



STANDARDIZATION OF GRAFTING TIME AND METHODS IN *SOHIONG* (*Prunus nepalensis* L.) : AN UNDERUTILIZED FRUIT UNDER MID HILLS OF MEGHALAYA

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ABSTRACT : Tongue grafting performed on 15th October recorded minimum days to sprouting (15.00 days), highest graft success (98%), survival percentage (85.78%). Wedge grafting done on 15th October also performed better with regards to graft success (96%) and plant survival (82.47%). Vegetative growth parameters of Sohiong grafts recorded at 3 months after graft success revealed that the highest plant height (65.38 cm), number of leaves per plant (70.87), scion (8.48 mm) and rootstock (8.77 mm) growth observed in tongue grafting done on 15th October. Whereas, the highest total carbohydrate content (18.48 %), C: N ratio (6.44) and phenol content (3.14%) in leaves were recorded in wedge grafting done on 30th September while the minimum total carbohydrate content (13.86 %), C: N ratio (4.18) and phenol content were recorded in tongue grafting done on 30th October. It may be concluded that Sohiong may be grafted by both tongue and wedge method of grafting during 2nd week of October under mid hill condition of Meghalaya for better graft success and plant growth.

Keywords : *Sohiong*, *Prunus nepalensis*, grafting method, time.

Prunus nepalensis L., which is locally known as *Sohiong* in Khasi (Meghalaya), is one of the most important indigenous underutilized fruit crops of sub-temperate areas and it belongs to the family Rosaceae. The crop is mostly grown in homestead and also as a subsidiary crop in the orchard of pear (Patel *et al.*, 12). It is found in scattered form in East Khasi Hills, West Khasi Hills and Jaintia hills district of Meghalaya as well as parts of Manipur state between 1500 to 2000 m altitudes. *Sohiong* fruit is known for its richness in vitamins, minerals and anti-oxidants properties (Deka *et al.*, 6). Fruits are being utilized by the tribal in various forms; eaten fresh when ripened or preparing juice and wine due to its unique colour and flavour. Most of the *Sohiong* tree of the region are of seedling origin (Patel *et al.*, 10). In general, seed propagated plant has long juvenile phase (about 7-8 years for blooming) and it is difficult to maintain its genetic purity. The vegetative means of propagation provides the best alternative to overcome the problems of genetic purity and long juvenile phase. The success of vegetative propagation largely depends upon the method, time of propagation and compatible stock-scion combinations. Keeping this fact in mind, attempts have been made to standardize the grafting time and technique for mass multiplication of *Sohiong* plant.

MATERIALS AND METHODS

The present investigation was carried out at Horticultural Research Farm of ICAR Research Complex for North Eastern Hills Region, Umiam, Meghalaya, India during 2010-11. The experiment was conducted in randomized block design with two grafting methods viz., Tongue grafting (M₁) and Wedge grafting (M₂) and the grafting time viz., 30th September (T₁) and 15th October (T₂) comprising four treatments replicated five times. Uniform, healthy and vigorous rootstocks of 1 year old pencil thickness seedlings of *Sohiong* were selected for wedge and tongue grafting. Scions were collected from the selected *Sohiong* tree (20 to 25 years old). Dormant shoot of pencil size thickness with apical growing portion of previous season growth having 4-5 healthy buds of 15 to 20 cm long as described by Patel *et al.*, (9) were used for grafting purpose. The observation on graft parameters like days to first sprouting, sprouting duration, grafting success, and survival percentage of grafts were recorded. The observations on plant growth parameters (plant height, number of leaves, scion and rootstock diameter) of grafted plants were recorded at three months after graft success from five grafted plants selected at random from each replication in each treatment.

Observations on plant bio-chemical parameters were analyzed at three months after graft success. Total carbohydrate in leaf sample was determined by anthrone method as described by Sadasivam and Manickam (13). Total nitrogen content was estimated by modified micro Kjeldahl method (Jackson, 8). Estimation of phenol content was done with folin-ciocalteau reagent as per the procedure suggested by Bray and Thorpe (3).

