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INFLUENCE OF METEOROLOGICAL CONDITIONS AND VARIETAL PECULIARITIES ON DEVELOPMENT OF FUNGAL DISEASES WINTER WHEAT

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Найбільш поширеними хворобами в 2011–2013 рр. під час вегетації пшениці озимої були борошниста роса, темно-бура плямистість листя, септоріоз листя. Найвищою урожайністю в середньому за роки досліджень відзначилися середньостиглі сорти: Ясочка (4,65 т/га), Либідь (4,44 т/га), Деметра (4,01 т/га) та середньоранній Царівна (4,59 т/га), а найменшою середньостиглі: Крижинка (3,86 т/га), Золотоколоса (3,87 т/га) і середньопізній Дубинка (3,99 т/га). Виділено сорти середньостиглі: Ясочка, Либідь, Деметра, та середньоранній Романтика, які є відносно стійкі до грибних захворювань пшениці озимої і при цьому гарантують одержання високих врожаїв зерна.

Ключові слова: *озима пшениця, сорт, темно-бура плямистість листя, борошниста роса, септоріоз листя, стійкість.*

For recent years there is observed the change of climate that is caused with global warming. However, it has the character of an extreme demonstration in separate period of plants vegetation. Annual rainfall approaches to norm or a little exceeding it.

It should be noticed the irregularity of moistening and its significant deviations for separate periods. From 10 analyzed year the quantity of precipitation for vegetative period of winters fluctuates within the limits of 106–144% (for 7 years) and 72–92% (for 3 years) compared to long-term norms [1, 2].

There are the most current and harmful diseases of winter wheat — septoriose, leaf rust, powdery mildew, spot blotch of leave, covered smut, fuzariose and root rof.

The infection by diseases pathogens is causes the decrease of plant productivity and grain quality. The yield losses are from 15 to 40% in dependence from variety and year conditions [3–6].

In our time the number of phytopathological problems are the consequence of impoverishing of genetic basis of breeding that a long time been founded on a limit quantity of sources concerning the diseases. The basic area under grain cultures is occupied with genetic uniform varieties. For arise of new virulent race such varieties to a great extent infected and become the cause of decrease of the gross yield of grain in the epidemy years. Immune concerning the separate races varieties on 2–3 year of registration reduces its resistance. In contrast to other fixed traits, the variety resistance in regard to pathogens is variable in time and in space. That is why, the study of the resistance of winter wheat varieties about diseases has the uninterrupted character [3].

The Ukraine has sufficient lands and climatic resources to grow almost all agricultural cultures in Easters Europe. Nevertheless, losses from unfavorable weather conditions in separate years on the territory of Ukraine in the section of regions can reach 45–50%. The estimations of the experts are showed that the higher level of agriculture, the less dependence on weather terms [1, 2].

The probability of influence to unfavorable weather terms at the Western Forest-Steppe and Polissya is considerable more than in other regions. Besides here the breeding work is not conducted on basic grain culture of winter wheat, that is why selection and introduction in the agricultural production of varieties of organization — originators which are placed in the area of Central Forest-Steppe, and even to Steppe are acquired of great significance. A significant dependence of the level and quantity of crop varieties by changes in ground, climatic and weather conditions are a consequence of low adaptivity of the genetic system.

Because varieties differ in indexes of ripeness, value, zones of origin, the a study of ther varietal reaction to the soil and climatic term of the Western Forest-Steppe is of interest both from a theoretical and practical point of view.

The aim of the article is to estimate in the conditions of the Western Forest-Steppe of

Ukraine the winter wheat varieties of different groups of ripeness on resistance to fungal diseases.

The investigation was conducted in 2010–2011 at Institute of Agriculture of Carpathian Region of NAASU on experimental fields and in laboratorial conditions of laboratories of seeds knowing and plant protection.

