

EFFECT OF TWO DIFFERENT PEACH CULTIVARS AND BUDDING DATES ON SWAT LOCAL PEACH ROOTSTOCK

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Abstract

The experiment was carried out at Nuclear Institute for Food and Agriculture Peshawar (NIFA) to investigate the effect of different budding times of peach varieties i.e., Early Grand & Florida King as a scion cultivar on peach rootstock. Peach seedlings were budded at 10 days interval i.e., 20 May, 30 May, 10 June, 20 June, 30 June and 10 July. The data showed that the Early Grand variety budded on peach rootstock at 30 May showed significant results on plant height (134 cm), number of branches (16.33), shoot diameter (13.02 cm) and number of leaves (302.99), while on 10 June and 20 May found better sprouting (35.19) and bud success percentage (69.30%). Florida King variety has a significant effect on plant height (101.22 cm), shoot diameter (8.71 cm), number of leaves (127.78) and bud success percentage (50.67%) on 20 June, followed by number of branches (5.33) and days to sprouting (40.10) showed on 30 May respectively. The minimum result showed on 10 July in both varieties Early Grand and Florida King which was budded on peach rootstock. Overall, the results showed that inserting of Early Grand buds on 30 May showed best result on peach rootstock.

Keywords: Peach, rootstock, time interval and Varieties.

Introduction

Peach [*Prunus persica* L.] is a stone fruit trees and deciduous in nature in the world after apples and pears. The total cultivated area around the world is approximately 1.6 million ha with the total production is about 20.2 million tons (FAOSTAT. 2019). China, United States, Italy and Spain produce world top production of peach fruits. Peach fruits production in Spain is about 1.4 million tons in 2010 and the major production which contributes among *prunus* species (apricot, plums, peaches and sweet cherries) and pome fruits which include (apples and pears). Total production of Peach which contributes by Spanish horticulture is about 4.5 % (Ministerio de Agricultura., 2012).

Peach is a significant stone fruit that is grown in regions of the world with warm climates. Especially stone fruits and pome fruits are mostly grown in sub-tropical regions. Peaches are produce in subtropics, but they are of lower quality. Peaches are among the most consumed fruits worldwide due to their lovely color and superior quality and flavor. Most peach growing countries are; USA, Italy, France, Japan, Argentina, Australia, Mexico, Korea, West Germany, Portugal, New Zealand, Spain, Greece, South Africa, Turkey, Canada, Yugoslavia, Chile, Pakistan, India and Austria (National Horticulture Board, 2015).

In mountainous areas, peach is the most cultivatable fruit crop of Pakistan. Because it plays an important role in the horticulture industry of Khyber Pakhtunkhwa, and it has a significant effect in improving the overall economy of the country (MINFA, 2015-16). In stone fruits peaches play a vital role in country's economy. The production of peach, in Pakistan were 73.9 thousand tonnes with an average production area of 14.8 thousand hectare, which is cultivated successfully in Swat, Hazara, South Waziristan, Charsadda, Peshawar, Chitral, Northern areas of Khyber Pukhtunkhawa and Balochistan, (Agriculture Statistics of Pakistan, 2017-18).

Peach can cultivate in every type of soil but grown well in sandy loam soil, fertile with a pH range of 6.7-7 and cannot stand in water logged condition. Desirable rootstock characteristics are to be used for a cultivar which is difficult to propagate vegetative or through sexual reproduction, budding and grafting techniques are typically used for desirable characters of the tree (Kako *et al.*, 2012). Successful budding in different deciduous fruits like plum, apricot and peaches occur in mid-August (Ahmad *et al.*, 2012). Mehmet & Cekic (2011) revealed that success union of scion and rootstock at proper budding time has a significant effect on black mulberry. The timing of budding and climate, environment has significant impact on growth of plants (Baryla & Kaplan, 2012). Success of budding and grafting closely relate with the type and quality of rootstock (Baryla & Kaplan, 2012; Baryla *et al.*, 2013). In cherry early budding is more successful and high quality of nursery is produce when practice of budding in the month of August (Maryam *et al.*, 2015). The best time for budding in sweet and sour

cherries is from August-September, whereas for stone fruit is mid-August (Vasilenko, 1991). Budding on 25th June having better result in cherries 32.6-36.7% as compared to other species. By practice of T-budding in late May to early June in the seedling of peach cultivar Lola and Sumbuli, grew well (Rudikova, 1987). In active growing season of peach budding is practiced. Practice of budding in different species and varieties having different time for health plant and suitable height (Imran *et al.*, 2012). Budding on 1st and 15th August in Mahaleb cherry having best effect on growth and branches of the trees as compared to 15 July and 1st September. In apricot and peach rootstock success of budding union depend on timing and climatic condition which result health plants (Akhtar, *et al.*, 2000). (Sohail *et al* 2015) recommended that in guava t-budding having best result when practiced on 31st July in nursery.

