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## EFFECT OF PRE-TREATMENTS AND SOWING MEDIA ON GERMINATION OF SEEDS OF *Tetrapleura tetraptera* (Schum & Thonn) Taub

Akinyele, A.O.\* and Onasanya, O. D.

Department of Forest Resources Management, University of Ibadan, NIGERIA.

\*Corresponding Author: akinyelejo@yahoo.co.uk

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### ABSTRACT

*Tetrapleura tetraptera* (Schumach. and Thonn) Taub is a single stemmed, robust, perennial tree of about 30m. It is generally found in the lowland forest of tropical Africa. The fruit consist of a fleshy pulp which when dried is used as seasoning spice in Southern and Eastern Nigeria. This study was carried out to investigate the effects of pre-treatments and sowing media on the germination of *Tetrapleura tetraptera* (Schum. & Thonn) Taub seeds. Four hundred and twenty (420) mature seeds of *T. tetraptera* were randomly collected from Ibadan, Oyo State, Nigeria and divided into 7 batches of sixty (60) seeds. Each batch of seeds was allocated into different pre-treatments - soaking in hot water (T1), sowing seeds directly into the soil (control (T2), soaking in water for 24 hours at room temperature (T3) and soaking in different concentrated solution of hydrochloric acid (HCl) - 10mg/L (T4), 15 mg/L (T5), 20 mg/L (T6) and 25 mg/L (T7). Each batch of pre-treated seeds was sown into Riversand (S1), Topsoil (S2) and Sawdust (S3) at 20 seeds per sowing medium. Cumulative germination counts were recorded for 12 weeks. The experiment was a Randomized Complete Block Design (RCBD). Data collected were subjected to statistical analysis. Epigeal germination was first observed in the river sand medium after three days. Analysis of variance (ANOVA) showed that there was no significant difference on the effect of pre-treatment on germination of seeds of *T. tetraptera* ( $P < 0.05$ ). Significant difference was observed on the effects of the sowing media and the interaction between pre-treatment and sowing media ( $P < 0.05$ ). In the riversand medium 56.43% germination was recorded while topsoil had 47.14% and sawdust had 7.86%. Interaction between pre-treatment and sowing media showed that seeds sown in riversand with no pre-treatment (control) and HCL 20 mg/L had the highest germination percentages of 85% and 75% respectively. Rate of germination was faster in riversand than topsoil. There was no germination in the control, HCL 20 mg/L and 25 mg/L sown in sawdust. *Tetrapleura tetraptera* seeds are easily germinated without any pre-treatment using both riversand and topsoil.

**Key words:** Germination, pre-treatment, soil media, *Tetrapleura tetraptera*

### INTRODUCTION

The continuous destruction of rainforest has threatened many useful and multipurpose plant species such as *Tetrapleura tetraptera* because little is known about its growth and regeneration principles for domestication, sustainable use and management. *Tetrapleura tetraptera* (Schumach and Thonn) Taub, family Mimosaceae, commonly known as Aridan (fruit) is a single stemmed, robust, perennial tree of about 30 m (Keay, 1989). The fruit consists of a fleshy pulp with small, brownish-black seeds.

The dry fruit has a pleasant aroma (Aladesanmi, 2007). It is therefore, used as a popular seasoning spice in Southern and Eastern Nigeria (Essien *et al.*, 1994; Agyapong, 2000; Okwu, 2005). The fruit is used to prepare soup for mothers from the first day of birth to prevent post-partum contraction (Nwawu and Akali, 1986 as well as management of convulsions, leprosy, inflammation, rheumatism, flatulence, jaundice and fevers (Ojewole and Adesina, 1983). The anticonvulsant activity of the volatile oil from fresh fruits of *Tetrapleura tetraptera* in mice has been reported (Nwawu and Akali,

1986). Its leaves are essential for the treatment of epilepsy (Adewunmi, 1991). The aqueous fruit extract has also been shown to possess hypoglycaemic properties (Ojewole and Adewunmi, 2004). The root extract has also been used for the treatment of gastrointestinal related clinical problems and treatment of malaria in Gabon (WHO 2002). It is generally found in the lowland rainforest of tropical Africa. In Nigeria, it is found mainly in the southern parts where it occurs in rainforest, secondary forest, fringing forests and derived savanna where rainfall and relative humidity are relatively high (Jimoh, 2005).

