

## MORPHOLOGICAL CHARACTERIZATION OF THE ARTIFICIAL HYBRID BETWEEN *STANHOPEA COSTARICENSIS* AND *STANHOPEA CIRRHATA* (ORCHIDACEAE)

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**ABSTRACT:** We report the production of a hybrid between *Stanhopea costaricensis* and *S. cirrhata* by artificial pollination. The hybrid plant and flowers are described. The flowers were normal and inherited morphological characteristics of both parent species. It is postulated that species of plants, like in the genus *Stanhopea*, that have very specific pollinators, have not evolved genetic mechanisms of isolation.

**RESUMEN:** Se informa sobre la producción de plantas híbridas entre *Stanhopea costaricensis* y *S. cirrhata*, por medio de polinización manual. Se describe el híbrido obtenido. Las flores del híbrido eran normales y heredaron características de ambas especies madre. Se postula que especies de plantas que dependen de polinizadores muy específicos, como en el género *Stanhopea*, no han evolucionado mecanismos genéticos de aislamiento.

**KEY WORDS / PALABRAS CLAVE:** Orchidaceae, *Stanhopea costaricensis*, *Stanhopea cirrhata*, hybridization, artificial pollination.

*Stanhopea costaricensis* Rchb. f. has large and conspicuous flowers with purple ring spots, born on pendulous, several-flowered inflorescences. Its geographical distribution spans from El Salvador to Panama (Jenny 1993). This species is related to *S. cirrhata* Lindl., which ranges from Nicaragua to Panama (Jenny 1993). *Stanhopea cirrhata* has geminate, lateral inflorescences. Both species belong to morphologically separated *Stanhopea* groups which differ especially in the morphology and size of the labellum. The lip of *S. costaricensis* has long horns, while *S. cirrhata* lacks them. Both species are geographically isolated by mountain ranges in Costa Rica and Panama; *S. costaricensis* is found in the Atlantic watershed, at mid and low altitudes, while *S. cirrhata* is found in the lowlands and altitude range of the Pacific side (Jenny 1993). Both species are pollinated by euglossine male bees (Dressler 1967).

Flowers of *S. costaricensis* were manually pollinated with pollinia of *S. cirrhata*, in September 2000. The parent plants were cultivated in the greenhouse of one of the authors (WR) in Santo Domingo de Heredia (9°58'46.23''N, 84°41.52'

14''W). Capsules matured at the start of year 2001. Seeds from one capsule were cultivated *in vitro* in the laboratory of Ing. Yolanda Chaverri Jiménez. Several seedlings were planted in individual pots containing arborescent fern roots as a substratum, in the greenhouse mentioned before, and two plants bloomed in October 2005. The floral characteristics of the hybrid flower, as well as those of the parent species, are illustrated (Fig. 1-3). The morphology of a hybrid plant and the flower are described herein:

### *Stanhopea costaricensis* × *cirrhata*

*Plant* epiphytic with creeping rhizome and clustered growths. *Pseudobulbs* oval, always unifoliate. *Leaves* coarse and leathery, petiolate, lanceolate, plicate and acute, 30-35 cm long, 10-15 cm wide, petiole 10-15 cm long, round in cross section with one side notched. *Inflorescence* directed downwards from the base of the bulb, up to 10 cm long and two-flowered; entire inflorescence covered by large, spread out broadly triangular and acute bracts. *Flowers* 5-7 cm large, sepals and petals beige with dispersed red spots, standing closer towards the

