
Leitung: Univ.-Prof. Dr. Ulrike Berninger

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INFILTRATED BY INVADERS: A TRAIT-BASED COMMUNITY APPROACH FOR UNDERSTANDING NICHE COMPETITION OF FLOWER-VISITORS IN THE HAWAII VOLCANOES NATIONAL PARK

Biological invasions are major threats to natural ecosystems. Native Hawaiian communities are characterized by high endemism and relatively poor species richness, and are particularly susceptible to introduced species that fill vacant niches or displace native organisms. Naturalized alien flower-visiting species often severely interfere with native co-evolved interactions due to competition for resources. In order to assess the potential for competition between native and invasive flower-visitors, we analyzed the niches of species based on functional plants traits (flower morphology, resources, scent, colour) and environmental parameters (weather, habitat); and quantified the degree of niche overlap of native and introduced species. Thus, by using a novel non-parametric statistical approach, we aimed to understand the mechanisms underlying niche displacements and invasions. Our preliminary results show that invasive species (e.g. honey bee, carpenter bees) tend to visit more plant species (native and invasive), but compared to the native bee genus (Hylaeus) do not have large realized niches. Furthermore, they only show little/moderate overlap in their niches. So far, we found little indication of the displacement of native flower-visitors by invasive alien species.
MULTIFUNCTIONALITY OF FLORAL SCENT BOUQUETS REVEALED BY INHIBITION OF PATHWAY-SPECIFIC PRODUCTS

Floral volatiles and colours act as a medium of communication. Next to mutualistic flower visitors, plants have to handle with a large number of antagonistic insects affecting them negatively. To discriminate between flower-visitor plants evolved floral filters that grant access to mutualists but keep antagonists at bay. To investigate the effects of floral scents on flower visitor communities, we augmented floral scents of a plant species with a bouquet dominated by products of the shikimate pathway (aromatics) with floral extracts of a plant emitting mostly products of the pyruvate / acetyl-CoA pathways (terpenoids) and vice versa. Augmented flowers were visited by insects not observed on flowers with a natural scent bouquet, while others stopped their foraging activity on these flowers. To further reveal the attractive and repellent properties of individual compounds within the complex bouquets, we biochemically inhibited the pathways of aromatics and terpenoids. The overall aim of this study is to decode floral scent bouquets by assigning attractive and defensive functions to individual compounds and to understand the multifunctionality of floral scents.

REFERENCES

MICRODIVERSITY IN POLYNUCLEOBACTER BACTERIA – SELECTION OR GENETIC DRIFT?

The bacterial species Polynucleobacter necessarius subsp. asymbioticus (further abbreviated as P. necessarius) shows cosmopolitan and ubiquitous distribution in the plankton of standing freshwater habitats. P. necessarius comprises on average about 10% of total bacterioplankton cells in various freshwater habitats and was detected in all climatic zones and over a wide pH range (3.8 – 8.5). The ubiquity of P. necessarius was explained by intra-taxon ecological diversification, i.e. specialization of lineages to specific environmental conditions. Genetic data indicates an unforeseen high number of closely related genotypes even among strains of a single lineage (microdiversity). The genetic differences between these strains might either be the consequence of neutral diversification by genetic drift or of positive selection, i.e. represent adaptations to different habitats or niches within a single habitat. Genome analysis of six strains, associated to the same lineage but isolated from three different locations provides insights on specific adaptations of closely related genotypes.

REFERENCES


FLAVONOIDS AND THEIR REGENERATIVE POTENTIAL FOR SPINAL CORD INJURY

Trauma of the central nervous system, such as spinal cord injury (SCI), are associated with an irreversible loss of neurons and neuronal connectivity. The spontaneous regenerative potential of the CNS through axonal regrowth or sprouting is very limited and even further repressed by local inhibitors. Currently, no curative treatments of SCI are available. Therefore, therapeutic strategies enhancing the regeneration after SCI, and in particular interventions promoting the sprouting of intact nerve fibres or the regrowth of damaged axons are acutely needed.