Production of healthy and vigorous nursery plants is the most important factor in successful plant propagation. Production of peach plant nursery requires high sprouting percentage and a desirable growth habit. Almost all stone fruits are vegetative propagated on the peach rootstock through budding. After successful budding, the plants from the nursery are transplanted into orchard and which is the ultimate goal. Majority of peach nursery growers don't know the suitable time for budding on peach rootstock in Peshawar valley, which causes low success rate of budding on peach rootstocks as well as the nursery plants remaining smaller in size and producing unhealthy plants. Moreover, healthy and well sized saplings are attractive for peach growers. The present research study aims to determine the

best time of budding and cultivar on peach rootstocks for maximum bud take success.

Materials and Methods

This experiment was laid out at Peach Fruit Nursery, Nuclear Institute of Food & Agriculture (NIFA), Peshawar in 2020. In this experiment the material were used in uniformed size peach seedling rootstock and scion buds from Early grand and Florida King. The two factor experiment (different budding times and varieties) was laid out in Randomized Complete Block Design (RCBD). Prior to budding peach stones were sown at 4 cm depth with 1 inch seed to seed distance and 2½ feet row to row distance in well prepared field. After successful germination of peach rootstocks, different times of peach budding on peach rootstocks were practiced. Four times replicate and fifteen buds per treatment were used and thus the total 360 buds of each variety Early grand & Florida king were budded at 10 days intervals i.e. (20th May, 30th May, 10th June, 20th June, 30th June and 10th July).

The data recorded plant height, number of branches, internode length, budding diameter, number of leaves, days to sprouting and bud take success were investigated. After 30 days of budding the green buds were counted and the bud success percentage was calculated by using the following formula:

$$\text{Bud takes success \% age} = \left[\frac{\text{Total green buds}}{\text{Total buds inserted}} \right] \times 100.$$

Budding length of five randomly selected buddings was measured with the help of meter scale and expressed in centimeters. Budding diameter was measured in centimeter with a vernier caliper. In each replication during budding

growth the number of branches was counted and the average number of branches per plant data was recorded. Number of leaves data was taken from the middle height of the plant on each side. Total five leaves were collected from each side and treatment of the tree and average number of leaves per plant was calculated. After 30 days of budding, the vegetative buds data in each treatment were taken, and the sprouting percentage of the bud was calculated by dividing the total sprouted buds by the total inserted buds by 100. After 60 days of budding, the sprouted buds were counted once more, and the success percentage was determined by dividing the total sprouted buds by the total buds taken, multiplied by 100.

To conduct the statistical analysis, the ANOVA (Analysis of Variance) was used. The Means were evaluated using Least Significant Differences (LSD) at the 5% level of significance using the statistical program Statistix (8.1) (Steel and Torrie, 1997).

Results and Discussion

1. Plant Height (cm):

The data in the table of plant height observed that both species of stone fruit Florida king and Early grand on peach rootstock were significant effect on different time of budding. The maximum plant height recorded in Early grand 134 cm which were budded at the end of May month while the minimum plant height shown in Florida king 70.22 cm which were budded on 10th July. Overall, the plant height in Early grand variety was 107.41 cm and Florida king 84.26 cm respectively. The maximum plant height in peach may be due to its higher compatibility to peach

rootstock and availability of proper climatic condition (Neem *et al.*, 2002) also reported the same finding.

2. Number of Branches (no):

Data in the table illustrated that number of branches on Florida king variety which was budded on peach rootstock at the end of May were a significant result 16.33 as compared to the variety Early grand which was budded on the same rootstock at 20th June observed 5.44 number of branches. The overall result recorded that the Early grand variety was maximum number of branches 10.25, while the Florida king was minimum number of branches 4.32 respectively. The findings are same with (Nitransky, 1987) who revealed that various rootstock impacts on peach root stocks on the peach cultivar Redhaven's susceptibility to adverse conditions. The size of the trunk, shoot growth and twigs growth as well as the loss of the lateral shoot, were significantly impacted by the Redhaven were budded on Lovell peach rootstock.

