DISPERSAL MECHANISMS AND SEX RATIO OF THERMOPHILOUS *MICROCEPHALOTHRIPS ABDOMINALIS* CRAWFORD 1910

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Abstract

Alien and invasive thrips (Thysanoptera) species from tropical and subtropical regions are spread into temperate countries by human activities and by shifting their natural range as a result of global climate change. Climate change induced consequences in exotic pest introductions or even invasions often in synergy with biological commodity trade globalisation have recently become one of the main challenges for applied phytosanitary care in terms of supporting the ability of exotic elements to establish adequate populations with suitable fitness. The main threat consists in at least temporary survival in mild climate ecosystems dispersing from artificially heated interiors with the potential to transmit economically important plant viruses. The species of *Microcephalothrips abdominalis* Crawford 1910 (male), which is an important pest of Asteraceae family with the ability to transmit Tobacco streak virus (TSV), has been found in the glasshouse of a botanical garden in Bratislava, Slovakia, few years after the most northern record of the species (female) in the area of Slovakia.

Keywords: climate change, introduction, invasive species, reproduction mechanism, Thysanoptera

Introduction

The presence of glasshouses with suitable host plants may contribute to the survival of alien species and also ease and support the establishment of their populations in new environment. In addition, climate change as a relatively new phenomenon plays an important role in the spread of alien species, often with the pest status, to the new environment (Hoffman & Parsons1997). Termophilous neotropical species *Microcephalothrips abdominalis* is considered as a pest of Asteraceae family plants (Pizzol *et al.* 2012), that is able to transmit *Tobacco streak virus* (TSV). European records of its occurence predominantly refer to warmer regions, including Atlantic and Mediterranean countries, especially Canary Islands (Zur Strassen 2003), southern France (Pizzol *et al.* 2012), Italy (Strapazzon 1999), Croatia (Vierbergen *et al.* 2006), Slovenia (Trdan 2002) and Hungary (Vierbergen *et al*. 2006) up to Slovakia (Fedor *et al.* 2018). Sampling the male of *M. abdominalis* in Slovakia (after the first record of female in 2018) has given the reason to discuss on climate change induced infiltration of this alien species in Central Europe (Zvaríková *et al.* 2020) and consider its possible reproduction mechanisms as well as colonization strategies (sexually and parthenogenetically).

Material and methods

Yellow Moericke traps (Fig. 1) were installed in the greenhouses of the Botanical Garden in Bratislava (Fig.3) during the season of 2019 and a total of 17 trappings in two-week intervals were carried out. Representatives of the flora belong to tropical and subtropical plants from Japan, New Caledonia and subtropical Asia. Temperatures range from 18 to 26 ° C. Traps were situated near plants (Arecaceae, Cycadaceae, Moraceae, Araucariaceae, Dryopteridaceae), doors and windows and installed at different heights from 0 to 2 m above the ground according to the average height of the plants in individual greenhouses. During the research no new plants were planted or brought to the greenhouse. The thrips specimens were stored in AGA solution (ethyl alcohol, glycerol, acetic acid), mounted and identified according to the standard methods used for thrips (Schliephake & Klimt 1979, ZurStrassen 2003, Fedor *et al*. 2012).

