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# STANDARDIZATION OF BENCH GRAFTING IN CUSTARD APPLE (*Annona squamosa* L.)

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**ABSTRACT :** An experiment on bench grafting in custard apple (*Annona squamosa* L.) employing cleft grafting technique was conducted at Indian Grassland and Fodder Research Institute, Jhansi during 2007. Bare rooted stocks of custard apple having 0.6 cm diameter were bench grafted with dormant scion of cv. *Balanagar.* Dormant scion shoots having 0.6 cm thickness used for grafting has given highest graft success (96.4%) when it was performed during 29th May, whereas minimum (37.8%) was recorded when 0.8 cm thick scion was grafted on 6th June. Days taken to sprouting, length of sprout, collar diameter, number of secondary branches and number of secondary roots per plant were significantly influenced by scion thickness and time of grafting.

***Keywords :*** *Custard apple, bench grafting, time of grafting, scion thickness.*

Custard apple (*Annona squamosa* L.), belongs to family Annonaceae, is one of the most delicious fruit crop of semi arid ecosystem. It is also known as *sitaphal*, sugar apple, sweet sop and *sarifa*. Due to its hardy in nature and escape from animal damage, custard apple has become naturalized in many tropical and subtropical parts of world. It is drought hardy plant, which can be grown in shallow soil without much care. Leaf shedding phenomenon during moisture stress period is its characteristic feature to be grown under arid and semi arid condition. The area under custard apple reported to be more than 40,000 ha mainly found in wild forms in Gujarat, Andhra Pradesh, Tamil Nadu, Orissa, Assam and Rajasthan (Chundawat, 2). Ripe fruits are rich in sugars and are generally consumed as fresh fruit, but are also widely used in semi- processed and processed products such as juice, jam and ice cream. Essential oil, can be extracted from its seed, has great medicinal and insecticidal value due to content of a number of chemical compounds including flavonoids, alkaloids and accetogenins. Its leaf shedding phenomena during moisture stressed period is its characteristic feature to be suited under semi arid ecosystem therefore it can be grown grown up to 600 mm rainfall / annum (Annon., 1) . It leaves contain annonine which escaped animal from grazing. Therefore, it also offers great potential for agroforestry. Ram *et al*. (7) reported its suitability under hortipastoral system in semi-arid situation. Custard apple is commonly propagated by seed which shown unevenly and irregularly due to taking of long time, depending on seed maturity and dormancy as well as variability in characteristics. Very little literature is available on vegetative propagation of custard apple. Rajput (6) reported that whip grafting found to be better than budding and Nair *et al.* (4) reported *in vitro* propagation of *Annona* hybrids (*A. squamosa* L. *A. cherimolia* L.). Very often plants give poor establishment in field on account of root damage while lifting plants from nursery. Transport of plants to long distance incur heavy expenditure besides practical difficulties, mortality of plants during transport in order to combat these problems an experiment on "standardization of bench grafting" with scion thickness and time of grafting was conducted .

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## MATERIALS AND METHODS

An experiment was conducted during 2007 to standardize bench grafting in custard apple (*Annona squamosa* L.). For the purpose, one year old rootstocks having uniform thickness (0.6 cm) were selected. The dormant scion shoots of cv. Balanagar with four thicknesses (diameter) viz; 0.5,

0.6, 0.7 and 0.8 cm were selected for bench grafting employing cleft method. The grafting operations were performed on 15th, 22nd, 29th May and 6th June 2007 with all four thickness. The experiment was laid out in randomized block design with three replications. Each treatment contained five grafted plants and total 240 grafts were made in this experiments. After grafting, bare rooted grafts were planted in polythene bags (22 x 15cm) duly filled with soil + FYM + leaf mould in the ratio of 1:1:1. Immediately after placing grafts in polythene, these were covered with a poly cap having size of 20 x 2.5 cm. Lower open top end of cap was buried in filling mixture to check evapo-transpiration loss and desiccation of grafts. Thereafter, they were kept under partial shade and watered them properly. Subsequently, watering and weeding were done as per the requirements. The cap was removed after a week of scion sprouting. Only one shoot from scion was allowed to grow. Observations on days to initiate sprouting, graft success and shoot growth and number of secondary roots (on 30th August at planting) were recorded.

