

VITAL VOLATILES - HOST LOCATION
IN PARASITIC WASPS ATTACKING BARK BEETLES

Eva M. Pettersson

Chemical Ecology, Göteborg University, Box 461, SE-405 30 Göteborg, SWEDEN

E-mail: Eva.Pettersson@chemecol.gu.se

ABSTRACT – Parasitoids are insects that spend their immature stages feeding on other arthropods and eventually kill their hosts. Parasitic wasps (Hymenopteran parasitoids) of bark beetles (Coleoptera: Scolytidae) have a remarkable ability to locate and oviposit on hosts which are concealed under the bark of coniferous trees. The trees are damaged or killed by bark beetles, which introduce pathogenic microorganisms into the phloem where they breed. Despite the lack of visual cues, the parasitoids distinguish bark beetle attacked trees containing susceptible hosts (mature larvae present in pupal chambers).

The aim of this thesis was to identify the host location cues used by four species of bark beetle parasitoids. Synthetic attractants for these parasitoids were successfully developed. Electron microscopy (SEM and TEM) revealed several types of odour perceptive sensilla on the parasitoid antennae. Volatile chemical samples collected from conifers with, or without, bark beetle larvae were analysed chemically (GC-MS) and electrophysiologically (GC-EAD). Monoterpene hydrocarbons were the predominant volatile compounds of healthy conifers, while the presence of oxygenated monoterpenes indicated bark beetle infested trees. A limited number of compounds, primarily oxygenated monoterpenes, elicited detectable neural (EAD) activity in the parasitoid antennae. EAD-active compounds were used to prepare synthetic baits which attracted parasitoid females in behavioural tests, including both Y-olfactometer and wind tunnel bioassays. The attractive compounds seemed not to arise from the parasitoid hosts, the bark beetle larvae, but from the host-plant complex, involving microorganisms.

In addition to having ecological and evolutionary interest, increased knowledge of the host location mechanisms in these parasitoids is potentially useful in developing environmentally safe control methods against epidemic outbreaks of bark beetles breeding in conifers.

KEYWORDS: Parasitoids, Hymenoptera, Pteromalidae, *Rhopalicus tutela*, *Roptrocercus mirus*, *Roptrocercus xylophagorum*, Braconidae, *Coeloides bostrichorum*, host location, odours, oxygenated monoterpenes, synthetic attractants, antennal morphology, chemical analysis, electrophysiology, bioassay, bark beetles, Scolytidae, conifers