Trials with Cocosoid Hybrids in Jacksonville, Florida

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1. Flower buds of *Butia capitata* just before opening.

North Florida poses some climatic challenges to growing palms. It has a subtropical climate for most of the time, but the occasional freeze places the area decidedly in USDA growing zone 9A. At best, one can grow 50 species of palms. Hybrids may expand the number of ornamental palms available to North Florida growers, but the production of hybrid palms is a slow process.

I wasted the better part of two decades in the search for obscure species of *Syagrus, Hyphaene, Rhopalostylis, Ceroxylon, Laccospadix* and *Jubaeopsis* to extend this list of cold hardy palms. This quixotic quest carried me to such destinations as Africa, Brazil, Bolivia and many others. It was largely unsuccessful, as these plants did not survive the rigors of our climate.

It was after squandering my robust years in these journeys that I seriously considered hybridization to extend the list of suitable palms for this climate. By this time, I had a mature grove of six *Butia capitata*, and these would be the subjects for me to research various combinations of related species. Dr. Merrill Wilcox had performed extensive trials with *Butia* and *Phoenix* (Wilcox et al. 1990, Wilcox 2001). I wanted to extend his research and attempt to create different combinations of *Butia* and other species.

Butia is a cocosoid palm. *Butia* shares a number of characteristics with other genera. Table 1 compares these characteristics. These characteristics became the basis for developing new hybrids, moreover this comparison would eventually enable one to discern the

2. *Butia capitata* inflorescence bagged to destroy male flowers.

Table 1. Some comparative characteristics of selected Cocosoid taxa (from Glassman 1968, 1987; Henderson 1995).

	Parajubaea spp.	*Jubaea chilensis*	*Jubaeopsis caffra*	*Allagoptera* spp.	*Butia* spp.	×*Butiagrus nabonandii*	*Syagrus romanzoffiana*	*Sagrus coronata*	*Syagrus schizophylla*
Trunk	Single	Single	Clustered	Clustered	Single	Single	Single	Single	Single and multiple
Petiole margins	Fibrous	Smooth or fibrous	Smooth or fibrous	Smooth	Armed with fiber-spines	Dentate toward apex	Smooth or fibrous	Fibrous	Armed with fiber spines
Pinnae	Regularly arranged		Regularly arranged	Clusters in many planes	Regularly arranged	Regularly arranged; some overlap	Clusters of 2–5	Clusters of 3 or 4	Regularly arranged
Pinnae L × W (cm)		30–46 × 2.5–3.0	80–85 × 3.0–3.3		26–80 × 0.5–2.5	106 × 2.5	70–85 × 2.5		
Peduncular bract	Sulcate	Smooth or striate	Smooth or striate	Sulcate	Smooth or striate	Some striation	Deeply striate	Deeply sulcate	
Rachillae		30–60 cm; maroon	71–82 cm; greenish brown	unbranched; yellowish-green	60–80 cm; greenish or purplish	60–80 cm; greenish brown			
Number of rachillae		100		N/A	50–99	180	80–280	48–52	
Pistillate flowers		7 × 9–10 mm; maroon	8–10 × 5–7 mm; cream	Yellow/cream	3–16 × 3.5–10 mm; cream or purplish	5–7 × 4–4.5 mm	4.5–6 × 4–6 mm	9–13 × 5–7 mm; maroon	5–8 × 4–6 mm
Staminate flowers		10–14 mm; maroon	12–20 mm; cream	6 mm	4–13 mm; cream or purplish	6 mm; purplish	6 mm; yellow to cream	7–11 mm; cream	5–8 mm; yellow
Stamen number	15	15–30	8–16	7–12	6	6	6	6	6
Fruitlength × diam. (cm)	3–7 × 3.0–3.8	3.4–4.1 × 3.0–3.8	2.8–3.1 × 3.0–3.2	1.2–2 × 1–1.3	1.8–4.2 × 1.0–2.8	0.4–0.9 × 0.6–0.8	0.8–1.2 × 0.6 cm		
Embryo pores	Basal	Near middle (equatorial)	Equatorial	1–2 pores	Equatorlial sometimes basal	Apical	Apical		
Endosperm		Homogeneous		Homogeneous	Homogeneous	Slightly ruminate	Irregular, ruminate		Ruminate

3. A seedling of *Butia* × *Jubaea.*

characteristics of hybrids produced from these species. These species would serve as the candidates for my trials. I initiated a series of trials in 2001 to determine if some of these intergeneric hybrids were feasible.

To hybridize *Butia*, one must understand the floral morphology. As a cocosoid, *Butia* has flowers borne in triads of one female (pistillate) flowers subtended by two male (staminate) flowers (Henderson et al. 1995). Staminate flowers mature first and release pollen. According to Henderson (1986), staminate anthesis lasts two weeks, and pistillate anthesis lasts just one week. Within a single inflorescence, some male flowers may be producing pollen when the first female flowers come into bloom. Consequently, one must guard against unwanted self-pollination and synchronize pollination (with a candidate pollen) with the females' later receptivity.

