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# **DYNAMICS OF THE DEVELOPMENT OF WORLD SCIENCE**



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# **DYNAMICS OF THE DEVELOPMENT OF WORLD SCIENCE**

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**ADAPTIVE POTENTIAL OF UKRAINIAN OAT VARIETIES**

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**Abstract.** Based on the study of a significant amount of literature data, the work of various breeding and research stations to create more high-yielding varieties of oats of domestic selection, characterized by the maximum realization of the genetic potential of productivity, is analyzed.

**Key words:** film oats; glaze; sort; seeding rate; yield.

**Introduction.** Modern volumes of food and fodder grain production do not yet fully meet the needs of the national economy due to the low level of yield and grain quality of major cereals. Particularly acute today is the issue of grain production of naked oats - the main raw material for the manufacture of high quality food and feed [1]. Oats are among the oldest cereal cereals, which, according to research, began to be cultivated later than wheat and barley in the second millennium BC.

The most important factor in the intensification of agricultural production is the variety. Only at the expense of a grade it is possible to reach increase in a crop by 20-30%. It is the cheapest lever to influence the stabilization of production and increase crop yields, especially in the current environment [1, 2]. Modern varieties should be

characterized by high adaptability not only to environmental factors, but also to certain agricultural practices and provide a stable level of high yields at optimal economic costs [3].

Different reactions of grain varieties to environmental conditions (water and temperature regime, supply of nutrients) are associated with their genetic characteristics, the introduction of new varieties of intensive type is promising [4]. The genetic potential of intensive varieties, according to many studies, is realized in production by only 15-20%, and grain quality is unstable over the years. Therefore, when choosing a variety for specific conditions should take into account not only the biological potential, but also precocity and other features.

An important condition for increasing yields, along with improving cultivation technology is the use of adaptive varieties in production. These are varieties that combine high potential productivity with resistance to abiotic and biotic factors. The use of high-yielding varieties of oats with significant adaptive potential, ie resistance to stress factors, will allow to exclude from the technological scheme a certain part of resource-intensive measures, thereby increasing the efficiency of growing this crop. It is known that the quantitative measure of stability is the degree of reduction of productivity of the variety in extreme conditions compared to productivity under optimal conditions [5].

Breeding work with oats in Ukraine began in 1886 at the Nemerchanskii variety testing station. Today, work on the creation of oat varieties is carried out at the Nosivskii selection and research station (Chernihivskyi 28, Desnianskyi, Slavutych, Neptun, etc.), at the Institute of Agriculture of the Carpathian region (Lvivskyi 1, Ant, Arkan), at the Verkhniatskii selection and research station of the Sugar Institute beets (Darunok, Dekameron), in the Institute of Agriculture of the steppe zone together with the subordinate Synelnykivsky breeding and research station (Synelnykivskyi 1321, Spurt, Busol, etc.).

General requirements for varieties grown for grain: high grain yield and plasticity, the ability to give a stable yield over the years, low percentage of films, double and hollow grains, precocity, resistance to lodging of the stem, shedding of grain, disease



and pests, good fodder and cereal qualities; resistance to adverse abiotic factors. These indicators should be inherent in varieties of intensive type. In addition, there are specific requirements.

In the feed grain direction, attention is paid to the increased protein and fat content in the grain, the amino acid composition of the protein, in the food grain - to the size, fullness, evenness of the grain, high protein content and low - fat, so that the grain does not turn sour due to their oxidation [6].

In the late 20th - early 21st century, the direction of oat breeding has changed dramatically. Efforts have been focused on breeding varieties without flower film, which inhibits the spread of the crop. In 1998-2002, the Institute of Agriculture and Breeding of the Belarusian Academy of Sciences created two varieties of naked oats - Biloruskyi holozernyi and Vandrovny. In competitive varietal tests, the first of them gave a maximum yield of 5.10 t / ha, and the second - 7.28 t / ha [1, 3].

Naked forms of oats have not become widespread, as they are inferior in yield to membranous and more demanding to the level of agricultural technology, water-thermal regime of cultivation, soil and field purity. The potential of modern varieties of naked oats is at the level of 5.0 t / ha, membranous - more than 11.0 t / ha. However, a number of authors have shown the possibility of creating varieties of naked oats with yields at the level of membranous varieties, as this feature is not associated with flower morphology and genes of nakedness.

