

STUDIES ON DIFFERENT METHODS AND TIME OF GRAFTING IN WALNUT (JUGLANS REGIA L.) UNDER DIFFERENT GROWING CONDITIONS

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ABSTRACT

To know the response of different grafting methods under different growing conditions at different time, a field experiment was conducted at the Fruit nursery, Department of Fruit Science, V.C.S.G Uttarakhand University of Horticulture and Forestry, Bharsar, Uttarakhand during 2015-2016. The experiment was laid out in Randomized Complete Block Design (Factorial) comprised of eighteen treatments combinations and three replications. Among all the treatments cleft grafting under polyhouse conditions during February performed best. The cleft grafting under polyhouse condition during February gave earliest sprouting of grafted plants (40.38 days) with maximum number of leaves per graft (114.47), number of branch per grafted plant (16.60), minimum dead sprouted grafts (40.38 %), maximum saleable plants (91.40%), maximum survival of grafts (38.87%), longest shoots (68.49 cm), maximum shoots diameter (0.97 cm) and maximum leaf area (31.75 cm²). The minimum dead graft after sprout (15.46 %) was recorded in veneer grafting under polyhouse in February.

KEYWORDS: Methods, time, conditions, grafting, walnut

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 the present investigation was therefore carried out to standardize the appropriate method and time under suitable growing conditions for the hills of Uttarakhand.

MATERIAL AND METHODS

The experiment on the effect of different grafting methods and time on grafting success in walnut under different growing conditions was carried out at the experimental field of Fruit Nursery, Department of Fruit Science, College of Horticulture, VCSG, Uttarakhand University of Horticulture and Forestry, Bharsar, Pauri Garhwal, during 2014- 2015. The site is located at an altitude of 1950 meters above mean sea level at a longitude of 78.99 °E and latitude of 30.056°N (IMD, 2014). The experiment was carried out under polyhouse, net house and in open field conditions with same methods of grafting viz tongue, cleft and veneer, but with different timing viz January and February. One year old seedlings raised from hard shelled nuts of walnut 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 variety Govind. The bud sticks used for grafting were one year old terminal shoots. The experiment was laid out with Randomized Block Design (Factorial) using three replications.

RESULTS AND DISCUSSIONS

The data on the effect of different methods and time on grafting in walnut under different growing conditions are given in Table 1 indicated the significant effect of different methods, time and growing conditions on the sprouting of grafts. The minimum days to sprouting (40.38days) were recorded in case of cleft grafting under polyhouse conditions during February followed by tongue grafting under net house conditions during January (44.77), whereas, maximum days to sprouting were recorded in case of veneer grafting (59.68 days) done in January under open conditions.

Cleft grafting under polyhouse condition during February also produce longest shoots (68.49 cm) with maximum diameter of shoots (0.97 cm) followed by veneer grafting under net house condition during January (68.38 cm length and 0.94 cm diameter), whereas, minimum shoots length and diameter (34.38 cm and 0.73 cm respectively) was recorded in veneer grafting under open condition during January (Table 2). The earlier sprouting and best growth of new shoots in cleft during February may be due to early and good contact of cambial layers of stock and scion and favorable environmental conditions during February, resulting in early callus formation. The reason for late sprouting and slow growth of shoots in veneer grafting done in January might be due to lower temperature and humidity which delayed the callus formation and took more days for sprouting. These findings are in conformity with the result of Joolka et al., (2001).

