The effect of nectar scent on honeybee (*Apis mellifera* L.) behaviour

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Floral nectar is a complex mixture of primary and secondary compounds. While most of the research has focused on the role of primary compounds for the interaction with pollinators, the role of secondary compounds is much less understood. Volatile organic compounds (VOCs) have only recently been investigated as part of the complex mixture of the chemicals found in nectar. They might play a role as pollinator attractants or as a repellent for herbivores. In addition VOCs in nectar may reduce fermentation of sugars in nectar by microorganisms. However, there might be a trade-off between these different functions. The floral and nectar VOCs of nine bee selected flower species were investigated using GC-MS. The response of honeybees (*Apis mellifera* L.) to four different concentrations (0.01%; 0.1%; 0.5%; 1%) of linalool, phenylethanol, and hexanoic acid were tested in choice tests against an unscented sugar solution (40% sucrose). Rejection of linalool began at 1%. Phenylethanol was rejected at a concentration of 1%. Hexanoic acid was a strong repellent even at low concentrations of 0.01%. Antimicrobial activity was found for all three VOCs over a period of six days. Different concentrations of VOCs (0.01%; 0.10%; 1%) did not have an effect on antimicrobial activity. The data indicates that some VOCs like hexanoic acid in nectar can have a strong repellent effect on honeybees while others like linalool are tolerated even at relatively high concentrations such as 1%. The findings indicate that nectar scent does have an effect on the behaviour of honeybees. The data also suggests that potential trade-offs between the antimicrobial activity of VOCs and repelling pollinators may be compound specific.

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Essential oil yield and composition of three *Helichrysum* species occurring in the Eastern Cape Province of South Africa

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Three species of *Helichrysum* namely *H. odoratissimum*, *H. cymosum* and *H. petiolare*, all commonly known as Imphepho (Xhosa, Zulu), are widely used in South Africa for medicinal purposes. The active ingredients assigned to the medicinal properties include both non volatile components like phlorogluconols in water extracts and volatile essential oil components. Main components in the essential oil from the three species harvested in the Kareedow area of the Eastern Cape and extracted using steam distillation included α-pinene, d-limonene, 1,8-cineole, γ-terpinene, β-caryophyllene and α-humulene. The concentrations of these components varied considerably between the three species with α-pinene highest in *H. odoratissimum* with 23.1% and lowest in *H. cymosum* with 8.4%. *H. Cymosum* had the highest β-caryophyllene content of 17.8% with *H. petiolare* the lowest content of 1.1%. Oil yield of especially *H. petiolare* showed a large variation between summer and autumn harvesting of 0.05% and 0.15% respectively. A thorough investigation is needed to quantify the variation of oil yield and composition between geographical regions and seasons.

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Multiple shoot induction from wild lettuce [*Launea taraxacifolia* (Willd) Amin, Ex. C. Jeffrey], an indigenous leafy vegetable

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Launea taraxacifolia (Asteraceae), also known as wild lettuce, is one of the many indigenous leafy vegetables (ILV) in Nigeria. Selection of *L. taraxacifolia* plants with tender leaves of low bitterness would increase its consumption. A limitation to cultivation and domestication of this plant is the lack of variability occasioned by the commonly used vegetative mode of propagation leading to inefficiency of conventional breeding. Molecular breeding will therefore be a more efficient method for genetic improvement of the plant and *in vitro* regeneration protocols are essential. The objective of this study was to compare the effects of a combination of benzyladenine (BA) with naphthalene acetic acid (NAA), and a combination of 2,4 - dichlorophenoxy acetic acid (2,4-D) with kinetin (KN) on multiple adventitious shoot regeneration and to develop an efficient micropropagation protocol for the species. The explants were cultured on MS (Murashige and Skoog, 1962) medium fortified with different concentrations of 2,4-D with KN and BA with NAA. A combination of BA with NAA was more efficient for multiple adventitious shoot regeneration as compared to the combination of 2,4-D with KN. Out of different explants utilized (leaf, stem and nodal), only leaf explants produced multiple adventitious shoots (100%) with an average number of 13.3 ± 2.4 shoots per explants on shoot induction medium (Murashige and Skoog (MS) medium + 2.0 mg/l BA + 0.1 mg/l NAA). Shoot buds elongated rapidly with over 50% of the elongated shoots rooting well on the same medium. This study, to our knowledge is the first report on the multiple adventitious shoot regeneration of *L. taraxacifolia*.

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Geographic variation in flower color: Spectral composition versus perception of pollinators

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Geographic variation of flower color can be the result of selective processes mediated by pollinators. Changes in flower color can steer visual attention of pollinators in different ways, thus influencing enhancing plants pollination success. Despite this is a widespread belief in pollination biology, there is no study that analyse at a geographical scale both, the spectral patterns of the light reflected by flowers across the entire wavelength range, and the colour space patterns obtained from pollinators perception of the reflected colours (adaptive component). Here we compare geographical variation structure of reflected flower color versus flower color perceived by pollinators, in 23 populations of the three species of genus *Monttea* (*Plantaginaceae*).There was substantial variation in the coloration of flowers between and within species considering both floral color components. However, for each flower segment measured (petal, floral tube and elaiophore), each color component showed different variation patterns. On one hand, at intraspecific level, coefficients of variation showed that the adaptive component is less variable at geographical scale than the spectral patterns obtained from flowers. On the other hand, nested analyses of variance showed mainly interspecific differences through the perception of pollinators. Moreover, multivariate analyses showed that pollinators could