Vapor activity of essential oils extracted from fruit peels of two Citrus species against adults of Callosobruchus maculatus (F.) (Coleoptera: Bruchidae)

G. MORAVVEJ¹, M. K. HASSANZADEH² and S. ABBAR¹
¹ Department of Plant Protection, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran.
² Department of Pharmaceutical Chemistry, School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran.
Moravej@ferdowsi.um.ac.ir

Introduction:
The mixing of plant oils is traditionally practiced against stored-product insects in Asia and Africa. Due to the problems encountered with the use of modern synthetic insecticides, recently interest in the use of biocides from plants has been revived. The present study investigated the effects of volatile fractions of Citrus limon and C. reticulata peel essential oils on the cowpea adult bruchid, Callosobruchus maculatus (F.).

Materials & methods:
The essential oils were extracted from fresh rind tissue (albedo and flavedo) of fruits by water steam distillation using a Clevenger apparatus. The 2-cm-diameter pieces of filter paper were impregnated with different oil concentrations. The filter paper was attached to the undersurface of the screw cap of a glass vial containing one- to 2-day old adults of C. maculatus. Mortality was recorded after 3, 6, 9, 12 and 24 h from the commencement of exposure. Mortality data at 24 h exposure time were analysed with the probit model using a Maximum Likelihood Program.

Results:
The citrus oils had high fumigant activity against adult beetles. There were positive and linear significant relationships between percent mortality of adults and duration of exposure to the essential oil vapors within all concentration levels and both plant oils, although not significantly within the concentration of 110 µl L⁻¹ of C. reticulata. Within each essential oil, the slopes of regressions of mortality rates on exposure times were smaller in low concentrations than those in high concentrations. The oil of C. reticulata was significantly more toxic than that of C. limon based on both 24 h LC₅₀ (33 and 45 µl L⁻¹, respectively) and 24 h LC₉₀ (75 and 99 µl L⁻¹, respectively) values.

Conclusions:
The citrus peel oils can be used as potential control measure against cowpea seed beetles. More investigations are needed for evaluation of their effects on other developmental stages.