New varieties of membranous oats such as Desnianskyi, Slavutych, Neptun, Arkan, Busol, Zakat, Zirkovyi, Parlamentskyi and naked varieties - Salomon, Samuel, Skarb Ukrainy, Marafon [4, 6] have been registered in Ukraine. The realization of the genetic potential of their productivity requires the development and improvement of cultivation technology in specific soil and climatic zones, because hydrothermal conditions are one of the main limiting factors in the cultivation of crops [8].

High-yielding varieties of oats were created in the Nosiv selection and research station - Parlamentskyi, Zakat, Vizyt and the first naked variety of domestic selection Skarb Ukrainy. The average yield over the years of testing was 6.2-6.8 t / ha. Golozerny variety formed a yield of 4.0-5.0 t / ha. Varieties Neptun, Zirkovyi,

Desnianskyi, Raiduzhnyi, Chernihivskyi 28, Chernihivskyi 27 are also stable in terms of yield [4]. Zirkovyi, variety in the competitive variety test provided a yield of 7.0 t / ha, which is 0.9-1.1 t / ha more than the national standard.

In the State variety test, the highest yield was obtained at Liubeshivskii DSS of Volyn region - 7.64 t / ha. The Zakat variety registered in 2010 provided a yield of 6.0 - 7.0 t / ha of grain and 55.0-60.0 t / ha of green mass in the competitive variety trial. The potential yield of the Parlamentskyi variety is 7.0 t / ha. In 2008, the yield of the variety at the Prylutskyi variety plant in the Chernihiv region was 6.9 t / ha. Golozerny variety of oats Skarb Ukrainy has been included in the Register of Plant Varieties of Ukraine since 2011 and is a national standard. At the Prylutskyi varietal division in 2009 the yield of the variety was 4.9 t / ha. In 2010, the highest yield of the variety was in Vinnytsia DCESR - 3.69 t / ha, Mankivskii DSS of Cherkasy DCESR - 2.93 t / ha, Yampil'skii DSS of Sumy DCESR - 2.73 t / ha [4, 6].

In unfavorable years, the grain yield of oats decreases sharply. Therefore, the greatest value is represented by varieties that combine high productivity and resistance to adverse growing conditions. The study of naked oat samples by yield and adaptive features in the Western Forest-Steppe showed that the category with high selection value (2.16-2.71) includes Canadian varieties AC Belmont, Terra, Boudrais, AC Hill, Belarusian - Hosha, Kazakh - Halz, Ukrainian - Avhol.

Selection value is a complex indicator that combines the yield with the level of adaptive capacity of the genotype. To assess adaptability and stability, homeostatic indicators are used, which show the ability of the genotype to counteract adverse environmental factors. The high level of homeostatic indicates increased stability of the yield of the variety with changing environmental conditions.

The greatest value is represented by the grades combining a high level of productivity with stability of its realization on various agrophones. The degree of reaction of oats to fertilizers is determined by the capabilities of the cultivar and is a hereditary property due to the biological characteristics of the variety. As the application of fertilizers increases, the requirements for cereal varieties increase. Varieties with a

low response to fertilizers prone to lodging and disease do not cover the cost of fertilizers and can not satisfy the production of intensive farming [5].

Almost all regionalized varieties of oats respond positively to the direct application of fertilizers, or their aftereffects. According to Kachanova T. V. [5], the productivity of oat grain was affected by varietal characteristics. When growing it on an unfertilized background, the grain yield of the studied varieties was the same (the difference is within the error). Against the fertilized background (N 90 P 60) higher yield (2.36 t / ha) was formed by the variety Chernihivsky 27, ie it can be argued that this variety responds better to the improvement of the nutrient regime compared to the variety Skakun.

Application of fertilizers at a dose of N 90 P 60 K 60 provided the formation of the highest yield of oats in the variety Herkules - 5.66 t / ha, while in the variety Lhovskiy 1026 on the same feeding background formed a much lower yield - 3.42 t / ha [2]. The highest yield of Myrnyi oats (3.98 t / ha) on carbonate chernozem was provided by the application of nitrogen at a dose of 90 kg/ha against the background of P 30. Further increase of nitrogen doses to 120 and 150 kg/ha did not increase the grain yield [4, 6].