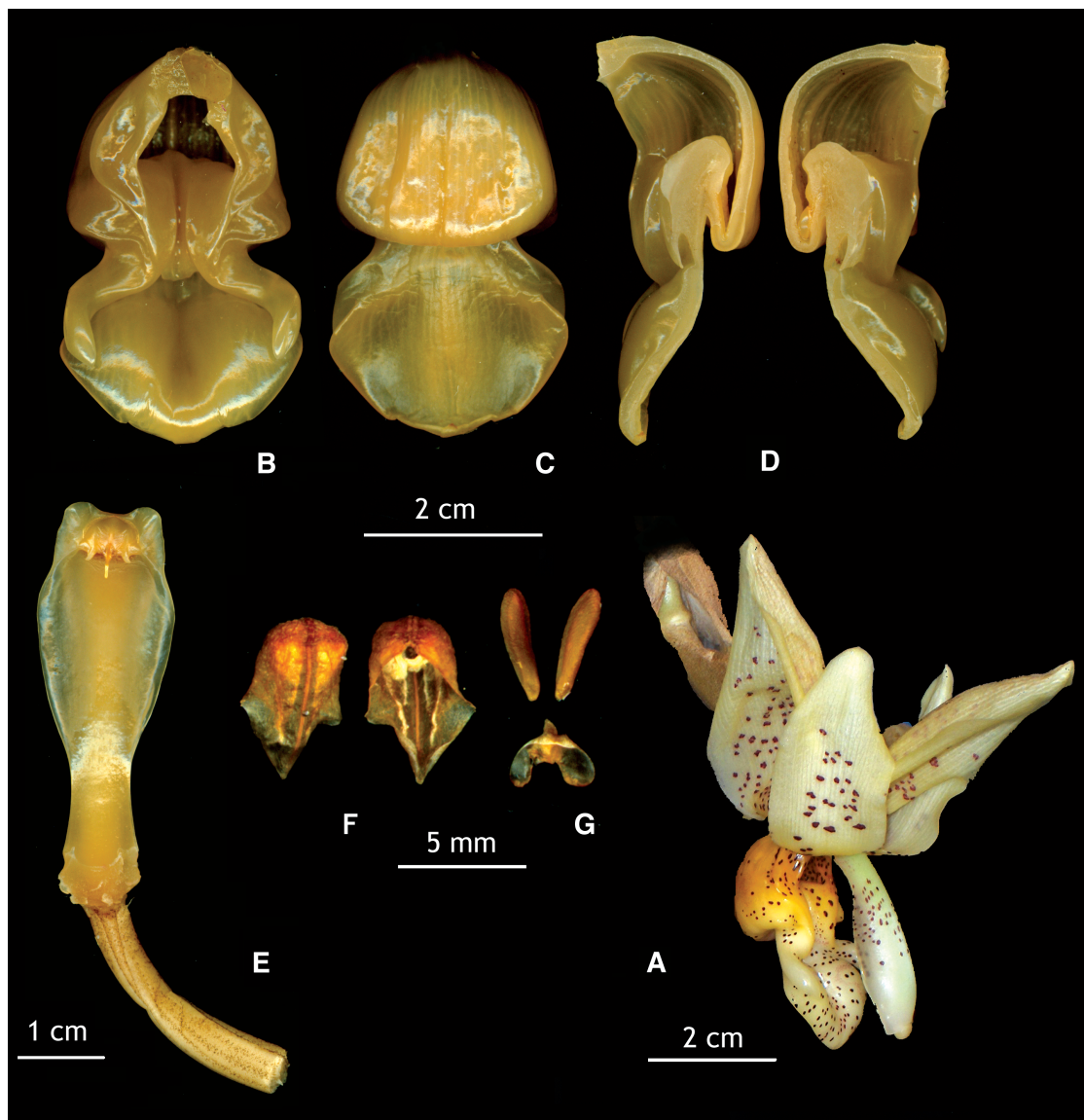


FIGURE 1. *Stanhopea costaricensis* x *Stanhopea cirrhata*: A - Flower. B - Lip (front view). C - Lip (dorsal view). D - Lip dissected. E - Column. F - Anther cap, two views. G - Pollinarium. Scanned by Gustavo Rojas.

base; lip gold yellow with fine red dots and a small eyespot; column white with fine red spots. *Dorsal sepal* oval, concave, acute, 5-6 cm long, 4 cm wide. *Lateral sepals* asymmetric, ovate, acute with same sizes than dorsal one. *Petals* narrowly lanceolate, acute, undulate, 5 cm long, 2 cm wide. *Lip* 4.5 cm long, 2.5 cm wide, saccate, flat at the bottom, without a knee, opening ovate, bridge broad and short, towards front and back lightly triangularly widened; hypochile ovate without edge at the transition to

mesochil; epichile broadly ovate fused to the front part of rudimentary horns of 1.5 cm. *Column* slender at the base, lightly curved and winged, with small horns protruding at the apex, 4.5-4.8 cm long, 1.3 cm wide. *Pollinarium* 6 mm long; pollinia 2, elongate on narrow stipes, and a cordate viscidium.

