

BIOLOGY AND LIFE-CYCLE OF LEAFMINER *Napomyza (Phytomyza) gymnostoma* Loew., A NEW PEST OF *Allium* PLANTS IN ROMANIA

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Abstract. In spring 2007, an allium leafminer was recorded for the first time in non-commercial onion crops in the areas of Arges and Ilfov in Romania. The pest was identified as *Napomyza (Phytomyza) gymnostoma* Loew based on morphological characters of the adults. It has been reported as an *Allium* pest from Central, Eastern and more recently in Western Europe. Elsewhere in Europe, *Napomyza gymnostoma* Loew has two generations per year. This paper presents the first description of the biology of *Napomyza gymnostoma* in Romania and the infestation rate on onions, leeks and garlic. The research was conducted in the Arges and Ilfov counties, during the period of 2008 – 2010. It was found that *Napomyza gymnostoma* develops two generations annually – the spring and autumn generations.

Key words: *Napomyza gymnostoma*, appearing period, infestation, biology, life-cycle.

INTRODUCTION

Napomyza gymnostoma is the *Allium* leafminer pest of leek (*Allium porrum*), onion (*Allium cepa*), chives (*Allium schoenoprasum* L.), garlic (*Allium sativum*) and of ornamental *Allium* plants (Agallou et al. 2004). *Napomyza gymnostoma* was added to the European and Mediterranean Plant Protection Organisation (EPPO) Alert List, in April 2005, following reports in the scientific literature that the organism was spreading within the EPPO region and becoming a significant pest of *Allium* crops (EPPO Reporting Service 2005).

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 (Zlobin 1994). The abdomen is also yellow on the ventral

side, halteres white, wing length varied from 2.9 in males to 4.0 mm in females, legs are dark with yellowish knees. The larvae are headless, white yellowish colored and rich 6-7 mm when fully grown. Puparia is dark brown, around 3,5 mm in length, have a pair of posterior spiracle each with 18-20 bulbs. The eggs are ovoid and translucent, whitish (Bouchery & Martinez 2004, Sionek 1999). The larvae of the first spring generation develop in garlic and onion stems and bulbs. First generation pupae diapause during the summer before adults emerge and lay eggs in leeks or other *Allium* species in the autumn, for the second generation. Pupae of the second generation overwinter in host plants, before adults emerge the following spring to lay eggs on hosts such as onions and garlic (Kahrer 1999, Collins & Lole 2005, Mesic et al. 2009).

MATERIAL AND METHODS

The study were conducted from 2008-2010 in non – insecticide treated field in two different regions: Arges and Ilfov. Laboratory experiments were made in the entomological laboratory of Central Phytosanitary Laboratory. The necessary observations to know the biology of the pest in Romania were made in both areas on the following plants of the genus *Allium*: onion, garlic and leek. Plants with symptoms were transported in the laboratory, placed in the laboratory condition in order to obtain adults. The obtained adults were observed in water or glycerin to check the external characters, mainly the coloration, but for an accurate identification the male genitalia was 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 12₅ stereomicroscope. For microscopic examination the genitalia were mounted in Hoyer solution and observed at Zeiss Axio Imager. A1. microscope.

The research of the intensity of the attack of *Napomyza gymnostoma* were made yearly, in the garden area on onion, garlic and leek plants. In every fenological period was picked up ten plants for each experimental variant of *Allium* species.

RESULTS AND DISCUSSION

The research was conducted in the Arges region and in Ilfov during the period of 2008-2010. It was found that *Napomyza gymnostoma* develops two generations annually, in the spring and autumn generations. Adults emerge in the spring from pupae that overwintered within host plant or soil. The flight of adult starts in the second decade of March, and is continuous till the first decade of May. The second generation flight starts at the beginning

of September and last till the end of October (Table 1). A couple days after copulation, the females from the second generation lay eggs mostly on leek plants. Larvae hatched from those eggs feed inside leek plants till mid-November. After finishing their developments, the larvae transform into pupae. Pupae over winter till the next spring when emerge new imagos. Females make large numbers of feeding punctures using their ovipositors to feed on leaf exudates. These punctures are the first sign that the flies are active. Most of the feeding punctures are arranged in lines, parallel to the leaf (Figure 2). The male (Figure 1) does not produce damage because they are unable to puncture leaves but have been observed feeding at punctures produced by females.

