A Method for Germinating Copernicia Palm Seeds

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It is well known that palm seeds are frequently very difficult to germinate. Much waste of time and bench space occurs, especially in dealing with large numbers of smaller seeds, when hundreds of pots are required to secure a few seedlings from seeds that germinate poorly under the usual direct planting approach. Recent intensive work in propagating numerous species of the genus *Copernicia* has led to experiences which may prove to be valuable to other growers of palms.

Early in an effort to learn some basic information about water absorption characteristics in seeds of certain *Copernicia* species it was discovered that protracted periods of soaking the seeds in daily fresh changes of tap water could induce first signs of germination within five days to three weeks. The occasional occurrence of slime caused by bacteria and molds attacking the seeds during this water-soaking period was discouraged by regularly rubbing the slime away from the seed coats manually when changing to fresh water. *Copernicia* seeds can easily be removed from within the fruit and consequently all seeds discussed here were clean and free of any vestiges of pericarp. In addition to wishing to prevent rot, the development of microbes was discouraged to obviate any possibility that phytotoxic or inhibitory substances be produced by them as has been suggested in the literature. Glass, porcelain and concrete containers were used during the course of this investigation.

Any softening of a particular seed was considered as a sign of incipient rot which prompted its discard after dissection. Very few seeds were ever lost in this manner and dissection usually revealed that insect infestation by bruchid larvae or the same insects attacked by a secondary parasite, a chalcid wasp, had caused the seed injury leading to susceptibility to rot. Since the seeds had been fumigated with methyl bromide the insects were dead prior to the soaking period.

It may be worth noting here that when hundreds of small seeds are being worked with, another labor-and space-saving device is water flotation of the seeds. Experience has shown that seeds that float are usually not viable. The most common reason for the lack of viability is injury due to insect parasitism, although on occasion fungus damage has been noted also. However, when the stage of larval development is very early, some seeds will not float despite fatal insect damage. Accordingly, not all of the nonviable seeds can be separated in this manner.

An obvious pattern of lower viability was noted for seeds in an inverse relationship to their age dating from time of harvest. Although older seeds may require many weeks of soaking before germination occurs in large numbers, the freshly harvested seeds were found to germinate as early as two days after soaking began. Freshly harvested seeds which of necessity were delayed as much as four weeks by U.S. Plant Quarantine inspection and fumigation treatment or by unexpected transit delays in shipping were found to begin the first flush of germination within five days. Continued soaking produced the appearance of additional germ sprouts until after one month over 80 per cent of the seed lot usually would germinate. Incidentally the evidence is that methyl bromide fumigation does not adversely affect viability of *Copernicia* seeds.

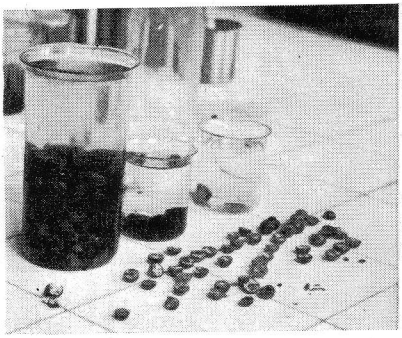

Fig. 1. Soaking *Copernicia* seeds in the laboratory in Brazil permitted detection and analysis of insect-infested "floaters."

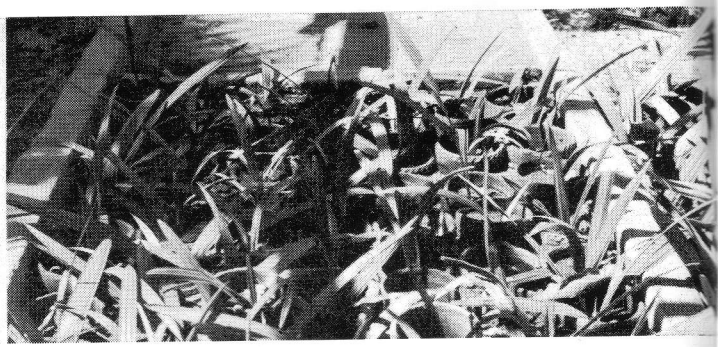

Fig. 2. Sunken pots in beds were repositories for some of the water-sprouted seeds. Nearly 100 per cent emergence occurs.