#### Discussion

*Stanhopea* flowers are exclusively pollinated by euglossine male bees (Dressler 1968), which are

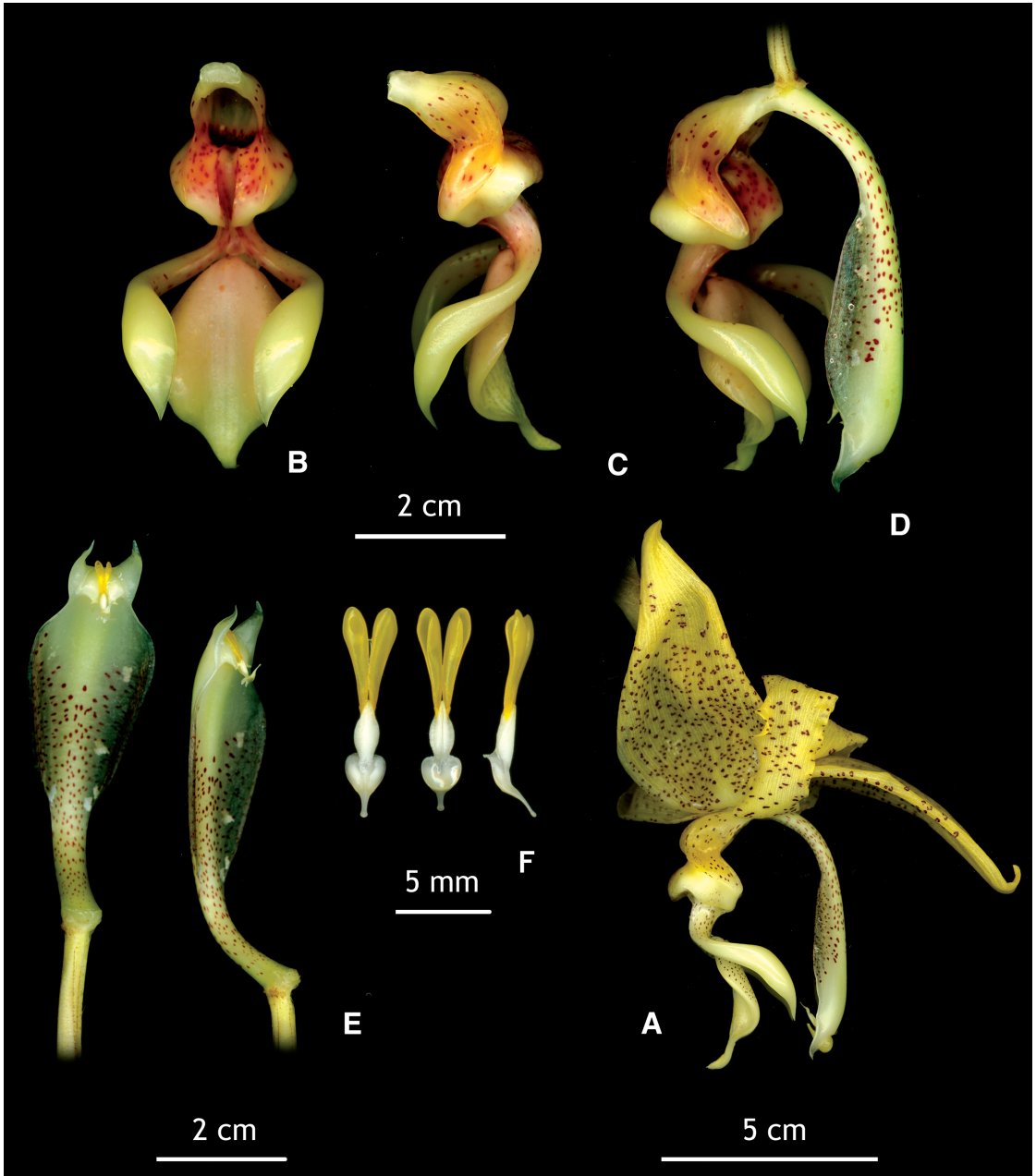


FIGURE 2. *Stanhopea costaricensis*. A - Flower. B - Lip (front view). C - Lip (lateral view). D - Lip and column. E - Column. F - Pollinarium, three views. Scanned by Gustavo Rojas.

attracted by floral odors. These bees store the orchid odors in the inflated hind tibia and are supposed to be used as attractants or in the courtship with the female partners (Dodson *et al.* 1969). The symbiotic relationship *Stanhopea* – euglossine bees are quite specific (Dressler 1968) and, although

some species are visited by several bee species, they are usually pollinated by one or few species.

