



Genetics of *Thrips palmi* (Thysanoptera: Thripidae)

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Abstract

Melon thrips (*Thrips palmi*) is the principal insect pest of vegetable and ornamental plants worldwide. In addition to inflicting feeding injuries on host plants, they act as vectors of economically damaging tospoviruses. Application of insecticides and host plant resistance has proven largely ineffective in the management of *T. palmi*. However, increasingly, genetic knowledge is being successfully utilized to manage insect pests. A number of recent studies have enriched the genetic database of *T. palmi*. In this review, we report on genetics of *T. palmi* for species identification and to study its populations structure. For example, a DNA polymorphism analysis of global *T. palmi* populations has revealed the existence of 29 haplotypes. The *T. palmi* population can be divided into three lineages based on phylogenetic analysis. A high maximum intraspecific distance is indicative of cryptic species within *T. palmi* populations. Regarding climate adaptability, the upregulation of trehalose biosynthesis genes, and genes encoding several heat-shock proteins is expected to enable *T. palmi* thermal adaptation to both cold and hot conditions. Genetics of *T. palmi* has shown that resistance to conventional insecticides like cypermethrin appears to be linked to mutations in the sodium channel. On the other hand, resistance to imidacloprid appears to be a result of cytochrome P450-mediated detoxification. *T. palmi* genes potentially involved in tospovirus transmission are also reviewed and new molecular tools for genetic study presented. Molecular modeling and docking analyses of groundnut bud necrosis virus glycoprotein demonstrated protein–protein interactions with *T. palmi* vacuolar ATP synthase E subunit, cathepsin, clathrin, adaptor protein 2, and enolase. Overall, a better knowledge of *T. palmi* genes will assist elucidation of thrips identification, means of adaptation in diverse ecological niches, mechanisms of insecticide resistance, and transmission of plant viruses. This data will be an invaluable tool for integrated thrips management.

Keywords Melon thrips · Haplotype · Identification · Adaptation · Insecticide resistance · Tospovirus transmission

Key message

- DNA polymorphism analysis indicates 29 haplotypes of *T. palmi*

- Possible involvement of glycerol and mannitol as cryo-protectants in cold-exposed *T. palmi*
- Resistance in *T. palmi* against cypermethrin due to mutations in the sodium channel
- Imidacloprid resistance in *T. palmi* as a result of CYP450-mediated detoxification
- C-type lectin appears to be the first known cellular receptor in *T. palmi* with which groundnut bud necrosis virus G_N protein interacts followed by clathrin-mediated endocytosis

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Introduction

Thrips palmi (Thysanoptera: Thripidae), commonly known as melon thrips, is a major pest of vegetable and ornamental plants worldwide. It causes economically significant losses particularly in Cucurbitaceae, Solanaceae, Fabaceae,