High productivity was obtained in the varieties Skakun - 5.01 t / ha and Borets 4.16 t / ha with an intensive fertilizer system which provided for the use of fertilizers at a dose of N 120 P 50 K 120 [4]. On sod-podzolic slightly superficially gleyed soils, the highest yield of oats (5.87 t / ha) of Bug variety and 4.97 t / ha in Lvivsky 1 variety was obtained by applying N 90 P 90 K 90 with retail application of nitrogen: before sowing and tillering phases. and dumping of panicles of 30 kg / ha. The increase in yield before control was 2.76-2.66 t / ha [3]. On gray forest surface gleyed soils the highest yield of film oats 3.97 t / ha of Arkan variety and 2.90 t / g of naked grain variety Solomon was obtained by applying mineral fertilizers at a dose of N 60 P 60 K 60. The increase in yield before control was 1,21-1,0 t / ha, respectively [6].

When growing Asilak oats on cultivated sod-podzolic loamy soil of Belarus, the optimal fertilization system is the use of pre-sowing cultivation N 60 P 35 K 60, which provides 4.09 t / ha of grain. The increase in yield from the application of

nitrogen fertilizers was 1.59 t / ha, and from the application of complete mineral fertilizers - 1.83 t / ha with a payback of 1 kg N and 1 kg NPK, respectively, 26.5 and 11.8 kg of grain. Research found high realization of productivity potential in oat varieties for fertilizer application at a dose of N 90 P 60 K 60. Synelnykivskyi and Skakun varieties responded better to fertilizer application compared to Kuban variety, and the average yield increase on fertilizer backgrounds was 6.0 ; 6.9; 5.4 c / ha, respectively.

The influence of vegetation conditions on the yield of oat varieties was also significant - the maximum yield in optimal moisture conditions in 2001 when applying mineral fertilizers in doses of N 90 P 60 K 60 was 5.36, 5.83 and 5.85 t / ha, respectively, for varieties Kubanskyi, Skakun and Synelnykivskyi 1321. The efficiency of complete mineral nutrition at high doses of fertilizers is significant only in conditions of sufficient moisture. In arid conditions, it is almost equivalent to a dose of N 60 P 30 K 30. High adaptability is characteristic of the Skakun variety, which is characterized by the highest selection value of the genotype [1, 4].

Research found that varieties of oats have an ambiguous rate of response to improved diet. The influence of vegetation conditions on the yield of naked oats was also significant - the maximum yield in optimal moisture conditions in 2012 with the highest dose of mineral fertilizers (N 90 P 60 K 90) was 3.60 (Salomon variety) and 3.80 t / ha (variety Skarb Ukrainy). The efficiency of complete mineral nutrition for Salomon variety at high doses of fertilizers is significant only in conditions of sufficient moisture supply. In arid conditions, it is almost equivalent to a dose of N 60 P 40 K 60.

However, the variety Skarb Ukrainy, both under conditions of insufficient (2011) and sufficient (2012) moisture supply, responded positively to the application of the maximum dose of fertilizers, and gave a significant increase in yield (1.37-0.30 t / ha). This indicates its high ductility and adaptability. Today, in connection with the replacement of old low-yielding varieties of oats with more productive and demanding nutritional conditions, the question of selecting the optimal doses of fertilizer for each variety is quite relevant [1, 4].

The largest producers of oats in the world are the EU countries, which account for 34.7% of its total production, Russia - 21.1% and Canada - 13.4%. Together, these countries produce about 69.2% of the total gross oat harvest in the world, while they are followed by Australia - 8%, the United States - 4.2%, Brazil - 2.9%, Chile and China each separately 2 , 7%, as well as Argentina and Ukraine, respectively, 2.2% each [4, 5, 8].

World oat production in 2017 reached about 22.9 million tons, which is 0.6% more than in 2016. The largest increase in oat production was observed in Australia (+ 37.6%) and Kazakhstan (+ 37.3%), as well as in Chile (+ 12.6%) and Russia (+ 4.9%). At the same time, a significant decrease in its production compared to 2015 occurred in the United States (-27.7%), Belarus (-18.7%), Brazil (-17%) and Canada (-12.5%) [6, 7, 8].

Ensuring the effective functioning of the grain market, including the oat market is possible by improving the structure of sown areas and crop rotations, introduction of zonal cultivation technologies developed taking into account soil and climatic conditions, predecessors and biological features of new regional varieties of intensive type, preliminary agreements between producers and processing enterprises for the production and sale of products, attracting investment and credit resources in the industry, improvement price regulation mechanism, etc.

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