Success and Survival Grafts as Influenced by Variety, Methods of Grafting and Scion Type in Guava (Psidium guajava L.)

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Abstract: Successful cultivation of Guava with grafts obtaining through grafting of best scion material on polypiara rootstocks resistant to Fusarium wilt disease was studied at the Germplasm Centre, Department of Horticulture, Bangladesh Agricultural University, Mymensingh, during 2000-2001. The experiment consisted three varieties of Guava (*Viz*. Kazipiara, Swarupkathi and L49 and Polypiara as rootstock), three different methods of grafting (*Viz*. Cleft, Veneer and Contact) and two types of scion materials (e.g. Hard Wood and Soft Wood). Grafting methods and scion types showed significant effect on the success and survival in guava grafting whereas, the varietal effect was found insignificant in most cases. The highest percentage of success (93.3) and survival (95.7) were obtained in the grafts done through Contact Grafting method. Physiologically mature Hard Wood scion contributed better grafting success (80.7%) than the Soft Wood scion (62.2%). In all cases, Kazi piara showed better performance than other two varieties.

Keywords: Contact, cleft, guava, grafting, hardwood, polypiara, rootstock, softwood, veneer, wilt-resistant.

1. INTRODUCTION

Guava (*Psidium guajava* L.), the apple of tropics, is one of the most important and widely cultivated fruits of Bangladesh (Ullah *et al*., 1992) [18]. In Bangladesh a good number of varieties, namely Kazi, Swarupkathi, Syedi, Kanchannaga, Allahabad etc. are cultivated successfully; among which Kazipiara alone contributes the lion share of total guava production. In guava cultivation, wilting is a serious problem. All the guava varieties are suffering from this disease, causing a great problem in guava cultivation (Meah and Mamun, 1991) [12]. But it is an alarming condition to Kazipiara, especially in the red acidic soil region. As the disease has no effective control measure, only grafted plants with wilt resistant rootstocks can reduce the incidence to some extent. Grafting is a very effective method for controlling soil borne diseases but to develop a rapid and efficient method of grafting is a prerequisite for it (Oda, 1995) [15]. This can be ensured through the production of grafted plants using resistant cultivars as rootstocks (Mitra and Sadhu, 1986) [14]. Grafting with red varieties could help getting wilt resistant plants (Darshana *et al*. 1991) [4]. Polypiara, a red variety of guava now growing successfully in various parts of the country, is known as wilt resistant. So vegetative propagation of guava by grafting, using Polypiara as rootstock could help in getting wilt resistant guava plants. Success in grafting and subsequent growth and development of successful grafts are dependent on a number of factors including variety, methods of grafting, scion and rootstock material and environmental conditions (Jagirder and Bhatti, 1968;[9] Kashyap *et al*. 1989;[10] Sing *et al*. 1992;[17] HRDP 1995;[8] Hartmann, 1997;[7] Dhar, 1998)[5]. The above discussion indicates that a number of factors are responsible on the success and survival of grafts, especially different scion material and using exotic variety as rootstock. Therefore, the present investigation was undertaken with a view to find out the best way of producing quality material of Guava using Polypiara as rootstock to fight against wilting problem.

2. MATERIALS AND METHODS

The experiment was conducted at the Germplasm Centre, Department of Horticulture, Bangladesh Agricultural University, Mymensingh. Three varieties of guava *Viz*. Kazipiara, Swarupkathi and L49, three methods of grafting namely Cleft, Veneer and Contact and two types of scion material e.g. Hardwood and Soft wood were applied in the present study. Physiologically matured disease free and straight shoots of actively growing condition were selected as scions of hard wood type and were marked as 'H' and immature healthy greenish twigs having actively growing shoot buds were selected as soft wood type scions and were marked as 'S.'

According to the design and objectives of the experiment the following works were done:

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- Collection of Polypiara rootstocks and their establishment,

- Selection of scion mother plants of different guava varieties,

- Collection of appropriate scions and preparation of scion woods,

- Performing different grafting operations.

One year-aged healthy disease free Polypiara seedlings with good growth condition were used as wilt resistant rootstocks and they were planted earlier. The Randomized Complete Block Design with three replications consisted of 270 grafts as a combination of 3 (No. of varieties) x 3 (No. of methods) x 2 (No. of scion type) x 3 (Replication) x 5 (for each replication) = 270. Watering, shading, removal of off-shoot, polybags and sheets, were done as and when necessary. Data on percent success and survival were recorded for statistical analysis.

