Bulletin of Insectology ***70*** *(1): 27-30, 2017*
ISSN 1721-8861

Thrips hawaiiensis a pest thrips from Asia newly introduced into Italy

Rita MARULLO, Alessandra DE GRAZIA
Department of Agricultural Sciences, Università degli Studi Mediterranea di Reggio Calabria, Italy

Abstract

Several permanent populations of *Thrips hawiiensis* (Morgan) were discovered outdoors for the first time in 2015, in different sites in Italy. The species widely distributed and common in tropical countries is now recorded from three European countries: France, Spain and Italy. It is a phytophagous and polyphagous species that infests flowers, vegetables and fruit trees belonging to several plant species. Its spread and establishment into European countries could be favoured by the climatic and cultural conditions. This paper reports a list of plants where the thrips has been sampled from, together with data referred to the morphological identification, the systematic position, distribution and bionomics.

Key words: thrips, invasive species, diagnosis, taxonomy, host range.

Introduction

Thrips, as the members of the insect order Thysanoptera are usually named, include many species which are preadapted to an invasive lifestyle. They are small (the length of body of the adults is often only a few millimetres or less than one, and can be carried by the winds far away), and they are opportunistic and ubiquitous insects. Thrips species occupy widely disparate niches resulting in the manifestation of a diverse array of lifestyles, particularly of dietary regimes. Phytophagous species are included mainly in family Thripidae (Marullo and De Grazia, 2013), and can be leaf and flower feeders with proclivities for facultative predation, others are virus vectors. Three genera *Frankliniella* Karny, *Thrips* L. and *Scirtothrips* Shull comprise also the most important thrips quarantine species for the EU territory. During the last twenty years, *Frankliniella occidentalis* (Pergande) was the most invasive non native thrips species which was introduced and established in Italy (Marullo, 2002). Information on its spread and assessment in Italy and in other countries, biology and control on the main economic importance crops have been reported (Tommasini and Maini, 1995; Kirk and Terry, 2003). Instead, no data are available for the host range and spread of *Echinothrips americanus* Morgan in the Italian regions, so that this introduced species is considered limited to glasshouse crops in northern Italy. At present, the major interests for studies on thrips species of agronomic importance and their biology have prevailed over their biotaxonomy in Italy.

Materials and methods

During the monitoring of the Thysanoptera fauna on wild-growing plants carried out by the research unit of the Department of Agriculture at the Mediterranean University in Reggio Calabria (South Italy) from beginning autumn 2015 to the end of October in Lamezia Terme, Pizzo Calabro and Vibo Valentia, thrips specimens were obtained by beating flowers of wild-growing plants living around crops. Also some specimens from the collecting on wild plants in Novi Ligure (Alessandria, northern Italy) were provided by G. Ravazzi, and a few adults were taken out two surveys, during late autumn, in Reggio Calabria. The samples were put in the AGA solution or 60% ethanol and kept in the refrigerator at 6 °C. The mounting of specimens on slides was done following the technique suggested by Mound and Marullo (1996) and the identification of species by using keys provided by Zur Strassen (2003), Mound and Marullo (1996) and Nakahara (1994), under the optical microscope (Axiostar Plus Zeiss, Germany).

Results

Permanent populations of *Thrips hawaiiensis* (Morgan) were discovered outdoors for the first time in Italy, both in northern and southern sites (table 1). All the specimens were collected during the end of September 2015 and mostly in October. In late autumn captures were very rare. No males were found in all the surveys.

Distribution

T. hawaiiensis is a polyphagous flower-dwelling thrips widely distributed and common in tropical Asia and the Pacific Region (India, Indonesia, China, Japan, Malaysia, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, Australia, Fiji, Guam, Hawaii, New Guinea, Samoa). It is also found in Africa (Angola, Mozambique, Nigeria, Sierra Leone, Uganda, Reunion Islands). In North America it is known in California, Florida, Georgia, South Carolina, Texas and Mexico. In the Caribbean and Central America it has been reported only from Jamaica (Sakimura, 1986). The species shows invasive capacities, and has been recorded recently from the south of France, where a population is established in the area of Antibes on the Mediterranean coast (Reynaud *et al*., 2008) from North Spain, Basque Countries (Goldarazena, 2011) and from Mersin province in Turkey (Etakan *et al*., 2015).

