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Morphological variations among pomegranate varieties: A comparative study of Bhagwa, double flower, and nana cultivars

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Abstract

Pomegranate (*Punica granatum* L.) is a widely cultivated and cherished fruit with various cultivars displaying distinct morphological characteristics. Among the diverse pomegranate varieties, Bhagwa, Double Flower, and Nana cultivars have gained attention for their unique traits and popularity in different regions. This comparative study aims to explore the morphological variations among these three prominent pomegranate varieties, shedding light on their distinctive features and potential implications for cultivation and marketing. Plant height (2.92, 2.12 and 0.57 m), thorn number/shoot length (14, 0 and 3.6), leaf length (5.41, 4.78 and 1.75 cm), leaf width (1.53, 1.37 and 0.69 cm), petiole length (0.58, 0.47 and 0.40 cm), fruit weight (199.70, 141.40 and 58.72 g), fruit length (7.52, 6.42 and 3.52 cm), fruit width (7.23, 6.26 and 3.21 cm), peel thickness (1.72, 2.45 and 1.82 mm), seed hardness (4.40, 9.72 and 11.50 N/mm) and yield (8.0, 7.2, 1.8 kg/plant) were observed in Bhagwa, Double Flower and Nana respectively.

Keywords: Pomegranate, morphological characterization, DUS

Introduction

Pomegranate is a high value horticultural crop of subtropical and tropical regions of the world, cultivated in Iran, India, Spain, Afghanistan and South Africa. It belongs to the family Punicaceae and has a diploid chromosome number $2n = 16$ or 18 . It is native to Iran. It is one of the oldest well-known edible fruit (Damania, 2005) ^[4] and highly prized for its nutritional and medicinal properties. A large variability exists in pomegranate fruit and plant characteristics due to heterozygosity nature, cross pollination and seed propagation. Morphological characterization has usually been done for the assessment of pomegranate germplasm, and is a vital step before the commencement of any molecular study. Comprehension of pomology is important for the biodiversity assessment, genetic resources preservation and proper genotype selection with desirable traits and future breeding planning (Zarei, 2017) ^[12]. Therefore, evaluating pomegranate progenies from breeding populations for improved horticultural traits remains a high priority as it is eco-friendly and cost effective. Thus, the present study is focused for diversity at morphological level based on DUS (Distinctiveness, Uniformity and Stability) characters depicted by PPV&FRA, 2001, which showed wide range of variation.

Materials and Methods

The research project was conducted using three distinct pomegranate cultivars: Bhagwa, Double Flower, and Nana. The quantitative evaluation of these genotypes included an assessment of their yield and yield-related characteristics, following the DUS (Distinctness, Uniformity, and Stability) guidelines.

Results and Discussion

Bhagwa, Double Flower, and Nana exhibited variations in several plant characteristics. Plant height was recorded at 2.57 m, 1.98 m, and 0.57 m, respectively. Thorn number per shoot length was observed at 7.5, 0, and 3.5. Leaf length displayed values of 4.75 cm, 3.93 cm, and 1.81 cm. Leaf width measurements were 1.39 cm, 1.31 cm, and 0.72 cm. Petiole length varied with values of 3.1 mm, 3.95 mm, and 1.64 mm. The leaf morphology closely resembled the findings of Parashuram *et al.* (2018) ^[10], Kadam *et al.* (2018) ^[6] and Aziz *et al.* (2023) ^[2].

The diversity in leaf characteristics could be attributed to varietal traits and genetic composition (Pandey *et al.*, 1997) [9].

