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SEED STORAGE BEHAVIOUR OF THE EDIBLE BAMBOO *DENDROCALAMUS BRANDISII* (MUNRO) KURZ

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Abstract: Studies on the storage behaviour of the edible bamboo *Dendrocalamus brandisii* were conducted to find the effect of different storage conditions, duration of storage and moisture content on seed germination. Seed attributes like thousand seed weight, length, width, thickness, moisture content and purity percentage were observed. Seeds of *D. brandisii* were small, ellipsoidal, deep brown in colour and 3.20±0.23 mm in length, 2.34±0.22 mm wide and 1.96±0.23mm thick. Thousand seed weight and number of seeds per kg were 6.89±0.08 g and 1,44,976±1788 kg respectively. The moisture content and purity were 8.19±0.22 and 95.87±1.00 percent respectively. Observation on storage indicated that seeds can be stored up to 30 months without any reduction in viability at 4^0C, 45% relative humidity and 8% moisture content in sealed double polythene bags(gauge 0.05mm), placed in airtight plastic containers. Seed samples stored in ambient temperature and 16^0C were able to retain viability only for five and ten months respectively. Seed moisture content significantly influenced the germination percentage of the seeds and the seed viability loss was increased with increasing moisture content.
Keywords: *Dendrocalamus brandisii*, Edible bamboo, seed viability, moisture content.

Introduction

Dendrocalamus brandisii (Munro) Kurz is a very large evergreen edible bamboo, which is commonly used for house building, for making baskets, handicrafts and furniture. It is widely cultivated in Karnataka and Kerala and the species is found growing in the tropical forests, chiefly on calcareous rocks up to an altitude of 1300 m (Seethalakshmi and Kumar, 1998). Young shoots are edible with good quality (Rao et al., 1998). Gregarious flowering is observed in this species with a long flowering cycle of 40-45 years.

Although, abundant seed production is observed, viability of seeds under natural conditions is very short. Planting stock through vegetative propagation methods faces the risk of synchronous flowering, which results in the loss of vegetative propagules along with the death of mother clumps. Seedling is the most dependable source of planting stock provided seed is available. Since flowering cycle is long (40-45 years), it will be extremely useful to develop appropriate storage methods that would prolong the viability of seeds, so that seeds

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when available can be used for raising planting stock in the subsequent years. The results of the investigations carried out to understand the storage behaviour of *D.brandisii* is given in the paper.

Materials and Methods

Seed samples for the study were collected from Ponnampet, Karnataka (12° 08' 32.5" N 75° 55' 16.0" E). Tarpaulin sheets were spread over the ground under the clumps, to facilitate the collection of fallen mature seeds. Collected seeds were air dried to about 8% moisture level. Dried samples were divided into 15 lots of 65 g each. Four replications of 100 seeds from each lot were used for all the experiments. Seed attributes such as thousand seed weight, length, width, thickness, moisture content and purity percentage were determined. Moisture percentage was determined using oven dry method using the formula:

$$\text{Percentage of moisture content} = \frac{(\text{Fresh weight} - \text{Dry Weight})}{\text{Fresh weight}} \times 100$$

Seed purity percentage was determined using the formula:

$$\text{Purity percentage} = \frac{\text{Weight of pure seed}}{\text{Total weight of sample}} \times 100$$

For storage studies**, s**eed samples were divided into 15 lots and 5 lots each was stored at three conditions viz. Ambient condition (T_1), 16^0 C (T_2) and 4^0 C (T_3). The samples were stored in sealed double polythene bags of thickness 0.05 mm, which in turn were placed in air tight plastic containers. 45% relative humidity was maintained in 16^0C (T_2) and 4^0 C (T_3). Seeds from all the storage conditions were tested for moisture content and germination percentage at monthly intervals till 30th month. Germination tests were carried out in vermiculite medium (100 × 4 seeds) and daily germination counts were recorded.

Results

Seed attributes: Seeds of *D. brandisii* were small, ellipsoidal and deep brown in colour. The seed attributes are presented in Table1.