Table 1. Sampling details for the surveys of *T. hawaiiensis* in Italy.

Plant species	Number of individuals	Locality	Date of sampling
Rosa sp.	24♀♀	Lamezia Terme	27 IX 2015
Gerbera sp.	4♀♀	Pizzo Calabro	8 X 2015
Leontodon autumnalis	120♀♀	Novi Ligure	10 X 2015
Nerium oleander	7♀♀	Vibo Valentia	18 X 2015
Arctium tomentosum	87♀♀	Novi Ligure	30 X 2015
Viburnum sp.	12♀♀	Reggio Calabria	6 XI 2015
Rosa sp.	16♀♀	Reggio Calabria	8 XI 2015

Systematic and morphological diagnosis

The species was described by Morgan (1913) from Hawaii under the name of *Euthrips hawaiiensis*, but the great morphological variability of the specimens (mainly in having 7 or 8-segmented antennae) on which it was identified by different authors has resulted in several re-descriptions and generated many recognized junior synonyms. *T. hawaiiensis* belongs to a group of species which includes also *T. florum* Schmutz, an oriental species widespread across Asia and Pacific up to Florida and Caribbean islands, and represents a species-complex of great taxonomic difficulty (Mound and Marullo, 1996). The two species are morphologically very similar and closely related and have been often confused and ,at one time, they were synonymized. However, *T. hawaiiensis* is distinguished in the female specimens by the shorter subterminal seta on the clavus, the presence of sculpture lines near the mesonotal anteromedian sensilla, and the postocular setae pair II that are almost as long as setae pair III. Instead the male of *T. hawaiiensis* can be separated by some characteristics of setae B1 and B2 on tergite IX, in particular by the length of B2 setae and the distance between the bases of B1 setae (Palmer and Wetton, 1987).

Morphological description of specimens collected in Italy

Adult female (figure 1A) with head and thorax from yellow to dark orange, abdomen brown; legs yellow or brown-yellowish; forewings greyish with the basal quarter paler brown; setae brown. Antennal segments (figure 1B) brown, except segment III, the apex of II and bases of IV and V yellow. All the specimens from Italy had 8-segmented antennae. Head broader than long, cheeks arched; ocellar setae III lateral of anterior ocellus; four pairs of postocular setae, the first one the longest. Pronotum (figure 1C) with anastomosing transverse lines of sculpture, about 60 short discal setae. Mesonotum (figure 1D) striated, with a median transverse striate area and a pair of campaniform sensilla. Metanotum (figure 1D) with a median longitudinal reticulate sculpture, 4 metanotal setae present, the median setae at the anterior margin. Forewing with 3 setae distally. Tergite II with 4 lateral setae, pleurotergites without accessory setae; abdominal sternites III-VII with 6-14 discal setae; tergite VIII (figure 1E) with a complete but short and irregular comb. Tergite IX (figure 1F) with setae B1 and B2 long. Ovipostor serrate and well developed.

Bionomics

The main studies on the biology of *T. hawaiiensis* have been carried on by Asian authors. In particular, the relationships between the temperature and thrips development and reproduction have been carried on by Murai (2001) in a laboratory study. The increase of temperature causes a shortening of the developmental period from egg hatch to adult emergence: at 10 °C it was 38.9 days, 8 days at 30 °C. Also longevity and fecundity were functions of the temperature. Developmental time decreased with temperature: 18 days at 25 °C, but 92 days at 15 °C. Maximum longevity was reached at 15 °C (121 days) and maximum fecundity at 20 °C (536 eggs). The daily egg production was constant during the lifetime of the female adults with 6-8 eggs per day at 20 °C. The sex ratio was 0.74. The species seems to tolerate low temperatures and to show greater potential voltinism than other pest thrips, i.e. *Thrips tabaci* Lindeman, *Thrips palmi* Karny, *F. occidentalis*, *Scirtothrips dorsalis* Hood and *Thrips imaginis* Bagnall.

