

Research Article

Effects of Indole Butyric Acid on Rooting In Cuttings of Burmese Grape, *Baccaurea Sapida*

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Abstract

An experiment was carried out in randomized block design with 5 treatments and 4 replications to study the efficacy of clonal propagation by means of mature stem cutting in Burmese grape, *Baccaurea sapida* Muell. Arg. Cuttings were taken from matured plants and treated with 0.2%, 0.4%, 0.6%, and 0.8% IBA solution with control. The study reveals that the species is amenable for clonal propagation by mature stem cutting. Applied auxin (IBA) significantly enhanced the rooting ability. Investigation revealed that cuttings treated with IBA @ 0.4% gave the best results in terms of highest rooting success (54.23%), root length (3.24 cm), root number (2.83), shoot number (0.94) and survival percentage (55.40%).

Keywords: Burmese Grape; IBA; Stem Cutting; Vegetative Propagation

Introduction

Baccaurea sapida Muell. Arg., commonly known as “Burmese grape” is a flowering plant belonging to the family-Euphorbiaceae. It is one of the important underutilized fruit crop, as it has remained confined mainly to backyard plantation and as forest creeper. The plant is native to Southeast Asian region distributed along the sub-Himalayan tract, mostly from Nepal to Sikkim, Darjeeling, Arunachal Pradesh, Tripura, Assam, Bhutan, Burma, Penninsular Malaysia, Tibet and Andaman Islands [1]. In West Bengal it is mainly grown in Cooch Behar, Jalpaiguri, Darjeeling, Uttar Dinajpur and Dakshin Dinajpur and also found in Nadia district to a limited scale. Locally the fruit is known as ‘Latka’, ‘Latkan’, ‘Lotko’, or ‘Notko’. It is a mild acidic fruit and mainly used as fresh fruit consumption. It is a slow growing, evergreen, cauliflory bearing, dioecious, short to medium height, flowering plant species. It flowers during the summer months (March-April) and fruits are mature during the rainy season (June-July). The fruit is oval to round in shape and turns yellow or yellowish brown in ripen condition. The type of fruit is berry and edible portion is aril which is covered by leathery rind. It can be propagated by

seeds and as it is dioecious in nature so variation is present among the present plant population. Besides, seedlings rose from seed need to attain a considerable height before flowering [2]. Again, the sex (maleness and femaleness) of Burmese grape cannot be detected before flowering of plants at 4-5 years of planting. Most of the male plants need to be removed after confirmation of sex. This is wastage of money, time and space of fruit production. Vegetative reproduction could open up a new horizon for the multiplication of this species for large-scale plantations since the species is amenable for rooting in juvenile stem cuttings [3]. However, multiplication of the species through clonal propagation from juvenile materials is unable to avoid the problems of detecting the male and female trees developed from the juvenile cuttings. Therefore clonal propagation through mature stem cutting from female trees can be an important tool for eliminating the problem of female. However, a little information is available about asexual propagation of Burmese grape. Therefore, the present investigation was carried out to study the effect of different IBA concentration on rooting from stem cuttings of *B. sapida*.

Materials and Method

Preparation of stem cuttings

The experiment was conducted in a non-mist polyhouse

of ICAR-AICRP on Fruit, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, during monsoon in the year 2016. Healthy and uniform stem cuttings were obtained from one year old branches of mature female plant. Cuttings were dipped in fungicide solution for 2-3 minutes and subsequently washed in distilled water and kept in shade for 10 minutes before giving hormonal treatment. After that cuttings were briefly dipped in the hormonal solution and were planted in polythene bag filled with substrate (Sand: Soil: FYM @ 1:2:1). In this study, there were five levels of IBA treatments (T₁- 0.2%, T₂-0.4%, T₃-0.6%, T₄-0.8% and T₅-control) with four replications and each replication consisted of ten cuttings. The polybags were then kept in the non-mist polyhouse and watered regularly.

Observation recorded

Observations were recorded daily up to 45 days after planting. The observation recorded were –

Rooting success percent

It was calculated by using this formula ----

$$\frac{\text{Total number of cuttings success}}{\text{Total number of cuttings planted in all replicates}} \times 100 (\%)$$

Shoot and Root length

They were measured with the help of digital slide caliper and expressed in cm.

Number of roots

The number of root was counted manually.

Survival percentage

The percentage of cuttings that survived was calculated with the following formula----

$$\frac{\text{Total number of survived cuttings} \times 100}{\text{Plant survival \% age} = \text{Total number of sprouted cuttings}} [4].$$

Experimental design and statistical analysis

The experiment was laid out in randomized block design with 5 treatments and 4 replications. Analysis of variance (one way classified data) for each parameter was performed using op stat software (online version). The statistical analysis was done by following Randomized Block Design (RBD) as per Gomez and Gomez [5]. The significance of different sources of variation was tested by error mean square by Fischer-Snedecor’s ‘F’ test at probability level of 0.05 percent.

