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## Effect of different grafting dates and wrapping materials on increment in length and girth of scion and increment in length and girth of root stock of softwood grafting in custard apple (*Annona squamosa* L.) cv. GJCA-1 under Saurashtra condition

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**Abstract**

An investigation was carried out to see the effect of different grafting dates and wrapping materials on success of softwood grafting in Custard apple (*Annona squamosa* L.) cv. GJCA-1 under Saurashtra condition during Feb- August of the year 2017 at Lalbaugh Farm, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat). The treatments comprised of seven different grafting dates and two different wrapping materials. The experiment was laid out in Completely Randomized Design with factorial concept and replicated three times. The results revealed that amongst different grafting dates and wrapping materials grafting done on 01.04.2017 with graft tied with degradable tape observed significantly maximum increment in length of scion (4.00%, 10.10% and 16.83%) at 30, 60 and 90 DAG (Table.2), maximum increment in length of root stock (1.30%, 3.95% and 5.84%) was recorded at 30, 60 and 90 DAG (Table.3), maximum increment in girth of root stock (18.48%, 26.97% and 43.18%) was recorded at 30, 60 and 90 DAG (Table.3). While, grafting done on 15.03.2017 with graft tied with degradable tape recorded maximum increment in girth of scion (19.57%, 45.97% and 46.37%) was recorded at 30, 60 and 90 DAG (Table.2) when, as compared to other treatments.

**Keywords:** Custard apple, Gujarat Junagadh custard APPLE-1, different grafting dates, wrapping materials

**Introduction**

Custard apple (*Annona squamosa* L.) belongs to family Annonaceae and is one of the finest fruits gifted to India by tropical America. It is cultivated in Mexico, Philippines, New Guinea, Malaysia, India and South American countries in the world. It has adopted well in India where a considerable variability is found in Aravali hills and Southern India. Custard apple plants can also be seen wild in Uttar Pradesh, Rajasthan, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Gujarat and Orissa.

The variety of custard apple named Gujarat Junagadh Custard apple-1 (GJCA-1) was developed by Department of Horticulture, Junagadh Agricultural University, Junagadh during year 2009 and recommended for cultivation. Gujarat covers 5081 hectares area of custard apple with the annual production of 51906 MT and productivity was 10.21 MT/ha during the year 2014-15 (Anon., 2016).

It is known that custard apple is a drought resistant plant and is normally grown under without any irrigation, but it may not be applicable for the newly planted grafts and irrigation may be essential for the first few years for their proper establishment. Artificial irrigation is neither practical nor economical in the arid region and harvesting of rain water and *in situ* conservation of soil moisture is only the variable alternative in this regards. It is popular by virtue of its spread in forests, wastelands, rocky slopes and other uncultivated places; it is generally classified as semi wild fruit (Kudmulwar *et al.*, 2008) [7].

Custard apple is a sub-tropical fruit preferring warm climate with moderate winter and humidity for high production. The tree remains dormant during cold season for a short period, yet frost and prolonged cool weather adversely affects the growth. It can tolerate temperature several degrees below freezing, but temperatures beyond 40 °C causes heavy flower abscission in northern India. Areas with an annual rainfall of 125-250 cm are highly suitable for its commercial cultivation. The optimum temperature requirement is between 15° to 25 °C.

It has a wide range of adaptability and can be grown successfully upto 1000 meters altitude (Bose *et al.* 2002; Joshi *et al.*, 1999 and 2000; Venkatratnam and Satyanaryanaswamy, 1956) [1, 4, 10].

The present investigation was carried out to find out suitable date of grafting and wrapping material for obtaining maximum success through softwood grafting in custard apple

### Materials and method

The experiment was conducted at the Lalbaugh Farm, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during Feb-August month of the year 2017. Junagadh is situated at 21.5 °N latitude and 70.5 °E longitude with an altitude of 60 meters above MSL on the western side at the foot hill of mountain Girnar sierra (Gujarat). Climate is typically subtropical, characterized by fairly cool and dry winter, hot and dry summer and warm and moderately humid monsoon.

The treatment comprised of seven different grafting date (D<sub>1</sub> – 15.2.2017, D<sub>2</sub> – 01.3.2017, D<sub>3</sub> – 15.3.2017, D<sub>4</sub> – 01.4.2017, D<sub>5</sub> – 15.4.2017, D<sub>6</sub> – 01.5.2017 and D<sub>7</sub> – 15.5.2017) and two wrapping material (W<sub>1</sub> - Polythene strip and W<sub>2</sub>- Degradable tape). The experiment was laid out in Factorial Completely Randomized Design (FCRD) with fourteen treatment combinations and three replications.

