



Flower biology and breeding techniques in tomato

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8 BENEFITS OF TOMATO

Improves vision

Prevents gallstones

Lowers hypertension

Good for digestive health

Helps to manage diabetes

Prevents urinary tract infections

Counters the bad effects of smoking

Reduces cholesterol levels & protects heart

INTRODUCTION



- Common Name : *Tomato*
- Botanical Name : *Solanum lycopersicum*
formerly Lycopersicon esculentum
- Introduced in India : *19th century by Britishers*
- Chromosome No. : $2n = 24$
- Family : *Solanaceae (nightshade)*
- Centre of origin : *Peru (South America)*

OTHER SPECIES

1. *L. pimpinellifolium* - Fusarium wilt, early blight resistant.
2. *L. peruvianum* - Leaf curl virus resistant.
3. *L. cheesmanii* - Salt resistant.
4. *L. hirsutum* - Fruit borer resistant.
5. *L. pennellii* - Drought tolerant.

AREA, PRODUCTION AND PRODUCTIVITY OF TOMATO

	AREA (000' ha)	PRODUCTION (000'Mt)	PRODUCTIVITY (Mt/ha)
❖ WORLD	4815.71	163029.746	33.9
❖ CHINA	1000	50000	50
❖ INDIA	882.03	18735.9	21.2

Tomato shares 9.4% of total vegetable area and 11.5% of total vegetable production in india.

SOURCE: NHB

HISTORICAL BACKGROUND

- Among the vegetable crops, first commercial F1 hybrid of brinjal was released during 1924 in Japan
- In tomato first F1 hybrid was developed in 1940 in Japan
- At national level first hybrid vigor was reported in chilli during 1933 in by IARI, New Delhi
- First public sector hybrid developed was Pusa Meghdoot in bottle gourd in 1971
- The first hybrid vegetable seeds (Karnataka of tomato and Bharat of bell pepper) were marketed in India by IAHS in 1973

OBJECTIVES OF BREEDING

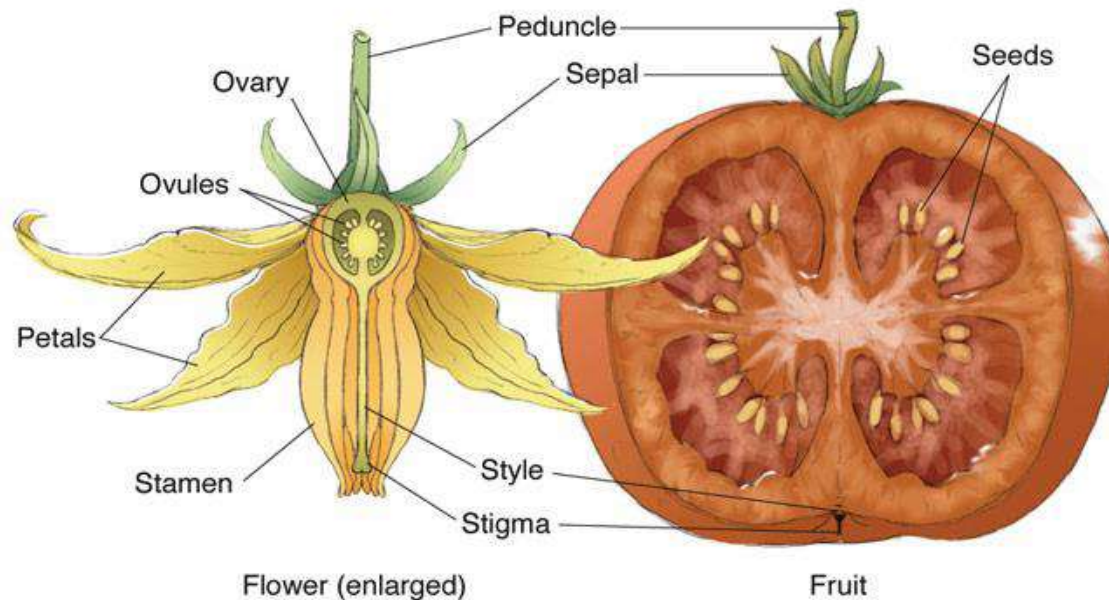
- Breeding for earliness.
- Breeding for increased fruit yield.
- Fruit quality like large round, uniform size, deep red colour and increased shelf life etc.
- Breeding for disease resistance like (Fusarium wilt, late blight anthracnose, bacterial wilt).

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- Breeding for insect resistance (fruit borer, whitefly etc).
- Breeding for Abiotic Stresses (cold tolerant, drought tolerant, salt tolerant, low temperature tolerant, herbicide tolerant).
- To breed varieties for prolonged storage and transportation *e.g, flavr Savr*
- To breed varieties suitable for processing

FLOWER BIOLOGY

The flowers are bisexual, radially symmetric, and consist of 5 parts (sepals, petals, anthers). The calyx is united, at least at the base. The corolla is also united but its shape varies.



