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8) EFFECT OF ROW SPACING ON MICROMYCETES SPREAD IN WINTER WHEAT AND ITS RHIZOSPHERE

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Abstract

Organic production requires significant changes in the system of agro-technological measures. The issues regarding the selection of crop cultivation technology, including the choice of row spacing to provide the area of nutrition, are still poorly understood. But these changes affect the redistribution of biota in the agroecosystems, such as microorganisms. Therefore, the purpose of the study was to find out the ecological peculiarities of row spacing impact on the spread of micromycetes on winter wheat plants and in its rhizosphere. Winter wheat (variety Vidrada) plants that grown with row spacing 15, 30 and 45 cm, as well as rhizosphere of these plants were studied for micromycetes infection.

It was found that micromycetes of the genus *Alternaria* dominated on wheat stems in all row spacings. At the same time, only fungi of the genus *Fusarium* were found on ears of the studied samples.The spread of alternaria on wheat stems with row spacing 15 cm and 30 cm was about 53.3%, at the same time with the width of the row spacing 45 cm it reached 60%, and the spread of fusarium on wheat ears with a row spacing 15 and 30 cm was 73.3%, while in the row spacing 45 cm it reached 80.0%.The major micromycetesnumber of colonies on the rhizosphere of wheat roots belonged to the genus *Trichoderma*, *Penicillum* and *Alternaria*. *Mucor* and *Aspergilus* fungi are found in small amount. Micromycetes of the genus *Alternaria*, *Trichoderma*, *Penicillum*, *Mucor* dominated in the row spacing 15 cm. In the row spacing 30 cm the overwhelming number were fungi of the genus *Trichoderma*, *Penicillum*, and 45 cm – fungi of the genus *Trichoderma*, *Penicillum*, *Aspergilus*.The total amount of CFU indicates that, like in plants, the soil rhizosphere does not differ in row spacing of 15 and 30 cm (and is 46.7 and 45.5 thousand CFU/1 g), but in row spacing 45 cm we found more. Therefore, we think that to prevent the large spread of mycological diseases of winter wheat, it is advisable to grow it with a row spacing 15 and 30 cm.

Introduction

It is well known that the productivity and sustainability of natural, agricultural and other ecosystems depend significantly on the number and variety of biota species and secondary forms of relationships between them, on the correspondence degree of the structural and functional organization of existing ecosystems with their evolutionarily formed standard types. Agroecosystems (agrocenoses) are deliberately modified artificial ecosystems that have disturbed, often emaciated natural diversity of biota due to the impact of a system of economic measures. Agrocenoses are formed by a person to grow a specific / target crop / agricultural plant (monoculture) every one (several) years. That is, every time after the previous agroecosystem in the crop rotation (or for other reasons), the “destroyed” natural interconnections of the “biocenosis – ecotope” are renewed, incl. “Micromycetes grouping – ecotope”. This period of “ecosystems change” can be considered as transitional or starting, which largely determines the success and speed of laying the first phenophases, the process of agrocenosis formation and, in general, agroecosystems. And they significantly determine the timely entry of the development stages of agrocenosis into natural phases of the vegetation period, as well as the successful passage of critical periods of ontogenesis (formation of biomass, planting of vegetative and generative organs; flowering / pollination; maturation of crops), in general – full use of agroclimatic potential.

Simplifying and / or disrupting the natural biodiversity of agroecosystems make them more vulnerable to negative environmental factors. To maintain their stability and productivity, and to maximize the use of agro-climatic potential, it is advisable to constantly improve the system of agro-technological measures. One of the recognized effective and promising directions in this sense is organic farming. It can ensure the harmonious combination of multiple aspirations – 1) ecological security (producing safe food), 2) protecting nature and man (conserving biodiversity, reducing negative impacts on adjacent natural ecosystems, reducing the risks of contamination in food chains), 3) ensuring co-existence of all types of ecosystems agricultural landscaping – natural, semi-natural and artificial, 4) economic benefit (from profit for better, safer products).

Organic production requires a significant change in the technology of agricultural production, in particular the system of agro-technological measures. This is a great potential for the opportunity to successfully overcome (or at least reduce) the risks / threats of negative factors: pests, climate extremes, technology defects or lack of resources. The issues regarding the selection of crop cultivation technology: plant density, sowing time, preparations treatment, the choice of row spacing to provide the area of nutrition are still poorly understood and therefore not widely used in organic farming. These changes, in turn, affect the redistribution of biological organisms in the agroecosystem. This is relevant because the rejection of chemical or biological plant protection measures provoke an increase in unwanted pests and diseases. For crops such as winter wheat, diseases such as fusarium, alternaria, sepotriosis, and others are of especial danger (Tymoshchuk et al., 2014; Hryhoriev & Khomovyi, 2019). The micromycetes that cause these diseases produce metabolites – toxins that can provoke disease in humans and animals who consuming products from infected wheat. Therefore, the **purpose** of the study was to find out the ecological peculiarities of row spacing impact on the spread of micromycetes on winter wheat plants and in its rhizosphere.