3. Shoot Diameter (cm):

The data in the table observed that the shoot diameter of both scion varieties Early grand and Florida king on peach rootstock were significant result on different time of budding. The data regarding Early grand Scion on peach rootstock 30th May were maximum shoot diameter 13.02 cm and on 10th July was minimum result 6.11, followed by Florida king Scion were maximum result on 20th June 8.71 cm while on 10th July was minimum 6.11 respectively. Overall, in both scion varieties of peach Early grand were successful result 9.69 cm then Florida king 7.6 on peach rootstock at different time of budding.

Ahmad *et al.*, (2012) it became clear from statistical analysis that different budding dates, grafting and their interaction have a significant result on stem thickness in guava budding.

4. Number of Leaves (no):

The data revealed that the number of leaves on peach rootstock with different time of budding on Early grand and Florida king were significant effect. The Higher number of leaves 302.99 were observed at 30th May in Early grand, while in Florida king 20th May was better result 127.78. The minimum number of leaves 84.11 in Early grand and 56.55 in Florida king at 10th July respectively. The mean data recorded that number of leaves on Early grand Scion 189.72 was more than Florida King scion variety 93.89 on budded peach rootstock due to the greater number of buds and branches present on the plant. That result matched with (Akhtar *et al.*, 2000) noted that the maximum number of branches, budding growth and highest number of leaves take place in peach plant budded by chip method on 28th August.

5. Days to sprout (days):

The analysis of variance of days to sprouting data recorded a significant variation in sprouting bud of both the scion varieties of Early grand and Florida king on peach rootstock, but non-significant result in interaction of varieties on different timing. Maximum Days to sprouting in Early grand at 10th June 35.19 and 30th May 38.25. While the minimum day to sprouting observed in Florida king and Early grand varieties at same time of budding 43.96 and 43.93 on peach rootstock. Overall, in both varieties Early grand 40.87 was early sprout as compared to Florida king 41.7 respectively.

During rainy season the saps flow in the plants have increase which helps in the success union of scion and rootstock. Ahmad *et al.*, (2012) observed that different times of budding have signification effect on days to sprouting in guava. The maximum number of days to sprouting in guava showed when practicing of T-budding is occur in the month of September, whereas the minimum results were noted in days to sprouting when practicing of budding occur in guava through chip budding.

6. Bud Success % age:

The data regarding bud take success revealed that different time of budding Early grand and Florida king scion on peach rootstock found significant. Maximum bud take success in Early grand 69.30 and Florida king 66.42 on 20th May. While minimum bud takes success Florida king 42.21 and Early grand 59.60 recorded on 10th July respectively. The mean data of Early grand

64.35 observed better than Florida King 53.65. The result of Singh *et al.*, (1986) noted that in mid-September shield budding showed the highest percentage of success followed by the mid-August.

Conclusion and Future Prospects

The data recorded in experiment illustrated that Early grand variety budded on peach rootstock at 30th May shows best result on plant height, number of branches, shoot diameter and number of leaves whereas, Florida king variety were significant effect on plant height, shoot diameter, number of leaves and bud success percentage on 20th June of budding on peach rootstock. Hence it is recommended that budding of early varieties should practice on peach rootstock after 20th May and before 10th June, while in late varieties budding should practice after 10th June and before 20th June respectively.

Table 1: Performance of budding parameters of Florida King and Early Grand Scion on Rootstock at different dates.

Budding Dates	Parameters					
	Bud Success %age	Days to Sprout (days)	Number of Branches (no)	Number of Leaves (no)	Plant height(cm)	Shoot Diameter(cm)
20/05/2020	66.42	42.21	4.77	84.11	82.22	8.11
30/05/2020	60.83	40.10	5.33	100.66	83.66	8.29
10/06/2020	55.52	44.89	4.99	116.55	87.33	7.56
20/06/2020	50.67	43.33	5.44	127.78	101.22	8.71
30/06/2020	46.25	43.70	3.33	77.66	80.89	6.52
10/07/2020	42.21	43.96	2.10	56.55	70.22	6.45
LSD	0.86	1.51	4.10	72.65	18.44	1.81

Table 2: Performance of budding parameters of Early Grand Scion on Rootstock at different dates.