Fruit weight was recorded at 187.62 g, 141.41 g, and 58.63 g. Fruit length exhibited values of 7.43 cm, 6.34 cm, and 0.62 cm. Fruit width showed measurements of 7.35 cm, 6.32 cm, and 0.51 cm. Peel thickness varied with values of 1.72 mm, 2.45 mm, and 1.82 mm. Seed hardness was measured at 4.6 N/mm, 9.82 N/mm, and 11.03 N/mm in Bhagwa, Double Flower, and Nana, respectively. These findings are in agreement with Khadivi *et al.* (2020) [8], Ashrafi *et al.* (2023) [1], Cirillo *et al.* (2022) [3] and Khadivi *et al.* (2023) [7] in pomegranate. The fruit yield was recorded maximum in bhagwa (8.0 kg/plant) followed by Double flower (7.2 kg/plant) and Nana (1.8 kg/plant).

Ultimately, the significant variations in growth and yield may be attributed to varietal characteristics, the genetic makeup of

the plants, and the adaptability of these varieties to different climatic conditions (Ghosh *et al.*, 2013) [5].

Table 1: Mean values of morphological characters of pomegranate cultivars

S. No	Parameters	Bhagwa	Double Flower	Nana
1	Plant height(m)	2.92	2.12	0.57
2	Thorn number/shoot length	14	0	3.6
3	Leaf length (cm)	5.41	4.78	1.75
4	Leaf width (cm)	1.53	1.37	0.69
5	Petiole length (cm)	0.58	0.47	0.40
6	Fruit weight (g)	199.70	141.40	58.72
7	Fruit length (cm)	7.52	6.42	3.52
8	Fruit width (cm)	7.23	6.26	3.21
9	Peel thickness (mm)	1.72	2.45	1.82
10	Seed hardness (N/mm)	4.40	9.7	11.50
11	Yield (Kg/plant)	8.0	7.2	1.8

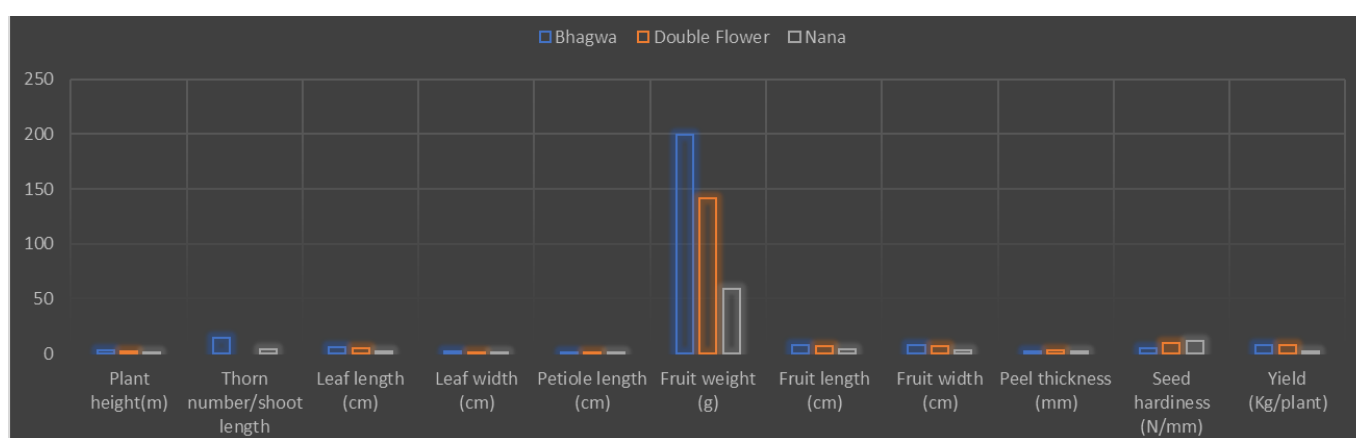


Fig 1: Variation in morphological characters

Conclusion

The comparative study of morphological variations among Bhagwa, Double Flower, and Nana pomegranate cultivars sheds light on the unique characteristics that define each variety. Such insights can be invaluable for pomegranate growers, researchers, and horticulturists, aiding in the cultivation of distinct varieties and the development of targeted marketing strategies. The diversity within pomegranate cultivars not only enriches the world of horticulture but also offers options for consumers seeking unique flavors, appearances, and ornamental qualities in this beloved fruit.

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