

Hawaii, it is really an island of paradise, anything grow beautifully there."

In another letter he says: "What is the medium you usually use to germinate palm seeds? I use the charcoal from rice husk (after they used rice husk as boiler fuel in the rice mill), it is a black and coarse grain, free from fungus and it is easy to transplant the seedling be-

cause the medium will not pack tightly after 2 or 3 months.

"Could you ask some member in Indonesia to contact with me, I want some *Pigafetta elata* seeds which is not in the Society list."

The rice charcoal adds one more to the varied list of germinating media used by Society members.

LUCITA H. WAIT

Collecting Palms in Brazil

S. F. GLASSMAN

University of Illinois at Chicago Circle

During the summer of 1965 I visited Brazil for the purpose of collecting and studying palms in the genus *Syagrus* and its allies which include *Arecastrum*, *Arikuryroba*, *Barbosa* and others.* The *Syagrus* alliance with some 40 or more species, is almost exclusively South American in distribution, only *Rhyticocos amara* being found in the West Indies. This group is a difficult one to study because many type specimens consist of incomplete material or are non-existent; many of the descriptions are inadequate for determination; and a number of the species are known only from one or two specimens

I arrived in Rio de Janeiro in the latter part of June, and subsequently visited Dr. Klare Markley who had been with the late Gregorio Bondar on his last collecting trip. Dr. Bondar had spent many years studying palms in Bahia and Espirito Santo. Dr. Markley politely declined the offer of collecting palms with me because he was busy completing a manuscript on vegetable oils. Before leaving Rio, I spent a few days at the Jardim Botânico studying herbarium specimens and observing various living palms. Fortunately, Dr. L. H.

Bailey and Dr. B. E. Dahlgren had made excellent collections of *Syagrus* in the Jardim back in the 1920's so it wasn't necessary to spend time preparing herbarium specimens here.

My next stop was the Instituto de Botanica de São Paulo which is part of the Ministerio de Agricultura in the state of São Paulo. I made arrangements with the director, Dr. Alcides Teixeira, to ship the specimens I collected back to the United States. Because of mailing restrictions, it is difficult for a foreigner to ship anything out of Brazil. The following day the director introduced me to Mr. José Correa Gomes, curator of the phanerogamic herbarium. After discussing collecting plans with Mr. Gomes, to my great delight he agreed to accompany me on the entire trip. Up to that time my plans were rather nebulous. Originally, I intended to fly to all of the major cities in the states of São Paulo, Minas Gerais, Espirito Santo and Bahia, rent a car and hire a driver or guide, and then drive to the designated collecting localities. New cars are very expensive in Brazil (even by U. S. standards) so there is an abundance of older, dilapidated models on the streets. When Mr. Gomes decided to join me my car problems were

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1. *Syagrus flexuosa* (?) between Araraquara and Baurú, S. Paulo, with J. C. Gomes.

solved because the Instituto de Botanica made a new Jeep available to us. It also solved the problem of a driver and guide who could speak Portuguese. Although Mr. Gomes spoke very little English and I spoke a fractured Portuguese, we were able to communicate with each other in Spanish. I agreed to absorb the automobile expenses and to leave a duplicate set of plants at the Instituto. In general, the cost of gasoline and maintenance of a car is slightly more expensive in Brazil than in the United States.

At the beginning of July we left by Jeep for a five day trip in the state of São Paulo. Travelling in a northwesterly direction, our first important stop

was at Fazenda dos Caeures, about 7 miles east of the town of Rio Claro. The owner of this cattle ranch was Mr. Jorge Ferguson, formerly of Texas, who spoke Portuguese with a southern accent. Of interest were scattered trees of *Arecastrum Romanzoffianum* and *Syagrus macrocarpa* (?) from which we collected specimens.

