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Efficacy of Essential Oil of *Ruta graveolens* Leaves Against *Sitophilus oryzae* (Linnaeus) as a Biorational Pesticide in Post-Harvest Pest Management

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Abstract

Essential oil bearing plants are arising as the most popular entrants in the replacement of synthetic insecticides in post-harvest insect pest management due to their volatility, biodegradability, eco-friendly and esculent properties. In the present study, essential oil was isolated from leaves of *Ruta graveolens* (Aruda) by hydro-distillation to evaluate its repellent properties, contact and fumigant toxic activities against the rice weevil, *Sitophilus oryzae*, which is the predominant pest of stored rice. All experiments were conducted under laboratory conditions (29±2^0 C and 84±2% RH). Essential oil at concentrations of 50, 100, 150 and 200 µl/ 10 ml acetone were tested against one week old *S. oryzae* adults using un-infested white raw rice as the food medium. For repellency assays, area preference method was used. For that one half of filter paper was treated with essential oil solutions while other half was treated only with the solvent (acetone) which was considered the positive control. Ten *S. oryzae* adults were released in the center of petri dish containing treated and untreated filter paper and number of insects present on each half was recorded after 30 minutes. Both contact and fumigation toxicity studies were conducted using 10×1.5 cm glass vials. In order to evaluate the fumigation toxicity, an oil impregnated filter paper disc was placed on underside of the screw caps of glass vials. The neck of each vial containing 20 adults was wedged with a piece of wire-mesh. Mortality of adults exposed to different concentrations of the oil was recorded 30 and 60 minutes after their introduction. Repellency rate of insects increased with the increase in dose and 100% adult repellent activity was observed at the highest dose (200 µl) after 30 minutes. Relatively high level of repellency was also recorded at the lowest dose (50 µl) amounting to 89%. In contact and fumigation toxicity bioassays, highest doses of the oil tested (150 and 200 µl) were extremely effective in inducing 100% mortality of weevils within an hour and over 90% within half an hour compared to that of the control which gives no mortality. The efficacy in respect to contact and fumigation toxicity after one hour was found to be 93% and 91% respectively at the lowest dose. The present study thus revealed that essential oil present in *R. graveolens* leaves has very high potential as a repellent, contact toxicant and a potent fumigant in controlling *S. oryzae* infestations in pest management programmes.

Keywords: *Ruta graveolens*, *Sitophilus oryzae*, Essential oil, Repellency, Toxicity