



Short communication

An observation on the embryonic development in *Thrips palmi* (Thysanoptera: Thripidae) eggs obtained by an artificial oviposition setup

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ABSTRACT

Thrips palmi is an important insect pest of vegetables and ornamental crops worldwide. Besides direct damage caused by feeding, it transmits several tospoviruses in a persistent-propagative manner. Eggs of *T. palmi* are microscopic and embedded within plant tissue by the sharp ovipositor of adult female. In the present study, an artificial oviposition setup has been standardized for *T. palmi*. Eggs of *T. palmi* were harvested in sterile water between two thin membranes. The developmental stages of *T. palmi* embryo were studied starting from oviposition up to hatching by inverted and confocal reflection microscopy. Energids were homogeneously distributed at an early stage of development. The anterior end of the egg curved with a constriction post 38 h. Initiation of tissue organization, mouthparts, appendages, compound eyes were observed at different time points. Appendages were well developed and segmentation was prominent post 70 h. The embryo was completely developed at around 80 h and hatched by 86 h post oviposition at 28 °C temperature. The study first time reports the embryonic development of *T. palmi* that would be helpful in detailed investigations of thrips developmental biology and evolution.

Introduction

Thrips palmi (Thysanoptera: Thripidae) is one of the key agricultural pests distributed in tropics and subtropics. It feeds on more than 200 plant species (Walker, 1992, Cermeli and Montagne, 1993, Loomans et al., 1999) belonging to the family Cucurbitaceae, Solanaceae, Fabaceae, and Asteraceae. Losses of about 15% in potato and 90% in cucumber are reported due to infestation of *T. palmi* (Vercambre, 1989, Cooper, 1991, MacLeod et al., 2004). Besides inflicting direct damage by feeding, it transmits tospoviruses (German et al., 1992). To date, seven tospoviruses viz. groundnut bud necrosis virus (GBNV), melon yellow spot virus (MYSV), calla lily chlorotic spot virus (CCSV), watermelon silver mottle virus (WSMV), watermelon bud necrosis virus (WBNV), tomato necrotic ringspot virus (TNRV), and capsicum chlorosis virus (CaCV) are reported to be transmitted by *T. palmi* (Rotenberg et al., 2015, Ghosh et al., 2017, 2019, Jagdale and Ghosh, 2019). It was considered to be restricted to Southeast Asia for many years, but it has been widely introduced across the globe in recent decades (Capinera, 2008, Seal et al., 2013).

The present understanding of thrips embryogenesis is limited to less than 10 species (Heming, 1980, Kumm, 2002, Moritz, 2002, Rajput,

2014) and no study reports embryogenesis of *T. palmi*. Adult female of *T. palmi* inserts its eggs inside the plant tissue by sharp ovipositor. The embedded egg is a major limitation in studying the developmental biology of *T. palmi* embryo. In view of this, an artificial oviposition setup has been developed to harvest eggs and study the embryonic development of *T. palmi*. The present study on the developmental stages of *T. palmi* embryo will be pertinent to shed light on the process of morphogenesis and developmental biology of thrips.

Materials and methods

The initial population of *T. palmi* was taken from a stock culture maintained at Advanced Centre for Plant Virology, Indian Agricultural Research Institute, New Delhi. Identification of *T. palmi* was based on morphometric keys (Bhatti, 1980, Cluever and Smith, 2017) and confirmed by sequencing the mitochondrial cytochrome oxidase subunit I following a PCR protocol described by Ghosh et al. (2016, 2019) and *T. palmi*-specific PCR (Jangra et al., 2020). A homogenous population of *T. palmi* has been developed from a single female on brinjal plants (var. Navkiran) under controlled environmental conditions (Yoshihara and Kawai, 1982, Jangra et al., 2020). Adult females of *T. palmi* were

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