Table 1. Emerge and development adults *Napomyza gymnostoma* during 2009-2010.

Region	Year	No Generation	Period flight		Duration flight (days)
			from	to	
Argeş	2009	1	02.04	05.05	26
	2010		11.04	09.05	28
	2009	2	15.09	20.10	43
	2010		20.09	30.10	40
Ilfov	2009	1	18.03	04.05	48
	2010		01.04	11.05	41
	2009	2	03.09	15.10	43
	2010		20.09	29.10	40
The average duration of adults development (days)					38.6

Females lay eggs a few days after copulation. The eggs are ovoid and translucent, whitish (Figure 3). Larvae from first generation are present from the second decade of April till the end of May. Second generation larvae are present from late September to end of November, (Table 2). Larvae emerge and mine downwards the leaf or bulb feeding on the succulent layers of the bulbs. The larval stage produce the most important damage especially in untreated cultures. The main problem is the presence of numerous larvae and puparia - up to 100 in a single leek plant (Billen 1999). During the research, the highest infestation was recorded in 2009, when was found 22 larvae and pupae of *Napomyza gymnostoma* per one leek plant in the Arges area (Table 3).

Napomyza gymnostoma is capable of severely infesting almost 100% of a crop. In Serbia around 20 pupae were found per leek stem. All plants were completely destroyed. Even at lower pest densities, the presence of mines on young plants may reduce the quality and marketability of produce

(Spasic & Mihajlovic 1997). After finishing their development, larvae transform into the stage of pupae (Figure 6). This stage lasts till September for the first generation.



Figure 1. The adult of *Napomyza gymnostoma* (male)



Figure 2. Feeding punctures – *Allium sativum*

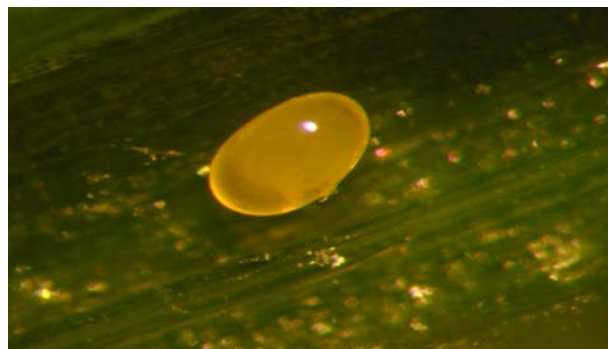


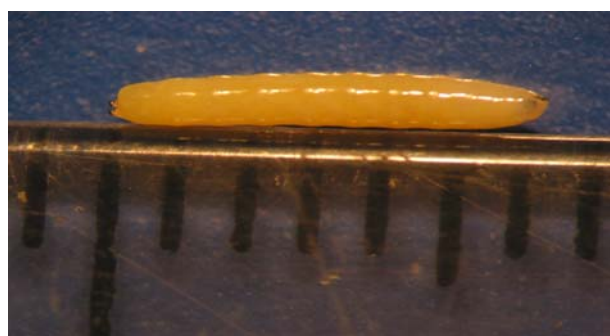
Figure 3. Egg of *Napomyza gymnostoma*.

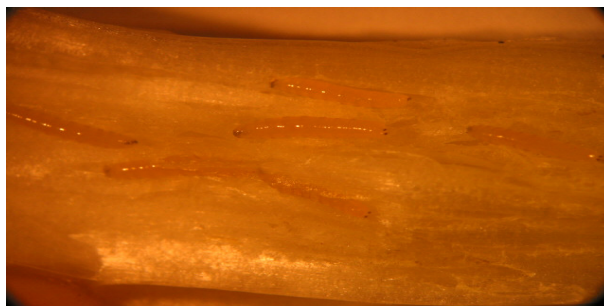
Tabel 2. Emerge and development larval stage - *Napomyza gymnostoma* during 2009-2010.

