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# The Effect of Different Propagation Media on the Reproductive Characters of Two Species of *Vernonia* in Port-Harcourt, Southeastern, Nigeria.

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## Abstract

This experiment was conducted at the Teaching and Research Farm of the Rivers State University of Science and Technology to compare the effects of different propagation media on the performance of *Vernonia* species. Two species of *Vernonia* (*amygdalina* and *hymenolepis*) and three propagation media (River sand (RS), Topsoil (TS) and Saw dust (SD)) were used for the experiment. Soil amendments (cassava peels (CP) and palm bunch ash (PBA) were also used. The propagation media were air dried for 3 days, ground and sieved through 2mm mesh except the sawdust which was not sieved. The cassava peels were air dried for 3 weeks and then crushed to obtain fine particles. The experiment was laid out in a completely randomize design (CRD) with three replications. 42.8g of each of the soil amendments were weighed using a weighing balance and mixed with the propagation media in the following rates 3kg topsoil, 3kg river sand and 0.5kg saw dust. The mixed media were incubated for 7days with application of tap water to field capacity. Stem cuttings of the two species of vernonia measuring 26cm long were dipped in the media in a slanting form at 45$^{o}$C. Results showed that the performance of *Vernonia amygdalina* and *Vernonia hymenolepis* were at best under the SDPBA combination compared to other treatment combinations which shows the superiority of the SDPBA combination over other treatment combinations. It was concluded that though sawdust mixed with palm bunch ash (SDPBA) media gave the best performance of *Vernonia amygdalina*, it could be successfully propagated in any of the media used or the experiment, and that the propagated *Vernonia hymenolepis* should be tried in another experiment using some rooting hormones.

**Keywords**:Propagation, growth media, *Vernonia* species, Reproductive character, soil amendment.

## 1.0 Introduction

*Vernonia amygdalina* is commonly known in Nigeria as bitter leaf and is referred to as 'Ewuro' in Ibadan, 'Etidot' in Cross Rive State and as Onugbu among the Igbo speaking states. The plant is a shrub of 2.5m with petiolate leaf of about 6mm diameter and has an elliptic shape. The leaves are greenish in colour with a characteristic bitter taste (Anonymous, 1999).

According to a 1$^{st}$ century botanist (Williams Vernon), the genus *Vernonia* belongs to the family Compositae. A few species in this easily recognized family are trees. In Nigeria, these are confined to the genus *Vernonia* or *Vernonia* shrub. This huge genus is particularly abundant in grasslands throughout the tropics and warmer regions of both hemispheres.

The bitter taste is due to anti-nutritional factors such as alkaloids, saponins, tannins, *Vernonia* and glycosides (Buttler and Bailey, 1973, Olugunde *et al.*, 1992 and Bonsi *et al.*, 1995).

The leaves are used as vegetables and stimulate the digestive system and a concoction of bitter leaves is used as medicine to reduce fever. It is used to treat stomach pains and a whole range of disorders and as fertility inducers etc.

The degradation of compound farms and deforestation of natural forests are known factors in the degradation of the natural *Vernonia* genepool. With the recent concern by the United Nations Environmental Programme (UNEP) to conserve

biodiversity, it has become essential to put up some form of workshop to evaluate the ground knowledge and influence the conservation of its diversity for the future. Though *Vernonia spp. a*re known widely among the people of West Africa there has been little or no collated research on this important plant. Hence there is need to determine propagation media that will be effective for its growth and establishment. The recent study is therefore aimed at comparing the effect of different propagation media on the performance of two species of *Vernonia*.

## 2.0 Materials and Method

This study was carried out in the forestry nursery site of the Rivers State University of Science and Technology Teaching and Research Farm, while all laboratory analysis were conducted at the soil and food science laboratories, both of the Faculty of Agriculture, Rivers State University of Science Technology, Port-Harcourt, Nigeria.Before the experiment was carried out, soil analysis was done to determine the nutrient contents of the soil media. Samples of the amendment materials were also analyzed.

