

Paramount Seeds Inc.

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Information provided courtesy of De Ruiter Seeds Inc.

Method: Japanese Top Grafting

With this method, the scion (variety) and the rootstock are cut off at a 45° angle. They are kept straight together with a silicon grafting clip.

Grafting consists of the following actions:

1. Seeding the rootstock
2. Seeding the variety
3. Preparations
4. Grafting
5. Fusion
6. Potting and spacing

1. Seeding the Rootstock

Seed the rootstock according to DRS recommendations.

The sowing date depends on the chosen rootstock, the cultural variety for grafting and also on the sowing and greenhouse conditions. That is why we strictly recommend to do your own germination test. With this test it will be possible to find out the germination rate, the germination behavior and the necessary number of days from sowing until the rootstock and the variety are ready for grafting.

- Depending on these results the sowing date will probably be 2 days before the sowing date of the cultural variety. It is recommended sowing in Rockwool plugs at 240 cells per tray, but sowing in soil trays (with plugs) is also possible.
- Rootstocks are typical light germinators, which make the light the most important factor to achieve a more equal plant. Therefore storage of the sown trays in the shed or dark germination cell is not recommended.
- Cover the seeds slightly with small size vermiculite, only the holes in the tray need to be filled.
- Put the trays onto the greenhouse floor or in a warm, light area immediately after sowing. Cover the trays with clear plastic to avoid dehydration of the seeds or place the trays in an area with very high humidity. If necessary also cover the trays against too hot temperatures because of direct sun light.
- Remove the plastic as soon as the very first green spot is visible. Humidity must be on a high level, otherwise the seedlings will dry off.

Note: Covering the trays with too much vermiculite or soil will have a bad influence on the germination speed and result in a more uneven germination.

- If the stem of the rootstock is quite short underneath the cotyledons, it is possible to place the just germinated trays for a maximum of 12 extra hours into darkness / under black plastic to stimulate the length growth.
- Due to the possible uneven emergence, the seedlings must be selected.
- On the same step the rootstock will be spaced, for instance from 240 plants to 120 or 80 plants a tray.
- This will give a more compact plant and more space for the grafting handling.
- Sorting is possible when there is enough growing difference visible, but not later than two days before grafting.
- Sorting must be done according to the same stem thickness, because the moment of grafting depends on the right stem thickness.

Note: Spacing also gives shorter and more thicker stems because of more light for the plants! The rootstock will finally germinate for almost 100%. The germination test will give you exact information about the germination behaviour for a good planning of the sowing dates. Selected rootstock seedlings could be kept at a lower temperature to make them thicker and sturdier (18 to 20C).

Recommended germination conditions:

- Temperature 24 - 25°C day and night
- RH 80%
- EC 1.5 – 1.8 mS/cm (in general: basic water + 1 mS/cm nutrition)
- pH 6.0 – 6.5
- Light (D/N) 4.500 lux/m² (05:00 – 16:00 hrs)

2. Seeding the Variety

Seed according to the standard recommendations.

Sowing date depends on the results of the germination test. The best time for grafting is when the rootstock and variety stems have the same thickness. Probably the variety grows a little more quickly than the rootstock, but it can also happen that the variety needs one or two days more time.

So grafting will be possible after approx. 17 days.

Plants could be kept from day 11 on at a lower temperature (min. 19°C!) to get better and stronger vigour.

3. Preparations

- Grafting must be done in an area with no direct sunlight.
- Make a plastic tunnel, about 30 cm high, clear plastic is preferred. Under high light conditions, a white film may be used.
- Strong sunlight can be reduced by a retractable screen or by Styrofoam sheets.

- Make a solution of disinfectant for disinfecting the hands (for instance with Dettol).
- Prepare all necessary materials: grafting clips, plastic, knives, labels, thermometer, plant sprayer, and screening material.
- Always use new and clean materials.
- Temperature should be approx. 21 – 23°C.
- Recommended knives: (old fashioned) razor blades; always use new knives and replace them after every break or between different varieties.
- Do not smoke during grafting or near plants for grafting.
- Humidity in the tunnel must be no lower than 80% .
- Give the plants the best possible tending before grafting (for rootstock EC 2 – 3 mS/cm);
- if possible do not water the plants less than 2-3 hours before grafting, otherwise the root pressure will still be too high.

4. Grafting Procedure

First cut off all the rootstock of a tray with a razor blade at a 45° angle.

We advise cutting the rootstock underneath the cotyledons, but stem should be at least 2 - 3 cm long (cutting the rootstock above the cotyledons will not have a negative influence on the grafting result).

If the stem is much longer, the plant gets very heavy and may fall over; for this case special clips are available with an extra hole for a support stick

A too short stem could give problems with root forming of the cultural variety (root forming can appear under too wet conditions and high humidity in combination with low temperature or not optimal conditions during grafting).