Species	Thousand seed weight(g)	Number of seeds / kg	Length (mm)	Width (mm)	Thickness (mm)	Moisture content (%)	Purity (%)
Dendrocalamus brandisii	**6.89±0.08**	**1,44,976±1788**	**3.2±0.23**	**2.34±0.22**	**1.96±0.23**	**8.19±0.22**	**95.87±1.00**

Table 1. Seed attributes of *Dendrocalamus brandisii*

Storage studies: The seeds sown in the medium germinated from the third day onwards and germination was completed within 13-16 days. The results indicated that *Dendrocalamus brandisii* seeds can be stored at 4^0C and 45% relative humidity for 30 months without any reduction in viability. Seeds stored in 16^0C were able to retain viability for about 10 months. A gradual decrease in the germination percentage was observed from the 11^{th} month onwards and viability was totally lost at the end of 24^{th} month. In the case of seeds stored in ambient condition, germination percentage was stable only for five months and viability was completely lost at the end of 11^{th} month (Fig 1).

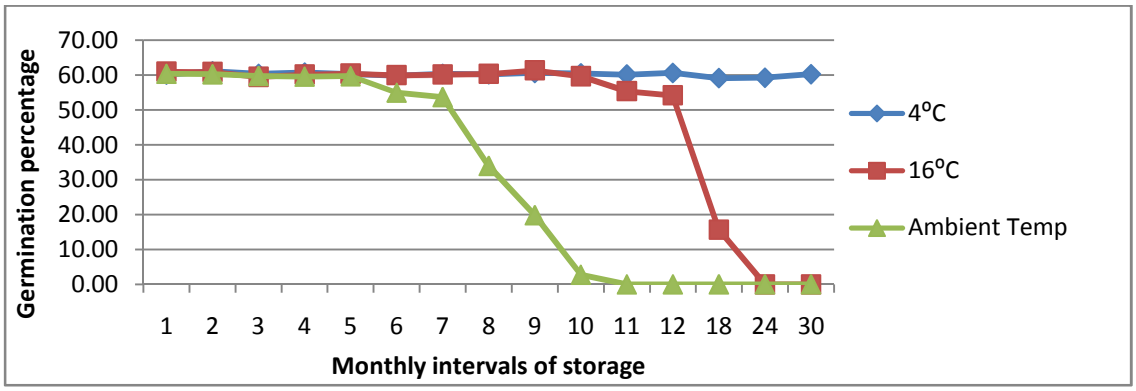

Fig 1. Effect of different storage temperatures and periods in the seed germination of *D.brandisii*.

In 4^0C storage seeds were able to maintain their initial germination and moisture percentage for 30 months. The regression equation connecting germination and moisture percentage of seeds stored in 4^0 C were not significant ($R^2 = 0.016$) (Fig 2).

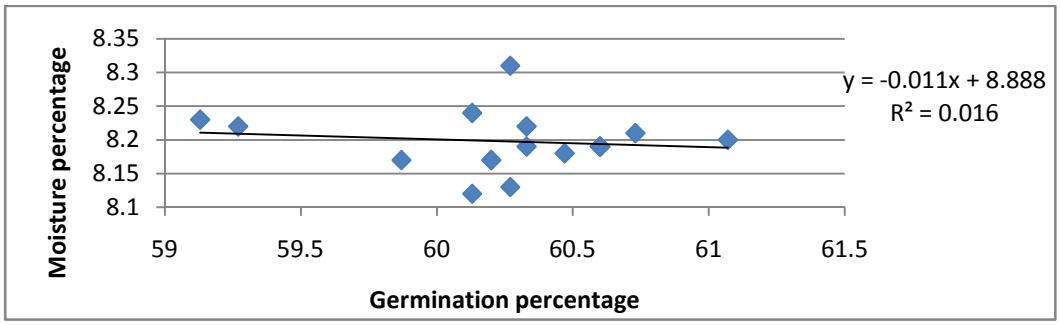

Fig 2: Graph shows linear regression between seed germination and moisture % of seeds stored in 4°C.

The regression equation connecting germination and moisture percentage of seeds stored in 16^0 C were highly significant ($R^2 = 0.790$). In 16^0C seeds were able to maintain viability for about 10 months. Germination percentage started to decrease from the 11^{th} month onwards

and at the end of 24 th month no germination was observed. The moisture content of *D. brandisii* seeds showed increasing trend with the decrease in germination percentage (Fig 3).

