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PROPAGATION OF GUAVA THROUGH CUTTAGE UNDER NET HOUSE CONDITION AT JABALPUR, MADHYA PRADESH, INDIA

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ABSTRACT

Different concentrations of IBA (0, 1000, 2000 and 3000 ppm) on guava semi hard wood and hardwood cuttings planted in different rooting media (Soil, Silt, Silt +Soil, Soil + Silt+ FYM, Soil+ Silt +Vermi compost) under net house condition poly bags. Significantly higher success percentage (33.09, 36.63%) was noted in both of cuttings treated with 3000 ppm IBA as compared to control (21.68 and 23.9 %) in semihard wood and hard wood respectively. The plants produced 5.44 and 5.33 numbers of leaves, 14.37 and 10.91 cm shoot length and 26.58 and 24.10 number of roots as compared to control . The study provided useful information on guava clonal multiplication through cutting and IBA impact on samihard wood and hard wood cuttings.

Figure : 01 References : 23 Table : 01

KEY WORDS : Asexual; Cuttings, IBA, Propagation technique; Protected environment; *Psidium guajava*.

Introduction

Guava (*Psidium guaj*ava L.) the poor man's fruit or apple of the tropics is popular in tropical and subtropical climates. It is native to tropical America stretching from Mexico to Peru[6,10]. Guava is cultivated in every tropical and subtropical country around the world[18]. This is a delicious fruit and is very nutritious and exceptionally rich in ascorbic acid and several minerals useful for human health[22]. Besides its high nutritional value, it bears heavy crop every year and gives good economic returns[16].

Guava propagation through seed does not produce true-to-type plants while clonal propagation has assured true-to-type plants. It was reported that guava is commercially propagated from seeds in Pakistan[9]. Guava, if propagated through seed, exhibits a great variation due to inevitable heterogeneity. Moreover, seed propagated plants come into bearing much later than vegetatively propagated plants. Through seed propagation unique characters of a certain variety cannot be preserved or multiplied. Seed propagation does not permit the utilization of superior important characters of a certain rootstock such as disease tolerance (viral fungal or bacterial), adaptability to varying agro-ecological conditions, manipulation of tree growth (dwarfness) and better influence of certain rootstock. Vegetative propagation is,

therefore, inevitable in guava[20]. In fruit trees, several vegetative propagation techniques as air layering, root cuttings and stooling, have been tried with varying success rate to increase productivity and gains by clonal propagation and selection[11,12]. However,these techniques are still not commercially viable due to varying rate of success, absence of tap root system and cumbersome process. Healthy planting material is essential to achieve good yield and quality produce. A well-established commercial nursery must improve the way of producing planting material using modern technology as there is the potential to produce true-to-type guava nursery plants with soft wood cuttings[1] In Punjab, guava is generally propagated from seeds and the seedlings are variable in both plant and fruit characteristics. Establishment of orchard through seedlings is not recommended at present time; as most of these seedlings will not be like the parental type in yield, taste and fruit flesh color.

The major issue in guava plantation is discriminate multiplication of plants from unreliable sources by nurserymen[17]. Non-availability of quality planting material and consequent substitution of poor quality seedlings have adversely affected the guava production. True-to-type initial planting material is basic need to ensure both quality and quantity in guava[17]. Breeding programmes for perennial plants like fruit trees are time consuming because of their slow growth rate and long generation time. In present context, rapid methods of propagation become very important when planting material is limited due to scarcity of a clone or varieties or due to sudden expansion in acreage. Adventitious root formation is a key component of clonal propagation of selected woody plants[18]. The present study was initiated to standardize the technologies for producing true-to-type plants of guava in short period of time *via* soft wood cuttings with application of different concentrations of indole-3-butyric acid.

Materials and Methods

The research studies were carried out under Net house condition, during the year 2013-14 and 2014-15.

Filling of poly bags: Before the cutting planting the 6 X 10 cm poly bags were filled with different growing media. Six hundred (600) poly bags of each growing media were filled *i.e.* 600 bags of soil, 600 bags of silt, 600 bags of soil + silt (1:1 ratio), 600 bags of Soil + Silt + FYM (1:1:1 ratio) and 600 bags of Soil + Silt + Vermicompost (1:1:1 ratio).

Preparation of cutting: After the filling of growing media in poly bags, the hard wood and semi hardwood cuttings of uniform size having 4-5 functional bud were taken from healthy plants of Guava variety Allahabad safeda from one year matured shoots planted at the fruit research station Imaliya and guest house no- 2 guava orchard.

