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Seed propagation for *Oxytenanthera abyssinica*

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Abstract: *Oxytenanthera abyssinica* seeds, collected from Lilongwe, Malawi, in 2003 were tested for viability and germination after three months of collection. Suitable temperature regime was identified.

Key words: Bamboo, seed germination, temperature.

INTRODUCTION

Several methods for vegetative propagation of *Oxytenanthera abyssinica*, such as culm cuttings, cuttings using sections of lateral branches, marcotting and layering, were attempted by the authors in Malawi in 2003, but without success. Fanshawe (1972) reported a germination rate of 5-30 per cent in *O. abyssinica* seeds at nursery in 11 days in Malawi but details were not provided. When seeds were sown with different orientations and at various depths, 'lay flat' orientation and 2.5 cm sowing depth gave the highest germination rate of 80 per cent (Embaye, 2003). However, no seed pre-treatment was given (*e.g.*, soaking in water) in his method.

No reliable method of seed treatment or appropriate planting season has been reported for propagation of bamboos in general. Seeds of *O. abyssinica* sown in the warm season (November in Malawi) were reported to have taken 11 days to germinate, while those sown in the cold season, 2-4 months (Anon., 1954). Therefore, avoidance of distinctly cool periods appears appropriate, but precise temperature recommendations are lacking. The flowering interval of *O. abyssinica* is still not clear and it has been reported that it occurs irregularly and the cycle is long (Fanshawe, 1972; Innes, 1977; Williamson, 1975). As flowering and seeding of *O. abyssinica* were observed in 2001-2003 in Lilongwe, Malawi, Tetrazolium test and direct germination test in controlled conditions were conducted to identify suitable temperature for germination.

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MATERIALS AND METHODS

Of the 123 seeds of *O. abyssinica* (Fig. 1) collected from the east bank of the Lingazi river in Lilongwe Nature Sanctuary (13º57′ S, 33º47′ E; 1060 m asl) on 11 May 2003, 23 seeds were randomly sampled and used for Tetrazolium test.

Tetrazolium test

As no Tetrazolium test procedure for bamboo was available in the literature, the test procedure for *Oryza sativa* (ISTA, 1996) was adopted for *O. abyssinica* seeds in a modified form. First, 23 dehusked seeds were soaked in distilled water and left in a dark cabinet maintained at 22°C for two hours to soften the seed coat. Next, the seed coat was abrased with sandpaper to facilitate water penetration into the seeds. Finally, the seeds were again soaked in distilled water and then left in a dark cabinet at a temperature of 27°C for 18 hours. The seeds were then longitudinally bisected along the embryonic axis. One seed in a decayed state and one without an embryo were excluded. The cut seeds were soaked in a one per cent aqueous solution of tetrazolium for two hours. Evaluation of staining was made immediately after this.

Direct germination test

Seeds were kept for three months at room temperature after collection. Of the 100 remaining seeds after the Tetrazolium test, 76 were used for a direct germination test in controlled conditions. The dehusked seeds were soaked in tap water to break any seed dormancy and left in a dark cabinet at 20°C for 24 hours. The seeds were sown vertically in seed tray filled with moistened sand, embryo end upwards. For investigation of thermal effects on germination, seed trays with 38 seeds each were kept in cabinets in two different temperature conditions (Table 1).

Table 1. *O. abyssinica*: Germination conditions imposed in growth cabinets

	Cabinet 1 (38 seeds)		Cabinet 2 (38 seeds)	
Temperature	32°C, 8 h	22°C, 16 h	36°C, 8 h	26°C, 16 h
Light	Light, 8 h	Dark, 16 h	Light, 8 h	Dark, 16 h
Humidity	90% at all times		90% at all times	

Germination of seeds in cabinets was monitored daily for a month from 12 August 2003 to 11 September 2003. The sand on seed trays was continually kept moist by spraying water ensuring that moisture content was not excessive.

The following parameters were determined:
Imbibition period (the number of days from sowing to the first recorded germination);
Total germination period (the number of days from sowing to the last instance of germination);

