Bioactivity-guided investigation of geranium essential oils as natural tick repellents.


Abstract
The evaluation of 10 essential oils of geranium, Pelargonium graveolens (Geraniaceae), were all shown to have repellent activity against nymphs of the medically important lone star tick, Amblyomma americanum (L.). The biological tests were carried out using a vertical filter paper bioassay, where ticks must cross an area of the paper treated with repellent to approach host stimuli. One of the essential oil samples that repelled >90% of the ticks at 0.103 mg/cm² was selected for further fractionation studies. The sesquiterpene alcohol, (-)-10-epi-γ-eudesmol, was isolated and identified by spectral methods. (-)-10-epi-γ-Eudesmol at 0.103 and 0.052 mg of compound/cm² of filter paper repelled 90 and 73.3% of the ticks, respectively. (-)-10-epi-γ-Eudesmol exhibited similar repellency to the reference standard N,N-diethyl-meta-toluamide (DEET) at concentrations of ≥0.052 mg of compound/cm² of filter paper, with (-)-10-epi-γ-eudesmol losing much of its repellency at 0.026 mg of compound/cm² and DEET at 0.013 mg of compound/cm². Isomenthone and linalool did not repel ticks at the concentrations tested. Most repellents are marketed with much higher concentrations of active ingredient than the concentrations of the natural repellents tested herein; therefore, effective compounds, such as (-)-10-epi-γ-eudesmol, found in geranium oil, have the potential for commercial development.

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