The agrotechnics growing was common for crop in given zone. The previous crop was winter ripe. Seeding rate was 5,5 mln. of viable seeds on 1 ha. The common area of sowing plot was 60 m^2, the accounting area was 50 m^2. The design of experiment was with three replications. The scheme of experiment: Zolotokolosa (control), Kryzhynka, Dubynka, Demetra, Tsarivna, Romantyka, Lisova pisnya, Yasochka, Lybid.

The study was conducted by conventional methods [7, 8], statistical test of experimental data with method of dispersive analysis [9].

The Western Forest Steppe, where researches were conducted, belongs to mildly warm, enough humid climatic zone, as sums of air temperature over 10 °C here are 2300–2600 °C, and GTC for the same period equals 1,5–1,8. Transition from one season to another is going slowly enough.

In the researches years (2010–2013) the weather terms were characterized with some deviations as for air temperature, so and for rainfall. Weather terms of 2010 in III decade of September had some deviation from long-term averages, separately temperature of air was higher on 10 0C, and the amount of temperature was smaller on 8,5 mm (deviation from the norm 55%). October was a little the caller compared with long-term indexes on 2,5 °C and the dried. For norm of precipitations 55 mm it's was 19,5 mm. November was characterized with increased air temperature –7,5 °C (norm 2,4 °C) and small deviations for precipitation sum. If the average long-term data the stoppage the fall vegetation is observed 17.11., than in fall terms 2010 plants vegetated to the beginning of December.

Temperature term of December 2010 were within –3,5 °C and 73,1 mm of precipitation. The winter months January-February of 2011 were somewhat warmer on 1,4–2,0 °C, but there was little of snow. Commencing from II decade of March was observed the intensive increase in temperature. For average month temperature of air 1,4 °C (norm 0,5), renewal of spring vegetation was started in III decade of March.

Spring months (April, May) were characterized with increased temperature of air on 3,8; 0,6 and amount of precipitations, which was 115 and 122% of the norm. July was very humid, when norm of 93 mm bell 161,9 mm. I decade of June was characterized with large amount of precipitation where for norm 32 mm were 52,7 mm that negative by influenced on formation of winter wheat seeds.

II and III decades of June were enough warm (2,1 °C) and dry. In common the temperature terms of year were higher by +1,1 °C.

The period on winter wheat sowing under yield of 2012 was characterized with increased an average dayly temperature of air and practically, the absence of precipitation: from II decade of September or the norm 20 mm was in last 5 mm. In III decade was 11 mm (norm 19 mm). In I decade of October was 3 mm of precipitation, II decade — 5 mm, II decade — 8 mm. Total for October fell 19 mm that maked 33% to average long-term meanings (norm 57 mm). November also characterized with absence of precipitation which composed only 4 mm, or 8% to the norm of 48 mm. In such weather terms the optimal wetting was not observed, that has caused drought and complicated conditions of sowing in optimal dates, and later with delay of appearance sprouts, their sparsing and delay of plants growth and development. The weather conditions in December were in levels of an average long-term meaning. The air temperature in January 2012 was at 2,0 °C higher from the norm –4,6 °C at near to norm of precipitation, and February was colder on –4,5 °C. Commencing from II decade of March the intensive increase of temperature was observed. Thus, at norm 0,1 °C the temperature in II decade was 5,4 °C, in III — 7,1 °C, which contributed to the renewal of the spring vegetation and plant tillering. Temperature of air in April and May also exceeded the rate to 2,8 and 1,9 °C at optimal level of precipitation. The period of yield formation was a little adverse, since in July was 109 mm at the rate of 93 mm, that exceeded the norm to 17,2%, and in I decade of June the temperature of air was reached to 25 °C.

The optimal period of sowing under yield of 2013 was favorable as for temperature regime so and for rainfall. The air temperature of II decade of September was on 2,4 °C, and rainfall was 60% higher from the rate. October and November were warm and dry. The meteorological conditions of winter months were corresponded to average long-time indices. March of 2013 was colder and moister. The average monthly air temperature was on –0,8 °C lower, and precipitation quantity in 2,7 times the larger. Temperature transition across 10 °C was in II decade of April, and in III observed the intensive warming (15,8 °C at the rate of 9 °C). Precipitation in July was 140,1 mm at the rate 93 mm, than in 1,5 times more for air temperature higher on 2,0 °C. July was warm and dry, the air temperature was higher on

1,2 °C, and precipitation was only 39,6% from the rate, that assisted to yield conducting of winter wheat in concise terms.

