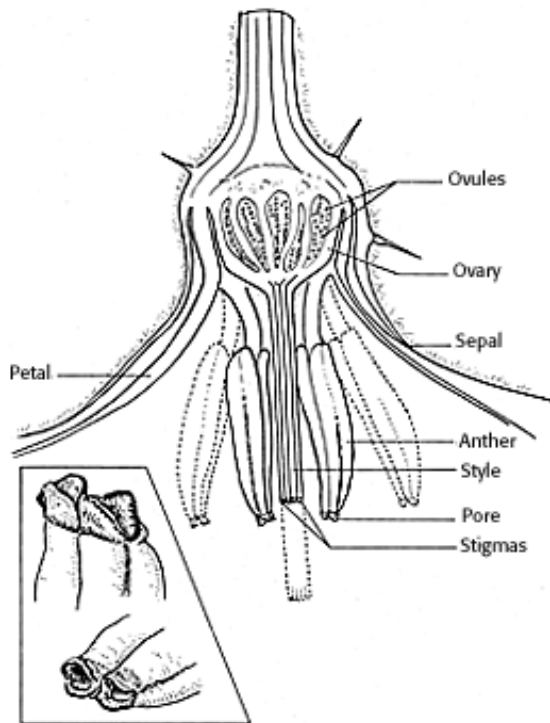


BRINJAL (*Solanum melongena*)

Brinjal is one of the most important vegetable crops grown extensively in the tropical and subtropical belts of the world. It is grown mainly fresh market and to a little extent for processing. Increased attention is now being bestowed to breeding and production of Brinjal. Production of brinjal can further be increased if improved cultural practices are combined with good quality seeds. The quality seed production techniques of brinjal comprises of the following steps.

Botany

Brinjal is often cross pollinated crop. Brinjal flower opens mainly in morning. A few flower open at 16 hr. Anther dehiscence occurs 15-20 minutes after flowers have opened. The period of receptivity ranges from a day prior to flower opening to 4 days after opening. Brinjal produces 4 types of flowers with different style length. (Long style, short style, medium style and pseudo short style). For seed production and better yield, the long and medium style is desirable. To increase the production of long and medium style application of more nitrogen or spraying of growth regulators during pre-flowering and flowering stages may be followed.



Method of seed production : Seed to Seed.

Stages of seed production

Breeder seed → Foundation Seed → Foundation Seed II → Certified Seed.

Varieties

Co.1, Co.2. MDU.1, PKM.1, KKM.1, PLR. 1. AU1, Pusa purple long, Arka nidhi, Pant smart, Arka neelkanth, Arka shrish.

Hybrids

CoBH1, Arka Navneet (IIHR 22-1 x supreme), Pusa H-5, Pusa H-6, MHB 10, MHB 39 (Mahyco), Azad Hybrid.

Season

The brinjal seed production can be taken up in the following 2 seasons. May-June and December- January.

Land requirement : The land should be free of volunteer plants.

Isolation

For varieties, 200 M or 100 M of isolation distance is required for foundation and certified seed, respectively. For hybrid seed production minimum of 200 M isolation distance should be maintained.

Seed rate

Varieties - 400 - 500 g/ha

Hybrids - 200 g/ha (Female) - 50 g/ha (Male)

Nursery

Sow the seeds in raised nursery bed of 20 cm height, in rows of 5 cm gap and covered with sand. Eight and ten nursery beds will be sufficient to transplant one acre. Apply 2 kg of OAP 10days before pulling out of seedling.

Transplanting

Seedlings are transplanted when they are 30-35 days old (12-15 cm height) preferably in the evening time. Spacing of 75 x 60 cm (non spreading) and 90 x 60 cm (spreading) varieties, 90 x 60 cm for female parent and 60 x 45 cm for male parent of hybrids.

Manuring

The field should be thoroughly ploughed for fine filth and apply 25 tons of FYM/ha. The other fertilizer requirement for brinjal variety and hybrid are same as followed for tomato seed production.

