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Response of budding methods and time on bud success and budding growth of peach (*Prunus persica*) on different rootstocks

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ABSTRACT

A present study was undertaken, to determine the most appropriate time and method of budding of peach (*Prunus persica* Batsch) cv. Shan-e-Punjab on different rootstocks to achieve the maximum bud take and budding growth, by budding peach cv. Shan-e-Punjab on peach, plum and apricot rootstock by T, inverted T and patch from 15 June to 1 August at 15 days interval. The results showed that inverted 'T' budding took minimum number of days for full sprouting in plum (17.99) and apricot (18.24) rootstock. Whereas, in peach T budding took 17.58 days for same. Among different dates, plants budded on 15th July took minimum number of days to full sprouting in peach (13.88), plum (14.66) and apricot (14.21) rootstocks. Budding on 1 July recorded maximum bud take success with 93.33% in peach, 86.66% in plum and 86.66% in apricot. Maximum scion length and girth were recorded on 1 July in peach (49.23 cm and 6.29 mm), plum (48.15 cm and 6.07 mm) and apricot (38.58 cm and 6.09 mm) respectively after 120 days after budding (DAB). Inverted T budding produces maximum scion length and girth in plum (37.73 cm and 4.98 mm) and apricot (32.83 cm and 5.10 mm). Whereas, the maximum scion length and girth (41.76 cm and 5.30 mm) in peach were observed in T after 120 DAB. From the present studies, it can be concluded that budding through inverted 'T' and T on 1 July gave maximum bud take and budding growth.

Key words: Budding, Bud take, Girth, Rootstock, Scion length, Sprouting

In India peach (*Prunus persica* Batsch) cultivation is confined to mid hills zones of Himalayas extending from J&K to hills at an altitude of 1500-2000 above MSL. Peach is a quite hardy fruit, preferring cold winter and sunny dry spring. The chilling requirement below 7ºC temperature for peach is around 650-1100 hr. With the introduction of low chilling cultivars, the area under stone fruits has increased considerably, due to which the demand for quality planting material has increased considerably. During nursery production, the common procedure is to grow rootstocks from seeds and then to bud named varieties upon them. The different stone fruits unite quite readily while subjecting to inter budding or inter grafting, but the resulting unions vary widely in degree of compatibility. Low success rate for budding stone fruit crops is due to incorrect time and method of budding. As a result, a very low number of plants are produced, which are relatively negligible in relation to a huge demand and is the biggest obstruction in the expansion of growing area under these fruit crops. The time of budding is different in different species and even varieties. One variety may perform well in one time while the others may not do so. Budding and grafting methods significantly affect bud take and survival outcome (Zenginbal *et al*. 2007, Rayya *et al*. 2009, Ali *et al*. 2012). Budding time significantly influences the budding compatibility (Baryla and Kaplan 2012). The best time for budding for plum, apricots and peaches is mid-August (Ahmad *et al*. 2012) and may vary under different climatic and environmental conditions. Therefore, standardization of method and time of budding is very important to get the highest success and good plant growth. Keeping in view the importance of time and method of budding, this study was initiated to find out the most appropriate method and time of budding for peaches (cv. Shan-e-Punjab) on peach, plum and apricot rootstock.

MATERIALS AND METHODS

The present investigations were carried out at Fruit plant nursery, Division of Fruit Science, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Udheywalla Campus, during the year 2011-2012.The seedlings were raised from peach, plum and apricot seeds of local cultivar and were budded at the

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age of one year. Bud wood was collected from ten year old healthy, disease free peach trees of Shan-e-Punjab. Three methods of budding, viz. T, Inverted-T and Patch budding were tried on four different dates (starting from 15th June to 1st August) at 15 days interval to find out the most suitable method and time for budding on peach, plum and apricot rootstock. Ninety seedlings were selected for budding by each method on every date with 30 seedlings per replicate. The budded plants were observed for recording the data on various parameters, viz. number of days taken to full sprouting, bud take success, linear and radial growth. The data on bud sprouting of individual plants were recorded on alternate days up to the completion of the sprouting and the number of days taken to full sprouting from the date of budding were calculated for every method and date. The data on bud take success of budded plants were recorded after the full sprouting of the buds and expressed in percentage of sprouted plants (Bud take success % age = Total green buds/ Total buds inserted × 100). The data on scion length and girth were recorded at 60, 75, 90, 105 and 120 DAB (Days after budding). Fifteen plants were selected randomly from each treatment. The linear shoot growth was measured with the help of scale, from the point of bud union to the tip of the main axis and was expressed as average per plant in centimetre (cm). The scion girth (mm) was measured with the help of a digital vernier calliper 1 cm above the bud union. Topping was also done after 2-3 weeks of the budding with the purpose of diverting the food materials to budding growth. All cultural practices like manuring, hoeing, weeding and irrigation were uniformly carried out during the research study**.** The data generated during the investigations were subjected to statistical analysis as prescribed by Panse and Sukhatme (2000) under factorial randomized block design with three replications.

