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RESPONSE OF SHOOTING HORMONES ON THE STEM CUTTINGS OF *Khaya ivorensis* A. Chev.

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ABSTRACT

The study investigated the effect of different hormones on the stem cuttings of Khaya ivorensis. The experiment was made up of five treatments which are (treatment one) Benzyl Amino Purine at 0.01gm/m level of concentration, (treatment two) kinetin at 0.01gm/m level of concentration, (treatment three) combination of both kinetin and benzyl amino purine, (treatment four) coconut water, and (treatment five) distilled water. The experimental design was completely randomized design (CRD). The result obtained showed that kinetin at 0.01gm/m level of concentration had the best performance of shoot height (13.04cm) while the least was the distilled water (4.27cm), combination of both kinetin and benzyl amino purine (6.54) gave the best performance in terms of number of leaves and the least was distilled water (4.68). For stem diameter, kinetin had the best performance (0.34mm) while the least was coconut water and distilled water (0.26mm). Based on the result of this study, it is concluded that kinetin is the best hormone for raising *Khaya ivorensis* and further study is recommended to be carried out at higher concentrations to determine the best concentration of hormones for optimal growth.

Keywords: Phyto-hormones, vegetative propagation, stem cuttings, *Khaya ivorensis*

INTRODUCTION

Plant hormones also known as phyto-hormones are chemicals that regulate plant growth, they are produced within the plant and occur in extremely low concentrations (Daphthne, 2005).

Hormones determine the formation of flowers, stem, leaves, shedding of leaves, sex of flower, senescence of leaves (Rost and Elliot, 1979). Hormones also determine plant longevity and even plant death. Hormones are vital to plant growth and if lacking them, plant would be mostly a mass of undifferentiated cell. Lack of hormone in the plant has always been known to cause abnormal growth (Stravistava, 2002). Olaniyan *et al*. (2006) reported the effects of varieties and local rooting hormones on air layering of sweet orange using coconut water and de-ionized water. It was observed that coconut water medium and distilled water treatments played little role in boosting root development in marcotting sweet orange varieties. Coconut water has been reported to contain water (950,000ppm), protein (1000ppm), fat (1000ppm), mineral water (4,000ppm), starch (40,000ppm), calcium (200ppm), phosphorus (10ppm) and iron ($5x10^6$) (Opeke, 2005).

Khaya ivorensis is an indigenous tree species, which belongs to the Meliaceae family. It is commonly referred to as Lagos mahogany, its importance cannot be overemphasized and includes timber production and medicinal purposes. It occurs in the moist forest where it is recognised by its dark bark, *khaya* is most exported from Nigeria due to its useful purposes. *Khaya ivorensis* is presently at risk of extinction due to its importance to man. Its natural regeneration is very poor, because seeds of *Khaya ivorensis* usually lose viability after two weeks of falling from the mother tree. (Orwa *et al*., 2009).

Most plants normally reproduce sexually; they all have the ability for vegetative propagation. This is because the meristematic cells can be differentiated according to the stage of growth, location of the plant and environmental condition (Klein, 2008).

Some of the principal constraints in indigenous tree production include long juvenile stage, genetic variability and lack of adequate knowledge on the cultivation of the species, slow

growth and late maturity (Hartmann *et al*, 1990; Opeke, 2005). Vegetative propagation which is achievable through reproduction from vegetative parts of the plant is a very useful technique for maintaining and preserving genetic characteristics of the plant (Hendromono, 1996). The presence of necessary genetic information in every plant cell to regenerate the entire plant affords this opportunity (Teiklehaimanot *et al.*, 1996).

In a wide sense, methods of vegetative propagation include: cutting, layering, budding, grafting, and tissue cultures. But cutting is the most common vegetative propagation method where parts of the 'parent' plant are removed and placed in a suitable environment so that they can grow into a whole new plant (the clone), which is generally identical to the parent plant (Hartman and Kester, 1983). Cutting exploits the ability of the plant to grow adventitious root, for instance, root material can regenerate from a location other than the existing or primary root system (either from a leaf or cut stem) under certain conditions (Ogunleye and Parakoyi, 2003). The study therefore investigated the reaction of *khaya ivorensis* cuttings to different growth hormones and determine the best among the growth hormones for *Khaya ivorensis* vegetative propagation.

MATERIALS AND METHODS

The seedlings of *Khaya ivorensis* were procured at Forestry Research Institute of Nigeria, Ibadan, and the cuttings were prepared with each stem having four nodes. About 0.1mg/ml each of Benzyl Amino Purine (BAP), Kinetin (K), Coconut Water (CW), combination of BAP and KA (BK) and Distilled Water (DW) were prepared and measured into different containers. The cuttings were dipped inside these hormones for sixty seconds (60s) and were immediately planted into polythene pots filled with soil. The experiment was arranged in CRD, replicated five (5) times and was monitored for twelve (12) weeks. The parameters assessed were plant height, shoot diameter and leaf production.

RESULTS

From Table 1 below**,** the greatest plant height was observed with Kinetin and the least was observed in distilled water, however, both Kinetin and the combination of BAP and Kinetin (BK) were significantly different from other hormones. The highest number of leaves was found in cuttings treated with the combination of BAP and Kinetin (BK) and was significantly different from the other growth hormones. There were no significant differences among the hormones for the stem diameter of *Khaya ivorensis* cuttings.

Table 1: Follow-up table showing effects of growth hormones on plant height, leaf production and stem diameter of *Khaya ivorensis* cuttings.

