



## Response of Selected Ornamentals to Rooting Hormone in Different Propagating Media

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### Abstract

An experiment was conducted in the nursery, the department of Crop, Soil and Pest management the Federal University of Technology, Akure, on stimulation of rooting of three ornamentals; *Rosa spp.*, *Mussaenda philippica* and *Bougainvillea spp.*, (Rose, Queen of Philippines and Bougainvillea respectively) using some rooting substances; Indole-3-Butyric Acid (IBA), Coconut water and Tetracycline, in different propagating media consisting of Topsoil, Coir fiber and Saw dust from July to September, 2012. The experiment was laid out in a Completely Randomized Design (CRD) and replicated three times. Data were collected on number of branches, the number of leaves per cutting, number of roots and length of roots. The results from the study showed that Topsoil had significant ( $P < 0.05$ ) effect on the rooting ability of *Rosa spp.*, and *Bougainvillea spp.*, with cuttings dipped in coconut water having the best performance, while *Mussaenda philippica* cuttings had no roots. Therefore root initiation in cuttings of *Rosa spp.* and *Bougainvillea spp.* could be enhanced when dipped in Coconut water for about five minutes.

### Keywords

Difficult-to-root plants, Plant growth regulator, Growth media, Ornamentals, Stem cuttings

### Introduction

The propagation of plants has been a fundamental occupation of mankind since cultivation began [1,2] hence, the essence of propagation is to increase the number of plants and also to preserve its essential characteristics [3,4] and the ornamental horticulture industry therefore comprises all process relating to growth, production or use of plant materials for aesthetic or functional value.

*Rosa spp.*, *Mussaenda philippica* and *Bougainvillea spp.*, (Rose, Queen of Philippines and Bougainvillea respectively) are important ornamental shrubs that are vegetatively propagated using stem cuttings. Roses are best known as ornamental plants grown for their flowers in gardens and sometimes indoors. They are used for commercial perfumery and cut roses are the favoured flower of wedding bouquets and floral gifts. Some are used as landscape plants, for hedging and for other utilitarian purposes such as game cover and slope stabilization. They also have minor medicinal uses Wikipedia, 2016. Bougainvilleas are widely cultivated as porch, adornments, arbour and ornaments. Their growth habits and beautiful showy bracts make them popular for landscapes. They are also used in mass planting, as shrubs or bushes,

ground covers, as hedge plants, barrier plants and slope coverings, in hanging baskets, and in containers for Bonsai [5]. Queen of Philippines cultivated mainly for its long lasting noticeable and colorful flaggy sepals form an important focal or spot plant in the gardens whenever they are used singularly or in group. They are used to create an accent in entrance, approach to a strategic garden structure or lawn background as hedge and spot plants [6]. Their beautiful colorful flowering twigs also make good cut flower materials for vase or wreath making [7].

The cuttings of these ornamental shrubs are conventionally rooted in containers by horticulturists and later transplanted. They however have a low genetic and physiological capacity for adventitious root formation,

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therefore, limiting their commercial production. Such ornamental plants have been popularly termed “difficult-to-root” as such; there is little ease in the propagation of these ornamentals [8]. Economically, however, the demand for these ornamentals especially in Nigeria necessitates that the difficult-to-root phenomenon be circumvented [9].

Growing media is an important factor in plant propagation; the selection and preparation of the medium is extremely important in terms of plant growth and quality because rooting performance depends on the type of medium used in propagation [10]. This is especially important in our country where the different types of growth media used in the developed countries are not available, accessible and affordable hence most of the peasant gardeners still use, topsoil mainly for their planting operations though it is bulky and heavy, very inconsistent in quality and environmentally unfriendly.

The application of synthetic growth regulators to enhance rooting has been widely adopted [11]. Rooting hormone hastens root initiation, increase the number and percentage of cutting rooted as well as quality of root produced by cutting [12]. Despite the fact that rooting hormones aid root formation, they are expensive and not readily available to peasant gardeners in Nigeria, also, constraints like; technicalities involved in proper application and the impact it has on the environment [6,13,14] necessitates the need to conduct studies on local alternatives such as coconut water and tetracycline which is accessible and commonly used by peasant gardeners in Nigeria as alternative means of stimulating stem cuttings to increase rooting percentage for better production.