Fig.1 Yellow Moericke trap

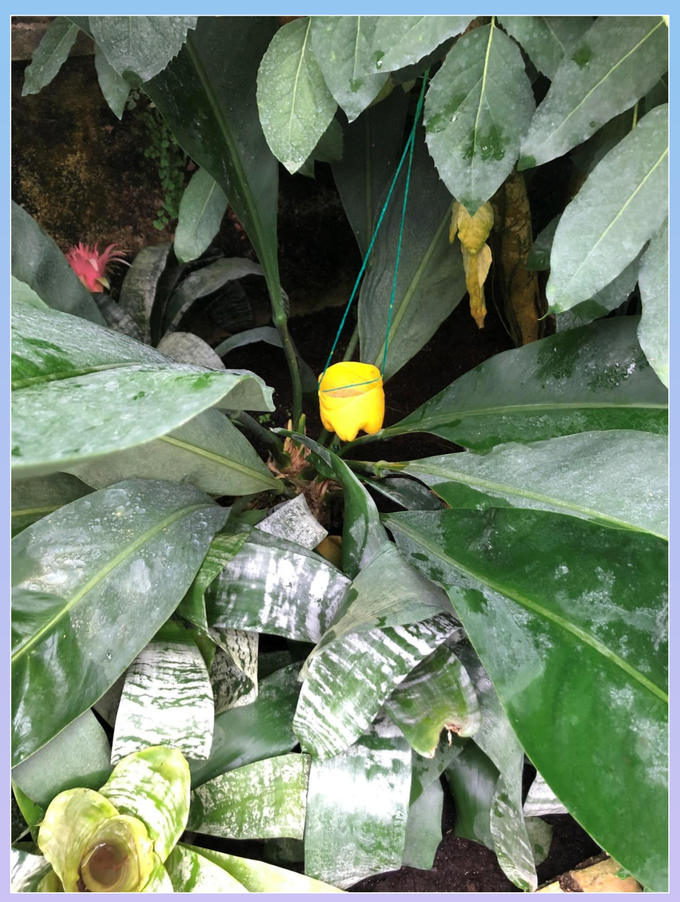

Fig.2 *Microcephalothrips abdominalis* (male)

Fig.3 Bratislava Botanical Garden (greenhouse where the male specimen was found)

Results and discussion

The first male specimen of *M. abdominalis* (Fig. 2) was observed in Bratislava Botanical Garden in August 2019, a year after the first record of this species (female) in Slovakia (Fedor *et al*. 2018). Due to the fact that the species can probably reproduce both sexually and parthenogenetically (O'Neill 1960, Bondy 2018), females are more numerous than males. As there is information only on female specimens in Central Europe (Jenser 2013) we have two hypotheses about the species sex ratio in Central European conditions:

1. this species may reproduce by thelythokous parthenogenesis, similar to *Thrips tabaci* Lindeman, 1889 (van Rijn *et al*. 1995), or introduced thrips in general (O'Neill 1960), where diploid females are produced from un-fertilized haploid eggs after doubling of the chromosome complement (Bondy 2018). The parthenogenetic reproduction is often considered as the most common in introduced species (O'Neill 1960) and according to the theory of „geographic parthenogenesis“, this type of reproduction tends to occur in modified conditions (Kellner *et al*. 2013), for example at the margin of the area of distribution (e.g. Stenberg *et al.* 2003).
2. *M. abdominalisis* distinguished by haplodiploid sex determination system, similar to arrhenotokous mechanisms of *Frankliniella occidentalis* Pergrande, 1895 (van Rijn *et al.* 1995), by which females produce male or female offsprig by selective fertilization (Bondy 2018). Haplodiploid sex determination system provides higher genetic variation (Lambrinos 2004) for species to be well adapted for colonization of new habitats (Higgins & Myers 1992). But since such reproduction is affected by various environmental and ecological factors (Wang *et al.* 2014; Crespi 1988) certainly the climate plays a crucial role in those phenomena.

As *M. abdominalisis* considered to be a neotropical element (Pizzol *et al*. 2012), with its most northern occurrence in Europe recorded in Slovakia (Fedor *et al*. 2018), we formerly assumed its exclusive parthenogenetic population here. However, our observation as well as relevant literature (Trdan 2002) indicate that global warming may probably have an impact on development and dispersal of this species in Europe (Fedor *et al*. 2018). The climate conditions do not appear to be as limiting as it was thought. The barriers are removing through global warming mechanisms and may facilitate infiltration of *M. abdominalis* in Europe. With its possible sexual reproduction in Slovakia we assume its parthenogenesis more in the North, including southern Poland.

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