The two species of *Vernonia* used for the experiment included –*V.amygdalina* and *V.hymenolepis,* sourced from the university farm. Soil media used for the experiment included River Sand (RS), Top Soil (TS) and sawdust (SD). Both the River Sand and Top soil were collected within the forest nursery area while the sawdust was sourced from the IIoabuchi Sawmill, Port-Harcourt. The soil amendments included cassava peels (CP) and Oil Palm bunch Ash (PBA) collected from RIVOC Oil Company, situated at Trans-Amadi area of the state. Materials used as soil media were air-dried for a period 3 days and ground to pass through a 2mm sieve mesh and properly homogenized, with the exception of sawdust which was also air-dried but not sieved. The cassava peels were air-dried for a longer period of three(3) weeks and properly hand crushed to obtain fine particles. The treatment combinations are presented in table 1.

Seventy two perforated poly-pots (20cm wide and 20cm long) were used for the experiment. Each of the twelve(12) treatments as shown above were replicated three times in a completely randomized design (CRD) for the two species of *Vernonia* used. 42.8g of each of the soil amendment CP and PSA were weighed using a weighing balance, mixed with 3kg of soil media (3kg top soils, 3kg of River Sand and 0.5kg of Sawdust). A lesser weight of sawdust was used due to the fact that sawdust is very light and thus 3kg of it would not be contained in a 20cm x 30cm poly-pot.

The materials were thoroughly mixed and incubated for one week with application of tap water to field capacity. Healthy stem cuttings of the two species of *Vernonia* measuring 26cm long and slanted at the base at angle of $45^0$ were then planted to obtain faster regrowth, and other reproductive characters of the species.

## 3.0 Results

### 3.1 Chemical Properties of Soil Media

The result of soil analysis for the various media used is as presented on Table 2. The percentage of total hydrocarbon (TH) present in the River sand, Top soil and saw dust were 0.009%, 0.088% and 0.219% respectively.

Thus the amount of TH in sawdust was highest. Available phosphorous is highest (7.25ppm) in the top soil while it is present in sawdust and River sand at 15.00% and 7.23% respectively. (Table 2). Also, Top soil contained the highest 0.215 (mol/kg) level of potassium (K) while in River sand potassium is present at 0.144cmol/kg level and 0.09cmol/kg in sawdust. Sodium and calcium levels in the Top soil were 0.870 and 1.10cmol/kg respectively while in River sand sodium was 1.739 cmol/kg and calcium was 0.40 cmol/kg.

Table 1. Treatment Combination

| | Soil Media | | |
|---|---|---|---|
| Soil Amendment | River Sand (RS) | Top Soil (TS) | Sawdust (SD) |
| Cassava Peels (CP) | RSCP | TSCP | SDCP |
| Palm Bunch Ash (PBA) | RSPBA | TSPBA | SDPBA |
| CP and Ash | RSCPPBA | TSCPPBA | SDCPPBA |
| Control | RS | TS | SD |

Saw dust had 0.11cmol/kg and 0.40 cmolkg was recorded for calcium (Table 2).

### 3.2 Chemical Properties of Amendment Materials

Total hydrocarbon present was in higher level (1.769%) in the Palm Bunch Ash (PBA) than in the cassava puts where it is present at 0.0874% (Table 2). Phosphorous was not detected in both cassava puts and PBA whole 1.05 and 0.75% were recorded for potassium in PBA and CP respectively (Table 3). Calcium was recorded at 0.06 in bith CP and PBA (See Table 3). Although Sodium, Iron, Copper, Zinc and manganese were not recorded for CP, the following values 0.10, 160431, 161.72, 63.46 and 99.06mg/kg were recorded for sodium, iron, copper, Zinc and manganese respectively in PBA (Table 3).

