INFLUENCE OF SOWING METHODS AND SEEDING RATES ON THE PRODUCTIVITY OF SPRING BARLEY VARIETIES IN THE CONDITIONS OF THE NNPC MNAU

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Summary. The article presents the results of studies of spring barley of different varietal composition (Helios, Stalker) under the influence of sowing methods (ordinary row (15 cm), narrow-row (7.5 cm)) and seeding rates (3.5, 4.0, 4.5 and 5.0 million germinating seeds per hectare) in the Southern Steppe of Ukraine.

Our data show that the optimal seeding rate in the experiment was sowing with 4.5 million germinating seeds per hectare using a narrow-row sowing method for the mid-season variety Helios. This variant ensured the formation of 3.60 t/ha of grain, conditional net profit of 12895.00 UAH/ha and a profitability level of 120.7%.

Keywords: spring barley, sowing methods, seeding rates, yield, economic efficiency

Recently, spring barley sowing areas in the region's farms have been unstable, and yields remain low. Therefore, the basis for increasing the yield of spring barley and increasing gross yields with minimal costs is the introduction of new high-yielding varieties into production, subject to the requirements of varietal agricultural technology and the use of energy-efficient elements of technology [1, 2].

One of the main reserves for increasing the yield of spring barley on the farm is compliance with the requirements of agricultural technology that best meet the biological characteristics of the variety. In this case, it is necessary to make the most complete use of the main characteristics of varieties: intensity of tillering, heat and moisture requirements, drought resistance, response to fertilizers and precursors, timing and methods of sowing, measures for crop care, etc. [3, 4].

The field experiments were conducted during 2020-2021 at the educational and research center of Mykolaiv National Agrarian University. The soils of the experimental farm are represented by southern low-humus, slightly saline, heavy
Loamy black soil on loess [5]. The humus horizon 47-52 cm is dark gray with a chestnut tint, characterized by salinity and a narrow ratio of Ca2+ and Mg2+ (2.5-2.8). The lowest moisture capacity of 0-70 cm of the soil layer is 22.0%, the wilting moisture content is 9.7% of the dry soil mass, and the density of the soil is 1.40 g/cm. The content of humus in the topsoil is 2.9-3.2%, mobile phosphorus is 38%, and exchangeable potassium is 332-525 mg/kg of soil. The soil contained 0.20-0.25% of gross nitrogen and 0.12-0.14% of phosphorus.

Agricultural technology of the crop in the experiment was generally accepted for the Southern Steppe zone of Ukraine, except for the factors under study. The predecessor of the experimental crops was winter wheat.

To solve this problem, a three-factor experiment was conducted with spring barley varieties Stalker and Helios with the study of seeding rates of 3.5, 4.0, 4.5 and 5.0 million seeds per 1 hectare. The experimental design included the following variants: Factor A (spring barley varieties):
- Helios;
- Stalker.
Factor B (Sowing method):
- Ordinary row (row spacing 15 cm);
- Narrow row (row spacing 7.5 cm).
Factor C (Seeding rates of germinating seeds):
- 3.5 million seeds/ha;
- 4.0 million seeds/ha;
- 4.5 million seeds/ha;
- 5.0 million seeds/ha.

The size of the accounting plots was 25 m² with four replications. All records and observations were carried out according to generally accepted methods [6-9].

As a result of the research, we obtained indicators showing that for the studied spring barley varieties the best method of sowing was narrow-row, which on average for two years provided a yield of 3.51 t/ha - Helios variety and 3.28 t/ha - Stalker variety. And accordingly, the yields were 3.34 and 3.04 t/ha with the conventional method of sowing at row spacing of 15 cm.

In terms of yield, the best among the studied varieties was the mid-season variety Helios, while the Stalker variety showed a 0.23-0.30 t/ha lower yield compared to it. The most significant response to the change in sowing method was found in the Helios variety, which indicates its high response to the sowing method.

The seeding rate of barley depends on climatic and soil conditions, level of agricultural technology, sowing methods, and variety characteristics. The seeding rate largely determines the yield and quality of the grain. In sparse crops, shoots of different tillering orders do not ripen at the same time, resulting in uneven grain size, weight, and biochemical composition. In thickened crops, plants form unfilled grains with increased firmness.

