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Recent studies show that cycads are pollinated primarily by insects. Ever since it was noticed that pollen-shedding cones of *Encephalartos* Lehm. emit distinct odours at the time when insects are present on cones, there have been questions about the role that cone volatiles play in mediating the interaction between cycads and their insect pollinators. A series of studies over the past five years have greatly increased knowledge on the volatiles occurring in *Encephalartos* Lehm. and their potential role in influencing pollinator behaviour. This paper examines the advances made in these studies and how they affect our interpretation of cycad pollination ecology. The analyses show that several compounds in *Encephalartos villosus* Lem. attract pollinators and provide the first evidence of pollinators attracted to traps baited with particular volatile compounds. The study also shows how the composition of cone odour can vary across the distribution of a species with no apparent change in pollinators. The paper examines convergence in cone odours between species occurring in the same area and puts these results into context with other studies of cycad pollination.

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Is floral scent key to shifts in pollination systems in *Protea*?

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The *Protea* genus in southern Africa (82 species) exhibits three main pollination systems characterized by, for example, different plant habits, floral scents and nectar sugar concentration. Bird pollinated species are usually trees that produce tall poorly scented inflorescences with hidden concentrated nectar. Insect-pollinated species have lower growth forms, open-bowl shaped and strongly fruity/sweet scented inflorescences with exposed dilute nectar. In addition, there are potentially 37 *Protea* species that are visited by rodents in the Cape. These inflorescences are also strongly scented, emitting cheesy or sour milk floral scents with sweet honey-like undertones. GC-MS analysis shows that the odours of beetle-pollinated species are characterised by benzenoid esters and monoterpenes and rodent-pollinated species by low concentrations of sulphides and green-leaf volatiles. The scent of the nectar alone has been shown to elicit a feeding response from both beetles and rodents, indicating that scent is functionally significant and proposed as the main modification in floral traits accompanying shifts in pollination systems in the genus.

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A comparative investigation of floral scent in angiosperms in relation to phylogeny and pollination biology

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The evolutionary success and high species diversity of angiosperms has been related to their often very specific interactions with animal pollinators and it is believed that one key feature explaining pollinator specialization is the emission of specific olfactory signals. The number of volatile organic compounds (VOCs) emitted by flowers can be more than 100 for a single species and the total number of compounds identified in angiosperms exceed probably more than 2000 compounds. Although progress has been made in the last decade our knowledge on the general evolutionary trends in floral VOCs is still very limited. The reason for this is that most studies have either focussed on single plant lineages or pollination systems to investigate convergent evolution in floral scent chemistry. Phylogentically informed statistical methods were only applied in very few studies but the analyses were based on presence/absence data thus reducing the information content of these datasets. Here I present a comparative study using compositional (percentage) data from the literature and unpublished floral VOC data of more than 500 species (ca. 1000 compounds). Phylogentically informed models (generalized estimating equation, PGEE) and multivariate statistical methods (Bray-Curtis similarities, NMDS) were used to analyse the data with respect to the pollination biology and phylogeny of the species. The results show that based on the floral scent patterns angiosperms can be divided into two (main) groups: (1) species with scent compounds similar to those found from degrading protein, fat, and/or carbohydrates (brood site mimicry systems - pollinated by flies or beetles); and (2) species with scent compounds indicating a non-degraded carbohydrate source (sweet or fruit like odours - pollinated mainly by bees, moths, and butterflies).

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Ecological roles of lichen secondary metabolites

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Lichens are a symbiosis between an ascomycete fungus and one or two photosynthetic partners, which can be cyanobacterial and/or green algae. Lichens produce a diverse range of phenolic secondary metabolites or “lichen substances” that usually accumulate on the outer surfaces of the hyphae. The first reports of lichen substances dates back to the 19th century, and since then about 1050 different secondary metabolites have been identified. In addition to their role in chemotaxonomy and systematics, lichen secondary compounds probably play many different biological roles. These include acting as sun-screens, anti-grazing agents, anti-fungal or antibacterial chemicals, allelochemicals, and antioxidants. These compounds also appear to be important in metal homeostasis and the pollution tolerance of lichen thalli. The range of bioactivities identified to date suggest that further research that eventually may result in the commercial production and exploitation of pharmaceutically interesting lichen substances.

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Small mammal pollinators attracted by potato scent of the South African Pineapple Lily, *Eucomis regia* (Hyacinthaceae)

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