

Germination of tropical forage seeds stored in ambient and controlled temperature and humidity conditions

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Introduction

Correct storage of tropical forage seeds in the humid tropics is critical in order to safeguard germination. Storing Mulato hybrid brachiaria (*Brachiaria ruziziensis* x *B. brizantha*) seed under ambient conditions could be safely done for 8–12 months in Thailand, but rapid deterioration in viability occurred with longer storage, with seed being totally non-viable after 20 months storage (Hare et al. 2008). However, Mulato seeds kept in cold storage (10 °C and 40% RH) for 3 years still maintained 80% germination. Similar results were found in northern Australia (Hopkinson and English 2005), where loss of viability of *Panicum maximum*, *Brachiaria decumbens*, *Brachiaria humidicola*, *Setaria sphacelata* and *Chloris gayana* seeds was rapid under ambient conditions with total death at 3 years. Under cold storage, maximum seed viability was still maintained after 6 years of storage.

Embryo dormancy is reduced with age (length of storage) and is usually short-lived (i.e. several months) in many *Brachiaria* species. Hare et al. (2008) found that dormancy was quickly lost in Mulato seed stored at ambient temperatures but still persisted strongly after 3 years in cold storage. Hopkinson and English (2005) found that dormancy persisted longer under cool storage than under ambient storage.

Forage seeds produced by Ubon Forage Seeds at Ubon Ratchathani University (Hare et al. 2013) are stored in a large commercial cool room (18–20 °C and 50% RH), but there are no data on how long seeds can be safely stored in this room. The objectives of this trial were to study: the effects of ambient storage and cool-room storage on germination of our range of tropical forage seeds; and the persistence of embryo dormancy with storage.

Materials and Methods

This study is an ongoing trial conducted at the Faculty of Agriculture, Ubon Ratchathani University, Thailand. It commenced in January 2011 and will continue for as long as seeds continue to germinate. This paper reports on the germination results for the first 2 years (January 2011–January 2013). Seeds of Mulato II (*Brachiaria ruziziensis* x *B. decumbens* x *B. brizantha*), Mombasa guinea (*Panicum maximum*), Tanzania guinea (*P. maximum*), Ubon paspalum (*Paspalum atratum*) and Ubon stylo (*Stylosanthes guianensis*) were studied. Two lots of Mulato II seed were available (harvested from ground-sweeping the seed; and harvested by knocking the seed from seedheads), and half of each lot was scarified in sulphuric acid for 10 minutes and half left untreated. Ubon stylo seeds were either scarified with sulphuric acid or left untreated. Each lot consisted of 3 kg of seed placed into commercial polyethylene bags.

Seeds were placed in 2 storage rooms (ordinary ambient conditions and a cool room). The ambient seed room was a seed storage shed at Ubon Ratchathani University and average monthly temperatures in this room varied from 22 °C (January) to 34 °C (July) and average daily RH from 80% (January) to 95% (August/September). The cool room was at the Ubon Rice seed station and was maintained at 18–20 °C and 50% RH throughout the study.

Seed samples were drawn in August and January of each year. Three lots of 100 seeds for each cultivar test were placed on petri dishes on top of filter paper wet with a 0.2% potassium nitrate solution and placed in a germination cabinet at 25 °C with 16 h dark and 35 °C with 8 h light. Germination counts were taken at 7 and 14 days.

Results

Seed germination of all cultivars, except Ubon stylo, deteriorated rapidly under ambient conditions with almost total death after 1 year of storage (Table 1). After 2 years storage in the cool room, seed germination of Mulato II and

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Ubon stylo was maintained but germination of Mombasa, Tanzania and Ubon paspalum seeds was starting to decline. Under ambient storage, only seed of Ubon stylo that was not acid-scarified still produced high germination (94%) after 2 years (Table 1).

Seeds of Mombasa and Tanzania guinea grasses showed improved germination following 8 months cool-room storage (Table 1). Seeds of Mulato II and Ubon stylo not scarified in acid and stored in the cool room, maintained very low germination (0–23%) but once scarified with acid, germinations increased to 73–88% for Mulato II and 99–100% for Ubon stylo (Table 1).

Discussion and Conclusions

This study indicates that:

- under ambient storage conditions, seeds of Mulato II, Mombasa guinea, Tanzania guinea and Ubon paspalum cannot be safely stored, even for short periods (8–12 months), with seeds almost totally non-viable after 12 months;
- seeds of Mulato II and Ubon stylo can be safely stored in controlled cool-room conditions for 2 years;
- seeds of Ubon paspalum and Mombasa and Tanzania guinea grasses can be safely stored in a cool room for up to 20 months, after which germination starts to decline;

- embryo dormancy in Mulato II and hardseededness in Ubon stylo could not be broken by storage and persisted strongly after 2 years storage in a cool room; and
- embryo dormancy in Mombasa and Tanzania guinea grasses was quickly broken by cool-room storage.

The study will continue to determine when, under cool-room conditions, the viability of the guinea grasses and Ubon paspalum reaches zero and for how long treated Mulato II and Ubon stylo seed will maintain its viability and untreated seed will retain its dormancy/hardseededness.

References

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Table 1. Effect of seed storage room conditions on 14 day seed germination (%) of 5 tropical forage cultivars.

Cultivar	January 2011	August 2011		January 2012		August 2012		January 2013	
		Cool ¹	Ambient ²	Cool	Ambient	Cool	Ambient	Cool	Ambient
Mulato II ground sweep, acid	84	91	34	90	3	89	0	87	0
Mulato II ground sweep, non-acid	5	9	17	7	1	17	0	7	0
Mulato II ground sweep, non-acid then acid with test	84	78	51	75	3	88	0	81	0
Mulato II hand knocked, acid	51	80	17	81	0	90	0	84	0
Mulato II hand knocked, non-acid	0	2	5	1	0	3	0	1	0
Mulato II hand knocked, non-acid then acid with test	51	83	26	75	0	84	0	73	0
Mombasa guinea	35	72	10	68	0	65	0	49	0
Tanzania guinea	43	58	15	45	1	58	0	29	0
Ubon paspalum	73	81	16	79	0	83	0	60	0
Ubon stylo acid	92	99	94	94	0	99	0	97	0
Ubon stylo non-acid	16	16	17	19	2	23	0	5	1
Ubon stylo non-acid then acid with test	92	100	96	99	87	99	93	99	94

¹18–20 °C and 50% RH; ²Range of mean monthly temperature: 22–34 °C; range of mean monthly RH: 80–95%.



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