Treatments	Plant height (cm)	Number of leaves	Stem diameter(mm)
BAP	10.10ab	5.76ab	0.28a
K	13.04a	5.99ab	0.34a
BK	12.44a	6.54a	0.30a
CW	6.50bc	5.55ab	0.26a
DW	4.27c	4.68b	0.26a
Grand mean	9.27	5.70	0.28
L.S.D	4.87	2.28	0.07
% CV	39.79	30.28	19.64

Cumulative Variance (CV) %, Least Significant Difference (LSD).

Plant Height

The ANOVA table (Table 2 below) revealed that there were significant differences among the treatments at 1% level of probability on the height of *Khaya ivorensis* seedlings

Table 2: Analysis of Variance for Plant height of *Khaya ivorensis* seedlings.

SV	DF	SS	MS	F	P
Treatment	4	288.12	72.03	5.29**	0.0045
Error	20	272.08	13.60		
Total	24	560.20			

Note **-significant at 1% level of probability. ($p<.01$)

The result from plant height showed that seedlings treated with K. have the best shoot performance with mean value of 13.04cm (Table1). Plants treated with B.K 0.1gm/ml (BAP+K) performed second best with 12.44cm in shoot height while DW (Distilled Water) had the least shoot height with mean value of 4.27cm, the follow-up test also showed that K and B.K treatments were significantly different from others.

Leaf Production

The result in table 3 showed that there were significant differences among the treatments at 5% level of probability for number of leaves produced by the plant and the follow up test performed (table 1) indicated that B.K. 0.1gm/ml (BAP+K) gave the best yield in leaf production with mean value of 6.54 followed by K 5.99 (Kinetin) while seedlings treated with DW (4.68) performed least.

Table 3: Analysis of Variance for number of leaves of *Khaya ivorensis* seedlings.

SV	DF	SS	MS	F	P
Treatment	4	9.22	2.30	0.77 **	0.005
Error	20	59.71	2.98		
Total	24	68.94			

Note **-significant at 1% level of probability. (p<.05)

Stem Diameter

The results from the table below (Table 4) showed that there is no significant difference among the treatments applied on the stem diameter of *Khaya ivorensis* seedlings at 5% level of probability.

Table 4: Analysis of Variance for stem diameter of *Khaya ivorensis* seedlings.

SV	DF	SS	MS	F	P
Treatment	4	0.0022	0.0056	1.75 ns	0.1787
Error	20	0.064	0.0032		
Total	24	0.086			

Note: NS - not significant (p>=.05).

However, from the results it was evident that seedlings treated with K (Kinetin) had the best stem diameter with mean value of 0.34mm followed by B.K (BAP+K) 0.30 and DW and CW had the lowest figure with the mean value of 0.26mm (Table 1)

During the experiment, it was observed that Kinetin at 0.1gm/ml had the highest sprout rate of 100%, BAP with 80% and B.K with 60% with five (5) days after setting in the soil while the Coconut water and Distilled water had the least of 40% and sprouted eight (8) days after settings.

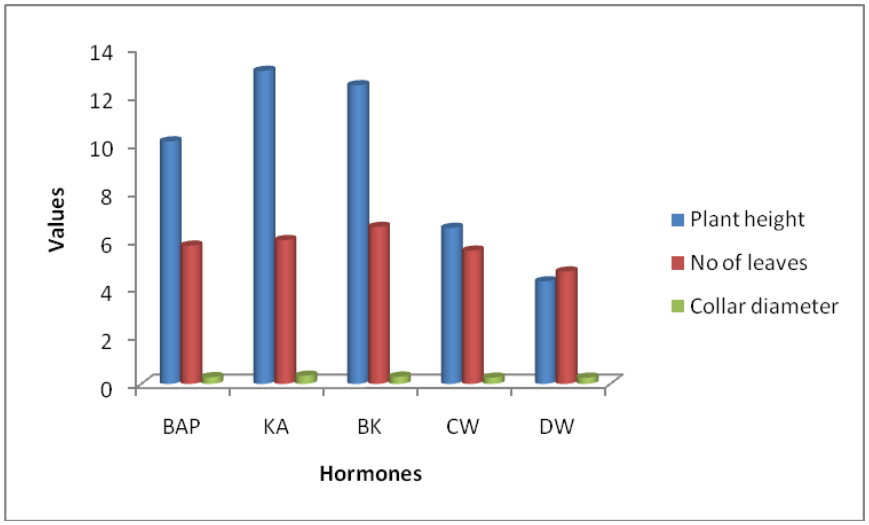

Figure 1: Effects of hormones on plant height, number of leaves and collar diameter

DISCUSSION

Hormonal effects on plants have been investigated by several authors with different results (Nakasone and Paul, 1999; Awodoyin and Olaniyan, 2000), Frimpong *et al.,* (1991) reported that stem cuttings of *V. paradoxa* root with difficulty, producing poor and inconsistent results, while in Ghana cuttings of plants yielded best results at higher concentrations. The success of hormonal treatments of plants depends on the stage of development of the plant used and the concentrations of hormones among others as Frimpong and Adomako (1987) observed best results when cuttings came from trees in the early stages of flowering.

Vlabu *et. al*. (2000), asserted that Kinetin has the ability to increase plant chlorophyll and adequate application of kinetin aid growth in plants. In this experiment, K.A was found to induce more sprouting than other treatments which also confirmed the findings of Shiral and Patil (1995) on vegetative propagation of *Ixora species* using different growth hormones at different levels.

CONCLUSION

The result obtained from the study revealed that the best treatment to be used for raising *Khaya ivorensis* through vegetative propagation is kinetin acid at 0.1gm/ml level of concentration as the treatment had the best performance in supporting the growth of *Khaya ivorensis* in both plant height and stem diameter.

Recommendation

Based on the result of this study, it is reccommended that kinetin is the best hormone for raising *Khaya ivorensis* and that further study should be carried out at higher concentrations to determine the best concentration of hormones for optimal growth.

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