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14–15 March 2024

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- PROCEEDINGS -

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PREFACE

"From the mouth of my immortal teacher Pasteur, I heard these words:
It is true that science is international, but every scientist must be a man who in his scientific work is warmed by love for the people from which he sprang and to whom he owes all his strength".

Prof. Dr. Milan Jovanović Batut (1847-1940)"
The first dean of the Faculty of Medicine in Belgrade

Agricultural science and agriculture as a profession monitor and study changes occurring in this area, point out problems in agricultural practice, and find solutions. The Faculty of Agronomy in Čačak, in addition to educating students, 29y traditionally organizes the Symposium on Biotechnology (SYMBIOTECH) every year. The main goal is to acquaint the wider scientific and professional public with the results of the latest scientific research, and bring together domestic and foreign scientists in the fields of primary agricultural production, food processing, and environmental protection. We work tirelessly in pursuit of excellence.

At the 2nd International Symposium on Biotechnology, a total of 80 papers were presented in the 7 sections: Field, Vegetable and Forage Crops, Pomology and Viticulture, Livestock Production, Plant Protection, Food Safety and the Environment, Food Technology, Nutritionism, and Applied Chemistry.

We owe great gratitude to the **Ministry of Science, Technological Development and Innovation of the Republic of Serbia** and the **City of Čačak** for their traditional financial support and patronage of SYMBIOTECH24. We thank companies, entrepreneurs, stakeholders and all long-time friends of the Faculty of Agriculture for their material and organizational support.

In Čačak, March 2024

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MYCOPOPULATION ON SEED OF WEED PLANTS IN ORGANIC VEGETABLE PRODUCTION CROP

Tanja Vasić[1], Sanja Živković[1], Vera Katanić[2], Bojana Vasilijević[2], Darko Jevremović[2], Jordan Marković[3]

Abstract: What often happens that weeds are not controlled after harvesting the cultivated crop. Thus, they continue to grow unhindered on agricultural land, becoming dangerous hosts for a large number of plant diseases and sources of constant infection. So far, there have been no systematic studies of the mycopopulation of weed seeds in Serbia. In this paper, we present the results of preliminary research. Weed seeds samples were collected during the summer and autumn vegetation of 2023. Isolation was performed using standard phytopathological methods. In these studies of the mycopopulation of weed seeds, a total of 500 seeds originating from ten weed species were examined. Seven genera of fungi were determined in this way: *Penicillium, Fusarium, Alternaria, Cladosporium, Epicoccum, Rhizopus* and *Mucor*.

Keywords: mycoppopulation, weeds seeds

Introduction

Organic agriculture is an agricultural production system whose main goal is to produce products that promote the creation and maintenance of human health. Therefore, it must be based on creating, maintaining and improving the relationship between the environmental impact of the habitat, the impact of the living community on the environment and the mutual impact of living beings, living community in an agroecosystem. Weed control is very important in cooperative relations in organic agriculture, because weeds are the spreaders of various plant diseases and plant pests (Knežević et al., 2008; Ivanović and Ivanović, 2001; Vrbničanin and Božić, 2016). Special attention should be paid to weed control in organic vegetable cultivation, which must be safe for health as a

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necessary and acceptable food for human consumption. Therefore, organic production of vegetables, plant diseases and crop pests must also include proper farming, correct crop rotation, use of controlled plant material, protection of beneficial plants and animals, and creation of favorable conditions for natural enemies and physical and mechanical destruction suppress with weed control (Kačergius, 2003; Knežević et al., 2010; Vrbničanin and Božić, 2021). At the same time, it is very important that weed control is timely and continuous, because otherwise weeds cause serious problems in the crop and its surroundings both during the growing season of the crop and in subsequent growing seasons. A total approach to weed control is only possible if we know under what conditions the presence of weeds in a certain crop causes damage and whether the implementation of weed control measures is economically viable. It also includes a long-term approach to solving the weed problem, because only the implementation of high-quality preventive measures together with weed control can significantly mitigate the damage caused by weeds in a single crop (Hulina, 1993; Kačergius, 2003; Stojanović et al., 2010).

