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MAIN FUNGIAL DISEASES OF SPELT IN POLISSYA

The present-day stage of Ukraine's agrarian complex reformation and development is characterized by the strategic task of intensifying the foodstuffs production for meeting our own requirements along with winning international markets [1]. Grain production proves to be the strategic and the most effective branch of the national economy [2].

Spelt is one of the most long-standing and promising grain crops in the plant-growing stores of mankind. In recent decades one can observe the revival of interest in the crop raising. It is widely cultivated in Germany, Italy, France, Czechia, Hungary, Slovakia and Poland [3]. In Ukraine the areas under the crop have been considerably increased.

Triticum spelta L. is a hexaploid wheat variety which is adaptive to unfavourable environmental conditions, has a high content of protein (up to 25%) and gluten (up to 40%), and is resistant to excess moisture. It is also of great value for the dietary nutrition, for it possesses good nutritive and feeding qualities. Spelt grain can be used as an alternative raw material for producing spirits. This crop is also gaining popularity with respect to organic farming and healthy food [4, 5, 6].

A number of researchers [3, 4, 8] maintain spelt proves highly resistant to infections caused by fungal disease pathogens. So, the investigations of A.K. Ninieva [4] prove that in the forest-steppe zone *Frankenkorn* spelt variety can combine a high yield level (5,89 t / ha) with considerably high resistance to diseases.

Spelt resistance to diseases makes it possible to abstain from applying chemical means of protection, or contributes, at least, to lowering the number of treatments. The protection of seedings of grain crops from causal organisms assumes paramount importance for enhancing production efficiency and improving grain quality [2].

Our research is aimed at determining the mycoflora of spelt grain and plants in Ukrainian Polissya with respect to improving the systems of its protection from diseases, since the information on the subject appears fragmentary.

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The subject of the research is the mycoflora of winter spelt plants and grain.

The research techniques. A complex of diseases of winter spelt in Polissya was determined within the period of 2012–2015. The planting materials and grain for the phytopathological analysis were selected on the experimental plots (the experimental field of Zhytomyr National Agroecological University which is located in Cherniakhiv district) and industrial seedings of Galeks-Agro Private Enterprise (Novograd-Volynsky district, Zhytomyr oblast).

The diseases of spelt were registered in accordance with generally accepted techniques [9, 10] on the varieties of domestic (Zoria Ukrainy, Yevropa) and foreign selection (*Oberculmer Rotcorn etc.*)

The level of grain infection with fungi was determined according to SSSU 4138-2002 [11].

The soil of the experimental plots is grey forest light loamy. The content of humus – 1,68–1,96 %, alkaline hydrolyzed nitrogen – 76–117 mg/kg, labile phosphorus – 145–185 mg/kg, the level of exchange potassium supply – 76–114 mg/kg, hydrolytic acidity – 2,3–4,0 mg-eq./ 100 gr of soil.

The temperature regime and the level of moistening in vegetation periods differed within the years of the research, though being approximate to the average year-long indices.

The research results. Of late, in Ukrainian Polissya there exists a tendency towards accelerating the development, spreading and hazard of causal agents of fungal etiology diseases caused by favourable weather and climatic conditions of the region, as well as by a number of objective and subjective reasons one can observe at farm enterprises with different forms of ownership due to the impossibility of full-scale keeping to the elements of the technologies of growing grain crops.

As a result of monitoring the development of diseases in winter spelt seedings, and proceeding from the detailed phytopathological analyses it has been established that plants are mostly affected by powdery mildew (agent – *Blumeria graminis* (DC.) f. sp. *tritici* Speer), brown leaf rust (*Puccinia recondite* Dietel & Holw.), septoria of leaf and ear (*Mycosphaerella graminicola* (Fuckel) Schroeter and *Phaeosphaeria nodorum* (Mueller) Hedja), pyrenophorosis (*Pyrenophora tritici-repentis* (Died.) Drechsler.), and root rots (*Bipolaris sorokiniana* (Sacc.) Shoemaker, *Fusarium oxysporum* Schlttdl., *Rhizoctonia aceralis* E. P. Hoeven).

The development of diseases in winter spelt varieties differed throughout the years of the research. The highest level of plant affection of *Oberculmer Rotcorn* variety with brown leaf rust was observed in 2012 and 2013, amounting to 18,2 and 11,7% respectively. The most intensive development of leaf septoria was observed in 2013 (17,7%), and of powdery mildew – in 2015 (up to 12–20%).

The highest level of root rots (up to 6,5%) and fusariosis of ear (up to 4,2%) was observed in spelt seedlings in 2014. The results of the phytoexpert examination of grain show that in 2012 the level of the internal infection of fungal etiology amounted to 48%. The dominating position was taken by the fungi of *Alternaria Nees* genus (19%). The fungi of *Nigrospora Zimm* genus were less frequent (14%).

