

Growth and Development Characteristics and Morpho-Biological Indicators of New Leek (*Allium Porrum* L.) Specimens

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Abstract: The article studies the phenological characteristics and the duration of the growing period of leek varieties belonging to the world collection. Based on the analysis results, the studied varieties were divided into three groups according to their growing period: early-maturing (growing period up to 130 days), mid-maturing (up to 150 days), and late-maturing (up to 200 days) varieties were identified, and their specific features were highlighted.

Keywords: leek, collection, variety sample, phenology, growing period, early-maturing, mid-maturing, late-maturing, yield (productivity).

Introduction

Although the leek is botanically a perennial plant, in agricultural practice it is cultivated as an annual or biennial crop. Morphologically, it differs significantly from the common onion (*Allium cepa* L.): its leaves are broad and flat, and its stem is rounded, reaching a height of up to 2 meters under optimal conditions. One of its key biological features is that it does not form a true bulb during the vegetative development stage.

In the first year of life, the plant mainly develops vegetative organs — leaves and a thickened stem. This thickened stem, referred to as the "false stem" or practically as the "stem/bleached stalk," is the main economically valuable and edible part of the leek. In the second year, the plant transitions to the generative development stage: flower stalks (generative shoots) up to 2 meters high are formed, producing seeds that ensure plant reproduction [1].

In its first year, the leek forms a strong root system developing from the base of the stem where the leaves attach (leaf base). Initially delicate and thread-like, the roots later transform into a dense, highly branched system. Morphologically fibrous in structure, these roots penetrate the soil up

to a depth of 50 cm, though the majority (approximately 90%) resides within the fertile upper 0–30 cm layer. This enables the plant to efficiently utilize nutrients and moisture [2].

Leeks do not possess a distinct taproot; their root system forms dynamically through the growth of lateral roots from the primary root and subsequently adventitious roots from the leaf bases. When roots are damaged during transplanting (seedling stage), the plant exhibits high regenerative capacity, ensuring rapid adaptation to new conditions and stable development [3].

This well-developed root system and plant biomass contribute to the accumulation of large amounts of organic residue in the soil. Therefore, leek is considered a valuable precursor crop that enhances soil fertility, improves its agrophysical and agrochemical properties, structure, and biological activity [4][5].

Materials and Methods

In conducting the field experiments, guidelines such as "Guidelines for Environmental Testing of Vegetable Crops in Open Ground" (Moscow, 1981), "Methodology of Experimental Work in Vegetable and Melon Growing" (Moscow, 1992), "Methodology for Conducting Experiments on Vegetable, Melon, and Potato Crops" (Tashkent, 2023), and "Methodology for State Variety Testing of Agricultural Crops" (Moscow, 2015) were utilized. Statistical analysis of the data was performed based on B.A. Dospekhov's analysis of variance (ANOVA) method using Microsoft Excel.[6][7]

Result

The homeland of the leek (*Allium porrum* L.), which is currently less common in our Republic, is considered to be Southwest Asia. From this region, the leek naturally spread to the shores of the Mediterranean Sea.[8][9]

The wild progenitor of the leek — *Allium ampeloprasum* — is still found in these areas today. Cultivated leek, which developed from this wild species, was widely grown as one of the main vegetable crops in ancient Egypt.[10]

By the Middle Ages, leek had spread widely across European countries and began to be cultivated. As shown by descriptions provided by ancient botanists, the bulb of the leek during those periods was significantly larger compared to modern varieties. This was also reflected in the manuscripts of Dioscorides, who lived in the 6th century.[11][12]

Leek (*Allium porrum* L.) belongs to the genus *Allium* L. and the family Alliaceae, and is considered one of the vegetable crops that has been cultivated since ancient times.[13]

In our scientific research, leek cultivars of Dutch breeding — Merlin (st), Bandit, Goliaf', and Forrest — as well as Russian breeding samples — Mamont, BIN 20, Tango, BGSN 62, Khobot Slona, UGH 223, Alligator, Russkiy Razmer, and K-104— were studied.

Seeds of the leek varieties were sown in the nursery in the first ten-day period (decade) of January, and 45-day-old seedlings were transplanted into open field conditions in the second ten-day period of February.[14]

During the seedling preparation process, the seeds were sown on January 5. Seedling emergence in the standard cultivar Merlin (st) was observed after 8 days. Compared to it, germination occurred 2 days earlier in cultivars BIN 20, BGSN 62, and K-104. Relative to Merlin, seedling emergence was delayed by 1 day in Tango, Bandit, Khobot Slona, and Alligator; by 2 days in 'Mamont, Goliaf', and Russkiy Razmer'; and by 3 days in 'Forrest'.

