International Journal of Research in Agricultural Sciences
Volume 3, Issue 2, ISSN (Online): 2348 – 3997)

# Effects of Rooting Hormones on the Juvenile Stem Cuttings of *Dioscoreophyllum Cumminssi* (Stapf) Diels (Serendipity Berry)

**T. O. Bamigboye**
Department of Crop Production Technology, Federal College of Forestry, Ibadan, Oyo State, Nigeria

**J. Kayode**
Department of Plant Science, Ekiti State University,Ado-Ekiti, Ekiti State, Nigeria.
Correspondence Author E.mail: joshua.kayode@eksu.edu.ng

**M. Obembe**
Department of Plant Science, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria

***Abstract*** **– The effect of some rooting hormones on the juvenile stem cuttings of *Dioscoreophyllum cumminssi* was investigated. Uniform, healthy, single node leafy stem cuttings were obtained from eighty (80) uniformly growing seedlings. The cuttings were treated with 1mg/ml of indole butyric acid (IBA), 1mg/ml of indole acetic acid (IAA), coconut water and distil water as control, using the quick dip method. The percentage survival of the cuttings, percentage of die back, number of new roots formed per cutting, length of new roots formed, and number of new shoot were assessed after 60 days. Results obtained revealed that the species responded differently to the four treatments and significant differences abound between all the treatments. Indo butyric acid had the highest survivor percentage (80%) and indo acetic acid had the lowest (20%). Also, significant differences abound in the numbers of roots. Coconut water had the highest mean value (21.25) and IAA had the least (5.50). Coconut water also had the highest mean value for new shoot but there was no significant difference between the values obtained from coconut water and IBA. Similarly significant differences were not observed between the values obtained from IAA and distil water. Results from the root length revealed that IBA had the highest mean value however no significant difference was observed between IBA and coconut water as well as the values obtained in IAA and distil water. Thus the use of natural growth hormone might enhance the development of the stem cuttings of this species from the wild.**

***Keywords*** **– Rooting Hormones, Juvenile Stem Cuttings, Dioscoreophyllum Cumminssi.**

## I. INTRODUCTION

Wild fruits form a staple food during the hunger periods in the agricultural cycle, especially in rural areas where rural households relied on fruits as a coping strategy during critical seasonal hunger period which usually lasts for about three to four months per year [1]. The fruit ripen at different times of the year and can be targeted to meet the food needs of rural households [2, [3]. In addition, households that engage in their cultivation had higher returns, higher productivity per hectare and enjoyed a stable resource-base.

Unfortunately, many of the wild fruits are now threatened plant species in the Nigeria because of massive habitat loss and fragmentation. Their conservation are now required as a salvage programme [4]. One of these species is *Dioscoreophyllum cumminsii* (Stapf) Diels (Serendipity berry). It is a dioecious annual liana found as a late successional, understorey species in West African semi-deciduous forests. The fruits and subterranean tubers are intensely sweet and are both edible. The sweetening substance in *D. cumminsii* is a protein (monellin), which is 3000 times as sweet as sugar.

Previous efforts made to domesticate some of the forest fruit species have showed little or no success due to inadequate silvicultural knowledge about their mode of planting [5], soil type, suitable nutrient requirements, nursery techniques and early growth behaviour, that will guarantee effective seed germination [6]. Delay in germination in the nursery is another serious constraint to the domestication of these species. Indeed, previous reports such as [7] and [8] asserted that knowledge of reproductive biology is very limited for most tropical fruit species. Thus the need for thorough investigation to minimize the delay in germination is imperative for the domestication of the species. Hence, the study being reported here investigated the effect of some rooting hormones on the juvenile stem cuttings of *Dioscoreophyllum cumminssi.*

## II. MATERIALS AND METHODS

Seeds of *D. cumminsii* were collected from south west Nigeria and used to raise seedlings under a propagator chamber. Two months after germination, uniform, healthy, single node leafy stem cuttings were obtained from eighty (80) uniformly growing seedlings. The cuttings were treated with 1mg/ml of indole butyric acid (IBA), 1mg/ml of indole acetic acid (IAA), coconut water, a local rooting hormone according to [9], and distil water (control).

The quick dip method, according to the standard procedure described by [10], was used. The single node cuttings were dipped into the hormones at the basal portion (0.5cm) of the cuttings for about five (5) seconds and set in washed and sterilized river sand medium. Watering was done twice daily with a knapsack sprayer. The cuttings were assessed for the following parameters after 60 days: percentage survival which was determined as the number of living plants per total cutting planted per treatment; percentage of die back, number of new roots formed per cutting, length of new roots formed, and number of new shoot.

The data collected was subjected to percentages and analysis of variance (ANOVA) was carried out on the data collected for the different parameters. Least significant difference (LSD), at 5% probability level, was used to

compare the significantly different means using statistical software package.

## III. Results

The results obtained revealed that seedlings of *D. cumminsii* (Table1) responded differently to the four treatments. There were significant differences between all the treatments. IBA had the highest survivor percentage of 80% mean value, while indo acetic acid had the lowest mean value for percentage survival of 30%. Coconut water showed an appreciable percentage over IAA and distil water.

