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Bat Visits and Changes in Floral Nectar During Anthesis of *Parkia pendula* (Mimosaceae)

By

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The current study on the chiropterophilous *Parkia pendula* (WILLD.) WALP. was conducted in the highly fragmented Atlantic Forest of the Brazilian state of Pernambuco.

The mean number of bat visits per capitulum was 384.7 ± 152.6 with a range from 216 to 473. Whereas *Phyllostomus discolor* was the most abundant visitor with 98.9% of all visits, *Platyrrhinus lineatus* and the nectar-thief *Glossophaga soricina* were rarely observed with only 0.7% and 0.4% of all visits, respectively. This confirms results of previous studies in Amazonia (HOPKINS 1984) which identified the omnivorous genus *Phyllostomus* and not the specialized nectar-bats (*Glossophaginae*) to be the main pollinator-group of *Parkia* species. Visiting started between 17:30 h and 17:45 h. The mean visiting frequency between 18:00 h and 00:00 h oscillated around 50 visits per hour. Bat visits decreased rapidly from 00:00 h until 01:30 h. Thereafter, visits were detected only occasionally.

Median nectar production per capitulum was 7.4 ± 1.5 ml ranging from 4.5 to 21.0 ml. Secretion was largest right after the start of nectar production (18:00 h), decreased slightly until 22:00 h and more rapidly thereafter until the end of production at 03:00 h. Calculations of the total nectar production per tree revealed large amounts of nectar offered per tree and flowering period with quantities up to 42 l per tree.

Three sugars were discovered in *P. pendula*'s nectar: the two hexoses fructose and glucose and the disaccharide sucrose. The total sugar concentration was highest right after dusk ($19.5\% \pm 5.6\%$) decreased until 22:00 h ($13.6\% \pm 3.4\%$) and increased until the end of production again

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(17.0% $\pm$ 4.2%). A drastic sucrose reduction was mainly responsible for the decline whereas an increase in the two hexoses raised the concentration again. Therefore, the nectar changed from being hexose-rich to hexose-dominated during anthesis.

A total number of 21 different amino acids were found in *P. pendula*'s nectar. Their occurrence during the time intervals revealed different temporal production patterns: alanine and proline could be found in nearly all samples. Other amino acids were exclusively or almost exclusively produced during the first hours of flower anthesis like arginine and threonine or towards its end like serine and glutamine. The total content of identified amino acids was highest at the beginning of nectar production, halved during the later intervals but increased at the end of nectar production again, similar to the temporal variation of sugar concentration.

The temporal pattern in *P. pendula*'s nectar production obviously correlates with the temporal activity pattern of its pollinators: highest nectar production and visitation rates by the flock-foraging bats during the first hours of night are followed by a decline until the end of production and visitation at approximately 03:00 h. However, changes in nectar's sugar and amino acid quantity and quality had no obvious effect on the bats' visitation rate. These changes are suspected to be linked to changes in the flowers' physiology due to aging. Such changes in amino acid and sugar composition are documented for species with flowers which produce nectar for more than 24 h (GOTTSBERGER & al. 1990, LANGENBERGER & DAVIS 2002) but never for species with an anthesis of a few hours only.

These findings elucidate the high variability of nectar composition even during short lasting anthesis and the necessity for multiple nectar samplings to characterize the nectar's amino acid and sugar composition.

References

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