Region	Year	No. generation	Period larval		Duration of stage (days)
			from	to	
Argeş	2009	1	22.04	28.05	36
	2010		30.04	31.05	32
	2009	2	25.09	12.11	49
	2010		23.10	23.11	30
Ifov	2009	1	10.04	25.05	46
	2010		20.04	18.06	59
	2009	2	20.09	30.10	51
	2010		20.10	20.11	30
The average duration of larvae stage (days)					41.6

Table 3. Dynamics of larval stage - Argeş during 2009-2010.

Host plant	Period	Average larvae/plant	No. maximum larvae/plant	Average larvae nonviable/plant
<i>Allium cepa</i>	22.04.2009	1	2	0
	28.05.2009	3,5	7	2
	30.04.2010	1,2	3	0
	31.05.2010	3,7	8	2
<i>Allium sativum</i>	22.04.2009	0,5	1	0
	24.05.2009	2	4	1
	02.05.2010	0,5	1	0
	25.05.2010	2	5	1
<i>Allium porrum</i>	25.09.2009	1	2	0
	12.11.2009	13,6	22	2
	27.10.2010	1	3	0

Figure 4. Larvae of *Napomyza gymnostoma*.

Figure 5. High larval infestation – *Allium porrum*Figure 6. Pupae of *Napomyza gymnostoma*Table 4. Emergence and duration of all stages - *Napomyza gymnostoma*
Argeş area 2009-2010.

Development stage	No. generation	During the stage		During the stage (average/days)
		2009	2010	
Pupae		- 30.03	- 31.03	
Adult	1	02.04-05.05	11.04-09.05	31
Egg		12.04-15.05	20.04-14.05	28,5
Larvae		22.04-28.05	30.04-31.05	33,5
Pupae		24.05-28.09	29.05-01.10	140,5
During the first generation (days)		02.04-28.09 179 days	11.04-01.10 173 days	176 days
Adult		15.09-20.10	20.09-30.10	41,5
Egg	2	12.09-20.10	01.10-30.10	34
Larvae		25.09-12.11	23.10-23.11	40,5
Pupae		20.10- 31.03.2010	03.11 -	163
During the second generation (days)		15.09- 31.03.2010 197 (days)	20.09 –	197

Table 5 Emerge and during the all stages - *Napomyza gymnostoma* Ilfov area 2009-2010.

Development stage	No. generation	During the stage		During the stage (average/days)
		2009	2010	
Pupae		- 31.03	- 31.03	
Adult	1	18.03-04.05	01.04-11.05	44,5
Egg		29.03-05.05	11.04-12.05	34,5
Larvae		10.04-25.05	20.04- 18.06	52,5
Pupae		05.05-26.09	29.05-30.09	134
During the first generation (days)		18.03-26.09 193 days	01.04-30.09 183 days	188
Adult		03.09-15.10	20.09-29.10	41
Egg	2	08.09-16.10	27.09- 20.10	31,5
Larvae		20.09-30.10	20.10- 20.11	35,5
Pupae		20.10 - 31.03.2010	01.11	163
During the second generation (days)		03.09- 31.03.2010 209 (days)	20.09-	209

The stages development period for *Napomyza gymnostoma* in the two areas was different. Due to lower temperatures in the Arges region debut of flight was made later, and the period of the flight was shorter than Ilfov. Duration flight for the second generation was identical in both areas. The egg laying period for the first generation in Arges is less than Ilfov. From the second generation the laying period was less in Ilfov than Arges. The larval stage period of both generations in Ilfov had a longer duration than Arges. The pupal stage has the highest duration. Referring to life-cycle of leafminer based on obtained date we can state that in Romania this pest has two generations per year. Due to climatic conditions the periods of stages development of insect in the two areas had some differences.

CONCLUSIONS

The result of this study confirm the existence of pest in Romania. Due to the favourable climatic condition and host plants grown, we consider *Napomyza gymnostoma* as a new potential major pest of *Allium* crops.

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.

The distribution of the pest at the national level it is not well known because of its new occurrence and also due to possible confusion with other *Allium* pest, especially *Delia antiqua*. It can be concluded that more attention should be paid to this potentially damaging pest of leek, onion, garlic and other *Allium* crops.

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