One of the major problems of *T. tetraptera* is the threat of extinction caused by deforestation. Ecological consequences of deforestation have been reported by many authors (Adedire, 1991; Akachuku, 1997; 1999; 2006). Existing stands of the species are mainly in the wild and traditional agroforestry systems. The production *T. tetraptera* is currently threatened by some factors such as forest fire that occur frequently in the dry season of the year, uncontrolled exploitation, lack of deliberate conservation programs by government, land clearing for road and urban development, non-recognition of valuable spices from it by incidental farmers. Since over 60% of the indigenous species are not usually found in regular cultivations, production of such species is limited by general lack of knowledge about their propagation, improved agro-techniques and reproduction physiology. A good proportion of the species have propagation problems associated with seed dormancy, long maturation periods and very low yield.

Dormancy is the term used genetically to encompass the processes that constitute a programmed inability for growth in various types of plant meristematic apices, often in spite of suitable environmental conditions (Lang, 1996). Also, Basu (1995) described dormancy as the inability of a viable seed to germinate under condition normally considered favourable for the purpose,

namely requisite water, temperature and oxygen. When dormancy is broken by physical or physiological means, the seed readily germinates and will emerge out of the soil. Dormancy regulates the time and conditions that germination will occur.

Pre-treatment is used to terminate dormancy and speed up germination. Pre-treatment could be in various forms of seed dressing, pelleting or coating designed to give the seed protection against pests, diseases or adverse conditions to improve uniformity of seedlings or render the seeds viable to the nursery man (FAO 1985).

There are no known large scale plantations of the species anywhere in Nigeria. In addition, there is inadequate information concerning the fruiting patterns of the species in the South-South geographical zone of Nigeria. This study therefore aimed at providing information on the best soil media and pre-treatment suitable for the germination of *Tetrapleura tetraptera* seeds.

## MATERIALS AND METHODS

### Location of experiment

The experiment was carried out in the screen house at the Department of Forest Resources Management, University of Ibadan, Oyo State. The University is situated 5 km to the north of the city of Ibadan on latitude 7-<sup>0</sup>27'N and longitude 3<sup>0</sup>54'E with a mean altitude of 200 m above sea level.

### Seed pre-treatment and germination

Seeds of *T. tetraptera* were removed from the pod and divided into batches for the pre-treatments. Seven (7) pre-treatments were used for the experiment. They were soaking in hot water (T1), direct sowing (control, T2), soaking in water at room temperature for 24 hours (T3) and using hydrochloric acid at 10 mg/L (T4), 15 mg/L (T5), 20 mg/L (T6) and 25 mg/L (T7). The pre-treated seeds were sown in three (3)

sowing media namely: riversand (S1), topsoil (S2) and sawdust (S3). Watering was done once daily with a watering can.

Four hundred and twenty (420) seeds were equally divided into seven (7) parts and each treatment had sixty (60) seeds which were equally divided into three (3) for each sowing medium. For the hot water treatments, seeds of *T. tetraptera* were soaked in hot water (100°C) and left to cool for 24 hours before sowing the seeds in different sowing medium. Also, seeds of *T. tetraptera* were soaked in water at room temperature for 24 hours.

For the Hydrochloric acid pre-treatment, 10 mg/L of HCL was obtained by adding 2.5 ml of 97% concentrated hydrochloric acid (HCL) into 25 ml of distil water; 15 mg/L was obtained by adding 3.75 ml of 97% concentrated hydrochloric acid (HCL) in 25 ml of distil water while 20 mg/L was obtained by adding 5.0 ml of 97% concentrated hydrochloric acid (HCL) in 25 ml of distil water; 25 mg/L was obtained by adding 6.25 ml of 97% concentrated hydrochloric acid (HCL) into 25 ml distil water. The seeds were soaked in different concentration of acids and left for 24 hours before sowing into the three soil media. Seed germination was monitored daily. The experimental design used was ANOVA (Randomized Complete Block Designs RCBD) after which Least Significant Design (LSD) was used to separate significant means.