For years of study the average induce of field germination of winter wheat varieties was the best in 2012, which was 93,1%, in 2010 was slightly lower — 88,6%, and the lowest in 2011 — 72,2%.

The yield late determine many factors, among its the wintering is one of the leading. Thus, the average per cent of plant wintering for three year of study of winter wheat varieties fluctuated from 87,3 to 96,3%. It was high in 2013 — 96,4% and in 2011 — 92,3%, and the lowest in 2012 — 91,3%, which had the effect the sugars quantity accumulated in knots of tillering.

In accordance with the results of our reseaches the growing of winter wheat is directly connected with condition of the environment, among its separated the factors of biotic nature.

Character of development and speed the spread of powdery mildew on the investigated varieties depended from varietal peculiarities and meteorological conditions, and separately for temperature of 17...20 °C and relative humidity of air above 80% we observed manifestation of disease on plants. Its development on varieties (Fig. 1) was10,7–25,3% during of study years.

There was marked the smaller development of disease on medium-ripening varieties: Lybid — 12,5%, Yasochka — 10,7%, Demetra — 12,0%, and medium-early Romantyka — 14,3%, Lisova pisnya –12,5%, and the largest — on medium — early variety Tsarivna — 24,8% and medium — ripening Kryrhynka — 25,3% in comparison with variety Zolotokolosa (St). According to the results of our researches disease developed better primaly on a densed sowings.

The appearance of spot blotch of the leaves on winter wheat during of the vegetation has assisted temperature of air 16–28 °C, humidity of air 60–80%. Resistant varieties, on it not defected. Development of disease on varieties was from 10,0 °C to 22,2% (Fig. 1).

The conducted investigations have been allowed to separate the medium ripening varieties: Yasochka — 10,0%, Demetra — 11,2%, Lubid — 11,7% and medium-early Romantyka — 13,2%, which were resistance to disease in comparison with Zolotokolosa (St) variety for unfavorable meteorological terms, and the most one–on medium ripening variety Kryzhynka — 22,2%.

According to our researches the pathogens of winter wheat septoriose are developed in a wide scope of temperature 4... 35 °C, the optimal is 14...25 °C.

The frequent rains, when relative humidity exceeded 80%, are assisted by intensive development of the disease.

The development of leaves septoriose about winter wheat vegetation in the course of researches has been within 11,3–26,3%.

The medium ripening varieties Yasochka — 11,3%, Demetra — 12,25%, Lubid — 14,3% and medium-early ones Romantyka — 13,0%, Lisova pisnya —14,3% in course of 2011–2013 at the phase of milk ripening were relatively resistant to septoriose.

The medium ripening variety Zolotokolosa (St) have not distinguished with resistance concerning this pathogen, but the infection degree by disease compared with medium-early variety Tsarivna (26,3) was to a great extent lower.

According to the results of our observations the wheat varieties, which have a good development succulent leaves, had infected by septoriose more intense, but the varieties with long stem had weaker infection. Separately, the disease had developed more intensive on the field edges, and also on sparse sowing.

The ability of varieties to high yield in a wide range of ecological conditions is important its trait. In specifical ground-climatic terms of the Western Forest-Steppe the varieties yield (Fig. 2) was different from 3,86 to 4,65 t/ ha (for the average data).