Table 2 shows that there were significant differences between numbers of roots, coconut water had the highest mean value for numbers of roots with 21.25 while IAA had the least mean value of 5.50, coconut water had the highest mean value for new shoot but there was no significant difference between coconut water and IBA, IAA and distil water had the same mean value for new shoot. There was no significant difference between IBA and coconut water for root length although IBA had a highest mean value for root length, also distil water was not significantly different from IAA.

Table 1. Percentage survivor of *D. comminsii* treated with rooting hormone

| Treatments | Percentage Survivor (%) | Percentage Mortality (%) |
|---|---|---|
| IBA | 80a | 20d |
| IAA | 30d | 70a |
| COCONUT WATER | 70b | 30c |
| DISTIL WATER | 45c | 55b |

Table 2. Effects of Rooting Hormones on Early Growth of *D. cumminsii*

| Treatments | Number of Root | New Shoot | Root Length (cm) |
|---|---|---|---|
| IBA | 16.00b | 4.00a | 1.830a |
| IAA | 5.500d | 1.50b | 0.63b |
| COCONUT WATER | 21.25a | 5.00a | 1.75a |
| DISTIL WATER | 7.75c | 1.50b | 0.58b |

## IV. Discussion

The result of this experiment indicated the important role of determining the optimal rooting medium in the process of vegetative propagation. Retention of leaves seems to be necessary for the cuttings as they do not have very large reserves. The ability of cuttings to survive and produce long and massive roots is very important.

The results further revealed that although IBA had the highest percentage of survival, Coconut water which is a natural hormone competed very well with the synthetic hormone at 80% and 70% survival respectively. Coconut water has been used as a supplement in many laboratories to improve regeneration of plant cells [11],[12], [13],[14], [15], [16], [17]. [18] demonstrated the advantage of coconut water for stem elongation and plant development in fruit species. Coconut water contains mainly water (94%) and growth promoting substances that can influence *in vitro* cultures including inorganic ions, amino acids**,** organic acids, vitamins, sugars, sugar alcohols, lipids, nitrogenous compounds and phytohormones [19]. Similarly, [20], [21] asserted coconut water contains sugar, amino acid, myo-inositol, and micro constituents of phenyl urea for tree development. Hence this explains the reason why Cocogro, an extract of coconut water, that is less expensive than imported growth hormones but equally effective is usually utilized [22].

Results obtained in this study revealed that the control (distil water) had better sprouting percentage than the one soaked in IAA. This observation tends to confirm the earlier report of [23], who asserted that untreated cuttings performed better than any other hormones on survival and sprouting of *J. curcas*. This might be attributed to the fact that juvenile tissues of certain plants tend to have higher phenols than their mature forms. The findings from this study agree with [24] who recorded the highest rooting rate (50%) for *Aesculus indica* cuttings treated with IBA at 2000ppm. [25] also observed a similar trend in the vegetative propagation of *Stereospermum suaveolens* with cuttings treated with 0.2% IBA producing the longest root.

## V. Conclusion

This study provides preliminary results concerning vegetative propagation of *D. cumminssi*. Since this wild fruit species exhibited some growth difficulty when planted directly from seeds due to some dormancy, planting of stem cuttings from the wild can be adopted using the natural growth hormone with the method of quick dip.

## VI. Acknowledgment

We acknowledge the receipt of TETFUND grant through Ekiti State University, Ado-Ekiti, Nigeria this study.

## Reference

[1] F. K., Akinnifesi, F. R. Kwesiga, J. Mhango, A. Mkonda, T. Chilanga and R. Swai, Domesticating priority miombo indigenous fruit trees as a promising livelihood option for smallholder farmers in southern Africa. Acta Horticulturae, 2004, 632:15-30.

[2] F. K. Akinnifesi, F. Kwesiga, J. Mhango, T. Chilanga, A. Mkonda, C. A. C. Kadu, I. Kadzere, D. Mithöfer, J. D. K. Saka, G. Sileshi, T. Ramadhani, P. Dhliwayo. Towards the development of miombo fruit trees as commercial tree crops in southern Africa. For, Trees Livelihoods, 2006, 16: 103-121.

[3] B. A. Jama., A. M. Mohammed, J. Mulaya and A, N, Njui. Comparing the 'Big Five': A framework for the sustainable management of indigenous fruit trees in the drylands of East and Central Africa. *Ecological Indicators* 2007

[4] G. I. B. Obioh and A. O. Isichei**.** A population viability analysis of serendipity berry (*Dioscoreophyllum cumminsii*) in a semi-deciduous forest in Nigeria. *Ecological Modelling,* 2006, 201(3 and 4), 558–562.

[5] J. Kayode and T.O.Bamigboye. Assessment of on-farm cultivation and conservation of indigenous fruit species in Ekiti State, Nigeria. Accepted by Journal of Agriculture and Ecology Research International, 2016, 7(3), 1-6.

[6] A. O. Akinyele. Effects of growth hormones, rooting media and leaf size on juvenile stem cuttings of *Buchholzia coriacea* Engler. *Ann. For. Res.* 2010, 53(2): 127-133.