**RESULTS**

**Effect of sowing media on germination percentage of *T. tetrapleura* seeds**

The number of *Tetrapleura tetraptera* seeds sowed was 420 seeds, out of which just 147

demonstrated an epigeal germination. The germination percentage was therefore 35%. The first emergence of the seedlings was observed after three (3) days of sowing seeds in riversand medium with pre-treatment of hot water and in five (5) days the control (no pre-treatment) germinated in riversand medium and topsoil medium. The germination in riversand medum was 56.43%, 47.14% in topsoil and 7.86% in sawdust (Figure 1). Riversand had highest percentage of germination after 13 weeks while the topsoil medium also had initial high rate of germination before the germination rate became slow. The sawdust had a very low germination percentage. The pre-treatments had no significant effect on the germination of *T. tetraptera* seeds, however, the various sowing media had significant effect on the germination of the seeds (P< 0.05) (Table 1).

Table 1: Mean values for the effect of pre-treatment on germination of *T. tetraptera* seeds

<b>Pre-treatment</b>	<b>Mean Germination %</b>
Hot water (T1)	25.0
Control treatment (T2)	43.3
Soaking in water at room temp. (T3)	40.0
HCL 10mg/L (T4)	48.3
HCL 15mg/L (T5)	41.6
HCL 20mg/L (T6)	36.7
HCL 25mg/L (T7)	21.7
LSD (5%)	23.6

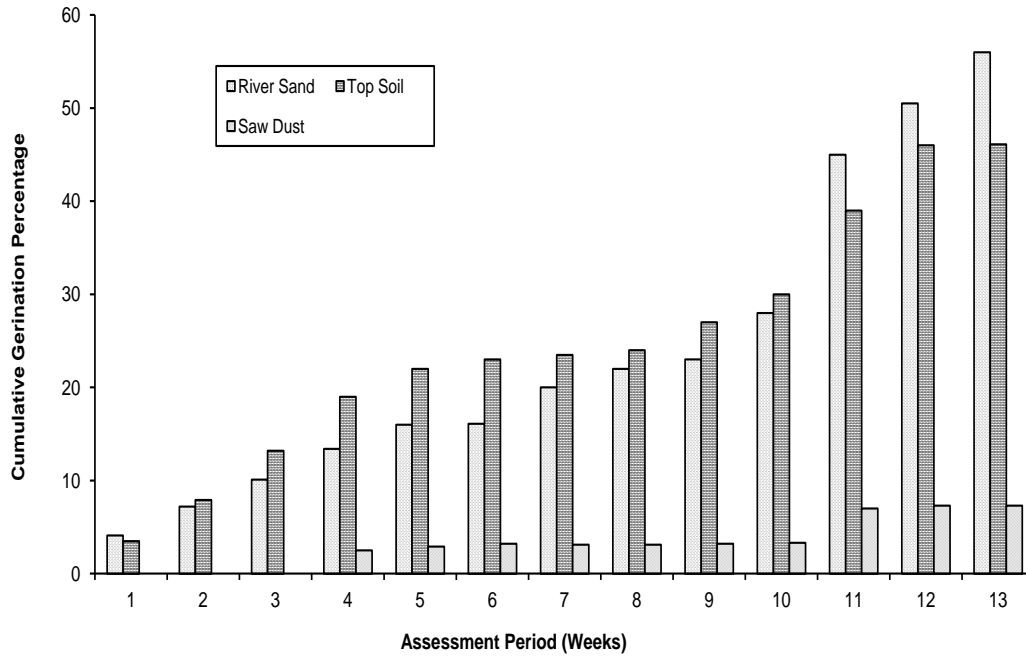


Figure 1: Cumulative germination percentage of *T. tetrapleura* seeds under different sowing media

