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INFLUENCE OF COTTON SEED GERMINATION DYNAMICS ON SEEDLING DENSITY AND YIELD

Ma'mura Sadirdin qizi Atabyaeva

Doctor of Agricultural Sciences, Professor, Andijan Institute of Agriculture and
Agrotechnologies

ORCID: 0009-0003-9959-1818 Doi mamuraatabaeva20@gmail.com

Bejijon Shavkatbek o'g'li Saydaliyev

Basic Doctoral Student, Andijan Institute of Agriculture and
Agrotechnologies ORCID: 0009-0004-6218-9790

Abstract: This article examines the cultivation of foreign cotton varieties. It was found that when pre-irrigation soil moisture was set at 70-75-65% of the Field Capacity (FC), with a theoretical seedling density of 220-240 thousand plants/ha, and the retardant applied 6 times during the vegetation period, as well as when pre-irrigation soil moisture was set at 65-70-60% of FC, with a theoretical seedling density of 150-160 thousand plants/ha and the retardant applied 3 times, the seed germination rate was 1.0-5.2% higher, and seedling density was 1.3-6.1 thousand plants/ha higher compared to the variants managed under these backgrounds. This resulted in an additional cotton yield of 9.8-28.0 q/ha.

Keywords: cotton, irrigation regime, Field Capacity (FC), theoretical seedling density, retardant, germination dynamics, cotton yield.

Аннотация: В данной статье рассматривается возделывание иностранных сортов хлопчатника. Установлено, что при поддержании предполивной влажности почвы на уровне 70-75-65% от ППВ (предельной полевой влагоёмкости), с теоретической густотой всходов 220-240 тыс. растений/га и применении ретарданта 6 раз в период вегетации, а также при предполивной влажности почвы 65-70-60% от ППВ, с теоретической густотой всходов 150-160 тыс. растений/га и применении ретарданта 3 раза, прорастание семян было на 1,0-5,2% выше, а густота всходов – на 1,3-6,1 тыс. растений/га выше по сравнению с вариантами, обработанными на этих фонах. В результате был получен дополнительный урожай хлопка-сырца от 9,8 до 28,0 ц/га.

Ключевые слова: хлопчатник, режим орошения, ППВ, теоретическая густота всходов, ретардант, динамика прорастания, урожай хлопка.

Relevance of the research. Currently, the increasing population and the reduction of agricultural land in our country make the task of obtaining stable, high, and quality yields from agricultural crops one of the most pressing issues. Therefore, the effective use of plant growth regulators, the development of scientifically based timings and norms for their application, and their implementation in practice are of great importance in increasing crop productivity. Plant growth, development, and yield are directly dependent on their genetic potential, climatic conditions, and the level of nutrient supply. In recent years, the



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use of plant bioregulators of natural and synthetic origin has expanded the possibilities for effectively managing these physiological processes, and their positive impact on the productivity and quality of agricultural crops has been confirmed in scientific research.

Degree of study of the problem. It is known that all cotton varieties require specific agrotechnical measures depending on the soil and climatic conditions. In research conducted by Kh. Egamov, A. Qosimov, I. Abdurakhmonov, and T. Komilov 22 in the conditions of the Andijan region, they noted that when cultivating the promising cotton variety O'zPITI-203, leaving seedling densities of 90, 100, and 110 thousand plants per hectare depending on soil fertility, a high-quality yield of 38-43 q/ha was obtained. In scientific research conducted by S. Ubaydullayev 33 in the conditions of typical gray soils of the Andijan region, when cultivating the Andijan-36 cotton variety with a row spacing of 60 cm and a seedling density of 90-100 thousand plants/ha, 18% of seedlings emerged on the 6th day after sowing. It was determined that when seeds were sown in a double-row system with row widths of 90 x (60x30) cm and a seedling density of 120-140 thousand plants/ha, as well as with 60 cm row spacing and seedling density 30-40 thousand plants/ha higher, early and optimal germination conditions were noted for cotton seedlings at 80x40 cm row spacing. Scientific research has shown that regulating pre-irrigation soil moisture relative to FC positively affects the development of the root system, nutrient uptake, and the formation of yield components. It has been scientifically substantiated that combining irrigation regimes and mineral fertilizer norms can significantly increase cotton yield 4,54,5.