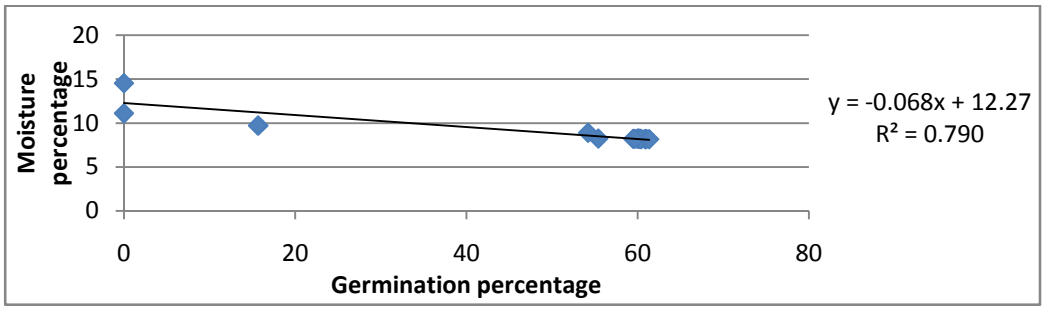

Fig 3. Graph shows linear regression between seed germination and moisture % of seeds stored in 16°C.

The regression equation connecting germination and moisture percentage of seeds stored in ambient temperature were highly significant (R^2=0.691). In ambient condition, germination percentage and moisture content of seeds were stable only for five months. The viability was completely lost at the end of 11th month. Moisture content also increased gradually with viability loss (Fig 4).

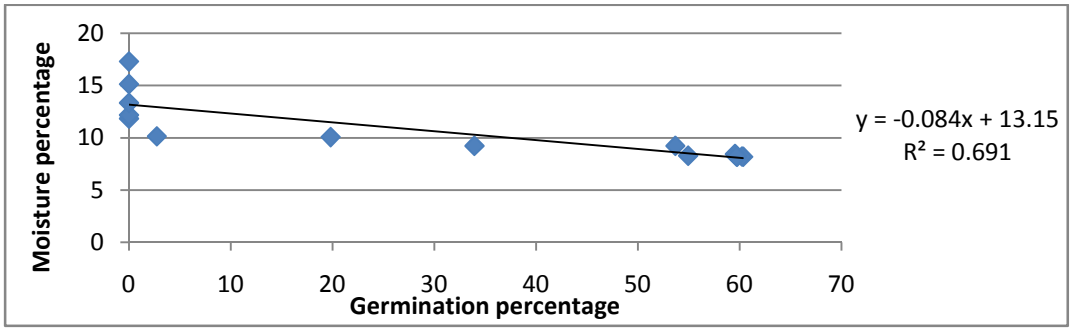

Fig 4. Graph shows linear regression between seed germination and moisture % of seeds stored in ambient temperature.

Discussion

The results show similarity to the earlier observations of (Boonarutee et al., 1990) that viability of *Dendrocalamus brandisii* seeds can be extended for 18 months by storing under cold room temperature (2-4^{0}C). In the present work, *D. brandisii* seeds were able to maintain their viability up to 30 months in cold storage (4^{0}C). The results of the study also showed that it behaves similar to other species such as *Bambusa arundinacea, Bambusa nutans, Dendrocalamus strictus, D. membranaceus* and *Thyrsostachys siamensis,* (White, 1947;

Gupta and Sood, 1978; Somen & Seethalakshmi, 1989; Ramyarangsi, 1990; Thapliyal et al.,1991; Rawat et al, 2003; Warrier et al.,2004). Seed viability can be extended by reducing the initial moisture content before storing. *Thyrsostachys siamensis* seeds stored at low temperatures (24^0C and 5^0C) maintained a high percentage of viability up to 27 months.

Previous studies in the seeds of *Bambusa bambos* and *Dendrocalamus strictus* reported that with accelerated ageing the total content of food reserves such as sugars, proteins and lipids, activity of peroxidase, acid phosphatase and alkaline phosphatase were reduced. Increase in total free aminoacids and the activity of amylases confirmed the degradation of seed reserves (Ravikumar et al., 1998; 2002). Therefore degradation of food reserves may be the main reason for the deterioration of seeds which results in the loss of viability. Baldwin (1955) concluded that a 1% reduction in moisture content can double the storage life of seeds. In this experiment seeds with lower moisture content retained their viability longer than those with higher moisture content. Therefore seed moisture content, temperature and food reserves can influence the duration of seed storage and should be the major factors to be considered in the further studies.

Conclusion

The present study on the seed storage behaviour of *D. brandisii* has revealed that seeds in cold storage (4^0C) with low moisture content (8%) were able to retain their viability for 30 months. Therefore *D. brandisii* seeds can be stored for longer duration under low moisture content and low temperature.

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