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SHORT COMMUNICATION

EFFECT OF INDOLE BUTYRIC ACID ON GROWTH OF *Bambusa vulgaris* Schrad. ex J. C. Wendl. STEM CUTTINGS

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ABSTRACT

A study was carried out to examine the response of *Bambusa vulgaris* stem cuttings to different concentrations of Indole butyric acid (IBA). Two node cuttings of *Bambusa vulgaris* of similar sizes were obtained from mother plants using secateur and treated with IBA at concentration levels of 50 mol., 100 mol., 150 mol., and 0 mol.,as control. They were planted direct in plastic pots containing sterilized river sand and laid out in completely randomized block design and replicated three times in a propagator. The parameters studied were number of leaves per plant, leaf area, culm diameter, biomass and carbon stock, which were assessed weekly for a period of 12 weeks. The data were subjected to analysis of variance (ANOVA) and means were separated using the least significant difference (LSD) at 5% probability level. Significant differences ($P<0.05$) were observed for all the parameters studied. Stem cuttings with 150 mol. of Indole butyric acid produced the highest number of leaves (9 leaves), largest leaf area of 18.20 $cm^2$and culm diameter of 1.90 cm and highest carbon stock of 14.29 g. Stem cuttings with 100 mol. of Indole butyric acid had largest biomas while, those without Indole butyric acid had the lowest performance for all the characters studied.

KEYWORDS: *Bambusa vulgaris*, stem cuttings, indole butyric acid, root initiation, growth parameters.

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INTRODUCTION

Bambusa vulgaris (bamboo) belongs to the family *Poaceae*. It is a plant with wide variety of purposes such as rehabilitation of degraded forest land, afforestation (Etukudo, 2003), biomass regeneration, carbon sequestration, erosion prevention and water shade protection. The culms of bamboos can be used as materials for house constructions, agricultural and fishery tools and as craft materials (Dransfiled, 1992). It can also be used for fencing and construction works especially for small temporary shelters, including flooring, roof tiles, panelling and construction of walls with whole or split culms. The culm is also used to make many parts of boats, including masts, rudders, outriggers, wind-breakers and flutes and distillation pipes. It is an industrial raw material for paper pulp. It can also be crushed and used for particle boards and flexible packaging grade paper (Aydhya, 2000). The young shoots are important as food materials as well (Chang, 1997).

Bamboos are now considered as prime renewable resources for biomass production. The importance of bamboo as a potential modulator of global environment has been reported (Bystriakova *et al*., 2004). Therefore, the development of bamboo plant could be highly beneficial to man and ecology. For these reasons, development of bamboo forest

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for stable supply of useful materials and extraction of metabolites for production of new functional chemicals is essential. Utilization of renewable fuel from bamboo can save vast natural forest resources and non-renewable fossil fuel such as mine coal, oil and gas. Direct chemical extractions have been obtained from different part of a bamboo plant such as antioxidant, pro -oxidant, antibacterial and aromatic compounds (Zhang, 2000).

Mostly half of the global deforestation and illegal logging of bamboos is due to the harvesting of fuel wood. The situation is worse in most of the developing countries. Africa particularly suffers from deforestation due to dependence on it for fuel energy. Already, with the present available technologies, bamboo production for energy use may well make a significant contribution to the current and future energy needs of developing world. Bamboo plays a significant role in climate change mitigation and sustainable economic development in the world (Uchimura, 1990). Indole butyric acid is among the common chemicals used to promote the formation of roots in plants (Farrelly, 1984). IBA is a white to light yellow crystalline solid, which melts at 125^{o}C under atmospheric pressure and decomposes before boiling. It is used as plant hormone and is an ingredient in many commercial horticultural plant rooting products. IBA is used to initiate root formation *in vitro* in micro propagation (Strivastava, 2002). The major problem facing bamboo in Nigeria is the difficulties associated with breeding using sexual method because it generally flowers only toward the end of its life span. The used of rhizomes and off shoots may not be practical because of their low viability.

Though propagation of *Bambusa vulgaris* from other plant parts is more economical method, plants regenerated from rhizome and off shoots tend to have low sprouting vigour and this could discourage farmers from investing into the business (Strivastava, 2002).Few researches on *Bambusa vulgaris* in the tropical region have led to little awareness and progress on the potential of the plant. Thus, the purpose of the study was to determine the most appropriate concentration of Indole butyric acid for propagation of *Bambusa vulgaris* by stem cutting as a means of improving its production and sustainability.

MATERIALS AND METHODS

Experimental Site

The study was carried out at Horticultural Nursery Unit of the Federal College of Forestry, Jericho hill, Ibadan, Oyo State. The institution lies within latitude 7^{o} 26$^{'}$ W and longitude 3^{o} 54$^{'}$ E of the Greenwich meridian. The climatic condition of the area is dominated by rainfall pattern ranging from 1300mm-1500mm with an average temperature of 28^{o}C. The area experiences two different seasons which are dry and wet seasons (Agro-meteorological station of Forestry Research Institute of Nigeria, 2011).