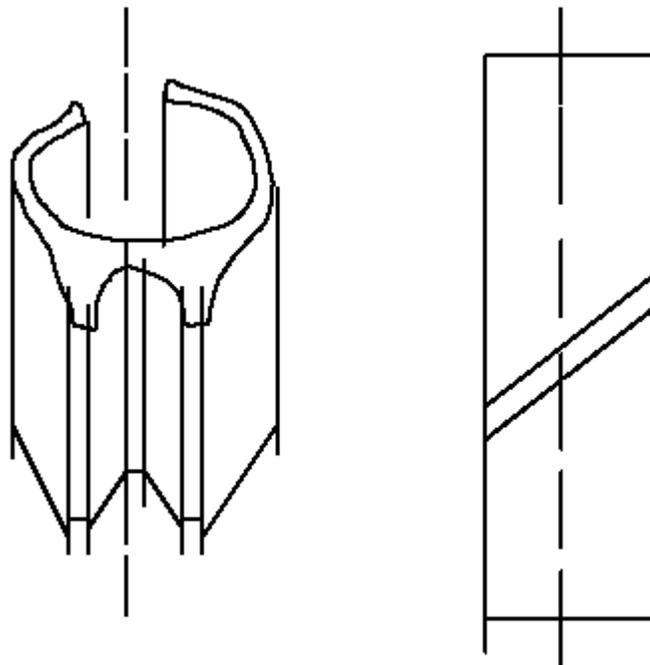
- Put the grafting clips on all the cut rootstocks of the tray.
- Clips should not be too big, but a little tight.
- Cut off the plants of the variety (scion) at the same angle as the rootstock.
- Cutting point depends on the stem thickness; most recommended way is to cut without cotyledons (keeping or not keeping the cotyledons has no influence on the grafting result).
- Stem of the rootstock and stem of the scion must have the same thickness for best possible contact.
- Do not cut off more heads than needed for the prepared rootstock.

Note: Under very hot conditions and low humidity it could be necessary to protect scion against dehydration. Spray the scion with a plant sprayer to keep them fresh. It is also possible to store the scion in a tray with clean (tap) water; but this will increase the possibility of infection by virus or other diseases.

- Place the scion in the clips of the prepared rootstocks and make sure that they make contact for 100%.
- Air or dirt between the two parts will result in failure of the grafting.
- If necessary prick a support stick next to the plant.
- If necessary give a fine spray on the plants as refreshment.
- Place the tray directly into the tunnel.
- Spray the inside of the tunnel to increase the humidity into the tunnel.
- Close the tunnel carefully.

Remarks:

- Avoid direct sunlight during the whole process.
- Cutting at an angle (45°) gives a good and large fusion surface and a better chance of success.
- Avoid transport, a working area next to the grafting tunnel would be most optimal.
- Do not cut all the scion stock; only the quantity required at the time..
- Place each finished tray directly into the tunnel and close the tunnel carefully after each tray.
- High humidity is necessary, but be cautious with spray on the plants in the late afternoon and evening and with dark weather.
- Optimum temperature for grafting is approx. 22 / 23 °C.
- Avoid temperatures in the tunnel above 28 / 30°C; higher temperatures will probably give problems and a poor result.



5. Fusion

- It is important to avoid direct sunlight onto the plants and to maintain a uniform climate.
- Until the plants have been hardened, shading will be necessary when it is sunny. The most common procedure is to keep the tent closed for three days.
- Check the plants only from the outside of the tunnel.
- On the fourth day check if the tunnel still smells healthy and if the plants are wet enough. Make a small gap in the tunnel for this and carefully close the tunnel after the check.
- The plants must not wilt. Should this happen mist the plants lightly (use water of greenhouse temperature).
- On the fifth day, ventilate a little. It is preferred to make a small gap and to check the condition of the plants each hour. Should they wilt, lightly mist the plants with clean water and close the tent again. In the evening or the next morning, the gap can be made again.
- On day 6, make the gap larger if the plants can handle it and remove the plastic on the seventh day (preferably in the morning or evening).

- When ventilation gives problems the procedure needs a day more. Under very optimal conditions it will be possible to use one day less for the procedure.

Note: Do not ventilate the tunnel too quickly. Bring the temperature and humidity of the tunnel slightly back to greenhouse level.

6. Potting and Spacing

After day 7 the normal plant raising procedures can be followed. Transplanting into a rockwool block is recommended from 9 to 10 days after grafting (when the rootstock and the variety have joined solidly). If the grafting clips is made of silicon, removal will not be necessary.

Pinching of the grafted plants will be possible when the plants placed back into the greenhouse.

SUMMARY

The breeding companies that develop greenhouse tomato varieties also breed specialized varieties solely for use as root stock. De Ruiter, for example, offers 3: Beaufort, Maxifort and Multifort They are from De Ruiter or any of their distributors, including, Paramount Seeds.

Can you grow rootstock yourselves? the answer is yes.

Grafting techniques take time and practice to learn. It should be possible to grow organic root stock, provided you buy seed that isn't Thiram treated. This may be difficult, as root stock varieties are less uniform in their emergence than the fruit producing varieties and De Ruiter generally primes and treats the seed before sale. Priming itself may disqualify the root stock from organic production.

Here's a list of pros and cons, which may not be complete:

Disadvantages:

1. Extra cost. It takes more time, planning and cash to buy the root stock seed, grow both the root stock and the fruiting variety plants and to graft the fruiting type on to the root stock, one by one.
2. Extra vigor. The root stocks are selected for vegetative vigor and soil borne disease resistance. If you already have problems with excessive vegetative vigor, root stock will aggravate the problem.
3. Increased risk. Once you've read the attached Guidelines, you'll be aware of how much work you'll be doing and how many things can go wrong with the process.

Advantages:

1. More vigor. If you need more, this is a secure way to get it.
2. More pest resistance. Root stock can allow you to use commercial varieties that lack resistance to important soil borne problems, including nematodes, fusarium crown and root rot, corky root
3. Organic production. The extra vigor and protection from pests makes root stock a potentially attractive choice for organic growers who have limitations on their responses to nutritional needs, diseases and pests. Writing this, I see that it contradicts what I said about organic root stock above, but I do know that DR considers root stock an option for organic growers.