

# Effects of Different Conditions and Duration of Storage on the Germination of Babassu Seeds (*Orbignya phalerata*)

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The babassu palm (*Orbignya phalerata* Mart.) is one of the greatest extractive resources of Brazil (EMBRAPA 1984). The palms of this genus occur in almost 200,000 square km of area and offer benefits including cash, fuel, fiber, oil and food for approximately 500,000 families of small rural producers (May et al. 1985).

However, little is known with respect to the biology of these palms. The present experiment studied the periods of elapsed time from planting until the initiation of germination, the intervals of occurrence of germination and the viability of seeds of the species of *Orbignya phalerata* subjected to different conditions and lengths of storage.

The information obtained is of value for the ongoing work in building a babassu germplasm bank by EMBRAPA (The Brazilian National Agricultural Research Network) as well as for people interested in cultivating this and related species.

The seeds (in fruits) were collected directly from the mature panicles. Fruits were selected according to size and external condition, and sorted into random lots in order to obtain a high degree of uniformity.

The treatments utilized combined conditions of storage as well as duration of

storage and subjected fruits to the following treatments.

## I. Conditions of Storage

- Fruits stored in the field, under the shade of a tree, directly on the soil.
- Fruits stored in the shade, in a simple shed, on a cement floor.
- Fruits stored in a conventional storage chamber for seed conservation, at a temperature of approximately 15° C.
- Fruits stored in a conventional storage chamber for seed conservation, at a temperature of approximately 10° C.

## II. Duration of Storage Prior to Planting

- Control: planted immediately after collecting the fruits.
- Planted three months after collection.
- Planted six months after collection.
- Planted nine months after collection.
- Planted twelve months after collection.
- Planted fifteen months after collection.
- Planted eighteen months after collection.
- Planted twenty-one months after collection.
- Planted twenty-four months after collection.

Treat- ment	Condition of Storage	Duration of Storage (Months)	Percentage (%) of Germination at Different Days												
			Initiation of Germination												
			Days	%	70	83	120	150	180	210	240	270	300	330	360
01	Control <sup>a</sup>	—	70	6.7	—	6.7	8.3	8.3	8.3	30.0	35.0	48.3	51.7	51.7	51.7
02	Fruits stored	3	97	30.0	—	60.0	68.3	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0
03	in the field	6	83	18.3	18.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
04		9	42	16.7	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3
05		12	183	3.3	—	—	—	—	—	3.3	3.3	3.3	3.3	3.3	3.3
06		15	69	1.7	1.7	1.7	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
07		18	61	3.3	5.0	5.0	5.0	5.0	5.5	6.7	6.7	6.7	6.7	6.7	6.7
08		21	—	—	—	—	—	—	—	—	—	—	—	—	—
09		24	92	8.7 <sup>b</sup>	—	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
10	Fruits stored	3	97	23.3	—	48.3	53.3	53.3	53.3	56.7	56.7	56.7	56.7	56.7	56.7
11	in sheds on	6	83	6.7	6.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
12	a cement	9	74	1.7	1.7	1.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
13	floor	12	88	1.7	1.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
14		15	69	1.7	1.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
15		18	—	—	—	—	—	—	—	—	—	—	—	—	—
16		21	69	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
17		24	—	— <sup>c</sup>	—	—	—	—	—	—	—	—	—	—	—
18	Fruits stored	3	97	11.7	—	21.7	26.7	26.7	26.7	28.3	28.3	28.3	28.3	28.3	28.3
19	in a seed	6	—	—	—	—	—	—	—	—	—	—	—	—	—
20	storage	9	127	1.7	—	—	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
21	chamber at	12	—	—	—	—	—	—	—	—	—	—	—	—	—
22	15° C	15	—	—	—	—	—	—	—	—	—	—	—	—	—
23		18	129	1.7	—	—	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
24		21	70	3.3	—	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
25		24	— <sup>d</sup>	—	—	—	—	—	—	—	—	—	—	—	—
26	Fruits stored	3	139	1.7	—	—	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
27	in a seed	6	—	—	—	—	—	—	—	—	—	—	—	—	—
28	storage	9	—	—	—	—	—	—	—	—	—	—	—	—	—
29	chamber at	12	—	—	—	—	—	—	—	—	—	—	—	—	—
30	10° C	15	—	—	—	—	—	—	—	—	—	—	—	—	—
31		18	—	—	—	—	—	—	—	—	—	—	—	—	—
32		21	—	—	—	—	—	—	—	—	—	—	—	—	—
33		24	—	— <sup>e</sup>	—	—	—	—	—	—	—	—	—	—	—