The highest yield on average for the years of research have the medium ripening varieties: Yasochka (4,65 t/ha), Lubid (4,44 t/ha), Demetra (4,01 t/ha) and medium-early Tsarivna (4,59 t/ha)

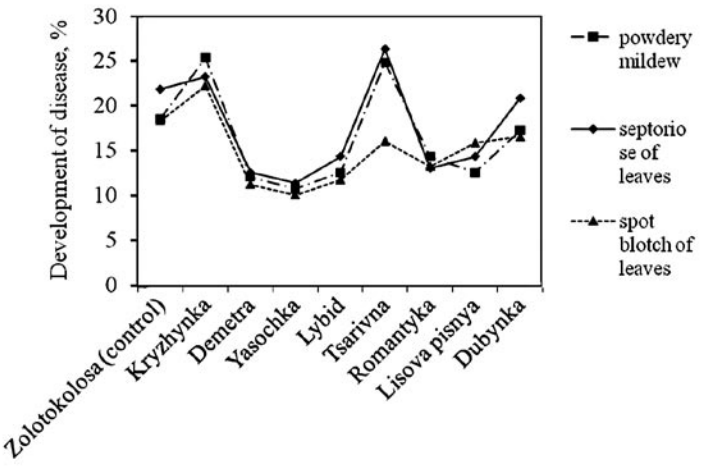

Fig. 1. The development of fungal diseases of winter wheat in the phase of milk ripeness depending on varietal peculiarities (average for 2011–20130), %

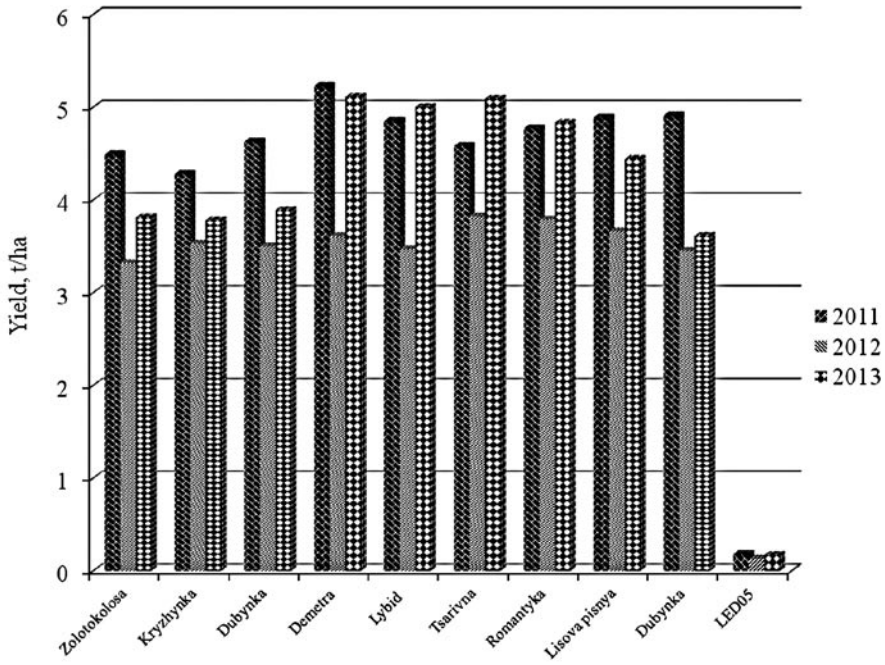

Fig. 2. Yield of winter wheat depending on the varietal peculiarities (average for the 2011–2013), t/ha

and the smallest yield have the medium ripening variety Kryzhynka (3,86 t/ha), Zolotokolosa (3,87 t/ha) and the medium-late Dubynka (3,99 t/ha).

The year 2011 was the most yielded on average for varieties — 4,74 t/ha, a little lower yield was received in 2013 — 4,40 t/ha, and the lowest in 2012–3,23 t/ha.

The difference for yield between varieties was 0,12–0,78 t/ha. The medium ripening variety Kryzhynka showed on the average for years study somewhat lower (3,86 t/ha) yield from control. This confirmed that is founded in the breeding programme the genetic productivity and variety plasticity is realized in different way in specific soil and climatic terms of the zone.

CONCLUSIONS

The fungal diseases, separately powdery mildew, spot blotch, septoriose of leaves have been the most spreading diseases in 2011–2013 during of the winter wheat vegetation.

