Applied Tropical Agriculture
Volume 25, No.2, 146- 149, 2020

EFFECTS OF GROWTH HORMONES AND ROOTING MEDIA ON STEM CUTTINGS OF *Parkia biglobosa* (JACQ.)

***Mukhtar, R. B., Inuwa, A. and Dantani, A.**
Department of Forestry and Wildlife Management, Bayero University, Kano
Corresponding author email: rbmukhtar.fwm@buk.edu.ng

Abstract
Parkia biglobosa is an important Agroforestry species, providing many goods and services for sustainable development. In spite of that, its population is decreasing rapidly as a result of over exploitation. In order to promote the propagation of this species for sustainable production, this research investigated the influence of rooting media (top soil, sawdust and river sand) and two different hormones of varied concentrations (Indole-3-Butyric Acid and Indole Acetic Acid at 50, 100 and 150ml/1L concentrations) on the stem cuttings of the species. The data for the study were collected on percentage survival, number of roots, length of longest roots, total root length and number of leaves. Factorial experiment was used in a completely randomized design. The data were analysed with descriptive statistics and analysis of variance. Means were separated with Duncan Multiple Range Tests where there is significant difference ($p<0.05$). Cuttings that were treated with indole-3-acetic acid at 100ml/1L and planted in sawdust (SD/IAA/100ml/1L) produced highest results with 22.2% survival which was similar to 55.53% (SD/IAA/150), with longest (4.76 cm) length of longest root and total roots length (10.36 cm) formed and as such recommended for vegetative propagation of *P. biglobosa.*

Key words: Growth hormones, rooting media, stem cuttings and *P. biglobosa.*

Introduction

Vegetative propagation of fruit trees through stem cuttings is vital for tree improvement and establishment of large plantations within a short time (Mukhtar, 2018). Even though, the possibility of vegetative propagation using hormones is not very clear for many indigenous species, but different methods of vegetative propagation have been used for genotype preservation in clone banks and orchards of many tree species worldwide. However, the influence of many growth hormones is not clear on indigenous tree species (Mukhtar, 2018 and Mukhtar *et al.,* 2016).

P. biglobosa (Jacq.), a perennial leguminous tree of the family *Fabaceae*, is distributed between latitude 5°N and 15°N and longitude 16°W and 32°W from the Atlantic coast in Senegal to the Sudan and northern Uganda in the African continent with greatest belt (about 500km) in West Africa (Oluwafemi *et al*., 2014). The species play a significant ecological role of nutrient cycling (Gbadamosi, 2005 and Udobi *et al*., 2010) and serves as a valuable source of food, especially the seeds which are useful spices for cooking (Oluwafemi *et al*., 2014), medicine, glaze for ceramic pots, fodder, firewood and charcoal production (Olorunmaiye *et al*., 2011). In order to preserve and encourage the sustained utilization of these goods and services, some ex-situ conservation measures like vegetative propagation is vital (Mukhtar, 2018 and Mukhtar *et al.,* 2016).

Materials and Methods

The Study Area

The study was conducted in Aliero area of Kebbi State (12°16′42″Nand Longitude 4°27′6″E). The state is in the Sudan savannah ecological zone with tropical continental type of climate, controlled by tropical maritime and tropical continental air mases, blowing from the Atlantic and the Sahara Desert respectively. The wet season is from May to September and the remaining period of the year is for the dry season. The mean annual rainfall is about 800mm and the temperature is generally high with a mean of 26°C. However, during the harmattan season (December to February), the temperature can go down to about 21°C and up to 40°C during the months of April to June (Mukhtar *et al*., 2016). The study area is characterized by dominant grasses and scattered trees like *Acacia species, Combretum spp.* and *Ziziphus spp.*

Method of data collection

Two nodal stem cuttings (3-5mm diameter) of 4-5cm lengths were obtained from the seedlings of this species which were raised in the nursery using standard procedure and treated with Indo-3-Butyric Acid and Indole Acetic Acid at 0, 50, 100 or 150 mg/1 concentrations using the quick dip method (Mukhtar, 2018). Three cuttings were allocated per auxin concentration and replicated three times. After dipping, the treated cuttings were immediately planted into three (3) different rooting media (top soil only,

river sand and sawdust). A three factor factorial experiment in CRD was adopted. The cuttings were arranged in a Completely Randomized Design in a high humidity propagator and were watered twice a day (morning and evening) with Knapsack sprayer. Cuttings were assessed on percentage survival, number of roots per cuttings (count), length of longest root per-cutting (measured with meter rule), total root length (summed), number of leaves (count).

