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## **INFLUENCE OF ELEMENTS OF CULTIVATION TECHNOLOGY ON FORMATION OF YIELD AND QUALITY OF WINTER TRITICALE GRAIN ON SOD-PODZOLIC SANDY-LOAM SOILS OF WESTERN POLISSYA**

*Research results of influence of cultivation technology elements on yield and quality of winter triticale grain of cultivator Valentine-90 are represented, namely introduction of mineral fertilizers and protection system in conditions of Western Polissya of Ukraine.*

**Key words:** *triticale, yield, fertilization program, protection system, protein, gluten*

**Introduction.** The purpose of crops growing is maximum realization of the plants potential productivity and achievement of the highest profitability of production manufacturing. Modern agriculture is in a transient stage from intensive and high-cost technologies of crops growing to rational and less energy-intensive ones, in which measures for minimizing technological operations are widely used.

Bioclimatic potential and fruitfulness of sod-podzolic soils of Western Polissya do not always meet biological demands of “leading” crops, in particular, modern wheat cultivators, for realization of their potential. It causes reduction of harvests and quality of crops grown in here ensures growing of grain, which is of little use for food purposes and frequently even does not meet characteristics fodder grain. Thus, in Ukraine a need for differentiation of grain production has arisen, which is related to the necessity of priority distribution of functional purpose of every kind of crops and respectively of economic and energetic provision of technologies for growing and processing [7].

One of trends of this purpose achievement is maximum use of high yield genetic potential of relatively new cereal crop – triticale, which broadens capabilities of net production and stabilizes the market of eco-friendly bread grain. Triticale is the first man-grown cereal crop, which has an ability to grow on soils deficient in nutrients [1, 3, 6], a capability to use nutrient elements of fertilizers and other factors of intensifying growing technologies efficiently, ensuring high yield and winter hardness [2, 6]. According to the results of many native scientists the triticale grain contains protein by 1 – 1.5% less than the winter wheat grain and by 3 – 4% more than its second paternal form – rye [10.]

There is no alternative for fertilization programs based on principles of optimization of plants nutrition with basic macro- and microelements. Only such an approach allows to regulate nutrition of plants during vegetation, to achieve maximum coefficients of their nutrient elements consumption from fertilizers, planned productivity and quality indices, to get the cheapest and competitive agricultural products [11].

That is why the aim of our research was to determine the influence of fertilizer system and protection for the formation of productivity and grain quality of winter triticale.

**Materials and methods.** Field researches shall be carried out during temporary experiments in botany department of Volyn state agricultural research station of Agricultural institute of Western Polissya within 2012-2013.

Soil of the research parcel – is sod-podzolic sandy-loam with the following content in the plough layer: moistureproof nitrogen – 6.15 mg/100g (under Cornfield), labile phosphorus – 20.25 mg/100 g of soil (under Kirsanov), exchange potassium – 17 mg/100 g of soil (under Kirsanov),  $pH_{\text{salt}}$  – 5.50.

The winter triticale of cultivator Valentine-90 was sown after the leguminous predecessor. Sowing was carried out by sowing machine SN-16 A under the experimental scheme. Method of sowing is integral-line one, depth of seeds folding – 5 – 6 cm. Variants of mineral nutrition foresee a background introduction of  $P_{30}K_{30}$  and  $P_{60}K_{60}$  before sowing the crop, a differentiated introduction of nitrogen fertilizers to the nutrition in dose of  $N_{30}$  and  $N_{60}$  under the stages of organogenesis and treatment of crops with the water-soluble fertilizer Crystallon in dose of 4 kg/ha at IV stage of organogenesis. Mineral fertilizers in the form of ammonium nitrate (34.4% d.r.), superphosphate (19.5% d.r.) and potassium salt (40% d.r.) were used.

All fertilization variants were studied with two protection systems: minimum one, which foresaw grain-treatment with product Vitavaks (2.5 l/t), and treatment of seedlings with herbicide Granstar Gold (300g/ha); integrated one, which foresaw grain-treatment with product Vitavaks (2.5 l/t), application of herbicide Granstar Gold (300 g/ha), antifungal agent Amistar Extra 280SK (0.5 l/ha), and insecticide Bi-58 (1 l/ha).

Total area of the seedling plot in the experiment was 40 m<sup>2</sup>, record plot – 25 m<sup>2</sup>. There was a four-time replication. Method of plots arranging was systematic.

Trial establishment was performed by the procedure of B.A. Dospheov (1985) [4], phenological observations throughout vegetation and development of triticale plant were performed by “The procedure of testing of new varieties of agricultural plants” (2000) [8], determining of chemical composition of the grain: protein, gluten according to (DSTU 4117:2007) [6], yields accounting was performed by the procedure of threshing of plots with the following grain filtration and 100% purity basis and 14% humidity basis, which were determined in accordance with “Procedure of state strain testing” (2001) [9].

