

## FLORA DA RESERVA DUCKE, AMAZONAS, BRASIL: COSTACEAE

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Costaceae Nakai, J. Jap. Bot. 17: 203. 1941.

Maas, P. J. M. 1972. Zingiberaceae: Costoideae. Fl. Neotrop. Monograph 8: 1- 139.

Maas, P. J. M. 1977. Costoideae (Additions). Fl. Neotrop. Monograph 18: 162-218.

Perennial, large **herbs** with rhizomes. **Leaves** spirally arranged, with a truncate ligule and a closed sheath. **Inflorescence** a spike, terminal on a leafy stem or sometimes on a separate leafless shoot. Bracts spirally arranged, red to green, large, imbricate, coriaceous to herbaceous, persistent, each bearing 1 flower. Each bract with a vertical line-shaped nectarial gland (=callus) below the apex. **Flowers** zygomorphic. Sepals 3, connate into a tube, persistent. Petals 3, basally connate. Fertile stamen 1, petal-like. Sterile stamen 1 (the so-called lip or labellum), tubular or spreading. Ovary inferior, 3-locular, placentation axile, ovules many. **Fruit** a capsule. Seeds many, black, completely covered by a white aril.

Costaceae has three genera and *c.* 80 species occurring throughout the Neotropic, being more concentrated in Costa Rica and Panama, and in the foothills of the Andes.

The family can be recognized at first glance by its spirally arranged leaves (even the stems are often spirally coiled), closed leaf sheaths, and by the presence of a ligule.

Only one genus, *Costus*, with three species, is found in the Reserva Ducke. The genus is pollinated by hummingbirds (the species with red to orange bracts and a tubular, small lip) or by large bees (the species with green bracts and a spreading, large lip). The inflorescence is much visited by ants which feed on the nectar produced by the glands on the bracts. They serve as a so-called ant-guard.

### Key to the species of *Costus* of Reserva Ducke

1. Plants densely covered with a velutinous indument of long, erect hairs, very soft to the touch; bracts red; flowers yellow ..... 3. *C. sprucei*
1. Plants sparsely to rather densely pubescent, covered with short, erect hairs; bracts green; flowers white.
  2. Bracts coriaceous, to 30 mm wide; leaf base generally cordate; corolla glabrous ... 1. *C. arabicus*
  2. Bracts herbaceous, to 12 mm wide; leaf base generally acute; corolla densely covered with erect hairs ..... 2. *C. congestiflorus*

**1. *Costus arabicus* L.**, Sp. Pl. 2. 1753; Maas, Fl. Neotrop. 8: 57. fig. 27. 1972.

**Herbs**, 1-3 m tall, often branched. Sheaths 5-15 mm in diam. Ligule 2-10 mm long. **Leaf** petiole 2-7 mm long. Lamina narrowly ovate to narrowly obovate, 10-25 cm long, 3-10 cm wide, glabrous above, subglabrous below, base cordate to slightly rounded, apex shortly acuminate. **Inflorescence** ovoid to fusiform, apex acute or obtuse, 3-10 cm long (to 20 cm in fruit), 2.5-4.5 cm wide (to 6 cm in fruit). Bracts green in the exposed part, reddish in the covered part, broadly ovate,

25-45 mm long, 20-30 mm wide, coriaceous, subglabrous, callus 3-7 mm long. Bracteole pinkish red, folded, 25-34 mm long. Calyx pinkish red, 18-26 mm long, lobes 4-6 mm long. Corolla snowy white, 60-70 mm long, glabrous, tube 15-20 mm long, lobes narrowly elliptic-obovate, 40-50 mm long. Labellum snowy white, broadly obovate, 50-70 mm long and wide, lateral lobes often tinged with purple, middle lobe blotched with yellow in the centre. Stamen snowy white, tinged with purple, 40-50 mm long. **Capsule** ellipsoid, 10-18 mm long.

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Antilles, tropical South America, specially the Guianas, the Amazon River Basin and South Brazil.

In non-inundated forest, on clayey soil.

Flowering and fruiting from November to April.

**Local name:** Cana-fistula.

15.V.1996 (fl) *Costa, M. A. S. & Silva, C. F. da* 537 (INPA U); 28.XII.1995 (fl) *Costa, M. A. S. & Assunção, P. A. C. L.* 589 (INPA); 4.XI.1994 (fl) *Ribeiro, J. E. L. S. et al.* 1491 (INPA); 11.XII.1963 (fl) *Rodrigues, W. & Coêlho, D.* 5587 (INPA); 21.IV.1998 (fr) *Souza, M. A. D. de et al.* 674 (INPA U); 12.V.1994 (fr) *Vicentini, A. et al.* 544 (INPA U).

