



## INNOVATIVE APPROACHES BY USING GRAFTING TECHNOLOGY FOR PRODUCTION OF VEGETABLES CROPS

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### ABSTRACT

Vegetable Grafting is an alternative approach used in vegetable production to fight against soil-borne diseases such as *Fusarium* wilt, bacterial wilt and nematodes. Grafting as a technology for the commercial production was later on adopted by many countries in Europe, Middle East, Northern Africa, Central America and other parts of Asia. For the production of many fruit-bearing vegetables which include watermelon, cucumber, melon, tomato, eggplant and pepper, grafted seedlings were used. These seedlings besides providing resistance against biotic/abiotic stresses increase the yield of the cultivars. Grafting improves quality of the plant and is used to induce resistance against low and high temperatures. Growth, yield and fruit quality of the scion is greatly influenced by the type of rootstock used. Due to high post graft mortality of seedlings, this technology is still in infancy in India. For its commercial application in India, sharpening of grafting skills and healing environment need to be standardized. This technique is considered as Innovative approach for production of vegetable crops and eco-friendly method for sustainable vegetable production.

**KEYWORDS:** soil-borne, diseases, *Fusarium*, grafting, vegetable.

### INTRODUCTION

Grafting techniques originated in China as early as 1560 B.C., and boomed in the Roman era [1-10]. Grafting as a technology for the commercial production was later on adopted by many countries in Europe, Middle East, Northern Africa, Central America and other parts of Asia. Grafting is an alternative approach used in vegetable production to fight against soil-borne diseases such as *Fusarium* wilt, bacterial wilt and nematodes since 1920s in Japan and Korea. An approach of two (or more) diverse living plant tissues joining together and developing as a new composite plant can be considered as a grafting method. The graft partners include a shoot system (scion) and a root system (rootstock) to take advantage of their superior properties for better adaptation with wide range growing conditions. For cucurbits and solanaceous crops,

hole insertion grafting, tongued approach grafting and splice grafting are the most common used methods for manual and/or automated graftage [11-14]. This grafting study was started in Center of Excellence for Vegetables at Krishi Vigyan kendra, baramati Dist- Pune since 2016-2017.

### Plant materials

Worked is carried out in KVK Baramati Planting Material includes Scion of tomato (*Solanum lycopersicum*) and root stock of Brinjal (*Solanum melongena*) [15]. When grafting, regardless of the method used, it is critically important to have good contact between the scion and rootstock vascular systems. This is accomplished by grafting plants with similar stem diameters. Plants should be grafted when plants have 2-4 true leaves and stem diameters between 1.5-2.5 mm.

### Objectives of grafting in different vegetables –

Vegetables	Objective
Tomato	Tolerance to bacterial wilt ( <i>Ralstonia solanacearum</i> ), <i>Fusarium oxysporum</i> , Nematodes ( <i>Meloidogyne</i> sp), <i>Verticillium dahlia</i> .
Eggplant	Tolerance to bacterial wilt ( <i>Ralstonia solanacearum</i> ), <i>Fusarium oxysporum</i> , <i>Verticillium alboatrum</i> , Nematodes, low temperatures, induction of greater vigour.

### Advantages of grafting

#### Tolerance to soil-borne diseases

Grafting is used to get rid of soil-borne diseases such as *Fusarium* wilt in Cucurbitaceous crops (cucumber, melon etc.) and Bacterial wilt in Solanaceous crops (tomato, pepper etc.)

#### Tolerance to abiotic stresses

To induce resistance against low and high temperature, grafts were generally used. For the production of fruiting vegetables under the winter greenhouse conditions, tolerance to extreme temperature is crucial.

**Effect on fruit quality:** Grafting is an effective approach to improve fruit quality under both optimum growth

conditions and salinity. The fruit quality of the shoot, at least partially, depends on the root system.

**Plant vigour promotion**

The root systems of selected rootstocks, much larger and more vigorous, can absorb water and nutrients more efficiently as compared to non-grafted plants.

**High yield**

**Slant Cut Tomato Grafting-**



When plants are cultivated in problematic soils, grafts have been used to improve yield.

**Methods of Vegetable Grafting**

1. Cleft grafting
2. Tube Grafting
3. Tongue Approach Grafting
4. Slant-Cut Grafting
5. Hole insertion/Top insertion grafting.



- Slant cut grafting is achieved by cutting the root-stock and scion stems at a 45° angle,
- Putting the cut edges of the two plants together, and securing with a grafting clip.
- It is important to cut the rootstock below the cotyledons to avoid unwanted rootstock regrowth. The scion can be cut below or above the cotyledon, wherever the stem diameter best matches the rootstock.

- Once the rootstock is cut, slip the silicon grafting clip onto the rootstock, followed by the scion, making sure that both stems are in tight contact with each other and no air is visible at the graft union.
- Mist plants frequently with water during the grafting process and place them in the healing chamber in the dark immediately.