Potting mixture of soil and FYM with a ratio of 1:1 was used for raising seedlings of custard apple rootstocks for softwood grafting. Regular clear polythene strip of 200 gauge having width of 1.5 – 2.0 cm which normally nurseryman uses for grafting and a newly introduced degradable tape of 25 mm width and 40 mm length which is self-adhesive, stretches easily. Self-adhesion is activated when stretched and shrinks to fit after application.

Defoliated scion sticks (10 days prior) were collected without damaging the buds. The length of scion stick was kept 8- 10 cm. The lower end of the scion stick was prepared in the form of wedge of about 3 cm. The top portion of custard apple (*Annona squamosa* L.) cv. *Sindhian* rootstock plant was selected and then top portion of the stem was split vertically about 3 cm in length forming 'V' shape. The wedge of scion was inserted into the slit of the rootstock and tied with polythene strip and degradable tape as per treatment details. The prepared grafts were kept in partial shady condition.

Five plants were selected at random from each treatment and tagged for recording the observations. Required observations were recorded from each repetition of different treatments and average value was calculated. The analysis of variance for experimental design was carried out for all the characters under study.

**Table 1:** Treatment combination of different grafting dates and wrapping materials

Treatment No.	Symbol	Details of treatment
T <sub>1</sub>	D <sub>1</sub> W <sub>1</sub>	Date 15-2-2017 X Polythene strip
T <sub>2</sub>	D <sub>1</sub> W <sub>2</sub>	Date 15-2-2017 X Degradable tape
T <sub>3</sub>	D <sub>2</sub> W <sub>1</sub>	Date 01-3-2017 X Polythene strip
T <sub>4</sub>	D <sub>2</sub> W <sub>2</sub>	Date 01-3-2017 X Degradable tape
T <sub>5</sub>	D <sub>3</sub> W <sub>1</sub>	Date 15-3-2017 X Polythene strip
T <sub>6</sub>	D <sub>3</sub> W <sub>2</sub>	Date 15-3-2017 X Degradable tape
T <sub>7</sub>	D <sub>4</sub> W <sub>1</sub>	Date 01-4-2017 X Polythene strip
T <sub>8</sub>	D <sub>4</sub> W <sub>2</sub>	Date 01-4-2017 X Degradable tape
T <sub>9</sub>	D <sub>5</sub> W <sub>1</sub>	Date 15-4-2017 X Polythene strip
T <sub>10</sub>	D <sub>5</sub> W <sub>2</sub>	Date 15-4-2017 X Degradable tape
T <sub>11</sub>	D <sub>6</sub> W <sub>1</sub>	Date 01-5-2017 X Polythene strip
T <sub>12</sub>	D <sub>6</sub> W <sub>2</sub>	Date 01-5-2017 X Degradable tape
T <sub>13</sub>	D <sub>7</sub> W <sub>1</sub>	Date 15-5-2017 X Polythene strip
T <sub>14</sub>	D <sub>7</sub> W <sub>2</sub>	Date 15-5-2017 X Degradable tape

### Experimental result and discussion

The experimental findings obtained from the present study have been discussed here in following heads:

#### Effect of grafting dates:

Among the different grafting dates 01.04.2017 (D<sub>4</sub>) was found maximum incremental length of scion (3.80% 9.85% and 15.42%) at 30, 60 and 90 DAG (Table.2), maximum increment in length of root stock (1.24%) at 30 DAG (Table.3), maximum increment in girth of root stock (21.10%) at 60 DAG (Table.3). Whereas, highest increment in girth of scion (18.93%, 42.03% and 45.32%) at 30, 60 and 90 DAG, maximum increment in length of root stock (3.02% and 4.41%) at 60 and 90 DAG (Table.2) and maximum increment in girth of root stock (15.36%) at 30 DAG (Table.3) when grafting was date (D<sub>3</sub>) 15-03-2017. while, maximum increment in girth of root stock (35.17%) at 90 DAG (Table.3) recorded when grafting done on (D<sub>6</sub>) 01.05.2017. This result may be attributed due to the optimum temperature (29 - 31 °C) and moderate humidity (45 - 55%) prevailed during these dates. This finding is in conformity with the results obtained

by Chovatia (1994) [2], Kudmulwar *et al.* (2008) [7] and Khopade and Jadhav (2013) [6] in custard apple.

#### Effect of wrapping materials:

Among wrapping materials, custard apple grafts tied with degradable tape (W<sub>2</sub>) recorded significantly maximum increment in length of scion (2.92%, 7.99% and 12.29%), maximum increment in girth (31.57%) of scion at 60 DAG (Table.2), maximum increment in length of root stock (0.90%, 1.77% and 2.48%) and maximum increment in girth of root stock (11.83%, 17.94% and 34.29%) at 30, 60 and 90 DAG and (Table.3). Whereas, for other characters days for sprouting of graft and survival percent, the wrapping materials *i.e.* polythene strip (W<sub>1</sub>) and degradable tape (W<sub>2</sub>) was found non-significant.