After obtaining specimens from the first tree we changed our collecting techniques radically. At first we used a ladder to reach the crown of the tree and proceeded to saw off various leaves and inflorescences. During the process of removing these parts, I was attacked by an assortment of large biting ants, bees and wasps, and other pests. In

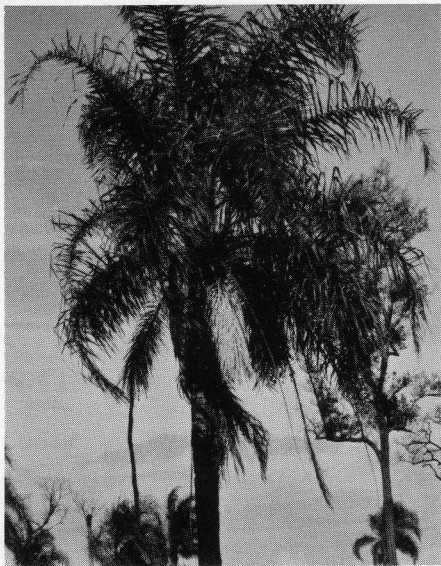


2. Part of a stand of *Arecastrum* and *Syagrus* with Jeep, Fazenda Pedro Felipe, 12 miles E. of Marilia, S. Paulo.

order to avoid direct contact with insects (and to avoid climbing the trees) the most satisfactory way to collect palm specimens is to cut down the whole tree by use of an axe or saw. It was usually necessary to obtain permission from the owner if the trees were on private land. After the tree fell we would wait for about five minutes at a safe distance to allow most of the creatures to fly or crawl away.

Later that afternoon we drove by a savanna (*cerrado*) northwest of Itirapina where we collected *Attalea humilis* (?) and an undescribed species of *Syagrus*. Both palms were trunkless. The following day we photographed isolated specimens of *Acrocomia* and *Arecastrum* on a coffee plantation between São Carlos and Araraquara. Both trees were in fruit. Coming back to the southwest, between Araraquara and Baurú, we noticed scattered specimens of *Syagrus flexuosa* (?) growing in a

savanna. These trees had slender trunks about 5-10 ft. tall. That night we stayed



3. *Arecastrum Romanzoffianum*, closeup of crown, Fazenda Pedro Felipe.



4. J. C. Gomes holding inflorescence and infructescence (leaves on ground) of *Syagrus* growing in same stand with *Arecastrum*, Fazenda Pedro Felipe.

in a beautiful modern hotel in São Carlos for only \$3.00 including meals.

During the next two days we probably saw more palms in the *Syagrus* alliance than at any time on our entire trip. The first formation encountered was about 10 miles east of Marília on a *fazenda* (ranch) with cattle, coffee and other crops. This forest of about 200 palms, apparently exposed to periodic burning, was dominated by *Arecastrum* and *Syagrus oleracea* (?). Travelling north of Marília, near Pompeia, we saw an extensive palm forest of an estimated 3,000 trees. There appeared to be at least three different species represented: a medium-to-tall, thick-trunked

palm (*Arecastrum*), a very tall (about 120 ft.) thin-trunked plant (*Syagrus* sp.), and a much shorter, thick-trunked tree (*S. oleracea*?). Formations of the above three species were observed along the same road in the following localities: about 200 trees on both sides of the road near Iacri, 5 miles N. of Tupã; many scattered groups of 25-50 trees along the road to Pararapua; and two separate formations of 200-300 palms each, 8 miles N. of Tupã. About 12 miles N. of Tupã, on the Fazenda Vanuir, we noticed a forest of about 1,000 trees, many with charred trunks. There were no very tall, skinny trees here, but a medium-sized *Arecastrum*, a me-



5. Closeup of apparent hybrid between *Arecastrum* and *Syagrus oleracea* (?), Fazenda Vanuir, 12 miles N. of Tupã, S. Paulo.

dium-sized *Syagrus*, and a short *Syagrus* about 10 feet tall. Preliminary observations indicated that one of the species of *Syagrus* was a hybrid. By this time our Jeep was so full of palms that we had to return to São Paulo to finish pressing them.

We spent the next two or three days at the Instituto de Botanica at São Paulo sorting out and cutting up the specimens for drying. Most of the specimens are cut up into pieces the size of a herbarium sheet ($11\frac{1}{2} \times 16''$) or smaller so that they will fit into the compartments of a standard herbarium case when dried. Less bulky specimens can be folded back once or twice and dried in that manner. Each piece is tagged and numbered, and loose flowers and fruits are placed in paper bags or packets.

