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**Effect of Some Plant oils, insect growth regulator
and an insecticide on the biochemical and
biological aspects of the Egyptian cotton leafworm,
Spodoptera littoralis (Boised.)**

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LIST OF ABBREVIATIONS

EC	Emulsifiable concentrate
<i>S.littoralis</i>	<i>Spodoptera littoralis</i>
E.O	Essential oils
<i>C.camphora</i>	<i>Cinnamomum camphora</i>
IGRs	Insect Growth Regulators
IPM	Integrated Pest Management
LC ₅₀	Median Lethal Concentration
LC ₂₅	lethal concentration for 25 percent of population
O.D	Optical Density
Ops	organophosphorus
ppm	part per million
R.H	Relative Humidity
rpm	Rotation per minute
PO	Phenol oxidase
RR	Resistance ratio.
CSIs	Chitin synthesis inhibitor
AcP	Acid phosphatase
AlkP	Alkaline phosphatase
α -Est.	alpha Esterase enzyme
β -Est.	Beta Esterase enzyme
MFO	Mixed Function Oxidase
GST	Glutathion-S-Transferase
GC	Gas-chromatograph

ABSTRACT

The cotton leafworm *Spodoptera littoralis* (Boisduval, 1833) is a destructive lepidopterous pest invading seriously many plant species all over the world. This destruction was the motivation for numerous studies to control this pest. In the present study the effect of the camphor oil (*Cinnamomum camphora*), the organophosphorus insecticide, chlorpyrifos, and the insect growth regulator, lufenuron, were evaluated against the fourth instar larvae of *S.littoralis* which were evaluated at LC₅₀ (= the lethal concentration for half of the population of the pest). The effects were investigated by some toxicological, biological, and biochemical aspects. Three essential oils were investigated to throw light on the most potent one. Camphor, onion, and mustard oils were tested. Camphor was the most potent one. So, further investigations using camphor oil were done. Gas-Chromatography (GC) analysis for Camphor essential oil revealed that Camphor oil contains more than insecticidal constituent for insects like camphor, 1.8 Cineol, and Linalool. Results showed that the LC₅₀ for lufenuron was (0.0002 ppm), chlorpyrifos (1.68 ppm) and Camphor oil was (20000 ppm). Some enzyme activities were estimated; acid and alkaline phosphatases, α and β Esterases, Transaminases (AST, ALT), Glutathione S-Transferase (GST), Mixed Function Oxidase (MFO), and Phenol Oxidase (PO). In addition, the total soluble carbohydrate, protein, and lipid contents also were evaluated. Finally, it may be concluded that camphor oil has the potentialities to reduce the population density of *S. littoralis*. So it may be used in combating the population of *S.littoralis*. Hoping that the obtained results may be of help in integrated pest management as it could be investigated in further researches.

Keywords: *Cinnamomum camphora*, *Spodoptera littoralis*, Chlorpyrifos, lufenuron, Toxicity, Bio-insecticides, essential oils, enzymes, GC analysis.