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Fasciation in the Male Rachillae of Borassus flabellifer

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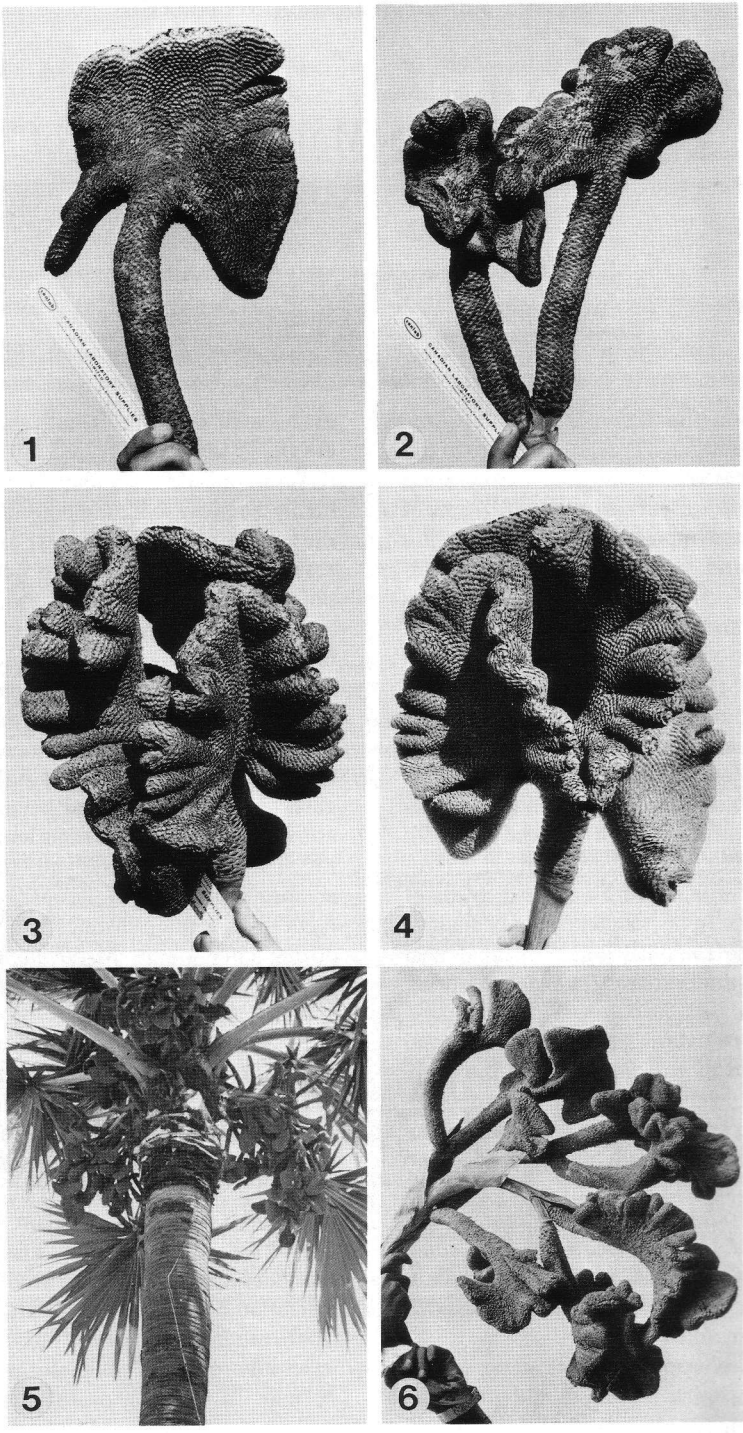
Fasciation (the flattening or banding due to fusion of organs) is relatively rare in the reproductive regions of palms. A perusal of the literature reveals that fasciation of rachillae was reported in *Areca catechu* (Costerus and Smith 1923), *Borassus flabellifer* (Andy 1869), *Cocos nucifera* (Costerus and Smith 1925, Davis 1957, Kempanna 1969) and *Latania* (Costerus and Smith 1923). In the course of ontogenetic studies on *Borassus flabellifer* Linn., interesting cases of fasciation of male rachillae were observed. Such an abnormality has not been recorded in this species except for a casual report by Andy (1869). Several plants in Kanyakumari, Tirunelvely, Ramnad and Madurai districts of Tamil Nadu, India, displayed abnormalities of the male rachillae and periodical field trips were undertaken to collect material.

