

Impact of an introduced pest thrips on the indigenous natural history and agricultural systems of southern Italy

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Introduction

Frankliniella occidentalis, a species of the Family Thripidae that includes many thrips of economic importance, has a nearctic origin, presumably in the south west of North America. It was introduced into Europe during the second half of the 1980's, through the horticultural trade in living plants. The first records for Italy reported damage to ornamentals (saintpaulia, chrysanthemum, carnation and geranium) in greenhouses, in the north-western coast of the peninsula (Liguria). In southern Italy, Viggiani & Jesu (1989) reported the species on flowers (gerbera), pepper and capsicum crops grown in greenhouses in Campania and Basilicata. Later it was reported on strawberry plants (Marullo, 1991) in the same southern regions, and on the table grape cultivar Italia, in Sicily (Cutuli & Previtera, 1990) and Apulia (Ciampolini et al., 1991).

The species is highly polyphagous with a wide host-range. It spreads from horticultural and ornamental crops (such as pepper, beans, carnation, roses and gerbera) to strawberry plants and also to trees including table grapes and peach (nectarines). In southern Italy local climatic and growing conditions vary greatly, from the poor soils of the montane regions, where the winters are very cold, to the rich and fertile soils of the coast, where the winters are almost frost-free. This diversity of growing conditions makes selection of local strains of the pest a real possibility.

During the hot weather of spring and summer, both in field and greenhouses, the spread onto additional hosts is favoured, and in winter in the lowlands, WFT can continue to develop on wild plants surrounding the greenhouses. In Southern Italy, the range of wild plant hosts is mostly *Amarantus* spp., *Chenopodium* spp., *Solanum nigrum* and *Heliotropium europeum* (Marullo, 1991). WFT has not been found on wild plants

or field crops in the montane regions, presumably because the winters are too cold for the species to survive. As a result, economic problems due to WFT are, at present, largely restricted to the coastal areas. The aim of the present talk is to discuss the impact of this recently introduced species on the native thrips fauna, particularly in the Mediterranean Basin, to consider how the species has spread in this area and colonized new plants, and also its influence on agricultural systems of these southern European regions.

Surveys and sampling methods

Surveys have been carried out during spring-summer months (March – July) in 1997 and 1998. In 1997, the investigated areas were Metaponto (Basilicata), Battipaglia and Torre del Greco (Campania); in 1998, sampling was extended to some important agricultural areas in Calabria Region, such as Lamezia Terme and Reggio Calabria.

Two samples were taken per month, selecting the most common wild plants living in the investigated areas near to important crops such as strawberry (in greenhouse and open field), peach (nectarine) and ornamentals (gerbera, carnation and chrysanthemum, in greenhouse). For each wild plant species, a sample consisted of 20 parts (leaves, stems or flowers) taken from 10 plants within the same farm or area. Each sample from a single species of wild plant was put into a plastic bag and preserved in a laboratory fridge at + 6°C. Adults of WFT and other thrips species were counted subsequently under a stereo microscope.

Impact on the indigenous natural history

In Table 1 the most common wild plants living in agricultural areas of some southern Italian Regions (Basilicata, Campania and Calabria) are listed, and the incidence (mean percentage) of the adults of

Plant species	Native Thysanoptera	Mean % <i>F. occidentalis</i>
AMARANTACEAE <i>A. retroflexus</i> L.	<i>Aeolothrips collaris</i> Pr. <i>Thrips flavus</i> Schrank	56%
BORAGINACEAE <i>Heliotropium arborescens</i> L.	<i>Thrips flavus</i> Schrank <i>Thrips sambuci</i> Heeger <i>Thrips tabaci</i> Lindemann	59%
CHENOPODIACEAE <i>Beta vulgaris</i> L. <i>Chenopodium</i> spp.	<i>Thrips major</i> Uzel <i>Thrips flavus</i> Schrank	70%
COMPOSITAE <i>Anthemis maritima</i> , L. <i>Anthemis tomentosa</i> L. <i>Chrysanthemum segetum</i> L. <i>Chrysanthemum coronarium</i> L. <i>Helichrysum italicum</i> (Roth)G.Don, <i>Inula</i> spp.	<i>Aeolothrips collaris</i> Pr. <i>Tenothrips discolor</i> (Karny) <i>Tenothrips frici</i> (Uzel) <i>Thrips atratus</i> Haliday	63%
CRUCIFERAE <i>Lobularia maritima</i> (L.) Desv. <i>Diploaxis</i> spp.	<i>Aeolothrips gloriosus</i> Bagnall <i>Aeolothrips collaris</i> Pr. <i>Thrips brevicornis</i> Pr. <i>Thrips major</i> Uzel <i>Thrips tabaci</i> Lindemann	55%
RANUNCULACEAE <i>Ranunculus</i> spp.	<i>Thrips angusticeps</i> Uzel <i>Thrips tabaci</i> Lindemann	64%
SOLANACEAE <i>Solanum nigrum</i> L.	<i>Aeolothrips collaris</i> Pr. <i>Aeolothrips ericae</i> Bagnall <i>Melanthrips fuscus</i> (Sulzer) <i>Thrips brevicornis</i> Pr. <i>Thrips flavus</i> Schrank <i>Thrips major</i> Uzel	78%

Table 1. Proportion of thrips fauna represented by adult *Frankliniella occidentalis*

Samples taken from wild plants during spring-summer of 1997/1998 in southern Italy (Basilicata, Campania and Calabria Regions).

