Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2729

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (5):** 1189-1194 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Effect of Grafting Methods on Growth Parameters of Kari Ishada Selections

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Received: 20.03.2017 | Revised: 26.04.2017 | Accepted: 1.05.2017

ABSTRACT

An investigation on "Grafting studies of the selections of Kari Ishada mango cultivar" was carried out in department of Fruit Science, Kittur Rani Channamma College of Horticulture, Arabhavi during the year 2015-16. Ten Kari Ishada selections were vegetatively propagated through two different grafting methods viz., stone and softwood grafting. Stone grafting proved to be the best for the Kari Ishada selections for the number of days to sprout (13.47), number of sprouts (1.91), number of leaves (8.76), shoot girth (5.68 mm) and sprout height (5.14 cm). 'KIS-15' responded well to the grafting with graft height (29.63 cm), number of days to sprout (14.50), number of sprouts (2.28), number of leaves (9.82), shoot girth (6.31 mm) and sprout length (5.61 cm). The interaction between the grafting methods and the Kari Ishada selections showed that, softwood grafting of 'KIS-27' had the highest graft height (34.10). The stone grafting of 'KIS-15' was the best for number of days to sprout (12.41), number of sprouts (2.45), number of leaves (10.40), shoot girth (6.64 mm) and sprout length (6.14 cm).

Key words: *Kari Ishada, Stone grafting, Softwood grafting, Graft height, Sprout, Shoot.*

INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important fruit crops of Anacardiaceae family that consists of dicotyledonous trees and shrubs. It is the most important fruit crop in India having socio-economic significance. Owing to the delicious quality of fruit and richness in vitamins and minerals, it is known as 'King of fruits'. Ancient Indians valued mango not merely for its sentiment or religious consideration, but they realized its importance in economics and cultural life of the society. Muslim Kings-Nawabs promoted the practice of planting best mango varieties.

Cite this article: Sampath, P.M., Naik, N., Thirupathaiah, G., Swamy, G.S. K., Kumar, C.J.N., Chongtham A.D. and Subraya, B.K., Effect of Grafting Methods on Growth Parameters of Kari Ishada Selections, *Int. J. Pure App. Biosci.* **5(5):** 1189-1194 (2017). doi: http://dx.doi.org/10.18782/2320-7051.2729

The long period of domestication of mango is well evidenced from its mention in ancient scripture. Ain-I-Akbari, an encyclopedia written during the period of 1590 AD amply gives the understanding of mango of that period[6].

In perennial trees like mango, asexual propagation like grafting renders preservation of the variations that might be accumulated through mutations which offers scope for the selection of good clones within a cultivated variety[4]. The growth parameters of the grafts vary depending on the genotype of scions and the grafting methods. In the present investigation, ten selections of Kari Ishada were vegetatively propagated through the two different grafting methods *viz.*, stone grafting and softwood grafting to study their impact on growth parameters of the grafts.

MATERIAL AND METHODS

The investigation on "Grafting studies of the selections of Kari Ishada mango cultivar" was carried out department of Fruit Science, Kittur Rani Channamma College of Horticulture, Arabhavi during the year 2015-16. The selections were made among the trees of the Kari Ishada cultivar grown in Ankola and Kumta taluks of Uttara Kannada district based on the morphological and quality parameters. The scions of ten such selections were brought to the nursery of the college and were studied for their grafting behaviour. The effect of the grafting methods and genotype of the scion were studied. The grafting methods used in the present study were stone grafting and softwood grafting.

Design: Factorial Completely Randomized Design (FCRD) with two factors

Factor 1: Grafting methods (2 types: Softwood grafting and stone grafting)

Factor 2: Kari Ishada selections (10 selections : 'KIS-3', 'KIS-4', 'KIS-7', 'KIS-11', 'KIS-13', 'KIS-15', 'KIS-17', 'KIS-24', 'KIS-25', 'KIS-27').

