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SEEDLING DENSITY OF WINTER WHEAT VARIETIES CHILLAKI (CONTROL), ULTRA AND FLESH UNDER DIFFERENT WATER-FERTILIZER (NPK) RATES AND IRRIGATION REGIMES

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Abstract. The study investigated the effects of different irrigation regimes and mineral fertilizer rates on seedling density, winter survival, growth, and development of the Chillaki, Ultra, and Flesh winter wheat varieties during 2024–2026. The research results showed that maintaining soil moisture at 80–80–75% of the limited field moisture capacity (LFMC), applying mineral fertilizers at rates of N-150, P-105, and K-75 kg/ha, and additionally using water-soluble and gel-based fertilizers had a positive effect on plant growth and the formation of productive tillers. Variant 3 was identified as the most optimal for the Ultra variety, while Variant 9 was found to be the most suitable for the Flesh variety.

Keywords: winter wheat, Ultra, Flesh, Chillaki, irrigation regime, field capacity, mineral fertilizers, plant density, winter survival, productivity.

Introduction

In accordance with Resolution No. PQ-10 of the President of the Republic of Uzbekistan, dated November 15, 2021, “On the Introduction of Market Principles Ensuring Free Competition in Grain Production and Marketing,” as well as with the aim of continuing reforms to liberalize the grain market, ensuring the uninterrupted supply of wheat and flour products to the domestic market, and maintaining price stability, the Cabinet of Ministers has established important priority tasks [5].

A Presidential Resolution of the Republic of Uzbekistan “On Measures to Increase Agricultural Production by Utilizing Additional Opportunities in Agricultural Areas” (No. PQ-465, dated December 30, 2024) was adopted. According to the Resolution, a new system is to be introduced to improve the production of agricultural products on field margins, household plots, areas surrounding private homes and multi-storey residential buildings, as well as on internal streets within mahallas [4].

Soil moisture is one of the important agrotechnical factors determining the productivity of agricultural crops. Particularly under irrigated farming conditions, the level of soil moisture has a significant effect on crop growth and development, as well as on the quantity and quality of the yield. Therefore, scientifically based irrigation management is one of the key conditions for obtaining high and quality yields from agricultural crops [1].

Ensuring an optimal plant density in cultivated wheat is one of the important agrotechnical factors determining plant growth and development, the formation of yield components, final productivity, and grain quality indicators. In particular, numerous



Date: 17th August-2026

scientific studies have reported that maintaining plant density within optimal ranges has a positive effect on increasing the gluten content of grain.

In the experiments conducted by X. Zaripov and A. Tog'ayev under the conditions of irrigated sierozem soils of the Navoi region, the winter bread wheat varieties "Asr" and "Davv" were sown at the optimal sowing date (October 20) using a seeding rate of 5.0 million viable seeds per hectare. When mineral fertilizers were applied at rates of N-200, P-140, and K-100 kg/ha, the overwintering rate of seedlings reached 95.6 and 96.8%, respectively. The lowest plant mortality rates were 4.4 and 3.2%, while by the end of the growing season, the highest plant survival rates were maintained at 88.5 and 91.6%, respectively [2].

In studies conducted by J. Hamdamov et al. on the winter bread wheat variety "ASR", the highest performance was recorded in the variants treated with UNI AGRO at 15 L/ha and SUPER-SAS at 15 L/ha. The average plant height in these variants was 72.3 and 68.0 cm, respectively, while the average grain yield was 16.8 and 12.5 t/ha higher than that of the control variant [3].

Research Results. In the experiments conducted in 2026, the effects of different irrigation regimes and mineral fertilizer rates on the plant density and winter survival of winter wheat varieties were studied. The results showed that the pre-winter plant density ranged from 420.8 to 471.3 thousand plants/ha across the experimental variants. The lowest plant density was recorded in Variant 1, at 420.8 thousand plants/ha, while the highest was observed in Variant 12, reaching 471.3 thousand plants/ha.

According to the early spring assessments, plant density ranged from 406.7 to 458.6 thousand plants/ha. The lowest value was again recorded in Variant 1 (406.7 thousand plants/ha), whereas the highest value was observed in Variant 12 (458.6 thousand plants/ha). Plant densities of 454.2 thousand plants/ha in Variant 8, 454.4 thousand plants/ha in Variant 13, 447.8 thousand plants/ha in Variant 9, 447.4 thousand plants/ha in Variant 11, and 447.2 thousand plants/ha in Variant 7 were also recorded. The number of plants that died due to low winter temperatures ranged from 7.0 to 14.1 thousand plants/ha across the variants. The highest plant loss was recorded in Variant 1 (14.1 thousand plants/ha), while the lowest loss was observed in Variant 9 (7.0 thousand plants/ha). In addition, plant losses of 8.0 thousand plants/ha in Variant 10, 8.9 thousand plants/ha in Variant 2, 9.7 thousand plants/ha in Variant 13, 10.0 thousand plants/ha in Variant 5, and 10.2 thousand plants/ha in Variants 8 and 11 were recorded as a result of exposure to winter cold (see Table 5.20).

The results of field experiments conducted during 2024–2026 demonstrated that maintaining pre-irrigation soil moisture at 80–80–75% of the limited field moisture capacity (LFMC) and applying mineral fertilizers at rates of N-150, P-105, and K-75 kg/ha, combined with the additional application of new water-soluble and gel-based fertilizers alongside conventional fertilizers, had a positive effect on the growth and development of the studied winter wheat varieties. These additional fertilizers were applied as suspensions twice during the tillering stage and twice during the stem elongation stage.





Figures 1–2. Process of determining the plant density of wheat

Table 1

Plant Density of Winter Wheat Varieties Chillaki (Control), Ultra, and Flesh under Different Water–Fertilizer (NPK) Rates and Irrigation Regimes, plants/m², 2026

Var, №	Plant Density, plants/m ²		Plant Density, plants/m ²
	Before Winter	Early Spring	
1	420,8	406,7	14,1
2	439,0	430,0	8,9
3	452,5	439,6	12,9
4	459,0	445,8	13,2
5	451,3	441,3	10,0
6	452,7	441,0	11,7
7	458,0	447,2	10,7
8	464,4	454,2	10,2
9	454,8	447,8	7,0
10	454,4	446,4	8,0
11	457,5	447,4	10,2
12	471,3	458,6	12,7
13	464,1	454,4	9,7

Note: In the variants where mineral fertilizers were applied at rates of N-150, P-105, and K-75, new water-soluble and gel-based fertilizers were additionally applied as suspensions twice during the tillering stage and twice during the stem elongation stage, in addition to conventional fertilizers. Alongside pre-irrigation soil moisture, the concentration of leaf cell sap, expressed as refractometer readings, was also determined.

Conclusion. During the wintering period, some plants died as a result of exposure to low temperatures, with plant losses ranging from **8,0 to 17,6 plants/m²**, depending on the experimental variant. The results of the three-year study demonstrated that the proper selection of water–fertilizer rates and irrigation regimes is of great importance for the growth and development of winter wheat varieties and the formation of productive tillers. **Variant 3** is recommended as the most optimal treatment for the cultivation of the **Ultra**

Date: 17th August-2026

variety, while **Variant 9** is recommended for the **Flesh** variety based on their agrobiological characteristics.

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