

Seed Production of Open-Pollinated Tomato Lines

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Introduction

Tomato is a very popular vegetable in the tropics. Open-pollinated (non-hybrid) tomato seed is easy to produce. Isolation of plants is usually not needed and each plant can produce thousands of seeds. This publication shows how to produce seeds from open-pollinated lines and varieties.

Crop Management

Climate

Ideal growing conditions are needed to produce high quality seed. Tomatoes grow best in the dry season under day temperatures of 21-25°C and night temperatures of 15-20°C. Vines will struggle to set fruit if temperatures exceed 30°C.

Humidity is an important factor. Humidity levels higher than 60% at the time of fruit maturity will increase disease problems and reduce seed yields. Seed production during the rainy season generally leads to low yields and poor seed quality.

Field Requirements

Select a sunny spot to promote maximum production of flowers and fruit. Avoid fields where the previous crop was tomato; this prevents the new seed crop from being contaminated with seeds from volunteer tomato plants. Avoid fields where the previous crop was sweet potato or a solanaceous crop (tomato, pepper, eggplant or



Figure 1. Producing open-pollinated tomato seed is easy. Isolation of plants is usually not needed and a single plant can produce thousands of seeds.

white potato); this prevents the build-up of diseases and insects. Growing tomato after paddy rice reduces the incidence of diseases and nematodes. Optimum soil pH is 6.0 to 7.0.

Hybrid Seed Production

These procedures cannot be used to produce seeds from hybrid plants. Seeds saved from F₁ hybrids will produce plants that are inferior and not uniform. Special techniques, not described in this guide, must be used to produce F₁ hybrid seed. See AVRDC International Cooperators' Guide, *Hybrid Seed Production in Tomato*.

Cultural Practices

Healthy plants produce healthy seeds. Pests should be controlled. Nutrient and water management should be optimal to achieve good fruit and seed yield. Staking is generally recommended. For more information on growing tomato, see AVRDC International Cooperators' Guide, *Suggested Cultural Practices for Tomato*.

Isolation

Nearly all tomato lines, including today's modern varieties, are *self-pollinating*. The male anthers shed pollen onto only the female style within the *same flower*. The style does not protrude outside the flower (Figure 2). Due to the structure of the flower and its mechanism of pollination, **isolation of different lines is usually not necessary.**

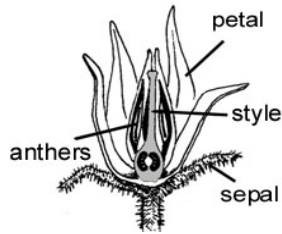


Figure 2. Typical tomato flower

There are exceptions. Currant tomatoes (*Lycopersicon pimpinellifolium*) and potato-leaf types of *L. esculentum* generally have styles that protrude outside their flower. These lines are more attractive to insects, and thus, more likely to be cross-pollinated. Check each line's styles at the first sign of flowering. Netting or caging to exclude pollinating insects is required if lines with protruding styles are used. Also, do not collect seeds of double fruits since double flowers are more prone to insect pollination.

Removing Off-Types

The lines should be as pure as possible. Know the plant habit, leaf type, immature fruit characters (e.g. shape, size, and shoulder coloring) of each line. Regularly inspect the plants. Remove any off-type (usually inferior) or virus-infected plants immediately. Symptoms of viruses include yellow mottling of leaves; severe curling or other distortion of foliage; and stunting of plants.

Fruit Production

The number of fruits produced per plant depends on the size of the fruit. Maintain about 30 fruits per plant for lines which produce large-sized fruit, 40 for medium-sized fruit, and 50+ for small-sized fruit.

Harvesting

Keep the fruits on the vine until they are fully mature, preferably to the pink or red ripe stage. This enables the seed to develop normally and fully. If fruits are harvested at an earlier stage, place them in a covered, cool dry place for three or four days until they become red ripe.



Figure 3. Harvesting

Collect fruits in nonmetallic containers, such as nylon net bags, plastic buckets, or crates (Figure 3). Metal containers may react with acids in the tomato juice and affect seed viability. Hence, they should not be used.

Seed Extraction

Option 1: Manual Extraction

Harvest the ripe fruits and keep them in nylon bags (Figure 4). Crush the fruits by trampling with feet (Figure 5).