## RESULTS AND DISCUSSION

### Sprouting and graft success

Days required to sprouting were influenced with scion thickness and time of grafting (Table 1). The initial sprouting was achieved significantly earlier (19.53 days) with thickest scion (0.8cm) when compared to other thickness of scions. Similarly, the grafting performed on 29th May have also taken least duration (19.05 days) as compared to before and late grafting. The graft made on 29th may with thickest scion produced early sprouting (16.5 days) as compared to rest of the treatment combinations. Early sprouting with thick scion may be attributed to greater amount of reserve food material (carbohydrates) in the scion shoot and early union owing to more surface contact between scion and root stock (Hartman and Kester, 3; and Pathak, 5). The thick scion grafted on 29th May showed earlier sprouting might be due to callusing and union have started in the graft has got favourable climate and scion come to active period after completing dormancy period during summer in subtropical region of Uttar Pradesh. Tewari *et al.* (10) have also reported that graft union was influenced with scion thickness in aonla. They also found that bench grafting in aonla on 15th of January, February and March gave 46.0, 83.3 and 26.6 per cent of success, respectively.

The final graft success percentage was recorded at plantable stage and found that this attribute was significantly affected with scion thickness and time of grafting. Table 1 showed that the graft success with same thickness of scion (0.6 cm) and stock was significantly higher (71.9%) as compared to other scion thickness, which ranged from 49.5-59.8 per cent. Similarly, before or late grafting from 29th May (78.5%) significantly declined the graft success. The grafting made on 6th June gave very poor success (44.6%). The scions having 0.6 cm thickness and grafted on 29th May reported to significantly higher success (95.4%) when compared to rest of the treatments. Tewari and Bajpai (12) reported that in aonla graft success was influenced with scion thickness. They also reported that critical diameter for grafting in aonla is 0.5 cm and if the scion is 0.1 cm thicker than rootstock gave higher success. Tewari *et al.* (11) also reported that dormant scion gave better performance in bench grafting in *ber* as compared to active scion because of better callusing and proper union of stock and scion.

### Shoot growth

Length of shoot was also influenced by relative thickness of scion and time of grafting (Table 2). The thick scion (0.8 cm) showed early sprouting and continuous growth after grafting resulted significantly longer shoot (24.35 cm) followed by 0.6 cm thickness of scion (20.9 cm). The thin scion (0.5 cm) produced shortest shoot length (18.03 cm) at the plantable stage of grafting. Similarly Singh *et al.* (8) reported that budling height was influenced with rootstock thickness and height of budding on root stock in ber. Tewari *et al.* (9) reported in aonla that the graft made on 15th February gave 84.6 cm length sprout when compared to15th January (83.6 cm) and 15th March (77.0 cm) . The thickest scion (0.8 cm) when grafted on 29th May gave longest sprout (31.6 cm) as compared to all graft combinations. This might be resumed food material along with optimum time of grafting.

**Table 1:** Effect of scion thickness and time of grafting on sprouting and graft success percentage of custard apple.

| Date of grafting | Days taken to sprout | | | | | Graft success percentage | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Scion thickness (cm) | | | | Mean | Scion thickness (cm) | | | | Mean |
| | 0.5 | 0.6 | 0.7 | 0.8 | | 0.5 | 0.6 | 0.7 | 0.8 | |
| 15th May | 23.2 | 23.1 | 22.2 | 21.5 | 22.50 | 42.1 | 62.5 | 56.3 | 42.9 | 50.95 |
| 22nd May | 19.8 | 19.5 | 19.5 | 19.8 | 19.65 | 51.1 | 72.7 | 61.6 | 53.8 | 59..8 |
| 29th May | 20.6 | 20.6 | 18.5 | 16.5 | 19.05 | 74.2 | 96.4 | 80.1 | 63.3 | 78.5 |
| 6th June | 23.1 | 23.1 | 20.0 | 20.3 | 21.43 | 43.3 | 56.2 | 41.2 | 37.8 | 44.6 |
| Mean | 21.68 | 21.68 | 20.5 | 19.53 | | 52.7 | 71.9 | 59.8 | 49.5 | |
| CD (P = 0.05) | Thickness<br>Days<br>T x D | 0.73<br>0.73<br>1.46 | | | | 1.42<br>1.42<br>2.84 | | | | |

