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EFFECT OF SOWING DATES ON PHENOLOGICAL DEVELOPMENT AND SEED YIELD OF ULTRA-EARLY ONION VARIETY BAHOROY

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Abstract
The study investigated the effect of sowing dates on phenological development and seed yield of the ultra-early onion variety Bahoroy. Field experiments conducted from 2022 to 2024 involved sowing seeds at different dates. Observations included germination, number of seedlings after thinning, overwintering survival, bolting, and seed maturation, assessed through phenological and biometric indicators. The results showed that seeds sown on July 1 achieved the highest seed yield and quality.

Keywords: Onion, Bahoroy variety, seed production, sowing dates, phenological development, seed yield.

Introduction

Provision of high-quality seed material is a key factor for achieving high and stable yields in agriculture. Vegetables, particularly onions, are widely cultivated and hold significant economic importance. Therefore, scientifically organizing onion seed production and improving the technology for producing high-quality seeds while preserving varietal characteristics is an urgent task.

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Sowing dates directly influence the phenological development of onions, bolting, and seed maturation. Incorrectly chosen sowing dates can reduce or completely prevent bolting, which in turn decreases seed yield. Optimizing sowing dates is therefore a critical factor for producing high-yield and high-quality seeds.

In recent years, special attention has been paid to the development of ultra-early onion varieties and to accelerated methods of seed production. The newly developed Bahoroy variety is distinguished by its short vegetation period, high adaptability, and ability to produce flower stalks. This variety allows direct seed production without cultivating mother bulbs, which provides a basis for developing resource-efficient technologies. Accordingly, the aim of this study was to determine the effect of sowing dates on phenological development, bolting, and seed yield of Bahoroy onions, and to scientifically identify the optimal sowing date.

Literature Review

The issue of obtaining high-quality seeds and ensuring yield in vegetable crops, particularly onions, has been extensively studied scientifically. Azimov and Normurodov [1] thoroughly examined the theory and practical foundations of vegetable seed production, including seed quality, storage, and standardization processes. They emphasized that timely and proper implementation of agrotechnical measures is critical for producing high-quality seeds.

Ataev and Khudayberdiev [2] analyzed the morphology, developmental stages, and agro-biological foundations of vegetable crops, highlighting that nutrition and irrigation regimes are key factors determining productivity. Boboev [3] identified factors affecting bolting in onions—temperature, sowing dates, seed quality, and the level of agrotechnical care.

Murodov [7] studied bolting as a physiological process, demonstrating the importance of variety selection, sowing dates, and agrotechnical measures to prevent premature bolting. Juraev and Qurbonov [5] investigated factors influencing seed quality and yield in vegetable crops under laboratory and field conditions, providing practical recommendations.

International studies have also paid special attention to onion seed production and quality. FAO [8] and Brewster [9] provided guidelines for quality control in onion seed production and strategies to increase yield.

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Thus, the scientific literature indicates that varietal characteristics, sowing dates, and agrotechnical measures directly affect the yield and quality of onion seeds. Based on these studies, optimizing sowing dates for ultra-early Bahoroy onions is scientifically justified.

Materials and Methods

The experimental object was the ultra-early Bahoroy onion variety. Field trials were conducted at the Research Institute of Vegetables, Melons, and Potatoes, following the institute's recommendations. Seeds were sown on June 20, July 1, July 10, July 20, and August 30. Each variant was planted on a 14 m² plot with three replications, using a single-row band method with a spacing of 70×15 cm and a seed rate of 0.3–0.5 g/m². During the study, the following phenological and biometric parameters were monitored: germination, number of seedlings after thinning, number of overwintered plants, bolting and number of bolting plants, flowering and seed maturation dates, and number of flower stalks per plant. The main methodological approach was based on the "Field Experiment Methodology" developed by Dospokhov B.A. (1985).

Results and Discussion

Field experiments thoroughly examined the effect of sowing dates on phenological development, bolting, and seed yield of the ultra-early onion variety Bahoroy (Table 1). The results showed that the rate and timing of seed emergence depended on sowing dates, with a 4–6 day difference observed between 10% and 75% emergence. The fastest emergence was recorded in the variants sown on June 20 and July 1, where 75% emergence occurred within 10–11 days. This indicates that soil temperature and moisture conditions during these periods were optimal for seed physiological activity.

