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COMPREHENSIVE STUDY OF ROMANESCO CAULIFLOWER CULTIVARS UNDER SUCCESSIVE PLANTING DATES

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Abstract: This article presents information on the origin of Romanesco cauliflower, its global cultivation area, yield potential, and the introduction of various cultivars into our Republic for evaluation under successive planting dates in the soil–climatic conditions of the central region. It was demonstrated that the origin of Romanesco cauliflower cultivars exerts a direct influence on their phenological development. Russian cultivars are distinguished by their relatively early to mid-season maturity, whereas French cultivars are characterized by late maturity and a prolonged vegetation period.

Keywords: Romanesco cauliflower, planting dates, cultivar samples, central region, introduction, phenological observations, biometric measurements**.**

Introduction. Romanesco cauliflower is a rare type of cabbage that has not spread widely across the world and is primarily cultivated in European countries. It is not recorded as a separate crop in international statistics, as major organizations classify Romanesco together with cauliflower and broccoli. Consequently, official data on its exact cultivation area or total yield are not available. However, based on research findings and information from farming enterprises, approximate indicators regarding the cultivation of Romanesco cauliflower are gradually being established.

Romanesco is cultivated on a very limited scale worldwide—approximately 10–15 thousand hectares, which accounts for only 0.5–1% of the area planted with cauliflower and broccoli. The main producer countries include Italy, France, Spain, the Netherlands, and, to some extent, the United States. In other countries, Romanesco is grown almost exclusively by small farms or in greenhouses on an experimental basis.

Although its heads resemble those of cauliflower, Romanesco generally produces lower yields. Average productivity ranges from 18–25 t/ha, rising to 25–35 t/ha under favorable agronomic conditions, and up to 35–40 t/ha in greenhouse cultivation or under drip-irrigation systems. Its estimated global annual production is approximately 200–350 thousand tons, indicating that Romanesco remains a relatively minor vegetable on the world market.

From a biochemical perspective, Romanesco is similar to cauliflower and broccoli, yet it possesses several distinctive features. Owing to its high content of biologically active compounds, it demonstrates strong antioxidant, anti-inflammatory, and immune-enhancing properties.

One of the most abundant vitamins in Romanesco is vitamin C, present in even higher quantities than in cauliflower. On average, 100 g of Romanesco contains 60–70 mg of vitamin C. It is also a good source of vitamins A, K, and several B-group vitamins (B1, B2, B3, B6, and folate—B9).

The mineral composition of Romanesco is also rich, with potassium, phosphorus, calcium, magnesium, iron, and zinc constituting its key elements. Potassium and phosphorus are

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particularly abundant, making Romanesco beneficial for cardiovascular function and bone strength.

Romanesco contains a high amount of dietary fiber, which improves digestive processes and supports a healthy gut microbiota. It also includes a range of bioactive compounds such as carotenoids (beta-carotene, lutein), polyphenols, flavonoids, chlorophyll, glucosinolates, and sulforaphane. These compounds are known for their anticancer effects, detoxifying properties, and strong antioxidant activity.

Due to its low carbohydrate content, Romanesco is considered a diet-friendly food. Per 100 grams, it contains an average of 3–4 g of carbohydrates, 2–3 g of protein, and only trace amounts of fat. Its energy value is merely 25–30 kcal, making it suitable for consumption by individuals with diabetes, obesity, or cardiovascular diseases.

Research Objective. The aim of this study is to select high-yielding, early-maturing Romanesco cauliflower cultivars—characterized by favorable morpho-biological traits and adapted to the soil–climatic conditions of the central region—through the use of the global collection and evaluation under successive planting dates, with subsequent introduction into production.

Research methods. Field experiments were conducted in accordance with the guidelines provided in Methodological Instructions for the Ecological Testing of Vegetable Crops in Open Fields (Moscow, 1981), Methods of Experimental Work in Vegetable and Melon Crops (Moscow, 1992), Methods for Conducting Experiments in Vegetable, Melon, and Potato Crops (Tashkent, 2023), and Methods of State Variety Testing of Agricultural Crops (Moscow, 2015). Statistical analysis of the data was performed using the Microsoft Excel software based on the variance analysis method developed by B.A. Dospekhov.

Research Results. The study analyzed the phenological development stages and growth duration of Russian and French Romanesco cauliflower cultivars based on their origin. The findings indicate that there are significant differences among cultivars in terms of biological development rate and maturity period.

For Russian cultivars—Veronika, Shennon, Jemchujina, and Zelyonaya Grozd—the onset of head formation was recorded within 100–118 days. The earliest head initiation was observed in the Shennon cultivar, reaching this stage at 100 days, confirming its classification as an early-maturing type with a short vegetation period. Conversely, the Veronika and Jemchujina cultivars initiated head formation later, on days 118 and 110, respectively.

The technical maturity of the Russian cultivars was generally reached within 120–125 days. In the cultivars Shennon and Zelyonaya Grozd, technical maturity occurred at 120 days, whereas in Veronika and Jemchujina, this indicator extended to 122–125 days, reflecting their slightly longer vegetation period.