Table 1: Effect of Different Methods and Time of Grafting on Days Taken To Sprouting Under Different Growing Conditions

Days Taken To Sprouting (Days)				
Conditions				
Grafting methods	Grafting time	Polyhouse	Net house	Open
Tongue	January	50.32	44.77	52.60
	February	46.37	49.85	55.65
Cleft	January	52.17	53.66	58.50
	February	40.38	58.56	48.41
Veneer	January	50.80	51.75	59.68
	February	52.64	51.35	53.65
SE. (d)			0.11	
CD.(0.05)			0.22	

Table 2: Effect of Different Methods and Time of Grafting on Shoot Growth under Different Growing Conditions

Shoot diameter (cm)					Shoot length (cm)		
Conditions					Conditions		
Grafting methods	Grafting time	Polyhouse	Net house	Open	Polyhouse	Net house	Open
Tongue	January	0.85	0.89	0.93	53.71	55.55	47.34
	February	0.85	0.84	0.88	60.45	45.62	41.83
Cleft	January	0.88	0.79	0.77	62.43	39.56	40.94
	February	0.97	0.85	0.87	68.49	52.53	55.80
Veneer	January	0.94	0.88	0.73	62.43	68.38	34.38
	February	0.84	0.76	0.86	40.58	48.55	49.82
SE. (d)		0.01			0.07		
CD.(0.05)		0.02			0.14		

The various growth parameters of grafted walnut plants also showed significant differences in total number of branch and number of leaves when performed by different methods and during different timings of grafting. The maximum number of branches (16.60) were recorded in cleft grafting under poly house conditions during February, whereas, minimum number of branch (9.69) were recorded in veneer grafting under open conditions during January. Again cleft grafting produce maximum number of leaves (114.47) under polyhouse conditions when performed during February however, the minimum number of leaves (52.51) was recorded under veneer grafting in open field condition during January (Table 3).

Table 3: Effect of Different Methods and Time of Grafting on Total Number of Branch and Number of Leaves under Different Growing Conditions

Total Number of Branches					Number of Leaves		
Conditions					Conditions		
Grafting methods	Grafting time	Polyhouse	Net house	Open	Polyhouse	Net house	Open
Tongue	January	14.55	10.53	11.70	81.68	70.80	59.54
	February	10.56	12.64	11.72	92.71	82.84	71.70
Cleft	January	11.56	12.66	10.73	67.70	56.77	45.71
	February	16.60	12.68	13.60	114.47	92.69	81.78
Veneer	January	15.65	12.81	9.69	102.60	103.6	52.51
	February	15.68	11.51	9.71	88.76	75.56	67.75
SE. (d)		0.10			0.03		
CD.(0.05)		0.22			0.07		

The data regarding leaf area of grafted plants presented in Table 4 indicated that cleft grafting under polyhouse conditions during February gave significantly highest value with 31.75 cm² leaf area whereas, minimum leaf area (18.58 cm²) was recorded under tongue grafting under polyhouse during February.

Table 4: Effect of Different Methods and Time of Grafting on Leaf Area under Different Growing Conditions

Leaf area(cm ²)				
Conditions				
Grafting methods	Grafting time	Polyhouse	Net house	Open
Tongue	January	28.63	26.74	28.15
	February	18.58	23.71	20.55
Cleft	January	28.99	25.66	24.69
	February	31.75	27.89	24.60
Veneer	January	27.65	25.63	23.64
	February	29.75	27.16	28.45
SE. (d)		0.11		
CD.(0.05)		0.22		

Table 5: Effect of Different Methods and Time of Grafting on Percent of Survival Grafts and Saleable Grafted Plants of Walnut Under Different Growing Conditions

Survival grafts (%)					Saleable grafts (%)		
conditions					Conditions		
Grafting methods	Grafting time	Polyhouse	Net house	Open	Polyhouse	Net house	Open
Tongue	January	33.66	28.36	25.88	86.55	85.60	84.76
	February	35.38	32.27	28.50	87.48	85.11	82.06
Cleft	January	29.47	26.41	36.80	83.22	83.28	87.84
	February	42.63	35.61	31.25	91.40	88.45	87.64
Veneer	January	39.58	39.22	18.66	90.24	90.50	81.69
	February	38.16	33.36	27.05	86.31	85.42	83.16
SE. (d)		0.01			0.01		
CD.(0.05)		0.02			0.03		

It is evident from the data of Table 5 that maximum survival rate of grafted plants (42.63%) was recorded in case of cleft grafting performed during February under polyhouse conditions. Minimum grafting survival rate i.e. 18.66 per cent was recorded in veneer grafting performed during January under open conditions. The maximum grafting success in cleft 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. 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.*, 2003).