RESULTS AND DISCUSSION

Days to bud sprouting, sprouting duration, graft success and survival percentage

The data presented in Table 1 revealed that the method and time of grafting had significant effect on days to first sprouting, sprouting duration, graft success and survival percentage. Tongue grafting performed on 15th October (M₁T₂) took the minimum days to sprouting and sprouting duration (15.00 & 28.40 days, respectively) followed by wedge grafting performed on the same date (M₂T₂) (16.60 & 33.80 days, respectively) and wedge grafting performed on 30th September (M₂T₁) took the maximum days (29.80 & 40.00 days) for first sprouting and sprouting duration. Tongue grafting done on 15th October took the minimum number of days for first sprouting and sprouting duration might be due to early callus proliferation in prevailing favourable temperature and relative humidity. This result is in agreement with the findings of Anon. (2) and Patel *et al.* (11) in *Sohiong*. Similarly, tongue grafting performed on 15th October (M₁T₂) recorded the highest graft success and survival percentage (98 & 85.78 %, respectively), which is closely followed by M₂T₂ (96 & 82.47%, respectively) while, wedge grafting done on 30th September (M₂T₁) recorded the lowest graft success as well as survival percentage (58 & 69.56 %). Higher success and survival in tongue grafted plants might be due to better cambial contact in tongue grafting as compared to wedge grafting resulting in maximum callus proliferation which ultimately resulted in quick and strong union formation and that had finally helped in greater nutrient uptake. These finding are in agreement with the findings of Ananda *et al.* (1) in apple, Dwivedi *et al.* (7) and Chauhan *et al.* (4) and Anon (2) in *Sohiong*.

Table 1: Effect of time and method of grafting on days to bud sprouting, sprouting duration, graft success and survival percentage of *Sohiong*.

Treatm ent	Days to sprouting (days)	Sproutin g duration (days)	Graft success (%)	Survival percentag e (%)
M ₁ T ₁	23.60 ^b	36.20 ^b	76.00 ^b	78.30 ^{ab}
M ₁ T ₂	15.00 ^c	28.40 ^c	98.00 ^a	85.78 ^a
M ₂ T ₁	29.80 ^a	40.00 ^a	58.00 ^c	69.56 ^b
M ₂ T ₂	16.60 ^c	33.80 ^b	96.00 ^a	82.47 ^a
CD (P=0.05)	2.46	3.16	10.75	9.69

M₁T₁: Tongue grafting on 30th September, M₁T₂: Tongue grafting on 15th October, M₂T₁: Wedge grafting on 30th September, M₂T₂: Wedge grafting on 15th October

Table 2 : Effect of time and method of grafting on vegetative growth of *Sohiong* at 3 months after graft success.

Treatm ent	Plant height	Number of leaves	Scion diameter (mm)	Rootstock diameter (mm)
M ₁ T ₁	52.38 ^c	40.93 ^b	8.09 ^b	8.74 ^{ab}
M ₁ T ₂	65.38 ^a	70.87 ^a	8.48 ^a	8.77 ^a
M ₂ T ₁	49.93 ^d	35.93 ^b	7.78 ^c	8.17 ^b
M ₂ T ₂	54.86 ^b	66.73 ^a	8.32 ^a	8.45 ^{ab}
CD (P=0.05)	2.08	6.13	0.19	0.57

M₁T₁: Tongue grafting on 30th September, M₁T₂: Tongue grafting on 15th October, M₂T₁: Wedge grafting on 30th September, M₂T₂: Wedge grafting on 15th October

Table 3 : Biochemical constituents of *Sohiong* leaf grafts at 3 months after graft success.

