GreenariA
Go Green, Learn Green
An Agricultural Monthly e-Magazine
Volume 02, Issue 02, 2024
e-ISSN: 2584-153X
Article ID: G-24-0209

VEGETABLE GRAFTING – GRAFTING IN CUCURBITS: A REVIEW

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INRTODUCTION

Due to the limited availability of arable land and high market demand for off-season vegetables (cucurbits) they are frequently cultivated under controlled environmental conditions. These conditions encompass extreme cold / heat, cool low-light winter greenhouses and so on. As a consequence, the incidence of cucurbit pests, and soil-borne diseases such as fusarium wilt caused by *Fusarium* spp are increasing and these conditions give rise to various physiological and pathological disorders, resulting in significant crop loss. Furthermore, chemical pest control measures are often costly, not consistently effective, and can have detrimental effects on the environment. However, **grafting** is emerged as a viable solution to alleviate many of these issues. This practice originated in Japan during the late 1920s, where watermelon (*Citrullus lanatus*) was first grafted onto pumpkin (*Cucurbita moschata*) rootstocks. Subsequently, watermelons were also grafted onto bottle gourd (*Lagenaria siceraria*) rootstocks. This innovative approach helps in increasing the production by eliminating the yield loss due to soil-borne diseases.

GRAFTING

Grafting is an asexual method of plant propagation in which a part of a plant (scion) is joined to another plant (rootstock) where it continues to grow as a single plant. It has been practiced in fruit trees for a long time; however, its application in vegetables is relatively new procedure that has gained popularity in the last few decades (Lee et al., 2010).

SELECTION OF ROOTSTOCK

The selection of rootstocks depends on specific geographical areas and it contribute to enhance the plant vigor by facilitating better nutrient uptake from the soil, protection against soil pathogens, tolerance to low soil temperatures, salinity, and wet soil conditions. The choice of rootstock can also impact plant growth, flowering, fruiting, fruit quality, and overall yield. Rootstock has direct influence on scion physiology. Grafting the susceptible scion onto a resistant rootstock can provide a resistant cultivar without prolonged screening and selection. It provides rapid result to control soil borne diseases than breeding new resistant cultivar.

In this article we are going to see about the grafting done in pumpkin and bitter gourd (during rainy season , growing of bitter gourd is challenging due to excessive soil moisture so , it is grafted on waterlogging –tolerant rootstocks like pumpkin can overcome this issue).

MATERIALS REQUIRED

SEED MATERIAL: For the purpose of rootstock: pumpkin seed -AVPU1391 is the germplasm has been used and for the purpose of scion: Bitter gourd seed – Green long has been used.

GRAFTING TOOLS: Hand gloves, blade, graft clips, supporting stick (to give support to the grafted plant until it gets union) and sprayers (to sprinkle the water).

HEALING CHAMBER: Construction of healing chamber were undertaken at the beginning of sowing and the main purpose for the construction of healing chamber is to place the

Grafted plants inside it once the grafting has been done. There are two types of healing chambers based the material used for the construction of the healing chamber.

- Natural material – Bamboo sticks
- Artificial material – Poly Vinyl Chloride pipes.

PROCEDURE INVOLVES

SOWING OF SEEDS: Seeds have been sown in the 50-cavity polystyrene tray at the rate of one seed per cell, the growing media used in this experiment is coco pith. The trays are kept under the glass house condition where the average temperature would be 30.8℃ and the relative humidity would be 64%. The seeds of scion and stock are sown in the same day for obtaining similarity in the thickness of the stem, which benefits the union of both plant structures.

IRRIGATION: Life irrigation has been provided throughout its germination and frequent irrigation has been done when the plants show the symptoms of dryness or sometimes irrigation is done when the coco pith is in dry state.

METHOD OF GRAFTING USED

Selection of grafting method depends on the crop, the farmer's choice / experience, the number of grafts required, access to labor and the availability of infrastructure facilities (Lee et al., 2010). Although many machines and grafting robots have been developed but manual grafting is the most popular and widely used method (Lee et al., 2010).

Here ONE COTYLEDON GRAFTING method has been under taken.

- ❖ One cotyledon grafting is also known as SLANT / SPLICE GRAFTING.
- ❖ This is used when the rootstock and the scion of same diameter.
- ❖ In this method one cotyledon and growing tip has been removed either from top to bottom or bottom to top by slant cut is given 35degree – 45 degree.
- ❖ Grafting clips are used for getting easy union of the scion and the stock.
- ❖ Post grafting management is important because easy fall off at the early stage.

HEALING CHAMBER

1. After the grafting process the grafted plants are kept in this chamber for about five days for healing purpose.
2. For first three days the entire setup should be covered with the layer of transparent polythene sheet and the layer of black polythene sheet/shade net.

3. This is done to maintain the temperature of 28℃ - 29℃ and the relative humidity should be around 95%.
4. Before placing the trays, the chamber should be sprayed with water to maintain the humidity.
5. On the fourth day the black polythene sheet/shade net has to uncovered and only the transparent polythene has been covered with the chamber.
6. After 6th day the grafted plants are kept in the normal room temperature and then they are transplanted in the main field.

RESULT

OBSERVATION

The following grafting data has been taken on 19th day after sowing that is 7th day after grafting.

Grafting on	Grafting details	No. of grafted	Success rate	Details for failure
12th DAS	6th day pumpkin with 3rd day bitter gourd	10	3	Fungal attack
13th DAS	7th day pumpkin with 5th day bitter gourd	3	2	No proper union
13th DAS	8th day pumpkin with 4th day bitter gourd	2	1	No proper union
13th DAS	8th day pumpkin with 5th day bitter gourd	6	4	No proper union
14th DAS	9th day pumpkin with 3rd day bitter gourd	3	3	
14th DAS	7th day pumpkin with 3rd day bitter gourd	3	2	No proper union
14th DAS	6th day pumpkin with 5th day bitter gourd	3	3	
14th DAS	6th day pumpkin with 4th day bitter gourd	6	6	
14th DAS	6th day pumpkin with 3rd day bitter gourd	3	3	

Here, the highlighted information shows the maximum success rate.

Pumpkin is the rootstock, bitter gourd is the scion used in experiment, this is because during rainy season, growing bitter gourd is challenging due to excessive soil moisture, which hampers root growth. However, grafting this on to waterlogging-tolerant rootstock (pumpkin) can overcome this issue.

Here, the numbers 3rd, 4th 5th, 6th, 7th, 8th, 9th on the column of grafting details denotes the days after sowing of seeds, whereas the numbers 12th, 13th, 14th on the column of date of grafting denotes the grafting work taken on the day or it can be said as grafting work done on that day from sowing of seeds.

CONCLUSION

Finally, from this experiment we came to know that grafting of "9th day pumpkin with 3rd day bitter gourd, 6th day pumpkin with 5th day bitter gourd, 6th day pumpkin with 4th day bitter gourd, 6th day pumpkin with 3rd day bitter gourd" shows the maximum survival rate. So, if grafting (one cotyledon grafting) done by this order we will get high survival rate so, the cost production will be less and the productivity will be increased.