Roguing

The roguing should be done based on the plant characters, leaf, branching and spreading characters and also based on fruit size, shape and color. The plants affected by [Phomopsis blight](#), [leaf spot](#) and [little leaf virus disease](#) should be removed from the seed production field.

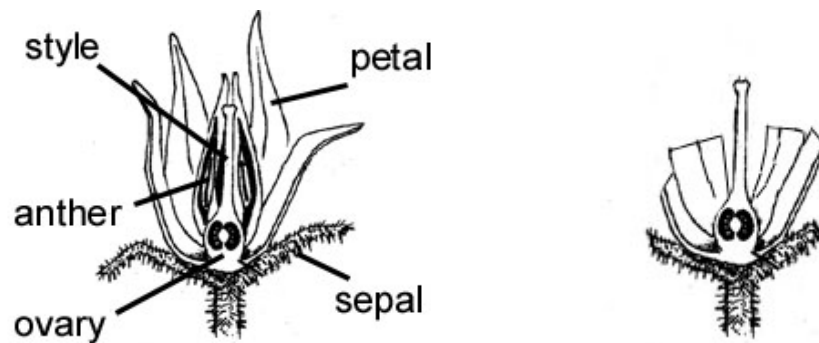
Pest and disease management

The pests like fruit borer, shoot borer, beetles, aphids, mealy bug and jassids can be controlled by spraying Nuvacron or Methyl parathion. The red spider mite can be controlled by spraying in Kelthane. The important diseases are

damping off and little leaf which can be controlled by spraying fungicide and systemic insecticides, respectively. Powdery mildew, leaf spot and anthracnose diseases can be controlled by spraying Benlate.

Hybrid seed production

The planting ratio of female and male parents adopted for hybrid seed production is normally 5:1 or 6:1. For production of hybrid seeds, crossing programme is done using emasculation and dusting methods as followed in tomato.



Harvesting and processing

Harvesting is done when fruits are fully ripe (when the fruits turn into yellow colour) i.e., 405 days after flowering. The harvested fruits are to be graded for true to type and off type and fruit borer infested fruits are discarded. The graded fruits are cut in 2-3 pieces or whole fruits will be put in a cement tank with water and crushed manually and then allow it for fermentation for 1-2 days. Then the floating pulp portions are to be removed, the seeds settled at the bottom should be collected and washed with water and then the seeds with equal volume of water is treated with commercial Hydrochloric acid @ 3-5 ml/kg of seed. The mixture is kept for 10-15 minutes with frequent stirring. Then the treated seeds are to be washed with water for 3-4 times. Afterwards seeds are dried under shade for 2-3 days over a tarpaulin and followed by sun drying for 1-2 days to reduce the seed moisture content to 8 per cent. Then the seeds are cleaned and graded with BSS 12 sieve. The processed seeds are treated with fungicides or Halogen mixture @ 5g/kg of seed.



Storage

The seeds dried to safe moisture content after treating either with captan or thiram @ 2 g/kg can be stored for 15 months in moisture vapour pervious containers, while it can be stored in moisture vapour proof containers for 30 months.

Seed Yield : 100-200 Kg/ha

Seed Certification

Number of Inspections

1. The first inspection shall be made before flowering on order to verify isolation, volunteer plants, and other relevant factors,
2. The second inspection shall be made during flowering to check isolation, off types and other relevant factors
3. The third inspection shall be made at maturity and prior to harvesting to verify true nature of plant and other relevant factors

Specific standards

Factors	Foundation	Certified
Off types – Variety	0.1%	0.25
Hybrid	0.1%	0.05%
Designated diseased plant	0.1%	0.5%

