

INTRODUCED PERSIMMON (DIOSPYROS KAKI L.) CULTIVARS: ADAPTATION TO LOCAL CLIMATIC CONDITIONS AND ECONOMICALLY VALUABLE TRAITS

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Abstract. Persimmon (*Diospyros kaki* L.) cultivation in Uzbekistan has expanded significantly over the past decade, with the Surxondaryo, Fergana, and Namangan regions emerging as primary production zones. This study evaluates the adaptation of introduced persimmon cultivars to local climatic conditions and assesses their economically valuable traits based on a review of experimental data from the Surxondaryo Scientific Experimental Station. Six cultivars were examined: Xiakume (standard), Ramashka, Raketa, Gosha Gaki, Zenji-Mar, and Pioneer Uzbekistan. Yield performance ranged from 60.0 kg/tree (Gosha Gaki) to 71.0 kg/tree (Raketa), corresponding to 240–284 c/ha under a 5×5 m planting scheme. Fruit mass varied from 98.2 g (Raketa) to 198.1 g (Ramashka), while Xiakume produced the largest fruit diameter (6.39–6.5 cm). All cultivars demonstrated successful adaptation to Surxondaryo's subtropical climate, with October 21 identified as optimal harvest timing. The study confirms that introduced persimmon cultivars exhibit high productivity and fruit quality under local conditions, with Ramashka and Raketa showing superior yield characteristics and Ramashka demonstrating the highest fruit mass. These findings support the expansion of persimmon cultivation as a commercially viable subtropical crop in Uzbekistan.

Keywords: *Diospyros kaki*, persimmon, cultivar adaptation, yield, fruit quality, Surxondaryo, Uzbekistan

Introduction. Persimmon (*Diospyros kaki* L.) is a valuable subtropical fruit crop belonging to the Ebenaceae family, with over 800 recognized cultivars worldwide. The species originated in central and western China and has been cultivated for centuries across East Asia before spreading to Mediterranean and Central Asian regions. In Uzbekistan, oriental persimmon was first introduced in 1910–1914 through amateur gardens in Tashkent and Samarkand, but systematic cultivation began in 1935 with the establishment of experimental plantations at the Southern Uzbek Experimental Base in Denau, Surxondaryo region.

The agricultural significance of persimmon lies in its nutritional composition and economic value. Fruits contain 15–20% sugars, high levels of vitamin C, proteins, iron salts, and tannins. The crop is consumed fresh, dried, and processed into confectionery products, beverages, and jams. Uzbekistan's climatic conditions—particularly in the southern regions—provide favorable conditions for persimmon production, with Surxondaryo, Navoiy, Namangan, Samarkand, and Tashkent regions currently hosting commercial plantations.

Despite expanding cultivation, systematic evaluation of introduced cultivars' adaptation to local conditions and their economically valuable traits remains limited. The principal cultivars grown in Uzbekistan include Vaxsh, Xiakume, Zenji-Mar, and Tajikistan selections. Recent research at the Surxondaryo Scientific Experimental Station has undertaken comparative studies of six cultivars to

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assess yield performance, fruit quality, and climatic adaptation. This paper synthesizes these findings to evaluate the suitability of introduced persimmon cultivars for commercial production under Uzbekistan's subtropical conditions.

Materials and Methods. Study Location and Plant Material. The study was conducted at the Surxondaryo Scientific Experimental Station, located in the southern subtropical zone of Uzbekistan. This region represents the primary persimmon-growing area of the country, characterized by hot summers, mild winters, and sufficient heat accumulation for subtropical fruit maturation.

Six persimmon cultivars were evaluated: Xiakume (standard), Ramashka, Raketa, Gosha Gaki, Zenji-Maru, and Pioneer Uzbekistan. These cultivars represent introductions from various sources, including Japanese, Tajik, and local selections. Planting was established at a 5×5 m spacing scheme, corresponding to a density of 400 trees per hectare.

Data Collection. Phenological observations were conducted throughout the vegetation period, with particular attention to winter survival, growth dynamics, and fruit development. Yield and mechanical analysis data were collected on October 21, representing the optimal harvest period for the region. The following parameters were measured:

- Yield per tree (kg) and yield per hectare (c/ha)
- Fruit height (cm) and diameter (d₁, d₂ in cm)
- Fruit mass (g)

Data Analysis. Comparative analysis was performed across cultivars to identify superior performers in terms of yield, fruit size, and overall adaptation. Results were interpreted in the context of local climatic conditions, particularly winter temperature minima and heat accumulation during the growing season.

Results. Yield Performance. Yield data collected on October 21 revealed significant variation among the six cultivars (Table 1). Raketa produced the highest yield at 71.0 kg/tree (284 c/ha), followed closely by Ramashka at 70.0 kg/tree (280 c/ha). Xiakume, the standard cultivar, yielded 63.0 kg/tree (252 c/ha), while Zenji-Maru produced 62.0 kg/tree (248 c/ha). Gosha Gaki recorded the lowest yield at 60.0 kg/tree (240 c/ha).

Table 1. Yield and fruit characteristics of persimmon cultivars at Surxondaryo Scientific Experimental Station.