[7] K. S. Bawa, P. S. Ashton and M. N. Salleh. Reproductive Ecology of Tropical Forest Plants, Management issues. Pp. 3-13, In Bawa K. S. and Hadley M. (Eds). Man and Biosphere Series, Vol. 7. UNESCO/Parthenon Publishing, Paris,1990.

[8] NRC. Managing Global Genetic Resources: Forest Trees. Committee on Managing Global Genetic Resources, Agricultural Imperatives Sub-Comittee on Managing Plant Genetic Resources. Forest Genetic Resources Workgroup Board on Agricultural Resources Committee. National Academy of Sciences, National Academy Press, Washinton DC, 1990..

[9] A. A. Olaniyan, J.A., Fagbayide, and H.G. Adewusi. (2006)**.** Effects of varieties and local rooting hormones on air layering of sweet orange (*Citrus sinensis* (L.) Osbeck) in Ibadan. Proceedings of the 24th Annual Conference of the Horticultural Society of Nigeria. 17th- 22nd September, 2006.

[10] H. J. Hartmann, D. E. Kester, F. I. Davies and R. L. Geneve**.** *Plant propagation:Principle and practices.* 6th edition. New Jersey: Prentice Hall .1997, 770pp.

[11] Y.Yoon, N.M. Hosakatte, J. H. Eun and Y.P. Kee**.** Biomass production of *Anoectochilus formosanus* hayata in a bioreactor system. *Journal of Plant Biology,* 2007, 50 (5), 573-576.

[12] S. Aktar, K. M. Nasiruddin and K. Hossain. Effects of different media and organic additives interaction on *in vitro* regeneration of *Dendrobium* orchid. *J. Agric. Rural Dev.*, 2008, 6: 69-74.

[13] A. Nasib, K. Ali and S. Khan. An optimized and improved method for the *in vitro* propagation of kiwifruit (*Actinidia deliciosa*) using coconut water. *Pak. J. Bot.*, 2008, 40: 2355-2360.

[14] P. Baskaran, P. Velayutham and N. Jayabalan. *In vitro* regeneration of *Melothria maderaspatana* via indirect organogenesis. *In vitro* Cell. *Dev. Biol. Plant*, 2009, 45: 407- 413.

[15] E. J.Cheong, R. Mock and R. Li**.** Optimizing culture medium for meristem tissue culture of several *Saccharum* species and commercial hybrids. *J. Am. Soc. Sugar Cane Technol.*, 2009, 29: 149-165.

[16] Y.J. Pena-Ramirez, J. Juarez-Gomez, L. Gomez-Lopez, J.L. Jeronimo-Perez, I. Garcia-Shesena, J. A. Gonzalez-Rodriguez and M. L. Robert. Multiple adventitious shoot formation in Spanish Red Cedar (*Cedrela odorata* L.) cultured *in vitro* using juvenile and mature tissues: An improved micropropagation protocol for a highly valuable tropical tree species. *In vitro Cell. Dev. Biol.-Plant*, 2010, 46: 149-160.

[17] S. Bhattacharya, T. K. Bandopadhyay and P. D. Ghosh**.** Somatic embryogenesis in *Cymbopogon pendulus* and evaluation of clonal fidelity of regenerants using ISSR marker. *Sci. Horticult.*, 2010, 123: 505-513.

[18] F. I. Trevisan**.** Optimization of in vitro organogenesis in passion fruit (*Passiflora edulis* f. Flavicarpa). *Scientia Agricola* 2005, 62(4), 346-350.

[19] J. W. H. Yong,Y. F. N. Liya-Ge and N. T. The Chemical Composition and Biological Properties of Coconut (*Cocos nucifera* L.) Water. Natural Sciences and Science Education Academic Group, Nanyang Technological University, Nanyang, Singapore, 2009, 14 (12), 5144.

[20] I. A. Acha, H. Shiwachi, R. Asiedu and M. O. Akoroda. Effect of auxins on root development in yam (Discorea rotundata) vine. Tropical Science, 2004, 44: 80 – 84.

[21] S. O.Agele, T. G. Ayankanmi and H. Kikuno, Effects of synthetic hormone substitutes and genotypes on rooting and mini tuber production of vine cuttings obtained from white yam (Dioscorea rotundata Poir). African Journal of Biotechnology, 2010, 9(30), 4714- 4724.

[22] PHNO. Philippine Headline News Online. (2003), www.newsflash.org/2003/05/si/si001595.htm

[23] O. F. Adekola and I. G. Akpan. Effects of Growth Hormones on Sprouting and Rooting of Jatropha Curcasl. Stem Cuttings. J. Appl. Sci. Environ. Manage. 2012, 16 (1), 168.

[24] M. Majeed, M. A. Khan and A. H. Mughal. Vegetative propagation of *Aesculus indica* through stem cuttings treated with plant growth regulators. Journal of Forestry Research, 2009, 20(2): 171-173.

[25] T. K. Baul, M.Mezbahuddin, M. Mohiuddin. Vegetative propagation and initial growth performance of *Stereospermum suaveolens* DC, a wild tropical tree species of medicinal value. New Forests, 2008, 37(3): 375-283.