

Pusa Shakti (DT-19): Promising tomato variety for summer cultivation and long-distance transport

Pusa Shakti (DT-19) is a newly developed indeterminate tomato variety from ICAR-IARI, Pusa, New Delhi, identified for release during the 42nd AICRP-VC Group Meeting (2024) for Zone V and notified vide S.O. 4917(E), dated 13 November 2024. It is tolerant to high temperatures, suitable for cultivation from October to May under open-field conditions. Fruits are round, deep red, with thick pericarp (7.0 mm), average weight of 80 g, 4.8 °Brix TSS, and 6.0 mg/100 g lycopene. With an average yield of 352 q/ha and potential exceeding 450 q/ha, this variety offers extended summer fruiting and long-distance transportability, enhancing farmer profitability.

PUSA Shakti (DT-19) is a promising tomato variety developed by the Division of Vegetable Science, ICAR-Indian Agricultural Research Institute, Pusa, New Delhi. This variety is indeterminate and tolerant to high temperatures, making it suitable for cultivation from October to May under open-field conditions. The ripe fruits have a thick pericarp (7.0 mm), which makes them suitable for long-distance transportation. Fruits are round, deep red in colour, with an average fruit weight of 80 g. They contain 4.8 °Brix total soluble solids (TSS) and 6.0 mg/100 g lycopene content. The average yield is 352 q/ha, with a potential of more than 450 q/ha.

Development of this variety will benefit farmers by enabling long-distance transport of tomatoes and providing a longer fruiting duration during the summer season, thereby enhancing profitability.

PUSA SHAKTI (DT-19)

Package of practices

Climate: Tomato requires a relatively warm season for its growth and development. Ideal night and day temperatures for fruit set and colour development are 20–25 °C. Crop can tolerate a temperature range of 10–40 °C.

Soil: Well-drained sandy loam soil is ideal for a good crop. It prefers a pH range of 6.0–7.0.

Sowing time: Being a warm-season crop, tomato can be grown successfully from October to May under North Indian conditions. Under low-cost polyhouses or naturally ventilated structures, transplanting is done in the last week of September, and the crop may last up to April.

Seed rate: 300 g/ha.

Nursery raising: Nursery should be prepared in the first week of September, either in a polyhouse or an insect-proof net house. It should be raised on a soilless medium consisting of cocopeat, perlite, and vermiculite to ensure the production of disease-free, healthy seedlings.

Nursery is ready for transplanting in 22–25 days after sowing, when seedlings reach a height of 10–12 cm and develop four true leaves. Prior to transplanting, the seedlings should undergo a hardening process by withholding irrigation for two days, followed by exposure

to outdoor conditions for 2–3 days. This practice strengthens the seedlings, significantly reduces transplanting shock, and ensures a better crop stand.

Transplanting:

Transplanting should be carried out on both sides of raised beds, 10 cm in height, with a row-to-row spacing of 0.75 m and a plant-to-plant spacing of 30 cm. The crop should



Fruits of tomato variety Pusa Shakti at maturity



Plant of tomato variety Pusa Shakti in fruiting stage

be cultivated under a drip irrigation system with mulch to ensure efficient utilization of water and nutrients.

Manure and fertilizers: Soil testing is essential to assess fertility and identify nutrient deficiencies, which should be corrected as required. About 20 tonnes ha of well-decomposed farmyard manure (FYM) should be incorporated during land preparation. Additionally, before transplanting, 60 kg each of nitrogen and phosphorus, along with 80 kg of potash ha, should be applied. A total of 120 kg of nitrogen should then be supplied in 2–3 split doses as top dressings: first, at 25–30 days after transplanting, second, at 50–60 days or during flowering, and third, if necessary, at 75 days after transplanting. Foliar spraying with a 1% urea solution is beneficial and should be done after each harvest. A 0.5% micronutrient solution, particularly calcium and boron, should also be applied at the initiation of flowering.

Irrigation: Maintaining proper soil moisture is crucial, especially during flowering and fruiting stages when water demand is high. In winter irrigation should

be provided every 8–10 days, while in summer, more frequent irrigation every 4 days is required, depending on weather conditions. To enhance water-use efficiency, drip irrigation is recommended, as it also facilitates fertigation. Mulching with straw or black polythene further conserves soil moisture and effectively controls weed growth.

