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## STUDY OF RESISTANCE OF WINTER WHEAT VARIETIES TO YELLOW RUST

**Abstract.** Resistance is an ability of plants to produce yield after affection of excitants. It can also be described by the ability to fast restoration of the affected vegetative organs. One of the factors limiting wheat yield is affected by the yellow rust (*Puccinia striiformis*). The pathogen reduces yield, seed quality, causes 100% yield losses under optimal weather conditions. Using of high quality varieties is one of the biotic factors in the selection in addition to finding the sources of resistance (tolerance) to disease.

**Keywords:** wheat, yellow rust, epiphytoty, tolerance, resistance, yield.

**Introduction.** Affection of wheat varieties with yellow rust will lead to reduction of crop yield and quality loss of seeds [1, 2]. As a consequence of disease the height of plant, thickness of stalk and length of spike will shorten, spike quantity, weight of seed will decrease. Due to deterioration of physiological processes the resistance of plant to winter period will be lost, gluten components with low molecular weight in the seeds will be formed, the synthesis process and accumulation of starch will go down as well as protein quantity will decrease in the endosperm [3, 4]. Development of yellow rust in autumn has a reverse effect for wintering of plants, resistance of wheat leaf to cold, infected with mycelium, will go down, occurrence of non-resistance varieties in autumn and wintering of spores will lead to loss 1/3 crop yield [5]. In years when there is epiphytoty the crop yield reduces up to 80-100%, the yield loss will lead to disastrous quantity [6, 7]. The decrease in indicators of seed yield is because of infection of the stalks with yellow rust. Usually it begins with infection of leaf, leaf's stick, cover of spike and spike's grass-blade. Especially when a stalk under spike is infected, the pathogen leads to destroying the crop yield. When the yellow rust disease develops highly, the infected leaf will stop life early, the growth of plant will slow and formation of seeds will be reduced [8, 9].

The most effective way to combat the most dangerous pathogen as yellow rust of wheat is to produce new germoplasm varieties that provide resistant genes, which stop lowering the yield and improve the quality of grains, i.e. the production of high-quality immune and high-quality wheat varieties [10-12]. However, a resistant variety will be affected by disease after a while. Even a sign of resistance does not guarantee preservation of product during heavy and medium development of disease. Resistance of wheat varieties to disease in a tolerance form can be seen as endurance to disease.

Tolerance of wheat variety to excitant of yellow rust is its ability to give satisfactory yield during total development of disease. Enduring variety, heavily damaged with yellow rust, will have high yield level over a variety grown in the second row with similar disease [13-15]. Endurance of what crop to yellow rust disease is performed through some ways:

– Some varieties, in spite of high development of disease, send nutritious substances to developing seeds of the plants;

– Individual varieties extend the time between affect and generating spore of pathogen. This mechanism ensuring tolerance nowadays is called "slow development of rust" («slow rusting»);

Varieties replacing pathogen spores to fast teleutospores. The leaves of these varieties limit generation of uredospores necessary for contact infection of excitant, they are transformed into black colour teleutospores in condition of peace, without activity in wheat. Decrease of chlorophyll is noticed in the cells of varieties tolerant to disease, but it is low in comparison with intolerableness [16-18]. According to scientists' research, during the epiphytha in production, high-tolerance winter wheat varieties give high yields and quality grain compared to intolerable varieties.

– Widespread use of tolerant varieties in production will prevent the loss of crop yields up to development the level of yellow rust.

**Study materials and methods.** To determine the level of tolerance, comparisons of crop yields and diseases of plant, which were in the same area, were studied. Determination of tolerance of winter wheat varieties on yellow rust was carried out by comparing the total crop yields and 1000 seeds of affected plant and non-infected plant [19, 20]. For this purpose, the experiment was performed in two options. In one option, the it was developed in epidemic environment and the second option was developed with fungicide (Tilt 250, 0.5 l/ha). After harvesting and trashing winter wheat and 1000 seed are weighed. Tested varieties were divided into groups according to decrease of weight of 1000 seeds: they are between 0,5-15,0 percent, 15,1-18,0 percent, 18,6-20,7 percent. After harvesting and harvesting, the winter wheat varieties were harvested and weighed 1000 grains. Tested varieties were divided into groups with a decrease in the mass of 1000 grains: 0.5-15.0 percent, 15.1-18.0 percent, 18.6-20.7 percent.

**Study outcomes.** It turned out that among studied varieties Bermet, Bogamaya 56, Turkmenbashi, Yanbosh, Compar, Fox are endurable to disease, because when damage is high, the loss in weight have not increased 0,5-15%. Varieties like Bezostaya 1, Koku, Chinese 166 infected for 40-80 percent had

