

FLORIDA'S WAX PALM: THE SILVER FORM OF *SERENOA REPENS* (ARECACEAE)

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ABSTRACT: *Serenoa repens* (Arecaceae) can be found in two distinct color forms: green and "silver." The green form is common throughout the state in pine flatwoods and other upland communities, while the silver form is confined to narrow belts along Florida's Atlantic coast and central ridge. To determine the basis for this color difference we examined the epicuticular wax pattern on the leaf surface, using scanning electron microscopy. We found that in the green form the epicuticular wax formed thin, flat, peeling sheets, while in the silver form the wax formed in thick, irregular patches of fused rod-like extrusions. This striking difference in epicuticular wax accounts for the color difference, but the ecological significance of this feature remains unknown.

THE saw palmetto, *Serenoa repens* (Bartr.) is an abundant and conspicuous component of the natural vegetation of Florida. This member of the palm family often forms the dominant understory vegetation in pine flatwoods throughout the state, and occurs also in sandhill, scrub, dry prairie, and other upland plant associations. The long roots of this species contain air canals and can penetrate to a meter or more below the water table in low-lying areas. However, the plants grow only where their stems can remain above the high water mark. The boundary between wetland and upland habitats is often sharply defined by the lower limit of saw palmetto growth. Saw palmetto is tolerant of moderate fires and sprouts new leaves within weeks of a burn. The nearly impenetrable thickets created by these clonal palms serve as habitat for numerous animals (Myers and Ewel, 1990), and provided the native Americans with numerous products used for food, medicine and fiber (Duke, 1985).

The silver form of this species, *Serenoa repens* forma *glauca*, according to Moldenke (1967), has long been of interest to horticulturalists and landscapers for the distinctive coloration. The silver form occurs naturally primarily in a narrow, discontinuous belt along Florida's Atlantic coast, stretching from St. Johns County to Dade County, and occasionally inland, particularly along the central ridge in Highlands and Polk counties. Silver *Serenoa* forms dense stands, often adjacent to stands of the green form. The palms are clonal, with procumbent trunks branching and bearing roots, but the extent to which stands represent individual clones is not known. Intermediate