- c. 12/64" d. 15/64"
6. In tomato the hybrid seed production is normally done by_____.
- a. Cytoplasmic Male Sterility b. Genic male sterility
c. **Emasculation and Hand Pollination** d. Detasseling
7. In tomato _____ is used as chemical hybridizing agents.
- a. Gibberelic acid b. Colchisin
c. Etheral d. **Malic hydraside**
8. Minimum germination percentage for tomato is _____.
- a. 90% b. 50%
c. **70%** d. 90%
9. Brinjal is self pollinated crop. (True/**False**)
10. In Brinjal for seed production and better yield_____ flower is suitable.
- a. Long style b. pseudo short style
c. short style d. **medium style**
11. The planting ratio of female and male parents adopted for hybrid seed production is normally
- a. **5:1** b. 8:1
c. 12:1 d. 10:1
12. _____ is the designated diseases in brinjal
- a. Root rot b. **Little leaf**
c. Leaf spot d. None
13. Genetic purity of brinjal hybrid is _____
- a. **90%** b. 60%
c. 75% d. 50%
14. Pure seed percentage of brinjal is _____
- a. 68% b. **98%**
c. 90% d. 50%
15. Designated disease allowed during certified seed production is
- a. 1% b. 0.2%
c. 0.05% d. **0.5%**

SEED PRODUCTION TECHNIQUES I IN VEGETABLES

TOMATO (*Lycopersicon esculentus*)

Tomato is one of the most important vegetable crops grown extensively in the tropical and subtropical belts of the world. It is grown mainly fresh market and to a little extent for processing. Increased attention is now being bestowed to breeding and production of tomato. Production of tomato can further be increased if improved cultural practices are combined with good quality seeds. The quality seed production techniques in tomato comprises of the following steps.

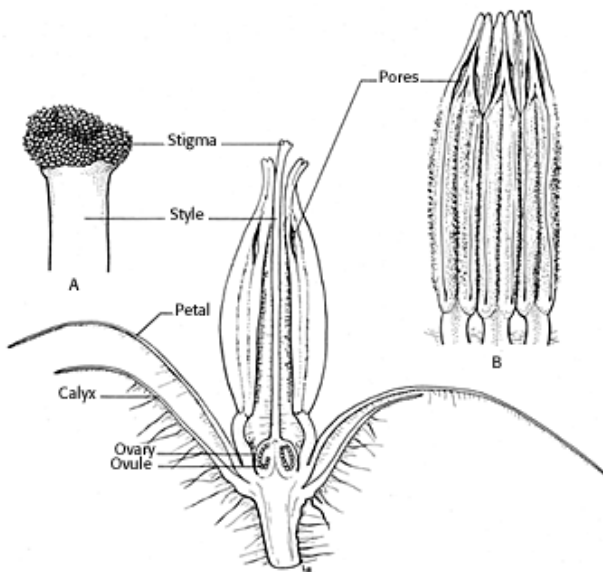


Figure 184. - Longitudinal section of tomato flower, x9. A, Tip of pistil; B, three anthers, greatly enlarged.



Botany

Tomato is a typical day neutral plant. It requires temperature of 15-20° C for fruit setting. Tomato is self pollinated crop. Self fertilization is favoured by the position of receptive [stigma](#) within the cone anthers and the normal pendant position of the flower.

Method of seed production : Seed to Seed.

Stages of seed production

Breeder seed - Foundation Seed I - Foundation Seed II - Certified Seed

Varieties :

Indeterminate varieties

Pusa Ruby, Solan Gola, Yaswant (A-2), Sioux, Marglobe, Naveen, Ptom-9301, Shalimar- 1, Shalimar-2. Angurlata, Solan Bajr, Solan Sagun, Arka Vikas. Arita Saurbh.

Determinate varieties

Roma (EC-13513), Rupali, MTH-15, Ptom-18, VL-1, VL-2, HS 101, HS 102, HS 110, Pusa Early Dwarf, Pusa Sheetal, Floradade, Arka Meghli, Co.1, Co.2, Co.3 (Marutham), PKM.1, Py1,

Hybrids

COTH-1, Pant Hybrid-2, Pant Hybrid-10, Kt-4. Pusa Hybrid-I-4, Arka Shreshta, Arka Vardan, Arka Abhijit, Navell 1 &2 (Sandoz), Rupali, Sonali, MTH 6

Season : May - June and November - December

Land requirement

Selection of suitable land for tomato seed production is important where the previous crop should not be the same variety to avoid the contamination due to the volunteer plants.

