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RESEARCH ON THE INFLUENCE OF PRECEDING CROPS AND SOWING DATES ON THE PRODUCTIVITY INDICATORS OF WINTER BARLEY IN THE CONDITIONS OF THE NORTHERN STEPPE OF UKRAINE

Barley is one of the oldest cultivated crops in the world, widely distributed globally. Since ancient times, the significance of barley as a primary food source has declined compared to other crops. It is used for animal feed and human food, with its main use being for the production of alcoholic beverages. The growing consumer interest in nutrition and health, along with the reputation of barley as a stress-resistant crop, indicates its potential benefits in the future [1].

In terms of global production of major crops, barley ranks fourth among cereal crops and eleventh overall, being widely cultivated worldwide. Barley grain is primarily used as animal feed, malt, and food products for human consumption, with malt being the second-largest use. Farmers also utilize barley straw as animal feed in Western Asia, North Africa, Ethiopia, Eritrea, Yemen, the Andes region, and East Asia [2].

It is essential to consider the state of food security regarding its cultural, political, agronomic, and economic context, as well as its biological potential. Barley is also a valuable component of crop rotation in terms of species diversity and pest and disease control. Since its requirements for sowing and harvesting dates differ from other important crops like wheat, its inclusion in rotation provides opportunities for managing workload throughout the season [3].

Based on summarized data from research institutions and the state variety testing system, recommended optimal sowing dates for winter crops are continuously developed. However, these are so closely linked to agronomic and soil conditions that they need to be clearly established in each natural climatic zone of the region, district, or even in individual farms [4].

Significant climate changes towards warming necessitate the expansion of winter barley sowing, which is less demanding regarding preceding crops and sowing dates compared to winter wheat [5-7].

However, for the conditions of the Northern Steppe of Ukraine, these issues remain insufficiently studied.

Given the above, it is relevant to study the response of modern winter barley varieties to preceding crops and sowing dates. The research territory is located in the black soil zone of the northern Steppe of Ukraine in the subzone of ordinary black soils transitioning to deep ones.

Due to the high sensitivity of winter barley plants to temperature and day length, sowing dates are very important. The counts of stems in winter barley plants at the end of autumn vegetation in the fall of 2023 showed that their tillering depended on the sowing dates and preceding crops.

For all the studied preceding crops, shifting the sowing date from early to later resulted in a decrease in the tillering of the plants. Higher tillering rates were achieved with early sowing, specifically on September 17, which resulted in 2.4 shoots per plant for the soybean predecessor and 2.2 shoots for sunflower. With later sowing dates (October 10 and 17), the plants entered winter in an unbranched state across all predecessors (Table 1).

Throughout the autumn period, higher tillering intensity was noted when growing winter barley after soybean.

The stem density of winter barley in the experimental variants depended on the preceding crops and sowing dates and was interrelated with plant density and their tillering. For all preceding crops, stem density decreased from earlier to later sowing dates. For instance, with soybean as the predecessor, the stem density for the

September 17 sowing was 998 plants/m², while for sowings on October 10 and 17, it dropped to only 422-431 plants/m². For sunflower as the predecessor, stem density decreased from 936 to 422-424 plants/m².

Table 1

Influence of Preceding Crops and Sowing Dates on the Tillering of Winter Barley Plants and Stem Density at the End of Autumn Vegetation (2024)

Sowing Date	Preceding Crops			
	Soybean		Sunflower	
	stems density, pcs./m²	plant tillering, pcs.	stems density, pcs./m²	plant tillering, pcs.
September 17	998	2.4	936	2.2
September 25	782	1.9	670	1.6
October 2	608	1.4	562	1.3
October 10	431	1.0	424	1.0
October 17	422	1.0	422	1.0

In the growing conditions of 2023-2024, the sowing dates for different preceding crops affected the survival rate of winter barley plants differently.

Research results indicate that due to quite favorable weather conditions during wintering, higher survival rates were observed with soybean (89.7%) and sunflower (88.8%) for sowing on October 2. The lowest winter hardiness rates (86.2% and 85.8%, respectively) were recorded for sowing on September 17.

Assessing the tillering of winter barley plants at the beginning of ear formation phase revealed a dependence: regardless of the predecessor, shifting the sowing date from early to later resulted in reduced tillering of the plants (Table 2).

For the predecessors soybean (2.8 shoots) and sunflower (2.7 shoots), the highest tillering was achieved with sowing on September 17. The lowest tillering, at 2.2 and 2.1 shoots per plant respectively, occurred with sowing on October 17 when growing winter barley after soybean and sunflower.

The stem density at the beginning of ear formation phase for the studied predecessors was higher in plants that exhibited greater tillering. For instance, with soybean as the predecessor, the stem density in the variant sown on September 17 was 1152 plants/m², while for sowing on October 17, it was 918 plants/m².

Table 2

Influence of preceding crops and sowing dates on plant tillering and stem density of winter barley at the beginning of ear formation phase (2024)

Sowing Date	Preceding Crops			
	Soybean		Sunflower	
	stems density, pcs./m²	plant tillering, pcs.	stems density, pcs./m²	plant tillering, pcs.
September 17	1152	2.8	1085	2.7
September 25	1118	2.7	1010	2.5
October 2	1017	2.5	968	2.4
October 10	960	2.3	920	2.2
October 17	918	2.2	870	2.1

Thus, the higher productivity of winter barley, based on plant tillering and stem density at the end of the autumn vegetation period in our experiments, was observed with early sowing on September 17. With soybean as the predecessor, winter barley plants were more productive – yielding 998 productive stems per m² and 2.4 stems per plant—whereas with sunflower as the predecessor, these figures were slightly lower at 936 plants/m² and 2.2 stems/plant, respectively. A trend was maintained regarding the influence of sowing dates and predecessors on the tillering of plants and stem density of winter barley at the beginning of ear formation phase.

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ЕКОЛОГІЧНА РОЛЬ НИЖНЬОДНІСТРОВСЬКОГО НАЦІОНАЛЬНОГО ПРИРОДНОГО ПАРКУ

Національний природний парк Нижньодністровський є великою територією (необхідною для здійснення процесів саморегуляції екосистем), яка включає одну або кілька екологічних систем, мало змінених або не змінених експлуатацією та поселенням людини, відзначається різноманітними типами ландшафтів, багатством рослинного і тваринного світу, а також різноманітністю ландшафтних систем, особливо цінних з наукової, освітньої, виховної тарекреаційної точок зору, або яка характеризується природними пейзажами високої естетичної цінності. Перебування і рух населення на цій території дозволяється за певних умов для відпочинку і культурно-освітніх цілей.

Екологічне оздоровлення річкових басейнів повинно бути одним із