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Effect of Pre-Soaking Treatments on the Success of Softwood Grafting and Growth of Mango Grafts

The rapid expansion of mango production in non-traditional areas is an important outcome of green revolution and application of newer technologies being one of the significant driving forces for the development. The most important varieties of the world are monoembryonic and there is a need to propagate them vegetatively. Hence it is imperative to select suitable rootstocks as desired. As a first attempt at nursery stage, it is essential to obtain maximum success by using suitable grafting technique . Mostly veneer, stone, approach and softwood grafting are commercially used for mango propagation. In these methods variation occurs due to an account of the rootstock factor, because of use of random rootstocks of unknown origin. Now days, mango is commercially propagated by softwood grafting with varied degree of success. It needs the proper age of rootstocks for softwood grafting and also the method that could be followed for different commercial varieties. The good germination per cent of mango stones is the main criterion and strong base for successful grafts. To attain good germination , mango stones were soaked in 20 to 200 ppm GA_3 solution for 24 to 48 hours or sprayed with 50 to 300 ppm GA_3 (Ram, 1997). Use of Panchagavya and Amritpani is also practised to enhance germination but there are no published data except for one or two with meagre details. (Pathak and Ram, 2004) and (Natarajan, 2002). Softwood grafting was performed on four months old rootstocks on linearly growing fresh terminal shoot of the rootstock. The height of the grafting may thus exert an influence on the success and subsequent growth of scion portion. Reddy and Melanta (1988) recorded *in-situ* softwood grafting on seven and six months old rootstocks and recorded the highest graft-take (90%) under Bangalore conditions. Similar results were reported by Singh and Shrivastava (1979) in mango. In light of these few references an experiment was taken up to enhance the germination and graft parameters by soaking stones with different pre-soaking treatments like organics and chemicals.

The present investigation was conducted at Department of Pomology, Kittur Rani Channamma College of Horticulture, Arabhavi, during 2006–2007.A completely randomized design with five replications and eight treatments were employed viz. Control, Water soaking (12 hours), KNO_3 1per cent (10min), GA_3 100ppm (10min), cow dung (12hours), cow urine (12 hours), Amrit pani (3% for 3hrs) and Panchagavya (3% for 3hrs). The scions from twenty-year-old grafted Alphanso established in Agriculture Research Station, Arabhavi were used. One season old shoots of pencil thickness, free from pest and disease were selected for the preparation of scions. The selected scions were defoliated ten days prior to grafting and these scions were separated on the day of grafting.

The vigorous container grown rootstocks were selected and top growth was decapitated with sharp knife and softwood grafting was done as per the standard procedures. The grafts were covered with polythene covering the joint completely and then kept in shade house. The grafts were watered daily and weeding was done as and when required. New sprouts (side shoots) arising from the rootstocks were removed regularly. The observations were recorded three months after grafting (MAG) for graft success and graft survival percentage and monthly interval for graft growth parameters

There were significant differences observed among the different bio-organics and chemical treatments. Maximum graft success was noticed in panchagavya three per cent (76.15%) followed by water soaking and GA_3 – 100 ppm (74.17 and 73.73% respectively). Significantly least graft success was noticed in control (64.07%). Similar trend was also observed for graft survival (Table 1). The influence of weather parameters like humidity and temperature on graft survival and grafting has been observed by Patel and Amin (1981). They found that temperature range of 23.15 - 25.87^0 C was most favourable for success and same reason may be resulted in higher success in the present investigation also.

The pre-soaking treatments were found to be significant at all stages of the growth with respect of sprout height, graft diameter, number of sprouts and number of leaves. Panchagavya three per cent noticed maximum sprout height (5.96 cm) followed by KNO_3 at one per cent with range of (2.642 to 5.64 cm) compared to control (2.11 to 4.28cm). Probably this may be due to better growth of grafts and weather condition like temperature and humidity, which played important role in growth of grafts. The highest graft diameter was recorded in panchagavya three per cent with range (7.28 to 8.40 mm) at 30 to 120 DAG, followed by GA_3 100 ppm (7.23 to 8.39mm respectively). However least graft diameter was recorded in control (6.5 to 7.51 mm respectively).This could be attributed to the vigorous growth of stock, which increased the growth and leads to maximum accumulation of stored metabolites at the time of grafting. Similar results were observed by Sappandi (2005) in wood apple and Devechandra, (2006) in jamun.