The study therefore, compared the performance of the selected ornamentals; *Rosa spp.*, *Mussaenda philippica* and *Bougainvillea spp.* in response to treatments with rooting substances Indole-3-Butyric Acid (IBA), and possible alternatives; Tetracycline, and coconut water in different growth media.

## Materials and Methods

The experiment was conducted in the nursery the department of Crop, Soil, and Pest management, the Federal University of Technology, Akure with (7°16' N, 5°12' E) located in the rain forest vegetation zone of Nigeria between July and September 2012. The climate is the West Africa monsoon with dry and wet seasons. The dry season is usually from November through March and is characterized by dry cold wind of harmattan. The wet season usually starts from April to October, with occasional strong winds and thunderstorms. The mean annual rainfall and number of rainy days in the year that the study was conducted were 1495.4 mm and 110 days respectively. The mean daily maximum and minimum

temperatures of the area in the year were 25 °C and 37 °C and the mean monthly maximum and minimum relative humidity were 83% and 65% (the Federal University of Technology Akure Meteorological Station).

The materials used were; stem cuttings of *Rosa spp.*, *Mussaenda philippica* and *Bougainvillea spp.* collected from healthy parent stock from the floriculture section the department of Crop, Soil, and Pest management, the Federal University of Technology Akure. Other materials used were; polythene pots, topsoil, coir fiber, sawdust, IBA, tetracycline and coconut water collected from immature fruits.

The media were prepared in the nursery at least two weeks before stem cuttings were planted to enhance proper homogeneity of the media. Topsoil was collected at the Crop Type Museum sited at the back of the department and sieved to get rid of stones and other extrogenous materials and also to improve aeration and porosity. The sieved soil was then pasteurized for three hours using a steam chamber and then further solarized for two weeks to kill pathogenic organisms and weed seeds. Sawdust was obtained from a Sawmill also within the state. The coconut fiber collected was sorted to ensure the fiber was free from shells and stones. It was then beaten with mallet and soaked in water to allow for fermentation. At the end of the fermentation period (3-4 days) the water was drained and the fiber re-soaked with fresh water for 12 hours. The fiber was sieved and excess water allowed to drain. It was then sun dried, further beaten with mallet, milled and sieved using 0.5 mm wire mesh to aid proper mixing with other media. The media were: Topsoil, sawdust, coir fiber and they were also mixed manually and composted over a period of two weeks to improve movement of water in the different media, dissolve nutrients, and oxygen in the media making it easy for plant roots to absorb. Perforated black polythene bags of size 20 cm by 12 cm obtained from the Ondo State Agricultural Development Agency were filled with the media. The media in the pots were firmed to hold the cuttings in place before the cuttings were inserted; the media were moistened and allowed to settle overnight.

The rooting hormones used was; Indole-3-Butyric Acid (IBA). The IBA was dissolved in 90% ethanol, then brought to final concentration of 6% ethanol 94% distilled water (v/v) that is; 0.5% Indole-3-Butyric Acid (IBA) solution [15] 3 Tetracycline capsules (750 mg) were dissolved in 4 quarts of water. The coconut water was extracted by poking holes in the “eyes” located on the side of the coconut fruits to ensure that the liquid obtained remain fresh and retain its essential nutrients. 100 ml of the fresh coconut water was then measured and poured into a clean bowl and the stem cuttings dipped in for 5 minutes. Cuttings of about 5-15 cm of the ornamentals (*Rosa spp.*, *Mussaenda philippica* and

**Table 1:** Physical and chemical composition of coir fiber.

Chemical properties	% Composition	Physical properties	Value
Lignin	45.84	Length in inches	6-8
Cellulose	43.44	Density (g/cc)	1.40
Hemi-Cellulose	00.25	Tenacity (g/Tex)	10.0
Pectin's and related compounds	03.00	Breaking elongation %	30
Water soluble	05.25	Diameter in mm	0.1 to 1.5
Ash	02.22	Rigidity of modulus (dyne/cm <sup>2</sup> )	1.8924
		Swelling in water (diameter)	5%
		Moisture at 65% RH	10.50

