

Review Article

<https://doi.org/10.20546/ijcmas.2023.1210.016>

## Crop Production Technology of Tomato Crop for Indian Region

Pragya Ramgiry\* and Meenakshi Ramgiry

Jawaharlal Nehru Agricultural University, Jabalpur-482004 Madhya Pradesh, India

\*Corresponding author

### Keywords

*Solanum lycopersicum*,  
Solanaceae family

### Article Info

**Received:**  
15 August 2023  
**Accepted:**  
22 September 2023  
**Available Online:**  
10 October 2023

### ABSTRACT

The modern production technology is very important for increasing production and productivity of the horticultural crops. By using modern production technology, we can save time by optimizing the smartly use of resources. The production technology tells us how to use inputs in an effective way. In crop production several factors affecting crop production including micro climate, soil fertility, availability of irrigation water and insect pests & diseases. How to manage these factors described by the productive production technology.

### Introduction

Botanical name : *Solanum lycopersicum* L.

Family : Solanaceae

Chromosome number :  $2n=24$

Fruit type: Berry

The tomato (*Solanum lycopersicum*) is a plant which belongs to Solanaceae family, and its close cousins are tobacco, chili peppers, potato, and eggplant. It is a herbaceous perennial crop often grown outdoors and in temperate climates as an annual. In Indian condition it can be grown in any season but it is classified under the summer vegetables. It is such a vegetable which is utilized the most after potato and onion. Tomato is used in almost all kinds of dishes;

it is also the most eaten vegetable in the whole world. Apart from vegetables, it is also used in salads and can be eaten as raw. Due to the presence of various minerals including protein, calcium, phosphorus and vitamin C in tomato, its consumption is considered very healthy for the human body.

### Climate and Temperature Required for Tomato Cultivation

Tomatoes can be grown everywhere; they don't need a special temperature, but extremely cold or hot weather stunts their growth and development. Tomato is a day neutral and warm season crop. Cool and dry weather is preferred by the crop and optimum temperature is 21-28<sup>0</sup>C during day and 15-20<sup>0</sup>C during night. Optimum temperature for colour development of fruit is 21-24<sup>0</sup>C. Development of

colouring pigment, lycopene will be hampered above 27°C. Seed germination and pollen germination are adversely effected below 10°C. During the period of flowering, higher temperature results in abscission of flowers, very poor flowering and low fruit quality, pollen sterility and low color development in tomato (Johkan *et al.*, 2011).

### **Suitable Sowing Time for Tomato**

In Indian climatic conditions tomato can be grown throughout the year but it is little different from area to area according to the season & growing condition.

kharif crop: May – June

Rabi Crop: August – Sept

Summer crop: December – January

### **Seed rate**

The seed rate used for tomato crop depends on the variety and spacing.

Open Pollinated Variety: 350-400g / ha

Hybrid Variety: 100-150 g / ha.

### **Raising of Seedlings**

To raise tomato seedlings for one hectare, an area of 200-240 m<sup>2</sup> would be sufficient. Prior to sowing, seeds are treated with fungal culture of *Trichoderma viride* (4 g/ kg of seed) or Thiram (2g/kg of seed) to avoid infections from fungal diseases such as damping-off disease.

Sowing should be done thinly in lines spaced at 10-15 cm distance. Seeds are sown at a depth of 2-3 cm and covered with a fine layer of soil followed by light watering by water can.

The beds should then be covered with dry straw or grass or sugarcane leaves to maintain required temperature and moisture. The watering should be

done by water can as per the requirement of the crop till germination is completed. As soon as the process of germination is completed the cover of dry straw or grass is removed immediately. During the last week in nursery, the seedlings may be hardened by slightly withholding water. Four to five weeks old seedlings are used for transplanting in the main field.

### **Field Preparation and Planting**

Growth and development of tomato crop is better in friable soil. To make the soil of the field friable, fill the field with water and then plough it after a few days, so that the lumps of soil present in the soil break down and turn into friable soil. After that prepare the ridges for planting tomato plants in the field. Then plant the tomato crop in it.

Main field preparation and transplanting: Seedlings are transplanted on raised beds or on sides of ridges. Field is ploughed 4-5 times and raised beds of 80-90 cm width or ridges and furrows are prepared.

Spacing depends on the growth habit (determinate, indeterminate or semi determinate) of variety and various spacing followed are 60 x 30-45cm, 75 x 60cm and 75 x 75 cm. Usually closer spacing results in early and higher yield, but it may affect size of fruits.

To treat the tomato seedlings before planting, make a solution of (Mancozeb + Metalaxyl) or Carbendazim, 3 grams per liter of water and keep it immersed for 5-10 minutes and then transplant the tomato seedlings.

### **Nutrients Managements**

The fertilizer dose depends upon the fertility of soil and amount of organic manure applied to the crop. For a good yield, 15-20 tonnes of well-decomposed FYM is incorporated into the soil.