Treatments

T_1 : 'KIS-3' stone grafting
T_2 : 'KIS-4' stone grafting
T_3 : 'KIS-7' stone grafting
T_4 : 'KIS-11' stone grafting
T_5 : 'KIS-13' stone grafting
T_6 : 'KIS-15' stone grafting
T_7 : 'KIS-17' stone grafting
T_8 : 'KIS-24' stone grafting
T_9 : 'KIS-25' stone grafting
T_{10} : 'KIS-27' stone grafting
T_{11} : 'KIS-3' soft wood grafting
T_{12} : 'KIS-4' soft wood grafting
T_{13} : 'KIS-7' soft wood grafting
T_{14} : 'KIS-11' soft wood grafting
T_{15} : 'KIS-13' soft wood grafting
T_{16} : 'KIS-15' soft wood grafting
T_{17} : 'KIS-17' soft wood grafting
T_{18} : 'KIS-24' soft wood grafting
T_{19} : 'KIS-25' soft wood grafting
T_{20} : 'KIS-27' soft wood grafting
*KIS : Kari Ishada Selection

The scions were on grafted local rootstock with two replications per treatment and ten grafts per replication were studied with 400 total number of grafts.

Seven to ten days old seedlings of local variety were used as rootstocks for stone grafting and the one year old seedlings of local variety were used as rootstocks for soft wood grafting. The healthy scions of pencil size thickness were collected from the particular mother trees from Ankola and Kumta and were brought to Kittur Rani Channamma College of Horticulture, Arabhavi for grafting. The scions were transported in the ice box after rolling them in the wet newspaper. These scions were grafted the next day after their separation from the mother plant. Stone grafting and softwood grafting are the two grafting methods used in the experiment. The grafting was done in the month of August in the year of 2015.

For stone grafting, seven to ten days old seedlings of the local variety were used as rootstocks. The thickness of scion and the rootstock was matched and the transverse cut

was given on the rootstock at about 5 cm from the base. After this, a longitudinal cut of 4 to 5 cm length was given on the rootstock. The top of the rootstock appeared like the letter 'V'. A scion of about 9-10 cm length and the same thickness as that of the rootstock was selected. The lower end of the scion was cut into gently sloping wedge of about 3 to 4 cm by removing the bark and a little wood from the two opposite sides. The wedge shaped scion thus prepared was carefully inserted into the 'V' shaped slit of the stock and secured firmly with 1.5 cm wide and 35 cm long, 200 gauge white transparent polythene strip. The scions were covered with small transparent polythene strip to avoid contamination or desiccation of the scions by creating humidity near and above the union region. This polythene strip also maintains the temperature and helps for graft union. Soon after grafting, the grafts were kept in shade house.

For the softwood grafting one year old seedlings of the local variety were used. At about 15-20 cm height, a transverse cut was given on the rootstock. The girth of rootstock in that region is almost equal to that of the scion. After this, a longitudinal cut of 4 to 5 cm length was given on the rootstock and then the scion was inserted after which procedure was continued as in stone grafting.

The growth parameters were recorded at 90 days after grafting. The graft height was measured with scale and expressed in centimeters. The number of sprouts and leaves that arose from the scion was counted and the girth of the sprout was measured from a marked point with the help of digital vernier calipers which, was expressed in millimeters. The sprout length was measured with scale and expressed in centimeters. The data on various characters were subjected to Fisher's method of analysis of variance and the interpretation of data as given by Panse and Sukhatme[8]. The level of significance used for 'F' and 't' tests was p=0.05. Critical difference (CD) values were calculated whenever the 'F' test was significant.

RESULTS AND DISCUSSION

The difference in number of days for sprouting was significant among the grafting methods, Kari Ishada selections and interaction between grafting methods and Kari Ishada selections (Table 1). The number of days for sprouting was less in stone grafting (14.50) compared to softwood grafting (16.10) which might be due to comparatively more secured cambium contacts between stock and scion in stone grafting resulting in early callus development leading to quicker repair of cells. The rapid formation of callus (parenchymatous) tissues allows translocation of vital biochemical compounds between stock and scion and has resulted in the minimum days to sprout in stone grafting. In the same way, Upadhya *et al.*[15] reported that, number of days taken for sprouting varied from 11.00 to 16.00 in stone grafting of mango and Singh *et al.*[14] reported an average of 23.33 days to sprout in softwood grafting of mango.

