

Scientific Cultivation of Tomato

Naval Kishor, Bhagwat Singh Kherawat, Richa Pant and Keshav Mehra and M.L. Reager
Krishi Vigyan Kendra, Lunkaransar

ARTICLE ID: 29

Introduction

The tomato is botanically known as *Lycopersicon esculentum* which belongs to the Solanaceae family. This family also includes other well-known species, such as potato, Chilli, capsicum and brinjal. Tomato is one of the most widely cultivated crops in the world. India is the second largest tomato producer in the world after China. It is an important source of vitamins and an important cash crop for smallholders and medium-scale commercial farmers. It is universally treated as Protective Food since it is a rich source of minerals, vitamins, antioxidants and organic acids. The attractive red colour of tomato fruit is due to lycopene and yellow colour is due to carotenes. Tomato is a good appetizer and its soup is a good remedy for preventing constipation.

Improved varieties: The choice of variety is based on fruit quality, adaptability and reliability, resistance/tolerance to diseases and pests, quality (firmness), plant growth habit, availability and suitability to the growing conditions. The important Tomato varieties grown in India are Pusa Ruby, Pusa Early Dwarf, Pusa-120, Pusa Gaurav, Pusa Sheetal, Pusa Uphar, Pusa Sadabahar, Roma, Punjab Chuhara, Pusa Rohini, Arka Vikas, Arka Saurabh, Arka Abha, Arka Alok, Arka Ahuti, Arka Meghali, Arka Ashish, Kashi Vishesh, Kashi Amrit, Punjab Varkha Bahar-1 and Punjab Varkha Bahar-2, Hisar Arun, Hisar Lalit, Swarna Naveen, Swarna Lalima, Swarna Vaibhav, Utkal Kumari, Utkal Dipti, Utkal Pallavi, Sakthi, Maruthan (Co-3), Pant Polyhouse Tomato-1 and Pant Polyhouse Tomato-2

F₁ hybrids: Pusa hybrid -1, Pusa hybrid-2, Pusa hybrid-4, Pusa hybrid-8, Pusa Divya, Arka Ananya, Arka Rakshak, Arka Vishal, Arka Abhijit.

Climatic Requirement: Tomato is a day neutral plant, which cannot tolerate frost. Tomato requires a relatively cool, dry climate for high yield and premium quality. However, it is adapted to a wide range of climatic conditions from temperate to hot and humid tropical. Temperature and light intensity affect the fruit-set, pigmentation and nutritive value of the

fruit. The optimum temperature is 21-28°C during day and 15-20°C during night for its proper growth and development, where as high humidity and high temperatures reduce fruit set and yields, low temperatures delay color formation and ripening. Temperatures above 30°C inhibit fruit set, lycopene development and flavor. Tomato plants react to temperature variation during the growth cycle. Optimum temperature for colour development of fruit is 21-24°C.

Soil Requirement: Tomato crop can be grown on a wide range of soils, however, it grows best on well-drained sandy loam to loam soil rich in organic matter. Soils with high acidity are not suitable for tomato cultivation. Tomato is moderately tolerant to a wide range of pH (level of acidity), but grows well in soils with a pH of 6.0 – 7.0 with adequate nutrient supply and availability. The land may be ploughed and harrowed 3 or 4 times to obtain a fine tilth.

Sowing time: The tomato can be grown almost throughout the year in the country. The number of crops grown varies from region to region.

Scheduling of time for tomato sowing

Area	Season	Time of nursery sowing	Transplanting
Northern Zone	Autumn winter	January	February
Hills	Late autumn	July-August	August-September
Eastern Zone	Spring summer	Late November	January
		March- April	April-May
		September	October

However, the number of crops and the time of seed sowing depend entirely on climatic conditions of the region.

Seed Rate: Tomato is normally transplanted because much better results are gained when seedlings are raised in a nursery. The seed rate of tomato depends upon soil fertility, irrigation facilities and sowing method. Tomato is usually raised in the nursery. For a Hectare area, seed rate for open pollinated variety is 400-500 g / ha and for F₁ hybrid is 125-175 g / ha.

