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Developmental suppressive properties of *Madhuca longifolia* against the cowpea bruchid, *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae): An effective green alternative for storage pest management

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Management of *Callosobruchus maculatus* (Coleoptera: Bruchidae), which is a major storage insect pest of legumes, relies heavily on synthetic insecticides at present. However, serious environmental and economic problems associated with the intensive use of these insecticides have led towards eco-friendly novel approaches such as botanical insecticides. From this perspective, the possible use of *Madhuca longifolia* seed oil as a reliable alternative to synthetic insecticides in controlling *C. maculatus* was investigated. For this purpose, several bioassays were conducted under ambient laboratory conditions ($28\pm 2^\circ\text{C}$ and $84\pm 2\%$ RH) using cowpea grains treated with a series of oil concentrations (0.5, 1.0, 1.5, 2.0, 2.5 v/v% /10g of seeds). Oviposition deterrence was evaluated by allowing a single female (introduced with 2 males) to oviposit on cowpea grains treated with different oil concentrations and recording the egg count after 72 hours. Egg hatchability on treated cowpea was assessed by counting the number of eggs hatched after 7 days. Effect of the seed oil on F1 progeny production was tested by counting the number of adults emerged from treated grains. Using the same F1 progeny to oviposit on un-infested cowpea grains, the effect of the oil on F2 progeny was assessed. Each bioassay was statistically analyzed using one-way Anova. Following standard procedures, characterization of the seed oil was made using Gas chromatography-mass spectroscopy (GC-MS) technique. All treated concentrations demonstrated significant oviposition deterrence when compared with the control. The lowest oviposition (9.20 ± 2.82) was observed with the highest concentration (2.5 v/v%) indicating high toxicity of the seed oil. When evaluating the egg hatchability, the highest concentration (2.5 v/v%) produced remarkably high reduction in egg hatchability (3.20 ± 1.42) compared with that of the control (56.80 ± 5.73). A significant reduction in F1 progeny was observed with all concentrations when compared with the control and the highest reduction (1.00 ± 0.85) was recorded with the highest concentration (2.5 v/v%). When considering the F2 progeny, it was revealed that reduction of F2 progeny was also dose dependent and the number emerged decreased with the increasing concentration. GC-MS revealed a high percentage of Dodecanoic acid, methyl ester (39.41%), Methyl tetradecanoate (25.49%), Hexadecanoic acid, methyl ester (14.46%) and 9- octadecenoic acid, methyl ester (12.06%). The overall findings, very strongly imply that *M. longifolia* seed oil could be successfully exploited as an eco-friendly grain protectant to replace harmful synthetic insecticides in the management of *C. maculatus* in storage conditions.

Keywords: *Callosobruchus maculatus*, *Madhuca longifolia*, Seed oil, Oviposition