

## Thar Anant: Lycopene rich heat tolerant variety of tomato suitable for arid and semi-arid regions

**Thar Anant, a lycopene rich and heat tolerant variety of tomato has been developed through induced mutation followed by selection in 2019-20 by ICAR - Central Horticultural Experiment Station. The variety is suitable for cultivation in arid and semi-arid regions. This article describes the cultivation technology and plant protection measures for this variety.**

THE tomato variety Thar Anant was developed through induced mutation followed by selection of desired phenotypic traits in the induced populations in 2019-20. The mutant having superior phenotypic traits was identified and homogenized based on the horticultural attributes and performance. It is having deep red fruit colour, rich in lycopene content (7.9 mg/100 g) with medium acidity (0.42%) and high flesh thickness (0.85 cm) under semi-arid condition of western India. It is highly vigorous in growth with dark green dense foliage. The mutant has bigger size of inflorescence length (16.3 cm) and distinguished by indeterminate plant habit, fruit size, fruit colour and yield potential over the parent. It is highly tolerant to heat stress and drought with high yield potential. The fruit weights about 120-130 g with attractive deep red colour fruits of round shape. Each plant yield varied between 4.2-4.9 kg under semi-arid conditions. The fruits mature in 70-80 days after transplanting, comes under medium maturity type. It is moderately resistant to ToLCV disease. The variety is highly suitable for table, processing and export purposes.



Thar Anant plant laden with mature deep red fruits

### Production Technology

#### *Nursery management*

In order to get healthy seedlings for planting, the raising of seedling in the nursery is highly essential. The seedlings are raised in bed, raised bed, plug tray approaches sowing in spreading or line sowing methods. Trays having hole size of 4.0 × 4.5 cm are optimum to raise the seedlings. The fully sterilized potting mixture is used. Needed protection measure to control seed borne pathogens is ensured by treating with captan 2 g/kg seeds. Two seeds are sown in each tray and one seedlings is thinned out at true leaf stage. Over-irrigation is harmful and facilitates root diseases, single watering in morning (winter, rainy season) and two watering (summer) is ideal. 5-10 ml water/spray liquid is sufficient for each seedling. 4-5 leaf stage seedlings (4 weeks) are ideal for transplanting.

#### *Main field preparation*

The field selected for planting must be leveled, ploughed 3-4 times until soil is in fine tilth and weed free condition. Flat bed or ridge methods are followed depending upon the soil, water availability and crop season. The ridges and furrows are formed depending upon the planting system either single row or paired row. Wide spaced ridges (1.0 m wide) are formed for paired row system of planting. Seedlings are planted at 90 cm between rows and 90 cm between plants in evening hours so the seedlings do not wilt due to sunshine.

#### *Nutrient management*

The crop yield is decided by the selection of variety and its nutrient use efficiency. Balanced and efficient use of fertilizer increases the productivity. The soil must have adequate organic C content, if not ensured with application of organic matter so as to attain C/N ratio of 25-30:1 with water holding capacity of 50-60% to ensure high nutrient use by the crop. The nitrate of N fertilizer is not absorbed by the plant and leaches out in rainwater. Similarly, phosphate does not completely dissolve in the water and is absorbed by the plant and washed out in



Seedlings ready for transplanting

rainwater. Nitrogen efficiency declines without applying P and K in the soil. Hence balanced nutrient application is must. N is required for vegetative growth and fruit set, P is needed for fruit production and K is crucial for fruit set and fruit development. Hence split application of N and K is advocated at 30, 60 and 90 days after transplanting. It is found that 3.3 kg N, 0.4 kg P and 4.2 kg K is uptaken by the plant to produce 100 quintal fruit yield in tomato. Hence, 132-16-128 kg NPK is required to obtain 400 quintal fruit yield, which vary depending upon the soil nutrient status and nutrient uptake per cent.

#### *Nutrient deficiency*

The unbalanced application of fertilizer and existing soil nutrient status are the root cause of deficiency which reflects on yield. The K deficient plant ripens unevenly; fruits are yellowish, blotchy and are thin fleshed. Ca deficient plants exhibit blossom end

rot disorder which occurs due to low translocation of Ca to the cells of the blossom end of flower causing dry rot on the bottom of enlarging fruit. The Mg deficient plant shows chlorosis in older leaves having veins of green and yellowish intermittent areas. It occurs in acid soil, having more K and sandy soil. Application of dolomite and limestone rectify the problem. In calcareous soil, Fe, Mn, Zn and boron deficiency prevails which causes chlorosis in young leaves or terminal shoots. Soil with more P interferes in Fe absorption. It can be controlled by spraying of Fe EDTA 0.05% (or) Manganese sulphate 0.3-0.5%, or Zn sulfate 0.2-0.3%, and boric acid or borax 0.1-0.2% depending upon the elemental deficiency.

#### *Seed sowing and transplanting*

The healthy seeds are sown in second week of June on raised beds for rainy season and early winter crop and, in first week of December on flat bed for late spring crop. The seedlings will be ready for transplanting within 3-4 weeks of sowing (4-5 leaf stage). Seedlings are withheld irrigation 3-4 days before uprooting from the nursery and transplanted immediately in the main field. The healthy, vigorous and disease free seedlings are selected for transplanting and the evening hours is highly preferable. Care must be taken during transplanting to ensure not damaging of root system and the seedlings are in vertical position. Seedlings are transplanted at 90cm between rows and 90 cm between plants.