T. hawaiiensis is a strict flower-dwelling species which can attack various crops such as tobacco (Kurozawa *et al*., 1964), rose (Woo and Paik, 1971; Wang, 1982), gladiolus (Chen and Lo, 1987), *Brassica oleracea* (Chandra and Lal, 1973), coffee (Ketavan, 1978), tea (Chen, 1979), mango (Lee and Wen, 1982), citrus (Srivastana and Bhullar, 1980; Chiu *et al*., 1991), apples and pears (Palmer and Wetton, 1987), and bananas (Tsai *et al*., 1992; Jhala *et al*., 2004). The species causes direct damages by puncturing flowers and fruits, inducing spot lesions, scarring, necrosis or malformation which depend on the intensity of the attack. It also feeds on pollen and causes problems to the fertility of the plants. It has not been recorded as a virus vector.

Conclusions

T. hawaiiensis is a highly polyphagous species and like the large host plant range including plants and flowers widely world traded, the potential risk of introduction and spread, from South France, Spain and Italy to the whole Mediterranean Region, might be almost realistic. In southern areas the spread and assessment is favoured by the suitable climatic conditions, both in open field and on protected crops. Instead, in northern Europe, the species could establish in glasshouses very easily. However, the potential risk for the diffusion in all Europe

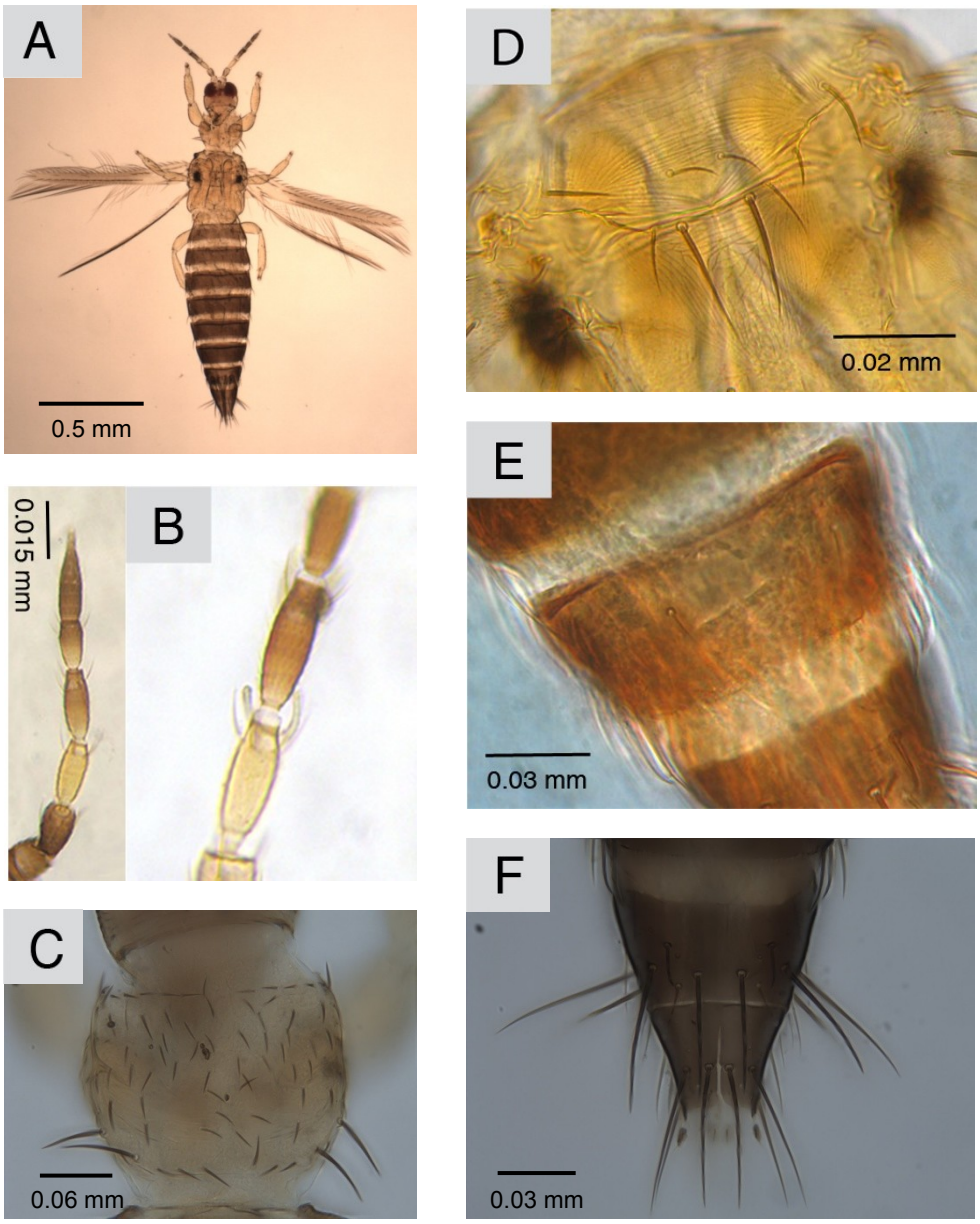

Figure 1. *T. hawaiiensis*. **A)** Habitus of adult female; **B)** Antenna (antennal segments III-IV on the right); **C)** Pronotum; **D)** Mesonotum and metanotum; **E)** Tergite VIII; **F)** Tergites VIII-X.
(In colour at www.bulletinofinsectology.org)

and the Mediterranean Basin needs to be monitored, considering that this species is not a virus vector and, so far, it is not proven to become invasive and harmful in the non-native areas where it has newly established. Whereas, the potential economic importance of *Microcephalothrips abdominalis* (Crawford) a tropical species recently introduced into Slovenia (Trdan, 2002), has been studied. This species has appeared to be mostly harmful as virus vector, i.e. tobacco streak virus (TSV), on ornamental plants from Asteraceae indoors in the continental part of the country. Moreover, surveys of strains of *E. americanus*, a North American pest thrips relatively newly established into European greenhouses, have been carried on cultivated plants indoors in Slovakia (Varga *et al*., 2010). The results of this study have demonstrated the selection of host plants and the variability of the infestation levels due to differences in food preference exhibited by larvae and adults. These new data on the feeding ecology may be considered in specific approaches when applying an effective biological or chemical control.

