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# Editorial: Women in chemical ecology 2022

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## Editorial on the Research Topic Women in chemical ecology 2022

We are delighted to present the inaugural Frontiers in Ecology and Evolution “*Women in chemical ecology*” Research Topic. At present, less than 30% of researchers worldwide are women. Long-standing biases and gender stereotypes are discouraging girls and women away from science-related fields, and STEM research. Science and gender equality are, however, essential to ensure sustainable development as highlighted by UNESCO. To change traditional mindsets, gender equality must be promoted, stereotypes defeated, and girls and women should be encouraged to pursue STEM careers. The field of chemical ecology is especially rich in female talented scientists, and some of their exciting work is brought together in this Research Topic. The papers gathered here highlight studies that address host plant selection, plant-mediated interactions within and across trophic levels, their effects on plant and insects’ communities, as well as the underlying mechanisms at plant chemistry and molecular levels.

Pollen beetles, which are specialists on the Brassicaceae, seem to prefer to feed on flowers with a carbohydrate-rich pollen, and [Bellec et al.](#) consider that such preference is adaptive since herbivore performance correlates positively with the plant carbohydrate content. The study highlights that to better understand the nutritional strategies of herbivores we need to combine assessments of the plant macronutrient content into host plant selection experiments and address the adaptive value of herbivore choices. [Friedrichs et al.](#) investigated the development of the polyphagous tansy leaf beetle on mono diets consisting of one species versus two mixed diets, both containing tansy. Polyphagous herbivores are assumed to benefit during their development by gaining a better nutritional balance and reducing the intake of toxic compounds from different plant species, but according to the authors, they also show strategies to metabolically cope with plant defences. In their study the authors highlight that the Coleoptera studied can deal with toxic hydrolysis products of glucosinolates by conjugation with different amino acids, which may enable this species to develop well on cabbage. They discuss the factors that might explain what leads to poorer development of the beetles on pure tansy diet or diet mixes containing tansy.

Whitaker et al. followed the pioneering research conducted in the late 1980's by Miriam Rothschild and Deane Bowers on aposematism in lepidopteran herbivores who showed that the cycad-feeding butterfly *Eumaeus atala*, sequester the toxic plant compound cycasin and thereby deter vertebrate and invertebrate predators. They focused on another cycad compound,  $\beta$ -methylamino-L-alanine (BMAA), that is known to accumulate in the tissues of insects and other herbivores, and which has been shown to have neurotoxic effects in humans. Through chemical analyses of that compound in different stages of the herbivore and behavioural experiments with predatory ants, they showed that high levels of BMAA in the tissues of cycad-feeding insects likely reflected passive bioaccumulation rather than defensive sequestration. Combined with the previous work by Rothschild and Bowers, these results lay the groundwork for further investigation into the processes underlying active sequestration and non-adaptive bioaccumulation. Caarls et al. studied the cellular and molecular responses of *Brassica rapa* and its wild relative *B. nigra* to *Pieris brassicae* eggs, and characterized potential insect egg-associated molecular patterns (EAMPs) inducing HR-like cell death. They found that eggs of *P. brassicae* induce early immune responses in both *Brassica* sp. but ethylene production and upregulation of SA-related genes are only detected in *B. nigra* expressing HR-like cell death. These responses are also induced in *B. nigra* by compounds in *P. brassicae* egg wash with possibly one or multiple EAMPs located in the egg glue derived from the female accessory reproductive glands. This study paves the way for future studies on identification of EAMPs in *Pieris* egg glue and corresponding receptor(s) in Brassica plants.

Thompson et al. studied the effects of belowground larval herbivory by striped cucumber beetle *Acalymma vittatum* on shaping zucchini squash interactions with aboveground herbivores such as adult cucumber beetles and squash bugs (*Anasa tristis*). They show that belowground larval herbivory induces changes in defensive chemicals and nutritional content that enhance aboveground resistance and deter herbivores, along with the enhanced emission of (*E*)- $\beta$ -ocimene. Possible defensive strategies that plants employ to overcome multi-herbivore attacks above- and belowground are discussed. Yoneya et al. studied the hypothesis that arthropod community composition and species richness are shaped by plant initial conditions. By experimentally manipulating the damage of willow tree *Salix eriocarpa* by the specialist leaf beetle *Plagioderia versicolora* or exposing trees to volatiles from damaged plants they show effects on the arrival and population dynamics of the beetle. Results are discussed relative to the plant initial condition as a key driver of community assembly and maintenance of species diversity. McCormick et al. reviewed

the literature published in the last decade and explored what is known about the ecological aspects of odours emitted by invasive plants, focusing on the factors affecting their emission and their role on intra and interspecific interactions. The authors concluded that the studies they reviewed collectively suggest that invasive species are more 'chemically diverse' than their native counterparts. The studies further suggest that invasive plants' may experience less variation in their odour emission and in response to environmental change than the native species.

The work presented here highlights the diversity of research performed across the entire breadth of chemical ecology research and presents advances in theory, experiment, and methodology with applications to compelling problems.

## Author contributions

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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