What usually happens here is that weed control is not done before harvest or after harvest of the cultivated crop. Thus, they continue to grow unaided in agricultural land, becoming dangerous hosts for many plant diseases and sources of persistent infection, as pathogens are transferred from them to crops. Ruddy grass growing outside agricultural areas, in neglected gardens and roadsides can also be hosts of plant diseases and sources of infection of crops.

The purpose of our work is to study the micropopulation of weeds in the organic production of tomatoes and peppers in an open field, because weeds occur in the harvest of peppers and tomatoes and are spreaders of pathogenic fungi on all surrounding crops, especially vegetables harvests.

Materials and methods

Samples of weed seeds were collected in the village of Trmčare (near Kruševac), from the plot of the Živković family during the summer growing season and from the land in the autumn growing season of 2023, where peppers and tomatoes were grown according to the principles of organic production. Surrounding the vegetable garden were cornfields. Wash the weed seeds thoroughly under running water. After washing, weed seeds are ready for isolation. Prepared seed samples were disinfected with 96% ethanol for 10 seconds and 1% sodium hypochlorite (NaOCl) for 1 minute, and then washed three times in sterile distilled water. They were then dried on sterile filter paper

and placed on potato dextrose agar (PDA) medium with streptomycin. Ten seeds per weed species were placed in Petri dishes in five replicates. They were kept in a thermostat at 25°C. Observations were made every 3 days, and most mycelial samples were developed for up to 14 days. The developed mycelium was examined on a new PDA substrate, and after initial growth, the mycelial tip was reseeded on the PDA. Microscopic examination was performed using Olympus CX31 microscopes. Morphological identification of fungi to genus was done using a standard key.

Calculated isolation frequency in percentage using the formula Vrandečić et al. (2011):

$$(\%)\ \text{Isolation frequency} = \frac{\text{Number of segments containing the fungal species}}{\text{Total number of segments used in the isolation}} \times 100$$

Results and discussion

A total of 500 seeds from ten weed species were examined in these weed seed micropopulation studies. These are the most common weeds in tomato and pepper plants: *Hibiscus trionum* L., *Xanthium strumarium* L., *Portulaca oleracea* L., *Eleusine indica* L., *Artemisia vulgaris* L., *Datura stramonium* L., *Clematis vitalba* L., *Raphanus raphanistrum* L ., A high percentage of fungal colonies formed around the weed seeds of *Salvia verticillata* L. and *Saponaria officinalis* L. (Table 1). In that context, seven different genera of fungi were identified: *Penicillium, Fusarium, Alternaria, Cladosporium, Epicoccum, Rhizopus* and *Mucor*. Among them, the genera *Fusarium, Alternaria, Cladosporium* and *Epicoccum* can cause great damage to plants grown in the field, and the genera *Penicillium, Rhizopus* and *Mucor* can cause serious damage to stored products.

Table 1. Frequency of fungal isolation on weed seeds

Weed species	Number of samples Plant part - seeds	Fungi species	(%) Isolation frequency
***Hibiscus trionum* L.**	50	*Penicillium* sp.	**26**
		Alternaria sp.	**24**
***Xanthium strumarium* L.**	50	*Alternaria* sp.	**8**
		Penicillium sp.	**10**
		Cladosporium sp.	**22**
		Rhizopus sp.	**6**