RESULTS AND DISCUSSION

Number of days to full sprouting

The effect of method and time of budding with respect to number of days taken to full sprouting of peach on peach, plum and apricot rootstock was significant but interaction between method and time of budding was non-significant (Table 1). The minimum mean number of days taken to full sprouting on peach were recorded in 'T' budding (17.58) which were at par with inverted-T budding (18.66), while patch budding took maximum number of days to full sprouting (20.41). In plum and apricot rootstocks, minimum number of days (17.99 and 18.24 in plum and apricot respectively) to full sprouting were recorded in inverted T budding, which were at par with the T budding. These results are in conformity with the results obtained by Joshi *et al.* (2011) in custard apple. They found that shield budding took minimum number of days (40.70) for sprouting followed by patch budding (41.08). Callus formation is an important factor for healing budding union and success in budding (Hartman *et al*. 2002). The earlier bud sprouting in T and inverted T budding may be due to the fact that the callus formation tissue were earlier in T and inverted T budding, which results in early healing of bud union and rootstock and scion connectivity, due to which early sprouting takes place. Among different time intervals of budding, the minimum number of days to full sprouting were observed, when budding were performed on 15th July (13.88, 14.66 and 14.21 in peach, plum and apricot respectively) which were at par with budding performed on July. Maximum number of days taken to full sprouting (26.99, 26.44 and 26.99 in peach, plum and apricot, respectively) were observed when budding were performed on 15th June. Similar results were obtained by Pathak *et al.* (1996) in July in aonla. Due to earlier healing of budding union and callus formation in July, number of days to sprouting decreases and percent of budding take increase. Dwivedi *et al*. (2000) in apricot, reported better sprouting in 'T' budding as compared to patch budding.

Bud take success (%)

Time of budding had significant effect on bud take success of peach on peach, plum and apricot rootstock. Whereas, method of budding and the interactions between method and time of budding were found to be non-significant

Table 1 Effect budding method and time on full sprouting of peach cv. Shan-e-Punjab on peach, plum and apricot seedling rootstock

Time of budding	Full sprouting (days) in peach				Full sprouting (days) in plum				Full sprouting (days) in apricot			
	Budding method				Budding method				Budding method			
	T	Inverted T	Patch	Mean	T	Inverted T	Patch	Mean	T	Inverted T	Patch	Mean
15 June	26.00	26.33	28.66	26.99	25.33	24.66	29.33	26.44	28.00	25.33	27.66	26.99
1 July	13.66	14.66	16.33	14.88	14.33	14.66	15.66	14.88	13.33	14.33	15.33	14.33
15 July	12.33	14.33	15.00	13.88	13.33	14.00	16.66	14.66	14.33	13.66	14.66	14.21
1 Aug	18.33	19.33	21.67	19.77	19.33	18.66	20.66	19.55	17.66	19.66	22.33	19.88
Mean	17.58	18.66	20.41		18.08	17.99	20.57		18.33	18.24	20.00	
Factors	*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*			
Method f budding	1.21				1.29				1.21			
Time of budding	1.39				01.5				1.39			
Method × Time	NS				NS				NS			

Table 2 Effect of budding method and time on bud take success of peach cv. Shan-e-Punjab on peach, plum and apricot seedling rootstock