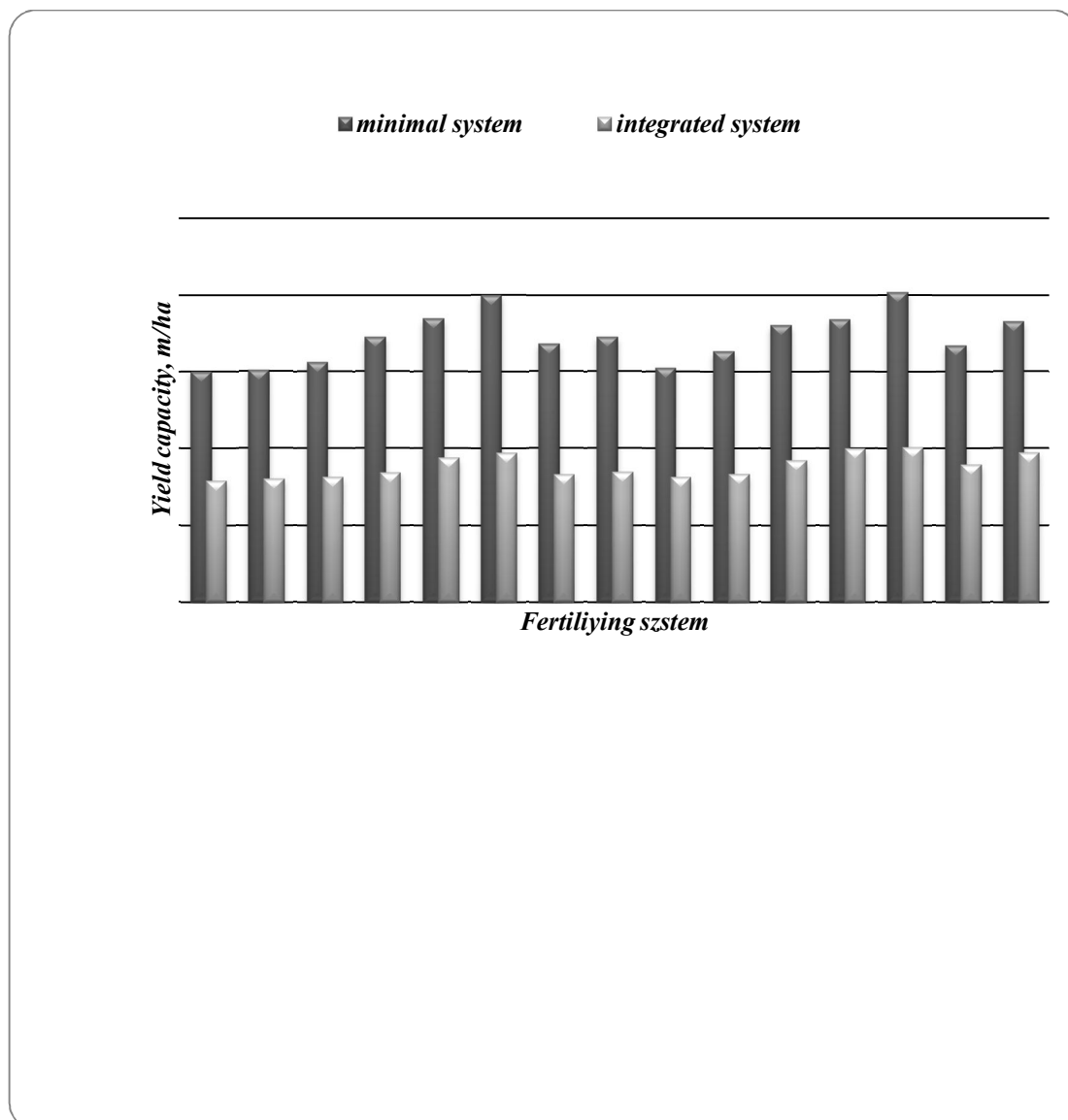
**Results and discussion.** According to the results of the conducted researches it was found out that the winter triticale of cultivator Valentine-90 on control (without fertilizers) in conditions formed the grain yield at the level of 1.67-1.71 t/ha and the effect of the protection system was equal to 0.04 t/ha.

When only phosphate and potassium fertilizers were used in dose of 30 kg/ha d.r., a rise of the yield relative to the control one in 1.59-1.73 times was noticed with absolute yield indices of 2.65-2.95 t/ha, in dose of 60 kg/ha in 1.96-1.94 times and 3.28-3.32 t/ha respectively (Fig. 1).

