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RESEARCH ARTICLE

Pretreatment And Early Growth Studies of *Pentaclethra macrophylla* (Benth) Seeds

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ABSTRACT

The study assessed the effect of sustainable development projects of Total Exploration and Production Nigeria Limited (TEPNL) on rural livelihoods of host communities in Rivers State, Nigeria. The specific objectives were to: describe the socio-economic characteristics of the respondents, identify the livelihood activities of the host communities in the study area and assess the extent of effect of TEPNL sustainable development projects on the wellbeing of the recipients. Primary and secondary data were used to elicit information necessary for the study. The primary data for the study were obtained using a structured questionnaire. Multistage sampling techniques was adopted from which 250 respondents were selected for the study. Descriptive and inferential statistics such as percentages, mean scores, multiple regression were used for data analysis. It was revealed that men were more in number. The respondents were within the age range of 50-59yrs. Majority of the respondents were farmers who also engaged in other livelihood activitie. The study further revealed that the sustainable development projects of TEPNL had 'no great effect' on the wellbeing of the respondents. However, there was a significant relationship between effect of the sustainable development projects of TEPNL and the wellbeing of the respondents. Thus, the study recommended among others the need for the benefactor to target their sustainable development projects at developing the sources of livelihood of the host.

Keywords- : Pretreatment, Early growth, *Pentaclethra macrophylla*, seeds

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INTRODUCTION

Forest represents an important natural resource that can help developing countries improve their economic well-being. More than 1.6billion people worldwide depend on forest for their livelihood (United State Agency of International Development USAID, 2007). Forest provides a wealth of important wood and non-timber forest products (such as edible nuts and fruits, medicinal plants, fibres, rattan, gum arabic and tannins) that people in the developed and developing world rely on; the value of wood and non-timber products provided by forest is immeasurable. One of the edible nuts and fruits that are of great importance found in the forest is *Pentaclethra macrophylla.*

Pentaclethra macrophylla (Benth) occurs in the forest zone of West and Central Africa, from Senegal to South-eastern Sudan and to Angola. It belongs to the family Mimosaceae. *Pentaclethra macrophylla* is planted or retained along the edges of home gardens and farms mainly for its seed from which edible oil can be extracted (Onyeike *et al*., 2002). Throughout the forest zone of West Africa the seeds are eaten boiled or roasted. They are also fermented to yield a snack or condiment with a meaty taste, very popular in Eastern Nigeria where it is called "ugba" (Oboh *et al.*, 2004). The empty dry pods are used as fuel for cooking. According to (Emebiri and Anyim, 1997), the medium-sized to fairly large *Pentaclethra macrophylla* tree is up to 35m tall; bole up to 100cm in diameter, often crooked and low branching with irregular, thick buttresses up to 3m high or without buttresses; outer bark grayish to reddish brown, thin flaking irregular, inner bark fibrous, yellow to orange twigs brown stellate –hairy.

Pentaclethra macrophylla comprises 3 species; 2 in Africa and 1 in South America. The other species, *Pentaclethra eetveldeana* (De Wild and T. Durand) can be distinguished by its smaller leaflets and simple hairs. The American *Pentaclethra macroloba* (Wild) yields timber traded as 'gavilan' and is an important medicinal plant. (Akindahunsi, 2004). *Pentaclethra macrophylla* is common in primary forest and secondary forest and coastal savanna, often in the vicinity of creeks and rivers. It is most common in altitudes up to 500m, although growth can be good at higher elevation where rainfall is adequate and temperatures are never cooler than 18^0C (Oxford Forestry Institute, 2004).Farmer protects *Pentaclethra macrophylla* species on farms because its open crown does not severely affect crop growth and because some trees are leafless during the growing season. The leaves also contribute to soil fertility (Latham, 2004), thus it can be used in agroforestry system.

Pentaclethra macrophylla wood called 'mubala' or 'ovala' is suitable as fuel wood and for charcoal making. As few trees develop straight trunk of harvestable size, timber of larger sizes is only occasionally available. The wood is hard and difficult to work, but suitable for poles, railway sleepers and general carpentry (Banks *et al*., 1999). Traditionally, pestles and mortars have been made from it; ash from its wood or pods is used as a mordant in the dyeing industry. Development of medicinal and aromatic plants such as Africa oil bean seed (*P. macrophylla*), Marjoram, Grindelia, Robusta Mustard, Nutmeg etc needs more attention due to its important role in the improvement of people's health. Hamann, (1991) reported that 75% - 90% of the world's population depends on traditional herbal medicine for their primary health care which *P. macrophylla* is a constituent ingredient.

