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Economical evaluation of different treatments for Fig trees against long-horned Beetle, *Hesperophanes griseus* (Coleoptera: Cerambycidae)

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Abstract: The long-horned beetle, (L.H.B.), *Hesperophanes griseus* (Fabricius) (Coleoptera: Cerambycidae) is one of the most destructive pests of fig trees (*Ficus carica* L.) in Egypt. The treatments of the recommended chemical insecticide, Anthio 33% (250 cc /100 L. water), Anthio 33% plus the plant extract Antholyza (*Antholyza ringens* Andr.) at 5% concentration, Anthio 33% plus entomopathogenic nematode, *Steinernema carpocapsae* and *A. ringens* plus the entomopathogenic nematode, *S. carpocapsae* were experimented for controlling L.H.B. infesting fig orchards at El- Twayle village, Arish city, North Sinai Governorate, Egypt. All treatments are considered good candidates for reducing the population of *H. griseus* larvae (% Reduction of infestation, 81.13%, 82.09%, 85.0% and 92.45) in fig orchards and increasing the monetary value. All above mentioned treatments significantly increased the average yield of fig. Anthio 33% +*A. ringens* was the most effective treatment caused an increase in average fig production/feddan. On contrary, *A. ringens* +*S. carpocapsae* showed the least increase of average yield of fig.
Key words: *Hesperophanes griseus*, monetary value, yield production, fig orchard.

Introduction

Ficus carica L. (Moraceae) has been cultivated for a long time in various places worldwide for its edible fruit. Fruits are eaten raw, dried, canned, or in other preserved forms[1]. Fig trees are infested with several insect pests mainly stem borers, scale insects, mealy bugs and fruit flies[2]. The long-horned beetle, *Hesperophanes griseus* F. (Coleoptera: Cerambycidae) is a serious borer on fig trees[3]. The newly hatched larvae are bored and fed just beneath the bark. As the larvae grow older, the deeply excavate longitudinal cylindrical tunnels were found parallel to the axes of the stems. In case of severe infestation, the trees undergo stress weakness that affecting the yield of fig[2].

Trials to control this pest in Egypt were directed only towards chemical treatments with insecticides in vineyards and in fig orchards[4]. Previous trail of *H. griseus* control was processed with conventional chemical pesticides which caused many hazards and pollution to the environment[5].

Entomopathogenic nematodes (EPNs), belong to families Steinernematidae and Heterorhabditidae, is soil inhabiting insect pathogens. They possess potential as biological control agents due to their broad host range, host seeking abilities, high virulence, safe for vertebrates and plants and can be easily mass-produced and applied using conventional equipment[6].

The present study aimed to evaluate some safe alternatives such as natural plant extracts and entomopathogenic nematodes to reduce infestation level of *H. griseus* in fig orchards.

Experimental

Field experiments were conducted in five infested fig orchards at El-Twayle village, Arish city, North Sinai Governorate, Egypt. The five orchards were designated to test the effect of the different treatments.

In the 1st fig orchard, the most effective insecticide (Anthio 33%), at the most suitable level (250 cc /100 l water), according to the previous results obtained by[5].

In the 2nd orchard, trees were treated with Anthio 33% plus the plant extract of Antholyza (*Antholyza ringens*) at 5% concentration as it was reported to be the most effective treatment (92.45% reduction)**[2].** Antholyza, *Antholyza ringens* Andr. (Family: Iridaceae) was collected from El-Arish area, North Sinai. It was kindly identified by Prof. Dr. M. El-Gebali, National Research Centre, Egypt. The plant was air dried and ground into fine powder. About 250g of air dried plant powder was defatted in soxhelt extractor using 70 % methanol. The alcoholic extracts were evaporated under vacuum at about 45ºC till dryness. Water emulsion was prepared by mixing five drops of Tween – 60 as emulsifier with 5g of plant extract, then water was added up to 100 ml to obtain 5% concentration of plant extract**[7].**

In the 3rdorchard, trees were treated by Anthio 33% at the same concentration plus the entomopathogenic nematode, *Steinernema carpocapsae,* at the concentration of 10000 IJs/ml. Nematode was maintained continuously on the 6th instar larvae of *Spodoptera littoralis*, following the technique described by[8] and modified by[9]. The tested plant extract as well as the nematode were inserted into active larval tunnels-indicating the existence of live larvae. Injection was accomplished by a syringe (20 ml).

Evaluation of treatments was carried out 15 days post application by counting the numbers of active larvae in tunnels in treated and untreated trees**[10]**.