Budding Dates	Parameters					
	Bud Success %age	Days to Sprout (days)	Number of Branches (no)	Number of Leaves (no)	Plant height(cm)	Shoot Diameter(cm)
20/05/2020	69.30	40.80	7.22	134.33	93.22	8.49
30/05/2020	67.24	38.25	16.33	302.99	134.0	13.02
10/06/2020	65.24	35.19	8.77	135.55	98.66	8.21
20/06/2020	63.30	43.23	14.11	297.11	123.77	11.71
30/06/2020	61.42	43.80	11.21	184.22	115.44	10.62
10/07/2020	59.60	43.93	3.88	84.11	80.0	6.11
LSD	0.86	1.51	4.10	72.65	18.44	1.81

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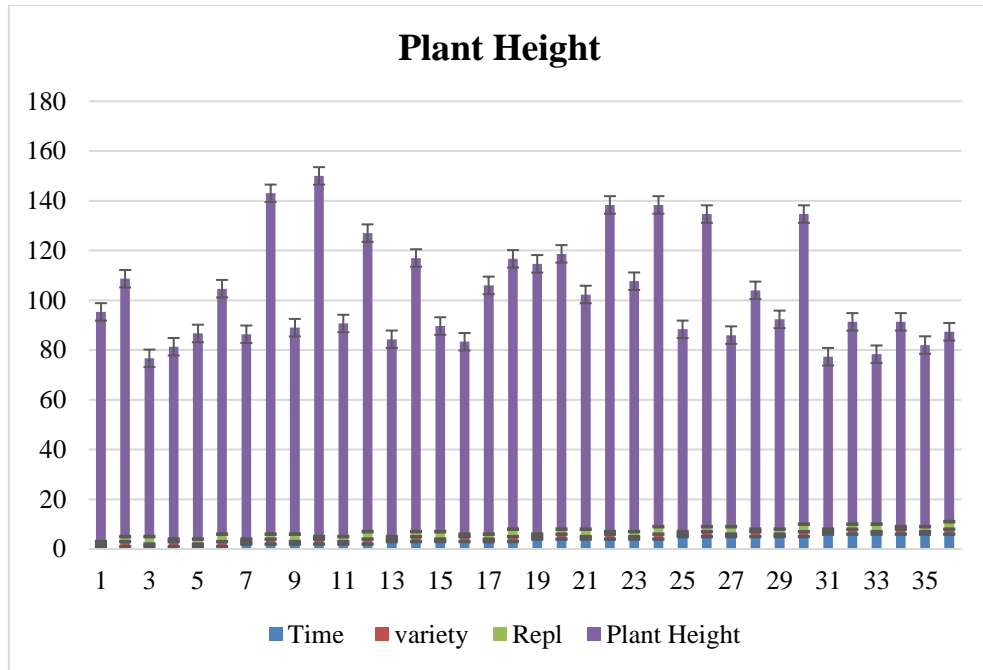


Fig. 1: Performance of Plant Height of Florida King and Early Grand Scion on Rootstock

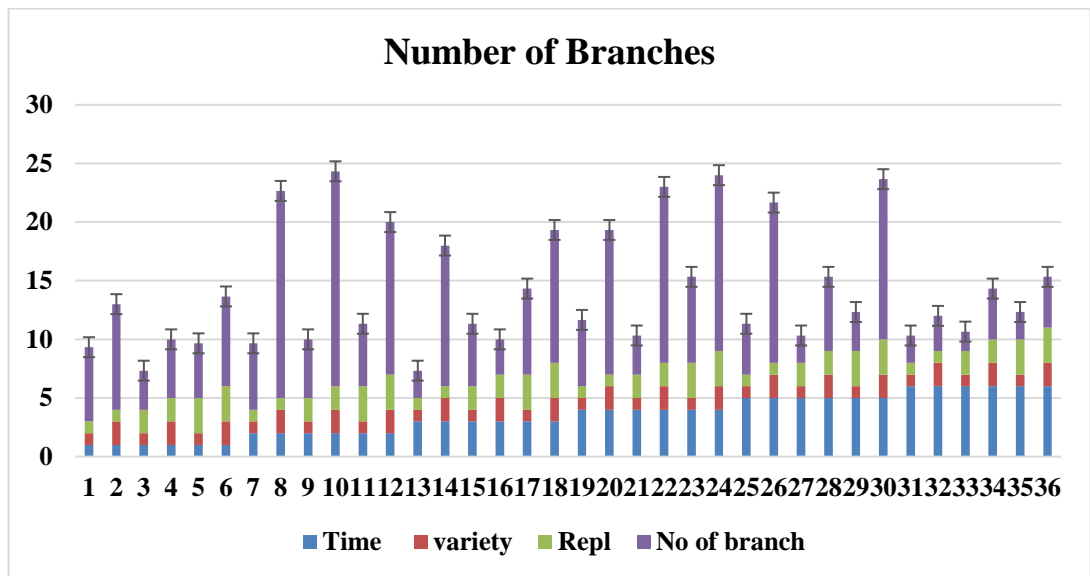


Fig. 2: Performance of Number of Branches Height of Florida King and Early Grand Scion on Rootstock