Research methodology. The research was conducted during 2023-2025 at the experimental farm of the Andijan Institute of Agriculture and Agrotechnologies on meadow gray soils. The local cotton variety "Andijan 36" and the Chinese variety **XinLuZhong-52** were cultivated according to the experimental scheme outlined below (Table 1).

(Table 1).

EXPERIMENTAL SCHEME

№	Cotton Variety	Irrigation Regime (% of FC)	Timing and Rate of Entojan Application (g/ha)	Seedling Density (thousand plants/ha)
1	Andijon – 36 (Control)	70-75-65	15:45:90	150-160
2	XinLuZhong - 52	70-75-65	15:45:90	150-160
3				180-200
4				220-240
5			10:15:45:90:90:12 0	150-160
6				180-200
7				220-240



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8	65-70-60	15:45:90	150-160
9			180-200
10			220-240
11		10:15:45:90:90:120	150-160
12			180-200
13			220-240

Research results: In our studies, when cultivating the Andijan-36 variety during 2023-2025 using standard production agrotechnology, with a theoretical seedling density of 150-160 thousand plants/ha, pre-irrigation soil moisture set at 70-75-65% of FC, and the growth regulator Entojan applied at rates of 15:45:90 g/ha in Variant 1 (control), the average germination rate over three years was 89.7%. Compared to Variant 2, where the foreign variety XinLuZhong-52 was cultivated under the same background, and Variant 5, where the growth regulator was applied 6 times during the vegetation period (10:15:45:90:90:120 g/ha) with a theoretical seedling density of 180-200 thousand plants/ha, seed germination was 5.2-4.6% higher. Under the aforementioned irrigation regime, with a theoretical seedling density of 220-240 thousand plants/ha and the retardant applied at rates of 10:15:45:90:90:120 g/ha (Variant 7), the seed germination dynamics were up to 1.4% higher compared to Variant 4, which had the same irrigation regime and seedling density but received the retardant only at 15:45:90 g/ha.

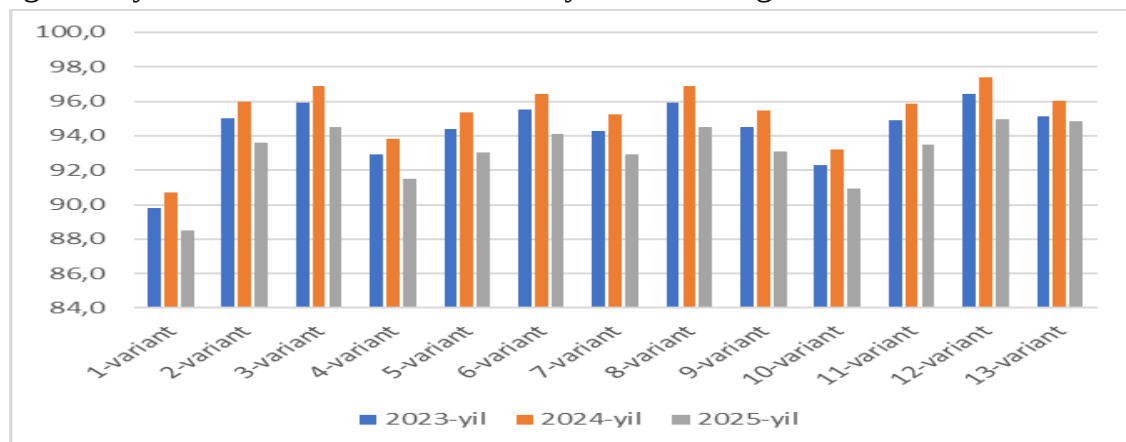


Figure 1. Seed germination rate, % (2023-2025)

In our research, when pre-irrigation soil moisture was set at 65-70-60% of FC, and the foreign variety XinLuZhong-52 was cultivated with a theoretical seedling density of 150-160 thousand plants/ha and the growth regulator applied at 15:45:90 g/ha (Variant 8), the average germination rate over three years was 95.7%. This was up to 6.1% higher than the control variant and 1.0% higher compared to Variant 11, which had the same irrigation regime and seedling density but received the retardant 6 times (10:15:45:90:90:120 g/ha).

