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Study of Various Plant Growth Enhancers on Propagation in Betel Leaf Cutting (*Piper betle*L.)

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Abstract:- The present experiment was conducted during the 2019-20 Rabi season at Pt. KishoriLalShukla College of Horticulture & Research Station Rajnandgaon (C.G.). The experiment was laid out in CRD (Completely Randomized Design) under shade net conditions with three replication, each replication consisted of 10 treatments. { T_1 (IBA 500 mg / lit), T_2 (IBA 750 mg / lit), T_3 (IAA 500 mg / lit), T_4 (IAA 750 mg / lit), T_5 (NAA 500 mg / lit), T_6 (NAA 750 mg / lit), T_7 (Moringa leaf extract 30 ml / lit), T_8 (IBA 1.5 mg + kinetin 2.0 mg / lit), T_9 (IBA 2 mg + Kinetin 3.0 mg / lit), T_{10} Control (without plant growth enhancer)}. The result indicated that T_1 (IBA 500 mg / lit) was superior for most of the characters under study i.e. Days taken for sprouting (12.33 days), Sprouting Percentage (80%), Number of leaves per cutting (13.77), Average shoot length per cutting (38.36cm), Number of primary roots (14.99), Fresh shoot weight (8.97g), Dry shoot weight (3.68g) and Survival percentage (83.33%).

Keywords:- *Plant Growth Enhancers, Betelvine, PGRs, Cutting, Propagation.*

I. INTRODUCTION

Betelvine (*Piper betle* L.) an important crop of the Piperaceae family, is an evergreen perennial climbing plant with heart-shaped glossy dark green leaves. In India, it is customary to serve betel leaves on various social, cultural and religious occasions and is also offered to guests as a sign of respect (known as tambool). Without Paan, no Hindu religious ceremony is also delivered after lunch and dinner, as well as at other social events. The cultivation of this crop in the state of Chhattisgarh is concentrated in the Chhuikhadan and Dongargarh blocks of the Rajnandga on district. The betelvine variety grown in this area is Billori. Another variety of paan, namely Meethapaan and Kalkatiapaan, is also popular in this area. The cultivation of Betelvine is essentially an occupation of small marginal farmers who have very small farms. The cultivation of betel vine is known for its greater potential to generate income and employment at the farm level. The initial cost of harvesting beetles is very high, but the benefits per unit area are also good. Few experiments have been carried out to examine the rooting effects of plant enhancers among various plant species (Steffens*et al*. 2006). Phytohormones, particularly auxins, contribute primarily to regulating root growth. For that reason, current research was carried out to explore the impact of PGRs on the rooting of *Piper betel* nodal cuttings.

II. MATERIALS AND METHODS

The experiment was done during the year 2019-20 at protected condition i. e., Shade net at Horticultural farm, Pt. K. L. S College of Horticulture & Research Station Rajnandgaon (C.G.). The experiment was laid out in the Completely Randomized Design and replicated three times. Each replication consisted of 10 treatments i.e.(IBA) 500 mg/lit (T_1), (IBA) 750 mg/lit (T_2), (IAA) 500 mg/lit (T_3), (IAA) 750 mg/lit (T_4), (NAA) 500 mg/lit (T_5), (NAA) 750 mg/lit (T_6), Moringa Leaves Extract 30 ml/lit (T_7), IBA 1.5 mg + Kinetin 2.0 mg/lit (T_8), IBA 2mg + Kinetin 3.0 mg/lit (T_9) and Control/without plant growth enhancer (T_{10}).Observations like days taken for sprouting (days), sprouting percentage (%), average length of sprouts (cm), number of shoots per cutting, average length of shoot per cutting (cm), average diameter of shoot per cutting (mm), number of leaves per cutting, number of primary root, length of primary root (cm), fresh weight of shoot (gm), dry weight of shoot (gm) and survival percentage were recorded. Finally, data was subjected to statistically analysis (Completely Randomized Design) by applying statistical procedure were undertaken on the basis of observations taken during the experiment for ten treatments as method described by Panse and Sukhatme (1967).

