

EFFECT OF NEEM AZAL-T ON THE COTTON LEAFWORM *Spodoptera littoralis* (Lepidoptera : Noctuidae)

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ABSTRACT

The effect of neem azal-T 5% (E.C.) was tested when added to the artificial diet of the 4th and 6th instar *Spodoptera littoralis* larvae (Lepidoptera: Noctuidae). Generally higher concentrations of 1.5, 1 and 0.7% caused 100% of accumulated mortality. The lower concentrations of 0.5, 0.3 and 0.1% caused different percentages of accumulated mortality. Prolongation of the larval instar period, malformation effects on larval, pupal and adult stages were observed with lower concentrations.

Keywords: Neem oil, *Spodoptera littoralis* larvae.

INTRODUCTION

The Egyptian cotton leaf worm *Spodoptera littoralis* (Boisd.) attacks a large diversity of host plants in different countries. In Egypt *S. littoralis* is considered to be one of the two "key pests" on cotton. Moussa *et al.* (1960) mentioned that this insect is able to attack about 112 plant species belonging to 44 families in tropical temperate zones of the old world.

Recently plant extracts gained more attention for controlling many of serious pests especially in tropical and subtropical countries. Also, they are biodegradable, very low in mammalian toxicity and potentially compatible with natural enemies (Kelany, 2001).

One of the implementations of integrated pest management is the application of new, highly selective pesticide with low side effects on the natural enemies. Owing to their mode of action, neem derivatives could be very suitable for integrated pest management (Schmutterer, 1990). They are primarily feeding poisons for larvae of polyphagous insects. Also, neem derivatives have been reported as selective natural pesticides with great effects on insect behaviour, growth and development (Schumetterer, 1988 and 1990; Koul, 1992 and Mordue and Blackwell, 1993).

The efficacy of neem oil against lepidopterous larvae were studied by Schumetterer, (1990); Salem and Matter, (1991); Abo El-Ghar *et al.*, (1994); Khalil *et al.*, (1994); Mogahed *et al.*, (1997 a & b); Mogahed and El-Gengaihi, (1998); Dimetry *et al.* (1998) and El-Naggar and Abdel-Fattah, (1999). Moreover, the neem oil reduced feeding of oligophagous and polyphagous lepidopterous larvae. Schumetterer, (1990) stated that adding neem oil in various concentrations to artificial diet of the gypsy moth gave 100% moulting inhibition in 2nd instar larvae. The tested larvae also, showed faded skin and blackish areas on their bodies before dying. On the other hand, some tested insects either shriveled and died as prepupae or moulted into malformed, nonviable pupae or moulted to adult with crippled wings.

This study aims to evaluate the insecticidal effects of neem oil (Neem Azal -T 5% EC) in low concentrations against the fourth and sixth larval instars of cotton leaf worm. These effects not only on the direct mortality or growth inhibition but also on the malformation of different stages.

MATERIALS AND METHODS

The mother colony of cotton leaf worm *Spodoptera littoralis* (Boisd.) (Lepidoptera: Noctuidae) was maintained under average laboratory conditions of $27 \pm 3^{\circ}\text{C}$ and $60 \pm 5\%$ R. H. The larvae were reared on a meridic diet (Hegazi *et al.*, 1977).

Neem oil was used as Neem Azal-T 5% EC produced by Bayer A. G., Germany. Neem oil was dissolved in current water at concentrations of (1.5, 1, 0.7, 0.5, 0.3, and 0.1%). 5 μl from each concentration was added to 0.075 gm of artificial diet daily. The newly moulted fourth and sixth instar larvae were forced to eat the treated artificial diet. Three replicates each of 30 individuals were used in each concentration plus one control replicate. Untile reaching the next instar, larvae were reared individually in plastic cups and covered with gauze cloth.

Treated larvae were checked daily. For mortality and malformation, examined and photographed by using a stereoscopic microscope. Percentages of mortality and malformation were calculated and recorded.

RESULTS AND DISCUSSION

The effect of the Neem azal-T on the cotton leafworm *Spodoptera littoralis* (Boisd) showed that the higher concentrations caused 100% mortality of larvae. However, the lower concentrations caused less percentage of mortality and malformed larvae, pupae and adults.