#### Interaction effect of different grafting dates and wrapping materials:

In the interaction effect of grafting dates and wrapping materials, interaction between grafting date 01.04.2017 and degradable tape (D<sub>4</sub>W<sub>2</sub>) recorded highest increment in length of scion (4.00%, 10.10% and 16.83%) at 30, 60 and 90 DAG

(Table.2), highest increment in length of root stock (1.30%, 3.95% and 5.84%) was recorded at 30, 60 and 90 DAG (Table.3) and Maximum increment in girth of root stock (18.48%, 26.97% and 43.18%) was recorded at 30, 60 and 90 DAG (Table.3) Whereas, interaction of grafting date 15.3.2017 and degradable tape as wrapping material (D<sub>3</sub>W<sub>2</sub>) was statically at par with D<sub>4</sub>W<sub>2</sub> at 30 and 90 DAG. The Maximum increment in girth of scion (19.57%, 45.97% and 46.37%) was recorded at 30, 60 and 90 DAG (Table.2) it was statistically at par with D<sub>3</sub>W<sub>1</sub> and D<sub>4</sub>W<sub>1</sub> at 90 DAG for

increment in girth of scion. These significant differences may be attributed due to combination of congenial weather conditions prevailed during grafting in the month of March and April and proper wrapping material degradable tape, which prevented desiccation of cut surface and increased callus formation that has positive effect on the growth of custard apple (Zenginbal *et al.*, 2006)<sup>[11]</sup>. The results obtained are in conformity with the results of Kumar and Shukla (2008)<sup>[8]</sup> and Singha (1990)<sup>[9]</sup>.

**Table 2:** Effect of different grafting dates and wrapping materials on incremental length and girth of scion at 30, 60 and 90 DAG.

Treatments	Increment in length of scion (%)			Increment in girth of scion (%)		
	30 DAG	60 DAG	90 DAG	30 DAG	60 DAG	90 DAG
<b>Grafting dates (D)</b>						
D1: 15.2.2017	1.93	5.63	8.87	8.87	28.57	31.23
D2: 01.3.2017	2.03	8.27	13.25	9.31	31.47	33.92
D3: 15.3.2017	3.38	9.37	15.33	18.93	42.03	45.32
D4: 01.4.2017	3.80	9.85	15.42	9.70	33.52	36.33
D5: 15.4.2017	2.53	6.48	9.67	9.97	18.01	32.47
D6: 01.5.2017	2.47	6.77	9.17	12.10	20.08	34.03
D7: 15.5.2017	2.78	6.37	9.33	10.67	29.48	37.45
S.Em.±	0.07	0.16	0.26	0.24	0.59	0.80
C.D. at 5%	0.22	0.48	0.75	0.70	1.71	2.33
<b>Wrapping materials (W)</b>						
W <sub>1</sub> : Polythene strip	2.48	7.08	10.87	11.34	26.47	35.25
W <sub>2</sub> : Degradable tape	2.92	7.99	12.29	11.39	31.57	36.40
S.Em.±	0.04	0.08	0.13	0.12	0.31	0.43
C.D. at 5%	0.11	0.25	0.40	NS	0.91	NS
<b>D × W interaction</b>						
D <sub>1</sub> W <sub>1</sub>	1.87	5.37	8.07	8.49	27.10	30.00
D <sub>1</sub> W <sub>2</sub>	2.00	5.90	9.67	9.25	30.03	32.47
D <sub>2</sub> W <sub>1</sub>	1.87	7.47	12.67	8.91	29.97	32.00
D <sub>2</sub> W <sub>2</sub>	2.20	9.07	13.83	9.71	32.97	35.83
D <sub>3</sub> W <sub>1</sub>	3.47	9.07	15.00	18.29	38.10	44.27
D <sub>3</sub> W <sub>2</sub>	3.30	9.67	15.67	19.57	45.97	46.37
D <sub>4</sub> W <sub>1</sub>	3.60	9.60	14.00	9.84	30.00	44.90
D <sub>4</sub> W <sub>2</sub>	4.00	10.10	16.83	9.55	37.03	27.77
D <sub>5</sub> W <sub>1</sub>	2.10	6.40	8.67	10.50	15.02	31.50
D <sub>5</sub> W <sub>2</sub>	2.97	6.57	10.67	9.45	21.00	33.43
D <sub>6</sub> W <sub>1</sub>	2.27	6.00	8.00	12.26	18.07	30.67
D <sub>6</sub> W <sub>2</sub>	2.67	7.53	10.33	11.94	22.10	37.40
D <sub>7</sub> W <sub>1</sub>	2.23	5.63	9.67	11.10	27.05	33.40
D <sub>7</sub> W <sub>2</sub>	3.33	7.10	9.00	10.24	31.90	41.50
S.Em.±	0.10	0.23	0.36	0.34	0.83	1.14
C.D. at 5%	0.31	0.68	1.07	0.99	2.42	3.30
C.V. %	6.96	5.46	5.51	5.21	4.99	5.51

