



**University of Zabol
Graduate School
Faculty of Agriculture**

Department of Plant Protection

The Thesis Submitted for the Degree of Master of Science

(In the field of Agricultural Entomology)

Title:

**Effects of essential oils of poleigamander and ajwain
on detoxifying and intermediary metabolism enzyme
activities of *Ephestia kuehniella* larva Zeller
(Lepidoptera: Pyralidae)**

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Abstract

The flour moth, *Ephestia kuehniella* Zeller is a cosmopolitan pest, which can develop its larval instars on grain (cereals, nuts and legumes) and flour and cause significant losses in the stored products. The widespread application of synthetic insecticides has led to many negative consequences such as insecticide resistance, toxicity to non-target organisms, residue problems and environmental pollution. Hence, an increasing attention is given to botanical products as alternatives to synthetic insecticides especially in the stored products. Essential oils and monoterpenoids may cause fumigant, contact or oral toxicity as well as repellency and distorting insect growth rate. In the current study, effects of *Carum capticum* and *Teucrium polium* essential oil (EO) and their major component including thymol and α -pinene, were studied on detoxifying and intermediary metabolites enzymes in forth instar larvae. The EOs of *C. capticum*, *T. polium*, thymol and α -pinene possessed toxicity against *E. kuehniella* larvae with LC₅₀ values of 5.42, 4.91, 6.81 and 10.66 (%), respectively. Effects of the LC₅₀ were studied 24, 48 and 72 hours after exposure of treatment to find their effects on detoxifying (EST and GST), intermediary metabolism (AST, ALT, γ -GM, aldolase, LDH, ACP and ALP) and phenoloxydase enzyme activities of larvae. The obtained concentration caused significant alterations in the activities and the amounts of some enzymatic and non-enzymatic compounds in hemolymph. EOs and their major monoterpenoids caused increased the activities of GST, γ -GT and ACP in the treated larvae as well as a reduction in of EST, ALT, AST, aldolase, LDH, ACP and phenoloxydase activities. The amounts of stored macromolecules like triglyceride, glycogen and protein decreased in treatment fat bodies of larvae that it might be due to tissue damages and energy demands. These results indicated that *C. capticum*, *T. polium*, thymol and α -pinene could be effective on the larvae of *E. kuehniella* by interfering in detoxifying, intermediary metabolism and phenoloxydase immunity.

Key words: Flour moth, Thymol, α -Pinene, Detoxifying enzyme, Intermediary metabolism, Phenoloxydase