

# Introduction of New Raspberry Varieties Under Meadow-Bog Soil Conditions in the Andijan Region

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**Abstract:** Raspberry (*Rubus idaeus* L.) is a valuable berry crop rich in vitamins, organic acids and polyphenolic antioxidants, yet its cultivation in the Fergana Valley of Uzbekistan remains poorly studied. This article presents the results of the first year (2025–2026) of a study on the introduction of seven raspberry cultivars of Italian, American, Dutch, Polish and Russian origin under the meadow-bog soil conditions of the Andijan region. The cultivars Violet, Margarita, Maravilla, Mapema, Lyachka, Avgustina and Vladimir were planted on November 11, 2025, at a 200 × 50 cm spacing (10,000 plants/ha) with drip irrigation, following pre-plant application of 10 t/ha of organic manure, 150 kg/ha of phosphorus and 50 kg/ha of potassium fertilizers and two nitrogen top-dressings. Phenological observations were carried out according to the standard methodology for variety evaluation of fruit and berry crops. Shoot emergence reached 90% in March–April 2026, flowering began on May 5, and the first ripe fruits were recorded from June 2 (Lyachka) to September 28 (Violet), giving a first-harvest window of almost four months. On this basis, the cultivars were grouped into early-ripening (Lyachka, Margarita, Vladimir, Avgustina), mid-season (Maravilla, Mapema) and late-ripening (Violet) groups. When summer air temperatures exceeded 30 °C, the Russian-bred cultivars showed high plant mortality, whereas cultivars from Italy, the USA and the Netherlands showed better heat and disease tolerance and stronger growth. The cultivars Maravilla, Margarita, Violet and Mapema are preliminarily recommended for further testing and cultivation in the Andijan region; multi-year trials with yield measurements are required to confirm these findings.

**Keywords:** raspberry, *Rubus idaeus*, cultivar introduction, phenology, ripening period, heat tolerance, meadow-bog soil, drip irrigation, Andijan region

## Introduction

Strengthening public health, ensuring healthy nutrition and making effective use of natural, vitamin-rich products are of great importance today. Among berry crops, raspberry holds a special place due to its taste, medicinal properties and richness in biologically active substances. Berries, including raspberries, are an important dietary source of phenolic compounds with high antioxidant

activity [1]. Red raspberry polyphenols, primarily anthocyanins and ellagitannins, have been linked to cardiometabolic and neuronal health benefits [2]. Ellagitannins are the main contributors to the antioxidant capacity of red raspberry fruit and are associated with vasorelaxation properties [3]. Raspberry phenolic compounds also show anti-inflammatory and cytotoxic activity [4]. Owing to these properties, raspberry is widely cultivated and used both as a fresh fruit and as a raw material for processing [5].

In Uzbekistan, the scientific basis of fruit growing has been described in detail [6], and the technology of fruit and grape production has been developed for the country's conditions [7]. Specific cultivation practices for berry crops have also been proposed [8]. However, the assortment of raspberry cultivars in the republic is limited, and their performance on the meadow-bog soils of the Fergana Valley, where summer temperatures regularly exceed 30 °C, has not been studied.

Modern breeding programmes are producing new raspberry cultivars with improved fruit quality, yield and resistance to pests and diseases [9]. Nevertheless, the morphological, chemical and sensory characteristics of cultivars vary considerably when they are grown outside their region of origin [10], so each cultivar must be tested locally before it is recommended for production. The aim of this study was to evaluate the growth, development and ripening times of new raspberry cultivars introduced to the meadow-bog soil conditions of the Andijan region and to identify the cultivars best suited to local conditions.

## Materials and Methods

The study was conducted in 2025–2026 on a small experimental plot of the Andijan Institute of Agriculture and Agrotechnologies by the staff and master's students of the Department of Crop Breeding, Seed Production and Medicinal Plant Cultivation. The soil of the experimental plot is meadow-bog.

Seven raspberry cultivars were studied (Table 1). In November 2025, the cultivars Maravilla, Margarita, Violet and Lyachka were brought from the Aksy District of the Kyrgyz Republic, and the cultivars Avgustina and Vladimir were obtained from the Fergana District of the Fergana region. The cultivar Mapema was also included in the study.

**Table 1.** Characteristics of the raspberry cultivars studied

| № | Cultivar         | Country of origin | Originator                      | Fruit weight, g* | Source of planting material      |
|---|------------------|-------------------|---------------------------------|------------------|----------------------------------|
| 1 | Violet (Vajolet) | Italy             | Sant Orsola, breeder Aldo Telch | 6–8              | Aksy District, Kyrgyz Republic   |
| 2 | Margarita        | USA               | —                               | 5                | Aksy District, Kyrgyz Republic   |
| 3 | Maravilla        | USA (California)  | Cassin Ranch                    | 5                | Aksy District, Kyrgyz Republic   |
| 4 | Mapema           | Netherlands       | Advanced Berry Breeding         | 6                | —                                |
| 5 | Lyachka (Laszka) | Poland            | —                               | —                | Aksy District, Kyrgyz Republic   |
| 6 | Avgustina        | Russia            | —                               | —                | Fergana District, Fergana region |
| 7 | Vladimir         | Russia            | —                               | —                | Fergana District, Fergana region |

\* According to the originators' descriptions; fruit weight was not measured in this study. "—" – no data.