Preparation of Growth regulator solution: The weighing of IBA was done with the help of electronic balance. The requisite quantity 1g,2g and 3g (1000 ppm,2000ppm and 3000 mg) were weighed separately and transferred into flask and then initially the IBA sample was dissolved in 10 ml ethyl alcohol (90%) and made the volume 1000 ml with mixing 990ml distilled water. By this process we found the 1000, 2000 and 3000 ppm IBA solutions.

Application of growth regulators: The fresh basal end cut of the cuttings about 2.5 cm were dipped in proposed hormonal solution for about 5 seconds and thenafter were let in shade, so that the cutting could absorb the hormone and best results were obtained. After this process the cuttings were planted in poly bags.

Planting: The cuttings about 0.75 to 1 cm thick diameter were taken and planted in poly bags with 2-3 functional buds below the ground. Before the planting a hole was done from planting place with the help of stick for preventing the buds to injuries.

Layout system of experiment was Factorial RBD replicated three times making 40 number of experimental units. Data on success percentage, length of sprouting (cm), total No. of leaves/cutting and number of roots taken after 120 days were collected during both years and were averaged and analyzed.

Results and Discussion

Success percentage

The data (Table-1) revealed that , the success percentage of cuttings in semi hard wood cuttings were recorded significantly highest 33.09% success with stem cuttings dipped in IBA @ 3000 ppm (G3), while, lowest 21.68% success of cuttings was recorded in G0 (control) in 1st year, 2nd year and pooled, respectively. In hard wood cuttings, stem cuttings dipped in IBA @ 3000 ppm (G3) were recorded significantly maximum 36.63% success of cuttings and it was lowest 23.90% in treatment G0 (control).

Usually higher dose of root promoting

hormone inhibits the sprouting of initials[20], which happened truly in this experiment. Minimum success percentage (13%) was observed in cuttings kept as control. These results are in line with those earlier[8] who reported that cuttings treated with IBA at 1000 ppm gave 37 percent success against control (17.5%). It was also observed that stem cuttings collected from mature stock plants gave the highest rooting percentage (60%) when treated with 0.4 percent IBA solution followed by two percent IBA[1].

Length of Shoot (cm)

Stem cuttings dipped in IBA @ 3000 ppm (G_3) were recorded significantly maximum length of shoots 14.37 cm over the control (G_0) *i.e.* 7.76 cm length of shoots in semi hard wood cuttings. In hard wood cuttings, stem cuttings dipped in IBA @ 3000 ppm (G_3) were recorded significantly maximum 10.91 cm length of shoots and it was minimum 6.07 cm in treatment G_0 (control). Earlier it was also reported maximum shoot length (8.24 cm) soft wood cuttings treated with 1000 ppm IBA and minimum (3.83cm) in control treatment[1].

Total number of leaves/cutting

Application of 3000 ppm IBA (G_3) in dipping of stem cuttings were recorded significantly maximum 20.19 and minimum 11.62 total number of leaves cuttings^{-1} were recorded under G_0 (control) in semi hard wood cuttings. In hard wood cuttings, stem cuttings dipping in the IBA 3000 ppm (G_3) were recorded significantly maximum 19.26 and it was minimum 10.75 leaves in treatment G_0 (control). Earlier workers[21] have reported significantly higher number of leaves per cutting in 3000 ppm. IAA also supported[13] these results who observed maximum number of leaves (10.20) in 1000 ppm IBA treatment.

Number of primary and secondary roots

Semi hard wood cuttings, (Table 1) results revealed that application of 3000 ppm IBA (G3) in dipping of stem cuttings were recorded significantly maximum 26.58 and minimum 12.88 number of primary and secondary roots/cutting were observed in control (G0). In hard wood cuttings, stem cuttings dipping in the IBA 3000 ppm (G3) were recorded significantly maximum 24.10 and it was minimum 11.50 number of primary and secondary roots/ cutting in treatment G0 (control). Earlierst it was reported that number of roots per cutting increased with higher IBA (4000ppm) against the lowest number of roots per cutting in 2000 ppm concentration[21]. The present results support the earlier findings[7]. It was further observed that cuttings with more number of leaves produced more number of roots, due to fact that photosynthesis and other activities were carried out in leaves that caused more number of roots. Adventitious root formation is a key step for vegetative propagation