Method of Data Analyses

Data were analysed using descriptive statistics and Analysis of Variance. Where there was significant difference, Duncan Multiple Range Test was used to separate the means. The SPSS software package (Version 20) was used for the analyses.

Results

Percentage Survival (PS)

The rooting media had no significant effect ($p>0.05$) on percentage survival but hormone concentration and the interaction of rooting media improved PS significantly ($p<0.05$) (Tables 1- 3). IAA/150 (37.02cm) was significantly higher than IBA/100 (3.70cm) (Table 2). SD/IAA/150 (55.53cm) was found to be significantly higher than RS/IBA/100, SD/IBA/0, SD/IBA/100, SD/IBA/150 and SD/IAA/50 which had 0.00 each (Table 3).

Number of Root (NR)

Rooting media, hormone concentration and their interaction had no significant effect ($p>0.05$) on number of root formed by *P. biglobosa* cuttings (Tables 1, 2 and 3).

Length of Longest Root (LLR)

No significant effect was recorded in rooting media and hormone concentration (Tables 1 and 2) though sawdust had LLR of 0.90cm but not significantly different ($p>0.05$) to river sand (0.61cm) (Table 1). IAA/100 had LLR of 1.58cm but was not significant (Table 2). The interaction of rooting media and hormone concentration had significantly ($p<0.05$) improved LLR where SD/IAA/100 had significantly higher LLR (4.76cm) (Table 3).

Total Root Length (TRL)

The interaction of rooting media and hormone concentration had a significant effect on TRL (Table 3) but rooting media and hormone concentration alone did not show any significant effect ($p>0.05$) (Tables 1 and 2). SD/IAA/100 had significantly higher TRL of 10.36cm than other treatment combinations (Table 3).

Number of Leaves (NL)

The Rooting media, hormone concentration and their interaction had no significant effect on number of leaves (Tables 1 - 3). Top soil (2.88), IAA/150 (3.72) and SD/IAA/150 (6.00) was not significantly different from the results of the other treatments.

Table 1: Effect of rooting media on juvenile stem cuttings of *P. biglobosa*

Treatments	PS	NR	LLR(cm)	TRL(cm)	NL
Top soil	24.99	0.79	0.27	1.14	2.88
River sand	22.20	0.52	0.61	1.88	1.43
Saw dust	18.04	0.91	0.90	1.62	2.37
S.E	5.197	0.444	0.325	0.966	0.621
Significance	*ns*	*ns*	*ns*	*ns*	*ns*

PS: Percentage survival; NR: Number of root formed; LLR: Length of longest root; TRL: Total root length; NL: Number of leaves

Table 2: Effect of hormone concentration on Juvenile stem cuttings of *P. biglobosa*

Treatment	PS	NR	LLR(cm)	TRL(cm)	NL
TS/IBA/0	44.43^{ab}	0.00	0.00^{b}	0.00^{b}	4.00
TS/IBA/50	22.20^{ab}	0.66	0.83^{b}	1.16^{b}	1.33
TS/IBA/100	11.10^{ab}	4.33	0.93^{b}	6.93^{ab}	2.66
TS/IBA/150	11.10^{ab}	0.00	0.00^{b}	0.00^{b}	1.66
TS/IAA/0	44.43^{ab}	0.00	0.00^{b}	0.00^{b}	1.66
TS/IAA/50	22.20^{ab}	0.00	0.00^{b}	0.00^{b}	2.00
TS/IAA/100	22.23^{ab}	0.00	0.00^{b}	0.00^{b}	2.16
TS/IAA/150	22.23^{ab}	1.33	0.40^{b}	1.06^{b}	1.16
RS/IBA/0	11.10^{ab}	0.00	0.00^{b}	0.00^{b}	1.66
RS/IBA/50	33.33^{ab}	1.50	1.70^{b}	7.20^{ab}	1.83
RS/IBA/100	0.00^{b}	0.00	0.00^{b}	0.00^{b}	0.00
RS/IBA/150	22.20^{ab}	0.66	1.40^{b}	1.40^{b}	0.33
RS/IAA/0	11.10^{ab}	0.00	0.00^{b}	0.00^{b}	0.00
RS/IAA/50	44.43^{ab}	2.00	1.83^{b}	6.50^{ab}	3.33
RS/IAA/100	22.20^{ab}	0.00	0.00^{b}	0.00^{b}	0.33
RS/IAA/150	33.30^{ab}	0.00	0.00^{b}	0.00^{b}	4.00
SD/IBA/0	0.00^{b}	0.00	0.00^{b}	0.00^{b}	0.00
SD/IBA/50	33.30^{ab}	2.33	2.33^{ab}	2.33^{ab}	3.66
SD/IBA/100	0.00^{b}	0.00	0.00^{b}	0.00^{b}	0.00
SD/IBA/150	0.00^{b}	0.00	0.00^{b}	0.00^{b}	0.00
SD/IAA/0	33.33^{ab}	0.00	0.00^{b}	0.00^{b}	5.66
SD/IAA/50	0.00^{b}	0.00	0.00^{b}	0.00^{b}	0.00
SD/IAA/100	22.20^{ab}	4.00	4.76^{a}	10.36^{a}	3.66
SD/IAA/150	55.53^{a}	1.00	0.16^{b}	0.33^{b}	6.00
S.E	14.700	1.255	0.920	2.733	1.756
Significance	*	*Ns*	*	*	*Ns*