Figure 1 depicts a close up of a *Butia* inflorescence with both pistillate and staminate flowers. To hybridize *Butia* successfully, this source of *Butia* pollen must be eliminated. This requires removing the male flowers before they can release pollen and pollinate the later opening female flowers. The male flowers are removed manually. Bagging the inflorescence or part of it isolates the female flowers and helps to prevent any residual pollen from contacting the female flowers. It may even kill residual pollen, as was suggested by Wilcox et al. (1990) and Wilcox (2001). The female flowers will become receptive several days to two weeks later (depending upon weather), and the target pollen can be introduced. Figure 2 illustrates a bagged *Butia* inflorescence.

Initial trials began in 2001. Dr. Wilcox had created a *Jubaea* × *Butia* hybrid with pollen from a *Jubaea* at Fairchild (Wilcox et al. 1990, Wilcox 2001). He opined that the Fairchild tree was probably not pure *Jubaea* and was probably itself a hybrid between *Jubaea* and *Butia*, as it had *Butia* characteristics. In North Florida, however, sources of *Jubaea* pollen were unavailable. *Jubaea* uniformly fails in North Florida, so a trip to California was necessary.

In spring 2001, Dr. Wilcox and I visited about 50 mature *Jubaea chilensis* from San Diego to Santa Barbara to study floral morphology and collect pollen. We were minimally successful, as we collected a single inflorescence and many blossoms that had fallen from larger trees. This fresh *Jubaea* pollen was introduced to several *Butia capitata* trees and over 200 viable seeds were produced. Figure 3 shows one of these *Jubaea* × *Butia* hybrids after several years.

I attempted further trials with *Syagrus romanzoffiana* with this *Jubaea* pollen but without success. *Syagrus romanzoffiana* has over 200 rachillae and emasculation is very difficult. Hybrid cross-pollinations produce seeds but no viable embryos. Other trials were conducted with accessions of *Parajubaea* and *Juabea* pollen from other sources, but no success was achieved on either *Butia* or *Sygarus* with this pollen.

In 2002, I conducted further trials with *S.* × *costae*, *Jubaea* and *Parajubaea* pollen but had no success. I further attempted several times to apply *Butia* pollen to *S. romanzoffiana* to create a "reciprocal Mule" but this produced no viable embryos. This was a year for developing technique and procedure. It was also a bad year for squirrels and so the success of pollination was inconclusive as I lost several seed batches. By this time, however, many of the 2001 *Butia* × *Jubaea* seedlings were germinating.

In 2003, I attempted trials with *Allagoptera arenaria* on the two *Butia capitata*. I also conducted further trials of applying *Butia* pollen on *S. romanzoffiana*. These multiple trials were unsuccessful. I have collected several volunteer plants at the base of these trees, but I need to defer judgment until I see some adult characteristics of the putative hybrids.

In 2004, I was the wiser for my three years of trials. I had studied the flowering cycle of my *Butia* grove and had perfected procedures of pollen collection and storage. Moreover, I had constructed scaffolds and ladders to perform pollination effectively. I conducted extensive trials with *Allagoptera arenaria*, *Butia* × *Jubaea*, *Syagrus coronata*, *Syagrus romanzoffiana* and *Jubaea chilensis*. These trials had mixed results. Pollinations of *S. romanzoffiana* with *Butia* and *Jubaea* were unsuccessful. However, pollinations of *Butia* × *Allagoptera,* as well as *Butia* × *S. coronata* were successful.

By June, 2005, I had conducted multiple trials with *A. arenaria, S.* × *costae* and *S. schizophylla*. Several seed sets are in the making. I am attempting a reciprocal cross of *A. arenaria* with *Butia* pollen. The emasculation process is a bit more difficult as the male flowers are concentrated in a dense spike, yet it is possible to produce fairly clean spikes for introducing *Butia* pollen. It requires further washing with high pressure water to remove any residual *Allagoptera* pollen. This technique has been fairly successful, as I have several seed batches.

Over the course of the last four years, I have produced approximately ten healthy *Butia* × *Jubaea* hybrids; moreover, I have produced apparently viable seeds of *Butia* × *S. coronata* and *Butia* × *Allagoptera* hybrids. Successes have been few, but persistent trials have refined my knowledge and technique and paid some modest dividends. It is early to declare definitive success on the hybrids, as it may be some time before the plants exhibit the mixed characteristics of species. I am looking forward to comparing the characteristics of these various hybrids to see what is produced. I am planning future trials with *Acrocomia*, *Jubaea*, and *Jubaeopsis* pollen.

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