Before planting, 10 t/ha of decomposed organic manure, 150 kg/ha of phosphorus and 50 kg/ha of potassium fertilizers were applied, and primary tillage (plowing) was carried out on October 18, 2025. The field was leveled on November 2, 2025, and the cultivars were planted on November 11, 2025, using a 200 × 50 cm scheme, which corresponds to a density of 10,000 plants per hectare. Drip irrigation lines were installed immediately after planting. During the growing season, nitrogen fertilizer was applied twice, on April 14 and June 20, 2026.

Phenological observations of shoot emergence, growth and development, branching, flowering and fruit ripening were carried out throughout the year in accordance with the programme and methodology for variety evaluation of fruit, berry and nut crops [11]. The field experiment was set up and the data were recorded following the general principles of field experimentation [12]. The ripening group of each cultivar was determined by the date on which its first ripe fruits appeared, and the number of days from the onset of flowering in the plantation to first ripening was calculated.

## Results

In early spring (March–April 2026), 90% of the planted raspberry plants produced shoots. Flowering in the plantation began on May 5, 2026. The dates of first fruit ripening differed considerably among the cultivars (Table 2).

**Table 2.** Ripening dates and ripening groups of the raspberry cultivars, 2026

| № | Cultivar         | Country of origin | First ripe fruit, 2026 | Days after onset of flowering** | Ripening group |
|---|------------------|-------------------|------------------------|---------------------------------|----------------|
| 1 | Lyachka (Laszka) | Poland            | June 2                 | 28                              | Early          |
| 2 | Margarita        | USA               | June 10                | 36                              | Early          |
| 3 | Vladimir         | Russia            | June 10                | 36                              | Early          |
| 4 | Avgustina        | Russia            | June 10                | 36                              | Early          |
| 5 | Maravilla        | USA               | June 25                | 51                              | Mid-season     |
| 6 | Mapema           | Netherlands       | June 25                | 51                              | Mid-season     |
| 7 | Violet (Vajolet) | Italy             | September 28           | 146                             | Late           |

\*\* Counted from the onset of flowering in the plantation (May 5, 2026).

The cultivar Lyachka was the first to ripen: its first fruits matured on June 2, 28 days after the onset of flowering. The first fruits of Margarita, Vladimir and Avgustina ripened on June 10, and those of Maravilla and Mapema on June 25. The cultivar Violet ripened much later, on September 28, 146 days after the onset of flowering. Thus, among the studied cultivars, Lyachka, Margarita, Vladimir and Avgustina belong to the early-ripening group, Maravilla and Mapema to the mid-season group, and Violet to the late-ripening group. Taken together, the cultivars provide a first-harvest window of almost four months, from early June to the end of September.

Observations of growth and development showed clear differences in tolerance to local climatic conditions. When summer air temperatures exceeded 30 °C, the Russian-bred cultivars suffered high plant mortality. In contrast, the cultivars bred in Italy, the USA and the Netherlands (Violet, Margarita, Maravilla and Mapema) showed greater resistance to heat and diseases and better growth and development than the Russian-bred cultivars Avgustina and Vladimir.

## Discussion

The large differences in ripening time among the cultivars reflect differences in their fruiting type. Annual-fruiting (primocane) raspberries can initiate flowers under the high temperatures and long days of summer and flower in the same year, whereas biennial-fruiting (floricane) cultivars require low temperatures or short days and a period of dormancy [13]. In primocane-fruiting raspberries, flower buds differentiate in July, while in floricane-fruiting types differentiation occurs in October [14]. The autumn ripening of Violet (September 28) is consistent with annual fruiting, while the early-summer ripening of Lyachka corresponds to the floricane type; in Poland, Laszka is evaluated as a floricane red raspberry cultivar [15].

The poor survival of the Russian-bred cultivars at temperatures above 30 °C is consistent with the known temperature requirements of biennial-fruiting raspberries: in the cultivar Glen Ample, for example, neither flowering nor dormancy was induced at temperatures above 15 °C [16]. Low-temperature conditions at the first stage of development also affect red raspberry genotypes differently [17]. Heat tolerance in *Rubus* is genotype-dependent, and some progenies outperform their parents in tolerance tests, with tolerance related to plant vigor and berry weight [18]. This supports our observation that cultivars from warmer breeding environments (Italy, the USA and the Netherlands) adapted better to the hot summers of the Andijan region. In addition, biostimulants containing glycine betaine or kelp extract have been shown to alleviate heat stress in red raspberry by protecting photosynthesis and antioxidant capacity, although their effect depends on the genotype [19]; such treatments may be tested in future experiments under local conditions.

The results should be considered preliminary. They were obtained in the first year after planting, when plants are still becoming established, and yield, fruit weight and the share of dead plants were not measured quantitatively. Multi-year trials with replicated plots, yield records, fruit quality analysis and statistical processing of the data are required to confirm the suitability of the cultivars for the Andijan region.

## Conclusion

The first year of introducing seven raspberry cultivars to the meadow-bog soil conditions of the Andijan region showed that shoot emergence reached 90% and that the cultivars differ considerably in ripening time: Lyachka, Margarita, Vladimir and Avgustina are early-ripening, Maravilla and Mapema are mid-season, and Violet is late-ripening. Together they provide a first-harvest window of almost four months, from June 2 to September 28. The Russian-bred cultivars Avgustina and Vladimir were damaged by summer temperatures above 30 °C, whereas the cultivars of Italian, American and Dutch origin showed better heat and disease tolerance and stronger growth.

Based on their heat and disease tolerance and good growth, the cultivars Maravilla, Margarita, Violet and Mapema are recommended for further testing and cultivation in the Andijan region. Combining early-, mid- and late-ripening cultivars will make it possible to extend the raspberry harvest season. Future research will focus on yield, fruit quality and heat-stress mitigation under the conditions of the region.

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