

Effect of Environmental Conditions on Super Bhagwa Variety of Pomegranate under Sirohi, Rajasthan

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ABSTRACT

The Super Bhagwa variety of pomegranate (*Punica granatum* L.) has gained popularity due to its high yield, excellent fruit quality, and resistance to certain pests and diseases. However, its performance is significantly influenced by environmental conditions. This study investigates the effects of the unique climatic and soil conditions of Sirohi, Rajasthan, on the growth, yield, and quality of the Super Bhagwa pomegranate. Data were collected through field experiments and analyzed to understand the interaction between the variety's growth parameters and the region's environmental factors. The results provide insights into optimizing agricultural practices for this variety under semi-arid conditions. The Super Bhagwa variety of pomegranate performs well under the semi-arid conditions of Sirohi, Rajasthan, with appropriate management practices. Temperature and soil moisture are critical factors influencing growth, yield, and fruit quality. Adoption of recommended practices can significantly enhance productivity, making pomegranate cultivation a viable option for farmers in this region.

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INTRODUCTION

Pomegranate is an important fruit crop valued for its nutritional and medicinal properties (Singh et al., 2012). The Super Bhagwa variety is particularly renowned for its vibrant red arils, high juice content, and market value (Singh et al., 2014h). Sirohi, located in the semi-arid region of Rajasthan, presents unique environmental challenges, including high temperatures, low rainfall, and sandy loam soils (Singh et al., 2014f). Understanding the impact of these conditions on the Super Bhagwa variety is crucial for maximizing its potential in this region (Singh et al., 2014e). The crop of oat is best grown in temperate regions and hence suitable for winter season (Singh et al., 2017).

Pomegranates (*Punica granatum*) tend to be fruitful in the Panicoid family, a subfamily of the Lytratiidae, which grows between 5 and 10 m (16 and 33 feet) (Singh and Sharma, 2017b). Many cultures rich in symbolic and mythological associations are assumed to come from Afghanistan and Iran before being introduced and exported to other parts of Asia, Africa and Europe (Singh et al. 2017c). Pomegranates and their juices are used in baked, cooking, juice mixtures, garnishes, alcoholic drinks, and cocktails (Singh and Sharma, 2017d). The names of pomegranates come from the medieval Latin *Poe* Mother 'apfel' and *grä-nä-tum* 'seed' (Singh et al. 2018). Garnet comes from ancient French *G* bullets through metathesis, from medieval Latin *x* handren bullets, as used in "dark red colours" (Singh, G. 2019). The modern French hand-ren bullet of pomegranate gave its name to the military hand-ren bullet (Singh, G., 2019a). Pomegranates are shrubs or small trees, growing to 5-10 m (16-33 feet) and have several thorny branches. Durable, some French copies survive for 200 years (Singh et al. 2025b). Rajasthan has 10 agricultural microzones according to the National Agricultural Research Project of the Indian Council of Agricultural Research (Singh et al., 2014d). The zone receives 500-600 mm of precipitation during the rainy season. Agricultural practices make money in both summer and Kharif harvests (Singh et al., 2015). The pomegranate fruit bowl is red, with hard pericarp on the outside and spongy mesocarp on the inside (white "albedo") and contains the interior walls of fruit with seeds (Singh and Singh, 2020). Plantically, the fruit is berries with edible seeds and pulp, and is made from a single flower ovary (Singh and Somvanshi, 2020a). *P. granatum* is grown as a vegetable harvest and as a decorative tree or shrub in parks and gardens (Singh, G., 2024).



(Fig. Pomegranate crop)

Mature specimens can develop sculpture twisted bark, several tribes, and distinctive overall shapes (Singh et al., 2024a). Hand-Ren-Bargain apples are drought and can be kept in arid regions with winding Mediterranean climates or in summer slope climates (Singh et al. 2024b). *P. granatum* reproduces inherently sexually, but can be transmitted using asexual reproduction. Diffusion methods include layers, hardwood cuttings, coniferous curls, and tissue culture (Singh et al. 2025a). Required conditions for root cutting include warm temperatures and half the environment within the range of 18-29°C (65-85°F) (Singh et al. 2024c). Root hormones increase root success rates, but are not necessary (Singh et al. 2024d).