**Table 2:** Effect of scion thickness and time of grafting on vegetative growth of shoot at planting.

| Date of grafting | Length of sprout (cm) | | | | | Collar diameter of sprout (cm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Scion thickness (cm) | | | | Mean | Scion thickness (cm) | | | | Mean |
| | 0.5 | 0.6 | 0.7 | 0.8 | | 0.5 | 0.6 | 0.7 | 0.8 | |
| 15th May | 15.3 | 18.3 | 15.8 | 19.6 | 17.25 | 2.21 | 0.32 | 0.29 | 0.28 | 0.28 |
| 22nd May | 21.3 | 19.6 | 15.6 | 22.8 | 19.83 | 0.31 | 0.35 | 0.29 | 0.32 | 0.32 |
| 29th May | 17.9 | 21.8 | 21.5 | 31.6 | 23.2 | 0.32 | 0.41 | 0.38 | 0.36 | 0.37 |
| 6th June | 17.6 | 23.9 | 18.6 | 23.4 | 20.88 | 0.21 | 0.31 | 0.27 | 0.26 | 0.26 |
| Mean | 18.03 | 20.9 | 17.88 | 24.35 | | 0.26 | 0.35 | 0.31 | 0.31 | |
| CD (P = 0.05) | Thickness<br>Days<br>T x D | 1.29<br>12.9<br>2.586 | | | | 0.0802<br>0.0802<br>NS | | | | |

**Table 3:** Effect of scion thickness and time of grafting on secondary branches and secondary roots at planting.

| Date of grafting | No. of secondary roots / plant | | | | | No. of secondary root / plant | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Scion thickness (cm) | | | | Mean | Scion thickness (cm) | | | | Mean |
| | 0.5 | 0.6 | 0.7 | 0.8 | | 0.5 | 0.6 | 0.7 | 0.8 | |
| 15th May | 2.7 | 4.6 | 3.5 | 2.3 | 3.28 | 24.5 | 25.4 | 20.3 | 22.9 | 23.28 |
| 22nd May | 3.4 | 5.3 | 4.1 | 2.3 | 3.78 | 22.3 | 26.8 | 24.7 | 21.8 | 23.9 |
| 29th May | 4.5 | 6.8 | 5.1 | 2.3 | 5.45 | 24.6 | 28.3 | 25.9 | 26.8 | 26.4 |
| 6th June | 1.2 | 3.4 | 2.6 | 5.4 | 2.40 | 21.3 | 22.8 | 20.3 | 19.9 | 21.01 |
| Mean | 2.95 | 5.03 | 3.83 | 2.4 | | 23.18 | 25.83 | 22.8 | 22.85 | |
| CD (P= 0.05) | Thickness<br>Days<br>T x D | 0.317<br>0.317<br>0.628 | | | | 2.177<br>2.177<br>NS | | | | |

The graft made with 0.6 cm thickness of scion showed significantly higher collar diameter of sprout (0.35 cm) at the base of sprouting followed by thicker scion (Table 2). The thinnest scion showed minimum thickness of sprout (0.26cm). The thickness of sprout was also significantly influenced with operation time of grafting. The graft made over on 29th May produced significantly thicker sprout (0. 37 cm) when compared to early or late grafting.

**Secondary branches and roots**

The secondary branches produced by grafted sprout influenced with scion thickness and time of grafting. The data (Table 3) revealed that 0.6 cm thick scion produced significantly higher number of branches per plant (5.03) followed by second (3.83) and third thickness (3.10). It might be due to same thickness of rootstock and scion performed at optimum time makes a congenial union resulted better growth of grafts. Similarly, the graft made on 29th May produced maximum number of secondary branches per plant.

The number of secondary roots plays an important role in establishment of grafted plant during nursery stage and field transplanting also. The scion with 0.6 cm thickness produced significantly higher number of secondary roots per plant (25.83) as compared to rest of the thickness of scion. Similarly, the graft made on 29th May produced 26.4 secondary roots/plant when compared to graft made on 15th, 22nd May and 6th June (23.28, 23.9 and 21.01 secondary roots / plant, respectively). The root attribute mainly depends on seedling growth and management practices. However, due to compatible union between stock and scion gave good source and sink relation as a result maximum number of secondary roots recorded with this treatment.

From the above results, it is clear that when one year old custard apple seedlings are bare rooted and bench grafted though cleft grafting method with 0.6 cm thickness of improved cultivar scion at the end of May month got 96.4 per cent success quality planting material at the time of planting (30th August).

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