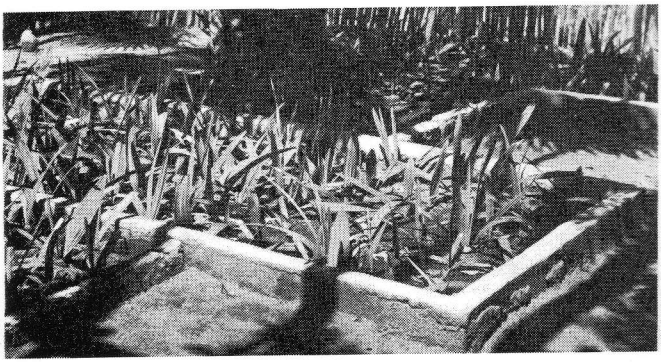

Fig. 3. Some seeds were planted directly in beds with brick-lined bottoms preventing excessive downward root-growth and simplifying transplanting.

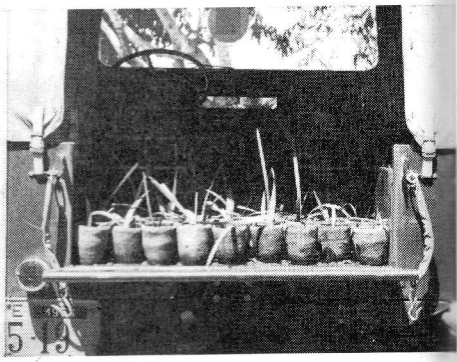

Fig. 4. Seedlings nine months old grown in nursery beds being transported to the field for transplanting.

Fig. 5. *Copernicia hospita* (right) from open nursery is too large at 3½ years for convenient handling but can be transplanted successfully. *Copernicia australis* (left) at nine months is a better size.

Fig. 6. *Copernicia Baileyana* two years old grown from seeds germinated by water-soaking technique.

The sprouted seeds were immediately planted singly in pots as fast as they germinated and first seedling leaves were observed to emerge within thirty-five days. This novel approach has great advantages over planting dry seed directly into potted soil since, unlike the dry technique, the viable seeds in this case can be distinguished from those which will not give rise to seedlings. There is consequently no loss in space, time, labor and materials, and the savings which thus accrue become available for more profitable use. It is also true in the case of *Copernicia* that higher percentage of germination is experienced using this technique.

When the factor of increasing age of seed is considered, a gradual decline is noted in per cent of viability of seeds in this genus of palms. This may also be true of other small-seeded palms. Since frequently long periods elapse between the time that the collector harvests and the grower receives the seed, it would be well for growers to consider testing this water-soaking technique as a more efficient means for germinating such palm seeds.

The specific palms involved in this study may not be considered very important by growers at present since research on them is being done in an area of restricted interest. However, it is thought that possible application of this technique might be found useful for other genera of palms. Some work has begun at the U.S. Plant Introduction Garden at Chapman Field, Coconut Grove, Florida, using other small-seeded palms known to be difficult to germinate.

Of the species studied by this laboratory one is from Brazil, one from Paraguay, one from Venezuela, and twelve are from Cuba. The Paraguayan specimen, *Copernicia australis* Becc., presented an additional problem.

With *C. australis*, it became apparent that simple water-soaking alone would not produce the desired germination since out of several thousand seeds only 1.5 per cent germinated within the first thirty days. This was an entirely unexpected result since the seeds were relatively fresh and fully mature. To determine what might break this apparent dormancy, a number of the treatments known to be successful in testing seeds of other plants were tried. They included:

1. Freezing for twenty-four hours in ice cube trays (one seed per cube) and then thawing in tap water.
2. Chilling in water for forty-eight hours at refrigerator temperatures (4°C.).
3. Soaking in hot water (five minutes at 70°C.).
4. 10 per cent sulfuric acid bath (fifteen minutes).
5. Continuous aeration in water. (seven days).
6. Scarification of seed coat near embryo.
7. Control—fresh changes of tap water.

Each set listed above was given the initial treatment described and then soaking in daily fresh changes of tap water was continued until germination occurred. The response was excellent for (6) scarification; good for (4) sulfuric acid bath and slight for (5) aeration. All other treatments showed no improvement over the control. Since the scarification proved to be the fastest method (overnight) it was selected for use when controlled early germination was required.