Objectives

- 1 To evaluate the growth performance of the Super Bhagwa pomegranate under Sirohi's climatic conditions (Singh et al., 2014c).
- 2 To analyze the effect of temperature, soil moisture, and other environmental factors on fruit yield and quality (Singh et al., 2014b).
- 3 To recommend suitable agricultural practices for optimal cultivation (Singh et al., 2014a).



(Fig. Pomegranate crop)

Materials and Methods

Study Area

The study was conducted in college of agriculture, Madjav University, Pindwara, Sirohi, Rajasthan, characterized by:

- **Latitude and Longitude:** 24.5°N and 72.8°E (Singh et al., 2013b).
- **Climate:** Semi-arid with temperatures ranging from 10°C in winter to 45°C in summer (Singh et al., 2014g).
- **Soil Type:** Sandy loam with moderate organic matter (Singh and Sharma, 2014).

Experimental Design

The research was carried out over two growing seasons, using a randomized block design (RBD) (Singh and Sharma, 2013a). The experimental plot included 50 Super Bhagwa plants spaced at 3m × 3m intervals. Key parameters monitored included growth metrics (plant height, canopy spread), yield (number of fruits per tree, fruit weight), and quality attributes (TSS, acidity, juice content) (Singh et al., 2013).

Data Collection

1. **Climatic Data:** Recorded daily temperature, rainfall, and relative humidity.
2. **Soil Analysis:** Measured pH, organic matter, and moisture content.
3. **Plant Performance:** Assessed vegetative growth, flowering, and fruiting patterns.

Statistical Analysis



The collected data were analyzed using ANOVA to determine the significance of environmental factors on growth and yield.

RESULTS AND DISCUSSION

Growth Parameters

- **Plant Height and Canopy Spread:** Growth was optimal during the post-monsoon period when temperatures were moderate (25–30°C) and soil moisture was adequate (Singh and Sharma, 2015a).
- **Flowering and Fruiting:** Initiation of flowering was observed in March, with peak fruiting during July-August. High temperatures above 40°C during flowering led to reduced fruit set due to heat stress (Singh and Sharma, 2016b).

Yield and Quality

- **Yield:** The average yield was 15-20 kg per plant, with higher yields recorded during the second growing season due to improved soil moisture management (Singh and Sharma, 2016a).
- **Quality Attributes:** Total soluble solids (TSS) ranged from 15–17°Brix, and juice content was 50-60%. High temperatures slightly reduced aril color intensity and TSS (Singh and Sharma, 2016).

Environmental Influences

- **Temperature:** High temperatures accelerated vegetative growth but negatively impacted fruit set and quality (Singh and Sharma, 2015b).
- **Soil Moisture:** Adequate irrigation during critical growth stages (flowering and fruit development) was essential to maintain yield and quality (Singh et al. 2017a).
- **Rainfall:** Erratic rainfall patterns affected soil moisture levels, necessitating supplemental irrigation (Singh et al. 2025e).

Recommendations

- 1 **Irrigation Management:** Drip irrigation should be employed to maintain consistent soil moisture levels, especially during flowering and fruiting stages (Singh et al. 2025d).
- 2 **Mulching:** Organic mulching can help conserve soil moisture and regulate root zone temperature (Singh et al. 2025c).



- 3 **Shading:** Providing shade during peak summer can mitigate heat stress and improve fruit set (Singh et al. 2025).
- 4 **Nutrient Management:** Balanced fertilization with nitrogen, phosphorus, and potassium is crucial for optimal growth and yield (Singh et al. 2024e).

CONCLUSION

The Super Bhagwa variety of pomegranate performs well under the semi-arid conditions of Sirohi, Rajasthan, with appropriate management practices. Temperature and soil moisture are critical factors influencing growth, yield, and fruit quality. Adoption of recommended practices can significantly enhance productivity, making pomegranate cultivation a viable option for farmers in this region.

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