Isolation requirement

For Seed production of tomato, varieties require minimum of 50 M for foundation seed and 25 M for certified seed. For hybrid seed production, it requires minimum of 200 M for foundation (parental line increase) and 100 M for certified hybrid seeds.

Seed rate

For i) Varieties - 300- 400 g/ha ii) For F₁ hybrid - Male parent 25 g/ha; Female parent 100 g/ha.

Nursery

Sow the seeds in raised nursery bed of 20 cm height, in rows of 5 cm gap and covered with sand. Eight and ten nursery beds will be sufficient to transplant one acre. Apply 2 kg of DAP 10days before pulling out of seedling.

Transplanting

Transplanting should be done with the seedlings are 20-25 days old, preferably at evening time. Spacing is 60 x 45 cm (90 x 60 cm for female parent and 60 x 45 cm for male parent of hybrids).

Manuring

After thorough preparation of a field to fine tilth, apply 25 tons of FYM per ha. Apply 100 : 100: 100 Kg of NPK/ha of which, 50% of the N is applied as

Roguing

The roguing should be done based on the plant characters (determinate / indeterminate), leaf, branching and spreading characters and also based on fruit size, shape and color. The plants affected by early blight, leaf spot and mosaic (TMV) diseases should be removed from the seed production field.

Planting ratio

For hybrid seed production, the female and male parents are normally planted in the ratio of 12:1 or 12:2.

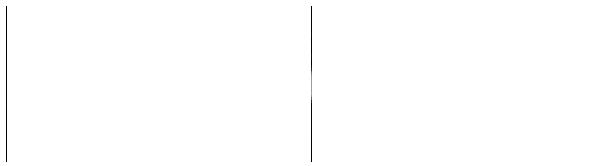
Pest and disease management

The major pests attacking tomato crop are leaf eating caterpillars and fruit borers, which can be controlled by spraying. The major diseases in tomato are [early blight](#) and [mosaic virus](#). The early blight rot can be controlled by spraying Benlate or Dithane M-45.

Harvesting seed extraction and processing

The fruits are harvested after full maturity of the fruit when turn in to red color fruits from first and last one or two harvests should not be used for seed extraction.

Stages of maturation: Mature green, Breaker, Turning, Pink, Red, Dark red / over ripe



The fruits from in between 6-7 harvest should be used for seed extraction. The seed viability is depends on the method on which the seeds were extracted and hence, it is more important to choose proper methods of seed extraction. Before seed extraction, the fruits are to be graded for true to type and selection of medium to large size fruits for getting higher recovery of quality seeds.

The acid method of seed extraction is the best method for tomato seed extraction. In this method, the fruits are to be crushed into pulp and taken in a plastic containers (or) cement tank. And then add 30 ml of commercial Hydrochloric acid per kg of pulp, stir well and allow it for ½ hour. In between this duration the pulp may be stirred well for one or two times. This facilitates the separation of seed and pulp. After ½ hour, the seeds will settle down at the bottom and then the floating fraction is to be removed. The collected seeds should be washed with water for three or four times.

- ✓ While following acid method we must use only plastic or stainless steel containers or cement tank.
- ✓ Care must be taken to avoid the usage of iron or zinc containers, which will affect the viability potential of the seeds and as well damage to the containers due to chemical reaction with acid.
- ✓ For large scale seed extraction we can use the tomato seed extractor developed by Tamil Nadu Agricultural University.
- ✓ The seeds extracted by this machine may again be treated with commercial Hydrochloric acid @ 2-3 ml/kg seed with equal volume of water for 3-5 minutes with constant stirring. And then seed should be washed with water for to four times.

- ✓ It is easy to dry the seeds extracted by acid method and also remove the fungus growth over the seed coat, thus seeds possess golden yellow colour and high vigour.
- ✓ The seed extracted by fermentation method posses poor vigour and off colour due to fungal activity.