**Table 2:** Physical and chemical properties of sawdust.

Chemical properties	Value	Physical properties	Value
Extractives	3.3	Moisture content	10.8
Lignin	29.3	Apparent specific gravity	0.14
Hollocellulose	83.8	Porosity (%)	84
Carbon (C) (%)	61.58	Water retention (%)	50
Hydrogen (H) (%)	5.32	Water drainage (mls-1)	282.0
Oxygen (O) (%)	33.04		
Nitrogen (N)	0		

**Table 3:** Physical and chemical properties of Topsoil.

Compositions	Value	Unit
pH in water	6.75	1:2
Organic matter content	7.57	%
Organic carbon	4.38	%
Nitrogen	0.57	%
Phosphorus	26.14	Mg/kg
Potassium	0.58	Cmol/kg
Sodium	0.44	Cmol/kg
Calcium	3.90	Cmol/kg
Magnesium	2.60	Cmol/kg
Water holding capacity	86.80	%
Percentage air-porosity	44.00	%

*Bougainvillea spp.*) were collected from healthy parent stock they were cut very early in the morning when the plant is fully turgid with secateurs. The stems were cut at 45-degree angle to leave a large surface for soaking up moisture. The foliage from the bottom half of the cuttings were removed to reduce transpiration. The cuttings were then inserted in the rooting media until the bottom half of the cuttings were covered, the mixtures were tamped down around the cutting to ensure firm contact. The cuttings were spaced adequately to allow all the leaves receive sunlight and kept free of emerging opportunistic weed seedlings by regular hand-picking throughout the duration of the experiment.

The treatments were laid out in a Completely Randomized Design (CRD). The factors were; 3 ornamental plants-*Rosa spp.*, *Mussaenda philippica* and *Bougainvillea spp.*; 3 growth media-topsoil, coir fiber and sawdust; and 3 Rooting Hormone-IBA, Tetracycline and Coconut water replicated 3 times. The treatments from 1 to 12 were: coconut water and Topsoil + coir fiber, coconut water and topsoil, coconut water and sawdust, Tetracycline and Topsoil + coir fiber, Tetracycline and Topsoil,

Tetracycline and sawdust, IBA and Topsoil + coir fiber, IBA and Topsoil, IBA and Sawdust, Topsoil + coir fiber only, Topsoil only, Sawdust only). Data were collected on the following parameters; Length of roots (cm), Number of leaves per cutting (by counting), Number of branches (by counting), Number of roots (by counting). The count data were transformed using the Square root transformation method all the data were subjected to Analysis of Variance (ANOVA) to determine the level of significance of the treatments and the means separated using Tukey test.

## Results

Coir fiber gave the highest amount of lignin content of 45.84 than the sawdust having 29.3 however sawdust analysis showed high amount of cellulose particles 83.8 and coir fiber having a lesser amount of 43.4 as shown in Table 1, Table 2 and Table 3 showed that Topsoil has high amount of the essential nutrients for growth like: N, P, K, Ca, Na, Mg, which is lesser or lacking in coir fiber and sawdust. However coir fiber and sawdust gave higher amount of carbon content than the topsoil, but the topsoil has highly significant water retention capability than the other media (Table 1, Table 2, Table 3).

*Rosa spp.* cuttings treated with Coconut water and Topsoil gave the highest number of branches (1.55, 1.89, 2.57, 2.89 and 3.06) at 4, 6, 8, 10 and 10 Weeks After Planting (WAP). Topsoil only performed better compared to the other media (1.42, 1.55, 1.88, 2.56, and 2.76) at 4, 6, 8, 10 and 12 WAP as shown in Table 4.

The number of branches of *Bougainvillea* cuttings in Topsoil treated with IBA increased significantly at 6, 10 and 12 WAP (1.64, 1.46, 1.46) shown in Table 5. Number

**Table 4:** Effects of rooting hormone and media on number of branches of *Rosa spp.*

Treatments	Weeks after planting (WAP)				
	4	6	8	10	12
1	1.8577b	1.65212a	1.6499a	1.4698 c	1.7991b
2	1.5588ab	1.8970ab	2.5790b	2.8295b	3.0622 c
3	1.7607ab	1.4698a	1.4698ab	1.4698a	1.4698ab
4	0.8796ab	0.7071a	0.7071a	0.7071a	0.7071a
5	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
6	1.4698ab	0.9984a	0.9984ab	0.8796a	1.0521ab
7	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
8	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
9	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
10	1.6776ab	2.0004b	2.3771ab	2.5638ab	2.6755bc
11	1.4256ab	1.5568a	1.8867ab	2.5630ab	2.7688bc
12	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a

