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EFFECTS OF SINGLE AND MIXTURE PESTICIDES ON EARTHWORMS (OLIGOCHAETA: LUMBRICIDAE): RESULTS FROM FIELD MONITORING

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INTRODUCTION and OBJECTIVES: The functioning of terrestrial ecosystems largely depends on underground biodiversity. However, the importance of soil fauna is often ignored or underestimated. According to the function they perform, soil organisms are divided into three major functional groups: chemical engineers, biological regulators and ecosystem engineers. Earthworms are considered to be the most important ecosystem engineers, primarily due to the formation of fertile soil. A review of the literature indicates an overall decline in soil fauna in agricultural ecosystems in Europe, including earthworms. Due to the close connection between earthworms and the substrate, modern agricultural practice can modify the physical and chemical properties of the soil so as to cause changes in the density and composition of earthworm communities. Therefore, the aim of this study was to evaluate the impact of the pesticides Caramba (fungicide: metconazole) and Cipcord (insecticide: cypermethrin) and their mixtures on the natural population of earthworms in agricultural fields.

MATERIAL and METHOD: The field trial was performed at Rimski Šančevi site (Novi Sad, Serbia). The experiment lasted from 2016 to 2018. Earthworms were sampled twice a year, during spring and autumn.

RESULTS and CONCLUSIONS: All adult earthworms of the family Lumbricidae belonged to four different species, and the decreasing order of the most dominant species looks like this: *Allolobophora chlorotica* (Savigny, 1826) > *Aporrectodea caliginosa* (Savigny, 1826) > *Aporrectodea rosea* (Savigny, 1826) > *Eisenia lucens* (Waga, 1857), without changes in their dominance during treatment. According to ecological forms, all species were endogeic, except *E. lucens* which was epigeic. The age structure of the earthworm population varied. During the spring seasons, there were more adults than juveniles. The highest density of earthworms was in the control and the lowest in the field that was treated with a mixture of pesticides. In the examined fields, earthworm populations were poor and non-associative. Endogeic species often dominate in earthworm communities in arable land, as our results have shown. Epigeic species may be present in smaller numbers due to the application of chemicals, but also the process of plowing, which mechanically directly affects the animals. Such research provides insight into the structure of lumbricide communities in anthropogenic ecosystems. The results showed that mixtures of pesticides had a greater impact on the structure of the earthworm population compared to pesticides that have one component as an active substance. Because soil is a dynamic entity, terrestrial organisms provide the best reflection of the true state of ecosystems and changes in them. Also, these results indicate the possibility of using Lumbricidae to assess the state of the environment.

KEYWORDS: Earthworms; diversity; fungicide; insecticide; agricultural field