The herbarium at São Paulo has ex-

cellent facilities for handling large collections such as we had. For instance, there is a ceramic-tiled table on one side of the room that is about 50 feet long. At one point, a visiting botany class of some students taught by Dr. F. Hoehne walked into the herbarium when our specimens were spread out from one end of the table to the other. They seemed to be impressed by the magnitude of the collection. At least, I hoped they would appreciate the amount of hard labor involved.

On July 8, we set out on the major part of the trip. Plans were to visit type localities and collect abundant material of poorly known or imperfectly described species in Minas Gerais, Espírito Santo and Bahia. As was the case in São Paulo, our luck in finding specimens both in flower and fruit was phenomenal. It was the flowering sea-



6. Trunkless species of *Syagrus* originally collected by Dr. Archer, 9 miles N. of Lavras, Minas Gerais.

son for most of the species of *Syagrus*, but in many instances there were also fruits in various stages of development.

On the road from São Paulo to Bragança (near the Minas Gerais border) and between Bragança and Lavras, occasional groups of *Arecastrum* were seen. Our objective in going to Lavras was to find a trunkless species of *Syagrus* collected by Dr. Andrew Archer in 1936. After considerable searching and inquiry we finally found a stand of about 100 plants (in both flower and fruit) growing in a more or less undisturbed grassland (*campo natural*). We were also told that there were other similar stands in the immediate region. São João del Rei was next on our list, but we were discouraged by the extremely poor roads. The highway to Belo Horizonte (about 108 miles N. E.), however, is mostly four

lanes and well paved. There didn't seem to be any palms of significance along this road until we approached a distance between 15-30 miles S. of the city where *Acrocomia* trees were found in dense stands.

Belo Horizonte is a modern city of nearly one million people and is the site of the University of Minas Gerais where we prepared our plant specimens. Before we left on this trip we were warned about the dangers of Chagas disease which was especially common in Minas Gerais. The disease is caused by a trypanosome and carried by a true bug (called "barbeiro" by the natives) which inhabits grassland and savanna areas. This bug is also particularly prevalent in old *pensões* (boarding houses) where they literally crawl out of the woodwork at night and transmit the disease by sucking the vic-



7. Stand of *Acrocomia* trees in pasture between Lagoa Santa and Serra Cipó, Minas Gerais.

tim's blood. As if that were not enough, we also learned that schistosomiasis had been recently introduced into Brazil from the Middle East and that all fresh-water ponds were a potential source of the disease. The worm larva (*cercarium*) can enter any part of the body through the bare skin when immersed in water.

On July 10, we set out for Serra Cipó, the type locality of *Syagrus pleioclada*, one of the trunkless palms. On the northern outskirts of Belo Horizonte and all along the road to Serra Cipó (a distance of about 60 miles) one or two species of *Acrocomia* seemed to be the only palms of significance; they occurred in dense stands or were scattered. At the foot of Serra Cipó, *Allagoptera*, a trunkless palm, was fairly common in the Savannas. *Syagrus pleioclada* was not to be seen until we approached the rocky outcrops of this mountain (up to 1300 m. elevation) where it was rather

scarce. Another trunkless species of *Syagrus* was also found here; it was very common and had excellent flowers and fruits. I found out later that it was an undescribed species.

We became so engrossed with collecting and admiring the scenery that we failed to notice the gas supply was getting low. The only gas pump in the area just happened to be out of gas so we decided to drive on to the nearest town, Morro do Pilar, which was only a "short" distance away. We drove until we ran out of gas on a lonely mountain road, in the dark and in the midst of a driving rainstorm. After waiting for about an hour, a truck came along and transported us to the town to get some gas. We returned to the Jeep with the gas and then went back to Morro do Pilar. The one "hotel" in town appeared to be a classical hiding place for the *barbeiros* which carry Chagas disease: the rooms had wooden walls and



