

Studies on Pre-Soaking, Method and Season of Grafting of Sapota Rootstock Khirnee

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(Received : December, 2003)

Abstract: Studies on influences of pre-soaking treatments, application of growth promoting substances and method and season of grafting on seed germination, growth enhancement of Khirnee rootstock and graft success in sapota respectively were conducted during 1996 to 2000. The study revealed that pre-soaking of Khirnee seeds (Rootstock of Sapota) in cowdung slurry for 24 hours resulted in higher (66.83%) seed germination. Khirnee seedlings sprayed with GA-200 ppm at 3rd and 6th month has enhanced the seedling growth. Inarching method of grafting had higher success of grafts during June-July season.

Introduction

Sapota a commercial fruit crop of South India, is known for its hardy nature, wide adaptability to diversified soil and climatic conditions and owing to this the area under sapota is increasing rapidly. But the availability of true to type planting material is insufficient to meet the growing demands of the growers. However, the sapota crop is beset with problems with regard to quick and large scale multiplication of planting material. The problem of poor germination of its popular rootstock Khirnee (*Manilkara hexandra* L.) seeds, limited availability of rootstock plants, slow rate of growth of Khirnee seedlings to attain the graftable size and approach method of grafting which is commonly used take longer time for the graft success. Use of plant growth regulators in enhancing seed germination and seedling growth of numerous plant species is well known (Tendolkar, 1978; Singh *et al.*, 1989 and Pampanna and Sulikeri, 2001). In addition synthetic chemicals other naturally available bioproducts or organics are known to contain vital plant growth substances which enhance the growth and development of plant (Anon., 1993) With a view to overcome the problems in

propagation of sapota, the studies were initiated at Kittur Rani Channamma College of Horticulture, Arabhavi (Belgaum dist) which comes under the Dry Zone of Northern Karnataka.

Material and Methods

The studies involved four different experiments. Studies on improvement of seed germination in Khirnee or Rayan (*Manilkara hexandra* L.). In order to improve the seed germination of Khirnee rootstock seeds the treatment of pre-soaking of seeds included growth regulator (GA₃ at 100 and 200 ppm; Thiourea and KNO₃ at 1% and 2% concentration) cowdung slurry and soaking in water for 24 hours. There were 9 treatments replicated four times in a completely randomised design. Each treatment consisted of 100 seeds soaked in respective solutions for 24 hours and then sown in seed pan having river bed sand as germination medium. Seed pans were kept under partial shade in open condition and watered regularly. After 35 -40 days of sowing the number of seeds germinated was counted and the germination expressed in percentage. The seeds without soaking was taken as control. Studies on growth enhancement of Khirnee

seedling. The study was also initiated to enhance the growth rate of Khirnee seedlings to attain graftable size rootstock. There were 9 treatments. Consisting of growth regulators, extracts of cakes and vermicompost (Vermiwash). The cattle dung, cakes and vermicompost were soaked in water for 24 hours. The supernatant was taken and diluted with water in 1:5 proportion (1 part of extract and 5 part of water). Three months old seedlings having two pairs of leaves were used for imposition of treatments. The extracts of cowdung, cake and vermicast were applied 6 times at fortnightly interval whereas, the tricontinol and gibberlic acid sprays were given at 3rd and 6th month of seedling growth. Each treatment consisted of 25 plants replicated four times in completely randomised block design. Studies on method and season of grafting. The study consisted of three methods of grafting (Inarching, *in-situ* and soft-wood) and season (June-July, Sep.-Oct. and Feb-March) with a view to know the suitable methods of grafting and the ideal season for grafting. Each treatment had 25 grafts replicated four times in randomised block design. The grafting was carried out on 18 months old uniform size Khirnee seedlings. Terminal portions of Sapota (Var. Kalipatti) shoots of 6-8 mm thick and 6-8 cm length with gray ash colour were selected as scions for insitu and soft wood grafting.

The sapota shoots having thickness of 8-10 mm and length of 45-60 cm from shoot tip were selected for inarching. The grafting success was recorded after 60 days in insitu and soft wood grafting and 120 days in inarching. The soft wood grafted plants were kept under partial shade. Studies on the optimum time for soft wood grafting. To find out suitable time for soft wood method of grafting, grafting was carried out at monthly interval from January to December. There were 12 treatments replicated thrice. Thirty grafts which were kept under partial shade were prepared at monthly interval with ten grafts for each replication and the design adopted was completely randomised design. The per cent of graft success was observed 60 days after grafting.