Among the Kari Ishad selections, the lowest of 13.47 days were taken for sprouting in 'KIS-15' whereas, the interaction found that stone grafting of 'KIS-15' took the lowest of 12.41 days to sprout (Table 1). The similar results were obtained in mango varieties like 'Langra' with 14.31 days[1]; 'Peach' with 12.83 days[2] and 'Rajapuri' with 14.67 days to sprout[10]. The better union of stock and scion in 'KIS-15' in the present study might have easily supplied the required nutritional quantity to the grafts for earlier sprouting. The variation also might be due to the difference in endogenous substances such as phenols and latex. Presence of more concentrated latex and hardiness of rootstock which hinders the process of graft union results in maximum days to complete sprouting[7].

The graft height was significantly high in softwood grafting on 90th day after grafting (27.77 cm) which is presented in table 1. 'KIS-15' had the highest graft height of 29.63 cm on 90th day after grafting. The interaction between the grafting method and Kari Ishada selections responded with the highest graft height in

softwood grafting of 'KIS-27' which had recorded 34.10 cm (Table 1). The same trend in graft height with 30.68 cm in ''Amrapali'' on 90th day after grafting was reported by Ram *et al.*[10]. These results corroborate with the findings of Singh *et al*.[14] and Shinde *et al*[12].

The better graft height of softwood grafting than stone grafting is due to the reason that, the grafting operation was done at the greater height in softwood grafting (around 15 cm) compared to stone grafting (around 5 cm). The difference in graft height was found among different Kari Ishada selections, which is probably due to the variation in the vigour of individual selections and the early sprout emergence of grafts.

The stone grafting had recorded the highest number of sprouts (1.91) and 'KIS-15' had the highest number of sprouts (2.28) compared to other selections. The interaction showed that the stone grafting of 'KIS-15' had the most number of sprouts of 2.45 (Table 1). The number of spouts of 1.94 in ''Amrapali'' (Islam, 2004) and 2.05 in 'Langra'[1] confirms the present study.

The selection 'KIS-15' has responded well to grafting by producing more number of sprouts probably due to the better bridging of graft union and well formed conducting tissues. The variation in the number of sprouts in grafts may be due the difference in cell division and differentiation capacity in the different Kari Ishada selections which might have happened due to the growth in meristematic cells coupled with physiological processes like photosynthesis and respiration. The difference in the number of nodes and absorption of leaf primordia also might have caused the variation in number of sprouts. Early callus formation that occurs from the rootstock component producing good union helps in the production of more number of sprouts[3].

The maximum number of leaves was recorded in stone grafting (8.76) which is presented in table 1I. Similarly, the number of leaves ranging from 7.6 to 10 at 120 days of grafting in stone grafting of mango was reported by Singh *et al.*[14]. Among the selections, 'KIS-15' had most number of leaves (9.82). The interaction effect showed most number of leaves (10.40) in stone grafting of 'KIS-15' (Table 1I). Similarly, the number of leaves of 8.64 was reported in 'Pairi'[11]. The highest number of leaves in 'KIS-15' might be due to more mechanical fit of the two cambium layers and proper hormonal level in the tissue. The different number of leaves in different Kari Ishada selections might be due to the variation in formation of callus and vascular continuity. These findings were in agreement with Singh and Suryanarayana[13]; Alam *et al.*[1]; Prajapati *et al.*[9] and Ram *et al*[10].

The shoot girth determines the vigour of grafts. The grafts with thicker shoots are considered to have better growth and vigour. Stone grafting recorded highest shoot girth of 5.68 mm (Table 1I). The selection 'KIS-15' had the thickest shoot girth (6.31 mm). Among the interactions, stone grafting of 'KIS-15' had the highest shoot girth of 6.64 mm (Table 1I). The similar shoot girth of 6.20 mm was reported in stone grafting of 'Langra' by Alam *et al*[1]. The better uptake of nutrients and water that increase the photosynthetic efficiency due to more number of leaves has resulted in better growth of the shoots.

The sprout length (5.14 cm) was highest in stone grafting. 'KIS-15' had the highest sprout length (5.61 cm). The interaction of the stone grafting and 'KIS-15' recorded the highest sprout length of 6.14 cm (Table 1I). In the same trend, highest sprout length of 6.00 cm was found in stone grafting of mango by Singh *et al*[14]. Shantagouda *et al.*[11] reported the sprout length of 6.50 cm in 'Arka Puneeth'. The better sprout length of grafts is due to the early emergence of buds.

Table 1: Effect of grafting methods on number of days to sprout, graft height and number of sprouts of Kari Ishada selections

Selections	Number of days to sprout			Graft height (cm)			Number of sprouts		
	Grafting method		Mean (Selections)	Grafting method		Mean (Selections)	Grafting method		Mean (Selections)
	Stone grafting	Softwood grafting		Stone grafting	Softwood grafting		Stone grafting	Softwood grafting	
KIS-3	13.78	15.15	**14.47**	24.05	29.38	**26.71**	2.02	1.75	**1.88**
KIS-4	14.16	17.9	**16.03**	23.63	24.23	**23.93**	1.97	1.45	**1.71**
KIS-7	16.07	18.33	**17.2**	21.62	23.31	**22.46**	1.52	1.25	**1.39**
KIS-11	14.72	16.1	**15.41**	23.13	26.35	**24.74**	1.89	1.4	**1.64**
KIS-13	15.8	16.88	**16.34**	22.63	25.67	**24.15**	1.65	1.38	**1.51**
KIS-15	12.41	14.54	**13.47**	25.48	33.79	**29.63**	2.45	2.1	**2.28**
KIS-17	15.18	15.82	**15.5**	22.93	26.95	**24.94**	1.75	1.51	**1.63**
KIS-24	16.36	16.45	**16.4**	20.54	25.82	**23.18**	1.44	1.45	**1.44**
KIS-25	13.06	15.46	**14.26**	25.05	28.07	**26.56**	2.28	1.6	**1.94**
KIS-27	13.41	14.4	**13.9**	24.43	34.1	**29.26**	2.15	2.38	**2.27**
Mean (Grafting method)	**14.5**	**16.1**		**23.35**	**27.77**		**1.91**	**1.63**	
	Grafting method (G)	**Selections (S)**	**Interaction (GxS)**	**Grafting method (G)**	**Selections (S)**	**Interaction (GxS)**	**Grafting method (G)**	**Selections (S)**	**Interaction (GxS)**
S.Em ±	**0.04**	**0.09**	**0.13**	**0.19**	**0.42**	**0.59**	**0.02**	**0.05**	**0.07**
C.D at 5%	**0.12**	**0.26**	**0.37**	**0.55**	**1.23**	**1.75**	**0.07**	**0.15**	**0.21**

Table 2: Effect of grafting methods on number leaves, shoot girth and sprout lenght of Kari Ishada selections

Selections	Number of leaves			Shoot girth (mm)			Sprout length (cm)		
	Grafting method		Mean (Selections)	Grafting method		Mean (Selections)	Grafting method		Mean (Selections)
	Stone grafting	Softwood grafting		Stone grafting	Softwood grafting		Stone grafting	Softwood grafting	
KIS-3	9.37	8.77	**9.07**	5.83	5.52	**5.67**	5.32	4.77	**5.04**
KIS-4	8.95	6.81	**7.88**	5.72	4.43	**5.07**	5.2	3.49	**4.34**
KIS-7	7.35	6.67	**7.01**	4.97	4.07	**4.52**	4.4	3.45	**3.93**
KIS-11	8.5	8.32	**8.41**	5.61	5.06	**5.34**	5.27	4.72	**4.99**
KIS-13	8.07	7.98	**8.02**	5.25	4.73	**4.99**	4.59	4.09	**4.34**
KIS-15	10.4	9.25	**9.82**	6.64	5.98	**6.31**	6.14	5.08	**5.61**
KIS-17	8.33	8.46	**8.39**	5.43	5.29	**5.36**	4.49	4.51	**4.5**
KIS-24	6.85	8.17	**7.51**	4.77	4.94	**4.86**	4.34	3.9	**4.12**
KIS-25	10.03	8.61	**9.32**	6.46	5.34	**5.9**	5.75	4.54	**5.15**
KIS-27	9.73	9.37	**9.55**	6.15	6.27	**6.21**	5.92	5.22	**5.57**
Mean (Grafting method)	**8.76**	**8.24**		**5.68**	**5.16**		**5.14**	**4.38**	
	Grafting method (G)	**Selections (S)**	**Interaction (GxS)**	**Grafting method (G)**	**Selections (S)**	**Interaction (GxS)**	**Grafting method (G)**	**Selections (S)**	**Interaction (GxS)**
S.Em ±	**0.09**	**0.2**	**0.28**	**0.02**	**0.05**	**0.08**	**0.05**	**0.11**	**0.16**
C.D at 5%	**0.26**	**0.59**	**0.84**	**0.07**	**0.16**	**0.22**	**0.15**	**0.33**	**0.47**