In the 4th orchard, trees were treated with the plant extract, *A. ringens* and the entomopathogenic nematode, *S. carpocapsae*.

The tested fig trees in each orchard were (8-10) years old and about 2.5 m in height. Each orchard was divided into 10 randomized plots, each contained 10 trees.

The 5th orchard was left untreated as control.

Data were analyzed using Duncan's multiple range tests**[11]**.

Results and Discussion

Results in table (1) indicate that the average yield of branch (kg) was duplicated when the trees were treated by Anthio 33% than control (6.1 and 3.0 kg/branch), respectively when %reduction of infestation reached to 85.0%. The yield increased to 6.4 and 6.8 kg/branch in orchards treated by Anthio 33% + *S. carpocapsae* and Anthio 33% + *A. ringens*, when %reduction of infestation reached to 82.09 %and 92.45%, respectively. The yield was 4.8 kg/ branch when fig trees were treated by *A. ringens* + *S. carpocapsae* % reduction of infestation reached to 81.13%. Statistical analysis of data showed significant differences among the average yields of trees at different treatments. The results obtained were in agreement with **[2]**who found that mechanical control (pruning and worming), followed by applied biological control (plant extracts) were considered good recommendations for reducing the population of *H. griseus* larvae in fig orchards. [12]stated that the treatments of hydrogen cyanamide, mineral oil and thidiazuron on figs increased the number of fruits in both the breba and main crop of 'Noire de Caromb', but decreased fruits' size of the breba cultivar crop. [5]stated that annual performance of sprayed anthio 33% insecticide with suitable level (250cc/100 l water) and two times may help in reducing the population of *H. griseus* larvae to a minimum level in fig orchards. [13]showed that there were significant increases ($P < 0.05$) in maize growth and yield parameters, grain yield, cob weight and % shelling percentage under sole and intercrop compared to the control treatment.

Table (1): Effect of treatments on fig long-horned beetle, *Hesperophanes griseus* (Fabr.), fig yield and monetary values.

Treatments	%Reduction of infestation	Avg. yield /branch (kg)	Avg. yield / tree (kg)	Avg. yield / plot	Avg. production / feddan	
					Kg.	Pounds
Anthio 33%	85.0	6.1c	48.8c	488c	4880c	19520c
Anthio 33% + *Antholyza ringens*	92.45	6.8c	54.4c	544c	5440c	21760c
Anthio 33% + *S. carpocapsae*	82.09	6.4c	51.2c	512c	5120c	20480c
***A. ringens* +** *S. carpocapsae*	81.13	4.8b	38.4b	384b	3840b	15360b
Untreated	0.0	3.0a	24.0a	240a	2400a	9600a

Mean within a column followed by the same letter are not significantly different at 5% level.

Data in table (2) indicate that the income of yield/ feddan was 9600 pounds in control orchard and it increased to 14940 and 20850 pounds when fig trees were treated by *A. ringens + S. carpocapsae* or Anthio 33% +*A. ringens*, respectively. After rebate the cost of treatment (pounds) the monetary value of treatments was 5340 pounds when fig trees were treated by *A. ringens + S. carpocapsae*, and 11250 pounds when trees were treated by Anthio 33% +*A.ringens*.

These results agree with that found by [14] who found that the treatments of two type of transgenic plant (IYG, AYG), Neem Azal-T/S 0.5% and Chlorophan 0.005% had positive effects on maize yield. The increased rate over the control ranged from 1.06 to 1.30 when SC 2031 as treated by Neem Azal-T/S and transgenic IYG, respectively. [15]studied the efficiency of EPN, *S. carpocapsae* against the 3rd and 5th nymphal instars and adults of the desert locust, *Schistocerca gregaria* (Forskal) under laboratory conditions. Based on mortality percentages, it was found that the tested nematode had high potentials for biocontrol agents against *S. gregaria*.

Table (2): Monetary values of different treatments used against the fig long-horned, *Hesperophanes griseus* (Fabr.)

Treatments	Avg. production /feddan		Cost / treatment (pounds)	Income of yield / feddan (pounds)	Monetary value of treatments
	Kg.	Pounds			
Anthio 33%	4880	19520	700	18820	9220
Anthio 33% + *Antholyza ringens*	5440	21760	700+210	20850	11250
Anthio 33% + *S. carpocapsae*	5120	20480	700+210	19570	9970
A. ringens* + *S. carpocapsae	3840	15360	210+210	14940	5340
Untreated	2400	9600	Zero	9600	---

All treatments are considered good candidates for reducing the population of *H. griseus* larvae in fig orchards and increasing the monetary value.

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