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PRACTICAL METHODS FOR HYBRIDIZATION IN THE *SYAGRUS* ALLIANCE

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Abstract. **Methods for collection, live preservation, storage, and use of pollen in hybridization of palms in, and related to, the *Syagrus* alliance are described. Included are *Butia* (a.k.a. *cocos australis*), *Syagrus* (formerly *Arecastrum*) *romanzoffianum* (a.k.a. *cocus plumosa* or queen palm), and their hybrid (*cocos* hybrid). Virtually no laboratory equipment is used.**

The *Syagrus* alliance is a group of more than fifty species of pinnate cocoid palms of widely differing forms comprised within the *Butiinae* (14) subtribe (Table 1). The forms vary from the massive *Jubaea spectabilis,* having a solitary trunk (11) through clustering (*e.g., Syagrus flexuosa*), and non-clustering (*e.g., Butia*) species of moderate size, to grass-like species such as *S. graminifolia* and *S. vagans* (2,3,6,14). The group varies widely in cold-hardiness; *Jubaea* and *Butia* are among the most cold-hardy of pinnate palms, while many others are tender or unevaluated. Several naturally occurring hybrids have been noted within the alliance as listed in Table 2 (1,4,5,7,8,9,12,17). These naturally occurring hybrids have comprised various combinations of clustering and non-clustering parents. The majority of the species in the *Syagrus* alliance whose chromosome number has been determined have n = 16 (13,14). There is extensive research relating to pollen extraction and preservation in the cocoid genera *Cocos* and *Elaeis* (10,15,16). There is a widely adapted medium available for testing viability of palm pollen (13). These favorable considerations, together with the esteem held in the industry for the hybrid between *Butia* and *S. romanzoffianum,* were strong encouragement for studies of hybridization within the *Syagrus* alliance.

Table 1. Summary of the Subtribe Butiinae (14)

Genera	Species contained
Allagoptera	5
Butia	8
Cocos	1
Jubaea	1
Jubaeopsis	1
Lytocaryum	3
Parajubaea	2
Polyandrococos	2
Syagrus	33

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Butia is by far the most convenient palm genus to use as a female parent at the latitudes of Gainesville and Jacksonville for these studies. We quickly noted that slightly less than half of the *Butia* specimens keyed as *B. capitata*; random mixtures including other species of *Butia* were common.

Materials and Methods

Butia specimens were selected for ease of emasculation of their inflorescences. Very large differences in this attribute were noted. All male and the occasional perfect flowers were removed, as the latter proved to be fertile. The emasculated inflorescence was enclosed in a large plastic bag prior to the emergence of the stigmas (Fig. 1a). Pollen was collected from desired male parents (15) and dried in a refrigerator over silica gel for two to four days. The pollen was no deeper than 10 mm in the container while dried. After the pollen was extracted from the inflorescence, the latter was heated in an oven at 40°C for one-day intervals and re-extracted (15). These batches of pollen were also dried over silica gel in the same manner. After drying, the bottles of pollen were capped and stored in the freezer. These were tested in the medium described (13), except colchicine was deleted.

Depending on the available quantity of pollen, it was applied to the stigmas either by Q-tip individually or by sprinkling the entire inflorescence. The pollen was applied shortly after the stigma emerged as in Fig. 1b, when the stigmas began to separate at their tips, through the stage depicted in Fig. 1c. The plastic bag was removed no more than a week later, as it seemed to cause precocious maturity with resultant small seed size. It is usually necessary to protect the developing infructescence with a screen-wire bag, as one squirrel can destroy hundreds of seed at milk stage within a few hours.

Table 2. Naturally-occurring hybrids in the *Syagrus* alliance.

Hybrid	Fertility status	Reference
Butia x *S. romanzoffianum*	sterile	9,12,17
Butia x *Jubaea*	fertile[z]	
S. coronata x *S. oleracea*	fertile	8
" x *S. romanzoffianum*	–	4
" x *S. schizophylla*	fertile[z]	4
" x *S. vagans*	–	1
S. oleracea x *S. romanzoffianum*	–	5

[z]Unpublished observations by the authors.

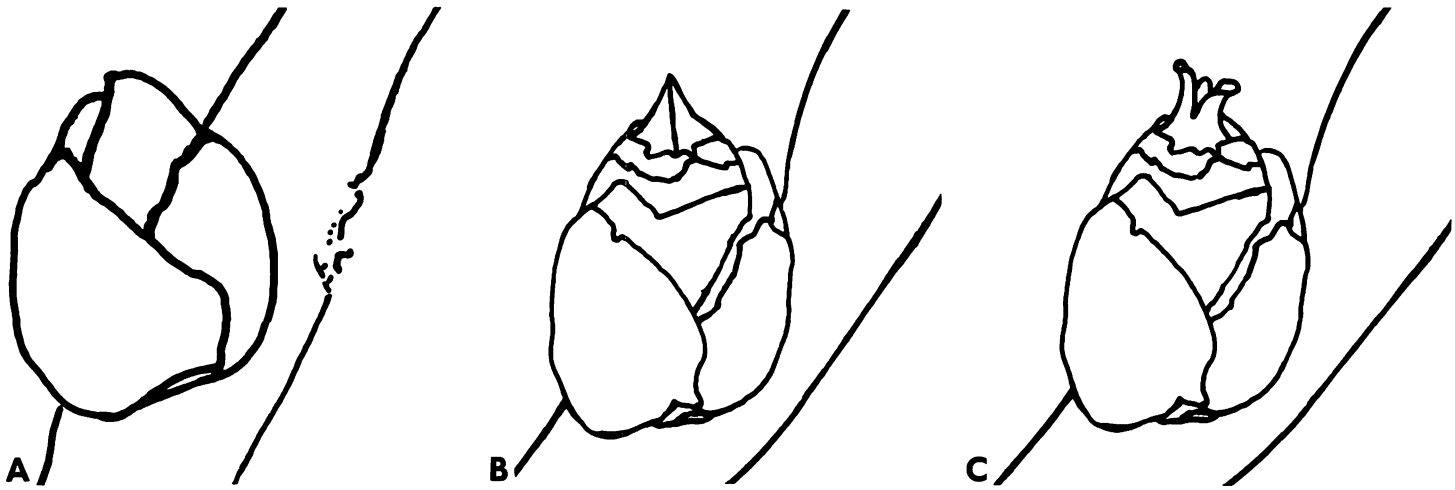

Fig. 1. Female flower of *Syagrus* alliance (a) before emergence of stigmas, (b) after emergence of stigmas, and (c) at end of receptive interval (enlarged).

Results and Discussion

Using the very simple extraction and preservation methods described herein, it was possible to store for a year in viable condition pollen of *Allagoptera arenaria, Syagrus* x *tostana,* and all of the *Syagrus* species listed in Table 2, except *S. schizophylla.* The latter species and *Butia* and *Jubaea* were not as amenable to the extraction procedure; nevertheless some pollen could be extracted and preserved and crosses were made from their pollen. We pollinated *Butia* with viable pollen from *Cocos* or *Elaeis* many times under ideal conditions without success. There is a widespread belief in the Florida nursery industry that the *Butia* x *S. romanzoffianum* hybrid is extremely vigorous. Our belief is that those hybrid seedlings that are discovered randomly in some *Butia* seedbeds are usually the genetically superior survivors from a much larger population of hybrid seedlings of mediocre vigor. The average vigor of seedlings from controlled crosses has been disappointingly low.

The authors feel that modern asexual propagation of selected hybrids offers considerable commercial horticultural promise because of the wide variety of plant forms available in the *Syagrus* alliance.

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