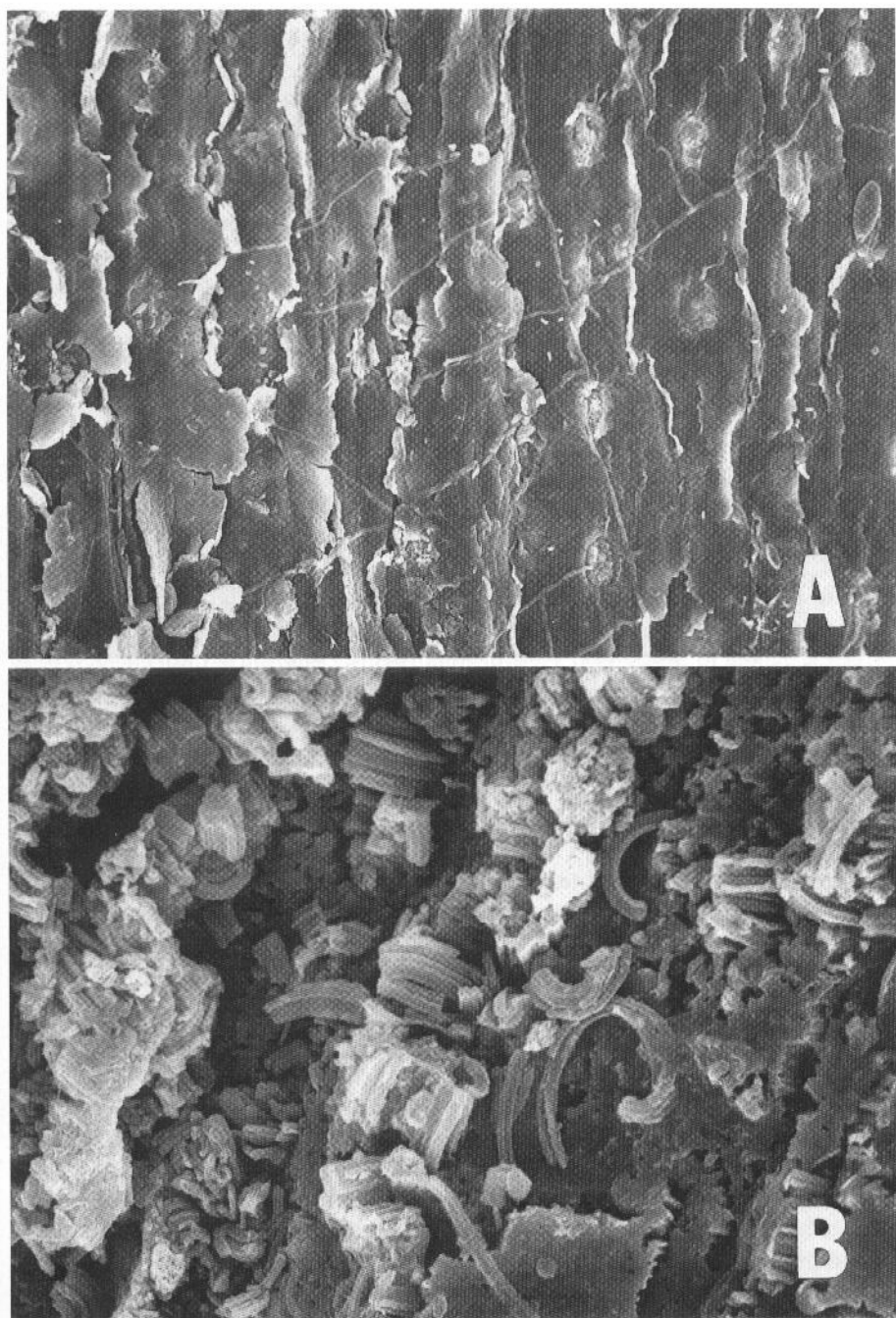


FIG. 1. Scanning electron micrographs of the lower leaf surface of *Serenoa repens* (magnification approximately 400 \times), showing epicuticular wax patterns: A, green form; B, silver form.

forms, determined on the basis of the overall color cast of the leaves, have also been found scattered throughout the state.

The purpose of the present study, conducted as part of the masters thesis of the second author (Taylor, 1995), was to examine the leaves of the different forms of *Serenoa repens* using electron and light microscopies, to explain the coloration differences. We hypothesized that the differences between the forms were due to different patterns or thicknesses of the waxy layer covering the leaves.

METHODS—Distribution information for the green, silver and intermediate forms of *Serenoa repens* was determined from the herbarium collections of the University of South Florida (USF), University of Florida (UF) and Florida State University (FSU). Determination was subjective, based on the appearance of the dried specimens and/or notes on the labels.

Specimens for microscopic examination were collected from sites in Marion, Jefferson, Brevard, Volusia, and Hillsborough counties, and prepared for both light and scanning electron microscopies, following standard procedures. Old, new and intermediate-aged leaves were collected from each of the three forms. Green and intermediate forms were collected from Brevard County (State Rd. 407, 11 miles west of Kennedy Space Center, on the east side of the road). Additional intermediate forms were collected from two sites in Marion County (State Rd. 40, ¼ mile east of the intersection of SR 40 and 588, and along the Redwater Lake Scenic route off State Rd. 40). The green form was also collected in Hillsborough County from natural populations in the University of South Florida Botanical Garden, Tampa, and in Jefferson County (5 miles from the Marion County line, near 229 mile marker on eastbound Hwy 110). The silver form was collected from Volusia County (off Hwy. A1A, across from the beach near the intersection with Sandpiper Ridge Rd.). An additional cultivated specimen of the silver form was obtained from the University of South Florida Botanical Garden.

RESULTS—Scanning electron micrographs revealed distinct differences in the pattern of epicuticular wax on the leaves of the green and silver forms of *Serenoa repens*. Light micrographs showed no differences in leaf structure. In the green form, epicuticular wax occurs in flat sheets that split and peel up slightly (Fig. 1a), whereas in the silver form, the wax forms in thick patches or blocks of fused rod-like extrusions (Fig. 1b). The latter type of wax is confined to monocots (Barthlott et al., 1998), and is common in other glaucous palms of the genera *Nannorrhops*, *Copernicia*, and *Hyphaene* (Taylor, unpublished data).

Intermediate forms, which were identified subjectively on the basis of color cast, were more variable. Some had wax layers similar to those of the silver form, whereas others are more like the green form.

DISCUSSION—Clear differences in the epicuticular wax layers of the green and silver forms of *Serenoa repens* suggest a basis for their color differences. The quantity of exfoliating wax in the silver form also suggests a potential for commercial production. Kitzke and Johnson (1975) considered the wax of *Serenoa repens* to have comparable properties, including a 'free-flaking' characteristic that aids in harvesting, to that of the commercial wax palm *Copernicia alba*. They also concluded, however, that the unavoid-

able cost of harvesting *Serenoa* leaves by hand would, in the United States, exceed the market value of the wax.

The distribution of the silver form of *Serenoa repens* along Florida's Atlantic coast and along the ancient coastline of the central ridge, suggests an adaptation to some environmental condition of a coastal habitat. This needs further investigation. The sporadic occurrence of thicker epicuticular wax layers ('intermediate forms') among green populations suggests that the same or different genes controlling this trait are present but rare throughout much of the range of the species.

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