

## **Fumigant Toxicity of the Essential oil of Saatar *Zataria multiflora* on tomato leaf miner, *Tuta absoluta* (Lepidoptea: Gelechiidae)**

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The tomato leaf miner (TLM), *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae), is an important pest on tomato, potato and other Solanaceous with a great economic importance. One of the main tools in its management, is the use of conventional synthetic insecticides, however this overreliance on the use of synthetic insecticides quickly leads to problems of insecticide resistance. The use of natural compounds such as plant essential oils are considered as a alternatives to chemical pesticides due to their lower toxicity on the non-target and low persistence in the environment. In this research, fumigant toxicity *Zataria multiflora* essential oil was studied on egg, the 2<sup>nd</sup> larval instars and adults. The essential oil was obtained by hydrodistillation method, using a modified Clevenger-type apparatus. Experiments were carried out at  $27 \pm 2^\circ\text{C}$  and  $65 \pm 5\%$  R.H. The fumigant toxicity of essential oil on 2<sup>nd</sup> larvae (inside leaf) and egg were tested in macro plastic container volume 1800 ml, The vials were contained leaves containing larvae mines with ten larvae (2<sup>nd</sup> instars) or 20 eggs, separately and For 2<sup>nd</sup> larvae (outside leaf) and adults bioassay experiments in glass vial volume 600 ml that contained ten larvae (2<sup>nd</sup> instars) or 10 adults, separately. No. 1 Whatman filter paper disks attached to the undersurface of vials. Filter papers were impregnated with series of pure concentrations of essential oil ranging from 20-640  $\mu\text{l L}^{-1}$  air, 2-10  $\mu\text{l L}^{-1}$  air, 0.8-2.5  $\mu\text{l L}^{-1}$  air and 1-2  $\mu\text{l L}^{-1}$  air were used in the main bioassay tests on egg, the 2<sup>nd</sup> larval instars (in mines, directly) and adults, respectively and each concentration and control included three replicates. The mortality was recorded after 48 hours and LC<sub>50</sub> values for egg, 2<sup>nd</sup> larvae (in mines, directly) and adults were calculated. Based on Probit analysis, the LC<sub>50</sub> values for egg, 2<sup>nd</sup> larvae (in mines, directly) and adults were 60.26, 4.44, 1.26 and 1.37  $\mu\text{l L}^{-1}$  air, respectively. The type and amount of constituents of the essential oils were analyzed by GC/MS. The major constituents of *Z. multiflora* were Thymol (33.52%), Carvacrol (14.37%) and  $\gamma$ - terpinene (8.50%). Our results showed that adult stage and second instar larvae, outside leaf of *T. absoluta* was more sensitive to *Z. multiflora* essential oil than egg and second instar larvae, inside leaf of this pest.

**Keywords:** *Zataria multiflora*, Essential oil, Fumigant toxicity, *Tuta absoluta*.