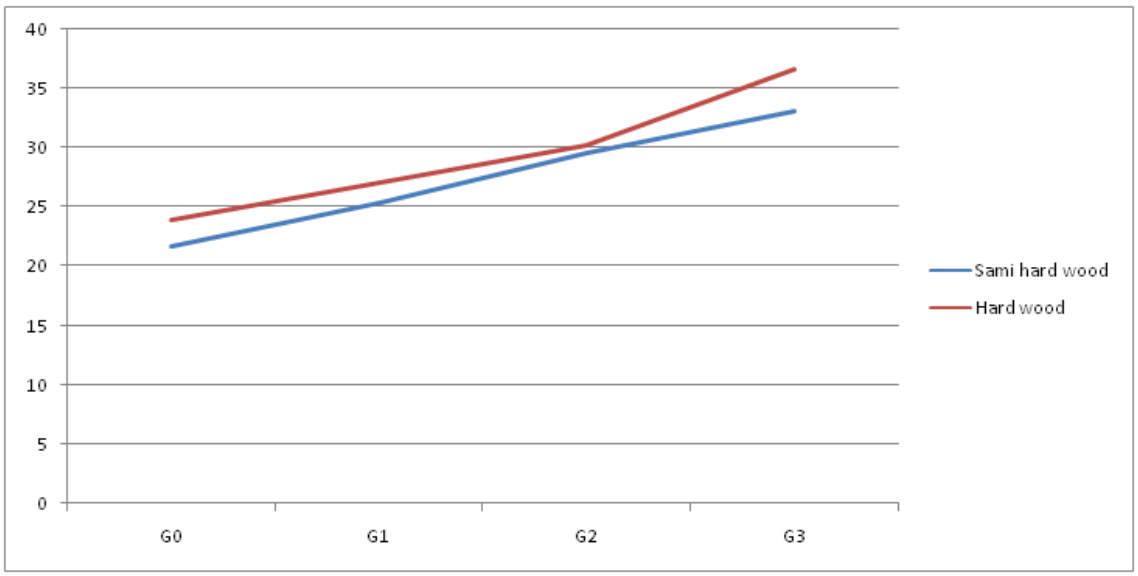

Fig. 1 : Success percentage of cuttings

comprising root induction, in which molecular and biochemical changes occur before any cytological event; root initiation when first anatomical modifications take place; and protrusion, corresponding to the emergence of root primordial[3,5]. Lateral roots development in Arabidopsis provided a model for study of hormonal signals that regulated post embryonic organogenesis in higher plants[14,23]. Lateral roots originated from pairs of pericycle cells, in several cell files positioned opposite the xylem pole, that initiated a series of asymmetric, transverse divisions to create 3 to 10 "short" daughter cells[4]. These short daughter cells have undergone radial enlargement and subsequently divided periclinally to give rise to inner and outer cell layers. Further periclinal divisions resulted in formation of lateral root primordial[2].

Conclusion

The study concludes that production of guava plants in net house condition proved to be the best for rapid and cheapest method multiplication of guava true-to-type plants. Significant results were obtained when guava nursery produced by semi hard wood and hard wood cuttings after application of 3000 ppm IBA. The plants produced by this technique will be true-to-type and can be planted in high density plane. These plants will bear earlier than the seedlings. The unique characters of a variety can be preserved through this technique. The technique was developed in this study is simpler, rapid, less labour intensive and economical, as root promoting hormones are required for root initiation. It is useful as compared to conventional method of propagation (grafting/budding) of guava because of higher success rate, independent of season and climate, small size of cuttings, use of juvenile shoot cuttings, disease free nature and production of large number of uniform true to mother type plants in a short period of time.

TABLE -1 : Semi hard wood and hard wood cuttings

Semi hard wood cutting				
IBA (g)	**Success percentage**	**Length of Shoot (cm)**	**Total number of leaves/cutting**	**Number of primary and secondary roots**
G0	21.68	7.763	4.505	12.88
G1	25.38	9.716	4.831	16.68
G2	29.59	12.222	5.208	20.41
G3	33.09	14.369	5.441	26.58
Hard wood cutting				
G0	23.90	6.07	4.494	11.50
G1	27.01	7.15	4.790	15.00
G2	30.15	8.26	5.123	18.36
G3	36.63	10.91	5.333	24.10
Semi hard wood cutting			**Hardwood cutting**	
	SEm±	**CD5%**	**SEm±**	**CD5%**
1	0.51	1.45	0.84	2.40
2	0.23	0.68	0.34	0.98
3	0.05	0.14	0.045	0.13
4	0.258	0.739	0.235	0.673

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