*Costus arabicus* is distinguished by its cordate leaf base and by its large, glabrous flowers.

The two collections by Ribeiro and Vicentini are quite problematic. They are different from typical *C. arabicus* in producing their inflorescence on a separate, basal, leafless shoot. As all flower characters seem to agree with *C. arabicus* we have placed it here. However, it needs further investigation.

**2. *Costus congestiflorus*** Rich. ex Gagnep., Bull. Soc. Bot. France 49: 97. 1902; Maas, Fl. Neotrop. 8: 41. fig. 21, 22. 1972.

**Herbs**, 0.5-1 m tall. Most parts of the plant (including corolla) sparsely to rather densely covered with short, white, erect hairs. Sheaths silvery white with dark red venation, 5-10 mm in diam. Ligule 1-2 mm long. **Leaf** petiole 1-5 mm long. Lamina narrowly elliptic to narrowly obovate, 10-20 cm long, 3-6.5 cm wide, base acute to rounded, apex acuminate (acumen 5-15 mm long). **Inflorescence** narrowly cylindrical, 3-10 cm long, 1.5-4 cm wide. Bracts green, narrowly triangular to triangular, 30-35 mm long, 5-12 mm wide, herbaceous, apex acute, often mucronate, callus 2-7 mm long. Bracteole green, tubular but often split to the base, 15-20 mm long. Calyx green, 25-33 mm long, tube often deeply split by the flower bud during anthesis, lobes narrowly triangular, 4-10 mm long. Corolla creamy white, 50-65 mm long, tube c. 20 mm long, lobes narrowly obovate, 30-40 mm long. Labellum creamy white, limb broadly elliptic in outline, when seen from the frontal side, 35 x

40 mm. Stamen creamy white, c. 25 mm long.

**Capsule** ellipsoid, 10-13 mm long.

The Guianas, Venezuela, and Brazil (Amapa, Amazonas, and Para).

In non-inundated forest, on sandy soil.

Flowering and fruiting from October to January.

1.XII.1994 (fl) *Assunção, P. A. C. L.* 107 (INPA KMG NYU); 5.I.1995 (fl) *Costa, M. A. S. et al.* 73 (INPA KMOU); 12.XII.1996 (fl) *Costa, M. A. S. et al.* 568 (U); 10.X.1995 (fl) *Miralha, J. M. S. et al.* 296 (INPA KU); 26.I.1995 (fl) *Nascimento, J. R. & Silva, C. F. da* 726 (INPA U); 29.I.1998 (fl) *Souza, M. A. D. de et al.* 554 (INPA).

*Costus congestiflorus* is characterized by herbaceous, very narrow bracts (up to 12 mm wide only), and purely white flowers, with hairy petals.

**3. *Costus sprucei*** Maas, Fl. Neotrop. 8: 96. f. 44. 1972; Maas, Fl. Neotrop. 18: 197. fig. 77 a-b. 1977.

**Herbs**, c. 1 m tall. Most parts of the plant (including the corolla) densely covered with a velutinous indument of white, erect hairs, soft to the touch. Sheaths 6-10 mm in diam. Ligule 2-7 mm long. **Leaf** petiole 2-8 mm long. Lamina narrowly elliptic to narrowly obovate, 6-22 cm long, 3-7 cm wide, base acute, rounded to cordate, apex acuminate (acumen 5-15 mm long). **Inflorescence** ovoid to cylindrical, apex obtuse, 3-7 cm long, 1.5-3 cm wide. Bracts red, broadly ovate, 15-25 mm long and wide, chartaceous to coriaceous, callus 2-7 mm long. Bracteole red, folded, 6-10 mm long. Calyx red, 6-8 mm long, lobes 0.5-2 mm long. Corolla yellow, 30-31 mm long, tube 6-8 mm long, lobes 22-25 mm long. Labellum yellow, oblong-obovate, 20-25 mm long, lateral lobes involute and forming a tube 7-8 mm in diam. Stamen yellow, 23-25 mm long. **Capsule** subglobose, 5-7 mm long.

The Brazilian states of Acre, Amazonas, Para, and Rondonia.

In non-inundated forest, on sandy soil.

Fruiting in February.

16.II.1995 (fr) *Nascimento, J.R.* 747 (INPA).

*Costus sprucei* can easily be recognized by its velutinous indument on most of its vegetative and floral parts (including the corolla).

