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RESEARCH REGARDING MORPHOLOGICAL ASPECTS OF *NAPOMYZA GYMNOSTOMA* LOEW.

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Abstract

Napomyza gymnostoma Loew, 1858 is a leaf miner from Diptera: Agromyzidae which was originally described in 1858, in Poland. This leaf miner is a pest of Allium spp.*, particularly leek, onion, garlic, chive and also is a potential pest of ornamental Allium plants. At present, is widespread in most European countries. This species is invasive therefore it is a significant pest of Allium spp. Agromyzidae family is characterized by having a great morphological similarity between the sexes. For a correct species identification the most significant and stable structure in the male genitalia is the distal end of the aedeagus (distiphallus). In Romania, Napomyza gymnostoma was first recorded in 2007 and specimens were identified based on morphological characters.*

INTRODUCTION

The *Napomyza* leaf miner belong to *Agromyzidae* family which is one of the largest fly family, with more than 2790 valid species belonging to 27 genera worldwide [10, 13]. *Agromyzidae* is a strict phytophagous family of *Diptera*. They exhibit an array of different feeding habits such as leaf-mining, stem-mining and stem-tunneling, cambium-mining, and parasitism of flower heads and fruit. Leaf-mining is generally the most widespread feeding behavior among *Agromyzidae*. The great majority (99.4%) of the *Agromyzidae* species show a high degree of host specialization which makes these insects especially suitable for taxonomic-phylogenetic considerations [14].

Generally damages are detected visually in form of mines along leaves. Visual detection in stems, roots, floral heads, or fruit is more difficult. Mines in leafs reduces the photosynthetic capacity, the cambium area, the nutrient transport capacity, and the quality of commercial products. Development of secondary fungal pests in the galleries is subsequently produced. Damage is variable in function of the infestation. *Napomyza* (*Phytomyza*) *gymnostoma* Loew. differ from

other *Phytomyza* in some characters (mainly of the male post abdomen) which led Spancer to remove it to *Napomyza*. In contrast, while acknowledging these plesiomorphic characters, Zlobin returned *Phytomyza gymnostoma* to *Phytomyza* because it lacks synapomorphies of his more precisely defined *Napomyza* [12, 15]. This species may deserve separate generic status once its phylogenetic position is more securely established. At the moment, in literature the recently expanding range and pest status of is *Phytomyza gymnostoma* [3, 6, 8, 13].

In spring 2007, an Allium leaf miner was recorded for the first time in non-commercial onion crops in Romania. Typical feeding symptoms were observed, caused by the mining behavior of larvae, producing the formation of descending galleries [4] (Figure 1).

Fig. 1. Onion leaves with feeding points

The pest was morphologically identified as *Napomyza* (*Phytomyza*) *gymnostoma* Loew. based on morphological characters of the adults**.** Following research (2009-2010) carried out by us found that the harmful damage to species: *Allium porrum, Allium cepa*, *Allium sativum* and even ornamental plants such as *Allium gygantheum*. In Romania the pest has two generation per year, one in spring and the other is autumn. The highest infestation was recorded at untreated leek, with 22 larvae and pupae per plant. Plants can be completely destroyed or reduced in market value [5]. The main goals of this work are to present some morphological characters useful for *Napomyza gymnostoma* identification.

MATERIAL AND METHODS

In 2008, some growers who produce onion and garlic crops on small surfaces observed that the plants were damaged by an unknown pest. Plants with symptoms were transported in the laboratory placed in good condition in order to obtain adults. To check the external characters, mainly the coloration, and the obtained adults were observed in water or glycerin. Since the male genitalia are important characters for identification of the leaf miners, slide preparations were made.

Usually the morphological interpretation of the genitalia requires extensive experience, and inexperienced entomologists make commonly systematic errors. This is the reason why usually the identifications are also confirmed by studying the external morphology, although in some cases is not enough. For an accurate identification the male genitalia should be examined. In this way, males were placed in 10% KOH solution and leave for 24 h for tissue maceration. After that the specimens were washed in distilled water and the abdomens were dissected under a Leica MZ 12_5 stereomicroscope. For microscopic examination the genitalia were mounted in Hoyer solution and observed at Zeiss Axio Imager. A1. microscope. In laboratory conditions were obtained adults, eggs and larvae from the second generation pupae. All stages were analyzed

RESULTS AND DISCUSSION

Agromyzidae family is considered the most taxonomically difficult between dipterans, due to the high degree of uniformity between species and the small size of specimens. Adults of *Napomyza gymnostoma* could be identified based on the following characters: small grayish, mat flies of 3 mm long, with a head largely yellow, wing length varied from 2.9 mm in male to 3.5 mm in female [2] (Figure 2).

Head with frons broad, three times width of eye; orbital setulae long, all proclinate; jowls deeply extended at rear, up to 2/3 height of eye. Third antennal segment rounded at end but elongate, broad epistoma present, palps broadening distally.