The highest yield on average for the years of research have been noted in the medium ripening varieties Yasochka (4,65 t/ha), Lubid (4,44 t/ha), Demetra (4,01 t/ha) and medium-early Tsarivna (4,59 t/ha) and the smallest yield have Kryzhynka (3,86 t/ha), Zolotokolosa (3,87 t/ha) and medium-late Dubynka (3,99 t/ha).

Thus, in terms of the Western Forest-Steppe of Ukraine should grow varieties Yasochka, Lubid, Demetra, Romantyka, which is relativel resistant to fungal diseases of winter wheat and warranted the receiving of high yield of grain.

In the future we plan to continue research in given direction with aim of more detailed study these questions.

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ЕКОЛОГІЧНА ОЦІНКА ТЕХНОЛОГІЙ ВИРОЩУВАННЯ ТРИТИКАЛЕ ЯРОГО В УМОВАХ ЗАХІДНОГО ЛІСОСТЕПУ УКРАЇНИ

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Розраховано та обґрунтовано комплексне екологічне оцінювання рівнів удобрення агроценозу тритикале ярого в умовах Західного Лісостепу України. Доведено доцільність впровадження в технології вирощування тритикале ярого мікробіологічного препарату Азотер та гумінового добрива. Виявлено, що досліджувані технології потребують певного удосконалення, проте можуть бути рекомендовані виробництву для мінімізації техногенного навантаження та навколишнє природне середовище.

Ключові слова: *тритикале яре, рівні удобрення, екологічне оцінювання, комплексні показники.*

В умовах науково-технічного прогресу значно ускладнилися взаємовідносини суспільства із природою. Людина, отримавши можливість керувати природними процесами, разом з тим почала забруднювати довкілля. Жодна інша галузь виробництва не пов'язана так із використанням природних ресурсів, як сільське господарство. Саме тому його слід розглядати як постійно діючий механізм охорони, культивування та відтворення живих природних багатств, а підходи до нього потрібно розглядати ще під одним кутом зору — охорони навколишнього природного середовища.

Особливо важливо здійснювати екологічне оцінювання технологій вирощування сільськогосподарських культур, а саме таких, які мало культивовані і перебувають на етапі впровадження, зокрема ярі форми тритикале.

На сучасному етапі розвитку суспільства основним повинно бути своєчасне уникнення можливих негативних ефектів від певної господарської діяльності. У сільськогосподарській галузі досягти цього можна лише за умови превентивного оцінювання технологій вирощування сільськогосподарських культур, застосування яких може бути причиною зниження родючості ґрунтів, погіршення якості продукції, забруднення природних вод, знищення корисних видів флори та фауни.

В умовах сучасного аграрного виробництва особливої уваги набуває вивчення та вдосконалення екологічного оцінювання забрудненості ґрунтів і сільськогосподарської продукції. Дослідженням та вирішенням таких проблем займалося чимало українських вчених, зокрема Е.Г. Дегодюк, А.І. Фатєєв, В.І. Кисіль, Н.А. Макаренко, В.В. Макаренко та ін. [1–4].

Як стверджує в своїх працях Н.А. Макаренко, попереднє оцінювання технологій вирощування сільськогосподарських культур доцільно проводити на стадії розроблення та апробації перед широким упровадженням у виробництво. Це дасть можливість оцінити ступінь екологічної безпеки технологій, які пропонуються сільськогосподарським виробникам, а також уникнути негативного впливу на стан навколишнього природного середовища та здоров'я людей [5].

В Україні є необхідні передумови для ефективного впровадження органічного виробництва сільськогосподарської продукції, тому для забезпечення дотримання вітчизняних та зарубіжних вимог [7, 10] доцільно поєднати дві складові — оцінку придатності сільськогосподарських угідь та екологічну експертизу агротехнологій вирощування [6].

Це питання вивчене недостатньо й потребує уточнення, особливо якщо це стосується