French cultivars—Romanesco Natalino and Romanesco Rase Campidiglio—entered the head initiation stage on the 120th day. Technical maturity in these cultivars was recorded on the 125th day, which is later compared to the Russian cultivars. Notably, the harvesting date and total vegetation duration for the French cultivars reached 130–132 days, indicating their classification as late-maturing types.

Vegetation period of Romanesco cauliflower cultivar samples (2025)

Table 1

Cultivar samples	Origin	Head	Technical	Harvesting day	Vegetation

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		formation onset day	maturity		duration, days
Veronika	Russia	118	125	127	127
Shennon	Russia	100	120	120	120
Jemchujina	Russia	110	122	125	125
Zelyonaya Grozd	Russia	105	120	120	120
Romanesco Natalino	France	120	125	132	130
Romanesco Rase Campidiglio	France	120	125	130	130

When analyzing the total duration of the growing period, the shortest vegetation period among the Russian cultivars was observed in Shennon and Zelyonaya Grozd (120 days). These cultivars are therefore suitable for intensive cultivation technologies and conditions requiring rapid production within a short timeframe. The longest growing period was recorded in the Romanesco Natalino cultivar, exceeding 130 days.

The results confirmed that the origin of Romanesco cauliflower cultivars directly influences their phenological development. Russian cultivars are distinguished by their relatively early to mid-season maturity, whereas French cultivars are characterized by late maturity and a prolonged vegetation period. These findings are of significant scientific and practical importance for selecting cultivars adapted to specific agro-climatic conditions and ensuring high and stable yields.

Biometric measurement results of different Romanesco cauliflower cultivar samples (2025)

Table 2

Cultivar samples	Seedling period	Head formation onset	Preharvest
	piece	piece	piece
Veronika	4	20	20
Shennon	4	24	24
Jemchujina	3	25	25
Zelyonaya Grozd	4	25	25
Romanesco Natalino	4	23	23
Romanesco Rase Campidiglio	3	21	21

To determine the growth and developmental rate of Romanesco cauliflower cultivars, measurements were taken of the length and width of fully expanded leaves at different growth stages (after seedling establishment, at the onset of head formation, and prior to harvest). Leaf surface area per leaf (dm^2) was also calculated.

At the seedling establishment stage, leaf length ranged from 5–7 cm, while leaf width ranged from 2–3 cm. The longest leaf was recorded in the Veronika cultivar, reaching 7 cm at this stage. In contrast, Zelyonaya Grozd and Romanesco Rase Campidiglio showed relatively smaller measurements (5 cm). These differences indicate that the initial growth rates of the cultivars are closely related to their genetic characteristics.

At the onset of head formation, leaf length increased sharply across all cultivars, reaching 45–50 cm. Leaf width varied within the range of 13–17 cm. The Zelyonaya Grozd cultivar exhibited the

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greatest leaf width (17 cm), indicating a wider leaf blade in this variety. In contrast, the Shennon cultivar had the smallest leaf width (13 cm).

Biometric measurement results of different Romanesco cauliflower cultivar samples (2025)

Table 3

Cultivar samples	Seedling establishment, cm		Onset of head formation, cm		Prior to harvesting, cm		Leaf surface area per leaf
	Leaf length	Leaf width	Leaf length	Leaf width	Leaf length	Leaf width	dm^2
Veronika	7	2	50	15	50	15	60
Shennon	6	3	45	13	45	15	68
Jemchujina	6	2	50	15	55	16	70
Zelyonaya Grozd	5	2	48	17	50	17	55
Romanesco Natalino	6	2	45	15	45	15	60
Romanesco Rase Campidiglio	5	3	45	15	45	15	62

At the pre-harvest stage, both leaf length and width reached their maximum values. In particular, the Jemchujina cultivar demonstrated vigorous vegetative growth, with a leaf length of 55 cm and a leaf width of 16 cm. Although the leaf length in the Veronika and Zelyonaya Grozd cultivars remained around 50 cm, their leaf width was comparatively greater, creating favorable conditions for enhanced photosynthetic activity.

Analysis of the leaf surface area per leaf revealed significant differences among the cultivars. The largest leaf area was recorded in the Jemchujina cultivar, reaching 70 dm^2. It was followed by Shennon (68 dm^2) and Romanesco Rase Campidiglio (62 dm^2). The smallest leaf area was observed in the Zelyonaya Grozd cultivar (55 dm^2). A larger leaf surface area enhances the plant's photosynthetic capacity and positively influences head formation, making it an important agronomic trait. These findings demonstrate that vegetative organs of Romanesco cauliflower cultivars develop differently across phenological stages. In particular, the Jemchujina and Shennon cultivars stood out due to their larger leaf areas, indicating higher photosynthetic potential. This scientific analysis is of considerable significance for planning agronomic practices, developing intensive cultivation technologies, and achieving high productivity.

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