Comparison of different seed extraction methods

	Fermentation	Acid	Alkali
Method	Mix fruit pulp with water - 24 - 48 h	HCl @10ml / Kg of pulp - 20-30 minutes	Washing soda @ 900mg/4 l of water- equal volume – overnight soak
Salient features	<ul style="list-style-type: none"> • Low cost. • Unskilled labour. • More Time taken • Low Seed recovery (0.5 to 0.6 %) • Dull seed colour. • Seed..borne.. pathogens 	<ul style="list-style-type: none"> • Cost is more. • Skilled labour • Lesser Time • High seed recovery (0.8 to 1 %) • Bright colour market value higher. • Seed borne pathogen – removed • Improper washing leads to injury to seeds 	<ul style="list-style-type: none"> • Recovery 0.7 to 0.8 per cent • Luster of the seeds will be lost. • Improper washing leads to injury to seeds

Fermentation method



Manual Crushing



Fermentation



Washing



Extracted seed

Acid seed extraction



Mechanical Crushing



Extracted seed



Acid treatment



Washing of seeds

Drying and grading

Seeds are to be dried in the shade. It should never be dried in hot sun. the safe moisture content of the seed for grading is 8 to 9 per cent. Seeds can be graded using 6/64" round perforated sieve.

Storage

The seeds dried to safe moisture content after treating either with captan or thiram @ 2 g/kg can be stored for 15 months in moisture vapour pervious containers, while it can be stored in moisture vapour proof containers for 30 months.

Hybrid seed production:

In tomato the hybrid seed production is normally done by 'Emasculation and Hand Pollination'. However use of chemical hybridizing agents (MH-1000 ppm) or CMS lines are also practiced

Emasculation and dusting

1. Emasculation is done before the anthers are mature and the stigma has become receptive to minimize accidental self pollination.



Selection of flower

2. Thus emasculation is generally done in the evening, between 4 PM and 6 PM one day before the anthers are expected to dehisce or mature and the stigma is likely to become fully receptive.
3. Emasculate the bud by hand with the help of needle and forceps. Remove the **calyx**, **corolla** and **staminal column** or **anthers**, leaving **gynoecium** i.e., **stigma and style** intact in the flower.



Removal of anther cone



Removal of corolla

4. Emasculated flowers should be covered immediately with red coloured paper cover to protect against contamination from foreign pollen and also for easy identification of emasculated bud during dusting.

5. Remove the red paper cover of the emasculated bud and dust the pollen gently over the stigmatic surface using cotton or camel brush, etc.,



Emasculated flower



Dusting of pollen

6. After dusting, the emasculated flowers are again covered with white or other coloured paper cover for two to three days.
7. Pollen collected from one male flower can be used for dusting 5 to 7 emasculated flowers.

Pollen collection



Male flower



Collected flower



Drying of flower



Collection of pollen I



Collection of pollen II



Pollen for hybrid crosses

Seed Yield : 100 -120 Kg/ha

Seed Certification

Number of Inspections

A minimum of three inspections shall be made as follows:

1. The first inspection shall be made before flowering on order to verify isolation, volunteer plants, and other relevant factors,
2. The second inspection shall be made during flowering to check isolation, **offtypes** and other relevant factors
3. The third inspection shall be made at maturity and prior to harvesting to verify true nature of plant and other relevant factors

Specific requirements

Factors	Foundation	Certified
Off types - variety	0.1 %	0.2%
Hybrid	0.01%	0.05%
Plants affected by seed borne diseases	0.1 %	0.5%

Seed standard (variety and hybrid)

Factors	Foundation	Certified
Pure seed (mini)	98%	98%
Inert matter (maxi)	2%	2%

Other crop seeds (maxi) 5/kg	5/kg	10/kg
Weed seeds (maxi)	None	None
Germination (mini)	70%	70%
Moisture (maxi)	8%	8%
For VP container	6%	6%