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SEED VIABILITY OF *Dacryodes edulis* (G. DON) H. J. LAM SUBJECTED TO DIFFERENT LENGTHS OF STORAGE

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ABSTRACT
Four hundred and fifty seeds of Dacryodes edulis were extracted from mature fruits obtained from the same source. These were divided into five parts and subjected to five treatments thus: T1: Fresh; T2: 7 days storage; T3: 14 days storage; T4: 21 days storage and T5: 28 days storage. Storage was done at room temperature. Each part was weighed in three replicates and then sown in germination box filled with topsoil. Analysis of Variance showed significant difference in seed weight at α = 0.05 although Duncan's Multiple Range Test revealed that T1 and T2 were not significantly different from each other. Germination was observed on the 17th Day after Sowing (DAS), 21 DAS and 24 DAS for T1, T2 and T3 respectively. Furthermore, T1 had the highest germination percentage of 96.7%, followed by T2 with a value of 70.0% while T3 had the least value of 36.7%. However, seeds in T4 and T5 did not germinate till the experiment was concluded. This study revealed that as length of storage increased, viability of Dacryodes edulis seeds reduced and this knowledge is crucial to its domestication.

Keywords: seed viability, storage, germination, non-timber forest products.

INTRODUCTION
The fruits of *Dacryodes edulis* are a delicacy among the people of Southern Nigeria where it is consumed as an accompaniment with fresh maize (Agbogidi and Eshegbeyi, 2006). Muhammed and Amusa (2005) rightly observed that most people in the world cannot afford the luxury of selecting a daily diet that contains both dairy and meat products as their source of food for their greatly needed calories and proteins. As a result of this, they depend on plants for their much needed nutrients. *Dacryodes edulis* is from the family Burseraceae and it is commonly called African pear. It is also known as Safou in French. The pulp of *D. edulis* is a good source of oil along with its seed and this oil is useful in the food, pharmaceutical and cosmetics industries as well as other industries where fat is used as a raw material (Nwosuagwu *et al.*, 2009). Awono *et al.* (2002) reported that even the leftover cake after the production of pulp oil may be useful in food industry such as bakery and can be used as baby food. Furthermore, the kernel which contains about 3.3% protein is commonly fed to livestock such as sheep and goat. The wood of *Dacryodes edulis* is elastic and it is generally used for tool handles particularly axe shaft and occasionally for mortars. The resin is sometimes burnt for lighting or used as glue. The bark of African pear wood can also be burnt as a primitive lamp oil or bush candle. The leaves contain dye. The tree is planted for shade and can also serve as an ornamental plant. The tree of *D. edulis* is useful in improving soil quality by providing large quantities of biomass which on decay add nutrients to the soil; this quality makes it a potential agroforestry species. The canopy of *D. edulis* can allow its integration into the traditional farming systems involving food crops mainly shade tolerant species (FAO, 1982). Research carried out in the humid lowland forest of South Cameroon showed that the peasant farmers use the tree as a good indicator of soil fertility (Agroforestry Database). However, despite the multipurpose benefits obtainable from *D. edulis*,

Youmbi *et al*. (1998) reported its inclusion in the list of endangered forest species (Leakey, 1999; Nwoboshi, 2000) which must be domesticated and made acceptable to local farmers for future generations to benefit from this economically important fruit tree species. Furthermore, increasing human population keeps exerting pressure on many indigenous tree species many of which are still in the wild. The domestication of *D. edulis* is constrained by a limited knowledge base since existing literatures have focused on reproductive biology, chemical analysis, management and economic potentials. Whereas, Akinnifesi *et al.* (2007) reported that one of the major challenges to widespread adoption of agroforestry and related technologies is the availability of quality planting stock of priority trees.

Seeds are still important starting materials for propagation of many vital tree species. Also, the use of seeds as propagules has been considered the easiest and cheapest and the most common means for many agroforestry and timber tree species. Furthermore, seeds are important planting stocks because many other vegetative propagation techniques still have their origin in seeds. Mng'omba *et al*. (2007) reported that comparatively, there is a lot of information on the seed germination behavior and optimal storage conditions for most of the agricultural crops compared to the wild tree species. Therefore, the knowledge of seed storage of indigenous trees is very crucial to tree propagation with some implications. One of these is that it will determine the medium in which seeds can be stored to retain their viability. Also, the length of storage for which such seeds can be stored will be known since the overall aim of seed storage is to have access to viable seeds in sufficient quantity whenever the need arises. This knowledge is also important in knowing the appropriate time for sowing seeds of any species to achieve optimum germination percentage. Also, many indigenous trees are still in the wild, managed by rural dwellers hence, there is need for a socially acceptable method of storage that is accessible to them. Collection of many indigenous fruits is still done in the wild by rural dwellers in a developing country like Nigeria where electricity supply is still erratic and unstable hence the adoption of storage at room temperature in this study.