#### *3.2.1 Number of sprouts in V. amygdalina*

Table 4 shows that soil media and amendment combinations had significant influence on the sprouting abilities of the *Vernonia* species used. At 7 days after planting (DAP), The highest number of sprout recorded was 2 and from plots that received the following combinations. River sand-cassava peels (RSCP), Saw dust (SD), saw dust-palm bunch ash (SDPBA) and Top soil-cassava peel (TSCP). However, this did not show significant difference ($P<0.05$) of the 1 sprout recorded from plots that received RS, RSPBA, and TS. But the 2 sprouts recorded was significantly different ($P<0.05$) from those recorded from plots with the following combinations of media and amendment material. RSCP, PBA, SDCP, saw dust-cassava peel-palm bunch ash (SDCPPBA), Top soil-cassava peel-palm bunch ash (TSCPPBA) and Top soil palm bunch ashh (TSPBA) (See Table 4). At 9DAP, the plot that received RSCP, SDPBA and TSCP had the highest (3) number of sprouts which showed significant difference ($P<0.05$) from the lowest (1) sprouts recorded from plots that received. RSPBA, SDCP, SDCPPBA and TS while (0) sprout were recorded from combinations such as RSCPPBA and TSPBA (Table 4) At 12 DAP, the highest (4) significant sprout was recorded from plots that had SD and SDPBA treatments combinations, while the lowest (1) number of sprout was recorded from RSPBA and SDCPPBA treatment combinations (Table 4). At 15 DAP, the highest (5) number of sprouts was recorded from plots treated with SDPBA combination, however, this was statistically ($P<0.05$) at per with the number of sprouts recorded from SD, TSCP, RS, RSCP, RSCPPBA, TS and TSCPPBA. However, the highest (5) numbering sprouts showed significant difference ($P<0.05$) from the number(2) of sprouts recorded from plot treated with RSPBA, SDCP, SDCPPBA and TSPBA combinations (See Table 4). At 19DAP, the highest number of sprouts(6) was recorded from SDPBA treated plots and this was significantly different ($P<0.05$) from the lowest number of sprout(1) recorded from TSPBA treated plot (Table 4).

At 23, 26, 30 and 42 DAP, similar results were obtained with the highest number of sprouts(7) from SDPBA treated plots, which was statistically ($P<0.05$) at par with the 5 number of sprouts recorded from SD, SDCP, TS and 6 number of sprouts recorded from TSCP treated plots (Table 4). However, the lowest (1) sprout at 23 DAP was recorded from TSPBA treated plots while at 26, 30 and 42 DAP, the lowest(2) number of sprouts were recorded from TSPBA treated plots (Table 4).

#### 3.2.2 Number of Sprouts in *V. hymenolepis*

V. hymenolepis at 7DAP had the highest (1) significant number of sprouts ($P<0.05$) from plots treated with RS, and TS media while other plots had zero (0) sprouts (Table 4). At 9DAP, an additional treatment (TSCP) plot was observed to have 1 sprout while other plot had 0 sprouts. However, at 12 DAP, the highest (3) significant ($P<0.05$) number of sprouts were recorded from plots treated with SDCPPBA combinations, though these did not show significant difference ($P<0.05$) from the 2 sprouts observed from plots treated with SDPBA and TSCP combinations while the lowest number of sprouts(1) was recorded from RS, TS and TSCPPBA treated plots (Table 4). At 15 DAP, the number of sprouts from SDCPPBA increased by 1 which brought the highest mean numbering sprouts at 15 DAP to 4 and this was significantly different ($P<0.05$) from the mean number of sprouts(1) observed from TS and TSCPPBA treated plots (Table 4). At 19 DAP, RSCPBA treated plot showed the highest (5) mean number of sprouts which was significantly different ($P<0.05$) from the lowest (1) mean number of sprouts recorded from RSCP treated plots (Table 4). Like in the case of V. amygdaline the various number of

sprouts recorded in the various treatment combinations were stable from 23 DAP to 42 DAP. However, the highest mean number of sprouts at 23DAP was 5 and recorded from RSCPPBA treated plots with the lowest (1) which is significantly different (P<0.05) from the highest obtained from RSCP treated plots (Table 4). At 26, 30 and 42 DAP, the highest common mean number of sprouts (7) was recorded from SDPBA treated plots which showed significant difference (P<0.05) from the lowest (1) mean number of sprouts recorded from RSCP treated plots (See Table 4).