Interculture: Weeds can significantly reduce tomato yield by competing for light, water, nutrients, and space, as well as serving as hosts for pests and diseases. To manage this, regular hoeing should be carried out as needed to suppress weed growth. Before transplanting and applying mulch, tomato beds should be treated with the pre-emergence herbicide pendimethalin at a concentration of 2 ml/l of water to effectively control weed emergence.

Training, pruning, and trellising: Staking is an essential practice for indeterminate tomato varieties to ensure high-quality fruits and higher yields. It should be initiated 20–25 days after transplanting. Plants should be gently tied to vertical stakes made from bamboo or plastic pegs. Support is provided using plastic wire or binder twine, loosely fastened at the plant base with a plastic clip and connected to overhead support wires running along the bed. Bamboo poles or plastic pipes, 5–6 feet in height, should be installed to hold the support system in place. After

the first harvest, lower leaves up to 30 cm (approximately 1 foot) from the ground should be removed, as this improves air circulation and reduces the risk of disease.

Harvesting: Harvesting generally begins 70–75 days after transplanting. Timing and stage of harvest depend on the intended use and transportation distance. For long-distance transport, tomatoes are picked at the mature green stage. For nearby markets, they are harvested at the pink stage, while fully ripe red tomatoes are harvested for processing purposes.

Average yield: Yield depends on climatic conditions and cultivation practices. In All India Coordinated Trials, the fruit yield was recorded at around 352 q/ha. However, under optimal conditions, the variety has an average yield potential of 450 q/ha.

Plant protection: Warm and humid conditions favour the development of pests and diseases. Common management practices include sanitation, soil solarization, mulching, and fumigation. Whiteflies and mites are major pests, while nematodes also pose problems in some

regions. Integrated Pest Management (IPM) practices are essential for effective control.

- **Whiteflies, aphids, and leaf miner adults:** Install yellow sticky traps (8" × 12") at 20 traps per ha, placed 10–15 cm (4"–6") above the plant canopy. Replace when more than 70% of the surface is covered with insects.
- **Fruit and shoot borer:** Install pheromone traps at 20 per ha; intercrop one row of marigold after every 15 rows of tomato to attract the pest. If necessary, spray Spinosad @ 1 ml/3 l of water.
- **Mites:** Apply spiromesifen @ 1 ml/3 l of water.
- **Whiteflies:** Use imidacloprid or flonicamid @ 1 ml/3 l of water.
- **Fungal diseases:** Spray carbendazim @ 1 g + mancozeb @ 2 g/l of water.

CONCLUSION

Pusa Shakti (DT-19) is a high-yielding, indeterminate

tomato variety that combines heat tolerance with superior fruit quality, making it highly suitable for summer cultivation and long-distance transportation. Its thick pericarp, deep red fruits, and extended fruiting duration enhance both market value and farmer profitability. With an average yield of 352 q/ha and a potential exceeding 450 q/ha, it addresses the challenges of climate variability and transport losses. Adoption of recommended production practices and IPM strategies ensures sustainable cultivation. This variety represents a significant advancement in tomato breeding, supporting food security, nutritional quality, and economic resilience for farmers.

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Organic fertigation system

An organic fertigation unit was developed for use of cowdung and vermicompost filtrates as a nutrient source for crops. A power-operated agitator was also fabricated for the organic fertigation unit for large-scale vegetable cultivation. The proportion of manure and water, duration of agitation, and settling time of manure solution were optimized to improve the nutrient content of supernatant and filtrate using the power-operated agitator. Vermicompost filtrate prepared by mixing vermicompost and water in a ratio of 1:5 followed by agitation for 10 min and settling for 6 hr showed increased nutrient content (K, P, Ca and Mg) in the filtrate. It was recommended that organic manure filtrate along with a 50% recommended dose of fertilizer should be applied to get a higher yield of okra and improve the nutrient and microbial status of the soil.

Source: ICAR Annual Report 2022-23

Labelling of Organic logos on organic products



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