EVALUATION AND KEEPING UNDER CONTROL THE PEST POPULATIONS OF GARLIC CULTIVATED IN AN ORGANIC SYSTEM

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Abstract. *Garlic is known to be a plant with few pests; however, this depends on the culture conditions and the population level. In the organic system, which is more widely practiced recently, the pests have multiplied both in terms of species and numerical quantity. Garlic itself is used as a bio-insecticide, however there are pests that can cause serious damage to crops if control measures are not applied. Through this work, we aimed to evaluate the pest species present in a private garlic culture in an organic system practiced for 2 years, on an area of 0.5 hectares. Analysis of the range of species but also the number of individuals were analyzed, as well as damages and control measures adapted to each identified species. Among the relevant pests identified, we mention the following: wireworms (Agriotes spp., Coleoptera: Elateridae) and nematodes (Ditylenchus dipsaci, Tylenchida: Anguinidae). Nematodes were by far the most problematic, their damage being evident in 40% of the plants analyzed and their number quite high. Control measures were chosen so that they fall into the category of non-polluting and applicable for the organic system. Thus, the planting of marigold plants and the application of commercial bio-nematocides are among those used. Their effect was positive, reducing damages by 25% in the second year. Conclusively, it can be mentioned that garlic crops affected by nematodes can be protected preventively if monoculture is avoided and the new crop is installed at a distance from the old one, frequent monitoring is done, repellent plants are interspersed and organic substances are applied for signaling.*

Keywords*: pest nematodes, garlic, monitoring, control, bio-nematocides.*

INTRODUCTION

Garlic is a vegetable known under the scientific name of *Allium sativum* (L). It belongs to the Liliaceae family. It has various uses (MEYERS, 2006). First of all, it is cultivated for its bulb, which is edible and used in human food, but also in the medicinal and pharmaceutical industry, as well as the phytopharmaceutical industry (CABI, 2010). It is a little pretentious in terms of abiotic factors, such as soil, soil temperature, humidity, but it requires optimal fertilization in good time (HORGOS ET AL, 2015). It can also create problems for farmers if they do not have knowledge about potential pests and pathogens, as biotic factors (GROZEA AND STEF, 2020).

The following were mentioned as pests identified in garlic crops in Romania: bulb nematode (*Ditylenchus dipsaci*) Kuhn., bulb spider (*Rhizoglyphus eguinopus* F.), onion fly (*Hylemia antiqua* Meig.), onion moth (*Acropiopsis assectella* Zell.), the tobacco thrips (Thrips tabaci L.), the sow beetle (*Agrostis tenuis* D.S.) and the Maybug (*Melolontha melolontha* L.) (GROZEA, 2006).

Other pests present are black aphids known as *Aphis gossypii*. Some soap sprays based on potassium salts or based on vegetable oil were used for them and they were moderately effective (WOODWARD, 2019).

Nematodes are difficult to free observed, identified and controlled. The symptoms of soil nematodes as *Ditylenchus dipsaci* are characterized by the cessation of growth, discoloured bulbs and thickened stems and the measures of young plants under their control are generalized by maintaining an adequate phytosanitary condition and not using the affected bulbs (ICAR, 2022). The hot water treatment seems to be good, but its efficiency is not

maximum (UC-IPM, 2022). Field performance of biocontrol agents is often inconsistent with uncertain effects (AGBENIN, 2004).

Among the flies, garlic can be damaged by the larvae of *Delia platura M*. and *Delia antiqua M.* which can affect 100% of production if control measures are not applied. However, although they can be controlled by biological methods, there are few references in the specialized literature. Among these are mentioned sanitary measures and the use of predatory spiders or insectivorous birds (ERDOGAN AND MUSTAFA, 2022; FIEDLER ET AL., 2007). The treatment with hot water seems to be good, but its efficiency is not maximum (UC-IPM 2022).

The role of garlic in the biological protection of other crops was also mentioned in the specialized literature by some researchers (PLATA RUEDO ET AL., 2017; BUTU ET AL., 2020; AL-SHURAYM, 2022) mentioning that it can remove most insects.

Through this work, we set out to see which are the important pests in a field garlic crop in an organic system practiced for 2 years and if we can keep their numerical level under control.

MATERIAL AND METHODS

The present study is carried out in a garlic culture cultivated in an organic system on a private property in the locality of Duboz (Nițchidorf) (figure 1), Timiș county, during 2021 and 2022 years. It can be identified by the following GPS data: 45.5556123, 21.5279252. The culture extends over an area of 0.5 hectares and the culture system is practiced for 2 years.

The study analysed the range of harmful species but also the number of individuals, as well as the damage and control measures adapted to each identified species.

Figure 1. Images captured in garlic culture; general view (left), stored bulbs and material analysis with a binocular magnifying glass (middle); healthy plant in vegetation (right)

For this, observations were made from sowing (planting) to harvesting, both in the vegetation and in the warehouse, on 300 plants analysed bimonthly, from a density of 300,000 plants/5000 m2, during the March-October period. The plants uprooted together with the soil were transported to the Phytosanitary Diagnosis and Expertise Laboratory in ULS King Mihai I from Timisoara, in order to identify the pests in the soil. Observations on the aerial parts were also analysed directly in the field and for details with a binocular magnifying glass (figure 1).