Prenylflavonoids represent a very promising class of pro-regenerative substances. After screening a whole library of flavonoids on foetal forebrain neural precursors and dorsal root ganglion neurons (DRGs), we could identify substances that promoted neuronal neurite outgrowth and branching - even in the presence of inhibitors for axonal outgrowth-, that promoted neuronal determination/maturation, and provided neuroprotection.

In my Phd-Project I will study the effect of especially one of these substances- designated as ENDF1 - Enhancement of Neuronal Differentiation Factor1- on axonal regeneration in vitro - on DRG neurons - and in different models of SCI in rats.

REFERENCES

ENVIRONMENTAL CHANGE, TEMPORAL HETEROGENEITY AND FRAGMENTED HABITATS: EFFECTS OF MULTIPLE STRESSORS ON BIODIVERSITY IN A MODEL ECOSYSTEM

High biodiversity imparts many benefits but is increasingly under threat. This proposal deals with the temporal and spatial aspects of three of these threats, fragmentation, eutrophication and warming. Therefore, the main focus of the project is to understand how the anthropogenic stressors of eutrophication and warming impact biodiversity in a fragmented, patchy landscape. A model aquatic system will be used, as this can easily be experimentally manipulated. Some of the hypotheses to be tested: when nutrient addition is pulsed rather than continuous, diversity will be higher not only autotrophs, but also in their grazers; when nutrient pulses are asynchronous between patches, diversity will be higher than when the pulse is at the regional scale; with higher temperatures, growth rates of algal grazers will be disproportionately higher than their prey; short-term temperature increases will act as a disturbance and decrease diversity at all but the most moderate temperature spikes. A metacommunity structure will moderate the effects of a temperature spike on diversity.

REFERENCES


König, Richard. Molekulare Regenerative Medizin, richard.koenig@sbg.ac.at

Betreuer: Hans-Christian Bauer, Ludwig Aigner, Helmut Mayr

AN EXHAUSTIBLE RESERVOIR OF IMMATURE NEURONS: AN UNSUSPECTED FORM OF ADULT CORTICAL NEUROGENESIS

Beyond both canonical neurogenic regions in the mammalian brain, namely the subgranular zone of the dentate gyrus and the subventricular zone of the lateral ventricles, immature neurons or neuronal progenitor cells can be found, even in phylogenetically old and highly conserved brain areas. One surprising example of those is the Piriform cortex. This trilaminar paleocortex, located bilaterally in the ventrolateral forebrain, is crucial for odor sensing and modulation. The immature neurons found here, termed tangled cells, seem to constitute a unique cell population, which is generated prenatally and preserve their immature characteristics through age. Our preliminary data, based on morphological analysis on a transgenetic mouse model, indicates an adult differentiation of tangled cells, making the Piriform cortex to a neurogenic active brain region. To investigate their immature character on a functional level, as well as the possibility of their functionally relevant integration, is the aim of this study and achieved by acute slice electrophysiology.

REFERENCES


BIG LIES FOR SMALL FLIES: DECEPTIVE POLLINATION IN CEROPEGIA

As far as known, all species of Ceropegia L. (Apocynaceae, Asclepiadoideae) are pollinated by flies from diverse families such as Chloropidae, Milichiidae, Phoridae, Scairidae, and Drosophilidae. Ceropegia is characterized by complex pitfall flowers with trapping devices (e.g., sliding areas, trapping trichomes) to catch, temporarily trap and finally release pollinators. Since the flowers do not offer any reward to their pollinators they are supposed to be deceptive, but the models they mimic are unknown. The South African species C. sandersonii and the Chinese species C. dolichophylla are pollinated by Desmometopa flies. These flies are kleptoparasites and feed on haemolymph or other secretions released by insect prey items of predatory arthropods. It is generally believed that the flies are attracted by volatile organic compounds which are set free from the prey item while it is being devoured. Honey bees caught by spiders are often crowded with Desmometopa flies feeding on fluids coating the exterior of the bee. Here, we identified the chemicals used by the two Ceropegia species to deceive Desmometopa and misuse them as pollinators.

REFERENCES