Tolerance of winter wheat varieties to excitantsof yellow rust

| Variety name            | Development of yellow rust, score/% | Infected with yellow rust |                        |                                  | Treated with fungicide |                        |
|-------------------------|-------------------------------------|---------------------------|------------------------|----------------------------------|------------------------|------------------------|
|                         |                                     | Yield, centner/ha         | weight of seed 1000, g | Reduction of seed weight 1000, % | Yield, centner /ha     | Weight of seed 1000, g |
| Aichurek                | 2/10                                | 40,0                      | 39,5                   | 4,81                             | 46,6                   | 41,5                   |
| Bezostaya 1             | 4/40                                | 14,26                     | 40,0                   | 18,69                            | 18,16                  | 49,2                   |
| Bermet                  | 3/50                                | 8,42                      | 30,0                   | 9,09                             | 8,90                   | 33,0                   |
| Bogamaya 56             | 4/50                                | 12,73                     | 39,5                   | 3,65                             | 14,71                  | 41,0                   |
| Derbes                  | 2/20                                | 15,96                     | 38,5                   | 11,49                            | 17,77                  | 43,5                   |
| Koku                    | 4/80                                | 20,63                     | 37,0                   | 15,90                            | 21,16                  | 44,0                   |
| Qarasay                 | 3/60                                | 18,17                     | 40,5                   | 13,85                            | 28,33                  | 47,0                   |
| Odesskaya 66            | 3/40                                | 9,24                      | 31,6                   | 15,05                            | 9,69                   | 37,2                   |
| Taza                    | 0                                   | 26,66                     | 44,8                   | 2,22                             | 26,70                  | 45,0                   |
| Turkmenbashi            | 3/30                                | 8,80                      | 36,5                   | 5,44                             | 10,84                  | 38,6                   |
| Skifjanka               | 4/20                                | 8,61                      | 35,3                   | 3,28                             | 12,84                  | 36,5                   |
| Umanka                  | 3/20                                | 31,0                      | 39,5                   | 9,19                             | 45,0                   | 43,5                   |
| Yanbosh                 | 3/20                                | 11,30                     | 33,7                   | 3,71                             | 12,30                  | 35,0                   |
| Chinies 166             | 4/60                                | 12,7                      | 32,0                   | 20,79                            | 12,37                  | 40,4                   |
| Compare                 | 4/40                                | 9,42                      | 31,7                   | 3,93                             | 12,37                  | 33,0                   |
| Clement                 | 2/10                                | 22,21                     | 39,5                   | 9,40                             | 24,71                  | 43,6                   |
| Fox                     | 3/40                                | 11,42                     | 39,3                   | 0,50                             | 20,53                  | 39,5                   |
| Morocco                 | 4/40                                | 24,79                     | 30,8                   | 15,38                            | 14,29                  | 36,4                   |
| Average                 | –                                   | 24,79                     | 35,3                   | –                                | 26,70                  | 43,6                   |
| Maximum                 | –                                   | 40,0                      | 45,5                   | –                                | 46,66                  | 54,5                   |
| Minimum                 | –                                   | 8,42                      | 30,8                   | –                                | 8,90                   | 33,0                   |
| EAEA <sub>095</sub> (%) | –                                   | 5,26                      | –                      | –                                | 5,72                   | –                      |

shown intolerance to yellow rust and weight loss of their 1000 seeds was between 15,90-20,79 percent. The lowest yield of infected variety was 8,42 centner/ha, average 24,79 c/ha, high 40,0 c/ha and the lowest in weight of 1000 seeds was 30,8 g, average 35,5 g, highest 45,5 g. However this value will be higher in the varieties treated with (table).

The only disease resistant variety 'Taza' will produce the same yield in two options. It shows that crop yield and weight of 1000 seeds will reduce due to effect of excitant of yellow rust.

When disease is developed the varieties tolerant to yellow rust among studied varieties Bernet, Bogarnaya 56, Karasai, Turkmenbasy, Yanbosh, Compare and Fox can be used to prevent product losses. According to scientists the sharp increase of uredospore number in the wheat fields and the speed of spread are directly related to the presence of intolerable varieties [19, 20]. Intolerant varieties allow widespread distribution and development of yellow rust, and even virulent pathotypes are the center of spores' reproduction do not guarantee the safety of product when disease develops heavily and medium. That is why the use of tolerant varieties is the key guarantee to sustaining of product without loss.

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### КУЗДІК БИДАЙ СОРТТАРЫНЫҢ САРЫ ТАТҚА ТӨЗІМДІЛІГІН ЗЕРТТЕУ

**Аннотация.** Төзімділік өсімдіктердің ауру қоздырғыштармен залалданғанымен қалыпты өнім беруге қабілеттілігі. Залалданған вегетативті мүшелерінің қалпына келуімен де сипатталады. Бидай өнімділігін шектейтін факторлардың бірі сары татпен (*Puccinia striiformis*) залалдануы. Патоген қолайлы ауа-райы жағдайында өнімді, дән сапасын төмендетеді, 100 % ға дейін егін түсімін кемітеді. Селекцияда ауруға қарсы төзімділік көздерін табумен қатар көнбістігі (толеранттылығы) жоғары сорттарды пайдалану негізгі биотикалық фактор болып саналады.

**Түйін сөздер:** бидай, сары тат, эпифитотия, толеранттылық, төзімділік, өнімділік.

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### ИЗУЧЕНИЕ УСТОЙЧЕВОСТИ СОРТОВ ОЗИМОЙ ПШЕНИЦЫ К ЖЕЛТОЙ РЖАВЧИНЕ (*PUCCINIA STRIIFORMIS* F.SP. TRITICI)

**Аннотация.** Устойчивость – способность растений выдерживать повреждения вредителями или поражение возбудителями болезней без существенного снижения продуктивности. Может также определяться способностью к быстрому восстановлению пораженных вегетативных органов. Несмотря на многие отрицательные стороны толерантности сортов к биологическим факторам, их возделывание дает значительные экономические преимущества у многих сельскохозяйственных культур. Поэтому в селекции целесообразно не только поиск источников устойчивости, но и использование образцов с высокой выносливостью к основным биотическим факторам. Одним из вредоносных заболеваний пшеницы является желтая ржавчина, вызываемая грибом *Puccinia striiformis* f.sp. tritici. Патоген снижает урожай, качество семян, может вызвать 100 % потерю урожая при наличии оптимальных погодных условий.

**Ключевые слова:** пшеница, желтая ржавчина, эпифитотия, толеранттылық, устойчивылық, урожайность.