

Fumigant Toxicity of Essential Oils from *Laurus nobilis* and *Rosmarinus officinalis* against All Life Stages of *Tribolium confusum*

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The essential oils from rosemary (*Rosmarinus officinalis* L.) and laurel (*Laurus nobilis* L.) obtained from Mersin Province in Turkey, were tested for their fumigant toxicity against all life stages of confused flour beetle (*Tribolium confusum* du Val.). GC-MS analysis showed that 1,8-cineole was found to be the major component of both rosemary and laurel essential oils. Vapors of rosemary and laurel essential oils were toxic to all life stages of *T. confusum*. Only 65% mortality of the eggs was achieved when exposed to a dose of 172.6 mg l⁻¹ air of rosemary essential oil at the longest exposure period (144 h); at the same dose, the pupae were the most resistant stage, with LT₉₀ (lethal time) value of 120.2 h. The adults were the most resistant stage to laurel essential oil, with LT₉₀ value of 77.2 h. On the basis of LT₉₀ values, tolerance of the life stages of *T. confusum* to rosemary and laurel essential oils was, in descending order: pupa < larva < adult, and larva < adult < egg < pupa, respectively. Based on the concentration × time (Ct) products (g h l⁻¹), rosemary essential oil was more toxic than laurel to the adults and larvae of *T. confusum*. However, laurel essential oil was more toxic than rosemary to the eggs and pupae. Since these essential oils need such high Ct products to obtain complete mortality of *T. confusum* compared with the most commonly used commercial fumigants, it would be impossible to use them on their own as a commercial fumigant against stored-product insects.

KEY WORDS: Essential oils; fumigant toxicity; *Tribolium confusum*; laurel; rosemary; bio-fumigant.

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