Growing winter triticale according to technology which provides for limited use of mineral fertilizers  $P_{30-60}K_{30-60} + N_{30(II)}$  - provided crop yield of 3,29-3,55 t/ha with a minimum system of protection, and 3,55-3,78 t/ha with an integrated one, where the effect of tools of chemical use was 2,10-2,11 t/ha. Yield growth of winter triticale due to application of mineral fertilizers regarding the control of the two systems of protection was 1,62-2,07 t/ha. The use of nitrogen fertilizers against this background in dose of 60 kg/ha d.r., contributed to the increase of the yield up to 4.49 t/ha, which exceeded the control by 2.78 t/ha.

Our studies on the peculiarities of formation of winter triticale productivity depending on fertilizer combinations revealed that the use of nitrogen dosing on stages of organogenesis increased crop yield in 2,00-3,12 times in regard to the control variant and in 1,61-2,14 times in regard to the background. Effect of fertilizers with regard to the control one did not exceed the limits of 0.98-1.61 t/ha. Effect from protective means in case of application of foliar fertilizing was 0.20-0.84 t/ha or 5.01-23.70%. Usage of liquid mineral fertilizer Crystallon promoted rising of the crop yield for 0.09-0.73 t/ha (2.10-21.10%).

Maximum yield of winter triticale of cultivator Valentine-90 in the zone of Western Polissya in conditions – 5.34 t/ha – was provided by cultivation technology, which foresaw an introduction of fertilizers  $P_{60}K_{60} + N_{30(II)} + N_{60(IV)}$  with the integrated protection system of plants. Under these conditions an increment from fertilizers relative to the control one made 3.63 t/ha and 2.02 t/ha relative to the background in case of pay-back of fertilizers with grain 17.29 kg/kg.



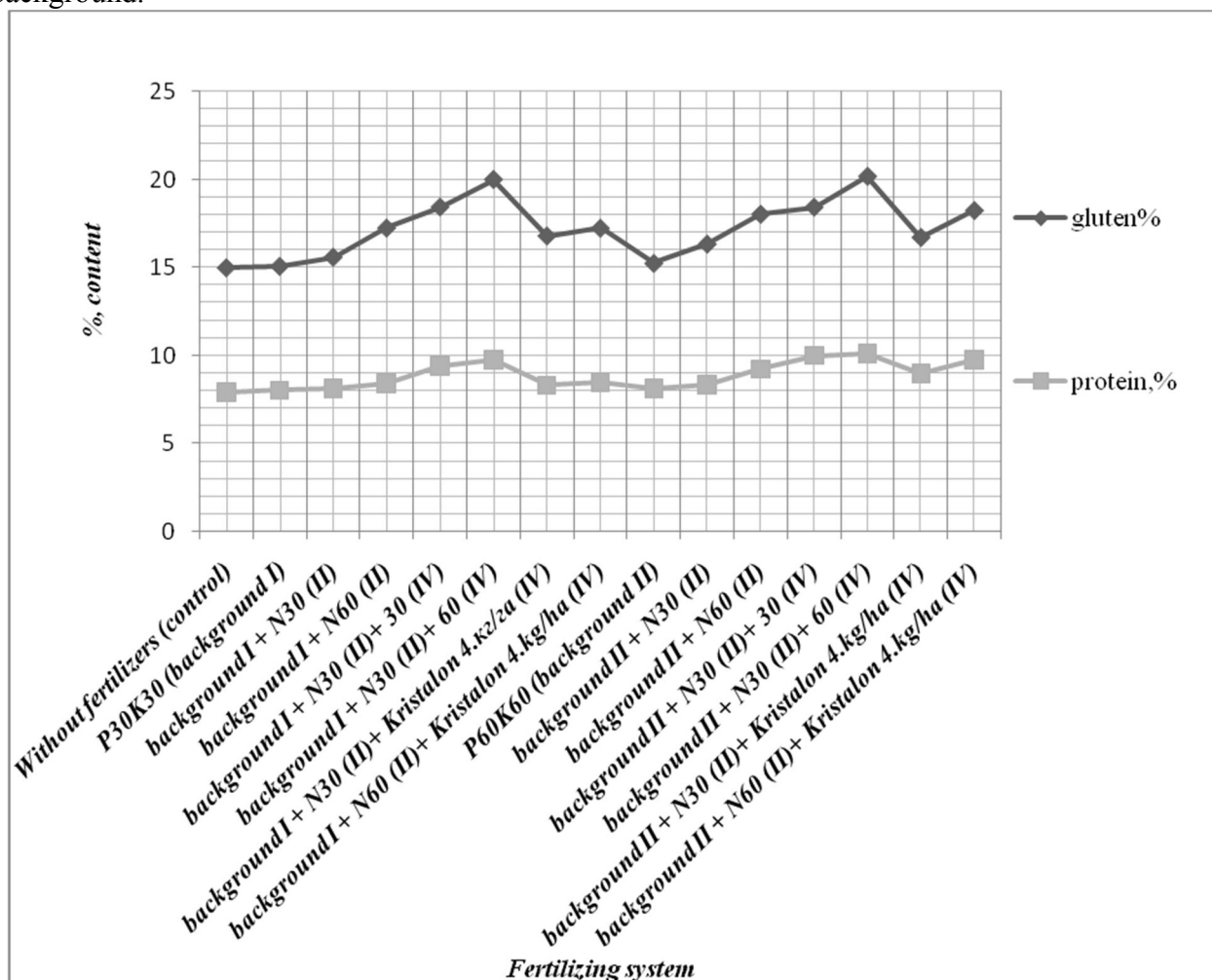
**Fig. 1 Yield of winter triticale of cultivator Valentine-90 depending on fertilization program and protection system, t/ha**