Acknowledgements

The authors thank Giorgio Ravazzi (Novi Ligure - Alessandria), for the specimens provided from northern Italy, and Serafino Cannavò from Department of Agricultural Sciences (UNIRC) for the preparation of figures. This study was financially supported by the Italian Ministry of Education, University and Research (MIUR), Research Project PRIN 2011 “Insects and globalization: sustainable control of exotic species in agro-forestry ecosystems (GEISCA)”.

References

CHANDRA J., LAI O. P., 1973.- Record of thrips of some vegetables and ornamental plants from Kulu Valley.- *Himachal Pradesh Indian Journal of Entomology*, 35: 164-166.

CHEN L. S., 1979.- Thrips infesting tea in Taiwan.- *Plant Protection Bulletin, Taiwan*, 21: 377-382.

CHEN L. S., LO P. K. C., 1987.- Differential preference of the flower-dwelling thrips, *Thrips hawaiensis* (Morgan) (Thysanoptera: Thripidae), to some gladiolus cultivars.- *Journal of Agricultural Research of China*, 36: 317-326.

CHIU H. T., SHEN S. M., WU M. Y., 1991.- Occurrence and damage of thrips in *Citrus* orchards in southern Taiwan.- *Chinese Journal of Entomology*, 11: 310-316.

ETAKAN E., OLCULU M., PEHLIVAN S., SATAR S., 2015.- A new thrips species recorded in Turkey: *Thrips hawaiiensis* (Morgan, 1913) (Thysanoptera: Thripidae).- *Turkish Entomological Bulletin*, 5 (2): 77-84.

GOLDARAZENA A., 2011.- First record of *Thrips hawaiiensis* (Morgan, 1913) (Thysanoptera: Thripidae), an Asian pest Thrips in Spain.- *OEPP/EPPO Bulletin*, 41: 170-173.

JHALA R. C., BORAD P. K., PHARPODA T. M., 2004.- Incidence of *Thrips hawaiiensis* (Morgan) on banana in Gujarat.- *Insect Environment*, 10: 55.

KETAVAN C., 1978.- *Thrips of economic importance and their control in Thailand*.- Report, Kasetsart University, Thailand.

KIRK W. D. J., TERRY I. L., 2003- The spread of the western flower thrips *Frankliniella occidentalis* (Pergande).- *Agricultural and Forest Entomology*, 5 (4): 301-310.

KUROSAWA M., TAKAOKA I., NAITO T., 1964.- Thrips infesting the tobacco plants in Japan (Thysanoptera).- *Japanese Journal of Entomology*, 32: 402.