Black polythene bags of size 5**x**8 inch with thickness of 200 gauges were used in this experiment. The polythene bags were filled with growing media consisted of sand, soil and well decomposed FYM in the ratio of 1:2:1 and in the bottom of the polythene bags 2-3 holes were made to ensure the drainage. The cuttings were taken from the healthy mother plants and uniform shoots were selected as propagating material. The cuttings were made in 15 cm in length with pencil thickness and having 3-5 nodes. The 10 cuttings were treated in each replication and total 30 cutting were planted in each treatment. Therefore, total 300 cuttings were used for rooting of cuttings. The cuttings were made as a slanting cut at top portion and a smooth horizontal cut at basal portion of cutting.

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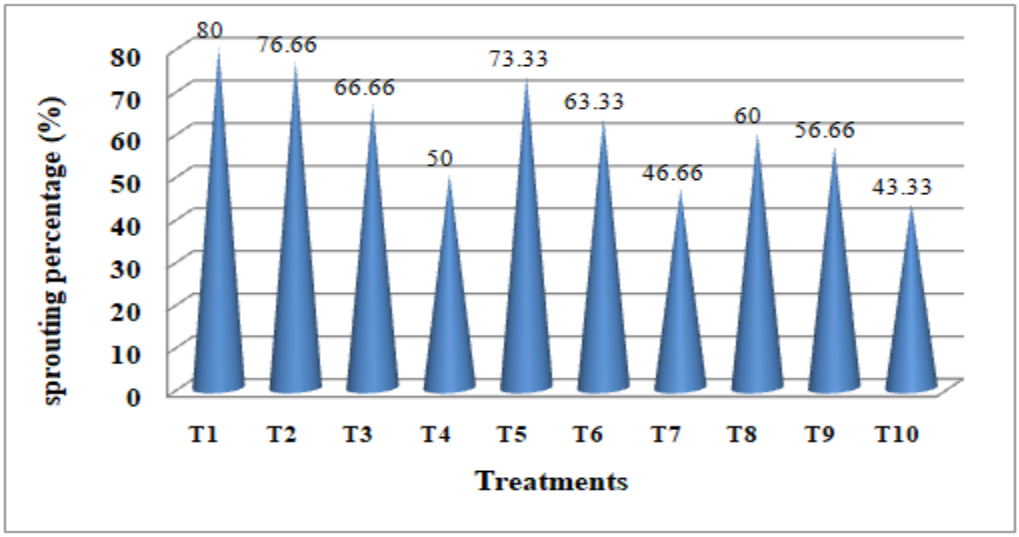
III. RESULTS AND DISCUSSION

Observations related to days taken for sprouting and sprouting percentage are displayed in Table1 and Figure 1.Significantly minimum days taken to sprouting (12.33) and maximum sprouting percentage (80 %) at 30 Days after planting was noted under treatment T_1 (IBA 500 mg/lit) which was found at par with treatment T_2 (IBA 750mg/lit) noted (13.66 days).Indole-3 Butyric Acetic acid (IBA) is the most efficacious plant growth hormone and causes earliness in sprouting, because it is more sustained (Hartmann *et al.* 2002). Early sprouting may have been synergistically affected by the use of IBA. The results are in agreement with Kesari*et al*. (2009)and Bhagya*et al.* (2014). The highest sprouting percentage might be due to the accumulation of carbohydrate in cutting and external use of Indole-3 Butyric Acid. It may affect the survival percentage of cuttings. Umesha*et al*. (2011) also observedearliness in sprouting, and greater development of shoot, through longer cuttings (1-3 node) of vanilla.