Treatme nt	Total carbohydrate rate (%)	Total nitrogen (%)	Carbohy drate: Nitrogen ratio	Total Phenol (%)
M ₁ T ₁	16.28 ^b	3.04 ^c	5.36 ^b	2.90 ^b
M ₁ T ₂	13.86 ^d	3.32 ^a	4.18 ^d	2.42 ^d
M ₂ T ₁	18.48 ^a	2.87 ^d	6.44 ^a	3.14 ^a
M ₂ T ₂	15.02 ^c	3.11 ^b	4.83 ^c	2.65 ^c
CD (P=0.05)	0.47	0.05	0.11	0.18

M₁T₁: Tongue grafting on 30th September, M₁T₂: Tongue grafting on 15th October, M₂T₁: Wedge grafting on 30th September, M₂T₂: Wedge grafting on 15th October

Vegetative parameters of *Sohiong* grafts

Vegetative growth parameters of *Sohiong* grafts recorded at 3 months after graft success revealed that method and grafting time had significant influence on plant height, number of leaves, scion and rootstock growth (Table 2). The highest plant height (65.38 cm) in tongue grafted plants performed on 15th October (M₁T₂) while the shortest plant height (49.93 cm) was recorded in wedge grafted plants performed 30th September (M₂T₁) at 3 month after graft success. The rate of increase in plant height was more in tongue grafting as compared to wedge grafting. This might be due to quick healing, better cambial contact which ultimately resulted in more translocation of food materials to the plant in tongue grafted plants. These results were in conformity to the findings of Dwivedi *et al.* (7) and Chauhan *et al.* (4) in apricot and Upadhyay and Badyal (15) in kiwi. The number of leaves per plant increased subsequently more in M₁T₂ (70.87) followed by M₂T₂ (66.73) but, they were statistically at par with each other. However, the lowest number of leaves was recorded under M₂T₁ (35.93) which were statistically at par with M₁T₁ (40.93, 41.40). The increase in leaf number in tongue grafting done on 15th October could be ascribed to increase in number of branches and favourable environmental conditions leading to emergence of new leaves and good root system which absorbed more nutrients from soil and ultimately helped in new growth of the plant.

The maximum scion diameter of 8.48 mm was recorded under M₁T₂ (Tongue grafting done on 15th October) whereas, the minimum scion diameter of 7.78 mm was recorded under M₂T₁ (Wedge grafting done on 30th September). Tongue grafting done on 15th October recorded the maximum rootstock diameter of 8.77 mm and the minimum rootstock diameter of 8.17 in M₂T₁ (Wedge grafting done on 30th September). Better cambial contact resulted in more nutrient uptake in tongue grafting than wedge grafting might be the possible reason for more growth of the scion and rootstock diameter. These results are in close proximity to the findings of Dwivedi *et al.* (7) in apricot and Chauhan *et al.* (5) in persimmon.

Biochemical constituents of *Sohiong* leaf grafts

The biochemical constituents of *Sohiong* leaf grafts presented in Table 3 showed that the highest total carbohydrate content (18.48 %), C: N ratio (6.44) and phenol content (3.14%) were recorded in M₂T₁ (wedge grafting done on 30th September) while the minimum total carbohydrate content (13.86 %), C: N

ratio (4.18) and phenol content were recorded in M₁T₂ (tongue grafting done on 15th October). Whereas, tongue grafting performed on 15th October (M₂T₁) recorded the highest total nitrogen content (3.32 %) and wedge grafting done on 30th September (M₂T₁) recorded the minimum nitrogen content (2.87%). This might be due to higher number of leaves which might have attributed the mobilization of this nutrient from the reserve sources (bark and wood) to the growing points (Sharma and Chandel, 14) and also might be due to the vigorous nature of the plant that utilized maximum N available in the soil.

CONCLUSION

Tongue grafting proved to be better technique of propagation of *Sohiong* with respect to higher graft success, subsequent plant growth characteristics and final survival percentage especially when done on 15th October.

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