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## **Still Open Questions in Floral Ecology of *Calliandra* (Mimosaceae), *Lycopersicon* (Solanaceae) and *Pharus* (Poaceae)**

By

Herwig TEPPNER\*)

*Calliandra angustifolia* BENTH. (Mimosaceae)

*Calliandra* BENTHAM (132 species, Neotropics) contains trees and shrubs with bipinnate leaves and more or less capitate inflorescences (BARNEBY 1998). *Calliandra angustifolia* BENTH. bears peripheral flowers with normal filament tube and no nectar, whereas the central ones have a white, petaloid filament tube and a nectary; both types can be either hermaphrodite or male, thus as a whole (transitional types excepted) four flower types occur in variable numbers and combinations in the heads of one and the same individual. Opening of flowers starts in the late morning (elongation of flower buds), at c. 16:00–17:00 hours CET the flowers are in anthesis, opening of the anthers begins with the dusk-fall (17:45–18:15), between 18:00 and 19:00, at least till c. 20:00 all anthers are open. Nectar secretion starts at c. 16:30–17:00 and emission of a weak odour at c. 19:00 (in the greenhouse, at a day length of c. 12 hours). The flat drop-like polyads [eight per anther, with a drop of pollen adhesive from lysis of cells lying in cavities (mucilage chambers) in the transversal septum of the thecae on the apex, PRENNER & TEPPNER 2005, TEPPNER 2007] are presented in an erect position. Anthesis lasts one night; in the morning the filaments of a head form a more or less cylindrical bundle and wither. During the night the flowers are clearly visited by sphingids and noctuids. In the late afternoon and in the following morning the flowers are also accessible for day-active visitors. In Peru especially hummingbirds are abundant visitors of *C. angustifolia* at daytime. Therefore we have the common and difficult question, if pollination syndromes do overlap or the hummingbirds are

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\*) Pens. Univ.-Prof. Dr. Herwig TEPPNER, Institute of Plant Sciences, Division of Systematics and Geobotany, Karl-Franzens University Graz, Holteigasse 6, 8010 Graz, Austria, Europe; e-mail: [herwig.teppner@uni-graz.at](mailto:herwig.teppner@uni-graz.at)

only accidental visitors with no effect in pollination. Since the anthers open after the onset of the dusk only, there is no chance in the evening. In the morning pollination could be possible, but the pollen tubes from nocturnal events lead over by some hours. Thus, it seems that the hummingbirds can contribute only little, if any, to pollination of *C. angustifolia*. For an exact clarification careful investigations in the nature would be necessary. Papers on the anther opening in some *Calliandra* species and on the floral ecology in *C. angustifolia* are planned for 2007 in *Phyton* 46 or 47.

*Solanum lycopersicum* L. (Solanaceae)

*Lycopersicon* MILLER, now *Solanum* sect. *Lycopersicum* (TOURN.) WETTST., possesses nectarless pollen-only blossoms. The anthers are laterally bound together to a tube, along their whole length usually, by interlocking hairs of adjoining anthers. The pollen is released into the tube, so a 'Streukegel' is formed, from which the pollen can be collected in a reasonable way only by bees with the ability of buzz-collection (vibratory pollen-collection): The indirect flight musculature vibrates at the natural frequency of the sternites and tergites, so that resonance occurs, which generates a high magnitude oscillation; it is transferred by the contact with the anthers and is necessary to accelerate the anther and to produce forces for sufficient acceleration of pollen grains within the anther for their release. The most important pollinators are bumblebees, in Central Europe the short-tongued *Bombus terrestris* and *B. lapidarius* as well as the long-tongued *B. pascuorum*. Surprisingly, under fine weather conditions, *Megachile willughbiella* (Megachilidae) could be proven also as a good and effective pollinator. *Hylaeus gibbus* (Colletidae) is known as pollinator for a longer time already. Five *Lasioglossum* (Halictidae) species were also observed to collect pollen. The medium-sized *L. zonulum* clearly uses vibration. Very difficult is the investigation of the two small species, *L. morio* (body length of females c. 5.2 – 6.2 mm) and *L. politum* (4.2 – 5.3 mm). In both species, the growing of the pollen load in the scopae during the manipulations on the top of the anther tube can easily be observed. In *L. morio* an acoustical proof of vibration was possible only once. With the help of a lens, vibration can be seen to some extent. In the smaller *L. politum* vibration can be deduced only indirectly from the identical behaviour on the flower. Since a body length of 7 mm is regarded as a limit for the ability of buzzing in the literature, the exact investigation of buzzing and its relations to other behaviour on the tomato flowers in these *Lasioglossum*s would be of special interest. For this purpose a suited technical equipment would be necessary because direct acoustical and visual observations are out of the limit in such small bees (details in TEPPNER 2005).

*Pharus latifolius* L. (Poaceae)

*Pharus* P. BROWNE (7 species, Neotropics) is a genus with many plesiomorphic characteristics, which forms together with *Leptaspis* R. BR. (Palaeotropics) the tribus *Phareae* STAPP and subfamily *Pharoideae* L.G. CLARK & JUDZ. of *Poaceae*. In molecular trees, within the family, this tribus sits on the second branch from below (GPWG 2001: 390, 395, 416). In *Pharus latifolius* L. one female and one male spikelet (both one-flowered) sit side by side at the nodes of the partial inflorescences. The female of each pair flowers at first, in a part of the inflorescences synchronously. In the female spikelet, the very acute, hooked, ca. 0.3 mm long hairs on the upper part of the lemma (which exceeds the glumes), known as dispersal mechanism (epizoochoric burrs; dispersal unit: lemma with the enclosed grain), are fully developed at flowering time already. In the male spikelet, due to the lack of lodicules, the anthers are pushed through the tip of the spikelet by elongation of their filaments. During the turgescence of the filaments, the anthers stand more or less oblique to erect and open only by short pore-like dilated slits at the distal end, thus, the whole amount of pollen remains in the anther and does not fall out (photos in TEPPNER 2002:6). According to observations in our greenhouse, when a lemma gets caught up in something and is then detached, the inflorescence flings back causing a cloud of pollen to be released from the anthers of the whole inflorescence. A shake-burr-mechanism for pollen dispersal (like in *Dipsacus* for the dispersal of the nutlets) seems to be unique, but verification and observations in nature are needed. Postanthetic, because of loss of turgor in the filaments, the anthers become pendent and the pores become a little larger. If pollen grains can drop now and can float in the air for sufficient time (in this rainforest grass) reaching to stigmas of another clone, is not known.

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Autor(en)/Author(s): Teppner Herwig

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