#### *Irrigation*

Irrigation schedule varies from place to place, in few areas the first irrigation is given after transplanting, where in other areas, it is given before transplanting. The life saving irrigation is advocated at 3rd day of transplanting and subsequent irrigation is done 7 days interval during summer or depending on soil moisture levels for other season. Over watering is also harmful for seedlings, and irrigation is ensured during winter season so as to maintain soil temperature above freezing. Imbalanced irrigation enhances fruit cracking problem. In paired row planting, drip irrigation is also possible due to which 30-40% water can be saved.



Field view of Thar Anant

#### *Intercultural operation*

Weeds compete with tomato for water and nutrients as the plants are shallow rooted and required adequate level for high yield. Hence, the weed free condition in the main field must be ensured. About 3-4 weeding are adequate, after the first weeding (30 days after transplanting) the seedlings are earthed up. Two more weeding are required. Before transplanting, the pre emergence herbicide basalin 2 litre is mixed with 600-700 litre of water is sprayed in



Training and staking in Thar Anant

1.0 ha for effective control of weeds.

#### Mulching

In order to ensure suitable micro-climate to the root zone, mulching is advocated which creates barrier to the moisture loss and alter temperature by few degree, suppress the weed growth. The fruit damage caused by direct soil contact is avoided and the high quality marketable produce can be harvested. Black polythene sheets are used as mulch, which is durable and enhances few degree temperature during winter season.

#### Training and pruning

Tomato plants required training in indeterminate growth types. The plants are given support by bamboo



Demonstration of Thar Anant at ICAR-CHES, Godhra

stick (1.0 – 1.5 m length) or the seedlings are tied with jute threads and facilitated to grow vertically. The disease incidence gets reduced, the insect finds no hiding places, fruits don't get direct contact with soil, spray fluid covers all the plant canopy are the advantages of training. The need based clipping or pinching is advocated.

#### Harvesting and yield

Tomato fruits are harvested at different stages for fulfilling different purposes. The fruits ripen at about 25-50 days and are harvested for long distance market. The 75% ripened fruits are plucked for local markets. The 100% ripened fruits are collected for seed extraction purposes. Even the unripe, matured fruits are harvested and sold in the market for the consumers prefer acidity. Average yield under normal conditions is 4.7 kg/plant and yielding 52-55 t/ha in a soil applied with 100:50:30 kg NPK/ha at a spacing of 90 cm between rows and 90 cm between plants.

#### Grading

The fruits are cleaned after harvesting and graded according to the colour, size, shape etc.

#### Pest and disease management

##### Fruit borer (*Helicoverpa armigera*)

It is a polyphagous insect which attacks many commercial crops. The adult male insects are yellowish in colour and females are reddish brown in nature. Female emerges in advance as compared to males and secrete sex pheromones to attract male adults. After mating in 2-5 days of emergence, female lays 3,000-4,000 eggs in an oviposition (10-23 days). Egg hatches in 3-4 days and the neonate larvae of creamy white with dark brown head emerges. The larvae period is about 15-25 days, which feed on the leaf surface and young floral buds. The larvae make holes of circular shape on the surface and feed by thrusting their heads inside. The holes are always surrounded by fecal pellets. The completely eaten hollow fruits falls down and the partially eaten fruits become deformed. It can be controlled by erecting nylon net barriers, growing cucurbits in crop rotation, keeping pheromone traps to attract male adults and killing, raising marigold as trap crop (15:1) at every 15 rows of tomato with 1 row marigold, introduction of egg and larvae parasitoids effectively controls the insects.

**Army worm (*Spodoptera litura*):** The gray colour larvae feed on the leaf surface and

cause skelitalisation. The mature larva feeds on the whole leaf and leaving the main veins alone. It does not bore the immature or mature fruits. It can be controlled by erecting nylon net barriers, growing cucurbits in crop rotation, keeping pheromone traps to attract male adults and killing, raising castor as trap crop to attract the egg laying female adult moths. Introduction of egg and larvae parasitoids effectively controls the insects.

**Whitefly** (*Bemisia tabaci*): It is a highly polyphagous insect which attacks many commercial crops. Hot and dry climate favour the multiplication and the rainy showers drastically reduce the population. The insect is active during day time and settle on the lower surface of leaf during night. The larvae finds the feeding site on leaf surface and insert its piercing and sucking type mouth parts inside and starts sucking the plant sap from the phloem due to which the plant vigour reduces. It can be controlled by using resistant variety, using yellow sticking trap (10 numbers/ha) in the main field, raising sorghum or pearl millet or maize as border crop and spray of imidacloprid or spinosad 1.5 ml/l systemic pesticide effectively controls the insect.

**Tomato Leaf curl virus** (TLCV): It is a serious disease found to attack tomato especially during summer crops. It is transmitted by whitefly. The affected plants

show interveinal chlorosis, curled leaves, shrunken terminal leaves with lower internodal distances. Severely affected plants do not produce flower followed by no fruit set, which causes even more than 80% yield loss. Application of spinosad (1.5 ml/l) along with neem oil 2.0 ml/l of water is sprayed for control.

**Tomato spotted wilt virus:** It is also a major viral disease of tomato. The leaves show bronzing symptom, followed by development of spots on leaves surface and finally plant shows wilting. This dreaded disease is spread by the vector 'Thrips'. The effective control of thrips is by keeping the field weed free, as many weeds act as an alternate host for thrips. Application of carbofuran in nursery and followed by 15 days after transplanting in the main field at 7kg/ha effectively control the disease. Spray of spinosad (1.5 ml/l) along with neem oil 2.0 ml/l of water or any other systemic pesticide control this disease.

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### TECHNICAL SPECIFICATIONS

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