(127)

Bio-efficacy of *Ruta graveolens* Essential Oil and Its Long Chain Aliphatic 2-Methlyl Ketone Constituents on the Egg Hatchability of *Corcyra cephalonica* (Stainton)

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Abstract

Plant essential oils are comprised of complex mixtures of components including minor constituents which determine the characteristic aroma and odour of the plant in contrast to synthetic insecticides based on the single products that act synergistically within plant as a defense strategy against herbivory and thus, it is likely that they are more durable towards evolving pest resistance. Hence, due to the evolutionary relationship with their functional roles and largely environmental friendly nature, these natural pesticides could be efficiently harnessed by the farmers in developing countries like Sri Lanka for post-harvest insect pest management. In that context, the present study was undertaken to assess the impact of the essential oil of *Ruta graveolens* and its long chain aliphatic 2-methyl ketone constituents (2-octanone, 2-nonanone, 2-decanone, 2-undecanone, 2-dodecanone and 2-tridecanone)on the egg hatchability of rice moth (*Corcyra cephalonica*), which is a serious lepidopteran pest of stored cereals, by exposing freshly laid eggs for various exposure time durations (6 hrs, 12 hrs and 24 hrs) in contact bioassays with different authentic concentrations under the laboratory conditions (29 ± 2^0C and 84±2% R.H.). The concentrations of essential oil and its ketone constituents applied and the exposure time periods were significantly influenced the percentage egg hatchability of *C. cephalonica*. Accordingly, the inhibitory activity of egg hatching was significantly increased with increasing concentrations and time periods of exposure. Essential oil of *R. graveolens* at the concentration of 0.204 µl cm^{-2} and the even-chained congeners at the corresponding authentic concentrations (0.0009-0.0045µl cm^{-2}) brought about 100% inhibition of hatching. Moreover, odd-chained congeners produced egg hatchability inhibition levels ranging from 60-90 % with the corresponding authentic concentrations (0.002-0.046µl cm^{-2}) after 24 hr exposure time duration. Based on LC_{50} values, the eggs were significantly more susceptible to even-chained congeners (LC_{50}= 0.00002 – 0.0015µl cm^{-2}) than to the odd-chained congeners (LC_{50}= 0.00008 – 0.0084µl cm^{-2}) and the essential oil (LC_{50}= 0.0096 µl cm^{-2}). Regression equations and the probability values of lethal concentrations of essential oil and its ketone constituents revealed a significant and positive role in the population inhibition of *C. cephalonica*. The present study demonstrates the potential of *R. graveolens* essential oil and its ketone analogues to be exploited as natural grain protect ants which is of immense significance in view of overcoming or reducing environmental and toxicological implications of the unsystematic use of synthetic pesticides.

***Keywords*:** *Corcyra cephalonica*, Egg hatchability, Essential oil, Long chain aliphatic 2-methyl ketones, *Ruta graveolens*