Results and Discussion

The pre-soaking treatments had significant influence on seed germination except in the year 1996-97. (T-1). The seeds pre-soaked in cowdung slurry for 24 hours resulted in significantly higher germination (66.83%) compared to rest of the treatments. This was followed by pre-soaking treatment in 1 % KNO₃ (61.00%). The higher germination percentage in cowdung slurry may be attributed to the presence of growth promoting substances (auxins) in cattle cowdung. These results are in agreement with

Table 1. Effect of presoaking solutions on Khirnee seed germination

Treatments	% germination			
	1996-97	1998-99	1999-00	Average
Thiourea 1%	53.00 (46.80)	47.50 (43.60)	53.50 (47.00)	51.33 (45.80)
Thiourea 2%	48.00 (43.90)	42.00 (40.40)	51.75 (46.00)	47.25 (43.43)
KNO ₃ 1%	59.00(50.22)	60.00 (50.70)	64.00(53.14)	61.00(51.35)
KNO ₃ 2%	56.00 (48.40)	56.00 (48.40)	59.50 (50.48)	57.16(49.09)
Cowdung slurry	62.00 (51.90)	64.00 (53.10)	74.50 (59.67)	66.83(54.89)
GA 100 ppm	52.00(46.10)	56.50(48.70)	60.50(51.06)	56.33(48.62)
GA 200 ppm	54.00(47.20)	57.00(49.00)	59.75(50.63)	56.91(48.94)
Water soaking	51.00(45.62)	49.50 (44.70)	49.00(44.44)	49.83 (44.92)
Control	48.00(43.90)	49.00(44.40)	46.50(42.98)	47.83(43.76)
SEm±	4.71	1.30	0.51	0.86
CD (0.05)	NS	2.68	1.43	2.49

Figures in the parenthesis are transformed values

the results of Anon. (1993). Application of growth promoting substances significantly influenced the seedling growth of Khirnee (T-2, 3 and 4). Application of GA (200 ppm) resulted in enhanced seedling growth, resulting in significantly higher plant height (27.44cm), stem girth (0.75 cm) and number of leaves in GA application may be attributed to the cell multiplication and elongation in the cambium tissues. These results are in conformity with the findings of Tendolkar (1978) and Pampanna (2001).

Inarching method of grafting recorded significantly higher graft success (85.00%) followed by insitu (36.25%) and soft wood (31.25%) grafting method (T-5). Among the 3 main seasons, the graft success was significantly higher in June-July months irrespective of the methods. The higher success in June-July months may be attributed to higher percentage of relative humidity (76-80%) coupled with minimum fluctuation between mean maximum (28°C) and minimum temperature (24°C) congenial for increased cell activity.

Significantly higher graft success (41.66%) was recorded in the month of May (T-6) followed by June (31.66%). These results are in accordance with the findings of Sulikeri *et al.* (1997). From the present investigations, it can be concluded that pre-soaking of Khirnee rootstock seeds in cowdung slurry for 24 hours was effective to get higher germination. Further, spraying of GA-200 ppm on Khirnee seedlings at 3rd and 6th month seedling growth. Among the methods and season of grafting tried, inarching in the month of June-July was superior in getting higher graft success. Soft wood grafting in May month was found superior followed by June for getting higher graft success.

Table 2. Effect of growth promoting substances on plant height of Khirnee seedling

Treatments	Plant height (cm)												
	Age of seedlings (months)												
	5				7				9				13
	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00	Average
Neemcake extract	5.61	8.12	9.45	11.10	13.50	14.30	17.90	17.00	21.80	21.15	21.80	21.15	21.48
Pongamia extract	5.47	-	10.23	-	14.70	-	18.00	-	22.80	-	22.80	-	22.80
Cow dung extract	6.27	8.25	10.15	11.15	15.87	14.79	19.30	17.10	25.80	21.96	25.80	21.96	23.88
Vermiwash	5.90	8.10	10.57	11.00	15.80	14.10	19.26	16.98	21.90	21.40	21.90	21.40	21.65
Tricontinal 0.1%	6.32	8.83	11.29	11.85	17.50	15.80	21.60	18.75	27.60	26.00	27.60	26.00	26.80
Tricontinal 0.2%	5.80	8.60	10.98	11.70	16.00	15.20	20.10	18.10	24.20	24.70	24.20	24.70	24.45
GA 100 ppm	6.15	8.30	11.00	11.30	15.53	15.10	19.90	17.95	23.30	22.15	23.30	22.15	22.73
GA 200 ppm	6.13	8.85	11.15	11.90	16.10	16.30	21.50	19.80	28.00	26.17	28.00	26.17	19.98
Control	5.50	7.98	9.40	10.20	13.10	12.10	17.10	14.90	21.00	18.95	21.00	18.95	27.44
SEm±	0.16	0.08	0.24	0.19	0.17	0.12	0.11	0.13	0.14	0.31	0.14	0.31	0.18
CD (5%)	0.50	0.23	0.73	0.55	0.51	0.34	0.34	0.37	0.43	0.89	0.43	0.89	0.52