At 90 and 120 DAG the maximum number of sprouts was observed with GA_3 –100 ppm, Panchagavya and KNO_3 (1%) (2.38, 2.23 and 2.26 respectively) (Table 2). It could be attributed to weather conditions at the time of the grafting season leading to more accumulation of food material of the stored metabolites. These results are in agreement with Padma and Narayan Reddy (1995) and Santosh, (2004) in mango. The treatments with Panchagavya produced maximum number of leaves (17.80) followed by KNO_3 (8.25 to 15.71). This might be related to vigorous growth of grafts induced by simulative organs and also influenced by maximum number of sprouts leading to maximum number of leaves The higher graft-take observed in the present investigation may be attributed to the better growth of rootstock before grafting operation. It is clear from this experiment that the osmo-priming treatments with bio-organics increased the graft success, survivability and graft growth parameters.

Table 1. Effect of pre-soaking treatments on graft success, graft survivability, progressive sprout height and graft diameter of mango at different stages of growth

Treatment	Graft success (%)	Graft survivability (%)	Sprout height (cm)				Graft diameter (mm)			
	Months after grafting		Days after grafting							
	3 MAG	6 MAG	30	60	90	120	30	60	90	120
T_1 - Control	64.07	67.12	2.11	2.96	3.42	4.28	6.52	6.85	7.16	7.51
T_2 - Water soaking (12hour)	74.17	87.05	2.44	3.51	3.72	4.88	6.83	7.14	7.35	7.91
T_3 - KNO_3 (1 % for 10 min)	73.15	80.44	2.64	3.75	4.22	5.64	7.07	7.20	7.59	8.29
T_4 - GA_3 at 100ppm(10 min	73.73	73.29	2.70	3.56	4.01	5.51	7.23	7.47	7.87	8.39
T_5 - Cow dung (12 hour)	61.50	85.11	2.17	3.20	3.78	5.36	6.59	6.91	7.28	7.47
T_6 - Cow urine (12 hour)	58.98	80.74	2.57	3.42	3.95	5.42	6.45	6.84	7.21	7.63
T_7 - Amritpani (3 % for 3 hour)	66.15	84.43	2.35	3.24	4.04	5.55	7.08	7.20	7.37	8.13
T_8 * Panchagavya 3 % for 3 hr)	76.15	92.04	2.95	3.55	4.06	5.96	7.28	7.49	7.89	8.40
S.Em±	1.17	0.39	0.15	0.13	0.09	0.16	0.19	0.16	0.12	0.17
C.D. at 5%	3.38	1.12	0.43	0.38	0.25	0.47	0.54	0.46	0.35	0.49

Table 2. Effect of pre-soaking treatments on number of leaves and number of sprouts on mango grafts

Treatment	Number of leaves				Number of sprouts			
	Days after grafting							
	30	60	90	120	30	60	90	120
T_1 - Control	5.22	7.27	7.65	10.69	1.06	1.58	1.73	1.88
T_2 - Water soaking (12hour)	6.21	7.91	9.74	13.31	1.24	1.78	1.93	2.08
T_3 - KNO_3 (1 % for 10 min)	6.09	8.25	13.29	15.71	1.42	1.99	2.15	2.26
T_4 - GA_3 at 100ppm(10 min	5.98	8.11	12.21	14.02	1.24	2.02	2.27	2.38
T_5 - Cow dung (12 hour)	5.31	6.90	8.71	11.58	1.59	1.27	1.93	1.84
T_6 - Cow urine (12 hour)	5.47	5.90	8.35	11.12	1.11	1.67	1.68	2.15
T_7 - Amritpani (3 % for 3 hour)	6.15	7.78	11.34	13.47	1.38	1.73	1.75	1.83
T_8 - Panchagavya 3 % for 3 hr)	5.89	8.53	14.41	17.80	1.69	2.02	2.20	2.23
S.Em±	0.28	0.30	0.65	0.93	0.20	0.17	0.20	0.14
C.D. at 5%	NS	0.86	1.87	2.68	NS	0.49	NS	0.40

NS= Non significant

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