3. RESULTS AND DISCUSSION

Methods and scion type significantly influenced the success and survival of grafting in guava. Variety did not show significant effect on the success of grafting, but a highly significant variation was found in the success for different methods of grafting. Contact grafting showed best performance (93.3%), but Veneer and Cleft method gave lower graft success (68.9% and 52.2%, respectively) as shown in Figure **1**. These results are partially supported by those of Roy and Sinha (1994) [16], who got 90.0% and 80.0% success in mango grafting done through approach and veneer method. Faruque and Fakir (1973), [6] Mitra and Bose (1990)[13] and Bhagat *et al*. (1999)[2] also found maximum percentage of success in contact method of grafting. Bhandery and Mukherjee (1970) [1] got better success in Veneer method of grafting in guava.

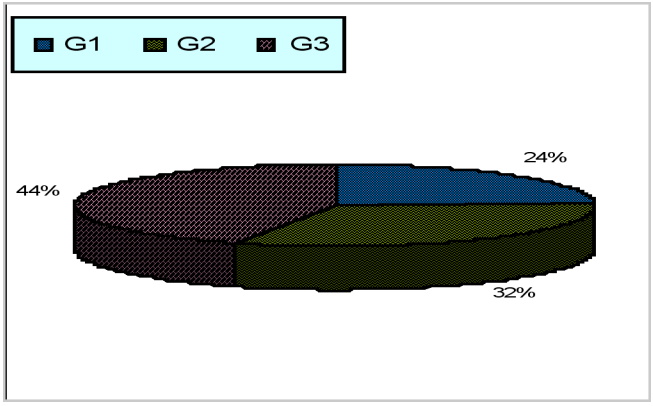

Figure 1: Effect of methods of grafting on the success of grafts in guava.

The effect of scion type on the success of grafts was found highly significant. The Hard wood scion gave 80.7% graft success, whereas the Soft wood scion contributed only 62.2% (Figure **2**). This can be explained in the light of the work of Jagirder and Bhatti (1968)[9] who found 95.0% success with mature scion while immature scion wood gave only 74.2% grafting success.

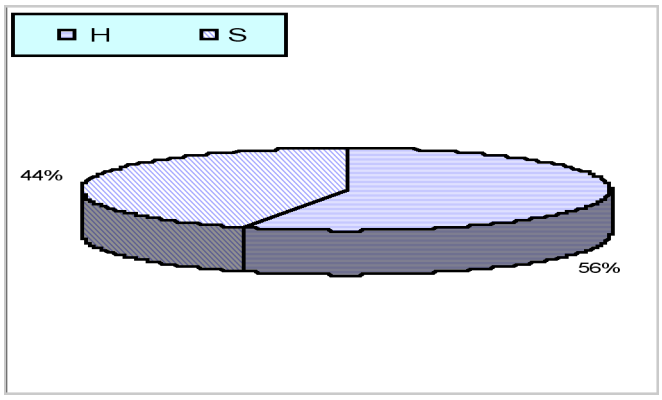

Figure 2: Effect of scion type on the success of grafts in guava.

The interaction effect between variety and method of grafting was found insignificant, but variety and scion type interacted significantly (Table **1**). Hard wood scion of the variety Kazi gave maximum grafting success (80.9%). The interaction effect of method and scion type also had marked effect on the percentage of grafting success. Highest success (95.6%) was found in contact method of grafting with Hard wood scion followed by Soft wood scion (91.1%) with the same method. Whereas, Cleft method of grafting with soft wood scion gave the lowest grafting success (40.0%, Table **2**).

All the three factors *Viz*., variety, methods of grafting and scion type did not interact significantly. The highest percentage of success (100.0%) was obtained from the variety Kazi when grafted with hard wood scion through contact method whereas, it was the lowest (40.0%) in Swarupkathi. On the other hand, Grafting success was invariably low in case of Soft wood scion in Cleft grafting irrespective of the variety used in the experiment (Table **3**).

