Grafting technique: Grafting Approximation for cucurbits.

General description of the grafting technology for horticulture crops.

Grafting, using resistant rootstocks, is an effective method for soil borne disease control. The technique is particularly useful in crops for which no commercially acceptable resistant material is available as these susceptible but high yielding cultivars can be grafted on resistant rootstocks. Several species and varieties are available to become rootstocks. This type of grafting can be used to protect crops against vascular diseases caused by *Fusarium* spp, *Verticillium* spp and *Phytophthora* spp and, at a certain level, nematodes like *Meloidogyne* spp.

Rootstock and scion are sown in a soiless system using multi-cell trays. The plants are ready for grafting from 9 to 20 days after germination. The most common procedure for grafting is as follows:

1. Rootstock: when the first real leaf has partially developed, the top portion of the plant is removed with a diagonal cut.
2. Scion: the root is removed with a diagonal cut.
3. Grafting: rootstock and scion are joined using a small peg and maintained together with a small clipping device.
4. Healing: the plants will be kept for 5 days in heated beds and high humidity environment under a polyethylene sheet (humid tent).
5. Hardening: the plants can be transplanted into other multi-cell trays (with larger holes) or to plastic pots, and transferred to a conventional greenhouse for 1 - 2 weeks before the final transplantation.

To maximise the efficiency of the technique, a perfect co-ordination of the vegetative cycles must be achieved before the conjunction of the two plants. During grafting, timing of the operations needs to be strictly controlled. Also, appropriate sanitation measures have to be adopted (use of pest free high quality seeds and substrates, sterile trays, knifes, blades and benches, the use of physical barriers against virus vectors and specific pesticides against insects and fungi). During the entire process the environmental conditions have to be optimised and controlled (temperature, humidity, composition of the substrate, sun radiation, ventilation, fertilisation,...).

The use of very high resistance plants as rootstocks (plants with horizontal resistance type or plants with multiple resistance genes) reduces the risk of resistance breaking. However, grafting together with IPM practices (e.g. rotation scheme) and cultural practices such as watering and mulch to regulate soil temperature increase the effectiveness of grafting and further reduce the risk of resistance breaking. Also, it is much easier and more economic to replace the rootstock than to develop a new commercial resistant plant variety.

Figure 1: squash rootstock seedlings.

Figure 2: watermelon scion seedlings

Figure 3: cutting the rootstock stem.

Figure 4: cutting the rootstock stem.

Figure 5: cutting the rootstock stem.

Figure 6: cutting the rootstock stem.

Figure 7: cutting the scion stem.

Figure 8: cutting the scion stem.

Figure 9: put together scion and rootstock.

Figure 10: put together scion and rootstock.

Figure 11: place the fixing device (lead strip).

Figure 12: place the fixing device (lead strip).

Figure 13: place the fixing device (lead strip).

Figure 14: grafted seedling.

Figure 15: grafted seedling.

Figure 16: transplanting into bigger cell (100-150 cc).

Figure 17: transplanting into bigger cell (100-150 cc).

Figure 18: grafted seedling transplanted into 150 cc cell.

Figure 19: grafted seedling transplanted into 150 cc cell.

Figure 20: healing tent.

Figure 21: healing tent.

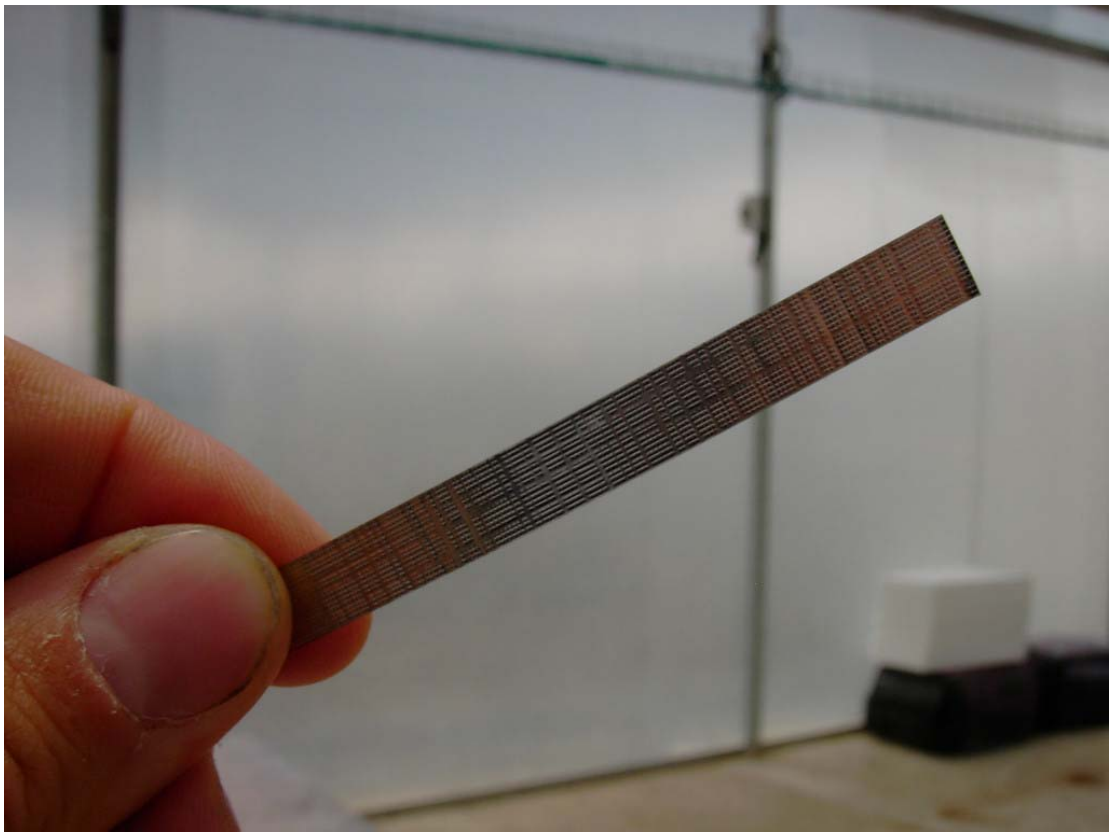

Figure 22: lead strip.

Figure 23: cutting the scion stem.

Figure 24: cutting the scion stem.

Figure 25: grafted seedling ready for transplanting.

Figure 26: training workshop.

Figure 27: training workshop.

Figure 28: workshop.