RESULTS AND DISCUSSION

From the analysis of the garlic plants and the surrounding soil, we found that insect pests from Arthropoda and nematode pests from Nematoda are present. Among them, we list the following: *Agriotes spp.*, *Delia antiqua*, *Aphis gossypii* and *Ditylenchus dipsaci* (which can be found systematically described in Table 1).

Table 1

The systematic description of the pests presents in the garlic culture from Duboz (Timis)

Common name of the pest	The scientific name	Class	Order	Family
Ditylenchus dipsaci	Bulb nematode	Nematoda	Tylenchida	Anguinidae
Aphis gossypii	Black aphids	Insecta	Hemiptera	Aphididae
Agriotes spp	Wireworms	Insecta	Coleoptera	Elateridae
Delia antiqua	Onion fly	Insecta	Diptera	Anthomyiidae

So far, the relevant pests identified, we mention the following: wireworms (*Agriotes spp.*, Coleoptera: Elateridae) and nematodes (*Ditylenchus dipsaci*, Tylenchida: Anguinidae) (Figure 2).

Figure 2. Damage caused to the garlic bulb by *Agriotes sp* and the nematode *Ditylenchus dipsaci*

Table 2

The numerical level of pests in the garlic culture from Duboz (Timis), in 2021-2022

Damage stage of the pest	Year	Number of pests			
		Ditylenchus dipsaci	*Aphis gossypii*	*Agriotes spp*	*Delia antiqua*
Female	2021	22	9	-	-
	2022	90	16	3	3
Male	2021	44	-	-	-
	2022	100	-	6	-
Larva	2021	24	21	25	-
	2022	84	28	86	-
Total		364	74	120	3

Table 2 shows that the numerical level of nematodes was higher than the other species. It was established at 364 individuals; followed by wireworms with 120 individuals, then by black aphids that recorded a total of 74 individuals and only 3 flies.

In the first year of observations (2021) there were fewer pests than in the second year of study (2022). There is an explanation, namely that in the absence of treatments of any kind in the first year, the pests multiplied excessively. We refer especially to nematodes, which registered a total of 274 individuals in the second year compared to 90 in first year (figure 3).

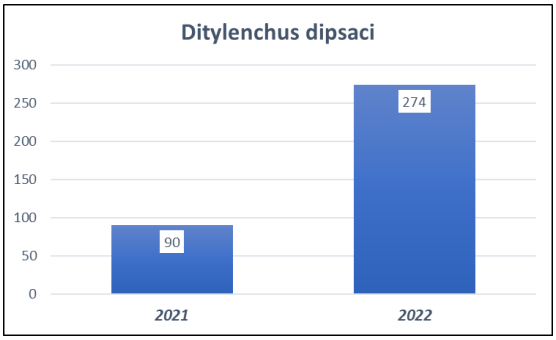

Figure 3. The comparative level between the first year and the second year of study regarding the species *Ditylenchus dipsaci*

Nematodes were by far the most problematic, their damage being evident in 40% of the plants analysed and their number quite high (figure 4).

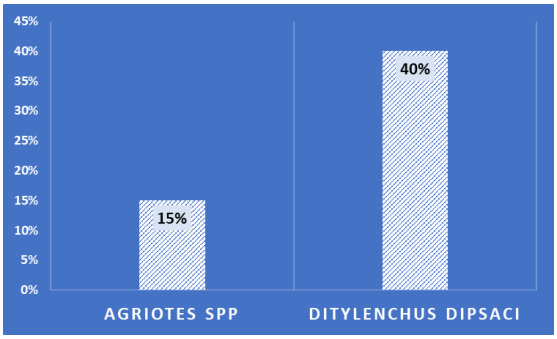

Figure 4. The attack percentage of the harmful species found in the garlic crop from the total analyzed plants before biological control

Control measures were chosen so that they fall into the category of non-polluting and applicable for the organic system. Thus, the planting of marigold plants and the application of commercial bio-nematocides are among those used. Their effect was positive, reducing damages by 25% in the second year (figure 5).

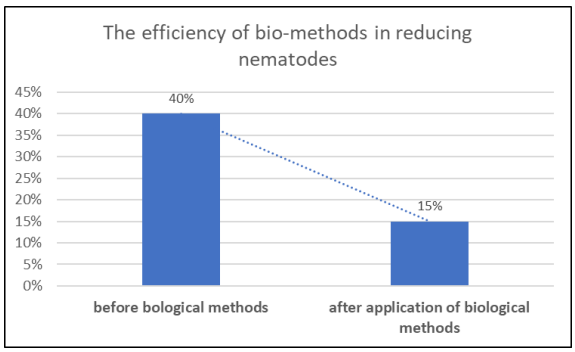

Figure 5. The attack percentage of the harmful species found in the garlic crop from the total analyzed plants after biological control

CONCLUSIONS

In conclusion, it can be mentioned that garlic crops affected by nematodes can be preventively protected if monoculture is avoided and the new crop is installed at a distance from the old one, frequent monitoring is carried out, repellent plants are interspersed and organic substances are applied to keep under control harmful population.

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