Graft survival was influenced significantly by the methods of grafting and scion type, but it remained unaffected for different varieties as well as by their (factors) interaction effects. The highest survival percentage was obtained from contact grafting method followed by veneer and cleft methods (Figure **3**), which

Table 1: Interaction Effect of Variety and Methods and Variety and Scion Type on the Success Percentage in Guava Grafting

Treatment	Methods of Grafting			Scion Type	
	G_1	G_2	G_3	H	S
V_1	56.7	70.0	96.7	80.9	60.0
V_2	46.7	66.7	90.0	73.3	62.2
V_3	53.3	70.0	93.3	80.0	64.4
LSD (0.05)	NS			7.9	
LSD (0.01)	--			10.2	

V_1: Kazipiara, V_2: Swarupkathi, V_3: L49, G_1: Cleft, G_2: Veneer, G_3: Contact, H: Hard, S: Soft.

Table 2: Interaction Effect of Methods of Grafting and Scion Type on the Success percentage in Guava Grafting

Methods of Grafting	Scion Type	
	H	S
G_1	64.4	40.0
G_2	82.2	55.6
G_3	95.6	91.1
LSD (0.05)	8.5	
LSD (0.01)	11.4	

G_1: Cleft, G_2: Veneer, G_3: Contact, H: Hard, S: Soft.

Table 3: Combined Effect of Variety, Methods and Scion Type on the Success Percentage in Guava Grafts

Treatment	Survival Percentage					
	G_1		G_2		G_3	
	H	S	H	S	H	S
V_1	73.3	40.0	93.3	46.7	100.0	93.3
V_2	53.3	40.0	73.3	60.0	93.3	86.7
V_3	66.7	40.0	80.0	60.0	93.3	93.3
LSD (0.05)	14.65					
LSD (0.01)	19.67					

V_1: Kazipiara, V_2: Swarupkathi, V_3: L49, G_1: Cleft, G_2: Veneer, G_3: Contact, H: Hard, S: Soft.

were 95.7%, 86.2% and 75.1%, respectively. The present results differed to some extent from the findings of Mahail and Singh (1962)[11] who obtained 100.0% survival, when the grafts were detached after 80 days in mango.

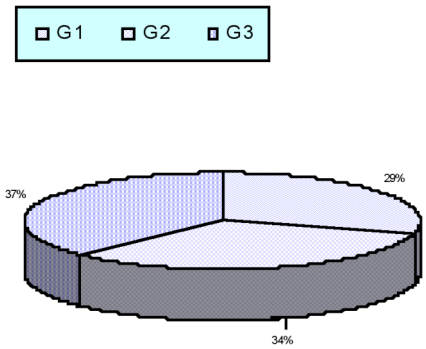

Figure 3: Effect of method on the percent survival in guava grafts.

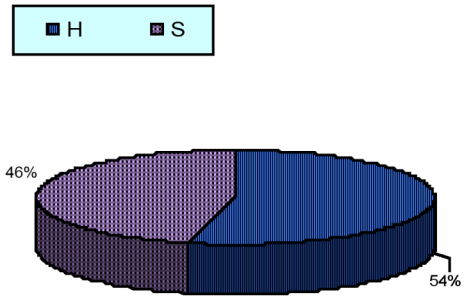

Figure 4: Effect of scion type on the percent survival in guava grafts.

Table 4: Combined Effect of Variety, Methods and Scion Type on the Survival Percentage in Guava Grafts

Treatment	Survival per cent					
	G_1		G_2		G_3	
	H	S	H	S	H	S
V_1	91.7	66.7	93.3	83.3	100.0	93.3
V_2	76.7	50.0	93.3	72.2	100.0	91.7
V_3	82.2	83.3	91.7	83.3	100.0	88. 9
LSD (0.05)	28.7					
LSD (0.01)	38.5					

V_1: Kazipiara, V_2: Swarupkathi, V_3: L49, G_1: Cleft, G_2 : Veneer, G_3: Contact, H: Hard, S: Soft.

A highly significant variation was observed in graft survival percentage over scion type. The highest graft survival rate (92.0%) was observed in case of physiologically matured Hard wood scion over Soft wood scion (79.2%) (Figure **4**) again verifies the necessities of the selection of physiologically matured scion material for grafting.

The interaction effects between the variety and grafting, variety and scion type as well as methods of grafting and scion type did not show any significant variation in the survival of guava grafts. However, all the three varieties gave highest survival rate (100.0%) when contact grafting method was applied in combination with hard wood scion. On the contrary Swarupkathi contributed the lowest graft survival percentage (50.0%) when Soft scions were grafted through Cleft method of grafting (Table **4**).

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