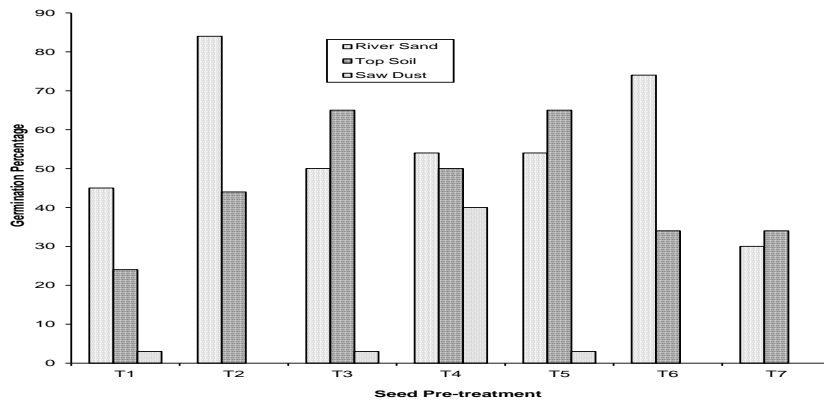


Figure 2: Interactive effect of sowing media and seed pretreatment on germination percentage of *T. tetrapleura*

In the absence of riversand, the graph also indicated seeds could be germinated in topsoil after soaking in water, HCL 15 mg/L, 10 mg/L and control treatment could also be used as alternatives. But the only

pre-treatment that is likely to be encouraged for sawdust is the 15 mg/L of HCL.

### DISCUSSION AND CONCLUSION

Much work has been done on the germination studies of several tree species (Benvenuti *et al.*, 2001; Aiilero, 2004;

Akinyele and Orosun, 2010; Akinyele, 2013). Jimoh and Okali (1999) worked on variation in fruits, seed characters and germination of *Tetrapleura tetraptera*. They examined the different seeds size in relations to the germination percentage but using only topsoil. The seeds pre-treated with 15 mg/L of HCL of *T. tetraptera* in riversand and topsoil gave the highest germination percentage at the earliest stage because during the pre-treatment the suberin in the seeds coats have been removed. But later in the experiment highest germination (85%) was obtained in hot water pre-treatment of riversand. This could be due to the good aeration of riversand compared to topsoil and sawdust. The 20 mg/L of HCL of riversand gave 75% germination while 15 mg/L and cold water pre-treatments in topsoil had 60% of germination. The direct sowing, 20 mg/L and 25 mg/L of HCL on sawdust recorded zero germination, while pre-treatment of hot water, cold water and 15ppm of HCL also on sawdust medium recorded only one (1) seedling germination. This may be attributed to the ability of sawdust to retain water thereby reducing aeration and encouraging fungal growth. Also, leachate from sawdust may be allelopathic, interfering with germination of seeds of *Tetrapleura tetraptera*.

For the hot water pre-treatment, the riversand medium had the highest percentage seed germination (45%) while topsoil had 25%. The control treatment had 85% germination in riversand medium but there was no germination of seeds in the sawdust medium. Sawdust had highest germination percentage of 40% in the HCL (10 mg/L) while other treatments in sawdust showed few or no germination which showed that sawdust medium is not advisable for the growth or germination of *T. tetraptera*.

### Recommendation

The result of this study has shown that the best pre-treatment for raising *Tetrapleura tetraptera* seedlings is the direct sowing using the riversand as the sowing medium. In situation where the riversand is not available or not accessible, topsoil can be used as a substitute. On no account should the seeds of *T. tetraptera* be raised with pre-treated HCL of 20mg/L and 25mg/L of 97% concentrated using the sawdust as a sowing media. The use of direct sowing, control, 10 mg/L, 15 mg/L and 20 mg/L of HCL on riversand can be encouraged, also direct sowing, control, 10mg/L and 15mg/L of HCL can be used on a topsoil.

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