

— SHORT COMMUNICATION —

First report of *Botanophila turcica* (Diptera: Anthomyiidae) on safflower *Carthamus tinctorius* L. in Greece

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Received: 30 March 2012

Accepted after revision: 17 October 2012

We report for first time the occurrence of *Botanophila turcica* (Diptera: Anthomyiidae) on safflower *Carthamus tinctorius* L. in central and northern Greece and thus, possibly, worldwide. The larvae of this fly are known to tunnel through the rosette meristem and root crown of the developing host plant, causing deformation of the developing leaves and occasionally plant losses. Till now, *B. turcica* has been reported to attack only rosettes of the invasive saffron thistle *Carthamus lanatus* L. and has, therefore, been suggested as a potential biological control agent of *C. lanatus*. However, our findings that *B. turcica* is also a pest species of cultivated safflower seems to impede its use in the biological control of saffron thistle.

Key words: Anthomyiidae, *Carthamus lanatus*, *Carthamus tinctorius*, Diptera, oilseed crops.

INTRODUCTION

Saffron thistle *Carthamus lanatus* L. (Compositae) is a winter annual weed growing in southern Europe from the southern Iberian to the southern Balkan peninsulas (Tutin *et al.*, 1976). It has spread invasively to other parts of the world and became particularly troublesome in dry pastures and cereal crop areas of southern Australia (Aeschlimann, 1997 and references therein). A close relative of saffron thistle is the cultivated safflower *Carthamus tinctorius* L., a crop cultivated worldwide in the winter or spring in semiarid regions as a source of oil for both human consumption and industrial uses. In Greece, safflower is cultivated for biodiesel production (Panoutsou *et al.*, 2008).

The anthomyiid genus *Botanophila* Lioy includes 70 species recorded from Europe (Michelsen, 2011).

Botanophila turcica belongs to a subgroup of *Botanophila* known as rosette-crown flies, because their larvae attack young, overwintering rosettes of thistles, knapweeds and other Compositae. *Botanophila turcica* appears to be widespread in the Mediterranean area as the second author has seen it at France, Spain, Greece and Turkey.

Till now, *B. turcica* was reported to infest saffron thistle but no relevant report on safflower has been evident.

MATERIALS AND METHODS

In winter 2005-06, the first author noticed the occurrence of an insect stem borer on safflower in Larissa, central Greece. A few years later, in February 2011, he noticed similar symptoms on safflower plants grown in the University Farm of the Aristotle University of Thessaloniki, northern Greece and in fields in the Rodolivos area of northern Greece (40°56' N,

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FIG. 1. Larva of *Botanophila turcica* tunnelling in the rosette meristem of young safflower plant.



23°57' E, 285 m asl). In all three cases, the percentages of infested plants ranged from 30-40%. The stem boring insect was a maggot of an unidentified fly that attacked the rosette meristem of young plants and caused deformation of $\frac{1}{2}$ of developing leaves (Fig. 1). Plants infested by *B. turcica* early in their growth may die whereas those infested late resume normal development.

In March 2011, injured plants from the Farm of the Aristotle University were planted in pots and maintained in a climatic room at 25°C and LD photoperiod of 16:8 in the Laboratory of Applied Zoology and Parasitology, Aristotle University of Thessaloniki. Approximately 40 adult flies emerged from puparia from the injured plants (Fig. 2) and were subsequently fed on liquid diet (water:sugar:yeast hydrolysate, 5:4:1) in the laboratory. The adults were preserved in 75% alcohol and subsequently identified by the second author as *Botanophila turcica* (Hennig, 1972) (Diptera: Anthomyiidae). This fly has been reported as a larval rosette feeder confined to the weed saffron thistle *Carthamus lanatus*.

RESULTS AND DISCUSSION

According to Sheppard & Vitou (2000) and Vitou et al. (2001), the only natural host plant of *B. turcica* ap-

pears to be saffron thistle (*Carthamus lanatus*) on which it completes one generation per year. Egg laying starts in the autumn, approximately one month after *C. lanatus* plant germination, and peaks in February and March. Eggs are laid on the leaves, one to three eggs per rosette, but after hatching, the larvae move to the centre of the rosette where they tunnel through the rosette crown causing blackening and deformation of the young leaves. The fully developed larvae, which cause the most severe damage, leave the plant in early summer and molt into a pupa in the soil.

Sheppard & Vitou (2000) showed that *Botanophila turcica* can have a significant negative effect on growth and reproduction of saffron thistle, although the level of damage depends on the growing conditions. In southern France, in sites with unfavourable growth conditions, mortality among the attacked plants was approximately 12%, while the remaining attacked plants were facing a seed loss of at least 70%. However, under favourable growth conditions, the attacks of *B. turcica* on saffron thistle showed no measurable effect on mortality or seed loss. It seems that under favourable conditions the plants compensate larval attacks by renewed growth above the damaged parts, although they do not achieve the same final growth as the undamaged plants.



FIG. 2. Adult fly of *Botanophila turcica*, emerged in the laboratory from field infested safflower plants.

Aeschlimann (1997) provided detailed evidence for considering *Botanophila turcica* under field conditions as strictly monophagous on saffron thistle and of no threat to cultivated crops of the closely related safflower. This conclusion was supported by El-Sheikh *et al.* (1990), Fischetti (1990) and Vitou *et al.* (2001), who never found field grown safflower attacked by this fly. Accordingly, it has been seriously considered to release *B. turcica* as biological control agent of saffron thistle in Australia (Morin & Sheppard, 2012).

This first report from Greece on *Botanophila turcica* as a pest species on safflower crops suggests that this fly should not be used as a biological control agent of *Carthamus lanatus*.

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