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Effect of scion stick storage methods on growth and success softwood grafts of mango (*Mangifera indica* L.) cv. KESAR

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ABSTRACT : The experiment was conducted at Agriculture Experimental Station, Navsari Agricultural University, and Paria. The investigation comprised of thirty treatment combinations of five wrapping materials, two storage conditions and three storage periods was conducted in Randomized Block Design (RBD) in Factorial concept with three repetitions. The minimum days required for leaf emergence as well as maximum growth of grafts in terms of total number of leaves, length of sprouted scion shoots, girth and success and survival of mango grafts received when grafts made with scion sticks stored in wrapping in moist cotton cloth + wax coating at cutting side (T_3) and stored at room temperature condition (C_2) for three days (P_2).

KEY WORDS : Mango, Softwood grafting, Scion sticks, Storage, Leaf emergence, Success, Growth

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Mango (*Mangifera indica* L.) belongs to family Anacardiaceae and is one of the popular fruit of tropical and sub-tropical region of the world, especially in Asia. Mango is grown almost in 63 countries around the world and this fruit occupy a unique place amongst the fruit crops grown in India. However, one of the most important restrictions in the rapid expansion of mango plantation is the shortage of quality planting material (grafts) in required numbers. Mostly, mangoes are vegetative propagated by inarching, veneer grafting, epicotyl grafting, softwood grafting etc. But softwood grafting and inarch grafting methods are presently practiced. In veneer grafting, it takes two year to raise grafts in nursery. Thus, involves more expenditure on care and management of plants. Epicotyl grafting technique is delicate and need expert and experienced hands to operate as the rootstock is very thin and brittle but in softwood grafting, it is easy to handle and quite efficient as well as grafts can normally raised within a year, thus reducing cost of raising grafts considerably. So, softwood grafting gives an excellence response in initial success with least possibility of mortality, better and uniform orchard establishment (Ram and Pathak, 2006). Moreover, transportation of bud sticks from one place to another is an economic proposition as compared to whole plant is costly and liable to be damaged it transit. An alternate solution to this problem is to procure bud sticks.

RESEARCH METHODS

An experiment comprised of thirty (scion stick storage) treatment combinations having three wrapping materials, two storage conditions and three storage periods. It was laid out in Randomized Block Design (RBD) in Factorial concept with three repetitions. Three wrapping materials were *viz.*, moist cotton cloth (T_1), wrapping in moist sphagnum moss (T_2), wrapping in moist cotton cloth + wax coating at cutting side (T_3), wrapping in Moist sphagnum moss + wax coating at cutting side (T_4), control [without any treatment](T_5); two storage conditions consisting refrigerator condition (C_1) and room temperature condition (C_2) and three storage periods comprising one day (P_1), three days (P_2), six days (P_3) of scion storage after detachment from mother tree. Mango seedlings of 4-5 months age raised in polythene bags of 13 x 10 cm size were used as a rootstock for mango grafts. The mature healthy, terminal, vigorous and 3-4 month old shoots were selected for scion and leaves were defoliated 10 days before for grafting. The mango grafts were prepared during

the months of July-August, 2011. All the observations were taken at six months after grafting except days required to leaf emergence.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation are presented below:

Days required to leaf emergence:

The minimum days required to leaf emergence was recorded when grafting made with scion sticks of mango stored after wrapping in moist cotton cloth + wax coating at cutting side (T_3). This wrapping materials holds adequate moisture and provided aeration inside bundle which kept the scion cells turgid ultimately it gives rapid proliferation of callus, speedy healing of grafts (Zimmerman, 1958) and it is in position to emerge early as compared to other wrapping materials treatments.

The earliness for leaf emergence on mango was recorded when scion sticks stored at room temperature as compared to refrigerator condition (Table 1). The maximum days taken for leaf emergence might be due to freezing of cell sap of scion sticks, which leads to some physiological deterioration, and delay leaf emergence of mango grafts. The

Table 1: Effect of wrapping materials, storage conditions and storage periods of scion sticks of mango cv. KESAR on leaf emergence, growth, success and survival of softwood grafts

Treatments	Days required to leaf emergence (Days)	Number of leaves	Length of sprouted scion shoot (cm)	Girth (cm)	Leaf area (cm^2)	Disease incidences on scion sticks (numbers)	Success (%)	Survival (%)
Wrapping materials (T)								
T_1	22.30	9.68	4.46	0.61	28.50	2.03	51.45	45.30
T_2	25.13	8.60	3.66	0.50	28.51	2.15	47.24	41.92
T_3	21.94	10.72	4.67	0.64	28.76	1.95	57.17	49.86
T_4	24.03	9.40	4.08	0.56	28.67	2.11	47.63	42.71
T_5	29.17	7.87	2.76	0.47	28.28	2.00	40.60	34.00
S.E. ±	0.59	0.21	0.08	0.01	0.66	0.07	6.08	5.79
CD. (P=0.05)	1.67	0.60	0.22	0.05	NS	NS	1.37	1.19
Storage conditions(C)								
C_1	25.91	9.01	3.75	0.53	28.47	1.99	45.93	40.18
C_2	23.12	9.50	4.10	0.58	28.61	2.11	51.70	45.34
S.E. ±	0.46	0.14	0.13	0.01	0.42	0.05	4.08	3.65
CD. (P=0.05)	1.29	0.38	0.37	0.03	NS	NS	1.06	0.75
Storage periods(P)								
P_1	22.63	9.83	4.32	0.57	28.66	1.96	50.88	46.09
P_2	22.32	9.94	4.43	0.59	28.66	2.03	51.93	47.48
P_3	28.60	8.00	3.03	0.51	28.31	2.16	43.65	34.71
S.E. ±	0.37	0.17	0.06	0.01	0.51	0.07	4.51	7.01
CD. (P=0.05)	1.06	0.47	0.17	0.04	NS	NS	0.86	0.92
Interaction (T × C)								
S.E. ±	0.84	0.30	0.11	0.02	0.93	0.12	0.88	1.49
CD. (P=0.05)	NS	NS	NS	NS	NS	NS	1.93	NS
Interaction (T × P)								
S.E. ±	1.02	0.37	0.13	0.03	1.14	0.15	1.33	1.41
CD. (P=0.05)	NS	1.05	0.37	NS	NS	NS	2.36	2.06
Interaction (C × P)								
S.E. ±	0.65	0.23	0.08	0.01	0.72	0.09	1.03	1.35
CD. (P=0.05)	NS	0.66	0.24	NS	NS	NS	1.50	1.31
Interaction (T × C × P)								
S.E. ±	1.45	0.52	0.19	0.04	1.62	0.21	1.68	1.55
CD. (P=0.05)	NS	1.48	0.53	NS	NS	NS	3.34	2.92
CV %	10.22	9.79	8.23	13.21	9.8	17.68	4.19	4.175