Results and Discussions

Rooting success percentage

Results (Table 1) represent that rooting success of cutting of *Baccaurea sapida* Muell ranged from 14.25 to 65.87%. Maximum

cutting success (65.87%) was obtained in T₂ followed by T₃ (58.25%) and minimum success (14.25%) was obtained in T₅ treatment. The data on cutting success percentage was statistically significant under all the treatments. Rooting ability of cuttings of *B. sapida* was found to increase significantly by IBA treatment in the present study. However, Nath and Barooah [6] reported 46.5% rooting when *B. sapida* (Latkan) cuttings were dipped in 2500, 3000 or 3500 ppm IBA (in 50% ethanol). IBA was more effective than IAA at stimulating rooting of Latkan with 0.05 mg/litre the optimum concentration [7]. Auxin IBA has a great effect on cutting success. Better formation of roots in auxin treated cuttings might be due to accumulation of metabolites at the site of application, synthesis of new protein, callus formation, cell division and cell enlargement [8]. The response of IBA could be that it is slowly degraded by the auxin degrading enzyme linked system [9]. Likewise Weaver [10] suggested that since IBA translocates poorly, it is retained near the site of application and is therefore very effective. The application of IBA might have an indirect influence by enhancing the speed of transformation and movement of sugar to the base of cuttings and consequently rooting as mentioned by Torkashvanda and Shadparvar [11] in hibiscus. Applied auxin was known to intensify root-forming process in cuttings. Usually polysaccharide hydrolysis was activated under the influence of applied IBA, and as a result, the content of physiologically active sugar increased providing materials and energy for meristamatic tissues and later for root primordia and roots. Hassig [12] examined the function of endogenous root forming components of plants and demonstrated that auxin component was required for development of callus in which root primordia initiated but for subsequent primordia development both auxin and non-auxin components are needed. It might be possible that in cuttings with optimum amount of endogenous auxin content and increasing of root number reflects the effect of applied auxin [13].

Treatments	Rooting Success (%)	Number of roots	Root length (cm)
T ₁ (0.2%)	52.40 (46.35)	1.98	2.33
T ₂ (0.4%)	65.87 (54.23)	2.83	3.24
T ₃ (0.6%)	58.25 (49.73)	2.23	2.83
T ₄ (0.8%)	44.69 (41.93)	1.66	2.17
T ₅ (Control)	14.25 (22.17)	1.53	2.02
SEm (±)	0.023	0.022	0.029
CD (P≤0.05)	0.072	0.069	0.089

Values in parenthesis are angular transformed values

Table 1: Effect of hormonal treatments on rooting success, number of roots and root length of Burmese grape (*Baccaurea sapida* Muell) cuttings.

Number of roots

Number of roots of cutting of Burmese grape was ranged from 1.53 to 2.83 (Figure 1). Highest number of roots (2.83) was in T₂ followed by T₃ (2.23). Lowest number of roots (1.53)

was obtained in T₅. Root number of cuttings of *B. sapida* was significantly affected by the auxin (Table 1). Similar result was reported by Hossain et al. that mean root number of cuttings of *Swietenia macrophylla* and *Chickrassia velutina* significantly enhanced with IBA treatment [14]. Increased number of roots in cuttings treated with auxin had been considered due to enhanced hydrolysis of nutritional reserves under the influence of auxin. Kamaluddin et al, [15] observed that applied auxin significantly increased the root number of cuttings of *C. velutina* [15]. Again, Al- Obeed [16] reported that the cuttings of guava treated with IBA in combination with catechol at 500 and 1000 ppm produced highest number of roots (31.1) while the control produced only 9.1 roots per cutting.



Figure 1: Cuttings of Burmese grape.

Root length

Root length was ranged from 2.02 cm to 3.24 cm. Highest root length (3.24 cm) was obtained in T₂ and lowest length (2.02 cm) was obtained in T₅. It was statistically significant under all the treatments. Similar result was reported by Mathew et al., [17] and mentioned that the primary root number, root length and root dry biomass showed a significant increase due to chemical treatments over the untreated cuttings. These results also supported by the findings of the study of Pathak et al., [18] on plum and Avanzato et al., [19] on peach.

Number of shoot

Auxin significantly affects the shoot number developed in *B. sapida* cuttings (Table 2). However, maximum number of shoots was developed in cuttings rooted with 0.4% IBA treatment and the minimum was in cuttings rooted without treatment. The mean shoot number was varied from 0.55 to 0.94 in *B. sapida* cuttings. Similar result was reported by Hossain et al., [14] who mentioned that shoots produced by the cuttings of *S. macrophylla* and *C. velutina* was indifferent to IBA treatments. However, Debata and Pank [7] reported the optimum bud break response was obtained with 0.1 mg IAA + 0.5 mg IBA/litre with 85% of explants producing an average of 2.3 shoots /explants in cuttings of mature *Bixa orellana*.

Survival percentage

Results (Table 2) represent that survival success of cutting of *Baccaurea sapida* Muell ranged from 40.29 to 67.81%. Maximum survival (67.81%) was obtained in T₂ followed by T₃ (61.30%) and minimum (40.29%) was obtained in T₅ treatment. The data on survival percentage was statistically significant under all the treatments. However, Nath and Barooah (1992) recorded that survival of rooted cuttings were 62.3% in *B. sapida* cuttings treated with IBA.

Treatments	Number of shoot	Survival (%)
T ₁ (0.2%)	0.74	59.78 (50.62)
T ₂ (0.4%)	0.94	67.81 (55.40)
T ₃ (0.6%)	0.84	61.30 (51.51)
T ₄ (0.8%)	0.65	50.21 (45.10)
T ₅ (Control)	0.55	40.29 (39.39)
SEm (±)	0.019	0.033
CD (P≤0.05)	0.060	0.102
Values in parenthesis are angular transformed values		

Table 2: Effect of hormonal treatments on number of shoots and field survival of Burmese grape (*Baccaurea sapida* Muell) cuttings.

Conclusion

The above discussion provides a suitable protocol of vegetative propagation of Burmese grape. Finally it can be concluded that IBA@ 0.4% is proved to be the best in terms of cutting success, growth performance and survival rate of *Baccaurea sapida*. Field investigation of the rooted cuttings of the species for large scale clonal multiplication could be an important aspect of future study.

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