Under greenhouse conditions, the formation of the first true leaf in leek cultivars was observed at a period of 22 days in the Merlin (st) variety.

Compared to it, the first true leaf formed 4 days earlier in BIN 20, BGSN 62', and K-104; 2 days earlier in 'Russkiy Razmer'; and 3 days later in Mamont, Goliaf', and 'Forrest'.

Furthermore, the formation of the 3rd–4th true leaves in leek cultivars was observed at a period of 44 days in Merlin (st).

Compared to this process, it occurred 2 days earlier in BIN 20, BGSN 62, and K-104, and with a delay of 1 day in Mamont, Goliaf', Forrest, and Russkiy Razmer.

Under open field conditions, the period from planting 45-day-old seedlings to pseudostem formation in leek cultivars was found to be 75 days in the standard variety Merlin (st).

Compared to the standard variety Merlin (st), pseudostem formation occurred 28 days earlier in BGSN 62, 25 days earlier in BIN 20, and 20 days earlier in Alligator.

Additionally, the period from planting 45-day-old seedlings to pseudostem formation occurred earlier than in Merlin (st) by 14 days in UGH 223, 10 days in Khobot Slona, 10 days in Forrest, 8 days in Goliaf', 7 days in Tango, 7 days in Russkiy Razmer, and 3 days earlier in both Bandit and K-104.

Conversely, in the Mamont cultivar, this phase lasted 82 days, forming 7 days later compared to the standard variety Merlin (st).

The period from pseudostem formation to technical maturity (technical ripeness) was 65 days in the Merlin (st) cultivar. Compared to this indicator, technical maturity was reached 31 days earlier in the BGSN 62 cultivar (34 days) and 23 days earlier in the BIN 20' cultivar (42 days), respectively.

Table 1. Phenological stages of leek cultivars from seedling preparation to harvest (2022–2024)

Name of cultivars (varieties)	In a nursery, date/days				In open field conditions		
	Date of seed sowing	From sowing to			From planting 45-day-old seedlings (20/II) to pseudostem formation	From pseudostem formation to technical maturity	From planting seedlings to harvest (growing season)
		Seedling emergence, days	First true leaf formation, days	Formation of 3rd–4th true leaves, days	Day	Day	Day
Merlin (st) (Netherlands)	05/I	8	22	44	75	65	140
Forrest (Netherlands)	05/I	11	25	45	65	54	119
K-104 (Russia)	05/I	6	18	42	72	63	135
Russkiy Razmer (Russia)	05/I	10	24	45	68	53	121
BGSN 62 (Russia)	05/I	6	18	42	47	34	81
Khobot Slona (Russia)	05/I	9	22	44	65	70	135
UGH 223 (Russia)	05/I	8	22	44	61	54	115
Alligator (Russia)	05/I	9	22	44	55	50	105

Name of cultivars (varieties)	In a nursery, date/days				In open field conditions		
	Date of seed sowing	From sowing to			From planting 45-day-old seedlings (20/II) to pseudostem formation	From pseudostem formation to technical maturity	From planting seedlings to harvest (growing season)
		Seedling emergence, days	First true leaf formation, days	Formation of 3rd–4th true leaves, days	Day	Day	Day
BIN 20 (Russia)	05/I	6	18	42	50	42	92
Tango (Russia)	05/I	9	22	44	68	62	130
Mamont (Russia)	05/I	10	25	45	82	71	153
Bandit (Netherlands)	05/I	9	22	44	73	58	131
Goliaf (Netherlands)	05/I	10	25	45	67	56	123

Furthermore, the period from pseudostem formation to technical maturity was recorded as 53 days in Russkiy Razmer, 54 days in UGH 223, 54 days in Forrest, 56 days in Goliaf', 58 days in Bandit, 62 days in 'Tango, and 63 days in K-104. In contrast, this period was distinguished by lasting 70–71 days in the Mamont cultivar.[15]

Conclusions

In conclusion, the leek cultivars were conditionally divided into three groups according to the duration of their vegetation period (growing season), Early-maturing cultivars (vegetation period up to 130 days): BGSN 62' (81 days), BIN 20 (92 days), Alligator (105 days), UGH 223 (115 days), Forrest (119 days), Russkiy Razmer (121 days), Goliaf' (123 days), and Tango (130 days). Mid-maturing cultivars (vegetation period up to 150 days): Bandit (131 days), Khobot Slona (135 days), and K-104 (135 days). Late-maturing cultivars (vegetation period up to 200 days): Mamont (153 days).

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