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Chemical studies of some plant essential oils and their effect on some stored product insects

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Abstract

Geranium (*Pelargonium graveolens*), Jasmine *Jasminum grandiflorum* (Fam. Oleaceae), Basil *Ocimum basilicum* Var, (Fam. Lamiaceae), and *Tagetes minuta* (Fam. Asteraceae) are economical plants in Egypt that can resist insect infections, which may be related to its oils. Three types of geranium essential oils (geranium oil, geranium absolute and geranium stripping oil) were extracted with three different methods (steam distillation, solvent extraction, and hydrodistillation, respectively). Seven types of crude essential oils, three natural components (linalool, citronellol, and geraniol), and synthetic counterparts of two of these components (linalool and citronellol) were evaluated against *Tribolium castaneum* and *Rhyzopertha dominica* adults through evaluating their repellency, fumigation, contact and effect on progeny. The seven types of crude essential oils were analyzed by Gas Chromatography/mass Spectrometry (GC-MS). Chromatographic analysis of the geranium essential oils demonstrated that citronellol is the main constituent, accounting 29.70%, 31.80% and 18.30% of geranium oil, geranium stripping oil and geranium absolute, respectively. Acetic acid was the main component in Jasmine absolute with 15.951%, while linalool was the main component for basil oil and basil absolute with 54.80% and 46.345% respectively, for tagette oil dihydrotagetone was the main component with 28.85%. Geranium oil, geranium absolute and geranium stripping oil had the highest repellent activity against *T. castaneum*. In contrast, all tested crude essential oils had 100% repellency against *R. dominica* except basil absolute had 92.5% repellency. Furthermore, natural linalool had the strongest fumigant effect on *T. castaneum* among the oil components, while citronellol had the

strongest effect on *R. dominica*, and the oil components had stronger fumigant effects than the crude essential oils.

The fumigation activity showed the same trend as repellency against the two tested insects. Based on the LC_{50}, the oil components have a stronger effect than the crude essential oils. Finally, *T. castaneum* was more tolerant than *R. dominica* to all tested materials. All geranium oils had no effect on *T. castaneum* for contact toxicity while geranium stripping oil had the strongest effect on *R. dominica* with the level of 63.1 mg/kg. All tested essential oils had reduction effect on both tested insects. The method of extraction effects on the chemical composition of essential oils produced from the same plant, all tested crude essential oils and its components (natural and synthetic) can be used as safe pesticide alternatives for stored product insects, geranium stripping oil is a new crude oil can increase the national income instead of losing it in waste water.