For barley varieties resistant to lodging and less bushy, seeding rates are increased by about 0.5-1.0 million seeds per 1 ha. Lower seeding rates are also used after the best predecessors.

In our experiments, we set out to study the dependence of spring barley yields on seeding rates.
The data obtained by us indicate that the optimal seeding rate for narrow-row sowing for the mid-season variety Helios and the early-ripening variety Stalker should be considered 4.5 million seeds per hectare. The yields averaged 3.60 and 3.37 t/ha, respectively, which is significantly higher for each variety than at a seeding rate of 4.0 and 5.0 million germinating seeds per hectare.

Yields of spring barley varieties were low at a seeding rate of 3.5 million seeds per 1 ha and amounted to less than 3.22 t/ha and 3.94 t/ha, respectively.

Compliance with varietal agrotechnics on the farm, studying its individual elements and improving them is aimed at increasing grain yield and quality, and the widespread introduction of the best research options requires a preliminary economic assessment and determination of economic efficiency.

In the farm conditions, we studied the features of individual elements of varietal agricultural technology for new spring barley varieties Helios and Stalker, such as sowing methods and seeding rates.

Compliance with or improvement of varietal agronomic requirements, which make it possible to more fully utilize the characteristics of the variety, provides an increase in yield, improves grain quality at minimal additional costs.

The calculation of the economic efficiency of the research results was based on the actual data of the accounting report and analytical calculations conducted during the year, which reflect the amount of costs, production and sales results. In calculating the cost-effectiveness, the cost of products was determined by the actual selling price, which was the average for the last year.

As a result of the calculations, the conditional net profit, when sowing spring barley of the Stalker variety with a row spacing of 15 cm, ranged from 9230.00 to 9908.50 UAH per 1 ha. The maximum values of conditional net profit (for this variety) were obtained in the variant where 4.5 million pieces of similar seeds were sown per 1 ha - 9908.50 UAH, the lowest - in the variant where sowing was carried out with a norm of 3.5 million pieces of similar seeds per 1 ha - 9230.00 UAH.

When sowing this variety with a row spacing of 7.5 cm, the conditional net profit was in the range from 10540.50 to 11409.50 UAH per 1 ha, i.e., compared to the conventional row method, the narrow-row method of sowing provides an increase in profit per unit area of spring barley variety Stalker. The highest value of conditional net profit was obtained in the variant where 4.5 million similar seeds were sown per 1 ha and amounted to 11409.50 UAH per 1 ha.

The best economic indicators of spring barley cultivation in the experiment were formed by the Helios variety, while the conditional net profit for sowing with a row spacing of 15 cm varied from 11041.00 to 12042.00 UAH per 1 ha. The highest value of conditional net profit was obtained in the variant where 4.5 million pieces of similar seeds per 1 ha were sown - 12423.00 UAH, the lowest (for this variety) - in the variant where sowing was carried out with a norm of 3.5 million pieces of similar seeds per 1 ha - 11041.00 UAH.

When sowing the mid-season variety Helios with a row spacing of 7.5 cm, the conditional net profit was in the range from 12025.00 to 12895.00 UAH per 1 ha, that is, compared to the usual row seeding method, the narrow-row method provided an increase in profit per unit area of spring barley variety Helios. The maximum value of conditional net profit was obtained in the variant where 4.5 million
pieces of similar seeds were sown per 1 ha and amounted to 12895.00 UAH per 1 ha. In this variant, the conditional net profit was maximized in the experiment.

Thus, when growing a modern variety of spring barley Helios using a narrow-row sowing method (7.5 cm) and a sowing rate of 4.5 million germinating seeds per 1 ha, the level of profitability is 120.7%, compared to 116.0-118.3% in other variants of the experiment. Thus, the mid-season spring barley variety Helios should be sown in a narrow-row method with an optimal seeding rate of 4.5 million seeds per hectare, which ensures a maximum average crop yield of 3.6 t/ha, a conditional net profit of 12895.00 UAH/ha at a minimum cost of 2968.06 UAH/t.

References: