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Effect of different methods, time and environmental conditions on grafting in walnut

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ABSTRACT

An experiment was conduced during 2005-06 to study the effect of different methods of grafting viz tongue, wedge and veneer with three different timings viz, 2nd, 3rd and 4th week of February under polyhouse conditions in walnut. The same experiment was repeated in field conditions with same methods of grafting but with three different timings viz 4th week of February, 1st and 2nd week of March. The results indicated that under polyhouse, the maximum grafting success (76.66%) was obtained through wedge method of grafting followed by (70.00%) through tongue grafting when done in 4th week of February. When the grafting was done in 3rd week, maximum success (66.66%) was achieved using wedge grafting followed by tongue grafting (63.33%). Veneer grafting resulted in maximum (53.33%) success when performed in 4th week of February. The grafting success was comparatively quite low in case of field conditions. In this case only 20.00 per cent success was obtained through wedge grafting done in 1st and 2nd week of March. The higher grafting success in wedge and tongue grafting recorded could be due to the favorable temperature and relative humidity at the time of grafting and rapid flow of sap in stock and scion that might have favored the healing process and established the continuity of cambial and vascular tissues for the graft take. Significant affects were also noticed on shoot length, number of leaves, number of leaflets, leaf area and days to leaf fall.

Keywords: Methods, time, environment, walnut, grafting

INTRODUCTION

Walnut belongs to the family Juglandaceae and has wide adaptability to grow in temperate regions of the world between 1,200 to 2,150 m above sea level. Jammu and Kashmir is the major walnut producing state in India. An area of 69,182 ha covered using natural population of walnut produces 94,579 metric tonnes annually (Anon 2007).

For a long time in the past, propagation through seed was only method available for walnut multiplication though this practice resulted into plants of great variability (Sharma et al 2003). Generally, walnut does not respond favourably to the

vegetative propagation techniques under normal conditions, the way other temperate fruits do. Various methods of vegetative propagation in walnut have been reported to give varying degree of success under different climatic conditions in India and abroad. The variations are dependent on different environmental conditions to which the plants are subjected before and after propagation (Chase 1947, Ibrahim et al 1978, Awasthi et al 1982, Qureshi and Dalal 1985). In fact, there is an urgent need to standardize the suitable techniques for clonal multiplication of walnut in order to ensure supply of quality plant material for expansion of area, achieve increase in production and productivity of superior nuts and meeting the international standards of quality characters of nut and kernel.

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MATERIAL AND METHODS

An experiment on the effect of different grafting methods and time on grafting success in walnut under two different environmental conditions was carried out at the experimental field of Division of Pomology, Shalimar Campus of Sher-e-Kashmir University of Agricultural Sciences and Technology, Kashmir during 2006. The experimental site is located at an elevation of 1,587 m above mean sea level and situated at 34.08^{o} North latitude and 74.08^{o} East longitude. The experiment was carried out under polyhouse and in open field conditions with same methods of grafting viz tongue, wedge and veneer, but with different timing viz 2nd, 3rd and 4th week of February under polyhouse and 4th week of February, 1st and 2nd week of March in open field conditions. One year old seedlings raised from thick shelled nuts were used as rootstocks in the study. The seedling rootstocks of 1-1.5 cm thickness were utilized for the purpose. The scion material was taken from a walnut selection SKAU-W-002. The budsticks used for grafting were one year old terminal shoots.

The polyhouse used under experiment was simple wooden structure that was covered with white polythene. To provide the suitable relative humidity for the success of walnut grafts, water was sprayed one or two times a day. However, to increase the temperature no additional aid was fitted. In open field conditions, natural environment prevailed. The experiment was laid in a Randomized Block Design (RBD) using three replications.

The observations were recorded on bud bursting/leafing out, average shoot length, number of leaves/shoot, leaf area/ shoot, grafting success (%) and proportion of saleable plants (%). The experimental data were analyzed for ANOVA using RBD as per the procedure suggested by Cochran and Cox (1957).

RESULTS AND DISCUSSION

The data on the effect of different methods and time on grafting in walnut under polyhouse conditions are given in Table 1. Minimum days to bud bursting (27.66)

Table 1. Effect of different methods and time of grafting on various characters of walnut under polyhouse conditions

Methods of grafting	Time of grafting	Bud bursting (days)	Grafting Success (%)	Shoot Length (cm)	No. of leaves/ shoot	Leaf area (cm)	No. of saleable plants (%)
Wedge grafting	2nd week of February	37.66	46.66	47.61	16.66	398.17	36.66
Wedge grafting	3rd week of February	31.66	66.66	55.08	18.66	418.77	56.66
Wedge grafting	4th week of February	27.66	76.66	56.22	20.00	531.20	60.00
Tongue grafting	2nd week of February	37.66	40.00	45.50	14.66	331.42	26.66
Tongue grafting	3rd week of February	33.66	63.33	50.90	18.00	495.27	50.00
Tongue grafting	4th week of February	29.00	70.00	55.45	19.66	513.80	53.33
Veneer grafting	2nd week of February	50.00	23.33	35.82	12.66	257.66	13.33
Veneer grafting	3rd week of February	43.00	36.66	39.86	14.00	331.37	23.33
Veneer grafting	4th week of February	31.66	53.33	42.21	16.00	450.93	36.66
CD (0.05)		1.88	14.80	2.35	N.S	1.52	2.289

were recorded in case of wedge grafting followed by tongue grafting (29.00) done in 4th week of February, whereas, maximum days to bud bursting were recorded in case of veneer grafting (50.00) done in 2nd week of February.