**Table 3:** Effect of different grafting dates and wrapping materials on incremental length and girth of root stock at 30, 60 and 90 DAG.

Treatments	Increment in length of root stock (%)			Increment in girth of root stock (%)		
	30 DAG	60 DAG	90 DAG	30 DAG	60 DAG	90 DAG
<b>Grafting dates (D)</b>						
D1: 15.2.2017	0.50	0.92	1.32	6.95	6.95	26.84
D2: 01.3.2017	0.73	1.22	1.53	8.23	8.40	30.28
D3: 15.3.2017	1.20	3.02	4.41	15.36	20.22	32.96
D4: 01.4.2017	1.24	2.92	4.06	14.80	21.10	35.01
D5: 15.4.2017	0.79	1.14	1.46	7.86	14.80	20.35
D6: 01.5.2017	0.52	1.01	1.38	8.26	19.10	35.17
D7: 15.5.2017	0.91	1.49	1.89	9.69	14.83	28.33
S.Em.±	0.01	0.03	0.04	0.20	0.34	0.73
C.D. at 5%	0.04	0.09	0.12	0.58	1.00	2.12
<b>Wrapping materials (W)</b>						
W <sub>1</sub> : Polythene strip	0.78	1.58	2.10	8.49	12.21	25.41
W <sub>2</sub> : Degradable tape	0.90	1.77	2.48	11.83	17.94	34.29
S.Em.±	0.01	0.01	0.02	0.10	0.18	0.39
C.D. at 5%	0.03	0.04	0.07	0.31	0.53	1.13
<b>D × W interaction</b>						

D <sub>1</sub> W <sub>1</sub>	0.45	0.84	1.28	6.43	6.43	24.39
D <sub>1</sub> W <sub>2</sub>	0.55	1.00	1.37	7.47	7.47	29.30
D <sub>2</sub> W <sub>1</sub>	0.68	1.16	1.49	7.27	7.37	25.38
D <sub>2</sub> W <sub>2</sub>	0.78	1.27	1.58	9.18	9.43	35.18
D <sub>3</sub> W <sub>1</sub>	1.16	3.74	5.15	12.72	16.83	25.66
D <sub>3</sub> W <sub>2</sub>	1.23	2.30	3.67	18.00	23.60	40.25
D <sub>4</sub> W <sub>1</sub>	1.18	1.89	2.27	11.12	15.23	26.83
D <sub>4</sub> W <sub>2</sub>	1.30	3.95	5.84	18.48	26.97	43.18
D <sub>5</sub> W <sub>1</sub>	0.73	1.13	1.42	6.62	10.13	17.63
D <sub>5</sub> W <sub>2</sub>	0.86	1.15	1.50	9.10	19.47	23.07
D <sub>6</sub> W <sub>1</sub>	0.48	1.00	1.35	7.27	17.43	32.87
D <sub>6</sub> W <sub>2</sub>	0.56	1.02	1.40	9.25	20.77	37.47
D <sub>7</sub> W <sub>1</sub>	0.78	1.31	1.75	8.03	11.80	25.10
D <sub>7</sub> W <sub>2</sub>	1.03	1.67	2.02	11.35	17.87	31.57
S.Em.±	0.02	0.04	0.06	0.28	0.49	1.03
C.D. at 5%	0.06	0.13	0.19	0.82	1.42	3.00
C.V. %	4.76	4.68	5.02	4.84	5.66	6.01

### Conclusion

On the basis of results obtained from the present investigation, it can be concluded that treatment combination of grafting date and wrapping material D<sub>4</sub>T<sub>2</sub> (01.4.2017 (D<sub>4</sub>) and degradable tape (W<sub>2</sub>) as wrapping material) recorded significantly maximum increment in length of scion, Maximum increment in girth of scion, maximum increment in length of root stock, Maximum increment in girth of root stock in custard apple grafts under saurashtra conditions. Hence, the date 01.04.2017 and degradable tape are suitable for success of softwood grafting and to obtain more number of grafts in custard apple in Saurashtra condition of Gujarat.

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