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Graft compatibility of Surinam cherry as a rootstock for jamun, guava and rose apple

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Abstract
An experiment on effect of graft compatibility of surinam cherry *(Eugenia uniflora* L.) as a rootstock for jamun, guava and rose apple was carried out at the Department of Fruit Science, College of Horticulture, Mysuru. The experiment was laid out with completely randomized design having four treatments and five replications. Observations on graft success, survivability, growth parameters *ie*., number of sprouts, sprout length and number of levers were recorded at monthly interval. Graft success percentage and percent survivability of the grafts was maximum (72.00 and 68.00 %, respectively) in surinam cherry as scion and also number of sprouts, sprout length and number of leaves were maximum at 30, 60 and 90 days after grafting, compared to other treatments.

Keywords: Surinam cherry, graft, compatibility and survivability

Introduction
An exotic fruit crop Surinam cherry (*Eugenia uniflora* L.) belongs to family myrtaceae, this fruit is also known by the name pitanga or Brazillian cherry or pumpkin cherry is famous for its attractive colour, nutritional and medicinal value. It is not an indigenous crop, but it is growing in some parts of India. There are many species of myrtaceae family which are edible, few are with little commercial production and limited to certain regions, such as the surinam cherry. These species, now unknown to the consumer market, may in the medium and long term to be constituted in species of commercial importance, especially on small farms, providing opportunities for additional income to the farmer. At the same time, it will bring benefits to consumers, through diet diversification based on fruits. Thus, there is a large number of species with potential to be explored for insertion into production system. Wild fruit species, mostly remain without agronomic studies to its cultivation. There are some exploitation initiatives in natural plant formations, driven by new trend of the fruit market, especially those rich in vitamins and other substances which have characteristics beneficial to health.

The commercial value of the surinam cherry clear from the high yield pulp, nutritional value, taste and exotic aroma, attracting mainly the demanding consumers for natural and healthy products. Besides the possibility of exploration to consumption of fruits in nature these species can be exploited by agribusiness for juices and for use in the manufacture of ice cream, jellies, jams, liquors and other products, among others, as essential oils that can be extracted from the leaves and other plant parts (Ferreira *et al*., 1987) [8]. This species has also attracted the attention of the pharmaceutical industry, since fruits are rich in vitamins and antioxidants (Santos *et al.,* 2010 and Lira *et al*., 2007) [17, 12] and also due to properties like antinociceptive, hypothermic effect, antidiabetic and antibacterial effect of leaf extract (Fadeyi and Akpan, 1989) [7]. Recently members of myrtaceae family like jamun, guava and rose apple were taken up in large scale cultivation by the farmers. However, the availability of genuine planting materials of these crops is one of the major constraint and availability of jamun seeds are seasonal. Since grafting is one of the commercial methods of propagation, the availability of proper rootsock is very important. Surinam cherry is hardy, dwarf in stature, can be cultivated in varied type of soil and fruits are available almost throughout the year it can be used as a rootstock for different species of myrtaceae family like jamun, guava and roseapple *etc*. Considering the above aspects, an investigation was carried out with an objective to study the graft compatibility of Surinam cherry as a rootstock for jamun, guava and rose apple.

Material and Methods
The present investigation was carried out in college of Horticulture Mysuru during 2017-18. The experiment was laid out with completely randomized design having four treatments and

five replications. Surinam cherry is used as common rootstock for four different (scion) fruit crops of myrtaceae family *viz.*, jamun (T_1), guava (T_2), rose apple (T_3) and Surinam cherry. Pre-cured scions were collected on the day of grafting and soft wood grafting was done in the month October. Grafts were watered daily with required quantity of water and weeding in the poly bags was done regularly. New sprouts (side shoots) arising from any portion of rootstock were removed regularly. Observation like Graft success percentage (%), Graft survivability percentage (%), Number of sprouts per graft, Sprout length (cm) and Number of leaves per graft were recorded.

The data generated from study were subjected to analysis by using standard method suggested by Panse and Sukhatme (1985) [15].

Results and Discussion

Graft success percentage (%) and Survivability percentage (%)

Graft success and survivability percentage was found maximum (72.00 and 64.00 %, respectively) in T_4 (Surinam cherry as scion). Whereas, it was minimum (24.00 and 22.00 %, respectively) in T_3 (rose apple as scion) and it was failure (00.64 %) in T_1 (jamun as scion) and T_2 (guava as scion) for the same.

Callus proliferation is essential for a successful grafting union, which occurs most readily at the time of year just before and duringbud breakin the spring. In case of jamun the bud break stagewas observed during the month of march and certain environmental requirements must be met for callus tissue development particularly temperature and relative humidity which influencemoisture and plant water relations as reported by Bharad and Mahorkar (2011) [3] in jamun.

The lower success of graft may be due to compatibility problems between graft and rootstock, since compatibility is a function of physiological and anatomical affinity. The first concerns the grafting region, which can become selective and may hinder the transport of sap between the parts. The second one would be related to the intimate association of the exchangeable tissues in the formation of the connection, which can be compromised when the crown and rootstock have different cells in size, shape and consistency, as reported by Franzon *et al.* (2010) in surinam cherry. Unfavorablestionic ratio in plants might be due to unlignified parenchyma cells at the interface and the cambium discontinuity which might be resulted in crucial symptoms (Gadekar *et al*., 2010) [10] in jamun.