Table 1: Effect of different plant growth enhancers on days taken for sprouting and sprouting percentage (%)

Treatments	Days taken for sprouting	Sprouting percentage (%)
T_1 (IBA 500mg/lit)	12.33	80.00
T_2 (IBA 750mg/lit)	13.66	76.66
T_3 (IAA 500mg/lit)	14.00	66.66
T_4 (IAA 750mg/lit)	15.00	50.00
T_5 (NAA 500mg/lit)	13.33	73.33
T_6 (NAA 750mg/lit)	14.33	63.33
T_7 (Moringa leaves extract 30ml/lit)	19.00	46.66
T_8(IBA 1.5mg+ Kinetin 2mg/lit)	17.33	60.00
T_9 (IBA 2mg + Kinetin 3mg/lit)	15.66	56.66
T_{10} (Control /without plant growth enhancers)	21.66	43.33
SEm ±	0.380	3.801
C.D. at 5%	1.129	11.21
CV	4.211	10.67

Figure 1: Effect of different plant growth enhancers on sprouting percentage (%)



Observations related to average length of sprouts per cutting, number of shoots, average length of shoots per cutting, number of leaves per cutting and average diameter of shoots per cutting are showed in Table 2. Average length of sprouts per cutting showed not significant at 90 Days After Planting under study, whereas treatment T_1 (IBA 500 mg/lit) and T_5 (NAA 500 mg/lit)showed significantly maximum number of shoots (3.99, 4.21),maximum average length of shoots per cutting (38.36 cm,36.94 cm) and higher number of leaves per cutting (13.77, 12.88) respectivelyat 90 days after planting.In combination with application of IBA and higher amount of reserved food material present in nodal cuttings may have established a better root system that results in more number of shoots and higher number of leaves(Hartmann *et al.* (2002). On other hand, treatment T_8 (IBA 1.5 mg + Kinetin 2 mg/lit) significantly exhibited maximum diameter of shoots per cutting (4.37 cm) at 90 days after planting, which was found at par with T_2 treatment (IBA 750 mg/lit) noted (3.95 cm). Probably the reason may be due to that the auxins, IBA activates the stem growth and leaf growth. The current findings are in agreement with Khan *et al.* (2011) in tomato and Murthy *et al.* (2010) in vanilla.

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Table 2 Effect of different plant growth enhancers on propagation through betelvine cutting

Treatments	Average length of sprouts per cutting (cm)	Number of shoots per cutting	Average length of shoots per cutting (cm)	Number of leaves per cutting	Average diameter of shoots per cutting (mm)
T_1 (IBA 500mg/lit)	1.95	3.99	38.36	13.77	2.74
T_2 (IBA 750mg/lit)	1.99	3.77	36.67	12.77	3.95
T_3 (IAA 500mg/lit)	1.92	3.33	35.79	8.10	3.69
T_4 (IAA 750mg/lit)	1.88	2.88	33.15	10.66	2.92
T_5 (NAA 500mg/lit)	1.97	4.21	36.94	12.88	2.39
T_6 (NAA 750mg/lit)	1.89	3.11	35.16	11.10	3.52
T_7 (Moringa leaves extract 30ml/lit)	1.78	1.77	31.34	8.88	1.99
T_8(IBA 1.5mg+ Kinetin 2mg/lit)	1.80	2.33	32.48	12.21	4.37
T_9 (IBA 2mg + Kinetin 3mg/lit)	1.86	2.66	32.50	9.88	3.16
T_{10} (Control /without plant growth enhancers)	1.71	1.66	30.71	9.66	3.82
SEm±	0.105	0.217	0.401	0.353	0.060
C.D. at 5%	NS	0.644	1.192	1.049	0.177
CV	9.896	12.617	2.028	5.562	3.169

Observations related to Number of primary roots was calculated at 90 days after planting and showed in Table 3. Perusal of data indicates that treatment T_1 (IBA 500 mg/lit) recorded significantly maximum number of primary roots per cutting (14.99), followed by T_5 treatment (NAA 500 mg/lit) noted (13.44), whereas treatment T_2 (IBA 750 mg/lit) recorded maximum average length of primary roots (21.75 cm) which was non-significant with T_5 treatment (NAA 500 mg/lit) (20.58 cm). It may be because of assembled nitrogenous substance and hydrolysis of carbohydrates at the basal end of the cutting, that increases the process of cell division and elongation. Prompt callus formation resulting increase in no. of primary roots. The current research is in concurrent with Gohil (2014) in cashewnut.