Generally, application of 120 kg N (260 kg urea), 80 kg P<sub>2</sub>O<sub>5</sub> (500 kg Super Phosphate) and 50 kg K<sub>2</sub>O

(83 kg murate of potas) per hectare is recommended for getting optimum yield. Half dose of N and full dose of P and K is given at the time of planting. The remaining amount of half N is given as top dressing 30 days after transplanting.

For hybrid varieties, the recommended dose per hectare is 180 kg (391 kg urea) N, 100 kg P<sub>2</sub>O<sub>5</sub> (625 kg Super Phosphate) and 60 kg K<sub>2</sub>O (100 kg murate of potas). 60 kg N and half of P & K are given at the time of transplanting. Remaining quantities of P & K and 60 kg N is top dressed 30 after transplanting. A third dose of 60 kg N is applied 50 days after transplanting.

The NPK combination are starter grades (19:19:19) for growth in middle stage and mono-potassium phosphate (0:52:34); potassium nitrate (13:0:45) for sugar conversion and disease resistance. (Malhotra, 2016). If due to some reason we are not able to provide basal fertilizer in the plant, then in that case we can use water soluble fertilizer like NPK 19:19:19. (Dosage: Foliar 75-80 g/pump & 1 to 5 kg per acre Fertigation - use the recommended dosage based on results of the soil analysis.)

Zinc is the major constituent of an enzyme Carbonic Anhydrase which is essential for nutrients metabolism and play role in biomass production (Cakmak, 2008).

Additional dose of 10 kg borax and 5 kg Zinc Sulphate are also recommended as basal dose for prevention of fruit cracking and to increase yield and fruit quality.

### **Irrigation**

If the crop is sown in summer season then it should be irrigated between 3 to 4 days in a week and if the crop is taken in winter season, then it should be watered once a week so that moisture is maintained in the soil. Drip irrigation and sprinkler irrigation are becoming more common in areas of water shortage.

### **Weed Control**

The critical period of weed competition in tomato is the first 30 days after transplanting. There are several integrated method for weed management in tomato like crop rotation, field preparation, soil solarization, soil fumigation and weedicide application.

Solanaceous crops respond very well to mulching. Many commercial organic producers routinely use synthetic mulch—most often black polyethylene film (black plastic)—for tomato, pepper, and eggplant. Black plastic effectively controls most weeds and warms the soil, thereby promoting crop earliness and sometimes total yield. Low number of weeds under black polythene mulch may be due to high temperature and reduced light availability compared to other mulches (Mishra *et al.*, 2020).

Solanaceous crops respond very well to mulching. Many commercial organic producers routinely use synthetic mulch—most often black polyethylene film (black plastic)—for tomato, pepper, and eggplant. Black plastic effectively controls most weeds and warms the soil, thereby promoting crop earliness and sometimes total yield. Low number of weeds under black polythene mulch may be due to high temperature and reduced light availability compared to other mulches (Mishra *et al.*, 2020).

### **Tomato plant under the polythene mulch**

Drip irrigation is usually laid under the mulch to deliver water and liquid organic fertilizer to the crop. The combination of drip irrigation with plastic mulch has significantly increased irrigation, water use efficiency and reduces the weed intensity in vegetable production (Howell, 2001). Some growers prefer black woven landscape fabric, which can be reused for seven or more years. Weeds emerging through planting holes are removed manually, and alley weeds are managed by hoeing, cultivation, mowing, organic mulch, or cover cropping.

**Table.1** Insect Pest Management Practices for Tomato Crop

Insects	Scientific name	Control
White Fly	<i>Bemisia tabaci</i>	Spray of imidacloprid 17.8 SL @ 1.0 ml/litre of water
Tomato fruit borer	<i>Helicoverpa armigera</i>	Spraying of novaluron 10% EC@ 0.5 ml/litre of water
Leaf minor	<i>Liriomyza trifoli</i>	Spraying of thiomethoxam 25% wg @ 0.5gm / lit of water
Root knot nematode	<i>Meloidogyne</i> spp.	Spraying of nemagone 30ml/15 lit of water

**Table.2** Disease Management Practices for Tomato Crop

Disease	Causal Organism	Control
Early blight	<i>Phytophthora infestans</i>	Follow crop rotation with non solanaceous crop like Mustard, cabbage, cauliflower etc. Seed treatment with Mancozeb for 20 minutes before storages for soil and tuber borne diseases. Apply Metalaxyl-8% + Mancozeb-64% WP @ 2.5g/liters of water
Late blight	<i>Phytophthora infestans</i>	Spray of Ridomil MZ 72 @ 2.5g/liters at 15 days interval spraying just after appearance of first symptom.
Bacterial wilt	<i>Ralstonia solanacearum</i>	spray of copper oxychloride 50 % wp @ 2.5g/liters of water
Anthracoese	<i>Colletotrichum</i> spp.	Spraying of fungicides such as mancozeb from flowering to fruit set. Control of fruit damaging insect such as fruit fly

