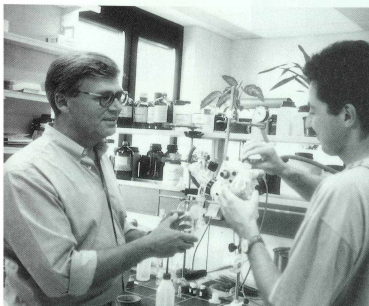


# Comparative and Ecological Phytochemistry

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## Research

Broad-based *phytochemical screenings* within certain groups of related plants (e.g. Rutaceae, Asteraceae, Apiaceae) show the different distribution and accumulation of characteristic secondary *plant metabolites*. After the first phase of discovery (qualitative HPLC), the isolation (quantitative MPLC) and structural analysis (in close collaboration with the Institute of Organic Chemistry, University of Vienna) various bioassays are now used to provide information on the presence of bioactive natural compounds.

First indications of the accumulation of *antifungal agents* already result from the "bioautography", in which developed thinlayer-chromatograms are sprayed with a spore suspension of phytopathogenic fungi (e.g. *Botrytis*, *Cladospo-*

*rium*, *Alternaria*) and the spores are brought to germination in a humid chamber. All antifungal compounds cause light-colored inhibition zones on the dark layer of fungal mycelia (see Fig.).

To gain a more detailed understanding and international comparability of the antifungal activity the ED<sub>50</sub>-values are determined. They show the lowest concentration of an active compound which reduces the growth of the germinating fungal-hyphae by 50 % as compared to the untreated controls.

Pure compounds as well as crude extracts are also tested for their *feeding deterrence and growth retarding activity against insects*. For a rapid screening the so-called leaf disc choice test is carried out in Petri dishes using larvae of the well known polyphagous pest insect *Spodoptera litoralis* (Noctuidae). More detailed effects can be observed in assays where phyto-chemicals are incorporated into the artificial diet of this moth.

Preliminary *antibacterial tests* are carried out on *Staphylococcus aureus*, *Escherichia coli*, and *Bacillus subtilis* using the agar diffusion technique. In the hole-plate method the phytochemicals are brought into contact with an inoculated agar and after incubation, the diameter of the clear zone around the reservoir is measured.

## Teaching

Lectures on the distribution, biosynthesis and ecological role of secondary plant metabolites ("Ecological Biochemistry").

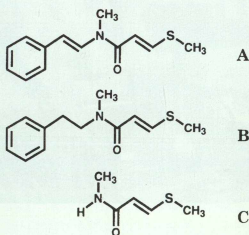
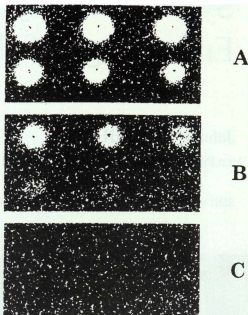
Practicals on phytochemical methods (chromatographic separation and spectroscopic identification) combined with bioassays (screening for antifungal, antibacterial, and antifeedant/repellent natural compounds)

## International Cooperations

Institute of Pharmaceutical Biology, University of Greifswald, Germany (toxicological studies on cicutoxin and related polyacetylenes); - Institute of Pharmaceutical Biology, University of Düsseldorf, Germany (cyclooxygenase and 5-lipoxygenase inhibition of unsaturated alkaloids and lignans); - Julius-von-Sachs-Institut für Biowissenschaften, University of Würzburg, Germany (insect growth inhibition and dietary utilization of naturally occurring coumarins); - Department of Botany, Kasetsart University of Bangkok, Thailand (phytochemical screening for bioactive compounds in tropical Rutaceae)

## Selected References

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- Hadacek F, Müller C, Werner A, Greger H, Proksch P (1994) Analysis, isolation and insecticidal activity of linear furanocoumarins and other coumarin derivatives from *Peucedanum* (Apiaceae: Apioideae). *J Chem Ecol* 20: 2035-2054
- Greger H, Hofer O, Zechner G, Hadacek F, Wurz G (1994) Sulphones derived from methylthiopropenoic acid amides from *Glycosmis angustifolia*. *Phytochemistry* 37: 1305-1310



**Fig.** Bioautographic detection of serial dilutions (100 µg, 80 µg, 50 µg, 30 µg, 20 µg, 10 µg) of three sulphur-containing amides, methylallukumbin A (A), methylsinharine (B), and penangin (C). Testfungus: *Cladosporium herbarum*