The analysis of the internal infection of spelt grain harvested in 2013 proves that the part of grain colonized by fungi was much lower as compared to 2012 and amounted to 32%. The fungi of *Alternaria* genus were isolated in 23% of cases. The fungi of *Fusarium* genus were revealed on 6% of grains. The frequency of isolation of *Penicillium Link* and *Cladosporium* genera fungi, as well as of sterile mycelium did not exceed 1%. *Nigrospora sp.* Fungi, though making a considerable part in the pathogenic complex of grain in 2012, were not revealed at all.

Weather conditions of 2014 contributed to the affection of seedlings with *Fusarium* genus fungi. The fungi of *Epicoccum* genus exhibited almost identical frequency as those of *Fusarium* genus (11 and 12% respectively). The fungi of *Alternaria* genus were revealed in 34% of grain. Besides in grain under study one can observe the development of sterile mycelium (up to 9%). Thus, the level of the internal infection amounting to 66% proved higher than in the previous years.

With respect to the ever increasing interest to spelt as a raw material for the dietary nutrition there appears a necessity of establishing strict control over the disease development in the seedlings, grain quality and the level of its contamination with pathogenic mycoflora.

Conclusions. In Ukrainian Polissya winter spelt is mostly affected by mycoses whose development differed as to their vegetation periods and depended on the temperature regime and moistening level.

It has been established that the basic causal agents of the crop plant diseases are *Blumeria graminis*, *Puccinia recondita*, *Mycosphaerella graminicola* and *Phaeosphaeria nodorum*, *Pyrenophora tritici-repentis*, *Bipolaris sorokiniana*, *Fusarium oxysporum* and *Rhizoctonia cerealis*. Among the spelt grain pathogens the dominating position is taken by such fungi genera as *Alternaria Nees*, *Fusarium* and *Nigrospora*

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Вивчено поширення грибних хвороб на посівах та зерні спельти озимої в Поліссі України. Встановлено, що рослини культури уражувалися збудниками *Blumeria graminis*, *Puccinia recondita*, *Mycosphaerella graminicola* і *Phaeosphaeria nodorum*, *Pyrenophora tritici-repentis*, *Bipolaris sorokiniana*, *Fusarium oxysporum*, *Rhizoctonia cerealis*. Максимальний розвиток септоріозу листя в агроценозі спельти відмічено 17,7%, борошністої роси до 20%, бурой листової іржі – 18,2%. Представлено результати фітоекспертизи зерна спельти із зазначенням частки ізольованих патогенів, поширених у різні роки

із змінними температурними режимами і рівнем вологості. Серед домінуючих патогенів на аналізованому зерні виявлено гриби родів *Alternaria*, *Fusarium*, *Nigrospora*.

Ключові слова: спельта озима, мікофлора, борошніста роса, бура листкова іржа, септоріоз, кореневі гнилі, ураження.

*Изучено распространение грибных болезней на посевах и зерне спельты озимой в Полесье Украины. Установлено, что растения культуры поражались возбудителями *Blumeria graminis*, *Puccinia recondita*, *Mycosphaerella graminicola* и *Phaeosphaeria nodorum*, *Pyrenophora tritici-repentis*, *Bipolaris sorokiniana*, *Fusarium oxysporum*, *Rhizoctonia cerealis*. Максимальное развитие септориоза листьев в агроценозах спельты выявлено 17,7%, мучнистой росы – до 20%, бурой листовой ржавчины – 18,2%. Представлены результаты фитоекспертизы зерна спельты с указанием доли изолированных патогенов, распространенных в разные годы с переменными температурными режимами и уровнем влажности. Среди доминирующих патогенов на рассматриваемом зерне обнаружены грибы родов *Alternaria*, *Fusarium*, *Nigrospora*.*

Ключевые слова: спельта озимая, микрофлора, мучнистая роса, бурая листовая ржавчина, септориоз, корневые гнили, поражения.

*Studied the spread of fungal diseases on crops and grain of spelt wheat winter in Polesie Ukraine. Established that the crop plants were infected with pathogens *Blumeria graminis*, *Puccinia recondita*, *Mycosphaerella graminicola* and *Phaeosphaeria nodorum*, *Pyrenophora tritici-repentis*, *Bipolaris sorokiniana*, *Fusarium oxysporum*, *Rhizoctonia cerealis*. Maximum development of Septoria leaf in spelt wheat agroecosystems seen in 17,7%, powdery mildew – to 20%, brown leaf rust – 18,2%. Results of grain phytoanalysis the proportion of common pathogens isolated in different years with variable temperature and humidity levels. Among the dominant pathogens detected in the analyzed grain fungi genera *Alternaria*, *Fusarium*, *Nigrospora*.*

Key words: winter spelt, mycoflora, powdery mildew, brown leaf rust, septoria, root rot damage.

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