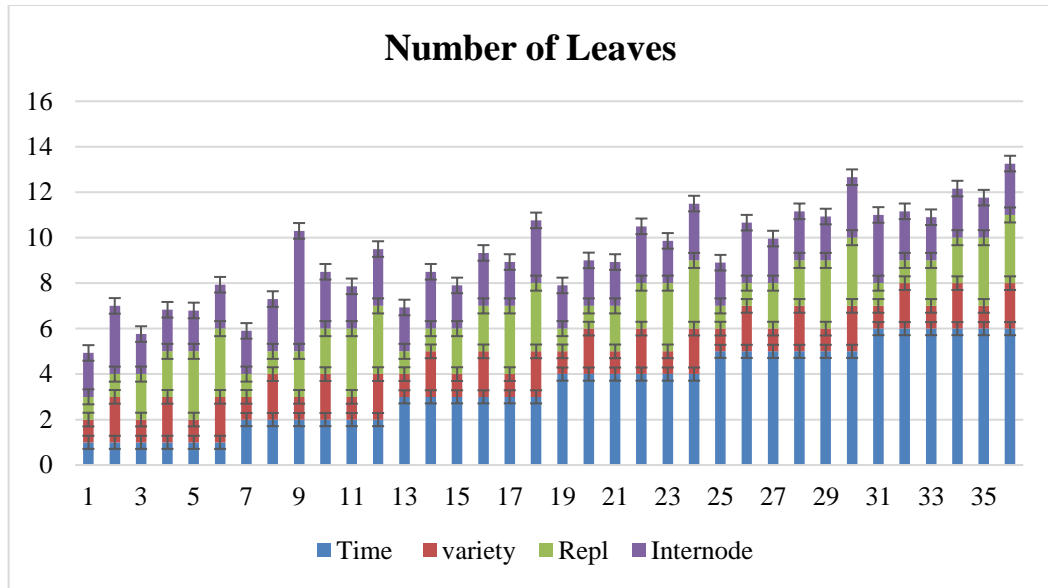


Fig. 3: Performance of Number of leaves of Florida King and Early Grand Scion on Rootstock

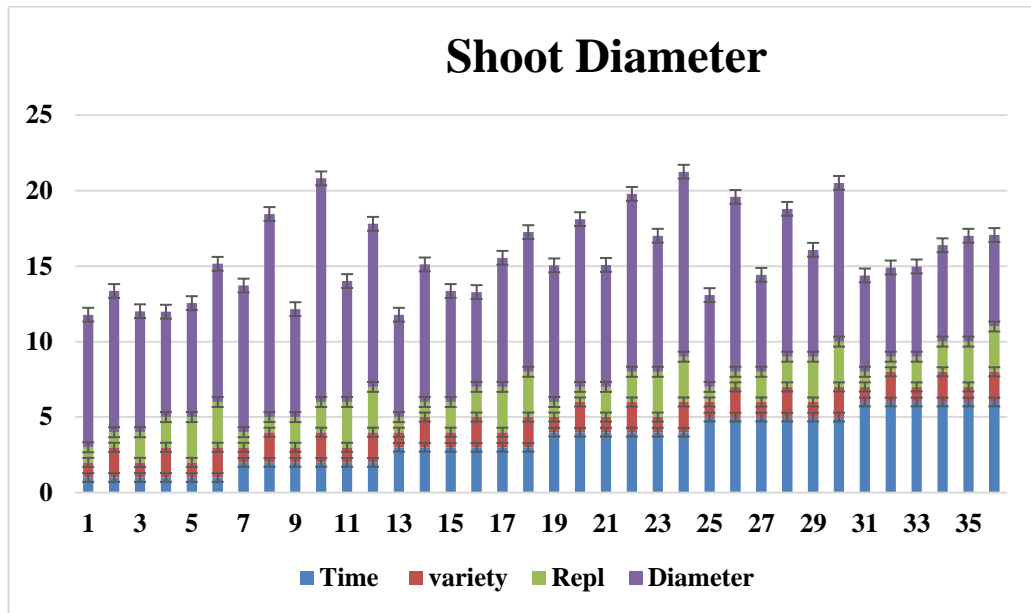


Fig. 4: Performance of Shoot Diameter of Florida King and Early Grand Scion on Rootstock.

