in this clade. It is also predicted that the fruity odours in these species are augmented by microbiological fermentation of nectar sugars in inflorescences.

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Phylogeny and chromosome evolution in *Melampodium* (Asteraceae)

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Melampodium L. is a genus of 39 species that is distributed throughout Mexico and Central America. It contains a high level of chromosomal diversity with $n=9$, 10, 11, 12, 14, 18, 20, 23, 24, 27, 28, 30 and 33. Information from nuclear ITS and chloroplast *matK* of all species provides a test of previous infrageneric classifications. In context of other genera of Heliantheae, *Melampodium* appears monophyletic, with close relatives being *Acanthospermum* from Central and South America and *Lecocarpus* endemic to the Galapagos Islands. Most of the sections are monophyletic except for sections *Alcina* and *Zarabellia*. The latter separates into two groups, *M. longifolium* and *M. mimulifolium* in one clade and *M. gracile*, *M. microcephalum*, and *M. paniculatum* in another. Within section *Melampodium*, the previous classification recognized five series. This structure is largely confirmed except for *M. glabribracteatum*, which seems best placed as a monotypic series. The new phylogeny reveals $x=11$ as basic within the genus. Both ascending and descending aneuploidy have occurred, followed by polyploidization via autopolyploidy and allopolyploidy. For example, *M. linearilobum* of series *Melampodium* is a putative diploid parent of the allohexaploid *M. sericeum* in series *Sericeum*, suggested by molecular sequences as well as by karyotypic and FISH data. As another example, the white-rayed complex (series *Leucantha*), previously hypothesized as having evolved in eastern Mexico, appears more likely to have originated from series *Cupulata* in northwestern Mexico. Speciation in this complex of *M. leucanthum* and migration eastward resulted in one lineage terminating on the Edward's Plateau in central Texas and another in the mountains of northeastern Mexico, followed by further speciation into *M. cinereum* in the Rio Grande valley and sandy plains of southern Texas. *M. argophyllum*, a hexaploid species confined to the low mountains near Monterrey, Mexico, is hypothesized as an allopolyploid derived from these other two taxa.

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Essential oil from *Pelargonium sp.* as alternative crops

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South Africa is importing 55 million Rand of essential oils per year. It is used for toothpaste, perfume, soap, washing powder, cool drink, sweets, ice cream, and increasing in the cosmetic and pharmaceutical industry. The Natural Products Industry is growing at 15% in demand worldwide. South Africa has a history of failing essential oil crops due to ignorance regarding the chemical composition and thus being exploited by the buyers. It is puzzling that there are only a few commercial farmers that are successful in South Africa, while *Pelargonium* species are indigenous to South Africa. It has a growing demand and is considered an option for small farmer enterprises. South Africa's share of the world exports in essential oils stands at 1, 03%. South Africa has unique indigenous oils that need to be developed and marketed. There is a world demand for the rose scented essential oil of a South African plant, *Pelargonium* sp. South Africa with its wide variety of climates and reputation of producing world quality wine can produce almost any crop. There is a desperate need in South Africa for suitable small farmer crops with low risk, alternative choices for commercial farmers, and long future for drought tolerant crops. The producers with a chemical analysis proved successful and formed part of the marketing strategy. To get the products up to a world standard and sustainable quantity, the chemical database of geranium oils in South Africa has to be coordinated and all information made available to new entrants.

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The Cape's orange genes: Are they well stitched? (Paraphyly of the Diosmeae, Rutaceae)

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The Diosmeae are typical members of the Cape flora. Although the species-level taxonomy has recently received much attention, the generic limits have remained uncertain. In this study plastid DNA (*psbA-trnH*, *atpB-rbcL*, and *rpl16*) were sampled from across the morphological spectrum of species and analysed using parsimony and Bayesian inference. The combined results show Diosmeae to be monophyletic and a number of genera to be polyphyletic. These data are mostly incongruent with the morphology data and suggest that, together with broader sampling of molecular data, more careful examination of morphological characters is needed prior to the adjustment of generic circumscriptions.

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Phylogeny of the daisy genera *Ifloga* and *Trichogyne* (Asteraceae: Gnaphalieae) and evaluation of the link between annuality and aridity in the succulent karoo

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The phylogenetic affinities of the anomalous genera *Ifloga* and *Trichogyne* (Asteraceae: Gnaphalieae) are poorly understood. In contrast to other ericoid-leaved gnaphaloids, most of which are woody subshrubs, these genera contain both annual and perennial species and typically occupy drier environments, being disjunctly distributed in South and north Africa. In this paper we use a phylogeny based on plastid (*trnL-trnF* and *psbA-trnH*) and nuclear (ETS) DNA sequences to evaluate the relationships of these genera, and to explore their evolution of an annual life history in relation to climate. The two genera comprise a single lineage which is situated outside of any existing subtribe in Gnaphalieae. Within this lineage, *Trichogyne* is embedded within *Ifloga*. Ancestral area reconstruction indicates a southern African origin for the *Trichogyne*+*Ifloga* clade, the disjunct distribution of the north African species being explained by a northward migration, possibly via a historical corridor of arid habitat. Likelihood reconstructions indicate that annuality was lost/gained four times in the group, these changes being most strongly associated with shifts in the duration of the moisture growing season. The tufted growth form and ground-level flowering of some annual species is interpreted as an adaptation for rapid and/or opportunistic flowering in environments in which rainfall events are short-lived or unpredictable. In at least one species, *T. polycnemoides*, this is associated with amphi-basicarpy, a novel discovery for this group and only the second known example of this reproductive strategy within Asteraceae.

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