Materials and Methods

The studies were conducted in Ukraine at the agricultural lands of Scientific and Production Center of Bila Tserkva National Agrarian University. Soil of the experimental site is black typical leached, with low humus, coarsedust light-loamy on carbonate loess. The area of research field is characterized by temperate continental climate and is located in conditions of unstable humidity. Winter wheat (variety Vidrada) plants that grown with row spacing 15, 30 and 45 cm (sowing date: October 2018), as well as rhizosphere of these plants were studied for micromycetes infection. Plants were not treated with fungicides or other preparations. Precrop – mustard, sowing density – one million seeds per ha. For evaluation we used the methods according to the state standard of Ukraine 4138-2002.For the estimation amount of phytopathogenicmicromycetes, samples were selected by the method of envelope in 5 sites by 3 plants (15 plants) in three repetitions, a total of 45 plants / sample. Soil sampling, isolation, accounting, and cultivation of micromycetes were performed according to methods generally recognized in soil microbiology (Zviahintsev, 1991). The number of grown fungi colonies was expressed in colony-forming units (CFU) in 1 g of air-dry soil.

Results and discussion

The population of phytopathogenicmicromycetes on stems and ears of winter wheat at different row spacing was revealed. It was found that micromycetes of the genus *Alternaria* dominated on wheat stems in all row spacings. At the same time, only fungi of the genus *Fusarium* were found on ears of the studied samples.

The spread of alternaria on wheat stems with row spacing 15 cm and 30 cm was about 53.3%, at the same time with the width of the row spacing 45 cm it reached 60%, and the spread of fusarium on wheat ears with a row spacing 15 and 30 cm was 73.3%, while in the row spacing 45 cm it reached 80.0%(Figure 1).

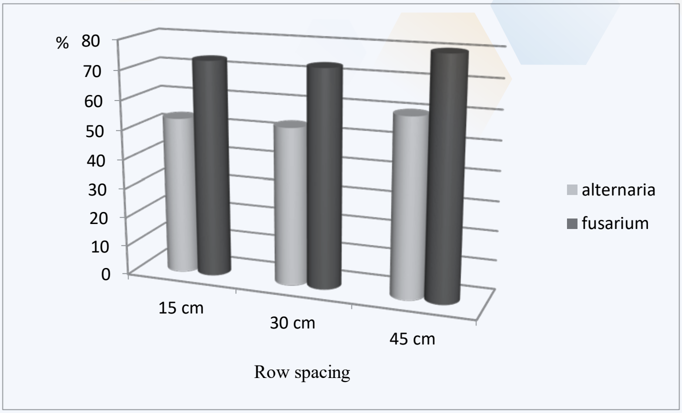
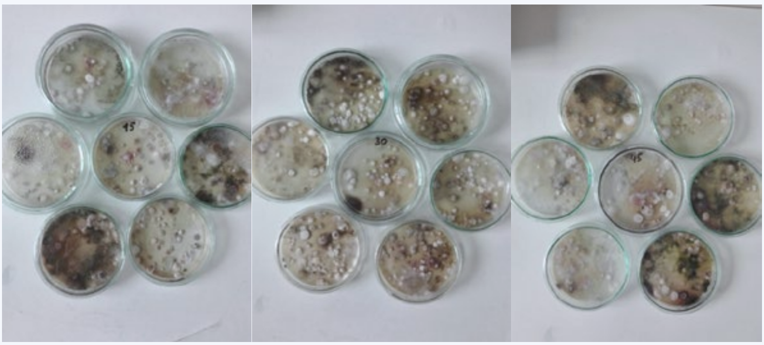


Figure 1. The spread of alternaria and fusarium on winter wheat plants depending on the row spacing (% of infected ears)

Wheat stems, irrespective of the row spacing, are mainly parasitized by *Alternaria* micromycetes, which cause brown spotting of the stems, and on ears by representatives of the *Fusarium* genus, which cause ears fusarium.

Micromycetes colonies on the rhizosphere of wheat roots were also identified. The major number of colonies belonged to the genus *Trichoderma*, *Penicillum* and *Alternaria* (Figure 2). *Mucor* and *Aspergilus* fungi are found in small amount. Micromycetes of the genus *Alternaria*, *Trichoderma*, *Penicillum*, *Mucor* dominated in the row spacing 15 cm. In the row spacing 30 cm the overwhelming number were fungi of the genus *Trichoderma*, *Penicillum*, and 45 cm – fungi of the genus *Trichoderma*, *Penicillum*, *Aspergilus*.



15 cm 30 cm 45 cm

Figure 2. Mycromecetes growth in rhizospheric soil dependent of row spacing in winter wheat crops

The total amount of CFU indicates that, like in plants, the soil rhizosphere does not differ in row spacing of 15 and 30 cm (and is 46.7 and 45.5 thousand CFU / 1 g – Table 1), but in row spacing 45 cm we found more.

Table 1. Quantity of CFU / 1 g of air-dry rhizospheric soil

Raw spacing	15 cm	30 cm	45 cm
CFU ($\cdot 10^3$)	46.7	45.5	62.4

Conclusions and Outlook

Therefore, we think that to prevent the large spread of mycological diseases of winter wheat, it is advisable to grow it with a row spacing 15 and 30 cm. Further research should focus on the selection of biological methods to control certain diseases.

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