



## Hybrid Seed Production in Tomato

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Tomato (*Lycopersicon esculentum*) is one of the most important vegetable crops. It is primarily grown in the tropical and subtropical belt of the world. Mostly it is grown for fresh market and in little for the processing industry. The production of the tomato can now be increased by developing new cultural practices and focusing on the quality seed. When compared with the open pollinated variety, hybrid tomato varieties have lots of advantages. Hybrid seeds mature early, have uniformity and are successful in producing higher yield. Hybrid seeds have better quality of fruits and are diseases resistance.

Tomato is a day neutral plant. It requires proper day and night temperature which are 15<sup>0</sup>-20<sup>0</sup> and 20<sup>0</sup>-28<sup>0</sup> for fruit setting respectively. Tomato is a self pollinated crop. The self pollination is favoured by the position of the stigma. The arrangement of receptive stigma on the cones of anthers, highly favours self pollination. The pendant position of the flowers also plays a crucial role in self pollination. The stigmas are receptive at the time of anthesis but do not dehisce before 24-48 hours. In tomato cross pollination is favoured by 5 % which is possible because of insects.

**Keywords-** Emasculation, Hybrid, Pollination, Seed, Tomato

### Floral Morphology of Tomato

The flower structure of tomato is short, racemose cyme of seven to eight flowers. The flower of tomato is perfect, hypogynous in structure, regular and pendant. It is typically six –merous. Calyx is short with six leafy lobes. The corolla is a short supporting tube and six broad lobes. There are six yellow-orange stamens which are attached to the corolla.

### Varieties

Hybrids: COTH-1, Pant Hybrid 2, Pant Hybrid 10, Kt 4, Pusa Hybrid 1-4, Arka Vardhan, Arka Abhijit, Rupali, Sonali

### Land Requirements

Select the land where there should not be any previous crop remnants, so that there should not be any volunteer plants from the same variety.

### Isolation Requirements

For seed production the tomato varieties should be 50 M for foundation seed and 25 M for certified seed. For Hybrid seed production the distance should be 200 M for foundation seed and 100 M for certified seed.

### Cultural Practices

- Time of sowing- June-August, November-December
- Seed rate- for F1 hybrid variety = male parent 25g/ha, female parent 100 g/ha

- Transplanting ratio=1:4
- Source of seed= seeds are obtained from approved seed agency for nuclear, breeder and foundation seeds.
- Nursery=The seeds are sown on the raised nursery bed of 15-20 cm height with 4-5 cm gap in rows which should be covered with sand. 8-10 nursery beds are sufficient. Apply minimum 2 kg of DAP before 10 days of pulling out the seedlings.
- Transplanting and spacing =20-25 days old tomato seedling should be transplanted with 60X45 cm. (male parents- 60X45 cm and female parents 90 X60 cm)
- Manuring and Rouging =25 Tons of FYM should be added to the fine tilled land with 100:100:100 kg of NPK doses/ha. Rouging should be done with respect to plant characters. The disease affected plants should be rogued out.

**Method of Seed Production** =Seed to seed

**Stages of Seed Production**=Breeder seed-foundation seed I-foundation seed II-certified seed

### Emasculation and Pollination

Emasculation is started by 50-55 days after sowing. The emasculation is done before the anthers are mature and stigmas are receptive for self pollination. The time of emasculation is between 4 pm -6 pm, prior to one day before the anthers are ready to dehisce and stigmas are more receptive. Hands, forceps and scissors should be sterilized before doing the emasculation with 95% alcohol. The first clusters flowers are removed. From second cluster, a flower is selected which is near to open in 2-3 days. Emasculate the buds by the hand. Remove the calyx, corolla staminal column. Leave the gynaecium. The emasculated flowers are covered with red bags for easy identification and prevent it from foreign particles.

**Pollen collection:** The pollens are collected in the early morning hours. The anther cones are removed and are kept in containers. The anthers are dried in 30<sup>0</sup> for 24 hours. A 100-watt lamp is required for temperature control. Pollens are also sun dried, but midday drying is not allowed. The pollens are then filtered with mesh screen and stored in dry container.