In *Borassus flabellifer*, normal male rachillae are cylindrical and elongate and are covered by tubular bracts in the early stages of development. Rachillae emerge through an opening at the distal end of the bract. Cincinni of male flowers are located in pits and the subtending basally connate bracts are spirally arranged around the central axis. Flowers, located in a pit, come out one after another and liberate pollen. The green color of rachillae changes to brown after anthesis.

In the abnormal cases, the tip of the rachilla becomes fasciated and produces different shapes. In simple cases, the tip becomes a dorsiventrally compressed structure while its proximal part remains cylindrical. In some instances, the fasciated part becomes divided into two units. In pronounced fasciation, the tip becomes highly compressed and bent and looks like the hood of a cobra (Fig. 1) and in some assumes a honeycomb-like body. Sometimes, the fasciated part is variously curved (Fig. 2). In extreme cases, the tip initially fasciates into three different units; each of the units proliferates independently forming variously shaped ridges and furrows with different types of extensions, with some of the extensions, located along the margins, being fingerlike and becoming miniature rachillae. Such cylindrical miniature rachillae also bear spirally arranged bracts enclosing cincinni of flowers. The three main units remain distinct and flare apart during later stages of development. The rachilla simulates the body of a sponge and appears most bizarre (Figs. 3,4).

The number of rachillae of an inflorescence undergoing fasciation varies. Among the several rachillae, only one fasciates and is conspicuous among the normal ones. In others, rachillae of only one primary branch fasciate and the rachillae in all the rest of the primary branches remain normal. In still others, rachillae in some primary branches are normal while among the rest, fasciation occurs only in isolated rachillae. There are instances where fasciation occurs in an inflorescence while all the others are normal. In extreme cases, almost all the rachillae of all the inflorescences of the plant fasciate variously and present all possible combinations of various shapes men-



1. Fasciated rachillae appearing like the hood of a cobra. ×⅓. 2. Two fasciated rachillae variously curved. ×¼. 3 and 4. Two different views of an intensely fasciated rachilla with a bizarre appearance. ×¼. 5. A crown of the plant full of fasciated rachillae. ×1/30. 6. One inflorescence with all the rachillae fasciated. ×⅙.

tioned above (Figs. 5,6). Such inflorescences, during later stages, hang down from the crown due to the great increase in weight. As a result of crowding of such peculiar inflorescences, it is difficult for a person to get into the crown (Fig. 5). Despite the fasciation, these rachillae still bear normal flowers.

The fasciated rachillae possess some basic trends. It is the distal end of the rachilla that undergoes fasciation, while a major portion of its proximal part is unaffected. Whatever may be the size and shape of the fasciated rachillae, it is fertile and bears clusters of normal flowers with fertile pollen. The rachilla bracts are also normal. Defasciation does not occur in a rachilla after fasciation.

A casual observation might suggest that fasciation of rachillae is a result of compression within the bracts or leaf sheaths. However, an analysis reveals that compression within the limited space is not responsible because all the bracts, primary axis, and proximal part of the rachillae are normal, the rachillae are not only compressed but show peculiar shapes that cannot be the result of compression, different units of a fasciated rachillae flare apart and are separated by ample space, and sometimes, only one rachilla of an inflorescence fasciates leaving all the others unaffected.