1-Lethal effects:

Effects of Neem azal-T 5% EC mixed with meridic diet on the mortality of the 4th and 6th larval instars of *S. littoralis* are represented in Table (1).

The data show no mortality in the control of both instars. Neem treatments caused accumulative mortality among *S. littoralis* 4th larval instar varying from 68.66 to 100%. Percentages of mortality were 68.89 ± 1.11 , 75.55 ± 1.11 , 82.22 ± 1.11 , 100, 100 and 100% at concentrations of 0.1, 0.3, 0.5, 0.7, 1.0 and 1.5%, respectively. When 6th instar larvae were fed on diets treated with Neem Azal T concentrations of 0.7, 1.0 and 1.5% a toxic effect was noticed, the highest percentage of mortality recorded was 100%. Same results were obtained by Dimetry *et al.* (1998) when petroleum ether extract of neem fruits and leaves was used. El-Mesiri (1998) recorded same results when tested extraction of Neem fruits and seeds against 2nd, 4th and 6th instar larvae. The lowest percentages of mortality were $61.11\% \pm 1.11$, 71.11 ± 1.11 and $75.51 \pm 1.11\%$, with concentrations of 0.1, 0.3 and 0.5%, respectively.

On the other hand, certain treated larvae with concentrations of 0.1, 0.3 and 0.5% continued their development to adult stage at the rate of 5.5, 5.5 and 6.6%, respectively. These adults laid unhatched eggs; the latter effect may be classified as a malformation effect. Similar results were reported by Dimetry *et al.* (1998).

Table (1): Effect of Neem Azal-T 5% E.C. on the mortality of 4th and 6th Instars larvae of *Spodoptera littoralis*.

Concentrations (%)	% Mortality	
	4 th instar	6 th instar
Control	00.00	00.00
0.1	68.66 ± 1.11	61.11 ± 1.11
0.3	75.55 ± 1.11	71.11 ± 1.11
0.5	82.22 ± 1.11	75.51 ± 1.11
0.7	100	100
1	100	100
1.5	100	100

Table (2) revealed that the treatment of the 4th and 6th larval instars with Neem Azal-T 5% E.C. caused prolongation of the larval duration. The 4th instar lasted for 14 ± 1.08, 15.5 ± 1.32 and 20 ± 1.29 days when treated with concentrations of 0.1, 0.3 and 0.5%, respectively, in compared with 9 ± 0.57 days for the untreated larvae. While in the 6th instar the larval duration were 8.67 ± 1.2, 9.67 ± 1.2 and 10.67 ± 1.2 days, respectively, compared with 6 ± 0.57 days for the control.

Table (2): Effect of Neem Azal-T 5% E.C. on the mean duration of the 4th and 6th *Spodoptera littoralis* larval instars .

Concentrations (%)	Duration (days)	
	4 th instar	6 th instar
Control	9 + 0.57	6 + 0.57
0.1	14 + 1.08	8.67 + 1.2
0.3	15.5 + 1.32	9.67 + 1.2
0.5	20 + 1.29	10.67 + 1.2

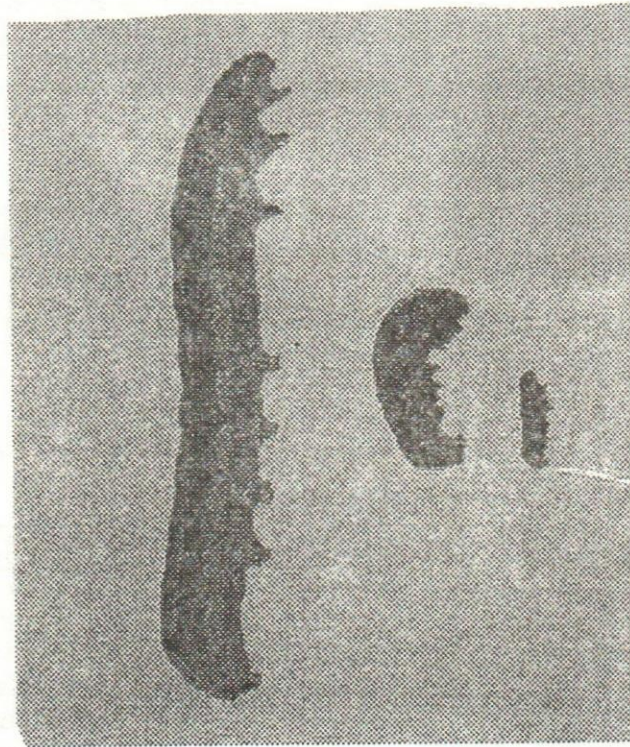
2-Morphological malformations:

Data showed that among the treated 4th larval instar, the average accumulative malformation percentages were 30, 23.3 and 16.6% for the concentrations 0.1, 0.3 and 0.5%, respectively. In the 6th larval instar the percentages of malformed insects were 20, 10 and 10% for the concentrations, 0.1, 0.3 and 0.5%, respectively.

In both larval instars, some treated larvae were dwarfed and shrank Figure (1), while the others were unable to shed off the moulted skin. Another type of juvenilization as larval-pupal intermediates was observed where the posterior portion of the body only transferred to pupal shape while the anterior portion had larval head capsule and thoracic legs. The juvenilized pupa with brownish pupal tegument appearance in abdomen having trace of prolegs (Figure, 2). Such malformation in pupal stages was recorded by Dimetry *et al.* (1998). Abnormal pupa without wings or failed to shed of the larval cuticle (Figure, 3).

juvenilized adults appeared as adults failed to shed the pupal cuticle (Figure, 4).

Similar developmental abnormalities were reported on the rice-earcutting caterpillar, *Mythimna separata* and the rice leaf folder, *Cnaphalocrocis medinalis* when treated with partially-purified fractions of neem extracts (Schmutterer, 1988). Neem often modified the development of insects by their influence on the hormonal system, especially on ecdysteroids (Schmutterer, 1990) leading to growth regulatory effects, exhibited by growth inhibition, malformation and mortality (Mordue and Blackwell, 1993). Such effects could be the reason for the mortality of the cotton leaf worm in the present experiment. However, the mortality of the cotton leaf worm could also be due to an anti-feedant effect, which induces starvation and then indirectly causes developmental deviance (Slama, 1978) and thus stimulates a growth inhibitory effect.



(Control) (Treatment larvae)

Figure (1): Dwarfing larvae in the last larval instar.

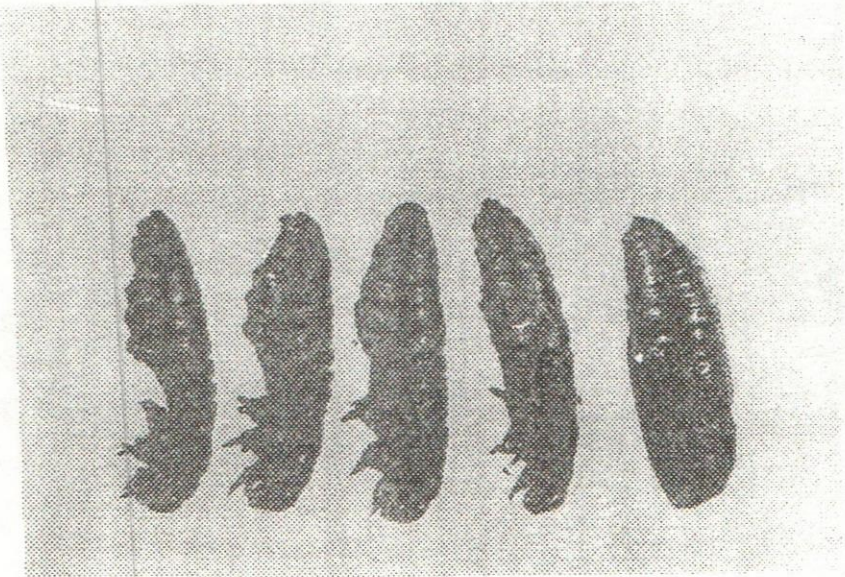


Figure (2): Juvenitized larval - pupal intermediates (right), Control (left).