Means followed by the same subscript in the same column are not significantly different at ( $P < 0.05$ );

(Treatment combinations from 1 to 12 respectively: coconut water and Topsoil + coir fiber, coconut water and topsoil, coconut water and sawdust, Tetracycline and Topsoil + coir fiber, Tetracycline and Topsoil, Tetracycline and sawdust, IBA and Topsoil + coir fiber, IBA and Topsoil, IBA and Sawdust, Topsoil + coir fiber only, Topsoil only, Sawdust only.)

**Table 5:** Effects of treatments on number of branches of Bougainvillea.

Treatments	Weeks after planting (WAP)				
	4	6	8	10	12
1	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
2	0.8796ab	0.7071a	1.3435ab	1.3435ab	1.3435ab
3	1.4829ab	0.7071a	0.7071a	0.7071a	0.7071a
4	1.1709ab	1.3863ab	0.9984ab	0.8796ab	1.0950ab
5	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
6	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
7	0.8796ab	1.0521ab	1.2675ab	1.3863ab	1.3863ab
8	1.6423ab	1.6423ab	1.4698ab	1.4698ab	1.4698ab
9	2.0158b	2.0378b	1.4829ab	1.0950ab	1.0950ab
10	1.3510ab	1.3510ab	1.2675ab	1.2675ab	1.2675ab
11	1.4400ab	1.3510ab	1.2675ab	1.4829ab	1.4829ab
12	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a

Means followed by the same subscript in the same column are not significantly different at ( $P < 0.05$ ).

**Table 6:** Effects of the treatments on number of branches Queen of Philippines.

Treatments	Weeks after planting (WAP)				
	4	6	8	10	12
1	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
2	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
3	0.9984a	0.8796a	0.7071a	0.7071a	0.7071a
4	0.8796a	0.8796a	0.9984a	0.9984a	0.7071a
5	1.0950ab	1.0950ab	0.7071a	0.7071a	0.7071a
6	1.2531ab	1.1785ab	1.2531ab	1.2531ab	1.0950ab
7	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
8	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
9	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
10	0.7071a	0.7071a	0.9984a	0.9884a	0.7071a
11	1.2675ab	1.2675ab	1.3510ab	1.3510ab	1.3510ab
12	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a

Means followed by the same subscript in the same column are not significantly different at ( $P < 0.05$ ).

of branches of Bougainvillea in Topsoil and Coir fiber treated with IBA also increased significantly ( $P < 0.05$ ) at 8 and 12 WAP (1.27 and 1.38).

The number of branches of Queen of the Philippines in Topsoil only increased significantly throughout the experimental period (Table 6). There was no significant difference observed in the other treatments. The number

**Table 7:** Effects of treatments on number of leaves of *Rosa spp.*

Treatments	Weeks after planting (WAP)				
	4	6	8	10	12
1	2.4257ab	1.5664ab	3.0412ab	3.0932ab	3.3269ab
2	2.8574ab	3.0813bc	4.9980bc	5.7009c	6.0729
3	3.5547c	2.7102ab	2.7495ab	2.7878ab	2.7870ab
4	0.9984ab	0.7071a	0.7071a	0.7071a	0.7071a
5	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
6	2.8250ab	1.6965ab	1.6965ab	1.7991ab	1.7991ab
7	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
8	0.7071a	0.7071a	0.7071a	0.7071	0.7071a
9	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
10	3.4295bc	4.6625c	4.1786bc	5.7009c	6.0729c
11	2.5425ab	3.3296ab	3.4108ab	4.9793	5.5634bc
12	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a

Means followed by the same subscript in the same column are not significantly different at ( $P < 0.05$ ).