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Furthermore, when cultivating the foreign cotton variety with a theoretical seedling density of 220-240 thousand plants/ha, pre-irrigation soil moisture at 70-75-65% of FC, and the growth regulator Entojan applied 6 times (10:15:45:90:90:120 g/ha), the seedling density was maintained up to 6.1 thousand plants/ha higher compared to applying Entojan only 3 times. This is explained by the fact that the preparation, applied from the earliest critical phases, promotes root system formation, increases leaf area, activates metabolic processes, ensures harmonious development of roots and above-ground parts, and increases the resistance of young seedlings to stress factors. In Variant 8, where pre-irrigation soil moisture was set at 65-70-60% of FC, the growth regulator Entojan was applied 3 times (10:45:90 g/ha - Note: likely a typo for 15:45:90? or 10:15:45?), and the theoretical seedling density was 150-160 thousand plants/ha, the seedling density was 1.3-4.7 thousand plants/ha higher compared to when pre-irrigation moisture was 70-75-65% of FC.

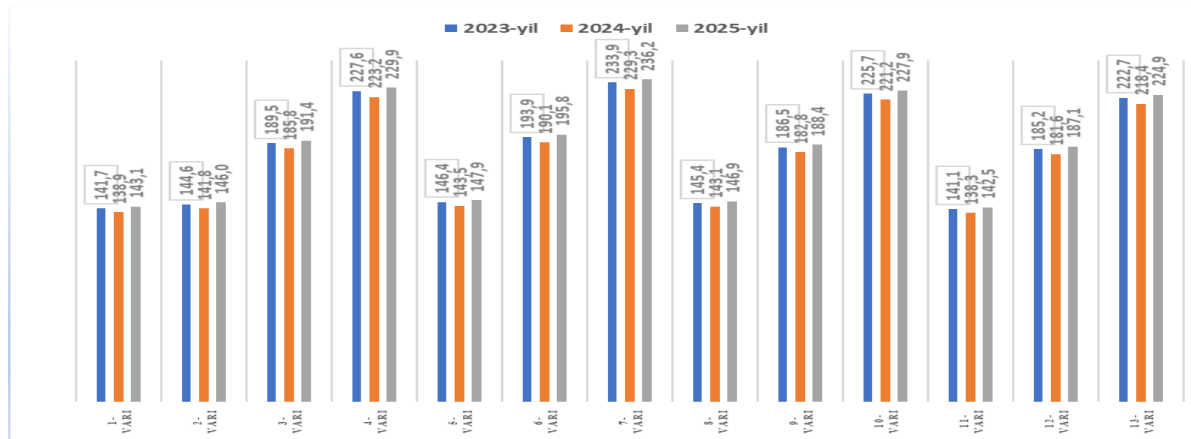


Figure 2. Cotton seedling density at the end of the effective period, thousand plants/ha (2023-2025)

In our research, when cultivating the Chinese cotton variety XinLuZhong-52 with pre-irrigation soil moisture set at 70-75-65% of FC, the growth regulator Entojan applied 6 times (10:15:45:90:90:120 g/ha), and a theoretical seedling density of 220-240 thousand plants/ha (Variant 7), the cotton yield was 68.5 q/ha. This was up to 8.5 q/ha higher than Variant 4, where the growth regulator was applied 3 times at 15:45:90 g/ha, and 17.1-18.7 q/ha higher than Variants 5 and 6 cultivated under the same background. This is attributed to the optimal irrigation regime improving plant water supply, the early and optimal application of the growth regulator balancing the development of vegetative and generative organs, and the optimal seedling density ensuring efficient use of light, moisture, and nutrients.

Conclusion. In our research on cultivating foreign cotton varieties, it was observed that when pre-irrigation soil moisture was set at 70-75-65% of FC, with a theoretical seedling density of 220-240 thousand plants/ha and the retardant applied 6 times during the vegetation period, as well as when pre-irrigation soil moisture was set at 65-70-60% of FC, with a theoretical seedling density of 150-160 thousand plants/ha and the retardant applied 3 times, the seed germination rate was 1.0-5.2% higher, and seedling density was 1.3-6.1

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thousand plants/ha higher compared to the variants managed under these backgrounds. This resulted in an additional cotton yield of 9.8-28.0 q/ha.

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