Soaking of several hundred untreated seeds in daily fresh changes of tap water was continued for nine months and during that time a sporadic flurrying of natural germination still occurred. All seeds after this protracted period were still viable and were finally germinated nearly 100 per cent by the scarification method. Apparently no harm from the long soaking-period occurs to the dormant seeds of this species so long as daily change to fresh water is continued to prevent microbial degradation.

The natural habitat of *Copernicia australis* Becc. is the flat plain lowland area

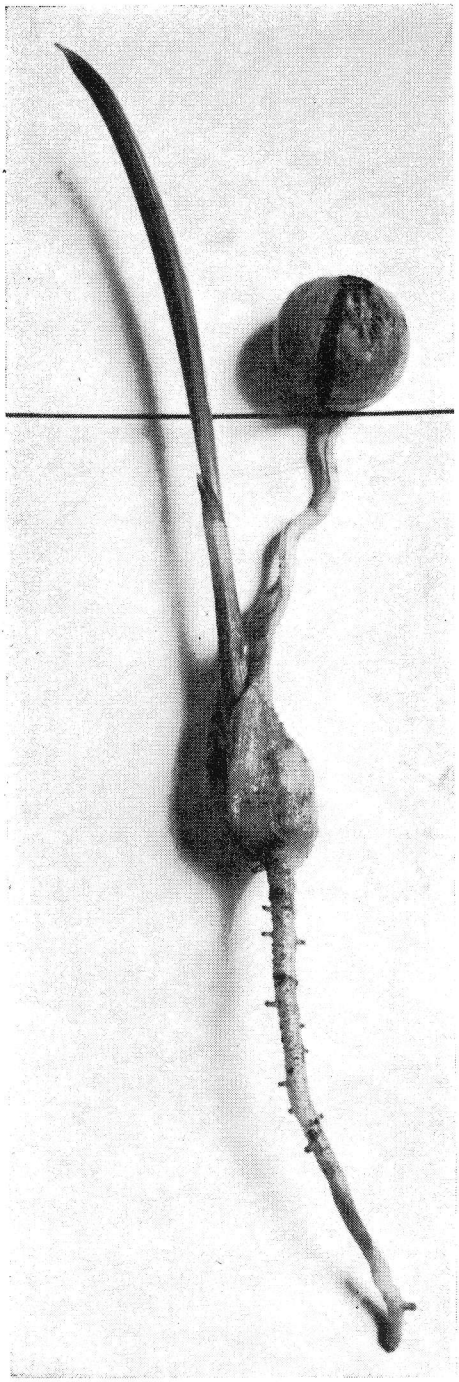

Fig. 7. *Copernicia hospita* seedling 40 days after initial germination sprout appeared grown in hydroponic system.

of the Gran Chaco in Paraguay. Annual flood stage of the Paraguay River produces standing water around the palms for weeks at a time and it seems likely that microbial degradation of the seed coat in this standing water may cause an effect similar to scarification. However this treatment variable of allowing microbial attack of the seed coat to occur was not practiced and whether this would encourage germination is not known.

By excising the flap of seed coat away from over the embryo the germination sprout could be induced to emerge within twenty-four hours in this group of long-soak seeds. That they should have remained alive under the described soaking conditions for such a long period seems unusual. Some preliminary work suggests that naturally occurring water-soluble and water-insoluble anti-microbial agents are to be found in the seed coat.

Extractives from various *Copernicia* seeds have been selected for further study to determine what their inhibitory powers might be. Despite the current lack of full understanding of the *C. australis* dormancy and water-soak phenomenon, the numerous seedlings which were grown from this lot are living tribute to the peculiar history of these seeds.

Occasional miscalculation in dissecting away the seed flap caused a tearing or cutting into the embryonic tip. This invariably resulted in the formation of a fibrous atypical root-like growth which continued atypical until the endosperm became exhausted. Such damaged specimens rarely recovered to produce normal seedlings.

From these experiences with fifteen of the thirty identified *Copernicia* species it is evident that this water-soaking method of seed germination is a most practical approach when attempting to grow large numbers of palms of that genus. It is suggested that many of the small-seeded palms may similarly benefit from this technique.