**Table 8:** Effects of the treatments on leaf number of Bougainvillea.

Treatments	Weeks after planting (WAP)				
	4	6	8	10	12
1	0.7071a	0.7071a	0.7071	0.7071a	0.7071a
2	1.3212ab	0.7071a	0.7071a	2.6064ab	1.9874ab
3	2.1959ab	0.7071a	0.7071a	0.7071a	0.7071a
4	1.8556ab	2.6281ab	1.5545ab	0.7071a	0.7071a
5	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
6	0.7071a	0.7071a	1.9984ab	0.7071a	0.7071a
7	1.2531ab	1.8428ab	2.9316ab	3.4096bc	3.4406bc
8	3.4690bc	3.6356bc	3.3459bc	3.3193bc	2.8969ab
9	4.0813c	4.0995c	2.5198ab	1.3212ab	0.7071a
10	2.5823ab	2.7723ab	2.6968ab	2.5239ab	2.9070ab
11	3.5561bc	3.3435bc	4.0682c	4.6483c	4.8872c
12	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a

Means followed by the same subscript in the same column are not significantly different at ( $P < 0.05$ ).

**Table 9:** Effects of the treatments on leaf number of Queen of Philippines.

Treatments	Weeks after planting (WAP)				
	4	6	8	10	12
1	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
2	0.7071a	0.7071a	0.7071a	0.7071a	1.9874ab
3	2.0229b	0.9984ab	0.7071a	0.7071a	0.7071a
4	1.3842ab	1.5010ab	1.5515ab	1.5515ab	0.7071a
5	0.7071a	1.6499ab	1.6018ab	0.7071a	0.7071a
6	1.9051ab	1.7837ab	2.0872ab	1.9806ab	0.7071a
7	0.7071a	0.7071a	0.7071a	0.7071a	3.4406bc
8	0.7071a	0.7071a	0.7071a	0.7071a	2.8969ab
9	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a
10	0.7071a	0.7071a	1.4432ab	1.6499ab	2.9070ab
11	1.6499ab	2.1675b	2.3700b	1.6499ab	4.8872c
12	0.7071a	0.7071a	0.7071a	0.7071a	0.7071a

Means followed by the same subscript in the same column are not significantly different at ( $P < 0.05$ ).

of leaves for *Rosa spp.* cuttings in Topsoil treated with coconut water was significant (2.85, 3.08, 4.99, 5.70 and 6.07) at 4, 6, 8, 10 and 12 WAP respectively (Table 7). Topsoil and Coir fiber (5.12 and 5.52); and Topsoil only (4.97 and 5.56) also showed better performance at 10 and 12 WAP.

Table 8 showed the effect of treatment on leaf numbers of Bougainvillea cuttings. For all the treatments considered number of leaves in Topsoil only (4.88) showed significant increase at 12 WAP though cuttings treated with IBA and rooted in Topsoil and Coir fiber also showed increase but not significant (3.44) at 12 WAP. Table 9 showed the effects

**Table 10:** Effects of treatments on number of roots.

Treatment	Rose root	Qop root	Boug. root
1	0.7071a	0.7071a	0.7071a
2	3.8350b	0.7071a	0.9984ab
3	2.5430ab	0.7071a	0.7071a
4	0.7071a	0.7071	0.7071a
5	0.7071a	0.7071a	0.7071a
6	1.7245ab	0.7071a	0.7071a
7	0.7071a	0.7071a	1.3842ab
8	0.7071a	0.7071a	1.7926ab
9	2.2349ab	0.7071a	3.0912bc
10	0.7071a	1.3842b	1.7721ab
11	2.9770ab	0.7071a	3.6579bc
12	0.7071a	0.7071a	0.7071a

Means followed by the same subscript in the same column are not significantly different at ( $P < 0.05$ ); \*(ROSE-*Rosa spp.*, QOP-*Mussaendaphilippica* and BOUG-*Bougainvillea spp.*).

**Table 11:** Effect of treatment on length of longest roots.

Treatment	Rose length	Q.O.P length	Boug. length
1	0.0000	0.0000	0.0000
2	9.5000c	0.0000	0.1000ab
3	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000
6	3.6330ab	0.0000	0.0000
7	0.0000	0.0000	1.5000ab
8	0.0000	0.0000	3.7666bc
9	0.0000	0.0000	0.9333ab
10	5.0000c	0.0000	2.2330ab
11	5.3300b	0.7333ab	8.566 c
12	0.0000	0.0000	0.0000

Means followed by the same subscript in the same column are not significantly different at ( $P < 0.05$ ).

of the treatments on number of leaves of Queen of the Philippines. Topsoil only, Tetracycline + Sawdust and Topsoil + coir fiber gave the same result at 12 WAP (1.64).