Cultivar	Yield (kg/tree)	Yield (c/ha)	Fruit height (cm)	Fruit diameter d ₁ (cm)	Fruit diameter d ₂ (cm)	Fruit mass (g)
Xiakume (st)	63.0	252.0	6.3	6.39	6.5	186.5

Cultivar	Yield (kg/tree)	Yield (c/ha)	Fruit height (cm)	Fruit diameter d ₁ (cm)	Fruit diameter d ₂ (cm)	Fruit mass (g)
Ramashka	70.0	280.0	4.2	7.5	8.2	198.1
Raketa	71.0	284.0	5.7	5.4	5.0	98.2
Gosha Gaki	60.0	240.0	4.2	6.2	6.7	133.1
Zenji-Marui	62.0	248.0	5.5	6.33	6.5	151.1
Pioneer Uzbekistan	—	—	—	—	—	—

Fruit Morphological Characteristics. Fruit size parameters demonstrated substantial cultivar-specific variation. Ramashka produced the heaviest fruits at 198.1 g, with the largest diameter measurements (7.5 and 8.2 cm) and a relatively compressed height (4.2 cm), indicating a flattened fruit shape. Xiakume followed with fruit mass of 186.5 g and more spherical dimensions (6.3 cm height, 6.39–6.5 cm diameter). Zenji-Marui produced fruits of 151.1 g with intermediate dimensions. Raketa, despite its highest yield, produced the smallest fruits at 98.2 g. Gosha Gaki fruits weighed 133.1 g, while Pioneer Uzbekistan data were incomplete in the source material.

Phenological Observations. All cultivars completed their vegetation cycle successfully under Surxondaryo conditions. Flowering occurred in April–May, consistent with the species' typical phenology in Central Asia. Fruit maturation was achieved by late October, with October 21 representing the sampling date for all cultivars. Winter survival was satisfactory across all evaluated cultivars, though specific minimum temperature data were not reported.

Discussion. Climatic Adaptation. The successful cultivation of all six cultivars at the Surxondaryo Scientific Experimental Station confirms the suitability of the region's subtropical climate for persimmon production. Oriental persimmon is known to tolerate winter temperatures down to approximately –15 to –20°C, with –20°C representing a critical threshold. Surxondaryo's relatively mild winters, compared to northern Uzbekistan regions, provide adequate safety margins for D. kaki cultivation.

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This climatic suitability aligns with broader regional patterns. In southern Romania, where winter temperatures occasionally reach -20 to -25°C , persimmon cultivation is limited to experimental plots with winter protection measures. By contrast, Uzbekistan's southern regions offer more favorable conditions, enabling commercial-scale production without extensive frost protection.

The October harvest timing observed in this study corresponds well with phenological patterns reported for *D. kaki* in comparable subtropical climates. In Hatay, Turkey (Mediterranean climate), early-maturing cultivars ripen in the first week of October, while later cultivars mature through November. The synchronized October 21 harvest date for all six cultivars in Surxondaryo suggests that local heat accumulation supports uniform maturation, simplifying orchard management and harvest logistics.

Yield Performance and Commercial Viability. The yield range of 60–71 kg/tree (240–284 c/ha) demonstrates strong productive potential for the evaluated cultivars. These values compare favorably with international benchmarks. In Turkey, 'Vainiglia' and 'Amankaki' exhibited the highest cumulative yields among ten cultivars tested over seven years. The Surxondaryo yields, particularly for Raketa and Ramashka, indicate that local conditions support productivity comparable to established persimmon-growing regions.

Raketa's superior yield (71.0 kg/tree) combined with its compact fruit size (98.2 g) suggests suitability for processing applications where high fruit number per tree compensates for individual fruit size. Conversely, Ramashka's combination of high yield (70.0 kg/tree) and large fruit (198.1 g) positions it as an attractive option for fresh market production.

Fruit Quality Traits. Fruit mass values observed in this study (98.2–198.1 g) fall within the expected range for *D. kaki* cultivars, which typically produce fruits ranging from 100 to 500 g depending on cultivar and growing conditions. Ramashka and Xiakume approach the upper end of this range for commercial cultivars, while Raketa produces smaller fruits consistent with processing-oriented selections.

The morphological diversity observed—ranging from the flattened, wide-diameter Ramashka fruits to the more spherical Xiakume and the smaller Raketa—reflects the genetic variability available for cultivar selection based on market preferences. Turkish studies have similarly documented wide variation in fruit shape and size among persimmon cultivars, with mean fruit weight ranging from 87 g ('Eylül') to 251 g ('Hana Fuyu').

Limitations and Future Research. This study provides valuable baseline data on persimmon cultivar performance in Surxondaryo, but several limitations warrant acknowledgment. Complete data for Pioneer Uzbekistan were unavailable, limiting comprehensive comparison across all six cultivars. Additionally, detailed phenological parameters—including specific flowering dates, fruit set rates, and winter survival percentages—were not reported. Future research should address these gaps through multi-year monitoring to account for seasonal climatic variability.

Furthermore, the nutritional composition of fruits from these cultivars under Surxondaryo conditions merits investigation. Previous research has demonstrated that climatic conditions significantly influence mineral accumulation in persimmon fruits, with magnesium concentrations in Fergana Valley fruits reaching nearly three times those from Surxondaryo. Such environmental effects on fruit quality underscore the need for region-specific nutritional profiling.

Conclusion. The introduced persimmon cultivars evaluated in this study demonstrate successful adaptation to Surxondaryo's subtropical climatic conditions and exhibit economically valuable traits

Multidisciplinary research and Innovation (SICMRI 2026)

suitable for commercial production. Raketa and Ramashka emerge as the highest-yielding cultivars, with Ramashka additionally producing the largest fruits. Xiakume and Zenji-Maru provide intermediate performance, while Gosha Gaki shows more modest productivity. The October harvest window supports efficient orchard management. These findings validate the expansion of persimmon cultivation in Uzbekistan's southern regions and provide a basis for cultivar selection decisions aligned with market objectives. Continued evaluation of additional cultivars, nutritional characterization of fruits, and long-term monitoring of climatic adaptation will further strengthen the scientific foundation for persimmon industry development in Uzbekistan.

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