The Honeybee as Pharmacophorus Insect

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Recently appeared an excellent review upon “insects pharmacophagously utilizing defensive plant chemicals (pyrrolizidine alkaloids (PA))” [Boppré 1986] dealing predominantly with Lepidoptera and emphasizing both aspects of gaining protection by the PA against insectivorous animals as well as the use of them as pheromone precursors and as growth determinants alike.

From other insect orders pharmacophagous behavior at least resulting in gaining protection against their natural enemies is well established too, see eg a recent report on some chrysomelid beetles and cucurbitacins [Ferguson & Metcalf 1985]. When the plant-derived chemicals don't work against an insect parasite, a second-order pharmacophagy may arise, as eg is shown by Lebistina spp. (Coleoptera: Carabidae: Harpalinae) parasitizing Diamphidia and Polyclada spp. (Coleoptera: Chrysomelidae: Alticinae) in S' Africa — both the host and the parasite larvae forming the larval arrow poison used by bushmen tribes [Neuwing & Scherer 1976]¹. Common to all these types of pharmacophagy is the ingestion of plant materials containing biologically active secondary metabolites by insects either along with the food or unrelated to actual feeding activity.

In the present notice, however, a related phenomenon suggested to be called “pharmacophory” is mentioned, to which scientists working in the fields of entomology and chemical ecology should pay more attention in the future in the author’s opinion. It is a concept primarily related to the honeybee, Apis mellifera L., which however may extend to other insects as well, at least to other members of the superfamily Apoidea (Hymenoptera). The difference between pharmacophorous and pharmacophagous behavior is made up of the fact that in pharmacophory the plant materials containing biologically active compounds are not ingested but instead collected, transported to the nest (or hive, in the case of the apicultured honeybee) and stored and used there. The material considered is not honey, but plant resins used by the bees as propolis. However, honey, or more precisely, nectar may be in some cases somewhat like a link between pharmacophagy and pharmacophory (provided it contains alkaloids or other biologically active plant metabolites), because it is ingested first, but given to nestmates by regurgitation after arrival at the hive and is stored outside the insects body. Honey containing bioactive secondary plant metabolites however is predominantly an “artefact”, being a consequence of artificial introduction of the honeybee in “new” parts of the world, where it is not native and did not coevolve with the vegetation, like New Zealand.

¹ It may be supposed here, however, that the toxic peptides of the arrow poison larvae are indeed derived from the host plant, although there is currently no proof at hand — either to support this hypothesis or the contrary.