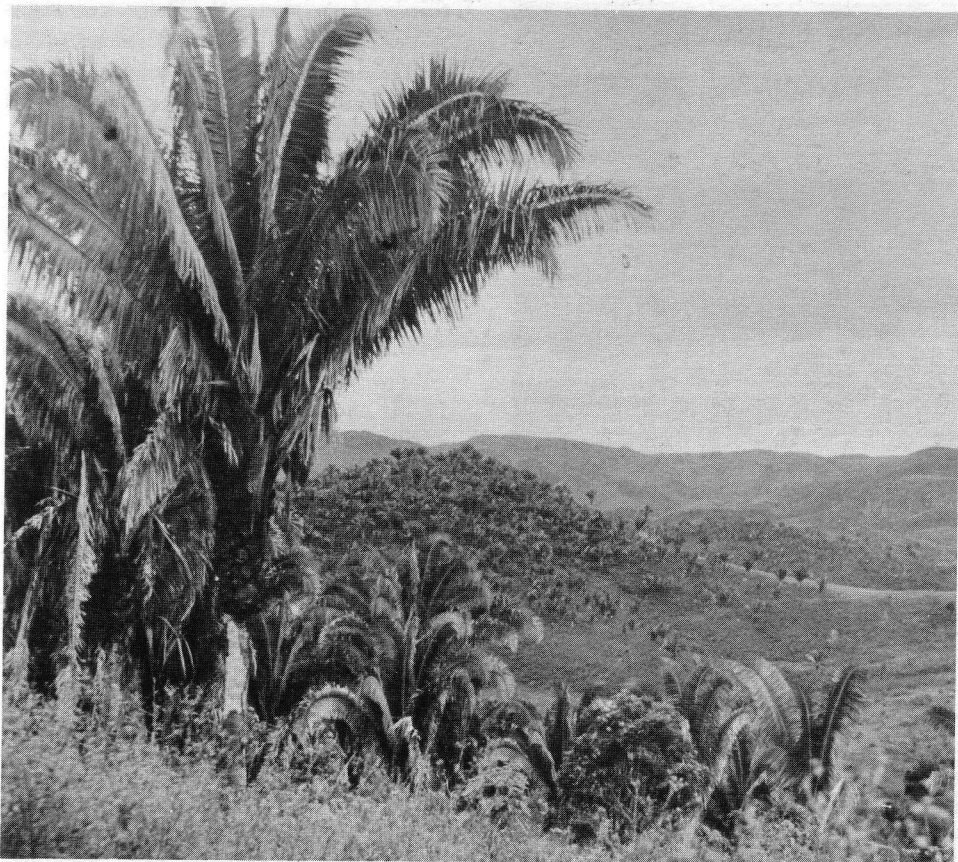
8. J. C. Gomes holding leaf and spathes of undescribed species of *Syagrus* (trunkless) in rocky outcrops of Serra Cipó, Minas Gerais.

ceilings which were falling apart. That night we slept in our clothes and the following morning we headed back to Serra Cipó with nary a bug bite. Apparently, the cool evenings during the winter season kept the bugs inactive.

On the return trip we drove through Serra do Palacio. The vegetation here was much more lush, undoubtedly due to the higher annual rainfall. The most conspicuous element of the vegetation was *Attalea compta* (?), a palm about 30-40 feet tall with long upright leaves. Over a distance of about 18 miles several thousand trees of this species were seen, then they began to disappear as

we approached the drier Serra Cipó mountain range. Before returning to Belo Horizonte, we decided to stop off at Lagoa Santa to confirm a collection of *Syagrus graminifolia*. We circled the lake a few times but could not find this plant anywhere. Instead, we found a stand of *S. campestris* (?) growing in a savanna adjacent to the *Quartel Aero-nautico* (Air Force Barracks). We counted about 48 trees with a trunk 1-2 m. tall, but the flowering period was over so only old inflorescences, fruits and leaves were collected.

We spent the next day pressing our plants at the University of Minas Gerais.



9. An extensive stand of *Attalea compta* (?), Serra do Palacio, Minas Gerais.

The Biology Department and herbarium is located in the new Faculdade de Filosofia building. The following day we drove to Ouro Preto, about 60 miles southeast of Belo Horizonte, to check on some records. Between the two cities the terrain is mountainous and the vegetation consists mainly of savanna, grassland and pasture. In places the vegetation has the aspect of Serra Cipó, but the only palms seen were scattered trees of *Acrocomia*, a tall *Syagrus* and *Arecastrum*. Ouro Preto ("black gold") is being preserved as a national shrine. The historical buildings, dating from colonial times, are now being restored. "Black gold" refers to iron ore which is mined throughout the area.