Table 3 Effect of different plant growth enhancers on variousgrowths attributes

Treatments	Number of primary root	Average length of primary roots (cm)	Fresh weight of shoot (gm)	Dry weight of shoot (gm)	Survival percentage (%)
T_1 (IBA 500mg/lit)	14.99	19.62	8.97	3.68	83.33
T_2 (IBA 750mg/lit)	12.66	21.75	7.59	3.48	81.54
T_3 (IAA 500mg/lit)	12.32	17.60	6.61	2.94	75.39
T_4 (IAA 750mg/lit)	9.99	15.15	6.08	2.26	72.69
T_5 (NAA 500mg/lit)	13.44	20.58	7.30	3.20	82.14
T_6 (NAA 750mg/lit)	10.11	16.96	6.59	2.54	73.80
T_7 (Moringa leaves extract 30ml/lit)	7.77	10.34	4.82	1.18	65.00
T_8(IBA 1.5mg+ Kinetin 2mg/lit)	8.66	12.50	5.84	1.20	67.22
T_9 (IBA 2mg + Kinetin 3mg/lit)	9.44	13.75	5.92	1.83	71.10
T_{10} (Control /without plant growth enhancers)	6.77	11.67	3.23	1.01	61.66
SEm±	0.573	0.460	0.459	0.054	4.939
C.D. at 5%	1.702	1.367	1.364	0.160	NS
CV	9.343	4.985	12.630	3.985	11.65

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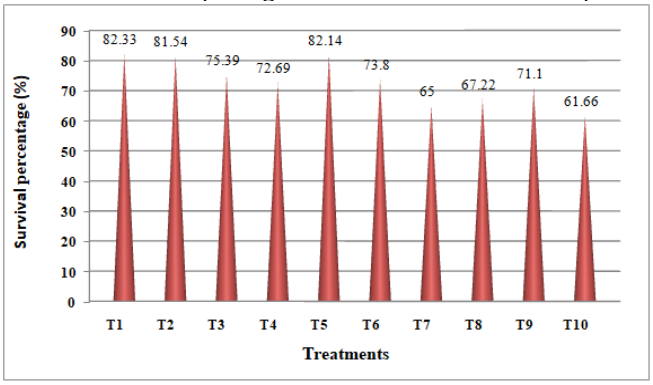
The characters fresh weight of shoot (gm)and dry weight of shoots (gm) were recorded at 90 days after planting and presented in Table 3. The result revealed that the significantly maximum fresh weight of shoots (8.97 gm) and maximum dry weight of shoots (3.68 gm) was noted by the treatment T_1 (IBA 500 mg/lit) followed by T_2 treatment (IBA 750 mg/lit).This is probably because of early sprouting, increase in number of leaves and leaf area as well as higher fresh weight of shoots. The present finding was supported by Shukla and Bist (1994) in Pear.

Observations onsurvival percentage was calculated at 90 days after planting and showed in Table 3 and Figure 2. It is evident from findings that the effect of different plant growth enhancers had shown no significant effect with respect to survival percentage. The highest (83.33%)survival percentage was calculated with T_1treatment (IBA 500 mg/lit) followed by T_5 treatment (NAA 500 mg/lit) (82.14%). Plant growth regulator IBA (Indole-3 Butyric Acid) increased the survival percentage of the cuttings in various fruit crops (citrus, grape, plum, pear, peach, olive and apple. This present findings are in agreement with Jan *et al*. (2015) and Soni*et al*. (2016).

Figure 2 Effect of different plant growth enhancers on survival percentage (%)



Standardized propagation technique for easy & fast multiplication in betelvine

IV. CONSLUSION

The result indicated that T_1 (IBA 500 mg / lit) was higher for characters, i.e. Days taken for sprouting (12.33 days), Sprouting Percentage (80%), Number of leaves per cutting (13.77), Average shoot length per cutting (38.36cm), Number of primary roots (14.99), Fresh shoot weight (8.97g), Dry shoot weight (3.68g) and Survival percentage (83.33%).

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