Table 2: Chemical Properties of Soil Media Used for the Experiment

| | TN | P | pH | K | OC | Na | Ca |
|---|---|---|---|---|---|---|---|
| **Soil Media** | **%** | **Ppm** | **1:2:5** | **Cmol/kg** | **%** | **Cmol/kg** | **Cmol/kg** |
| **River Sand** | 0.009 | 7.37 | 5.40 | 0.144 | 0.30 | 1.739 | 0.40 |
| **Top Soil** | 0.088 | 18.25 | 6.60 | 0.215 | 0.77 | 0.870 | 1.10 |
| **Sawdust** | 0.219 | 1500 | | 0.09 | | 0.11 | 0.40 |

Table 3: Some Chemical Properties of Amendment Materials Used for the experiment.

| | **Extractable Nutrients** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | % | | | | | Ppm, ug/g, mg/kg | | | |
| **Soil Amendment** | TN | P | K | Ca | Na | Fe | Cu | Zn | Mn |
| Cassava Peels | 0.0874 | | 0.75 | 0.06 | | | | | |
| Palm Bunch Ash | 1.769 | | 1.05 | 0.06 | 0.10 | 1604.31 | 161.72 | 63.46 | 99.06 |

## 4.0 Discussion

Results of this revealed that the Top soil (TS) used was richer in mineral compared to River sand (RS) and sawdust (SD). This palm bunch ash (PBA) had more extract table nutrients than the cassava peals (CP). Results also showed that the V. amygdaline and V. hymorelepis performances were at the best and SDPBA compared to other treatment combination. This SDPBA have demonstrated superiority over other media and amendment combinations due to the steady increase in number of sprouts recorded which could be attributed partly to the greater percentage of nitrogen recorded from the sawdust as seen in Table 1 and partly to the availability of extractable nutrients in PBA. Unlike the V. amygdalina, poor number of sprouts was recorded from V. hymololepis from 7 DAP to 15

Table 4: Effects of Treatments on Number of Sprouts of *Vernonia amygdalina* and *Vernonia hymonelepis* at given days after planting