**Pollination:** Remove the red paper bag from the emasculated flowers; dust the pollen gently on the stigmatic surface by cotton and camel brush. Cover the pollinated flower with white bags for two to three days. The pollens which are collected from one male parent can be used to pollinate 5-7 flowers.

### Harvesting

Tomato fruits are harvested within 50-60 days after pollination. Completely coloured and matured fruits are harvested for hybrid seed extraction.

### Stages of Maturation

Mature green, Breaker, Turning, Pink, Red, Dark red / over ripe

The fruits of 5-6 harvest are used for seed production. The seed is extracted from the hybrid fruits which are true to its types and are of proper shapes. Proper seed extraction method is also very much important to retain the seed viability.

### Seed Extraction

**Manual method:** The fruits which are harvested are kept in the nylon bags. Then the fruits are crushed by tramping it with feet. After crushing the pulp is fermented to separate the seeds. When the temperature is above 25<sup>0</sup>, then one day fermentation is enough. If the temperature is low, go for two days fermentation. The material is then kept in the container for washing. Then fill water in the container and rotate it with stick, so that the flesh attached

to the seed should be separated. Do it several times, till all the flesh, gels and seeds get separated completely.

**Mechanical method:** For large scale seed extraction mechanical seed extractor are used. The ripe fruits are kept inside the machines and the seed extractors crush the fruit and separate the flesh pulp and seed. The seed gels are treated with 0.7 % HCL and again stir it for 40 minutes. When the seed is completely separated from the gel, pour it into the water for washing. Wash the seeds till no acid is left with seed. Now place the seed in a container full of water and incline it, so that the debris can float in the water. Repeat it till the seeds are clean. Acid seed extraction method is one of the best methods for seed extraction in tomato.

### Seed Drying

Tomato seeds are hanged in the open air dried in by drier for removing excess moisture. The dried seed are kept in container for 3-4 days at 30<sup>0</sup> for 6- 8 % moisture in it.

### Seed Packaging and Storage

The seeds of tomato are stored for 3-5 years. The tomato seeds are stored in air tight container like sealed glass jar, metal can etc. The container should be labelled with hybrid name and parent's names. The seeds are stored where the temperate is not more than 20<sup>0</sup> and Relative Humidity is 30%.

### Seed Certification

Minimum of three inspections is required for verification of hybrid seed.

**1<sup>st</sup> inspection-** it is done before flowering in order to verify the isolation and volunteer plants.

**2<sup>nd</sup> inspection-** it is done during flowering to check all types of isolation and offtypes.

**3<sup>rd</sup> inspection-** it is done at the time of maturity and before harvesting to verify the true to type of plants and other factors.

### Conclusion

The production strategy of hybrid seed in tomato is emerging in high rate. The scientific techniques and man power has tremendously helped in increase the quality seed in the sector of vegetable seed production. With proper techniques and guidance the success in quality seed can be increased. Nutrient rich seeds are the stepping stones for the proper nutritious food. So, hybrid seed production in tomato leads to high rich nutrients in tomato and increase the yield efficiently.

### References

1. Cheema, D. S., & Dhaliwal, M. S. (2004). Hybrid tomato breeding. *Journal of new seeds*, 6(2-3), 1-14.
2. Opeña, R. T., Chen, J. T., Kalb, T., & Hanson, P. (2001). Hybrid seed production in tomato. *AVRDC International Cooperators Guide Publication No*, 01-527.
3. Saleem, M. Y., Asghar, M., Haq, M. A., Rafique, T., Kamran, A., & Khan, A. A. (2009). Genetic analysis to identify suitable parents for hybrid seed production in tomato (*Lycopersicon esculentum* Mill.). *Pak. J. Bot*, 41(3), 1107-1116.
4. Buddhika, W. J., Peris, R., Ratnasekera, D., & Subhashi, A. P. T. (2013). Pollination Studies in Hybrid Tomato Seed Production (*Lycopersicon esculentum* Mill.).