops become invisible for *T. palmi* when irradiated with red light. Thrips are prevented from sucking and mating, gradually reducing their density and decreasing damage. Red LEDs at 660 nm have been proven to be particularly effective against *T. palmi* and can be highly effective when used appropriately for the target plants and greenhouse shape (Shibao, M. & Tanaka, H., 2015).

Biological Control

Currently, biological approaches for thrips control can be broadly divided into using predatory arthropods (macro-organism) and entomopathogenic fungi (Microorganism). These control methods are thought to be less likely to lead to resistance than the use of chemical insecticides.

Natural Enemies (macro-organisms)

In greenhouses, the augmentative release of natural enemies is a common IPM strategy for controlling thrips. Well established examples for natural enemies used for thrips control in the greenhouse are: predatory mites from the genus *Amblyseius spp*. (Phytoseiidae) like *A. swirskii*, and *Neosiulus cucumeris* (Kakkar, *et al*. 2016). In Japan, predatory bugs like *Nesidiocoris tenuis* (Miridae) (Yano *et al*. 2020) or *Orius strigicollis* (Anthocoridae) (Cannon *et al*. 2007) have been released successfully, as well as predatory thrips (*Franklinothrips vespiformis*) (Ohishi & Yasuda, 2002).

To optimize the efficacy of natural enemies, it is important to elucidate the potential side effects of agrochemicals for non-target species. Chemical control should be selective towards the target pest species. Moreover, understanding the potential of negative sublethal effects is important.

Life stages of natural enemies need to be considered carefully when integrating insecticide applications with natural enemies. Modern more selective insecticides can be less damaging to natural enemies than older broad-spectrum MoAs. They might also be less problematic because of reduced exposure of non-target species.

Microbial control

Formulated *Beauveria bassiana* and *Lecanicillium muscarium* are known to control thrips species including *T. palmi* (Cannon *et al*. 2007). It is essential to understand the optimal environmental conditions and thrips ecology for microbials to produce good results.

Host Plant Resistance

Host plant resistance to thrips or viruses transmitted by thrips can be solutions for controlling plant damage. In Japan, melon yellow spot disease is causing problems in cucumber production. This disease is caused by melon yellow spot virus (MYSV) transmitted by *T. palmi*. It causes yield loss and reduction of fruit quality. A cultivar "Ryokka" was developed, which is moderately resistant against MYSV. Fruit quality is as good as in common greenhouse cultivars, and yield are the same under disease free conditions. In areas where cucumber yellow blight occurs, "Ryokka" shows in comparison with non-resistant greenhouse cultivars reduced yield loss and contributes to stable production (pers. comm.).

Successful IPM for *T. Palmi*

In 2025, the Agricultural Administration Office of Osaka Prefecture developed an IPM program for controlling *Thrips palmi* in greenhouse eggplant production using a combination of red colored nets, natural enemies, and chemical insecticides. The most effective timing and release methods for *Amblyseius swirskii*, and *Metarhizium anisopliae* soil granule formulation were elucidated and the timing of insecticide applications of spirotetramat and emamectin benzoate optimized, to reduce impact on the biological agents. The results indicated that the chemical insecticide use against *Thrips palmi* could be reduced by 40% in compared with conventional practice. The program will diminish the development of insecticide resistance by reducing exposure of the target insects. Furthermore, 30% labor saving for pest control were achieved compared with conventional control practice (pers. comm.).

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