Cuttings of *Rosa spp.* in Topsoil treated with coconut water and Bougainvillea cuttings in Topsoil + Coir fiber had the highest number of roots at 12 WAP (Table 10). The effect of treatments on length of roots for *Rosa spp.* and Bougainvillea cuttings showed a significant increase ( $P < 0.05$ ) *Rosa spp.* cuttings had the longest roots (9.50) over Bougainvillea (3.76). However, there was no significant effect on root length of Queen of the Philippines (Table 11).

## Discussions

The application of the rooting hormone IBA (Indole-3-Butyric Acid) in comparison with other treatments, significantly improved rooting in Bougainvillea. According to [2], one of the best rooting promoters is the IBA due to its fast auxin activity and an enzymatic system of fairly slow destruction. The influence of auxin in promoting adventitious root formation through their ability to promote the initiation of lateral root and enhancing the transport of carbohydrates

to the cutting base is well documented in several studies [16-18]. IBA has been reported to be effective in inducing rooting in stem cutting of *Cedrus deodara* [19]. Zeinab and Hossein (2014) [20] also reported that IBA treatments significantly increased rooting percentage compared with the control in *Hibiscus rosa-sinensis*. IBA did not significantly influence rooting in *Rosa spp.* and Queen of Philippines cuttings. This result support the findings of that the addition of growth hormones had little overall effect on the percentage of rooted stem cuttings of *Calliandra calothyrsus* [21]. Effectiveness of exogenous applications of auxin in promoting rooting on stem cuttings is dependent on adequate absorption by plant tissue. Amount of time between cutting collection/preparation and treatment can also have an influence on absorption, with greater water loss from the cutting base prior to treatment increasing the suction that develops at the base of the cutting [22]. The highest number of root was recorded in the mixture of topsoil, coir fiber and coconut water; the ability of cuttings to survive and produce long and massive roots is very important [23] reported that potting media as well as nutritional requirements are the most important factors affecting growth of ornamental plants. Khayyat, *et al.* (2007) also observed that, the type of rooting media and their characteristics are of utmost importance for the quality of rooted cuttings [24]. The highest number of leaves per cutting was observed in *Rosa spp.* cuttings rooted in the mixture of topsoil and coir fiber, while the lowest number of leaves was observed in *M. philippica* cuttings. An appropriate soil media generally has to have an optimal volume of gas filled pore space and oxygen diffusion rate adequate for respiration [25]. According to [26], the number of leaves produced per cutting is determined by type of cutting used, plant growth regulators utilized, temperature, dry matter content of the cuttings before sticking in the medium and health status of the plant. Since all cuttings used in this investigation were uniform, the highest average number of leaves of Rose cuttings rooted in topsoil and coir fiber could be attributed to other medium characteristics like porosity, water holding capacity and nutrient content. Topsoil was found to be superior in the propagation of Rose and Bougainvillea when compared to the other media components for the parameters considered closely followed by mixture of topsoil and coir fiber. This could be attributed to increased aeration and drainage leading to increased porosity that promotes root growth and development, also, nutrients in the soils are mostly found at topsoil [27].

## Conclusion

1. The results obtained from this study, revealed that the rooting of *Rosa spp.* cuttings was enhanced when dipped in coconut water for 5 minutes, Bougainvillea cuttings rooted well when treated with IBA, while Queen of the Philippines had no roots across all treatments suggesting the need for further research.

2. Topsoil mixed with coir fiber gave good results and can be used to improve properties of potting medium. When not available, however, fertile topsoil can be used. Sawdust, as observed, supported germination or sprouting but could not sustain growth and development of the ornamentals suggesting the possibility that it may however show good promise when incorporated with topsoil.
3. For the average peasant gardener in Nigeria Topsoil and mixture of topsoil and coir fiber, is recommended for use in commercial propagation of *Rosa spp.* and *Bougainvillea* under similar conditions.

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