FLOWERING BEHAVIOUR

- **ANTHESIS:** Starts at 6 AM and maximum flower opening till late morning.
- **DEHISCENCE:** 8 AM – 11 AM.
- **RECEPTIVITY OF STIGMA:** 16 hrs before and 5 days after anthesis.



Plants vary in mating system from completely outcrossing to completely inbreeding (selfing)



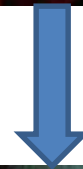
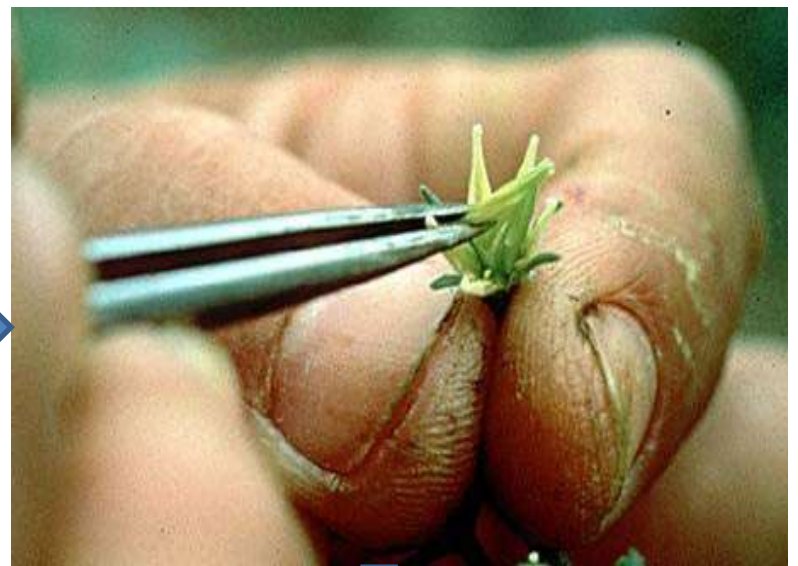
Cultivated Tomato



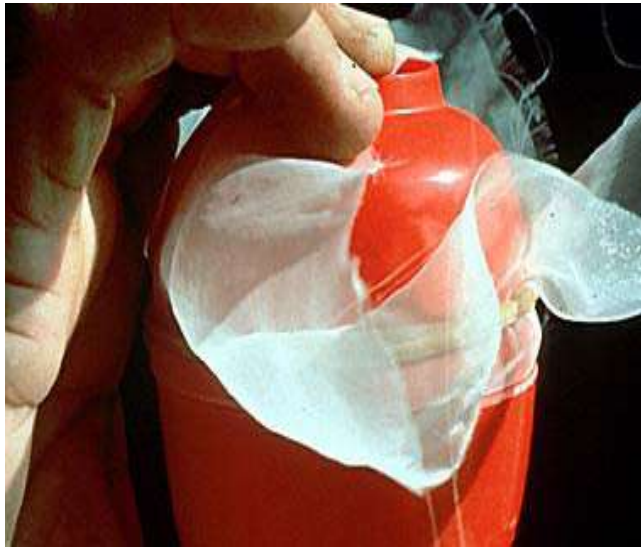
Wild Tomato

- Cultivated tomatoes are self-pollinating.
- Pollen shedding often occurs before flowers open.
- Self-pollinating leads to homozygosis. Inbred lines breed true

CROSSING TECHNIQUES



EMASCULATION PROCEDURE



COLLECTION OF POLLEN



pollination



Hybrid fruits

Breeding procedures

- ❖ **Introduction:** Seeds of improved varieties are introduced from one ecological area to another and evaluated. *E.g., "Marglobe"*.
- ❖ **Pure line selection:** Arka vikas, Arka saurab.
- ❖ **Back cross method:** is commonly utilized in wide crosses or in inter specific gene transfer for resistant to diseases.

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- ❖ **Pedigree method:** has the most common method in tomato. In this method single plant selection is initiated in F₂ and is continued through successive generations till pure lines are obtained (up to F₆ generations)
- ❖ **Single seed decent method**
- ❖ **Heterosis breeding**
- ❖ **Mutation breeding**

CONT...

❖ **Biotechnological methods:**

- Breeding for resistance to abiotic stress
- Tomato is sensitive to low and high temp from the stage of germination to ripening. *E.g., Transgenic variety*
- “**Flavr Savr**” was developed for long shelf life and transportation.

ARKA RAKSHAK



- ✓ First public **triple disease resistant** tomato F1 hybrid in India.
- ✓ High yielding F1 hybrid giving yield of **90-100** tons per hectare in **140-150** days.
- ✓ Triple disease resistance to tomato **leaf curl virus, bacterial wilt and early blight**.
- ✓ Suitable for **summer, kharif and rabi** seasons.

THANK YOU