

The Carnauba Wax Palm (*Copernicia prunifera*).

I. Botany

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This paper is the first of a series intended to present much of the information contained in the author's unpublished thesis entitled *The Carnauba Wax Palm (Copernicia prunifera) and Its Role as an Economic Plant* (1970).

Naming of the Species

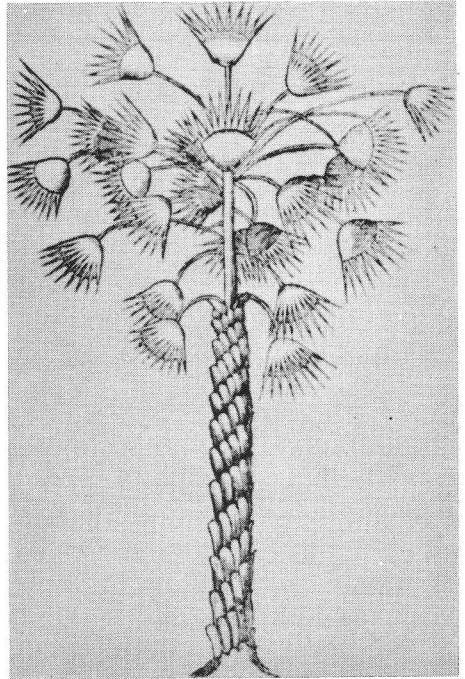
The common name "carnauba" is derived from a Tupi Indian word meaning literally "tree that scratches." This designation was no doubt used by the Brazilian Indian group because of the spiny petioles and residual leaf bases which cover the lower portion of the trunk.

General agreement exists that the earliest published reference to carnauba is found in the 1648 work by Marcgravius and Piso entitled *Historia naturalis Brasiliae*. In a later work published in 1658, Piso provided the first illustrations of this plant, one of which is reproduced in Fig. 1.

The descriptions and illustrations provided by Marcgravius and Piso led to the inclusion of an account of carnauba in Ray's *Historia Plantarum* (1688). This in turn was picked up by Miller in the eighth edition of *The Gardeners Dictionary* (1768) and given the designation *Palma prunifera*. This naming of the species was overlooked for nearly two hundred years until Moore (1963) reinstated the species name *prunifera*.

In Brazil, Arruda da Câmara in 1810 gave the binomial *Corypha cerifera* to

carnauba, but this was revised to *Copernicia cerifera* by Martius in 1838. An attempt to honor Arruda da Câmara as the discoverer of carnauba wax was made by Macedo (1867) when he proposed that it be renamed *Arrudaria cerifera*. This change, however, was not adopted, and carnauba carried the scientific name *Copernicia cerifera* until Moore corrected the specific epithet to *prunifera*.



1. One of the earliest known illustrations of carnauba. From Piso (1658).



2. Nine-year-old carnauba palms which have not yet produced trunks due to premature leaf harvesting. Photo courtesy S. C. Johnson & Son, Inc.

Botanical Description

The recent revision of *Copernicia* by Dahlgren and Glassman (1961) provides a comprehensive description of *C. prunifera*. Since this paper is focused on man's use of the carnauba, only the parts of the plant which are relevant will be considered, such as the stem, root, fruit, and leaf.

Trunk. In Brazil two common terms are used to refer to the trunk. When the tree is young and has yet to put forth a stem free of leaf bases it is referred to as *cuandu*, a word which also refers to a Brazilian type of porcupine. When the tree reaches maturity the upper portion of the stem is smooth and free of leaf bases through natural leaf fall. It is then referred to as *lavada* which translates as "cleaned."

Normally the carnauba has a single trunk. However instances of damage to the terminal shoot through insect activity result in branching. There are photographic records of trees exhibiting four and five such branches (Andrade and Salgado, 1945, and Min. Agr., 1929).