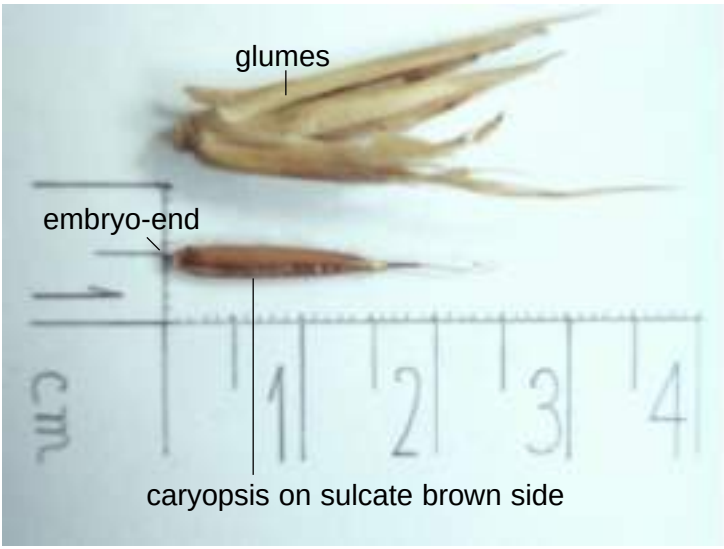

Figure 1. *O. abyssinica* seeds collected from Lilongwe (June 2003).

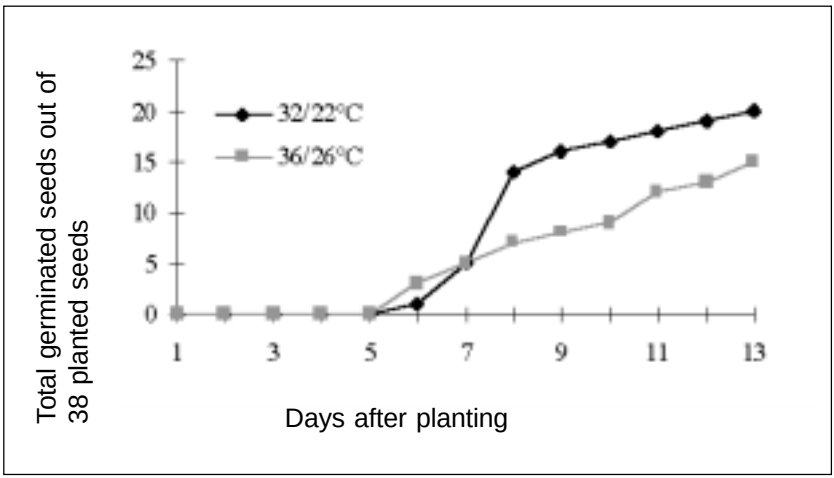

Figure 2. Results of direct germination test of *O. abyssinica* under controlled conditions.

Cumulative germination percentage (the final level of germination recorded);
Mean daily germination percentage (calculated by dividing the cumulative percentage by the number of days for each of the time period);
Final daily speed of germination (the mean daily germination percentage for the duration of the test period).

From the parameters above, the following additional values were derived:
Germination energy (the highest of the calculated mean daily germination percentages);

Energy period (the interval in days from sowing to reaching the highest mean daily germination);
Germination value (the germination energy multiplied by the final daily speed of germination)**.**

RESULTS AND DISCUSSION

Tetrazolium test

All the 21 seeds (100%) were viable in the Tetrazolium test.

Direct germination test

The cumulative germination percentage under the 32/22°C regime was higher than the 36/26°C regime (Fig. 2; Table 2). The cumulative germination percentage one month after sowing was 53 (20 out of 38 seeds) under the 32/22°C regime and 40 (15 out of 38 seeds) under the 36/26°C regime. Most seeds which did not germinate were decayed probably because excessive water was supplied. Of the two regimes compared, the temperature 32/22°C regime (light 8 hours/ dark 16 hours) was more suitable for the germination of *O. abyssinica* seeds than the 36/26°C regime. However, there was no significant difference between the number of germinated seeds in 32/22°C regime and 36/26°C regime. Observation period was 30 days after sowing but the total germination period was 13 days in both treatments. Energy period of the temperature regime of 36/26°C (13 days) was longer than that of the regime of 32/22°C (9 days) (Table 2).

Table 2. Derived parameters of germination test

Parameters	Treatment	
	32/22°C	36/26°C
Germinated seeds/total	20/38	15/38
Imbibition period (days)	6	6
Total germination period (days)	13	13
Cumulative germination (%)	53	40
Final daily speed of germination	4.0	3.0
Energy period	9	13
Germination energy (%)	4.7	3.0
Germination value (no units)	18.8	0

Embaye (2003) obtained a similar germination rate to that recorded here for *O. abyssinica* seeds from Ethiopia (50%) with embryo-end up orientation in 32 days after sowing and 60 per cent in 45 days. Although all the seeds were viable in the Tetrazolium test, only 40-53 per cent germination was recorded in the direct

germination test depending on the temperature regimes tried. Taking this fact into account, temperature regimes need to be modified, probably 1-2 degrees lower, to minimise the loss of seed viability.

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