Our next big trip in Minas Gerais was to Diamantina, a delightful little town about 150 miles north of Belo Horizonte. The road to Sete Lagoas, with its vegetation mainly crop land and pasture, had many *Acrocomias* along the way, but only scattered specimens of a tall and a medium-sized species of *Syagrus*. For the next 30 miles or so only occasional clusters of *Acrocomia* and scattered *Syagrus* trees could be seen. In the vicinity of Paraopeba we found the same trunkless species of *Syagrus* as in Lavras. On the west side of the road, in a partly grazed grassland, only seven specimens were seen; but there were about 50 specimens with a much healthier appearance growing in



10. Trunkless species of *Attalea*, J. C. Gomes holding fruits, junction of highway leading to Brasilia and Curvelo, Minas Gerais.

a savanna on the other side of the road. This species was also found here and there (in groups of 25-50 specimens) in other pasture areas along the road. At the junction of the highways leading to Brasilia and Curvelo we saw about 30 plants of a trunkless species of *Attalea* with leaves 10 feet tall. About 12 miles farther up the road to Curvelo we approached some swampy land with 20 or more tall *Mauritia* trees growing there. This is part of the "Resfriado" association which can be identified by certain characteristic species including *Mauritia*. Not too far from here a small stand of *Acrocomia* and several *Syagrus oleracea* (?) were seen. On the Fazenda da Prata and other places along the road to Curvelo for the next 12 miles or so, the *Syagrus* of Lavras was frequent. An interesting observation was that some of the older specimens had trunks up to two feet high. Near Curvelo we noticed several specimens of the trunkless *Attalea* again in a pasture. The road from Curvelo to Diamantina (about 89 miles) was mostly unpaved, but it was fairly straight and not too hilly. The only place of any significance between the two towns is Gouvea, about two-

thirds of the distance. There was a gas station, but unsatisfactory sleeping accommodations. From about 9 miles south of Diamantina to the outskirts of the city interrupted stands of *Allagoptera* and the *Syagrus* from Lavras (some with short trunks) were seen in pastures. On the rocky hills in the distance, *Syagrus glaucescens*, with a trunk 5-15 feet high, was common. Diamantina is the type locality of this species.

The beautiful town of Diamantina (about 15,000 population) is nestled in the mountains adjacent to Serra de Biribiry, about 1200 m. elevation. The streets are very narrow and cobblestoned, and the restaurants serve some of the best *churrasco* (charcoal broiled beefsteak) in Brazil. It has some fairly decent hotels, one of which is very modern and inexpensive. The name of the town is derived from diamonds and other precious gems which have been or still are being mined throughout the area. On the northern outskirts of town, several small stands of *Allagoptera* were seen in over-grazed savannas. In the foothills of Serra de Biribiry we collected some specimens of a trunkless *Syagrus* growing in a rocky savanna. It appeared to be *S. pleioclada*, previously found in Serra Cipó. Perhaps the most common palm throughout this mountain range, and in Serra do Gombo as well, is *Syagrus glaucescens*. Several hundred trees were seen growing only in rocky outcrops. We collected this plant in all stages of development, and no other palms were seen until we reached a distance of 14 miles northwest of Diamantina. In a secondary growth forest (*mata*) in the foothills of Serra do Gombo, we noticed a few trees of *Syagrus comosa* (in flower and fruit), about 40 feet tall. Other palms in the area were a trunkless *Attalea* and *Syagrus flexuosa* (?). With the exception of *Syagrus glaucescens*, the aspect of the

vegetation around Diamantina appeared to be similar to that of Serra Cipó.

We returned to Belo Horizonte on July 17 to prepare our specimens and ship the dried ones back to São Paulo. At this point we had completed about one-half of our proposed itinerary. Careful plans had to be made for the trip to Vitoria, Espirito Santo. Although the distance between the two cities is only about 240 miles, there is no direct route. If I had known how bad the roads really were, I would have decided to fly to Vitoria instead. Most of the maps showed roads under various stages of construction so that travelling in that direction was more or less guess-work.