During our experiments in conditions the gain with low protein content as for triticale was formed, which amount depended on norms and terms of fertilizers introduction. The lowest percentage content of protein in the grain was noticed on the control variant – 7.92 % (Fig.2). Introduction of mineral fertilizers in dose of  $P_{30-60}K_{30-60}$  promoted increasing of protein content in the winter triticale grain of up to 8.04-8.15 %. At that its cropping from the unit area was increasing 0.68-1.01 times. The differentiated nitrogen fertilizers and Crystallone treatment in nutrition under the stages of organogenesis promoted increasing protein content in the grain of up to 8.14-10.11 % and cropping from 1 ha by 14-108 % relative to the background.

As a result of the analysis, it was found that retail application of nitrogen fertilizers in dose of  $P_{30-60}K_{30-60} + N_{30(II)} + N_{30(IV)}$  protein content in winter triticale grain of variety Valentin-90 promotes it growth from 9.41 to 10.00%, which provided the collection of protein within 3,74-3,98%. When a single dose of nitrogen fertilizers  $P_{30-60}K_{30-60} + N_{60(II)}$  was applied, grain protein content was slightly lower and ranged within 8,14-9,23%, while the collection of protein was 3,24-4,05%.

Crude gluten content in the winter triticale grain in the years of carrying out the researches was not high – at the level of 15-20 %. Introduction of mineral fertilizes promoted growth of gluten percentage content in the grain and of cropping from the unit of area. Fertilizers introduction

favoured gluten rise in 0.66-3.10 times relative to the control one and by 19-129 % - relative to the background.



**Fig.2. Quality characteristics of winter triticale of cultivator Valentine-90**

The usage of liquid mineral fertilizer Crystallon in winter triticale crops promoted the increase of gluten content from 16,80 to 18,24%. Grain with the highest technological characteristics of grain quality was received due to introduction of P<sub>60</sub>K<sub>60</sub>+N<sub>30(II)</sub>+N<sub>60(IV)</sub>: content of protein 10.11 %, of gluten 20.18%.

**Conclusions.** Consequently, the highest yield of the winter triticale of cultivator Valentine-90 at the rate of 5.34 t/ha and quality characteristics of grain on sod-podzolic soils of Western Polissya were provided by the cultivation technology, which foresaw introduction of P<sub>60</sub>K<sub>60</sub> + N<sub>30(II)</sub> + N<sub>60(IV)</sub>, with the integrated protection system.

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#### *Анотація*

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***Вплив елементів технології вирощування на формування продуктивності та якості зерна тритикале озимого на дерново-підзолистих супіщаних ґрунтах Західного Полісся***

*Представлено результати досліджень впливу елементів технології вирощування на урожайність та якість зерна тритикале озимого сорту Валентин-90, а саме внесення мінеральних добрив, та системи захисту в умовах Західного Полісся України.*

***Ключові слова:*** тритикале, урожайність, система удобрення, система захисту, білок, клейковина

#### *Аннотация*

*Езупова Т.В., Дыбка М.И.*

***Влияние элементов технологии выращивания на формирования урожайности и качества зерна тритикале озимого на дерново-подзолистых супесчаных почвах Западного Полесья***

*Представлены результаты исследований относительно влияния элементов технологии выращивания на урожайность и качество озимого тритикале сорта Валентин-90, а именно применение минеральных удобрений и системы защиты в условиях Западного Полесья Украины.*

***Ключевые слова:*** тритикале, урожайность, система удобрения, система защиты, белок, клейковина