Table 3. Effect of growth promoting substances on stem girth of Khirnee seedling

Treatments	Stem girth (cm)											
	Age of seedlings (months)											
	5				7				9			
	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00
	0.29	0.28	0.34	0.30	0.49	0.38	0.53	0.48	0.67	0.63	0.67	0.63
Neemcake extract	0.29	0.28	0.34	0.30	0.49	0.38	0.53	0.48	0.67	0.63	0.67	0.63
Pongamia extract	0.28	-	0.33	-	0.49	-	0.55	-	0.69	-	0.69	-
Cow dung extract	0.27	0.28	0.32	0.30	0.53	0.39	0.58	0.50	0.66	0.65	0.66	0.66
Vermiwash	0.26	0.27	0.32	0.29	0.54	0.38	0.58	0.49	0.65	0.62	0.65	0.64
Tricontinal 0.1%	0.27	0.30	0.31	0.35	0.56	0.49	0.59	0.63	0.66	0.72	0.66	0.69
Tricontinal 0.2%	0.27	0.30	0.31	0.33	0.53	0.42	0.62	0.60	0.73	0.70	0.73	0.72
GA 100 ppm	0.27	0.30	0.30	0.32	0.51	0.40	0.59	0.58	0.67	0.67	0.67	0.67
GA 200 ppm	0.28	0.31	0.30	0.36	0.53	0.51	0.62	0.64	0.74	0.76	0.74	0.75
Control	0.27	0.27	0.29	0.29	0.49	0.33	0.52	0.43	0.64	0.52	0.64	0.52
SEm $\pm$	0.01	0.01	0.02	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
CD (5%)	NS	0.2	NS	0.1	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.03

Table 4. Effect of growth promoting substances on number of leaves of Khirnee seedling

Treatments	Number of Leaves											
	Age of seedlings (months)											
	5				7				9			
	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00	96-97	99-00
	7.70	7.80	12.60	11.20	12.90	12.00	14.10	13.30	17.50	16.98	17.50	16.98
Neemcake extract	7.70	7.80	12.60	11.20	12.90	12.00	14.10	13.30	17.50	16.98	17.50	16.98
Pongamia extract	8.10	-	12.10	-	12.84	-	13.40	-	15.80	-	15.80	-
Cow dung extract	8.67	7.90	12.10	11.30	14.12	12.10	14.20	13.60	15.40	17.20	15.40	17.20
Vermiwash	7.98	7.80	13.10	11.10	13.30	11.90	14.50	13.50	16.80	17.10	16.80	17.10
Tricontinal 0.1%	7.95	9.15	12.00	12.00	12.87	13.10	13.10	16.00	14.00	19.65	14.00	19.65
Tricontinal 0.2%	8.34	9.00	13.80	11.95	13.95	13.15	14.00	15.90	14.50	19.20	14.50	19.20
GA 100 ppm	9.23	8.90	14.10	11.85	14.20	13.00	14.60	15.60	17.40	19.00	17.40	19.00
GA 200 ppm	9.00	9.20	14.00	12.30	12.60	11.50	12.90	12.95	15.40	15.30	15.40	15.30
Control	7.60	7.50	12.00	10.10	12.60	11.50	12.90	12.95	15.40	15.30	15.40	15.30
SEm $\pm$	0.14	0.13	0.23	0.10	0.17	0.10	0.22	0.11	0.23	0.20	0.23	0.22
CD (5%)	0.43	0.38	0.69	0.29	0.53	0.29	0.66	0.31	0.68	0.58	0.68	0.63

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Table 5. Influence of method and season of grafting on graft success in sapota

Treatments	Months	Success of grafts (%)		
		1998-99	1999-00	Average
Inarching	June-July	85.00(9.27)	85.00 (9.27)	85.00(9.27)
	Sept-Oct	70.00(8.41)	67.50(8.27)	68.75(8.34)
	Feb- March	72.50(8.56)	75.00(8.71)	73.75(8.64)
In situ	June-July	35.00(5.98)	37.50(6.18)	36.25(6.08)
	Sept-Oct	22.50(4.75)	42.50(6.59)	32.50(5.65)
	Feb-March	7.50(2.75)	20.00(4.51)	13.75(3.63)
Soft -wood	June-July	30.00(5.53)	32.50(5.77)	31.25(5.60)
	Sept-Oct	15.00(3.53)	40.00(6.38)	27.50(5.16)
	Feb-March	2.50(1.57)	17.50(4.26)	10.00(2.91)
SEm±		0.42	0.20	0.30
CD 5%		1.26	0.59	0.87

Figures in the parenthesis are transformed values

Table 6. Influence of soft wood grafting at monthly intervals in sapota

Sl.No.	Treatments	Success of grafts (%)		
		1998-99	1999-00	Average
1	January	0.00 (0.70)	0.00 (0.70)	0.00(0.70)
2	February	0.00(0.70)	13.33 (3.66)	6.66(2.18)
3	March	0.00(0.70)	13.33(3.66)	6.66(2.18)
4	April	0.00(0.70)	13.33(3.66)	6.66(2.18)
5	May	40.00(6.36)	43.33(6.60)	41.66(6.48)
6	June	30.00(5.52)	33.33(5.80)	31.66(5.66)
7	July	23.33(4.88)	23.33(4.85)	23.33(4.86)
8	August	0.00(0.70)	46.66(6.85)	23.33(4.86)
9	September	13.33(3.71)	43.33(6.60)	28.33(5.15)
10	October	13.33(3.71)	26.66(5.18)	19.99(4.44)
11	November	0.00(0.70)	16.66(4.09)	8.33(2.40)
12	December	0.00(0.70)	0.00(0.70)	0.00(0.70)
SEm±		0.28	0.16	0.22
CD at 5%		0.86	0.49	0.63

Figures in the parentheses are transformed values

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