Means followed by the same letter(s) within a column are not significantly different (P>0.05)

Discussion

The growth media and hormone concentrations significantly improved the rate of survival and root growth of *P. biglobosa* cuttings. The type of growing media and hormone concentrations showed similar results on the survival and growth variables that were assessed. This revealed that, vegetative propagation is not an effective means of regenerating *P. biglobosa.* However, the cuttings could be treated with IAA/100ml/1L in sawdust. The poor result obtained could be attributed to the fact that cuttings used for the study had no leaves and based on the findings of Akinyele (2010) and Oboho and Iyadi (2013), the retention of leaves seemed necessary because stored photosynthate in cuttings is required for physiological function and they are produced in leaves for *B. coreacea* and *Garcinia kola*. This however, contradicts the findings of Sally (2012) where the presence and size of leaf on stem cutting were found to be insignificant on *Treculia africana* cuttings. These variations could however be dependent on the type of the species and its characteristics. The findings from this research suggest that, *P. biglobosa* cuttings should be treated with IAA/100ml/1L and planted in sawdust (SD) (SD/IAA/100ml/1L) for vegetative propagation.

Conclusion and Recommendation

The types of rooting media and growth hormones at the concentrations applied in this study were not effective for vegetative propagation of *P. biglobosa* however, cuttings can be treated with IAA/100ml/1L and planted in sawdust media for some improvement.

References

Akinyele, A.O. (2010). Effects of growth hormones, rooting media and leaf size on juvenile stem cuttings of *Buchholzia coriacea* Engler. *Annals of Forest Research*, 53(2):127-133.

Gbadamosi, A.E. (2005). Genetic variation in *Enantia chlorantha* (oliv): A medicinal plant. *Journal of Food, Agriculture and Environment*, 3(1):153-156.

Oboho, E.G. and Iyadi, J.N. (2013). Rooting potential of mature stem cuttings of some forest tree species for vegetative propagation. *Journal of Applied Natural Science*, 5(2):442-446.

Olorunmaiye, K.S., Fatoba, P.O., Adeyemi, O.C. and Olorunmaiye, P.M. (2011). Fruit and seed characteristics among selected *Parkia biglobosa* (JACQ) G. Don population. *Agricultural and Biology Journal of North America*, 2(2):244-249.

Oluwafemi, A., Adenubi, A., Adebayo, O., Ojobo, O., Olumayowa, O., Solomon, A. and Taiwo, O. (2014). Genetic diversity of *Parkia biglobosa* from different agro-ecological zones of Nigeria using RAPD markers. *International Journal of Biodiversity,* 1(1): 1-6.

Sally, A.S. (2012). Effects of auxins and leaf size on rooting of *Treculia africana*, (Decne) stem cuttings. *Science Journal of Environmental Engineering Research*, 1(210):1-5.

Mukhtar, R.B. (2018). Effect of rooting media and hormone concentrations on vegetative propagation of *Balanites aegyptiaca. Journal of Forestry Research*, 30(1):73-76.

Mukhtar, R.B., Isah, A.D., Bello, A.G., and Aliero, A.A. (2016). Vegetative propagation of *Adansonia digitata* (L.) using juvenile stem cuttings, various rooting media and hormone concentrations. *Journal of Research in Forestry, Wildlife and Environment*, 8(4):95-100.

Udobi, C.E., Onaolapo, J.A. and Agunu, A. (2010). Antibacterial potentials of the methanolic extract and aqueous fraction of the stem bark of the African locust bean (*Parkia biglobosa*). *European Journal of Scientific Research*, 43(4):590–602.