Being brave and adventurous souls we started out on a trip that soon proved to be disastrous. On July 20 we left for Vitoria by way of Ouro Preto. About 39 miles east of Belo Horizonte we noticed four very tall, narrow trunked *Syagrus* trees. Between Ouro Preto and Mariana, several *Arecastrum* trees were seen along the road. Between Mariana and Ponte Nova (distance of some 33 miles) occasional trees in genera *Acrocomia*, *Arecastrum*, *Attalea* and *Euterpe* were seen. Because of a detour we had to proceed back in a northerly direction to Nova Era on a bumpy, unpaved road for about 48 miles. *Arecastrum* was frequent, *Euterpe* was occasional and a few tall *Syagrus* trees were seen. That night we slept in Fabriciano in a brand new hotel which was very inexpensive, some 30 miles to the northwest of Nova Era. Several stands of *Acrocomia* were seen along the way. Because of numerous detours we had been travelling in a zigzag fashion and surely had gone at least 120 miles out of the way. The worst stretch of road that we encountered was between Fabriciano and Manhuaçu, a distance of only about 60 miles on the map, but it took



11. J. C. Gomes holding inflorescence and infructescence of *Syagrus comosa* collected in secondary growth forest, Serra do Gombo, Minas Gerais.

us about 10 hours to get there. I dubbed this the "Oregon Trail" because it reminded me of some of the cattle trails that are shown in cowboy movies. Even though I was badly shaken up from this nightmare, I managed to record some of the palms seen on the way; stands of a trunkless *Attalea*, a medium-sized *Attalea* and stands of *Euterpe* were common on the hillsides and in some of the valleys; and scattered *Arecastrum* trees were seen here and there. That evening we decided to drive on to Iuna, Espirito Santo, which is roughly one-third of the distance to Vitoria. Incidentally, some of the highest mountains in Brazil are found in this particular region. We slept in Iuna and the following morning we started out for Vitoria. It was a clear, beautiful day with the temperature in the 70's; and although the road was hilly and somewhat winding, it was dry and passable. Our spirits were high because we knew that in four or five hours we would reach our destination. We never made it because at one point we ap-



12. J. C. Gomes holding leaves of same *Syagrus comosa*.

proached a steep, sharp curve in the road and before we knew it the car went sailing over a 50-foot cliff. As the Jeep tumbled down the hillside, I was thrown out the side door before it finally struck a rock and came to a stop. Gomes got the full impact of the crash. He struck his head on the windshield and was killed instantly. It was tragic that the trip should end this way because we had been over roads far more dangerous for driving and still managed to survive. I was much more fortunate, escaping with an assortment of nasty cuts and bruises. After four days in a hospital at Iuna, I negotiated a ride to Vitoria where I made plane connections to Rio and then to the United States.

It is with deep sadness that I conclude this article. Mr. Gomes was a fine gentleman and field companion. His death puts an extremely high price on collecting palms.

A Potting Mixture for Palms

RUSSELL C. MOTT

*Experimentalist, Department of Floriculture and Ornamental Horticulture,
Cornell University, Ithaca, N. Y.*

Research carried on at Cornell University in the Department of Floriculture and Ornamental Horticulture and Department of Vegetable Crops by James W. Boodley and Raymond Shel-drake, Jr. has been concerned with artificial soil mixtures for commercial plant growing. A modification of the so-called Peat-Lite mixes has been developed for general potting of aroids, begonias, ferns, gesneriads, and many other species of plants now growing in the tropical greenhouses at Cornell, as well as palms which are grown in clay pots and redwood tubs and are maintained under glass throughout the year at a night temperature of 65° F. The results of using this mixture for palms

have been very encouraging and are thought worth reporting in PRINCIPES. This information is not based on data derived directly from experiments with palms but rather from observation and experience.

The components of the potting mixture were selected because they are readily available, are uniform in composition, and because they have certain physical and chemical characteristics that are important to the growth of plants. German or Canadian sphagnum peat moss is preferred to the domestic peat mosses which frequently contain large quantities of nutrients or other material in unknown amounts and are usually too decomposed to provide the