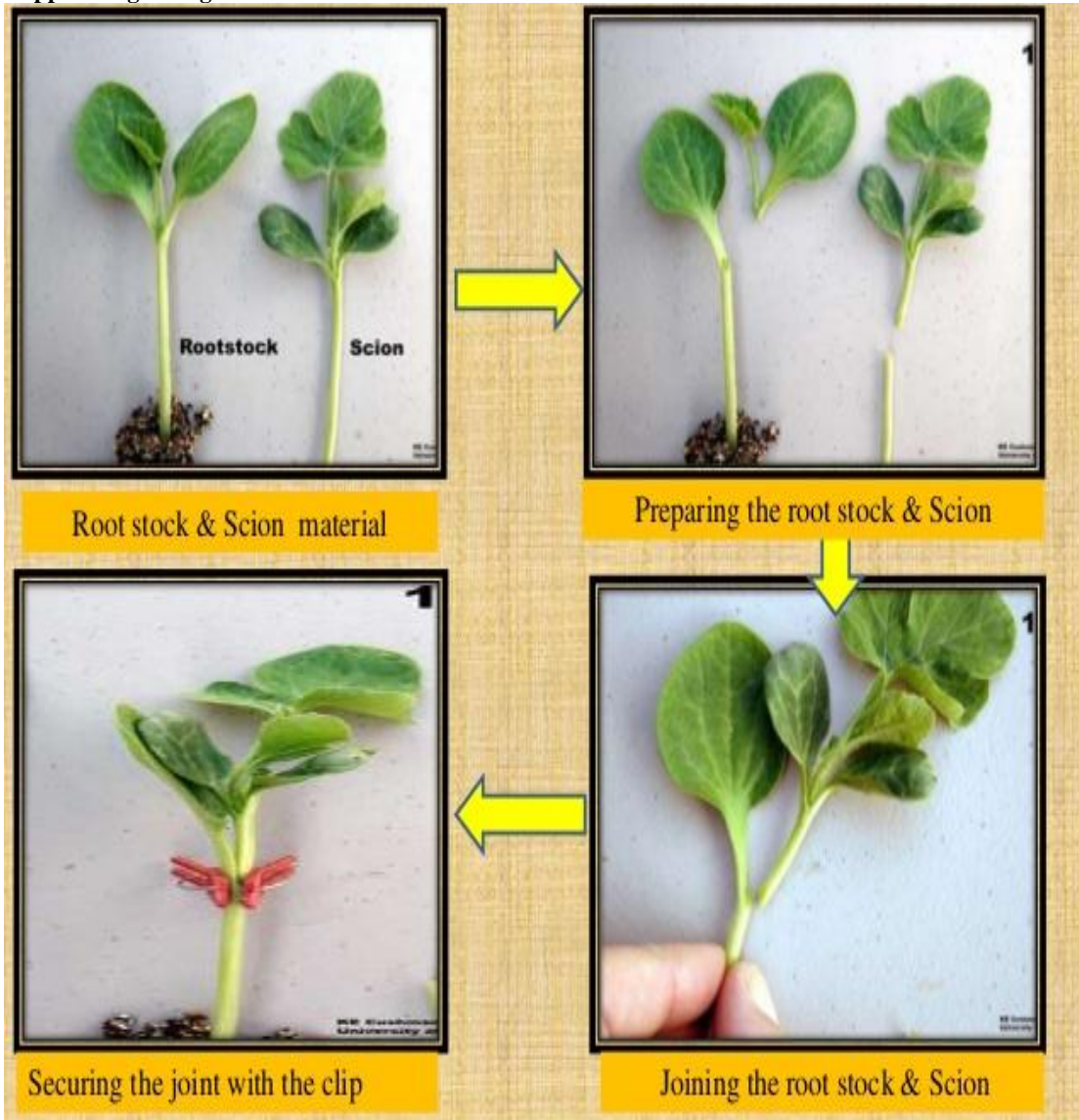
**Cleft Grafting**





- Cut the rootstock below cotyledons that removes the cotyledons and damages the meristem tissue, and give cut at stem in middle with the help of sharp blade.
  - Cut the scion at a 45° angle on two sides to form a wedge
  - Insert the scion into the rootstock. Slip the silicon grafting clip onto the rootstock, followed by the scion,
- Tongue approach grafting**

- making sure that both stems are in tight contact with each other and no air is visible at the graft union.
- Mist plants frequently with water during the grafting process and place them in the healing chamber in the dark immediately.



- Cut a 45° downward slit halfway through the rootstock stem below the cotyledons.
- Cut an identically angled upward slit in the scion stem.
- Bring the two cut stems together so the plants are joined.
- The angle and location of the cuts must be relatively precise, so the scion can be placed on top of the rootstock.
- Attach a clip to secure the plants, Mist the plant with water and place it in healing chamber in dark immediately.

## CONCLUSION

Grafting is a method of plant propagation, done by utilising selective rootstock and scion combinations for tolerance against soil borne diseases that directly influences the production of vegetable crops. As a result, increased net returns achieved in wide range of soil and environmental stress conditions even in off season. It is a rapid alternative means to the moderately slow breeding methodology. In recent days, grafting application leads the limit use of harmful soil disinfectants which minimizes the toxic residues in vegetables and environmental pollution. Hence, it is suggested that, by adopting modern innovations and indigenous wild relatives, we can realize commercial use of grafting to attain the low input sustainable horticulture in future.

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