METHODOLOGY

One hundred and fifty mature fruits of *D. edulis* were collected from Igede-Ekiti (latitude $7^{0}39^{1}0^{11}$N and longitude $5^{0}7^{1}0^{11}$East), Ekiti State, Nigeria. These fruits were carefully depulped to avoid seed damage. The seeds were then divided into five parts and subjected to different lengths of storage before they were sown. Storage was done at room temperature by spreading the seeds on trays in the laboratory. There were five treatments in all thus: T1: Fresh; T2: 7 days storage; T3: 14 days storage; T4: 21 days storage and T5: 28 days storage. Seeds for each treatment were weighed on metler balance before sowing. Seeds in each treatment were sown in germination trays filled with topsoil in three replicates. These were watered daily in the morning to field capacity and onset of germination was daily observed till no further germination took place for about seven days. Germination was taken to have occurred when the plumule emerged above the soil surface. Results of seed weight, germination rate and percentage were subjected to analysis of variance while Duncan's Multiple Range Test was used to separate means that were significant at α=0.05.

RESULTS

Mean seed weight

Mean seed weight varied significantly among the different lengths of storage of *Dacryodes edulis* seeds. T1 had the highest value of 362.84g followed by T2 with a weight of

315.79g while the least seed weight was obtained in T5 with a value of 265.42g. Analysis of Variance (ANOVA) revealed significant difference in seed weight across treatments at α=0.05. However, Duncan's Multiple Range Test (DMRT) revealed that seed weight value for T1 was not significantly different from that of T2 while these values were different from T3, T4 and T5. Furthermore, T3 was significantly different from T4 and T5 while T4 and T5 were not different from each other (Table 1).

Germination of *Dacryodes edulis* seeds

In T1, germination began on the 17th Day after Sowing (DAS) and was completed on the 29th DAS while germination percentage of 96.7% was recorded. Also, in T2, germination began on the 21st DAS and was completed on the 43rd DAS giving germination percentage of 70%. Germination began in T3 on the 24th DAS and was completed on the 45th DAS and germination percentage of 36.7% was recorded. In both T4 and T5, none of the seeds germinated till the experiment was terminated giving 0% germination for both treatments (Figure 1). Germination began earlier and was completed earlier in T1 than in T2 and T3. ANOVA revealed significant differences ($p<0.05$) among the treatments. However, DMRT showed that T1 was significantly different from T2, T3, T4 and T5 while T2 and T3 were significantly different from each other and these were also different from T4 as well as T5. Nevertheless, T4 and T5 were not significantly different from each other ($p>0.05$). Figure 2 shows the trend in germination count across the period of the experiment at one week interval starting with the day after sowing when germination was first observed in all the treatments.

DISCUSSION

There was reduction in seed weight as length of storage increased with the highest value obtained in Fresh seeds, followed by the seeds stored for 7days while the least value of seed weight was obtained from the seeds stored for 28days. This means that there was reduction in moisture content as length of storage increased. Pangou *et al*. (2011) reported that fresh seeds with a certain level of moisture content (15-90%) normally germinate with a germination percentage of 80-90% but that even a small decrease in moisture content will lead to a significant decrease in seed germination. Also, seeds sown fresh had the highest germination rate and percentage among the different lengths of storage. Seeds sown fresh germinated earlier than the ones sown after 7days of storage and 14days of storage respectively. Seeds subjected to both 21 days and 28 days of storage did not germinate at all. Likewise, Pangou *et al.* (*op. cit.*) still observed fresh seeds as having the highest germination percentage than those stored for different lengths of time. The result of this study is in agreement with the earlier study of Kalenda *et al.* (2002) who reported the seeds of *Dacryodes edulis* as recalcitrant, with uncertain storage behaviour and epigeal germination. Germination rate and percentage of any batch of seeds are important factors in nursery and field establishment of forest crops; as these will influence available planting stocks and subsequently extent of regeneration at any given time.

Finally, the result of this study revealed that *D. edulis* seeds can be stored for a relatively short period of time of not more than 14days without the use of storage media if a measure of germination will be obtained in a batch of seeds. This knowledge is essential for a developing country like Nigeria where most indigenous tree species still exist in the wild close to rural areas that have no access to electricity supply. Storage has been considered by Chin and Roberts (1980) as an important aspect of any sound seed management especially in tropical humid tree species where it is necessary practice due to short supply and dormancy.

