



A rapid field-based assay using recombinase polymerase amplification for identification of *Thrips palmi*, a vector of tospoviruses

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Abstract

Thrips palmi (Thysanoptera: Thripidae) is an important pest of vegetables, ornamentals, and legumes worldwide. Besides damage caused by feeding, it transmits several tospoviruses. Identification of *T. palmi* at an early stage is crucial in implementing appropriate pest management strategies. Morpho-taxonomic identification of *T. palmi* based on the adult stage is time-consuming and needs taxonomic expertise. Here, we report a rapid, on-site, field-based assay for identification of *T. palmi* based on recombinase polymerase amplification (RPA), its first application in insects. RPA primers designed based on 3' polymorphisms of the Internal Transcribed Spacer 2 region efficiently discriminated *T. palmi* without any cross-reactivity to other predominant thrips species. RPA was performed with crude DNA, extracted from single *T. palmi* simply by crushing in sterile distilled water and could be completed within 20 min by holding the reaction tubes in the hand. The assay was further simplified by using fluorescent as well as colorimetric dyes thus eliminating the gel-electrophoresis steps. The presence of *T. palmi* was visualized by a change in color from dark blue to sky blue. The assay was validated with known thrips specimens and found to be effective in diagnosing the presence of *T. palmi* in natural vegetation. This on-site, rapid assay for diagnosis of *T. palmi* can be used by non-expert personnel in the field of quarantine and pest management.

Keywords RPA · Melon thrips · Insect vector · Tospovirus transmission · Thrips diagnostics

Key message

- *Thrips palmi* an important pest of vegetables and ornamentals transmitting several tospoviruses
- Morpho-taxonomic identification stage-specific, time-consuming, and needs taxonomic expertise
- Rapid, on-site, field-based assay for identification of *T. palmi* using recombinase polymerase amplification

- Assay uses crude extract of *T. palmi*, completed within 20 min by holding the reaction tubes in hand without use of sophisticated laboratory instruments
- The presence of *T. palmi* visualized by a change in reaction color
- Useful for non-expert personnel in field-based identification, quarantine, and adopting suitable pest management strategies

Introduction

Thrips (order Thysanoptera) are important agricultural pests that cause significant losses in yield and quality of agricultural products worldwide. These small insects cause damage to leaves, flowers, and fruits by feeding and sometimes induce galls. Distinctive silvery scarring on the leaves, stems, or fruits is often visible due to their feeding (Trdan et al. 2007; Chisholm and Lewis 2009; Ghosh et al. 2009, 2017). Besides the direct damage, thrips also transmit economically damaging tospoviruses (family *Tospoviridae*, order *Bunyavirales*) (Rotenberg et al.

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