

**Title** Side effects of grain protectants on biological control agents: How *Hyptis* plant extracts affect parasitism and larval development of *Dinarmus basalis*

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### Abstract

*Dinarmus basalis* Rondani (Hymenoptera: Pteromalidae), an ectoparasitoid of bruchid pests of stored cowpeas (*Vigna unguiculata*), is a potential biological control agent. We investigated whether grain protectants from *Hyptis spicigera* and *H. suaveolens* (Lamiaceae) disturb parasitism and post-embryonic growth of the parasitoid. When cowpeas containing bruchid larvae were treated before being placed in the presence of *D. basalis* females, the rate of parasitism decreased on average up to 24% and 47% in the presence of, respectively, leaf dry powder and essential oils from both plant species. The estimated larval mortality was higher on treated (9.55 to 28.6%) than on non-treated parasitized hosts (2.8%), depending on the plant species and the plant extract tested. Additional larval mortality was higher for essential oil, and for *H. suaveolens*. An in-depth analysis of the pre-imaginal development in capsules adapted for this purpose showed that without treatment, mortality was recorded only for eggs and the first two larval stages. With treatment, mortality not only significantly increased on eggs but also spanned all other pre-imaginal stages. Pre-imaginal development was also significantly extended in the presence of treatment, depending on the type of extract and dose used. In conclusion, both plant species exert acute toxicity on *D. basalis* larvae and also act as growth inhibitors. These results provide additional information that enable us to move towards the harmonious use of allelochemical compounds from plants while protecting biocontrol agents from their adverse effects.

<http://www.springerlink.com/content/a165627315448r67/fulltext.pdf>