Data collected in the field reveal that fasciation does not appear to be the result of physical damage, disease or insect attack, neither can it be due to superabundant nourishment nor other environmental factors since plants in the vicinity do not show it. It seems that the fasciation noted in *Borassus* must be due to some physiological disturbance, causing stimulation in the growing point. When the single growth center of the rachilla is converted into an extended plate, the derivatives can produce a honeycomb-like structure. If it is changed into a number of such centers, curious shapes of rachillae as seen in Figures 3 and 4 will result. It seems that fasciation is a peculiarity of certain individuals.

Discussion

Costerus and Smith (1925) gave no details about the fasciated rachilla of *Cocos nucifera*. However, their figure 17 reveals that the distal part of the spike is fasciated while its proximal end is cylindrical. This is similar to fasciation noted in *Borassus* of the present study. A similar observation was made in *Cocos nucifera* by Kempanna (1969). Branching and rebranching of a fasciated spike of *Cocos nucifera*, as observed by Davis (1957) was not noted by Costerus and Smith (1925).

The occurrence of normal male flowers with functional pollen in the fasciated spike of *Cocos nucifera* (Kempanna 1969) is also similar to *Borassus flabellifer* of the present study, and differs from the observations of Davis (1957) who recorded only sterile or underdeveloped male flowers. In contrast, flower-bearing is normal and never leads to sterility in the individuals of *Borassus* studied by us.

In *Latania*, fasciation was noted in the rachillae of only the lowest branch of the first order (Costerus and Smith 1923). In the present study, there was no such restriction. In some cases, almost all the rachillae in all the inflorescences of a plant were fasciated (Fig. 5).

In *Areca catechu* the tips of the fasciated rachillae were flowerless (Costerus and Smith 1923), but such a flowerless condition in fasciated rachillae was never met with in *Borassus* of the present study.

The factor responsible for fasciation in *Borassus flabellifer* (Andy 1869), *Areca catechu*, and *Latania* (Costerus and Smith 1923) and *Cocos nucifera* (Costerus and Smith 1925) was not identified while Davis (1957) suggested that fasciation in *Cocos nucifera* was caused by insect attack or similar injury during meristematic stage and Kempanna (1969) believed that insect or damage of the part by disease during

ontogeny or giving out some kind of stimuli for rapid growth by the plant might be responsible. In the present study fasciation seemed to be due to physiological disturbance to the growing points of the rachilla.

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PALM BRIEF

A Visit with August Braun at Jardin Botanico, Caracas

As guests of Dr. Rodolfo Belloso, in November, 1990, Crafton Clift and I had an opportunity to visit the Jardin Botanico in Caracas before proceeding to the Rio Tuy farm where Crafton was working in research and development of tropical fruits.

Shortly upon arriving at the garden, we made ourselves known to the former director, August Braun, who is known for his articles in *Principes* and as author of a number of books on palms indigenous to and growing in Venezuela. His recent publications, especially well-written, are *Palmas Autoctonas de Venezuela y de los Paises Adyacentes* (Native Palms of Venezuela and Adjacent Countries) and *El Cultivo de las Palmas en el Tropico* (The Cultivation of Palms in the Tropics). Both of these books in Spanish are quite useful and have information on species not normally found in some of the books written in the United States or Australia. Crafton and I were each presented with autographed copies for our own libraries.

Dr. Braun is a very gracious, friendly man whose main direction in life has been and is to study and grow palms. His vast experience over many years relate to both common and rare species. Since arriving at the garden in 1951 from his native Switzerland, he has almost singlehandedly planted the wide variety of species in the garden's collection, many of which grow to absolute perfection in Caracas' climate. The long avenue of *Roystonea venezuelana* (Fig. 1)—perhaps the longest planting of these grandest of all royals in the world—were planted just before his arrival but nurtured to perfection by his loving attention. In other parts of Caracas where a lowering of the water table has resulted in many *R. venezuelana* mortalities (such as the once-great boulevard in the Country Club of Caracas, since replaced with *Washingtonia*) his royals are now almost 40–50 m high and still healthy and still growing. One wonders at the maximum height these plants can achieve. Though some question exists as to the validity of this species—some classifying it as only a variety of *B. oleracea*—there is a dis-