

## Chemical Composition and Insecticidal Activity of Three Essential Oil and Beauvericin Nanogel on *Plodia interpunctella* (Lepidoptera: Pyralidae)

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**Abstract :** The Indian meal moth *Plodia interpunctella* (Hübner) (Lepidoptera: Pyralidae), of stored grain pests which destroy the seed completely. Their larval stages feed on the nutrient germinating kernels part found in the seeds grain. This leads to a reduction causing a badness to seed germination and seed viability. It controlled by many insecticides which pollute and causes a harmful diseases to human being. Three tested oils were evaluated on this target pests. Plant extracts, essential oils and medical oils are materials which used to control many stored pests. Plant oils extracts have a lower effects on parasites and predators and not pollute the medium. By using the apparatus gas chromatography flame ionization detector gas chromatography-analysis of three essential oil tested. This research was point to explore and appreciation the activity of three oils and nano gel Beauvericin against *P. interpunctella* in the laboratory conditions and in the store conditions. The three essential oil tested proved that, percentage of  $\alpha$ -Pinene recoded 7.76, 7.72 and 6.66 for *C. cyminum*, *A. squamosa* and *G. officinale* respectively. The composition of the  $\beta$ -Pinene recoded 4.61, 8.92 and 30.63 for the corresponding oils tested. Results showed that after analytically the oils tested, the effective compound of *C. cyminum* oil are p-cymene and Terpinene. Results obtained show that the LC50 recorded 125, 112, 55 and 20 ppm after *P. interpunctella* treated with medical oils of *Guaiacum officinale*, *Annona squamosa*, *Cuminum cyminum* and Beauvericin 3% respectively. The accumulative mortality of *P. interpunctella* after treated with *A.squamosa* oil-loaded nanogels which showed that it is the highest oils from infestations recoded when the seed treated with 3% after 48 days, the accumulations obtained 44% at followed by 24 after 24 days of storage. Results, cleared that the seed protection by *G. officinale* recorded 40% at concentrations of 3% after 48 days of storage seeds. *C. cyminum* was the highest mortality by 98, at concentrations 3%. The highest seed protection proved after *C. cyminum* oil-loaded nanogels 14% followed by *G. officinale* 29% and *A.squamosa* 44%.when the seeds treated with Beauvericin 3%. Results of this work cleared that the essential medical oils have a useful action effect on target insects. Plant essential and medical oils, their active ingredient have potentially high bioactivity against on *P. interpunctella*. The medical and essential oils incorporation and usage the nano-formulation release stopped the highly degradation vaporization and the increasing in the constancy, and save the lower effectiveness of the dosage/application. The research results proved that the highest seed protection obtained after *C. cyminum* oil-loaded nanogels followed by *G. officinale* and *A.squamosa*. It could be complemented that *P. interpunctella* were more susceptible to medical oils loaded nanogel (MOLNs ) than medical oils only (MO). MOLNs had best lower amount of the residual activity than MO only. MOLNs might mend the insecticidal action of the medical oil tested by the slow effective release of the medical oils to control *P. interpunctella* mostly at the lower doses.

**Keywords :** *Cuminum cyminum*, *annona squamosa*, *guaiacum officinale*, beauvericin 3 %, *plodia interpunctella*

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