Insecticidal Activity of *Some* Indole Derivatives Against *Spodoptera littoralis* (Boisd.)

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ABSTRACT

Eight indole derivatives were studied for their insecticidal activity on both larvae and eggs of *Spodoptera littoralis* (Boisd.). Insecticidal effects were a function of chemical structure, larval instar and concentration. All derivatives were more effective on the 4th larval instar after 5 days except compounds **3** and **7** with 612.8 and 437.7 µg/gm LC_{50} on 6th instar, respectively. Indole-3-butyric acid (**2**) was the most effective with 70.9 and 39.7 µg/gm LC_{50} on the 4th after 9 and 13 days, while 1-acetylindole-3-butyric acid (**3**) and 1-acetyl-2-phenylindole (**7**) were more effective with 151.4 and 80.6 µg/gm LC_{50} values against sixth instar. While compounds **1, 2, 3** and **4** activated the larval weight of both instars, effect of the other derivatives was based on larval instar and concentration. Compound **3** was the most effective inhibiting pupation to 10% and blocking adult emergence to 25% after 21 and 45 days at 10 µg/gm in comparison to control. Malformations of intermediates and pupae as well as blocking adult emergence were higher in treated 4th larval instar based on the structural differences. Egg hatching was completely suppressed at 100 µg/gm of compounds **3** and **7**. Dipping eggs in compound **2** solution inhibited hatching with IC_{50} equaled 29.1 µg/ml and killed the produced larvae with LC_{50} equaled 26.2 µg/ml. Transferring the immersed eggs to a poisoned medium enhanced the toxicity with IC_{50} equaled 13.2 µg/gm and LC_{50} equaled 15.2 µg/gm. Compound **7** multiplied the effect with IC_{50} of 15.3 µg/gm and LC_{50} of 7.5 µg/gm.

Key words: Indole ; Spodoptera littoralis ; larval mortality ; development ; egg hatching

INTRODUCTION

The Egyptian cotton leaf-worm, *Spodoptera littoralis* (Boisd.) is an important polyphagous insect attacking cotton, several cultivated crops and ornamentals worldwide. Several synthetic insecticides that may not be environmentally safe are used for its control. Searching for other new insecticides is one of important concerns. Several plant extracts showed persuasive lethal and sublethal effects against it (Abbassy *et al.*1998; Shonouda *et al.* 2000 & 2008). These activities were referred to plant originated heterocyclic alkaloids Ben Jannet *et al.*, (2000) & Tringali *et al.*,(2001).

Among heterocycles, the indole nucleus occupies a major importance as pharmaceuticals and antimicrobial agents. 5-Nitro-2-phenyl-1H-indole, 2-arylindole derivatives with ortho substitution on the phenyl ring and 5-methoxyindole-3-acetic acid exhibited potent antibacterial activity (Wang and Ng, 2002) & Samosorn *et al.*, (2005).
3-Acetyl-2,5,6-trichloro-1-(2-deoxy-beta-D ribofuranosyl)-indole and some other derivatives induced potent antiviral activity Williams *et al.*, (2004). Indole-3-butyric acid controlled 23 bacteria and 15 fungi species Gulluce *et al.*, (2003). Combination of indole acetic acid at 100 µg/ml with *Cryptococcus laurentii* suppressed *Penicillium expanum* and *Botrytis cinerea* more than did *C. laurentii* alone (Yu and Zheng, 2007). Indole acetic acid, its 5-methoxy derivative, 1H-indole-4,7-diones and other indole alkaloids reduced spore germination, mycelial dry weight and protein content of several fungi (Jingyong *et al.*, 2008, Kumar *et al.* (2007) and Ryu *et al.* (2007)). Antileishmanial activity of *Aspidosperma ramiflorum* is due to indole alkaloid content Tanaka *et al.*,(2007).

Regarding the insecticidal activity, sulfur-containing indole, camalexin plays an important role of defense in Brassicaceae, as toxic to pathogens and insects with antimicrobial and anti-fungal properties (Glazebrook, 2005). *S. littoralis* showed generally low sensitivity to feeding on different classes of alkaloids. Accumulation of indole glucosinolates reduced insect herbivory by *S. exigua* Gigolashvili *et al.*, (2007). Tryptanthrin, indole-3-acetonitrile showed insecticidal and anti-feeding activity against termites, *Reticulitermis santonensis* and larvae of the house longhorn beetle, *Hylotrupes bajulus* (Seifert and Unger, 1994).

Due to the mentioned biological activities and others of indole derivatives, this study aimed to examine eight indole derivatives for their effects against *S. littoralis*. These effects included larval lethality, reduction of larval weight, inhibition of pupation, blocking of adult emergence, developmental stages and malformations in the produced stages as well as egg hatching beside produced larval mortality.

MATERIALS AND METHODS

1. Tested Compounds:

Both indol-3-acetic acid GRG, Batch No 971381, Code No L 17070 and indol-3-butyric acid, Sisco Research Laboratories PVT. LTD,