Frankliniella occidentalis relative to other thrips species collected is reported. From this it is clear that WFT now colonizes many of the wild plants that grow in southern Italy around field crops and greenhouses. In this way, WFT is increasing its total population in the area, and although the species composition on these wild plants probably changes during the year, these plants must be considered as a potential source of infestation of the pest for any susceptible crops in the area. The incidence of tospoviruses was not considered in this study, but if tospoviruses are present in any of these weeds then this would be a further factor in limiting crop production in southern Italy.

The data indicated in Table 1 are derived from general collecting over a period of 2 years, and represent only a preliminary to a more exhaustive sampling survey. Currently it remains unclear why WFT represents such a high proportion of the thrips on these weedy plants. Many questions remain to be considered. Is WFT reducing the populations of indigenous thrips species, either by displacing them or through predation? Are the natural enemies of the native thrips not attacking WFT, or is the reproductive potential of this pest too great for these natural enemies to restrain the populations? Is WFT invading the more pristine Mediterranean habitats, including the *Quercus* forests and the maccia mediteranea.

Impact on agricultural systems of southern Italy

Before the introduction of WFT, the most important thrips in the agroecosystems of southern Italy were *Thrips meridionalis* on peach trees, *Thrips tabaci* on horticultural crops such as tomatoes, and *Heliothrips haemorrhoidalis* in greenhouses. None of these were a serious problem, except locally, because they all attack the vegetative parts of plants, and they all were controlled relatively easily both chemically and biologically. The situation has changed radically during the past 15 years. WFT is now a major pest on several crops, both as a tospovirus vector and from its direct feeding damage. Local natural enemies do not achieve a satisfactory level of control, and broad spectrum insecticides are widely deployed on several crops. Table 2 lists the most important crops of southern Italy, including ornamentals and fruit trees, infested by *F. occidentalis*.

Economically the crop most seriously affected is strawberries, with more than 10% reduction in area cultivated over the past five

years. WFT feeds in the flowers and causes severe damage to the young fruits, including necrosis and abortion. During spring and summer, this crop is likely to be sprayed with insecticides about ten times in southern Italy, with resultant reduction in potential profits to the growers.

WFT is now a key problem in the production of table grapes. The adults feed amongst the flowers and both young and mature fruits, causing necrosis of the fruits and hence reduced profitability. Southern Italy is a major producer of horticultural crops, both in greenhouses and in open fields, with a substantial export market in northern Europe early in the year. WFT is now a serious limitation on the profitability of these crops, including flower crops and tomatoes.

In contrast, WFT is not reported as a pest of citrus in southern Italy. The most common thrips in the flowers of various citrus varieties in this area is *Pezothrips kellyanus*, Kelly's Citrus Thrips. This situation is particularly interesting, because WFT was reported on Thripsnet early in 2001 as being common in citrus flowers in North Africa, and a

CROP	<i>Allium cepa</i> <i>Carthamus tinctorius</i> <i>Fragaria vesca</i> <i>Brassica oleracea</i> <i>Lactuca sativa</i> <i>Capsicum annuum</i> <i>Lycopersicum esculentum</i> <i>Beta vulgaris</i> <i>Daucus carota</i>	Adults and larvae feed on flowers, leaves and fruits. Leaves curled and with necrotic patches. Fruits deformed, often with large whitish halos. Strawberry fruits bronzed
ORNAMENTALS	<i>Gladiolus</i> spp, <i>Rosa</i> spp, <i>Dianthus</i> spp, <i>Gerbera</i> spp, <i>Chrysanthemum</i> spp.	Adults and larvae feed mainly on flowers, causing necrotic spots and white streaks on petals and other flower parts.
FRUIT TREES	<i>Vitis</i> spp., <i>Prunus</i> spp <i>Armeniaca vulgaris</i> , <i>Persica vulgaris</i> , <i>Persica laevis</i>	Adults and larvae feed mainly on flowers and fruits, on young fruits of table-grapes causing a small necrosis surrounded by a whitish halo. On nectarine fruits (young and mature fruits) whitish halos and necrosis with splits and development of moulds.

Table 2. List of crops, ornamentals and fruit trees infested by *F. occidentalis* in southern Italy

few specimens of WFT have been seen from citrus flowers in Cyprus. The balance between these two species, both in Italy and in other countries, needs to be monitored in the coming years.

Similarly interesting is the situation in peach and nectarine orchards. Twenty years ago, *Thrips meridionalis* was the most common species, although it bred mainly on the young leaves. Now WFT is a major problem on these stone fruit crops. This thrips feeds within the flowers on the very young fruits, and a low population of WFT can cause serious economic losses due to surface damage to fruits, as well as abortion of some fruits.

The importance of faunistics in crop protection

The wild plants listed in Table 1 are widely distributed in southern habitats, and constitute the wild flora that surrounds areas of crops. In this way, they are subject to cultural practices such as cutting or increasing around crop fields with the objective of providing a source of indigenous entomophagous species, including both predators and parasitoids. These wild plants may thus be important in facilitating the spread and colonization of new plants and habitats by WFT. This "support" to WFT invasion is particularly evident during summer, when these wild plants are highly colonized by WFT individuals and cultivated plants have no more parts to be infested (flowers or fruits). But it is more evident during the southern

mild winter (on the coastal areas), with mean temperatures 5° or 7°C. Under these conditions, the wild plants are already bearing many flowers and constitute a "reserve centre" for WFT.

Plans for crop protection against western flower thrips in southern Italy must now take into consideration the large proportion of this species that is established on reserve hosts. The problem of controlling such a pest, with a large proportion of the total population not on a crop at any one time, is clearly difficult, particularly in the absence of good information on the extent of movement of WFT between crops and wild host plants. Successful control of this pest on several crops will be achieved in the future only if we take into consideration the overall ecological situation, and the interactions between our crops, the surrounding weeds, and the natural ecosystems of our countryside.

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