Time of budding	Bud take success (%)				Bud take success (%)				Bud take success (%)			
	Budding method				Budding method				Budding method			
	T	Inverted T	Patch	Mean	T	Inverted T	Patch	Mean	T	Inverted T	Patch	Mean
15 June	60.00	80.00	80.00	73.33	70.00	80.00	70.00	73.33	70.00	70.00	80.00	73.33
1 July	100.00	90.00	90.00	93.33	90.00	90.00	80.00	86.66	80.00	90.00	90.00	86.66
15 July	90.00	80.00	90.00	86.66	90.00	70.00	80.00	80.00	80.00	80.00	80.00	80.00
1 Aug	80.00	70.00	70.00	73.33	60.00	70.00	60.00	63.33	60.00	70.00	70.00	66.66
Mean	82.50	80.00	82.50		77.50	77.50	72.50		72.50	77.50	80	
Factors		*CD (P=0.05)*				*CD(P=0.05)*				*CD(P=0.05)*		
Method of budding		NS				NS				NS		
Time of budding		9.43				9.04				7.66		
Method × Time		NS				NS				NS		

(Table 2). Among different dates of budding, highest bud take success were observed in the plants budded on 1 July with 93.33% on peach, 86.66% plum and 86.66% on apricot rootstock, which were at par with 15 July. Minimum bud take success were recorded when budding were performed on 1 August with 73.33% on peach, 63.33% on plum and 66.66% on apricot rootstock. These results are in conformity with the results of Dwivedi and Singh (1999) who in Ladakh region found maximum bud take (80%) on 15 July with shield method of budding in apricot. Tripathi and Kumar (2004) also found highest bud take (70%) in bael, when budding was done during last week of July and decreased with the advancement of the season. Ahmad *et al*. (2015) recorded maximum bud sprouting (60.00%) for guava plants budded on 1 July and minimum sprouting percentage (46.55%) were noted in plants budded on 20th August. Percent of bud take depends on good temperature and relative humidity and rate of sap movement in rootstock and scion at time of budding if all situations are suitable, this might provide favourable environmental conditions for cambium growth of scion and rootstock. This has been confirmed with the findings of Hartman *et al*. (2007). Proper temperature and humidity could also facilitate the union between stock and scion (Ahmad *et al*. 2012). The effect of environmental factors seems to be mediated through enzyme activation to elongate and differentiate the cambium to form shoot primordia. So, optimum condition of temperature and humidity prevailing during July gave comparatively higher success. Similar results have been reported by Singh and Singh (1986). The probable cause of the decreased bud take success with the advancement of the season might be due to low temperature and reduced sap flow in rootstock, stressed callus formation and suppressed activity of hydrolyzing enzymes that favours inadequate mobilization of reserve food material. As reported by Ahmad *et al*. (2012), in peach, budding time had no considerable effect on bud take success which was contrary to our findings since in our research budding time was effective on bud take success. Chandel *et al*. (1998) found that the maximum mean sprouting (57.00%) and bud-take success (54.00%) were recorded when budding was done on 15 July. Whereas, the lowest mean sprouting (15.00%) and bud-take success (12.90%) was found on 30 August in kiwi. Dwivedi *et al*. (2000) in apricot reported higher bud success percentage in 'T' budding as compared to patch budding. Best results with shield budding and significantly lower rate of success in patch budding might be due to the formation of better bud union resulting in better contact of cambial layers of stock and scion in shield budding (Pathak 1991).

Scion length (cm)

The data pertaining to scion length showed that budding dates, methods and their interaction in general had significant effect on scion length. Among the budding methods, viz. 'T', inverted-T and patch budding tried on different dates from 15 June to 1 August, the maximum shoot length after 120 DAB was recorded in inverted-T which were at par with 'T' budding done on peach, plum and apricot rootstock. Inverted T budded plants showed maximum mean shoot length at all days of observations (Table 3, 4, 5). Inverted T budding produces maximum scion length of 37.73 cm in plum and 32.83 cm in apricot after 120 DAB. At all the observations, these values were significantly higher than budding performed by other two methods (T and patch) except on plum at 105 DAB and 120 DAB where the inverted 'T' was at par with 'T' budding. The maximum scion length of 41.76 in peach was observed in T budding after 120 DAB. At all the observations, the values were significantly higher than budding performed by other two methods (T and patch) except at 105 DAB where T budding was at par with inverted 'T' budding. Patch budded plants recorded minimum scion length with 31.96 cm in peach, 33.41 cm in plum and 25.88 cm in apricot after 120 DAB. These results are in accordance with the results obtained by Dwivedi *et al*. (2000) in apricot, they found maximum linear growth in 'T' budding as compared to patch budding. The quick and strong union formation in inverted T and T causes higher uptake of water and nutrients

Table 3 Effect of budding method and time on scion length (cm) of peach cv. Shan-e-Punjab (on peach seedling rootstock)