Nursery management and transplanting: The nursery should be sited in a well-drained area preferably not previously grown with a Solanaceous crop. The seedbed or nursery site should be in a place protected from direct sunlight by erecting a shade structure. Soil

solarisation of nursery bed by covering them with white transparent polythene sheet for one month should be done in hot summer months. A net area of about 225m² may be required to raise the seedlings for one hectare area. In order to grow seedlings in the nursery, beds of 1m x 3m are prepared with a height of 20 cm. Well decomposed FYM is properly mixed into nursery bed at the rate of 2 kg per m². Apply phorate (Furadon) at the rate of 12.5 g per m² of nursery bed. Sowing of the seeds should be done in straight lines drawn at an interval of 5 cm with 2 cm spacing between successive seeds implanted. Sowing of seeds should be done at a depth of 0.5 cm to 1 cm. Cover the seeds with fine sand and straw. After sowing irrigate the seedbeds with a rose-can twice a day to ensure sufficient moisture for germination. After germination the straw must be removed. Cover the nursery bed with fine nylon net to escape the damage by virus transmitting insects. A week before transplanting, reduce the irrigation frequency to harden the seedlings.

The field is first ploughed with soil turning plough followed by 4-5 ploughing with country plough or harrow before transplanting. Levelling should be done after ploughing. At the time of soil preparation, raising of the planting bed above ground level facilitates drainage during rainy season and if this practice is followed during winter season, it enhances plant growth by conserving the soil heat. Transplant the seedling to the main field 4 to 6 weeks after sowing. Seedlings of 15-25 cm tall with 3-5 true leaves are most suitable for transplanting. Transplanting should be done in the afternoon or on a cloudy day to reduce the transplanting shock. Transplanting should be done on raised beds or flat land at a spacing of 0.6 – 1.2 m between rows and 0.45 – 0.9 m between plants depending on the varieties.

Nutritional Requirement: Nutritional requirement of tomato generally depends on soil type, fertility status of the soil, previous crop grown and irrigation facilities. A well decomposed farmyard manure @ 20-25 t/ha should be incorporated during field preparation to enrich the soil with organic matter. In addition to this, a fertilizer dose of 90-100:60-70:50-60 kg N:P₂O₅:K₂O / ha is required for successful crop production. One third of Nitrogen and the entire dose of phosphorus and potash should be applied at the time of transplanting. The remaining dose of N should be applied in equal doses, i.e., 25-30 and 45-50 days after transplanting. Foliar application of nutrient has been found beneficial. Additional dose of 10 kg borax and 5 kg Zinc Sulphate, as basal dose, are also recommended for correcting fruit cracking and to increase yield and fruit quality.

Irrigation: Tomato plants required adequate moisture throughout their growth period. First irrigation is required soon after transplanting. Irrigation for tomato should be regularly especially during critical periods like flower setting and growth of the fruits. Irrigate the crops at an interval of 3 - 4 days during summer and 10-15 days during winter to maintain the soil moderately wet. Regular irrigation reduces blossom end rot, ensures uniform fruit development, prevents fruit splitting, reduces the risk of sun scorch, enhances fruit growth and increases the size and number of fruits. A long spell of drought followed by sudden heavy irrigation may cause cracking of the fruits.

Intercultural Operations

Hoeing and weeding: Weeds at initial stage of crop growth may pose problem as the weeds in tomato field compete with crop plants for nutrients, moisture, light and space, hence, weeding should be done frequently in order to keep the weeds under control. Weeding should be done regularly to reduce nutrient competition, and to destroy alternate hosts of pests and disease.

Training/Staking: Cultivars that have an indeterminate growth habit require training on trellises or suspended on twine from over head wires. It is done by providing individual stack or by erecting 2-2.5 m long poles on either side of ridges for stretching G1 wire. Branches of plants are supported on poles or strings with twine.

Harvesting: In indeterminate cultivars, fruits are normally be harvest 70-100 days after planting. While determinate cultivar may begin fruit at 70 days depending on the environment conditions. Harvesting maturity depends on the purpose whether for fresh market, processing, long distance transport etc. Following maturity standards are recognized in tomato:

- 1) **Green stage:** Fruits fully grown, fruit colour changes from green to yellowish and cavity filled with seeds surrounded by gelly like substance. Harvested for long distance market.
- 2) **Turning or breaker stage:** Fruits firm, 1/4t portion of fruit changes to pink in color, but the shoulder still yellowish green. Harvested for long distance market.
- 3) **Pink stage:** 3/4t of whole fruit surface turns pink color. Harvested for local market.
- 4) **Light red:** Entire fruit surface is red or pink but the flesh is firm. Harvested for local market.

5) **Red ripe or hand ripe:** Fully ripened and coloured. Flesh becomes soft. Harvested for processing and for seed extraction.

Yield: The yield of tomato largely depends upon variety, soil fertility, growing season and cultural practices adopted during cultivation of crop. In open pollinated varieties yield of 25-40 t/ha and in F1 hybrids yield of 50-70 t/ha can be achieved.