REFERENCES

1. Alam, M. A., Islam, M. S., Uddin, M. Z., Barman, J. C. and Quamruzzaman, A. K. M., Effect of age of seedling and variety of scion in stone grafting of mango. *Int. J. Sustain. Crop Prod.*, **1(2):** 27-32, (2006).
2. Baita, H. U., Manga, A. A. and Mustapha, Y., Evaluation of different morphotypes of mango (*Mangifera indica* L.) for use as rootstock in seedlings production. *Bayer J. Appl. Sci.*, **3(1):** 79-82, (2010).
3. Asante, A. K. and Barnett, J. R., Graft union formation in mango. *J. Hort. Sci.* 5:781-790, (1977).
4. Islam, M. N., Rahim, M. A. and Farooque, A. M., Standardization of time and grafting techniques in Mango under Bangladesh condition. *Asian J. Plant Sci.*, **3(3):** 378-386, (2004).
5. Iyer, C. P. A. and Mukunda, G. K., Improvement of mango by selection and hybridization, In: Srivastava RP (ed) Mango cultivation, International Book Distributing Co., Lucknow, India, pp. 13-38, (1998).
6. Mukherjee, S. K., The mango - its botany, cultivation, uses and future improvement, especially as observed in India. *Econ. Bot.*, **7:** 130-162., (1952).
7. Pandiyan, R., Manivannan, K. and Kumar, A. G., Effect of growth regulators and age of root stocks on the propagation of jack through grafting. *J. Agric. Res.*, **2(2):** 241-243, (2011).
8. Panse and Sukhatme P V., Statistical methods for Agricultural workers. Indian council of Agricultural Research, New Delhi, (1967).
9. Prajapati, G. K., Patel, M. M., Bhadauria, H. S., Varma, L. R., Modi, D. J. and Garasiya, V. R., Study of softwood grafting on different mango varieties. *Asian J. Hort.*, **9(1):** 210-242, (2014).
10. Ram, R. B., Kumar, D., Lata, R., Sonkar, P. and Meena, M. L., Studies for the standardization of stone grafting in six mango cultivars under Lucknow conditions of India. *Acta Hort.*, **1066:** 95-98., (2015).
11. Shantagouda D P, Swamy G S K, Yallesh H S, Thammaiah N and Prasad K.. Effect of different mango rootstocks on success of softwood grafting. *Asian J. Hort.*, **3**(2): 389-390 (2008).
12. Shinde, V. V., Mahale, M. M., Jadhav, P. V. and Dubale, J. J., The Effect of Type of Scion Stick on Success of Softwood Grafting in Cashew (*Anacardium occidentale* L. 'Vengurla-4'). Proc. Ist IS on Cashew Nut, Eds.: Ravindran *et al*., *Acta Hort.*, **1080:** 263-268 (2015).
13. Singh, D. B. and Surayanarayana, M. A., Studies on softwood grafting in mango. *Flora and Fauna*, **2(1):** 83-84 (1996).
14. Singh, N. J., Tripathy, S. M. and Ghumare, V., Studies on growth and survival of stone grafts as influenced by age of seedling rootstock in mango (*Mangifera indica* L.*)* cv. Amrapali. *Appl. & Nat. Sci.*, **6(2):** 716-719, (2014).
15. Upadhya, M. S., Baral, D. B., Gautam, D. M. and Shrestha, S. M., Influence of rootstock age and pre-defoliation of scion on the success of epicotyls grafting of Mango. *Int .J. Res.*, **7:** 34-36 (2014).