Time of budding	60 DAB				75 DAB				90 DAB				105 DAB				120 DAB			
	Budding method				Budding method				Budding method				Budding method				Budding method			
	T	Inverted T	Patch	Mean	T	Inverted T	Patch	Mean	T	Inverted T	Patch	Mean	T	Inverted T	Patch	Mean	T	Inverted T	Patch	Mean
15 June	27.39	25.38	17.06	23.27	29.43	28.55	19.86	25.94	32.16	30.12	22.89	28.39	34.66	32.98	26.42	31.35	38.93	34.62	31.82	35.12
1 July	28.05	32.87	25.27	28.73	31.95	36.05	29.24	32.41	33.72	40.95	33.21	35.96	38.34	44.25	36.43	39.67	48.47	58.42	40.82	49.23
15 July	18.38	19.34	16.75	18.15	22.72	24.38	19.41	22.17	26.08	26.48	22.11	24.89	28.92	30.71	26.08	28.57	31.58	41.01	32.58	35.05
1 Aug	16.76	18.76	13.08	16.20	20.59	21.86	15.05	19.16	23.89	24.82	18.35	22.35	26.96	27.89	21.61	26.48	27.98	32.99	22.65	27.87
Mean	22.64	24.08	18.04		26.17	27.71	20.89		28.96	30.59	24.14		32.22	33.95	28.11		36.73	41.76	31.96	
Factors	*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*			
Budding method	0.71				0.96				1.11				1.72				0.93			
Time of budding	0.82				1.11				1.29				1.99				1.08			
Method × Time	1.42				1.92				2.23				3.45				1.87			

Table 4 Effect of budding method and time on scion length (cm) of peach cv. Shan-e-Punjab (on plum seedling rootstock)

Time of budding	60 DAB				75 DAB				90 DAB				105 DAB				120 DAB			
	Budding method			Mean	Budding method			Mean	Budding method			Mean	Budding method			Mean	Budding method			Mean
	T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch	
15 June	27.39	25.13	17.06	23.19	28.55	26.80	20.37	25.24	32.27	29.90	23.99	28.71	34.77	30.73	29.69	31.73	38.04	33.37	33.09	34.83
1 July	34.05	38.47	31.27	34.59	36.95	41.80	34.24	37.66	41.84	44.70	40.21	42.21	42.43	49.00	43.35	44.92	46.82	51.17	46.47	48.15
15 July	20.76	23.09	20.79	21.54	25.02	26.13	23.45	24.86	29.08	29.23	27.15	28.48	31.92	31.86	30.93	31.57	35.58	35.35	32.95	34.62
1Aug	18.26	20.01	15.58	17.95	21.09	22.91	17.55	20.51	25.39	26.07	20.85	24.10	27.92	28.14	21.11	25.72	28.94	31.03	21.15	27.04
Mean	25.11	26.67	21.17		27.90	29.41	23.90		32.14	32.47	28.02		34.26	34.93	31.27		37.34	37.73	33.41	
Factors	*CD(P=0.05)*				*CD(P=0.05)*				*CD(P=0.05)*				*CD(P=0.05)*				*CD(P=0.05)*			
Budding method	1.22				1.12				0.90				1.08				1.31			
Time of budding	1.41				1.30				1.04				1.24				1.52			
Method × Time	2.44				2.25				1.81				2.16				2.63			

Table 5 Effect of budding method and time on scion length (cm) of peach cv. Shan-e-Punjab on (apricot seedling rootstock)

Time of budding	60 DAB Budding method			Mean	75 DAB Budding method			Mean	90 DAB Budding method			Mean	105 DAB Budding method			Mean	120 DAB Budding method			Mean
	T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch	
15 June	26.64	24.50	18.31	23.15	28.06	25.08	19.96	24.36	30.44	26.65	20.72	25.93	32.69	27.51	22.07	27.47	34.75	30.56	23.77	29.69
1 July	27.37	31.85	24.52	27.91	29.82	33.51	26.50	29.94	32.70	36.96	28.98	32.88	35.12	39.28	31.51	35.30	38.32	42.36	35.07	38.58
15 July	16.63	19.46	16.02	17.37	19.45	22.48	17.35	19.76	20.48	25.03	19.70	21.73	21.90	27.43	21.68	23.67	24.23	31.38	23.93	26.51
1 Aug	16.01	17.88	14.83	16.24	18.42	20.83	16.81	18.68	20.07	23.91	18.11	20.69	23.43	25.98	19.37	22.92	24.44	27.03	20.77	24.08
Mean	21.66	23.42	18.42		23.93	25.47	20.15		25.92	28.13	21.87		28.28	30.05	23.65		30.43	32.83	25.88	
Factors		*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*		
Budding method		0.67				1.13				1.13				1.18				1.07		
Time of budding		0.77				1.31				1.30				1.36				1.23		
Method × Time		1.34				2.27				2.26				2.36				2.14		