Forest resources and their roles in livelihood are in many forms which include food supply, income earning, employment, education, medicine and

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energy found *P. macrophylla* useful. In terms of food for example, African oil bean seed (*P. macrophylla*) are being used for upgrading protein content of body food. *P. macrophylla* is used in Africa in traditional human and veterinary medicine. The ripe fruits are applied externally to heal wounds. Extracts of the leaf, stem bark, seed and fruit pulp have anti-inflammatory and anthelmintic activity and are used to treat gonorrhea and convulsions, and also used as analgesic (Akindahunsi, 2004). Despite these enormous importances of *P. macrophylla*, there is paucity information on the silvicultural requirement of the species for its proper plantation establishment. Therefore this study sought the effect of pretreatment on seed germination and early growth of *P. macrophylla* (Benth).

MATERIALS AND METHODS

The seed of *Pentaclethra macrophylla* were procured from Aleshinloye market in Ibadan. Ten seeds of *Pentaclethra macrophylla* were soaked in each treatment such as dilute tetraoxosulphate (vi) acid (dil H_2SO_4) for different time intervals i.e. 5minutes (T_1), 10minutes (T_2) and 15minutes (T_3) and then washed with water to remove traces of the acid after which it was air dried before planting in the planting trays. Treatment four was those soaked in cold water for 24hours (T_4) and air dried before planting in the planting trays. The mechanical scarification was done by gently cracking ten seeds with hammer (T_5) and then planted in the planting trays. The controls (T_0) were sown in the germination box without pretreatment. The treated seeds were sown in the sieve containing sterilized river sand and watered daily. Observation was recorded daily for emergence.

The germinated seedlings from these treatments were transplanted into polythene pot containing 2kg of top soil, a week after germination because it possesses long tap root and watering were done once a day. The experiment was laid out in Completely Randomized Design (CRD) and replicated 10 times. This was allowed to stabilize for a week before data collection started. Data were taken weekly. Growth variables assessed include: Plant height (cm) using meter rule, Stem diameter (mm) using digital vernier caliper, Leaf production by counting, Biomass (g) by weighing the wet weight, oven dry the plants using oven dry machine (GallenKamp), then weighing them to determine the dry weight and subtract the dry weight from wet weight of the component parts (leaves, stems and roots) in the laboratory using sensitive weighing scale. Data collected were subjected to descriptive statistics and Analysis of Variance (ANOVA) while significant means were separated using Duncan Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Table 1: Germination percentage of treated *Pentaclethra macrophylla* seeds (%)

TREATMENT %	SEEDS SOWN	SEED GERMINATED	GERMINATION
T_0	10	7	70%
T_1	10	7	70%
T_2	10	5	50%
T_3	10	7	70%
T_4	10	9	90%
T_5	10	9	90%

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The above result showed that T_4 (seeds soaked in cold water for 24hours) and T_5 (seeds gentle cracked with hammer) had the highest germination percentage of 90%. Followed by T_0 (control), T_1 (seeds soaked in dil. H_2SO_4 for 5min) and T_3 (seeds soaked in dil. H_2SO_4 for 15min) with 70%. While T_2 (seeds soaked in dil. H_2SO_4 for 10min) have the least percentage of 50%. A seed pre-treatment (mechanical scarification and soaking in water for 24hours) enhances the germination (Hong *et al*., 1996).

Table 2: Mean seedling growth of *Pentaclethra macrophylla* from different seed germination pretreatments.

reatment	Plant height	Stems diameter	Number of leaves
T_0	14.05	1.71	7.98b
T_1	9.91	1.69	7.02d
T_2	5.70	1.04	4.32e
T_3	13.94	1.87	7.58c
T_4	15.27	2.45	8.10b
T_5	18.38	2.02	12.6a
Grand mean	12.88	1.80	7.94
LSD	8.59	0.99	4.63
%CV	74.40	61.35	65.09

Note: Means with the same letter are not significantly different from each other but means with different letter are significantly different.

Table 3: Mean dry weights of component parts of *Pentaclethra macrophylla* seedlings.

Treatment	Leaf	Stem	Root
T_0	4.52a	1.92abc	4.25ab
T_1	2.42bc	1.69bc	3.2bc
T_2	1.35c	0.84c	1.41c
T_3	3.00abc	1.89abc	3.10bc
T_4	3.86ab	3.13a	4.68ab
T_5	4.6a	2.95ab	6.12a
Grand mean	3.29	2.07	3.79
LSD	2.07	1.41	2.50
%CV	70.80	75.88	73.57

Note: Means with the same letter are not significantly different from each other but means with different letter are significantly different.