| | DAY 7 | | DAY 9 | | DAY 12 | | DAY 15 | | DAY 19 | | DAY 23 | | DAY 26 | | DAY 30 | | DAY 30 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TREATMENT** | V.A | V.H | V.A | V.H | V.A | V.H | V.A | V.H | V.A | V.H | V.A | V.H | V.A | V.H | V.A | V.H | V.A | V.H |
| RS | $1^{a}$ | $1^{a}$ | $2^{a}$ | $1^{a}$ | $2^{bc}$ | $1^{b}$ | $3^{ab}$ | $2^{b}$ | $3^{bc}$ | $2^{bc}$ | $3^{bc}$ | $3^{b}$ | $3^{bc}$ | $3^{bc}$ | $3^{bc}$ | $3^{bc}$ | $3^{bc}$ | $3^{bc}$ |
| RSCP | $2^{a}$ | $0^{b}$ | $3^{a}$ | $0^{b}$ | $3^{b}$ | $0^{c}$ | $3^{ab}$ | $0^{c}$ | $3^{bc}$ | $1^{c}$ | $3^{bc}$ | $1^{c}$ | $3^{bc}$ | $1^{cd}$ | $3^{bc}$ | $1^{cd}$ | $3^{bc}$ | $1^{cd}$ |
| RSCPPBA | $0^{b}$ | $0^{b}$ | $0^{c}$ | $0^{b}$ | $2^{bc}$ | $0^{c}$ | $3^{ab}$ | $0^{c}$ | $3^{bc}$ | $5^{a}$ | $4^{b}$ | $5^{a}$ | $4^{b}$ | $5^{ab}$ | $4^{b}$ | $5^{ab}$ | $4^{b}$ | $5^{ab}$ |
| RSPBA | $1^{a}$ | $0^{b}$ | $1^{b}$ | $0^{b}$ | $1^{c}$ | $0^{c}$ | $2^{b}$ | $0^{c}$ | $2^{c}$ | $0^{d}$ | $2^{c}$ | $2^{bc}$ | $3^{bc}$ | $2^{c}$ | $3^{bc}$ | $2^{c}$ | $3^{bc}$ | $2^{c}$ |
| SD | $2^{a}$ | $0^{b}$ | $2^{a}$ | $0^{b}$ | $4^{a}$ | $0^{c}$ | $4^{ab}$ | $0^{c}$ | $4^{b}$ | $2^{bc}$ | $5^{ab}$ | $4^{ab}$ | $5^{ab}$ | $4^{b}$ | $5^{ab}$ | $4^{b}$ | $5^{ab}$ | $4^{b}$ |
| SDCP | $0^{b}$ | $0^{b}$ | $1^{b}$ | $0^{b}$ | $2^{bc}$ | $0^{c}$ | $2^{b}$ | $0^{c}$ | $4^{b}$ | $1^{c}$ | $4^{b}$ | $2^{bc}$ | $5^{ab}$ | $2^{c}$ | $5^{ab}$ | $2^{c}$ | $5^{ab}$ | $2^{c}$ |
| SDCPPBA | $0^{b}$ | $0^{b}$ | $1^{b}$ | $0^{b}$ | $1^{c}$ | $3^{a}$ | $2^{b}$ | $4^{a}$ | $2^{c}$ | $4^{ab}$ | $3^{bc}$ | $4^{ab}$ | $3^{bc}$ | $4^{b}$ | $3^{bc}$ | $4^{b}$ | $3^{bc}$ | $4^{b}$ |
| SDPBA | $2^{a}$ | $0^{b}$ | $3^{a}$ | $0^{b}$ | $4^{a}$ | $2^{ab}$ | $5^{a}$ | $2^{b}$ | $6^{a}$ | $2^{bc}$ | $7^{a}$ | $3^{b}$ | $7^{a}$ | $7^{a}$ | $7^{a}$ | $7^{a}$ | $7^{a}$ | $7^{a}$ |
| TS | $1^{a}$ | $1^{a}$ | $1^{b}$ | $1^{a}$ | $2^{bc}$ | $1^{b}$ | $3^{ab}$ | $1^{bc}$ | $4^{b}$ | $2^{bc}$ | $5^{ab}$ | $4^{ab}$ | $5^{ab}$ | $5^{ab}$ | $5^{ab}$ | $4^{b}$ | $5^{ab}$ | $4^{a}$ |
| TSCP | $2^{a}$ | $0^{b}$ | $3^{a}$ | $1^{a}$ | $3^{b}$ | $2^{ab}$ | $4^{ab}$ | $2^{b}$ | $4^{b}$ | $2^{bc}$ | $6^{ab}$ | $2^{bc}$ | $6^{ab}$ | $6^{ab}$ | $6^{ab}$ | $3^{bc}$ | $6^{ab}$ | $3^{bc}$ |
| TSCPPBA | $0^{b}$ | $0^{b}$ | $2^{a}$ | $0^{b}$ | $3^{b}$ | $1^{b}$ | $3^{ab}$ | $1^{bc}$ | $3^{bc}$ | $2^{bc}$ | $3^{bc}$ | $3^{b}$ | $3^{bc}$ | $3^{bc}$ | $3^{bc}$ | $4^{b}$ | $3^{bc}$ | $4^{b}$ |
| TSPBA | $0^{b}$ | $0^{b}$ | $0^{c}$ | $0^{b}$ | $0^{d}$ | $0^{c}$ | $0^{c}$ | $0^{c}$ | $1^{c}$ | $3^{b}$ | $1^{cd}$ | $3^{b}$ | $2^{c}$ | $2^{c}$ | $2^{c}$ | $3^{bc}$ | $2^{c}$ | $3^{bc}$ |

Means in the same column having the same letter(s) is/are not significantly different at p<0.05 according to LSD. while V.A= *Vernona amygdalina;* V.H= *Vernonia hymonelepis*

DAP. But at 19 DAP there was slight increase in the planting of *V.* hymenolepis which progressed to 42 DAP, however, the quality of spout as observed was not healthy as dry up was observed after 42 DAP. The poor sprouts suggests that V. hymenolepis does not grow well when propagated vegetatively this is conformation with the findings of Fube and Djonga (1987) who reported that propagating *V. hymenolepis* by seeds gave a better result than propagating by stem cutting of V. hymenolepis.

## 5.0 Conclusion

Although, Saw dust Media mixed with Palm Bunch Ash (SDPBA) gave the best performing of V. amygdalina, it could be successfully propagated in any of the media used with the various combinations. However, the propagation of V. hymenolepis through cuttings should be tinyed with some rooting hormones.

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