Put the bags of crushed fruits into big plastic containers and ferment to separate the gel mass embedding the seeds. To hasten the fermentation process, put weights over the bags or keep the fruits submerged in the liquid fruit mass (Figure 6).

The time of fermentation depends upon the ambient room temperature. If temperature is above 25°C, one day of fermentation may be sufficient. If cooler, two days of fermentation may be needed. Fermentation for more than three days may spoil the seeds' quality.

Put the seeds in an open plastic container. Then, fill up the container with water and stir the seeds to allow the pieces of flesh and skin sticking on the seeds to float.

Incline the container and gently remove the floating refuse, making sure that the seeds remain at the bottom (Figures 7 and 8). Repeat the washing several times, adding fresh water to the container every time until all the flesh and gel are completely removed, leaving clean seeds at the bottom (Figure 9).



Figures 4-9. Tomatoes are harvested in bags, which are stepped on, and then fermented. Seeds are cleaned by careful removal of floating pieces of flesh and skin.

Option 2: Mechanical Extraction

Mechanical seed extraction is used by large-scale operations. Put the ripe fruits into the mechanical seed extractor for crushing and separation of the seeds and gel from the pulp (Figure 10). Gather the seeds and gel mass in a suitable container such as plastic tub or bucket (Figure 11).

Instead of fermentation, treat the seed-gel mass with 0.7% hydrochloric acid (HCl) at a rate of seven milliliters of HCl per kilogram of seed-gel mass (Figure 12). Stir the seed-gel mass while the acid is being added. Continue stirring for 40 minutes until the gel is softened or dissolved. Do



Figures 10-14. A machine extracts the seeds from fruits. Seeds are then treated with hydrochloric acid to loosen their gelatinous coating, and then cleaned using water.

not use a higher concentration of acid nor a longer treatment time otherwise you will injure the seeds.

When the seed is separated from the gel, pour the acid-treated seeds into a clean fine-mesh bag. Wash the bag with tap water thoroughly so that no acid is left on the seeds' surface (Figure 13). While washing, step on the bag to squeeze out the remaining gel.

Place the seeds into an open plastic container, filling it to one-third capacity. Then, fill the container with tap water. Stir the seeds to enable the small pieces of flesh and skin to float. Incline the container and remove the floating debris (Figure 14). Make sure the seeds remain at the bottom of the container.

Repeat the washing procedure several times until all the debris is gone and the seeds are clean.

Seed Drying

Place the washed seeds in bags. Excess water can be removed by hanging the seeds in the shade for a day. An even quicker way to remove water is to place the seeds in a spin dryer (Figure 15).

After the excess water is removed, uniformly spread the partially dried seeds in a flat plastic container or aluminum pan. Loosen any clumps of seeds (Figure 16). Enclose this container with its seeds into a net nylon bag.

Place the container into an air drier (Figure 17). Drying continues for three to four days, maintaining a temperature of 28-30°C. Higher temperatures at the time of drying may cause seeds to germinate.

Stir the seeds two to three times daily so that seeds dry uniformly. Loosen any seeds that clump together. These procedures will get the seeds to the desired 6-8% moisture content.

Seed Storage

Tomato seeds can be safely stored for at least three to five years. Place seeds in manila envelopes, cloth or mesh bags, plastic containers, or foil envelopes. The best containers are airtight, such as a sealed glass jar, metal can, or foil envelope.

Label each container carefully. Note the names of the line or variety, the year, and any other information you feel is valuable.

Store seeds in a cool, dry place. Small quantities can be kept in an airtight container inside a refrigerator. For larger quantities, a special room with controlled humidity and temperature should be used. If possible, the temperatures should not exceed 20°C and relative humidity (RH) in the storage area should not exceed 30%.

More Information

For more information on this topic, contact Dr. Peter Hanson at <hansp@netra.avrdc.org.tw>.

Several International Cooperators' Guides and other publications have been written on topics related to tomato cultivation and vegetable seed production (including hybrid tomato seed production). This information is available at the AVRDC web site, <<http://www.avrdc.org.tw>>.



Figures 15-17. Seeds are spun-dried, spread and loosened in a flat container, then rebagged and placed into an air drier.