***Portulaca oleracea* L.**	50	*Penicillium* sp.	**24**
		Cladosporium sp.	**10**
***Eleusine indica* L.**	50	*Alternaria* sp.	**10**
		Penicillium sp.	**20**
		Cladosporium sp.	**16**
Artemisia vulgaris L.	50	*Alternaria* sp.	**20**
		Cladosporium sp.	**10**
		Fusarium sp.	**6**
		Epicoccum sp.	**16**
***Datura stramonium* L.**	50	*Mucor* sp.	**14**
		Alternaria sp.	**14**
		Fusarium sp.	**22**
***Clematis vitalba* L.**	50	*Alternaria* sp.	**10**
		Penicillium sp.	**24**
		Cladosporium sp.	**20**
***Raphanus raphanistrum* L.**	50	*Alternaria* sp.	**24**
		Cladosporium sp.	**10**
		Epicoccum sp.	**18**
***Salvia verticillata* L.**	50	*Alternaria* sp.	**24**
		Penicillium sp.	**14**
		Cladosporium sp.	**20**
		Mucor sp.	**8**
***Saponaria officinalis* L.**	50	*Alternaria* sp.	**26**
		Penicillium sp.	**8**
		Cladosporium sp.	**22**
		Fusarium sp.	**38**

It usually happens here that the weeds are not controlled after the harvest or harvest of the cultivated crop. Thus, they continue to grow unaided in agricultural land, becoming dangerous hosts for many plant diseases and sources of persistent infection, as pathogens are transferred from them to crops. Ruddy grass growing outside agricultural areas, in neglected gardens and roadsides can also be hosts of plant diseases and sources of infection of crops (Triole et al., 2022). Mirzaee et al., 2009 reported that *Albugo Candida* causes white rust of *Erysimum crassicaule* in Iran.

It is known that some pathogenic fungi, such as those causing cabbage (*Plasmodiophora brassicae*), develop in the roots of other single cruciferous plants, such as cowpea (*Capsella Bursa pastoris*), wild radish (*Raphanus raphanistrum*), wild mustard (*Sinapis arvensis*) and others, so they must be removed from the cabbage. As soon as the disease appears and for the next 6-7 years, if you want to grow cruciferous plants in this place, you must destroy all the cruciferous

plants so that the fungus is also destroyed (Hulina, 1993; Ivanović and Ivanović, 2001; Stojanović et al., 2010; Knežević et al., 2010).

The fungus *Erysiphe polygoni* parasitizes hundreds of plant species (375 species from 175 genera) and causes diseases in Fabaceae (especially attacking peas) and Cucurbitaceae. The fungus *Sclerotinia trifoliarum* parasitizes many weeds, for example: *Ranunculus repens, Holosteum umbellatum, Capsella Bursa pastoris, Veronica persica, Plantago lanceolata, Senecio vulgaris, Sonchus* sp. and *Taraxacum officinale* (Stojanović et al., 2010; Knežević et al., 2010). Through the weeds, the fungus can spread, causing a very dangerous disease, clover cancer. This disease causes severe damage to crops of different types of clover, alfalfa, asparagus and beans. Its stem is thick compared to the average height, the leaves are smaller and covered with spermagonia and ecido. On milkweed, the parasite lives in the underground part of the stem in the form of a mycelium, which can produce ecidium on the leaves of newly formed shoots every spring. Echidiospores infect peas and basidiospores infect milkweed (Stojanović et al., 2010). The fungus *Alternaria brassicae* (Berk) Sace attacks cabbage, cauliflower, canola, as well as other cruciferous vegetables and even weeds, where they overwinter as conidia and thus the infection is renewed the following year (Hulina, 1993).

Conclusion

This paper presents preliminary results on the micropopulation of weed seeds from organic production of tomato and pepper crops. Fungi have been isolated from the seven genera *Penicillium, Fusarium, Alternaria, Cladosporium, Epicoccum, Rhizopus* and *Mucor*, which can infect crops in the field and in storage, where they can cause serious damage.

Therefore, the destruction of weeds that are potential hosts of plant diseases is a very important agrotechnical measure. This must also be done after removing the crop and after harvesting. Mainly to reduce the infectious inoculum of these parasites and prevent their spread from weeds to crops. For diseases that have multiple hosts during development, weeds are particularly important for their persistence and spread of infection. Crop diseases usually overwinter on weeds associated with crops, where they cause damage. Thus, most of the host weeds of plant pathogenic fungi are found in the same plant families as the cultivated species.

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