Rootstock and Its Importance in Fruit Crops

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Rootstock is the lower portion of the graft which develops into the root system of the grafted plant. A rootstock may be seedling, a rooted cutting or layered plant. It is also described a plant which already has an established healthy root system on to which a cutting or bud from another plant is grafted. The plant part grafted on to the rootstock is usually called scion. Rootstocks are being used in plant propagation for more than 20 centuries. It's may be a same or different species from the scion (Singh *et al.*, 2021).

Types of rootstock

1. Seedling rootstock

These types of rootstock are developed from the seed. These rootstocks are relatively simple and economical to produce. Root systems of seedling rootstocks are deeper. These are mostly used for tropical and sub-tropical fruit crops. Seedling rootstocks have an advantage that the plant doesn't retain viruses occurring in their parent plant. Seedling rootstocks have a disadvantage of genetic variation which may lead to variation in performance of scion (Goswami, 2017).

2. Clonal rootstock

Rootstocks propagated by vegetatively are known as clonal rootstocks. These also include those fruit crops which have azygotic seeds *Viz.*, pathenogenetic, polyembryonic and apomitic seed. Each clonal rootstock is genetically same and has identical growth characteristics in given environment. Major disadvantage of clonal rootstock is that, they retain the viruses occurring in the parent plants. Clonal rootstocks commonly used in temperate region fruit crops (Hartmann *et al.*, 2002).

Characteristics of an ideal rootstock

- It should exhibit a high degree of compatibility with scion cultivars and give maximum life to trees.
- It should be well adapted to climatic conditions of the particular region like frost, cold and heat.
- Should be resistant to disease and pest prevalent in the concerned area.
- Should be tolerant to adverse soil conditions like salt and droght.
- Must exhibit favourable and positive influence on the performance, bearing and quality of scion variety.
- Should possess good nursery characteristics like germination, high degree of polyembryony, ability to attain graft-able size in short period and free from excessive branching.

Importance of rootstocks in fruit crops

1. **Tolerance against biotic stress**

Losses due to insect pest and diseases can be minimized by using tolerant rootstocks which are well known in crops like citrus and grape. Rough lemon and Clepatra mandarin have been found tolerant against tristeza, exocortis and xyloporosis . Nematodes are limiting factor in citrus production, which can be overcome by using trifoliate orange as rootstock. Several *Vitis* species show good resistance against nematodes. Freedom, Harmony and Dog

Ridge are rootstock root knot nematode resistance. Different *Vitis* species are known for their ability to tolerate soil infestation of phylloxera and nematodes. In breeding new rootstock, the aim is to combine resistance to these pests along with other key traits. It is important to test new rootstocks for resistance to different races or biotypes of the pests before they are selected for use as rootstocks in evaluation.

2. Improved fruit quality

Rootstocks are sometimes important in the improvement of the fruit quality for crops like, grapes and citrus. There are several report which emphasized their influence on the improvement in quality through TSS, reducing sugar and acidity content of the fruits, Granulation in citrus is also indirectly influenced by the vigour imparted by the rootstock. Higher degree of the granulate in Jaffa sweet orange on Jatti Khatti as a rootstock.

3. Increased scion yield efficiency

Rootstocks influence the scion vegetative growth directly or indirectly and thus are decisive in manipulating yield efficiency. In several of the fruit crops, fruit yield per unit area has been found to be influenced by the rootstock. In citrus, the role of the Rangpur lime, Dogridge in grapes and Vellai Kolumban in Alphonso mango has proved the importance of rootstock in increasing scion yield efficiency. The vigour imparted to scion has direct relationship with the fruit yield because of more fruiting area. However, productivity index may vary with the rootstock efficiency to produce fruit per unit area.

4. **Wider adaptability**

Wider adaptability is one of the important characteristic of the rootstock for the successful adoption by the farmers. Rootstock with low multiplication rate and adaptation in limited geographical area may restrict the usefulness. There is a need of rootstocks for different crops with successful performance under biotic and abiotic stresses, beside adaptively to wide range of soils and climatic conditions.

Table 1: Rootstocks for different fruit crops

Crops	**Rootstocks**	**Grafting method**	**Month**
Mango	Velliacolamban	soft wood grafting	July-September
Grape	Ramsey and Dogrees	Whip grafting	September – October
Sapota	Khirni or Rayan (*M. hexandra*)	soft wood grafting	August-September
Cashew	Local cashew	Soft wood grafting	March-September
Ber	Local / Desi red ber seedling	Patch budding	July-August end
Aonla	Local Aona seedling as stock	T budding	June-September, February
Jack fruit	Local Jack fruit	Soft wood grafting	December
Tamarind	Local tamarind seedlings.	Soft wood grafting	March-April
Apple	Crabapple, malling IX stocks.	Tongue grafting	February-March

(Sources: Chadha, 2019**)**

5. **Improve salt tolerant**

The indiscriminate use of heavy quality of chemical fertilizer and the over exploitation of aquifers has dramatically multiplied of surface area affect by salinity. It is commonly accepted that growth inhibition by salt stress is associated with alteration in the water relationship within the plant ,

caused by osmotic effects with specific ionic consequences or energy availability related to carbohydrate concentration. Walker demonstrated that the rootstocks 'cleopatra mandarin' excludes Cl- but not Na+. this suggests that the ability to exclude these two ions stems from different mechanisms. In India, grape rootstocks such as Dogridze and 110 R are presently being employed mainly to overcome the adverse effects of abiotic stresses like drought and soil salinity and to manipulate vigor of vine to some extent . Mango rootstocks '13/1' has relative high salt tolerance under field condition and makes mango cultivation possible under saline stress conditions also. It is a polyembryonic rootstocks commercially used in Israel and Egypt and has been tested in various regions of the world foe tolerance in calcareous soils and saline condition.

Conclusion

From the foregoing discussion it can be concluded that, rootstock play vital role in propagation of fruit crop. It protects the fruit crops from adverse effects of drought and salt stress. It helps to improve nutrient uptake from the soil and yield as well as quality of fruit. In fruit crops, rootstocks also give the tolerance against different biotic stresses.

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