<sup>a</sup> Fruits planted after collection; <sup>b</sup> Number of fruits planted: 23; <sup>c</sup> Number of fruits planted: 57; <sup>d</sup> Number of fruits planted: 58; <sup>e</sup> Number of fruits planted: 59.

The control consisted of 60 fruits planted approximately two days after collection. The planting of the control was planned for the same day of collection, but this was not possible.

The rest of the treatments, 60 fruits randomly selected, stored under the various conditions outlined above, were planted after each period of treatment. The exceptions were treatments 9, 17, 25 and 33, and due to a deviation in the plan, these were planted in smaller groups conforming to the numbers mentioned in the footnote in Table 1.

The entire fruits were planted in the same way as in nature. The planting was in a greenhouse, in trenches with a spacing of 1.0 m  $\times$  0.2 m, in Teresina, Piauí. The seeds were irrigated during the dry season at intervals as necessary to maintain humidity in the soil. Generally, irrigation took place every three days. When there was sufficient rainfall, the irrigation was not needed.

Each entire fruit was considered as a single diaspore, capable of reproducing a new organism (Angely 1959). Generally, the fruits of babassu contain 2-6 kernels or seeds, covered by a very thick and woody endocarp. We consider that germination is established in the diaspore when there is the emergence of at least one plantlet. Even when two or more seeds produce plantlets on the same fruit, we only consider this as the germination of a single diaspore. The notes on germination were made, at a minimum, every week.

Table 1 lists the number of days from planting until the initiation of germination, the total percentage of fruits that germinated in this experiment as well as the percentage of fruits that had germinated over intervals of 30 days, from 90 to 360 days.

We found that there was a significant lack of uniformity in the germination. The range of the initiation of germination was 42-183 days, respectively, in treatments four and five, with an amplitude of 141

days. On the other hand, in treatment eleven, the duration from the initiation to the end of germination lasted 488 days.

The fruits that were stored in the field for three months (treatment two) gave the greatest percentage of germination (70%). The second highest percentage of germination was of the fruits stored in the field over a nine-month period (treatment four) which gave a germination rate of 58.3%. The third highest rate was from materials stored in a shed for three months (treatment ten) which resulted in a 56.7% germination. Finally, the fourth highest percentage, 51.7%, was obtained from the control group.

The control group (treatment one) nevertheless had seedlings germinating after 416, 468 and 521 days after planting, with a final germination rate of 56.7%. In treatment eleven, a single fruit germinated 571 days after planting. In general, we have found that there is a tendency for a reduced rate of germination in materials planted after the sixth month of storage. The only exception was from treatment four (fruits kept in the field over a nine-month period) and this was considered an unusual case.

One of the significant tendencies seen from this experiment was the negative influence that storage at lower temperatures (10° C and 15° C) had on germination, especially as the storage periods became longer. The fruits that were stored at 10° C had a germination rate of only 1.7% when the storage period was three months (treatment 26). After six months of storage at this temperature, there was no germination.

Based on the results of this experiment, the following conclusions and recommendations are presented:

1. It is best not to store fruits destined for planting for periods longer than three months.
2. It is best not to store fruits destined for planting in conventional seed storage

chambers at temperatures from 10° C–15° C.

3. Fruits collected for planting can be kept in the field, under trees, thereby reducing costs of storage.

4. Even though the non-uniformity of germination is an important characteristic for the survival of *Orbignya* in regions with irregular rainfall, it is of great disadvantage for the formation of seedlings in a nursery. For this reason, we suggest that planting of the entire fruit is not the method of choice for germination of

babassu, and that other alternatives for the multiplication of this species be utilized.

#### LITERATURE CITED

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