and longer growing period may account for the higher growth of T and inverted T-budded plants. Kumar *et al.* (1994) attributed poor growth of patch budded plants may be due to some gap left in longitudinal incisions of bark and at corners which would have resulted in poor success rate. Time of budding has a significant effect on the scion growth (Table 3, 4, 5). Among different dates of budding maximum scion length in peach, plum and apricot were observed in plants budded on 1 July followed by 15 June at all days of interval of observations. Whereas, minimum scion length was observed on 1 August. Maximum scion length observed on 1 July was 49.23 cm in peach, 48.15 cm in plum and 38.58 in apricot after 120 DAB, followed by 15 June observations. At all days of observations these values were higher than other dates of budding (15 July and 1 August). 1 August showed minimum scion length on peach 27.87 cm, plum 27.04 cm and apricot 24.08 cm rootstock after 120 DAB. These results are in accordance with the results obtained by Akhtar *et al.* (2000) who studied that apricot when budded on peach rootstocks from 7 June until 12 July found better bud growth from budding on 12 July.

Scion girth (mm)

The data pertaining to scion girth showed that different budding dates, methods and interaction between time and method of budding in general had significant effect on scion girth (Table 6, 7, 8). Among the different budding methods, the maximum scion girth in plum was 4.98 mm and 4.85 mm in apricot after 120 DAB in inverted-T which were at par with 'T' budding. At all the observations, the values were significantly higher than budding performed by patch budding except at 60 DAB in apricot where it was found non significant. In peach maximum scion girth (5.30 mm) was recorded in T budding after 120 DAB followed by inverted T budding (5.16 mm). Patch budded plants recorded minimum scion length with 31.96 cm in peach, 33.41 cm in plum and 25.88 cm in apricot after 120 DAB. These results are in accordance with the results obtained by Dwivedi *et al.* (2000) in apricot, they found maximum radial growth in 'T' budding as compared to patch budding. The quick and strong union formation in inverted T and T causes higher uptake of water and nutrients and longer growing period may account for the higher growth of inverted T and T-budded plants. The increase in scion length may also be attributed to presence of greater number of leaves, that elevated the rate of photosynthesis and hence carbohydrate formation increased. The maximum number of leaves/plant may be due to maximum number of branches and maximum budding growth. These results confirm the results drawn by Akhtar *et al.* (2000) in apricot. Kumar *et al.* (1994) attributed poor growth of patch budded plants may be due to some gap left in longitudinal incisions of bark and at corners which would have resulted in poor success rate. Time of budding has a significant effect on the scion girth (Table 6, 7, 8). Among different dates of budding maximum scion girth in peach (6.29 mm), plum (6.07 mm) and apricot (6.09 mm) were

Table 6 Effect of budding method and time on scion girth (mm) of peach cv. Shan-e-Punjab (on peach seedling rootstock)

Time Of Budding	60 DAB				75 DAB				90 DAB				105 DAB				120 DAB			
	Budding method			Mean	Budding method			Mean	Budding method			Mean	Budding method			Mean	Budding method			Mean
	T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch	
15 June	2.70	2.62	1.93	2.41	3.13	2.77	2.41	2.77	3.98	3.08	3.11	3.39	4.71	3.63	3.46	3.93	6.08	4.33	4.24	4.88
1 July	2.94	3.03	2.70	2.89	3.19	4.02	3.09	3.43	4.44	4.75	4.18	4.45	5.68	5.94	4.56	5.39	6.29	6.38	6.21	6.29
15 July	2.45	2.76	2.43	2.54	2.57	3.35	2.53	2.81	4.05	4.23	3.92	4.06	4.58	4.88	4.34	4.60	5.12	5.34	4.73	5.06
1 Aug	2.36	2.48	2.35	2.39	2.54	2.69	2.48	2.57	3.10	4.02	3.00	3.37	3.37	4.27	3.12	3.58	3.72	4.61	3.23	3.85
Mean	2.61	2.72	2.35		2.85	3.20	2.62		3.89	4.02	3.55		4.58	4.68	3.87		5.30	5.16	4.60	
Factors	*CD(P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*			
Budding method	0.11				0.09				0.08				0.12				0.06			
Time of budding	0.13				0.11				0.10				0.14				0.07			
Method × Time	0.23				0.19				0.17				0.24				0.13			