Natural hybridization of *S. costaricensis* by *S. cirrhata* is not easy to occur because they do not share the same pollinators. *Stanhopea costaricensis* is visited by medium size to large euglossine males

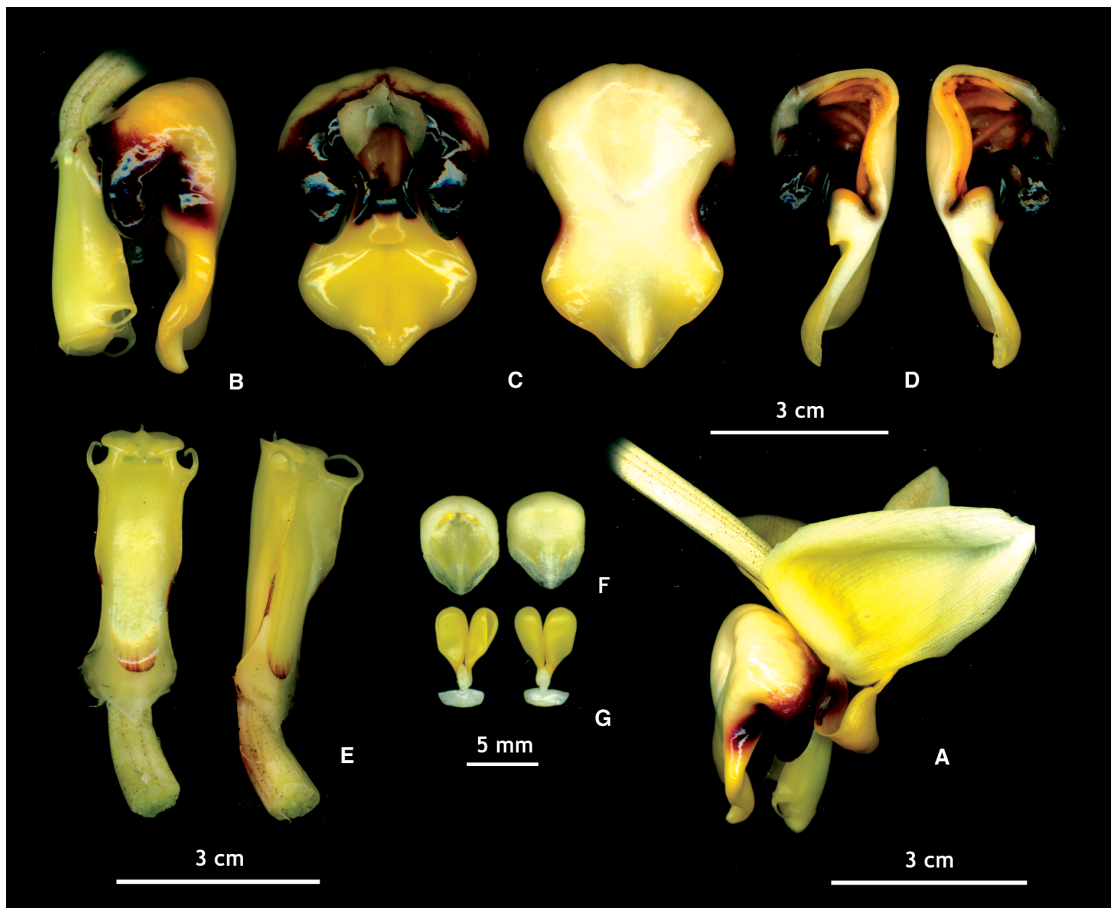


FIGURE 3. *Stanhopea cirrhata*. A - Flower. B - Lip and column. C - Lip, two views. D - Lip dissected. E - Column. F - Anther cap, two views. G - Pollinarium, two views. Scanned by Gustavo Rojas.

of the genera *Eufresia* and *Eulaema*, while *S. cirrhata* is visited by small *Euglossa* males. The difference in the pollination syndrome between orchid species may be due to the production of different attractants and a different floral morphology and colors, specially the conformation of the column and labellum (Fig. 2-3) which is probably fundamental in the pollination mechanism.

The flowers of the *Stanhopea* hybrid obtained had the general morphology of the genus and did not present visual abnormalities. They had characteristics found in both the parent species, however the *S. costaricensis* phenotype predominated, e.g. the hybrid has the labellum divided into three parts and a distinct epichile, a long, curved and slender column, with the wings restricted to the two apical thirds (Fig. 1E), while in *S. cirrhata* the labellum is divided into two

parts, the epichile is rudimentary, and the short, erect, massive column is winged from the base. The most striking characters of the hybrid flower are the general white cream color with solid purple spots and the presence of rudimentary horns, which are long in *S. costaricensis* and absent in *S. cirrhata*. There are few published records about natural hybrids in the genus *Stanhopea*. Natural hybrids are reported by Dressler (1993) between *S. ecornuta* Lem. and species with large horns, e.g. *S. ecornuta* x *S. costaricensis* (see also Jenny 1993). According to Dressler (1968) the paucity of interspecific hybrids in *Stanhopea* suggest that mechanical or other barriers are partially effective in this case.

It is postulated that plant species that possess very specific pollinators have not evolved genetic isolating mechanisms, and this could explain the

easiness why artificial commercial hybrids are obtained.

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