The earlier bud bursting in wedge and tongue grafting performed during the 4th week of February may be due to early and good contact of cambial layers of stock and scion, resulting in early callus formation. The reason for late bud bursting in veneer grafting done in 2nd week of February might be due to lower temperature and humidity which delayed the callus formation and took more days for bud bursting. These findings are in conformity with those of Joolka et al (2001) who reported that the cleft grafting took minimum days for bud sprouting when performed during 3rd week of March followed by tongue grafting when employed during the same time.

Maximum grafting success (76.66%) was recorded in case of wedge grafting performed during 4th week of February, followed by 70.00 per cent in tongue grafting performed during the same time. However, when the wedge and tongue grafting were done in 3rd week of February the success was 66.66 and 63.33 per cent, respectively. Minimum grafting success ie 23.33 per cent was recorded in veneer grafting performed during the 2nd week of February.The maximum grafting success in wedge and tongue grafting might be due to the fact that the favorable temperature and

relative humidity at the time of grafting and rapid sap flow in stock and scion favoured the healing process and established the continuity of cambial and vascular tissues for the graft take. These observations are in conformity with those of Ibrahim et al (1978) who reported that maximum take was recorded in cleft grafting when performed during February. The lower success rate in veneer grafting might be due to the low temperature and relative humidity at the time of grafting and grafting methods which did not support the success.

The comparatively lower percentage of success in veneer grafting in comparison to the dormant grafting might also be due to the fact that veneer grafting is performed with terminals of growing shoots having plump bud when the stock and scion are in active growth and the temperature and humidity are optimum (Chauhan 1968). Grafting in green house was found more successful than grafting on dormant seedlings by Kantrachi (1989). He concluded that various methods with different dates of grafting gave better results in walnut. A good graft success using different methods with different time of grafting has also been reported by several researchers (Chandel et al 1998, Chauhan and Sharma 1982, Dar 2003, Sharma et al 2006).

The various growth parameters of grafted walnut plants also showed non-significant differences in average shoot length and leaf area when performed by different methods and during different timings of grafting. But non-significant results were recorded with respect to number of leaves/shoot.

Different methods and timings of grafting significantly influenced the proportion of saleable plants (Table 1). The highest proportion of saleable plants (60.00%) was obtained with wedge method of grafting when performed during the 4th week of February followed by wedge grafting (56.66 %) when performed during 3rd week of February, which might be due to quick union formation, early bud sprouting and availability of long period of growth of the grafts.

The data regarding the days to bud burst under open field conditions show that the minimum days (41.00) were recorded in wedge grafting when performed on 2nd week of March followed by 43.00 days in tongue grafting performed during the same time. Maximum days (65.00) were recorded in veneer grafting when performed in 4th week of February (Table 2).

The highest percentage of success (20.00%) was obtained in wedge grafting, performed during the 1st and 2nd week of March, followed by tongue grafting (16.66%) performed during 2nd week of March. The combined effect of methods and time of grafting on graft success, total shoot length and number of leaves per shoot exhibited non-significant

Table 2. Effect of different methods and time of grafting on various characters of walnut under open field conditions

Methods of grafting	Time of grafting	Bud bursting (days)	Grafting Success (%)	Shoot Length (cm)	No of leaves/ shoot	Leaf area (cm)	No of saleable plants (%)
Wedge grafting	4th week of February	56.66	10.00	18.95	6.66	130.03	10.00
Wedge grafting	1st week of March	46.00	20.00	19.65	8.00	194.07	23.33
Wedge grafting	2nd week of March	41.00	20.00	21.32	9.33	198.27	30.00
Tongue grafting	4th week of February	58.00	10.00	18.91	6.33	191.23	13.33
Tongue grafting	1st week of March	49.00	10.00	19.97	7.33	198.00	16.66
Tongue grafting	2nd week of March	43.00	16.66	20.63	8.33	203.77	16.66
Veneer grafting	4th week of February	65.00	10.00	17.31	5.33	132.69	10.00
Veneer grafting	1st week of March	57.00	10.00	18.46	5.66	133.37	10.00
Veneer grafting	2nd week of March	52.33	10.00	19.88	8.33	162.87	13.33
CD (0.05)		1.538	N.S	N.S	N.S	64.509	1.537

differences. These findings are in conformity with those of Pathak and Srivastava (1975), who observed cleft grafting to be superior to tongue and side grafting methods in order to achieve the maximum success, when performed during mid March; and Dar (2003) who observed that the environmental conditions greatly affected the grafting success and growth parameters in walnut, when cleft grafting was performed on 24th March under open field conditions. However, these observations are contrary to the findings of Guatam (1990) who observed a higher percentage of success when modified cleft grafting was performed during winter and summer. Qian and Qian (2000) also observed the higher percentage of success in walnut, when cleft grafting was done during February-March.

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