Third antennal segment black, first and second yellowish, palps black; mesonotum mat grayish black, sides of thorax uniformly dark. The legs are black, knees indistinctly yellowish. The halteres can be interpreted as atrophied second pair of wings although they have got an important sensual function. The coloration of the halteres is white. The abdomen consists of 5 pregenital segments in male and 6 in female. The first one is rather short and closely associated with the second tergite. It is only recognizable through an incomplete suture. Both the joints and the margins of the tergites are yellowish. As diagnostic character this coloration can be misleading because it often depends on the condition of the specimen. The tergites are covered with fine hairs (setulae) of different size. At the posterior margins the hairs are often longer than elsewhere.

Fig. 2. Adult male - *Napomyza gymnostoma*

Male genitalia: The current systematic diagnosis of the *Agromyzidae* family focuses on the study of the male genitalia to be unique for each species [7, 9, 11].

The genitalia structure of the male allows us to discriminate between species and clarify the relationship between the positions of the genera. The shape of the aedeagus somewhat resembles *Chromatomyia* species. The postgonites greatly enlarged ventrally, with a strong, curved spine at end, surstyli free, extending far into epandrium [12, 15]. Female genitalia are not usually used in identifying Agromyzidae, only in cases of the absence of the male.

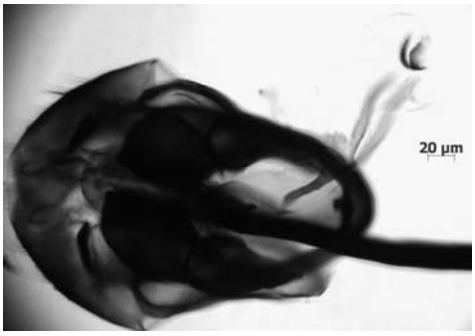

Fig. 3. Male genitalia complex

The component parts of complex male genitalia is shown in (Figure 3) and distiphallus in (Figure 4).

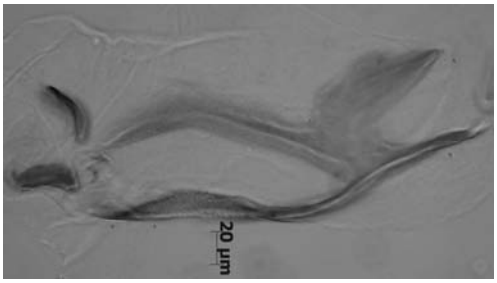

Fig. 4. Distiphallus

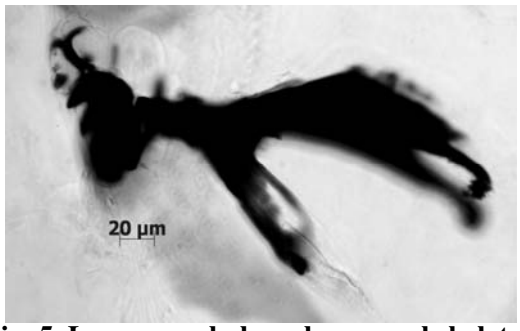

Fig. 5. Larvae-cephalo - pharyngeal skeleton

The eggs are milky white in color, translucent, elongated oval-shaped, sizes of 0.2 and x 0.5 mm.

The larvae reach 0.5-0.6 mm in the later stage of development [2]. Cephalo pharyngeal skeleton is black and consists of two mandibles or mouth hooks which bear strong teeth and some sclerites (Figure 5).

The back of the larvae is truncated and has two rear stigmas each with 30 pores. At the end of the abdomen have two black-colored lenticels. The larva has a similar spiracles in the anterior part of the body just behind the head, but slightly smaller. Numbers of pores at this point are 10-12 [1].

The pupae are reddish-brown and measures approximately 3.5 to 4 mm long [1]. It is dististinctly segmented, flattened ventrally. Posterior spiracles pairs have each 18 to 20 bulbs (Figure 6).

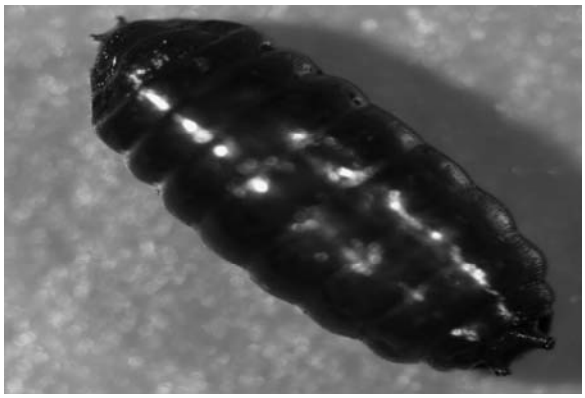

Fig. 6. Pupae

CONCLUSIONS

1. The male genitalia, in combination with the host plants (*Allium* spp.) are quite distinctive to separate *Napomyza gymnostoma* from other agromyzids of economic importance.
2. The genitalia structure of the male allows us to discriminate between species and clarify the relationship between the positions of the genera.
3. The most significant and stable structure in the male genitalia is the distal end of the aedeagus (distiphallus).

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