Table 7 Effect of budding method and time on scion girth (mm) of peach cv. Shan-e-Punjab (on plum seedling rootstock)

Time of budding	60 DAB				75 DAB				90 DAB				105 DAB				120 DAB			
	Budding method			Mean	Budding method			Mean	Budding method			Mean	Budding method			Mean	Budding method			Mean
	T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch	
15 June	2.65	2.54	1.66	2.28	3.23	2.81	2.27	2.77	3.54	3.19	2.84	3.19	4.29	3.74	3.55	3.86	5.02	4.45	4.32	4.59
1 July	3.07	3.47	2.98	3.17	3.34	4.46	3.40	3.73	4.18	4.68	3.99	4.28	5.35	5.79	4.31	5.15	6.01	6.23	5.97	6.07
15 July	2.83	3.14	2.87	2.94	3.23	3.73	3.02	3.32	3.86	4.29	3.69	3.94	4.40	4.95	4.09	4.48	4.91	5.37	4.48	4.92
1 Aug	2.28	2.44	2.30	2.34	2.56	2.66	2.63	2.61	2.95	3.27	3.03	3.08	3.21	3.57	3.23	3.33	3.48	3.88	3.90	3.75
Mean	2.70	2.89	2.45		3.09	3.41	2.83		3.63	3.85	3.38		4.31	4.51	3.79		4.85	4.98	4.66	
Factors	*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*			
Budding method	0.22				0.10				0.28				0.26				0.16			
Time of budding	0.26				0.12				0.33				0.30				0.19			
Method × Time	NS				0.20				0.57				0.53				0.33			

Table 8 Effect of budding method and time on scion girth (mm) of peach cv. Shan-e-Punjab (on apricot seedling rootstock)

Time of budding	60 DAB				75 DAB				90 DAB				105 DAB				120 DAB			
	Budding method			Mean	Budding method			Mean	Budding method			Mean	Budding method			Mean	Budding method			Mean
	T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch		T	Inverted T	Patch	
15 June	2.56	2.49	1.92	2.32	3.07	2.63	2.33	2.67	3.90	3.01	3.54	3.48	4.65	3.56	4.97	4.39	6.12	4.27	5.74	5.37
1 July	2.86	3.03	2.38	2.75	3.13	4.02	2.80	3.31	4.17	4.81	3.94	4.30	5.34	5.92	4.26	5.17	6.00	6.36	5.92	6.09
15 July	2.34	2.63	2.35	2.44	2.53	3.22	2.50	2.75	3.71	4.15	3.85	3.90	4.34	4.81	4.25	4.46	4.85	5.23	4.64	4.90
1 Aug	2.29	2.37	2.23	2.29	2.52	2.59	2.41	2.50	2.96	3.96	2.89	3.27	3.17	4.19	3.01	3.45	3.44	4.50	3.12	3.68
Mean	2.51	2.63	2.15		2.81	3.11	2.51		3.68	3.98	3.55		4.37	4.62	4.12		5.09	5.10	4.85	
Factors		*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*				*CD (P=0.05)*		
Budding method		NS				0.16				0.27				0.21				0.18		
Time of budding		NS				0.19				0.31				0.25				0.21		
Method × Time		NS				0.33				0.54				0.43				0.37		

observed in plants budded on 1 July followed by 15 July in peach, plum and 15 June in apricot. Whereas, minimum scion girth was observed on 1 August in peach (3.85 mm), plum (3.75 mm) and apricot (3.68 mm). These results are in accordance with the results obtained by Akhtar *et al*. (2000) who studied that apricot when budded on peach rootstocks from 7 June until 12 July found better bud growth from budding on 12 July.

From the present studies, it can be concluded that budding through inverted 'T' and 'T' method on 1 July took minimum number of days to full sprouting, gave maximum bud take success and maximum scion length and girth. Hence, the most appropriate time and method of budding of peach cv. Shan-e-Punjab on peach, plum and apricot rootstock is inverted T or T budding on 1 July.

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