NS = Non significant

results are in support with earlier findings by Tandel and Patel (2009) in sapota.

The minimum days required to leaf emergence was recorded when mango scion sticks stored for three days (P_2) and used for softwood grafting. While the increased storage period gradually delayed the days required for leaf emergence of mango softwood grafts. The least time taken for leaf emergence may be due to abundant accumulation of carbohydrates and other food material after defoliation (10 days before grafting), which initiates bud activation and they are in position to sprout early up to three days. As the storage period increased, it took more time for emergence. The result is agree with previous findings of Kumar and Jain (1998) and Roy and Hoda (1994) in mango.

Total number of leaves and length of sprouted scion shoots of grafts:

Significantly the maximum number of leaves and length of sprouted scion shoots of grafts were noted when grafting made with scion sticks stored after wrapping in moist cotton cloth + wax coating at cutting side (T_3). This wrapping material holds adequate moisture and provided aeration inside bundle of mango scion sticks during storage. While the minimum number of leaves and length of sprouted scion shoots were recorded when grafting made with scion sticks stored without wrapping (T_5).

The maximum number of leaves and length of sprouted scion shoots of grafts might be due to stored carbohydrates and other food substances available in the scion sticks of mango after defoliation (10 days before grafting) (Zimmerman, 958) and due to congenial monsoon weather at room temperature (C_2).

The maximum number of leaves length of sprouted scion shoots of grafts were achieved with scion sticks stored for three days (P_2) and decreased as the storage period increased. The decreasing trend in number of leaves of softwood mango grafts might be due to rapid decaying of cut ends of scion sticks as the storage period increasing. It is in conformity with results of Dhakal and Hoda (1986).

Girth of grafts:

Significantly, the maximum girth of softwood grafts was recorded when grafting done with those scion sticks stored after wrapping in moist cotton cloth + wax coating at cutting side (T_3). This finding is in support of Amin (1978) in mango.

When grafting made with scion sticks stored at room temperature recorded maximum girth of mango softwood grafts, which might be due to congenial weather during storage of scion sticks in monsoon (Table 1). The results are accordance with earlier findings by Tandel and Patel (2009) in sapota.

The highest girth of mango grafts was obtained with scion sticks stored for three days (P_2) and as the storage period increased, the girth of grafts decreased. The decreasing trend of girth might be due to the rapid decaying of tissues from cut ends of scion sticks as the storage period increasing. These findings of present experiment are in conformity with the result obtained by Manker *et al.* (1999) in mango, Tandel and Patel (2009) in sapota

Leaf area (cm^2) and disease incidences on scion sticks:

The effect of different wrapping materials, storage conditions and storage periods failed to manifest their significance in respect of leaf area and disease incidences on scion sticks of mango grafts.

Success and survival of grafts (%):

Softwood grafting done in monsoon season gave maximum success and survival due to congenial weather. Significantly, highest success and survival of softwood grafts were obtained when grafting made with scion sticks stored after wrapping in moist cotton cloth + wax coating at cutting side (T_3) (Table 1). These wrappings hold adequate moisture and provide aeration inside bundle of mango scion sticks so it might have kept scion cells turgid and highly turgid cells are likely to give rapid proliferation of callus and speedy healing of grafts and therefore, they are in position to enhance grafts success and survival as compared to other wrapping materials. While the minimum success and survival were obtained when grafting made with scion sticks stored without wrapping (T_5). Olmstead and Keller (2007) in grape and Amin (1978) in mango also reported similar findings.

The minimum success and survival of mango grafts were observed when grafting made with scion sticks stored at refrigerator condition (C_1). It might be due to rapid freezing of scion cell sap which leading to death of cells and they are in position to give poor success of grafts. However, the maximum success obtained when grafting made with scion sticks stored at room temperature condition (C_2). This finding is in support of Tandel and Patel (2009) in sapota.

Significantly, the maximum success and survival of mango softwood grafts was recorded when grafting made with scion sticks stored for three days (P_2) and success and survival per cent decreased as storage period expanded. This might be due to rapid decay of tissues from cut ends of mango scion sticks during longer storage period. The result is agree with previous findings of Manker *et al.* (1999), Kumar and Jain (1998) and Roy and Hoda (1994).

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