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## Pollination ecology of *Mucuna* sp. nov. (Fabaceae) from southeastern Brazil

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### Abstract

A study of pollination ecology and breeding systems of *Mucuna* sp. nov. (Fabaceae, Faboideae, Phaseoleae) was carried out in May and June of 2002 and 2003. The study site is on the coastal lowlands covered by sub-humid evergreen broadleaf forest, in Picinguaba, near to Ubatuba, São Paulo, southeastern Brazil. The pollination ecology of this species was studied through direct observation, analyses of the floral structures, measurements of nectar production and breeding system experiments. This new species of *Mucuna* and *Mucuna sloanei* have similar features, but the former has a pseudo-raceme whereas the latter has an umbellate inflorescence. *Mucuna* sp. nov. is a climber that occurs on river banks. The flowering period is annual, of the cornucopia type. Each inflorescence bears 12-15(21) yellow, odorless and resupinate flowers which last seven days. The reproductive organs are enclosed in a keel, released through the explosive opening of the flower. Pollen viability is 92,2% and the stigma is receptive throughout the anthesis period. Nectar production starts in the bud, and the volume diminishes after the fifth day of anthesis; after the explosive opening of the flower it stops. Sugar concentration is statistically the same throughout anthesis, ranging from 9,7% to 10,8%. This *Mucuna* species is predominantly xenogamic and has some features of self-incompatible. Fruit abortion is usual in hand pollination experiments, and in natural conditions many fruits are also aborted two to three weeks after pollination. The explosive opening of the flower is associated with cell-wall lignification of the internal petal tissue (mesophyll), and with secondary wall thickenings (strips) in the cell-wall of the woody inner epidermis of the apical region of the keel. Entwined papillae in the non-lignified part of the inner epidermis of the apex of the keel, keep the petals firmly united. Foraging by the birds *Cacicus haemorrhous* (Icteridae), *Psarocolius decumanus* (Icteridae) and *Coereba flaveola* (Emberizidae) was recorded on flowers of *Mucuna* sp. nov. *C. haemorrhous* inserts its bill into a flower and through bill-spacing it triggers the explosive opening mechanism, thus reaching the otherwise unavailable nectar. *P. decumanus* also triggers the explosive opening mechanism when it takes nectar, but it bends the flowers when it perches on the inflorescences; *C. flaveola* does not usually succeed in triggering the mechanism, so it pierces the base of the keel and wings of the corolla to steal nectar. Besides nectar, *C. haemorrhous* captures and consumes caterpillars of the skipper butterfly *Astrartes talus* (Hesperiidae), found

within about 15,6% of the visited flowers. These larvae feed on the leaves and pupate inside the flowers of *Mucuna* sp. nov., occurring in about 35% of the examined flowers. While taking nectar and/or larvae, the Icterids receive a cloud of pollen on the top of head and touch the stigma, due to the explosive mechanism of pollen-delivery. This foraging behavior renders the cacique an effective pollinator of these large flowers, and the use of the bill-spacing technique to forage for insects, could be an exaptation of icterine birds to open and pollinate explosive flowers like *Mucuna* sp. nov.

**KEYWORDS:** *Mucuna*, new species, explosive flowers, floral and reproductive biology, pollination, passerine birds, bill-spacing, caterpillars, Atlantic forest, southeastern Brazil.

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