Growth-rate. Under normal conditions, where leaves are not harvested, the carnauba grows at a rate of about one foot per year (Kitzke, 1954a). The effects of harvesting leaves are significant as shown by Kitzke's research in Brazil. Trees planted side by side were grown under conditions of complete protection, and of regular harvesting of leaves. After 21 years the protected trees measured about 7.5 meters to the top of the crown while the trees subject to leaf cutting measured some three meters to the same point. In cases where harvesting of leaves has been initiated at too early an age, and where such practices have been continued, it is possible to have trees of nine years of age which still have not produced a trunk.

The number of leaves produced by a mature tree each year is on the order of 46 to 60. Indications are that leaf fall occurs about one year after leaf emergence takes place; therefore, the crown of a mature tree is made up of leaves one year of age and younger. It has also been found that petiole lengths increase as the tree becomes taller and older (Kitzke, 1954a).

The subject of growth-rate naturally leads to speculation concerning the life-span of the carnauba. While early estimates put the life-span at up to 200 years, Kitzke estimates that 75 years would be a reasonable figure. The question of the effect of constantly harvesting leaves is an interesting one. No quantitative data are available, but continued harvest may arrest senescence and prolong the life-span.

Root. The root system of the carnauba is typical of palms in general. The mature tree has a large clump of innumerable branching roots, some of which extend laterally a distance of several meters.

The carnauba seedling initially pro-



3. The white carnauba, a form of *C. prunifera*. Photo courtesy of S. C. Johnson & Son, Inc.

duces a long juvenile "tap" root which serves as a temporary organ of anchorage and water absorption. It is this long root which has probably led to the mistaken belief that the carnauba cannot successfully be transplanted.

The underground stem of the seedling immediately begins to form adventitious roots, usually three or four within the first year. As the diameter of the stem below ground increases, so does the number of adventitious roots. In this way the fibrous root system typical of palms is formed (Kitzke, 1951).

Fruit. Flowering of the carnauba occurs randomly throughout the year. This is not common in the genus *Copernicia* which is normally synchronous and may be the disruptive effect of leaf harvesting injury. Botanical maturity or first-flowering occurs between the ages of 12

and 15 years. The small ovoid fruits are light to medium green initially, ripening to a dark purple to black color. They have a whitish pulp which, when ripe, has a sweet although somewhat astringent taste, and contains a single large seed.

Leaf. The fan-shaped leaf of the carnauba has in mature trees about 60 leaf divisions. The central division is about 90 cm. long. Both surfaces of the leaf have a coat of wax, which can be processed to become the carnauba wax of commerce.

Varieties

Taxonomic studies of varieties of *C. prunifera* have not been completed although there is some preliminary information. The common carnauba described above is representative of the total population.

Three other types of carnauba are reported. The white carnauba (Fig. 3) is distinguished by the distinctive shape of the crown. The name is derived from the roots which are said to be lighter in color than those of the common form. Despite being valued for its medicinal use, it is said to be rare and the existence of a single specimen in a large *carnaubal* is considered fortunate. It has been stated that another distinguishing characteristic of the white carnauba is that the petioles make a pattern around the trunk spiralling to the left, rather than to the right. This is not valid however because the common carnauba occasionally exhibits the same pattern.

Another reported type is the giant carnauba, which is designated because of its height of up to 15 meters. Whether this is in fact a true variety has not been determined. It may merely represent the potential height to which any carnauba would grow if the leaves were not harvested.

Based upon research carried on by S. C. Johnson & Son, Inc. at Raposa near Fortaleza, Brazil, there is evidence of one additional type. It is based on a significantly smaller leaf size and has been designated "small-leaf" (Kitzke, 1955b).

Related Species

In addition to *C. prunifera*, two other species occur naturally in South America: *C. tectorum*, which is found chiefly in the savannas of Venezuela; and *C. alba*, which has a distribution centered on Paraguay.

Prior to Beccari's study of New World palms in 1907, it was generally believed that *C. alba* and *C. prunifera* were a single species, and they were combined under *C. cerifera*. The taxonomic revision to two species went unnoticed in

several studies subsequent to that date and this has caused considerable confusion in the literature.

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