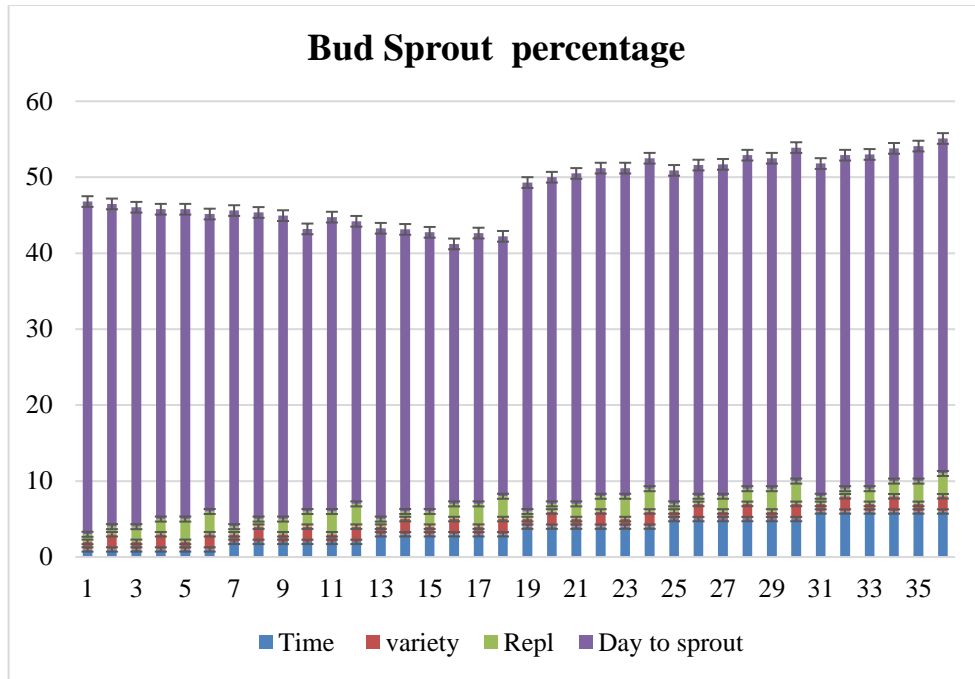


Fig. 5: Performance of Days to Sprout of Florida King and Early Grand Scion on Rootstock.

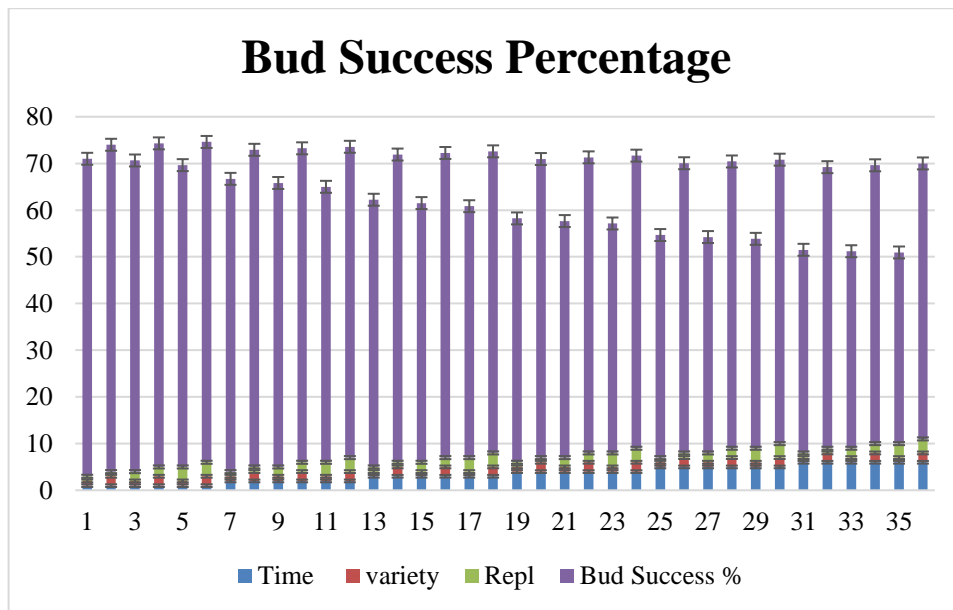


Fig. 6: Performance of Bud Success Percentage of Florida King and Early Grand Scion on Rootstock.