LEE H. S., WEN H. C., 1982.- Seasonal occurrence and injury caused by the thrips and their control on mangoes.- *Plant Protection Bulletin,Taichung*, 24: 179-187.

MARULLO R., 2002.- Impact of an introduced pest thrips on the indigenous natural history and agricultural systems of southern Italy, pp. 285-288. In: *Thrips and Tospoviruses. Proceedings of the 7th International Symposium on Thysanoptera* (MARULLO R., MOUND L. A., Eds).- Australian National Insect Collection, Canberra, Australia.

MARULLO R., DE GRAZIA A., 2013.- Territorial distribution, classification and relationships amongst Italian Thysanoptera.- *Bulletin of Insectology*, 66 (1): 127-134.

MORGAN A. C., 1913.- New genera and species of Thysanoptera, with notes on distribution and food plants.- *Proceedings of the United States National Museum*, 46: 1-55.

MOUND L. A., MARULLO R., 1996.- The thrips of Central and South America: An introduction (Insecta: Thysanoptera).- *Memoires on Entomology, International*, 6: 1-487.

MURAI T., 2001.- Development and reproductive capacity of *Thrips hawaiiensis* (Thysanoptera: Thripidae) and its potential as a major pest.- *Bulletin of Entomological Research*, 91: 193-198.

NAKAHARA S., 1994.- The genus *Thrips* Linnaeus (Thysanoptera: Thripidae) in the New World.- *Technical Bulletin, United States Department of Agriculture*, 1822: 1-18.

PALMER J. M., WETTON M. N., 1987.- A morphometric analysis of the *Thrips hawaiiensis* (Morgan) species-group (Thysanoptera: Thripidae).- *Bulletin of Entomological Research*, 77: 397-406.

REYNAUD P., BALMES V., PIZZOL J., 2008.- *Thrips hawaiiensis* (Morgan, 1913) (Thysanoptera: Thripidae), an Asian pest now established in Europe.- *OEPP/EPPO Bulletin*, 38: 155-160.

SAKIMURA K., 1986.- Thrips in and around the coconut plantations in Jamaica, with a few taxonomic notes (Thysanoptera.- *Florida Entomologist*, 69: 348-363.

SRIVASTAVA S., BHULLAR J. S., 1980.- Thrips- a new record as a pest of citrus blossoms in Himachal Pradesh.- *Current Science*, 49: 747.

TOMMASINI M. G., MAINI S., 1995.- *Frankliniella occidentalis* and other thrips harmful to vegetable and ornamental crops in Europe.- *Wageningen Agricultural University Papers*, 95: 1-42.

TRDAN S., 2002.- After the first record of *Microcephalothrips abdominalis* (Crawford) in Slovenia: presentation of the species and evaluation of its potential economic importance.- *Zbornik Biotehniske Facultete Univerze Ljubljani, Agricultural issue*, 79 (1): 309-316.

TSAI Y. P., HWANG M. T., CHEN H. P., 1992.- Occurrence and damage of *Thrips hawaiiensis* in banana orchards.- *Chinese Journal of Entomology*, 12: 231-237.

VARGA L., FEDOR P. J., SUVAK M., KISELAK J., ATAKAN E., 2010.- Larval and adult food preferences of the poinsettia thrips *Echinothrips americanus* Morgan, 1913 (Thysanoptera: Thripidae).- *Journal of Pest Science*, 83 (3): 319-327.

WANG C. L., 1982.- Insect pest and their injury on rose.- *Journal of Agricultural Research of China*, 31: 97-101.

WOO K. S., PAIK W. H., 1971.- Studies on the thrips (Thysanoptera) unrecorded in Korea.- *Korean Journal of Plant Protection*, 10: 69-73.

ZUR STRASSEN R., 2003.- Die terebranten Thysanopteren Europas und des Mittelmeer-Gebietes.- *Die Tierwelt Deutschlands*, 74: 1-277.

Authors' addresses: Rita MARULLO (corresponding author, rmarullo@unirc.it), Alessandra DE GRAZIA, Dipartimento di Agraria, Università degli Studi Mediterranea di Reggio Calabria, Località Feo di Vito, I-89060 Reggio Calabria, Italy.

Received July 10, 2016. Accepted October 20, 2016.