

Effects of lemongrass essential oil on reproductive cycle, lipids composition and xenobiotics enzymes of *Callosobruchus maculatus*, cowpea insect pest

Marcela S. Alves¹, Cristiane M. Cardoso¹, Emerson G. Pontes¹, Marco A. A. Souza¹,

¹ Programa de Pós-graduação em Química, UFRRJ. BR 465, km 7, Seropédica, RJ, Brazil.
decoerej@yahoo.com.br

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Cowpea-weevil is a storage pest mainly infecting cowpea. Depending on the regions, the decrease in cowpea production by cowpea-weevil can exceed 70% during a six month storage period. Based on the frequently reported insecticidal potential of the essential oils (EOs) under insect species, this study aimed to investigate the fumigant effect of lemongrass EO and citral on some aspects of life-cycle, behaviour and metabolism in cowpea-weevil. Essential oils from dried leaves were obtained by hydrodistillation in Clevenger apparatus for 1 h. GC-FID and GC-MS analysis was carried out on a Hewlett-Packard 5890 II (Palo Alto, USA) and GC/MS QP-2010 Plus (Shimadzu, JPN). Substances were separated into the fused silica capillary column VF-5ms (30 m × 0.25 mm i.d., film thickness 0.25 µm, Agilent J&W). Analysis conditions and compound identification were the same as reported by literature¹⁻³. The first bioassay procedure with essential oil and citral were the same as reported by literature¹. Aliquots assay of lemongrass essential oil and citral were 0.09, 0.18, 0.37, 0.55, 0.74, 0.92 and 0.04, 0.09, 0.18, 0.27, 0.45 and 0.89 mg cm⁻³ respectively. The second bioassay procedure was carried out with two day old insects treated or not with 0.37 mg cm⁻³ of lemongrass essential oil for 12 hours. Incubation and monitoring conditions were the same as those previously cited in first bioassay. The treatments were performed as follows: 1) females without essential oil; 2) Males and females without essential oil; 3) Males with essential oil and females without essential oil; and 4) Males without essential oil and females with essential oil. Lipids and protein contents, as well as, enzyme assays procedure were the same as reported by literature⁴⁻⁸. The cowpea-weevil mortality (52%), oviposition (13%) and emergence (4%) and were observed for EO treatments. Citral caused increase in mortality (85%) and decrease in oviposition (31%) and new adult emergence (3%). After 12 hours of exposure to lemongrass EO, alterations in female cowpea-weevil sexual behaviour, oviposition, fatty acids and triacylglycerol contents were observed. Also under these conditions, reductions in acetylcholinesterase (female and male) β-esterase and glutathione-S-transferase (female) activities were observed, while α-esterase and carboxyesterases (female) showed an increase. Lemongrass EO caused toxicity, changes in sexual behaviour and also alterations to the total activity of biotransformation enzymes, which can be pointed out as one of the probable mechanisms involved with EO toxicity, as well as to give new perspectives to the cowpea-weevil, without the use of conventional insecticides.

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