Sources of Experimental Materials

Two-node cuttings of *Bambusa vulgaris* were obtained from mother plants at the Forestry Research Institute of Nigeria (FRIN), Jericho hill, Ibadan, Oyo State. River sand was collected from a stream, besides the Central Nursery (FRIN). The Indole butyric acid (IBA) hormone was procured from the University of Ibadan. Standard propagator, secateur, hand trowel, vernier callipers, cutlass, measuring ruler, field notebook, pen, paper cello tape, plastic tray and permanent marker were also used for the experiment.

Experimental Procedure

Sharp cutlass and secateurs were used for cross cutting of *Bambusa vulgaris* into two- node cuttings. Care was taken so as not to injure any portion of the cuttings, especially the dormant buds. All prepared stem cuttings were treated with Indole butyric acid (IBA) diluted with distilled water and prepared at 50 mol., 100 mol. and 150 mol. and 0 mol. concentrations. Ten stem cuttings were “quick dipped” into each of the treatments before being planted. The cuttings were planted direct into plastic pots containing sterilized river sand in a propagator to initiate root system of their own. The treatments were laid out in a randomized complete block design and replicated three times. There were 30 cuttings for each treatment. All pots were labelled corresponding to each treatment inside the propagator and given 25cl of water daily and monitored every day for sprouting. Data collection started three weeks after planting of the stem cuttings, and readings were taken at 2 weeks interval for a period of 12 weeks. Characters

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studied were number of leaves per plant, culm diameter (mm), leaf area(cm2) and carbon stock. The treatment and levels were: T1= 50 mol. of diluted IBA hormone, T2= 100 mol. of diluted IBA hormone, T3= 150 mol. of diluted IBA hormone and T4= Control (without IBA).

Number of leaves per plant was counted for each stem cutting from the base to the tip of the plant. Culm diameter was measured with the aid of vernier callipers in millimetre. The length and width of leaves of tagged plants were measured in centimetre and their mean multiplied to obtain a value which is then further multiplied with the correction factor (0.74). The final value was taken for the leaf area for each plant which received a particular treatment. The fresh weight of the plant was measured with the use of weighing balance in grams, while the dry weight was obtained by drying the plant in an oven at 105^{o}C for 4 hrs and then allowed to cool before being weighed to obtain the final weight.

Data Analysis

The data obtained were subjected to Analysis of variance (ANOVA) and means separated with the least significant difference (LSD) at 5% probability level.

RESULTS AND DISCUSSION

Number of leaves per plant

The result for number of leaves per plant of *Bambusa vulgaris* indicated significant differences (P <0.05) when treated with different levels of IBA. Stem cuttings treated with 150mol of IBA produced the highest numbers of leaves (9 leaves), followed by 50 mol. of IBA with 4 leaves, while the control gave the lowest numbers of leaves (1 leaf). The result was in line with the finding of Strivastava (2002) that different levels of Indole Butyric acid produce varied effects on plants and could be used for plant regeneration.

Table 1: **Leaf count, leaf area, culm diameter, biomass and carbon stock as influenced by IBA concentrations**

Treatment	No. of leaves	Leaf area (cm^2)	Culm diameter (cm)	Biomass(g)	Carbon(g)
$T_{(50}$ mol.)	4	10.17	1.53	22.22	11.11
$T_{2(100}$ mol.)	2	3.23	1.84	28.57	12.50
$T_{3(150}$ mol.)	9	18.20	1.90	25.00	14.29
$T_{4(0}$ mol.)	1	1.27	1.27	20.00	10.00
LSD (P< 0.05)	1.83	6.93	0.700		

Leaf Area (cm^2)

The result for leaf area of*Bambusa vulgaris* treated with 150 mol. of IBA had the largest leaf area of 18.20 cm^2 followed by 50 mol. of IBA with 10.17cm^2, 100 mol. of IBA gave 3.23 cm^2 while those without IBA gave lowest leaf area of 1.27 cm^2. Significant differences (P<0.05) were observed for leaves treated with different IBA concentrations. Harry and Bassey (2009) reported significant (P 0.05) growth in plantain embryos with plant hormone administered at different concentrations.

Culm diameter (cm)

The result revealed that culm diameter treated with 150 mol. of IBA had the highest culm diameter of 1.90 cm, followed by 100 mol. of IBA with 1.84 cm. Stem cuttings with50 mol. of IBA gave 1.53 cm while thosewithout IBA gave the lowest culm diameter of 1.27 cm. However, significant differences were observed among treatment means (P< 0.05). It appears that higher concentrations of Indole butyric acid (IBA) produced greater effects on plant characters than lower quantities of the plant hormone.

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Carbon Stock (g)

The result (Table 1) shows that 150 mol. of IBA gave highest carbon stock of 14.29 g, followed by 100 mol. of IBA with 12.50 g while 50 mol. of IBA gave 11.11 g. Stem cuttings without IBA gave lowest performance of 10.00 g. the behaviour of stem cutting with IBA for carbon stock follow the same trend as for culm diameter indicating that higher doses of IBA creates effect than lower doses. For biomass, 100 mol. of IBA induced higher biomass than other treatments.

CONCLUSION

The study shows that Indole butyric acid (IBA) hormone contributes to effective propagation of *Bambusa vulgaris* stem cuttings and revealed that the plant requires IBA Hormone for fast growth. However, IBA at 150mol concentration has the best performance and can be used to improve the growth of the species.

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