Table 1 Phenological observations in accelerated seed production of Bahoroy onion variety

Sowing date	Emergence 10%	Emergence 75%	Seedlings after thinning	Overwintered plants (no.)	Overwintered plants (%)	Bolted plants (no.)	Non-bolted plants (no.)	Total flower stalks	Avg. per plant	Flowering (10%)	Flowering (75%)	Seed maturity (10%)	Seed maturity (75%)
20.06	26.06	30.06	133	116	89	14	11	197	1.7	20.05	25.05	15.06	03.07
01.07	07.07	11.07	133	120	92	11	8	240	2.0	22.05	27.05	16.06	03.07
10.07	16.07	20.07	133	117	89	15	11	147	1.25	23.05	29.05	17.06	04.07
20.07	28.07	03.08	133	113	85	19	14	105	0.9	23.05	29.06	17.06	04.07
30.08	09.09	12.09	133	0	0	131	100	0	0	0	0	0	0

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After thinning, the number of seedlings was similar across all treatments (131–133 plants). The number of overwintered plants ranged from 113 to 120, with the highest survival rate observed in the July 1 sowing (92%). This indicates that plants formed at this sowing date were well prepared for overwintering.

Bolting and generative development were strongly dependent on sowing dates. The highest number of flower stalks was recorded in the July 1 treatment — 240 in total, with an average of 2.0 per plant. In the June 20 and July 10 treatments, this indicator was 1.7 and 1.25, respectively, while in the July 20 treatment it decreased to 0.9. No bolting was observed in the control treatment (August 30), indicating the importance of sufficient vegetative mass accumulation and overwintering for generative development.

Flowering and seed maturation phases in all variants occurred from late May to early June. The highest seed yield was recorded in the July 1 variant — 516 kg/ha of high-quality seeds. In the June 20 and July 10 treatments, seed yield was 417 and 315 kg/ha, respectively, while in the July 20 treatment it was 225 kg/ha. No seed yield was obtained in the August 30 treatment.

Table 2 Seed yield analysis in accelerated seed production of Bahoroy onion variety

Sowing date	Seed yield (kg/ha)	1000-seed weight (g)	Germination energy (%)	Germination (%)
20.06	417	3.77	85	88
01.07	516	3.80	78	85
10.07	315	3.50	75	78
20.07	225	3.42	72	79
30.08	0	0	0	0
$LSD_{0.05}$	1.8			
SX%	0.5			

According to laboratory analyses, the 1000-seed weight ranged from 3.46 to 3.80 g, germination energy from 72–85%, and germination percentage from 78–88%. The highest quality indicators were recorded in the June 20 and July 1 variants.

In the following year, onions grown from seeds sown on July 1 and July 10 showed low bolting rates (0.8–1.4%) and high bulb yield (50.1–50.2 t/ha). This confirms that high-quality seeds improve the efficiency of bulb production.

Thus, the experimental results demonstrated that sowing date has a decisive influence on phenological development, formation of generative organs, and seed

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yield in onion. The optimal sowing date was July 1, which provided the highest seed yield and quality indicators. Early or late sowing may restrict generative development and reduce seed productivity.

Conclusions

1. Field experiments demonstrated that sowing dates in the ultra-early Bahoroy onion variety have a decisive influence on phenological development, overwintering survival, and the formation of generative organs.
2. Seeds sown at early (June 20) and mid (July 1) dates emerged uniformly, overwintered successfully, and accumulated sufficient vegetative mass for generative development.
3. The highest number of flower stalks (an average of 2.0 per plant), seed yield (516 kg/ha), and quality indicators were recorded in the July 1 sowing treatment.
4. Sowing on July 10 and July 20 restricted generative development and reduced seed yield (315–225 kg/ha). No bolting or seed production was observed in the August 30 treatment.
5. Laboratory analyses showed that seeds produced at optimal sowing dates had high germination (78–88%) and germination energy (72–85%). In the following year, onion bulbs grown from these seeds exhibited low bolting rates (0.8–1.4%) and high marketable yield (50.1–55.2 t/ha).
6. Based on the obtained results, the optimal sowing date for producing high-yield and high-quality seeds of the ultra-early Bahoroy variety using the accelerated method is July 1.

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