CONCLUSION

The variations observed in germination percentage of *Dacryodes edulis* from the five different lengths of storage showed that seeds sown fresh and seeds stored at room temperature for 7days should be adopted for this important species since they both gave high germination percentage (≥70%). The seeds could be raised in forest nursery prior to orchard establishment so that there can be access to planting materials whenever these are needed for large scale plantation establishment. In a developing country like Nigeria where electricity supply is still erratic and unstable, seed storage at room temperature is still very appropriate.

In order to obtain a high germination percentage of 70% and above, seeds of *D. edulis* should be sown fresh or stored for not more than one week if seeds have been carefully depulped to avoid mold growth. For further study, seeds of *D. edulis* stored for more than 14days at room temperature can be subjected to pre-germination treatments to investigate the possibility of viability at such longer periods.

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TABLE 1: Differences in seed weight of *Dacryodes edulis* from the various treatments.

Treatments	Mean Seed weight
T1	362.84a
T2	315.79a
T3	291.64b
T4	278.15c
T5	265.42c

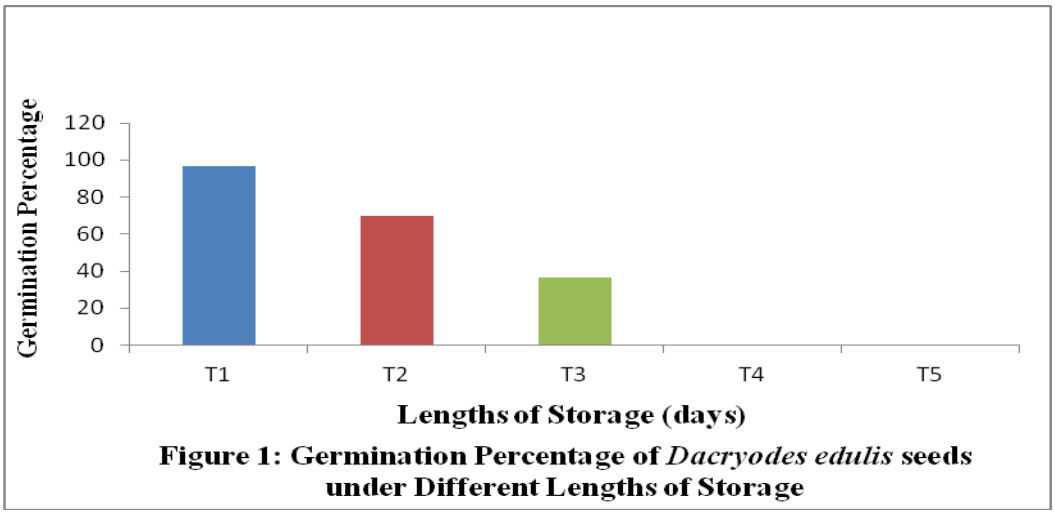

Figure 1: Germination Percentage of *Dacryodes edulis* seeds under Different Lengths of Storage

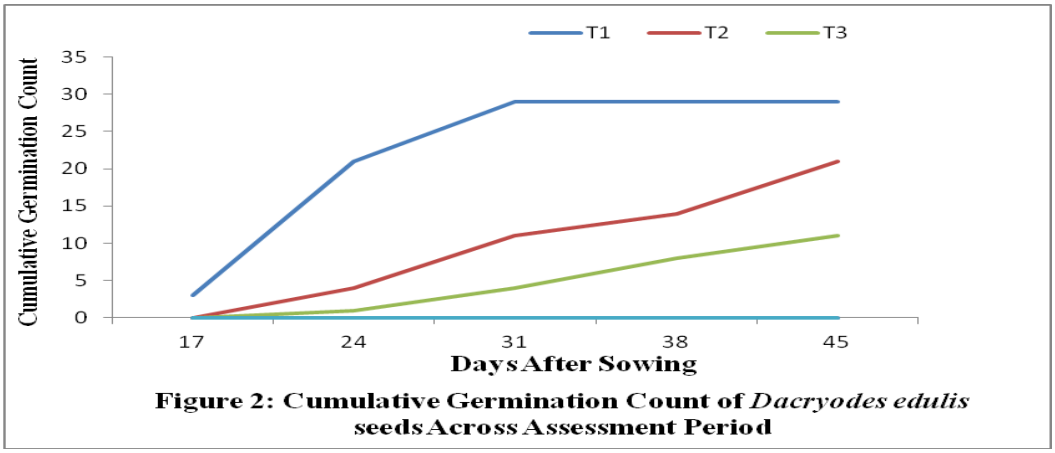

Figure 2: Cumulative Germination Count of *Dacryodes edulis* seeds Across Assessment Period