# Antifeedant effect of Mediterranean plant essential oils upon *Acanthoscelides obtectus* Say (Coleoptera), bruchid of kidney beans, *Phaseolus vulgaris* L.

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*Abstract*

The insecticidal effect of 23 essential oils from mediterranean plants (Labiateae, Umbellifereae, Lauraceae, Rutaceae, Myrtaceae, Gramineae and Myristicaceae) was tested on *Acanthoscelides obtectus* Say, one of the most damaging pests of stored legumes. The oils exhibited fumigant effect on adults and decreased both oviposition and larval growth. Reduced larval penetration and development inside artificial seeds made from cotyledon flour of *Phaseolus vulgaris* were due to antifeedant activity. Slight activity was produced by *Laurus nobilis*, *Eucalyptus globulus* and *Mentha piperata* and the strongest activity was produced by *Anethum graveolens*, *Ocimum basilicum*, *Myristica fragrans* and *Cuminum cyminum*.

## Introduction

The use of traditional protectants of crops is an old and common practice (Golob and Webley 1980) and, recently, insecticidal and repellent properties of plants have been underlined (Anjana et al. 1988; Saxena 1989; Rajapakse 1990; Morallo-Rejesus et al. 1990; Regnault-Roger and Hamraoui 1993). Among the most efficient upon *Acanthoscelides obtectus* Say (Coleoptera), the bruchid of kidney bean, *Phaseolus vulgaris* L., the Labiateae family was identified. These plants are well known to provide essential oils and we observed that the hydrodistillated extract presented two kinds of toxicity upon the beetle: a strong and rapid effect induced by vapours but also, at lower concentrations, an inhibition of reproduction by decreasing oviposition or by producing ovicidal and larvicidal effects (Regnault-Roger et al. 1993; Regnault-Roger and Hamraoui 1994).

In this work, we intend to complete the previous observations and to study if essential oils have an antifeedant effect upon *Acanthoscelides obtectus* Say. This activity will increase interest in using essential oils for management of stored-product pests.

## Material and Methods

### Biological

Insects (*A. obtectus* Say) and beans (*Phaseolus vulgaris* L.) were laboratory reared. Fertilised eggs were chosen for this experiment. Beetles were kept in a room at 27°C with a moisture level of 65–75% and photoperiod 12 hours light/12 hours dark.

### Botanicals

Leguminoseae seeds were hulled and cotyledons reduced to flour which was riddled (mesh 0.5mm). Aromatic plants used in the experiment (Table 1) were obtained either from the Institute fields or the local market. Essential oils were extracted by steam distillation (Guenther 1972). Two samples of *Thymus vulgaris* were experimented because of the numerous chemotypes.

### Bioassay

Each essential oil was incorporated into the seed flour. Two series were done: respectively 99.5% and 99% of flour for

**Table 1.** Botanical classification of tested essential oils (according to G. Bonnier 1990).

| Botanical species | Family | Sample number in experiments |
|---|---|---|
| *Anethum graveolens* L. | Umbellifereae | 20 |
| *Apium graveolens* Houtt | Umbellifereae | 18 |
| *Cinnamomum verum* Presl | Lauraceae | 15 |
| *Citrus limon* (L) Brum F. | Rutaceae | 21 |
| *Coriandum sativum* L. | Umbellifereae | 23 |
| *Cuminum cyminum* L. | Umbellifereae | 17 |
| *Cymbopogon nardis* Wats | Gramineae | 11 |
| *Eucalyptus globulus* Labill. | Myrtaceae | 6 |
| *Laurus nobilis* L. | Lauraceae | 7 |
| *Lavandula angusifolia* P. Miller | Labiateae | 5 |
| *Mentha piperata* L. | Labiateae | 2 |
| *Myristica fragrans* L. | Myristicaceae | 19 |
| *Ocimum basilicum* L. | Labiateae | 14 |
| *Origanum majorana* L. | Labiateae | 13 |
| *Origanum vulgare* L. | Labiateae | 10 |
| *Pertoselinum sativum* L. | Umbellifereae | 16 |
| *Rosmarinus officinalis* L. | Labiateae | 3 |
| *Salvia officinalis* L. | Labiateae | 12 |
| *Satureia hortensis* L. | Labiateae | 4 |
| *Thymus serpyllum* L. | Labiateae | 1 |
| *Thymus vulgaris* L. | Labiateae | 8 and 9 |
| *Verbena officinalis* L. | Labiateae | 22 |

N.B.: sample n°24 is control (no essential oils)

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