Number of sprouts

Number of sprouts at 30, 60 and 90 days after grafting (DAG) was found to be maximum (2.05, 3.14 and 4.17, respectively) in T_4 (Surinam cherry as scion) whereas it was minimum (1.25, 0.2 and 0.00, respectively) in T_1 (jamun as scion).

Franzon *et al.* (2010) in surinam cherry reported that the greater the affinity between graft and rootstock, the greater the probability of success in grafting. Thus, the difference in the percentage of graft union between the different selections may be influenced by the two types of incompatibility, either because the different selections present physiological differences, since these may respond differently to the environmental conditions, either by differences in relation to the rootstock. Also, it may be being influenced by anatomical differences between the involved in selections. This incompatibility results in less number of sprouts in grafts. These observations are in line with findings of Angadi and Karadi (2012) [1] in jamun and Syamala *et al.* (2012) [18] in guava.

Sprouts length

Sprout length was found to be maximum at 30, 60 and 90 DAG (0.55, 1.2 and 2.61 cm, respectively) in T_4 (Surinam cherry as scion) whereas it was minimum (0.14, 0.27 and 0.00 cm, respectively) in T_1 (jamun as scion).

According to Fachinello *et al.* (2005) [6], temperature and humidity are the main factors involved in the grafting process and together which can influence the rate of division which affects the formation of new cells, responsible for the union between the tissues involved. Thus, the cells of the exchange region, which have high meristematic capacity, and which are responsible for the union between rootstock and graft, must have had their process of division and multiplication accelerated which is responsible for sprouting and sprout length. Similar results were obtained by Franzon *et al.* (2011) [9] in Surinam cherry, Bezerra *et al.* (1999 and 2002) [2] in Surinam cherry, Uchoi *et al.* (2012) [19] in jamun.

Number of leaves

Number of leaves was found to be maximum at 30, 60 and 90 DAG (06.85, 13.85 and 20.90, respectively) in T_4 (Surinam cherry as scion). Whereas, it was minimum (1.40, 0.25 and 0.00, respectively) in T_2 (Guava as scion).

Early sprouting followed by optimum temperature and humidity might be responsible for production of more number of leaves (Devi *et al*., 2018) [5]. The congenial weather conditions prevailing during grafting triggered cell activity in scion. The higher cell activity results in early sprouting of scion and more number of leaves on scion (Pampanna and Sulikeri 2000) [14] in sapota. The results obtained in the present investigation are in close conformity with the results obtained by Khatun *et al.* (2008) [11] in jack, Raghavendra *et al.* (2011) [16] in wood apple and Mulla *et al.* (2011) [13] in jamun Grafting incompatibility was due to physiological and biochemical differences between the grafted parts. Presence of substances that inhibited the formation of callus, such as phenolic compounds. Myrtaceae generally exude a large amount of these toxic substances, according to Fachinello *et al.* (2005) [6] and also confirmed by Cassol *et al.* (2017) [4] in *Pliniacauliflora.*

Table 1: Performance of graft success and survivability among members of myrtaceae family

Treatments	Success percentage (%)	Survivability percentage (%)
T_1 (Jamun)	00.00 (00.64)*	00.00 (00.64)*
T_2 (Guava)	00.00 (00.64)	00.00 (00.64)
T_3 (Rose apple)	24.00 (29.22)	22.00 (27.80)
T_4 (Surinam cherry)	72.00 (58.24)	68.00 (55.70)
S.Em ±	02.88	02.73
C.D @ 5%	06.70	06.36

* Values in parenthesis are arc sin transformation data

Table 2: Number of sprouts and sprout length of the grafts at different stages of growth

Treatments	Number of sprouts			Sprout length (cm)			Number of leaves		
	30 DAG	**60 DAG**	**90 DAG**	**30 DAG**	**60 DAG**	**90 DAG**	**30 DAG**	**60 DAG**	**90 DAG**
T_1	1.25 (6.40) *	0.20 (2.22) *	0.00 (0.65) *	0.15 (1.67) *	0.27 (2.23) *	0.00 (0.65) *	03.00 (9.92) *	00.35 (2.81) *	00.00 (0.65) *
T_2	1.20 (6.25)	0.30 (2.89)	0.00 (0.65)	0.36 (3.40)	0.32 (2.10)	0.00 (0.65)	01.40 (6.63)	00.25 (2.39)	00.00 (0.65)
T_3	1.00 (5.73)	1.00 (5.64)	2.04 (8.18)	0.37 (3.46)	0.53 (4.06)	0.58 (4.30)	02.50 (8.63)	02.80 (9.25)	03.15 (10.15)
T_4	2.05 (8.14)	3.14 (10.19)	4.07 (11.36)	0.56 (4.21)	1.21 (6.22)	2.61 (9.21)	06.85 (15.01)	13.85 (21.69)	20.90 (26.10)
S.Em ±	0.22	0.16	0.13	0.10	0.20	0.26	00.84	01.27	01.86
C.D @ 5%	0.50	0.38	0.31	0.24	0.47	0.60	01.94	02.97	04.34

DAT- days after grafting

Conclusion

Surinam cherry and rose apple shown compatibility with surinam cherry as rootstock and jamun and guava was unsuccessful for graft union with surinam cherry as rootstock.

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