Table 4: ANOVA table for plant height (cm)

SV	DF	SS	MS	F	P
Treatments	5	988.80	197.76	2.15	0.07^{ns}
Error	54	4955.80	91.77		
Total	59	5944.60			

Note: there is no significance different among the treatment at 5% level of probability.

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Table 5: ANOVA table for stem diameter (mm)

SV	DF	SS	MS	F	P
Treatment	5	11.33	2.27	1.85	0.12^{ns}
Error	54	65.99	1.22		
Total	59	77.32			

Note: there is no significance different among the treatment at 5% level of probability.

Table 6: ANOVA table for number of leaves

SV	DF	SS	MS	F	P
Treatment	5	363.86	72.77	2.72	0.02*
Error	54	1443.43	26.73		
Total	59	1807.29			

Note: there is significance different among the treatment at 5% level of probability.

Table 7: ANOVA table for leaf dry weight

SV	DF	SS	MS	F	P
Treatment	5	81.35	16.27	3.06	0.02*
Error	54	287.51	5.32		
Total	59	368.85			

Note: there is significance different among the treatment at 5% level of probability.

Table 8: ANOVA table for stem dry weights

SV	DF	SS	MS	F	P
Treatment	5	86.07	7.21	2.93	0.02*
Error	54	133.06	2.46		
Total	59	169.13			

Note: there is significance different among the treatment at 5% level of probability.

Table 9: ANOVA table for root dry weights

SV	DF	SS	MS	F	P
Treatment	5	129.59	25.92	3.33	0.01*
Error	54	420.53	7.79		
Total	59	550.12			

Note: there is significance different among the treatment at 5% level of probability.

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DISCUSSION

Seed coats of many plant species are hard and have evolved to overcome difficult environmental conditions like heat by direct sunlight, digestive enzymes of animals, severe drought and mechanical damage (Meyer *et al*., 1991 and Silvertown, 1999). Seed dormancy has several advantages to plants (Tao 2000) as it enriches the soil seed bank with hard seeds, provides germination over a period of time whenever environmental conditions are suitable for seedling growth and survival (Wang *et al*., 1998). These seed coats hardiness are important factor that affects the germination pattern of the species (Lodge and Whalley, 2002); without breaking this dormancy, it is difficult to obtain required quantities of seedlings to plant up hectares of land in plantation establishment. Therefore, breaking the seed dormancy by softening the seed testa to allow water inhibition is crucial for any afforestation and deforestation programmes.

Analysis of Variance shows that there was no significant difference among the treatments in height and stem diameter but there was significant difference among the treatments in leaf count at 5% level of probability. Also there was significant difference among all the treatments at 5% level of probability in biomass production. However, treatment five (T_5) i.e. seeds pretreated through mechanical scarification has the highest mean value in plant height (18.38cm) and number of leaves value (12.66). It also shows the same performance in leaf dry weight mean value (4.60g) and root dry weight mean value (6.12g). T_4 i.e. seeds pretreated with cold water for 24hours performed next to T_5 in height mean value (15.28cm) and number of leaves mean value (8.10). It has the highest performance in stem diameter mean value (2.45mm) and stem dry weight mean value (3.13g), but next to T_5 in leaf and root dry weight with mean value of 3.86g and 4.68g. In all the variables assessed, T_3 i.e. seeds pretreated with dil. H_2SO_4 for 10minutes has the least performance.

The result above is in accordance with the assertion that a seed pre-treated with (mechanical scarification and soaking in cold water for 24hours) enhances the germination (Hong *et al*., 1996). Alaje *et al* (2018) also asserted that water treatments enhance germination percentage of *P. macrophylla* seeds and the seeds soaked in water for 6days recorded highest percentage germination. Lower germination percentage recorded in Dil. H could be as a result of acid burnt the seeds and thereby lost its germination ability.

CONCLUSION AND RECOMMENDATION

This study indicated that *P. macrophylla* germinates readily and better when scarified with mechanically and when soaked in cold water for 24hours. It is concluded that both mechanical scarification and soaking in cold water for 24hours pre-treatment influenced the production of healthy and vigorous *P. macrophylla* seedlings, because it has the highest value of seedling height, stem diameter and number of leaves production. It is recommended to soak in cold water for 24 hours so as to get an encouraging germination percentage for sustainable production of *P. macrophylla*, because it can be easily carried out by the farmers and it does not required much technicality.

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