**Fig.1**



**Table.3** Physiological Disorder of Tomato Crop

Disorder	Symptoms	Causes
Fruit Cracking	<ul style="list-style-type: none"> <li>• Radial Cracking: Usually seen at ripe stage and crack radiate from pedicel end to stylar end.</li> <li>• Concentric cracking: Seen around shoulder of fruit even at green stage.</li> </ul>	Fruit cracking is caused both by genetic and environmental factors. Effect of soil moisture and Boron deficiency Soil application of 10-20 kg of borax/ha during soil preparation.
Blossom end rot	Water soaked spots of one cm or more appear at point of attachment of petals and effected portion becomes sunken, leathery and dark coloured.	Due to calcium deficiency and high temperature Spraying of 0.5% calcium chloride at fruit development stage are recommended for control of blossom end rot
Puffiness	Fruit surface is generally flattened and locules are unfilled with pulp and seeds	Poor pollination low or high temperature
Sun scald	Whitish, sunken and papery lesion develops due to sun heat	Expose of fruits to high temperature above 40 degree Celsius
Vascular browning	When the stem is cut from the centre the vascular portion of the affected plants looks brown in colour and tissue is killed at a later stage.	It can be corrected by using 1.5% Magnesium Sulfate as foliar spray at the time when the symptom appears.

**Fig.2**





**Fig.3**



### **Staking of tomato**

Staking increases fruit yield, reduces the proportion of non marketable fruit, and enhances the production of high-quality fruits (Anonymous, 2007). Staking is a process which helps tomato plants to stand uprightly by giving them support. This will create space for good air circulation, as well as ease up field operations such as, weeding, fertilizer application, spraying and harvesting. Strong poles, ropes, plain wire and sticks can be used to help tomato plant to stand upright in the rows and therefore avoid plant logging.

### **Staking in Tomato with Rope**

#### **Harvesting**

Fruits become ready for first picking in about 60-70 days after transplanting. Improper maturity/harvesting stage are also the major factor that affects both qualitative and quantitative loss of tomato. Maturity stage of tomato fruit at harvest is an important determinant of many quality traits (Beckles, 2012). Tomato maturity stage is classified into six stages (Green, Breaking, Turning, Pink or Pale red, Light Red, and Red) based on its colour (USDA, 2007).

#### **Yield**

Yield of tomato depend upon the cultural practices adopted. The yield per hectare varies greatly

according to variety and season. On an average, the yield varies from 20-25 t/ha. Hybrid varieties may yield upto 50-60 t/ha.

By the adoption of this production technology, there will be increase in production and productivity and it will also increase income of the farmer. By using proper recommended doses of fertilizer and proper management of pest and diseases, good quality of fruit will be obtained which ultimately results in higher yield.

### **References**

- Anonymous, (2007). "Green Beans Integrated Pest Management." An Ecological Guide Training Resource Text in Crop Development, Major Agronomic Practice, Disease and Insect Ecology, Insect Pest, Natural Enemies and Diseases of Green Bean, Food and Agriculture Organization, Rome, Italy
- Beckles, D. M. (2012). Factors affecting the postharvest soluble solids and sugar content of tomato (*Solanum lycopersicum* L.) fruit," *Postharvest Biol Technol.* 63(1): 129–140. <https://doi.org/10.1016/j.postharvbio.2011.05.016>
- Cakmak, I. (2008). Enrichment of cereal grains with zinc: Agronomic or genetic biofortification. *Plants and Soils* 302, 1-17. <https://doi.org/10.1007/s11104-007-9466-3>
- Howell, T. A. (2001). Enhancing water use

- efficiency in irrigated agriculture. *Agronomy Journal*.93:281-289.  
<https://doi.org/10.2134/agronj2001.932281x>
- Johkan, M., Oda, M., Maruo, T., Shinohara, Y., (2011). Crop production and global warming. In: Casegno, S. (Ed.), *Global Warming Impacts-Case Studies on the Economy, Human Health, and on Urban and Natural Environments*, pp. 139–152.  
<https://doi.org/10.5772/24467>
- Malhotra, S. K. (2016). Water soluble fertilizers in horticultural crops-An appraisal. *Indian Journal of Agricultural Sciences*. 86 (10): 1245-1256.  
<https://doi.org/10.56093/ijas.v86i10.62095>
- Mishra P, Sahoo T R, Rahman F H, Mahapatra N, Sahoo P K, Mahapatra R K (2020). Effect of different mulching on soil moisture in soil weed dynamics and Yield of Tomato (*Lycopersicon esculentum* L.) in Post Flood Situation in Coastal Odisha. *Journal of Experimental Agriculture International* 42(7):32-38.  
[https://doi.org/10.9734/jeai/2020/v42i73055\\_1](https://doi.org/10.9734/jeai/2020/v42i73055_1)
- USDA (2007). *The US and World Situation: Fresh and Processed tomatoes*. USDA Foreign Agricultural Services Horticultural and Tropical Products Division.

#### How to cite this article:

Pragya Ramgiry and Meenakshi Ramgiry. 2023. Crop Production Technology of Tomato Crop for Indian Region. *Int.J.Curr.Microbiol.App.Sci*. 12(10): 131-137. doi: <https://doi.org/10.20546/ijcmas.2023.1210.016>