Different methods and timings of grafting significantly influenced the proportion of saleable plants (Table 5). The maximum saleable plants (91.40%) were recorded in cleft grafting under polyhouse conditions during February. However, minimum saleable plants (81.69%) was recorded in veneer grafting under open condition during January, which might be due to quick union formation, early bud sprouting and availability of long period of growth of the grafts.

Table 6: Effect of Different Methods and Time of Grafting on Dead Grafts and Percentof Dead Graft after Sprout of Walnut under Different Growing Conditions

		Dead grafts (%)			Dead after sprouts grafts (%)		
		conditions			Conditions		
Grafting methods	Grafting time	Polyhouse	Net house	Open	Polyhouse	Net house	Open
Tongue	January	47.78	44.42	55.78	18.56	27.22	18.34
	February	45.04	42.40	52.98	19.58	25.33	18.55
Cleft	January	48.07	47.21	43.79	22.46	26.38	19.41
	February	40.38	41.67	51.67	16.99	22.72	17.08
Veneer	January	43.48	40.90	57.45	17.02	19.88	23.91
	February	46.38	42.68	54.24	15.46	23.96	18.76
SE. (d)		0.03			0.05		
CD.(0.05)		0.07			0.11		

The minimum percentage of dead grafts (40.38 %) was recorded in cleft grafting under polyhouse conditions during February, whereas, maximum (57.45%) was recorded in veneer grafting under open conditions during January (Table 5). 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).The minimum dead grafts after sprouts (15.46%) was recorded in veneer grafting under polyhouse condition during February, whereas, maximum dead graft after sprouts(27.22%) was recorded under tongue grafting in net house conditions during January

REFERENCES

1. Anonymous 2007. Statement showing area and production of walnut in Jammu and Kashmir state. Department of Horticulture, Government of J&K.
2. Awasthi DN, Sinha MM, Srivastava RP and Misra RS 1982. Evaluation of epicotyl grafting in walnut in relation to success and survival. Progressive Horticulture 14: 178-179.
3. Chandel JS, Negi KS and Jindal KK 1998. Studies on vegetative propagation in kiwi (*Actinidiadeliciosa* Cher). Indian journal of Horticulture 55(1) : 52-54.
4. Chase SB 1947. Budding and grafting in eastern black walnuts. Proceedings of the American Society of Horticultural Science 49: 175-180.
5. Chauhan JS 1968. Effect of plant growth regulators on bud taken in walnut (*Juglansregia L.*). MSc thesis submitted to Punjab University, Chandigarh, India.
6. Chauhan JS and Sharma SD 1982. Veneer grafting a new technique for walnut propagation. Fruit Science Reports 7: 45-48.
7. Cochran WG and Cox GM 1957. Experimental designs. John Willey and Sons, New York, USA.
8. Dar2003. Studies on walnut grafting as affected by rootstocks thickness, nut hardiness and environmental conditions. MSc thesis submitted to the Sher-e- Kashmir University of Agricultural Sciences and Technology, Kashmir, J&K, India.

9. Ibrahim M, Sadiq CM and Idris CM 1978. Experiment on comparative studies on different propagation techniques in English walnut (*Juglansregia* L). *Journal of Agricultural Research Pakistan* 16(2): 205-209.
10. JoolkaNK, RindheAB and Sharma MK 2001. Standardization of method and time of grafting in pecan. *Indian Journal of Horticulture* 58(3): 212-214.
11. Qureshi AS and Dalal MA 1985. Status of nut crops in Jammu and Kashmir state. *Progressive Horticulture* 17: 197-205.
12. SharmaAK, Singh SR, Srivastava KK and Sounduri AS 2003. Studies on success of walnut grafting as affected by time and environment. *Indian Journal of Ecology* 18: 123-125.