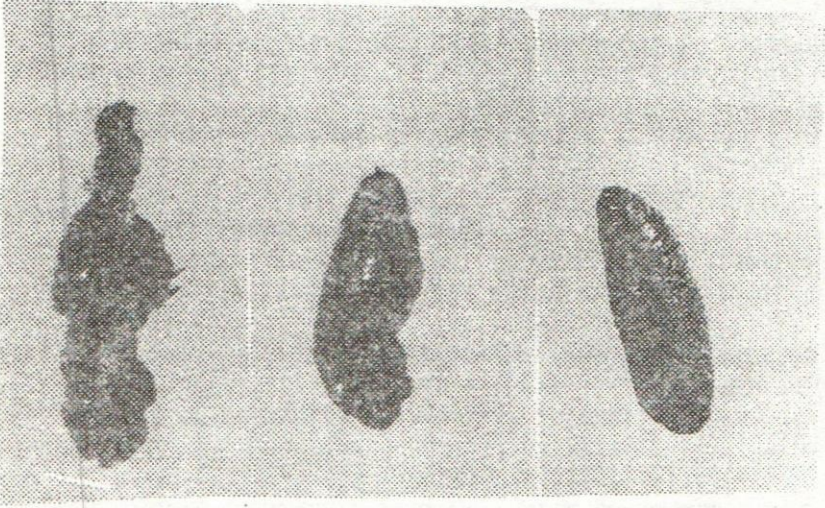


Figure (3): Abnormal pupae failed to shed the larval cuticle (right), control (left).

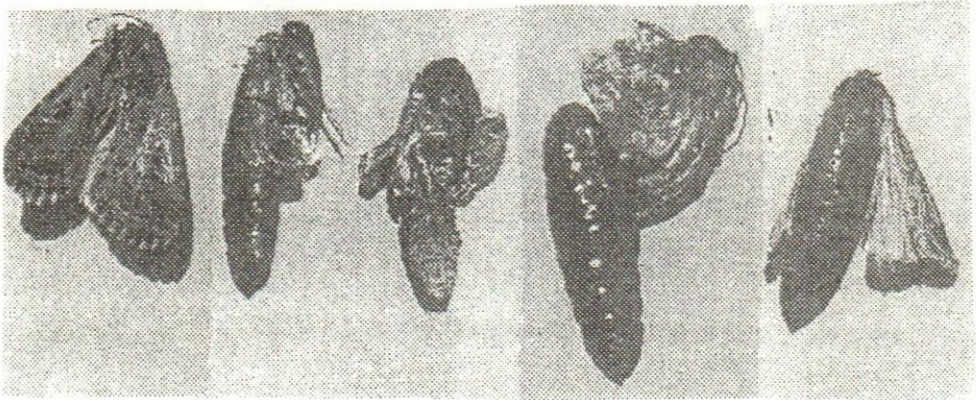


Figure (4): Adults failed to shed the pupal cuticle (right), control (left).

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تأثير مادة نيم أزال- ت علي دودة ورق القطن الكبرى (رتبة حرشفية الأجنحة)

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تم في هذا البحث تغذية يرقات دودة ورق القطن الكبرى على بيئة صناعية معاملة بمادة النيم أزال-ت (5% أزدراختين) و هي احد المستخلصات التجارية لنبات النيم إنتاج شركة باير الألمانية وقد استعملت هذه المادة في صورة مستحلب في الماء العادي بالتركيزات التالية: 1,5 و 0,7 و 0,5 و 0,3 و 0,1%. وقد تم معاملة العمر الرابع وكذلك العمر السادس من يرقات دودة ورق القطن الكبرى بهذه التركيزات. و دلت النتائج علي أن التركيزات المنخفضة أدت الي حدوث تشوهات باليرقات و العذارى وكذلك الحشرات الكاملة و قد تم توضيحها بالصور بينما التركيزات العالية أدت الي حدوث نسبة موت 100% بالإضافة الي إطالة في فترة العمر السيرقي المعامل.