

EFFECT OF SOME INSECTICIDES ON
BIOMPHALARIA ALEXENDRINA, THE INTERMEDIATE
HOST OF SCHISTOSOMA MANSONI IN EGYPT
II- EFFECT ON THE SNAIL INFECTION WITH S.MANSONI

BY

El-Sheikh, H.* ; Hamid, M.E.* ;
Mohamed, A.M.** and Mongy, S*.

* Zoology Department, Faculty of Science,
Tanta University.

** Zoology Department , Faculty of Science,
Menoufia University.

Egypt

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ABSTRACT

The present investigation was undertaken to study the effect of certain insecticides; triazophos cyolane (organophosphates) and cypermethrin (pyrethroid) on the susceptibility of B. alexandrina snails to infection with S. mansoni miracidia as well as on their rate of cercarial shedding.

Exposure of the snails to sub-lethal concentration equivalent to 1/10 LC₅₀ of either triazophos or cyolane for one week before infection induced marked reduction amounting approximately to 50% in the rate of infection. In addition, the reduction in the rate of infection recorded ran along with retardation in the number of cercariae shed/snail/day.

Cypermethrin, on the other hand, did not show any significant effect on both criteria.

INTRODUCTION

Many workers have studied the effects of various molluscicides on the susceptibility of the snail intermediate hosts to the infection with schistosomes including copper sulphate, sodium pentachlorophenate (NaPCP) and Baylu/scide on the infection rate of B. truncatus with S. haematobium [7], copper sulphate and Frescon on infection of B. alexandrina with S. mansoni [6] .

The present study was undertaken to evaluate the effectiveness of some insecticides which are widely used in the field of plant protection on the susceptibility of B. alexandrina to infection with S. mansoni cercariae.

MATERIAL AND METHODS

B. alexandrina snails were maintained under constant laboratory conditions (Temperature; 25 ± 2 °C ; Food ; fresh lettuce). The method used for rearing the snails was followed as that described by Hopf and Muller (5).

1. Insecticides:

(a) Triazophos (organophosphorous), O, O diethyl c-1 phenyl 1-1, 2,4 triazol 3-yl-phosphorothioate.

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Trade name: Hostathion.

(b) Cyolane (organophosphorous) 2-(diethoxy phosphiny-
limino) -1, 3-dithiolane.

(c) Cypermethrin (pyrethroid), RS-alpha-Cyano-3-
phenoxybenzyl (IRS) -cis-trans-3-(2,2-dicarboxylate.

Trade name: Ripcord.

2. Effect on the snail susceptibility to infection with

S. mansoni:

Snails used in this study were taken from labora-
tory maintained snails. Their size ranged between 5-7 mm.
in shell diameter.

The snails were immersed in each of the prepared
aquaria, containing the sub-lethal concentration of the
insecticide (1/10 LD₅₀) for one week. A control group
was kept in dechlorinated water. After the exposure
period, the snail were picked up, washed thoroughly in
dechlorinated water, then infected with S. mansoni miracidia.

3. Snail infection:

The snail were infected individually in test tubes
with 5 miracidia in 2-3 ml dechlorinated tap water at
27-29 °C under light and left for at least five hours.

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The snails were then transferred to jars containing dechlorinated water. The snails were examined after three weeks post-infection and re-examined again every three days to detect the cercarial shedding in both treated and control snails.

4. The percentage of cercarial shedding:

The infected snails which had been treated with the sub-lethal concentrations of the tested insecticides as well as the control snails were washed thoroughly with dechlorinated water. Each group was left in a beaker contained 100 ml dechlorinated water. The snails were put under bright sun light at 11 a.m. and cercariae were collected at 13 a.m. hour [2]. One ml of cercarial suspension from each beaker was counted in a betri dish after staining with Lugol's iodine solution. Five estimations for every beaker were considered. The average of the count / snail was determined every three days and for two weeks after the first cercarial shedding.

RESULTS AND DISCUSSION

The present investigation was conducted to evaluate the effects of certain insecticides; triazophos, cyolane and cypermethrin; currently used in Egypt in plant protection on the susceptibility of B. alexandrina snails to S. mansoni infection and their rate of cercarial shedding.

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The results obtained elucidate that the susceptibility of B. alexandrina snails to infection with S. mansoni miracidia were significantly reduced after being treated with the sub-lethal concentrations (1/10 LC₅₀'S) of triazophos and cyolane but not with cypermethrin as shown in table (1). Thus pre treatment of the snails for one week with either triazophos or cyolane then infection with S. mansoni miracidia, showed marked retardation amounting approximately to 50% in the rate of infection compared with the untreated control snails. However, the statistical analysis of the results indicated that the significant decrease ($p < 0.05$) in the rate of infection (X^2 - test) runs along with the reduction in the number of cercariae shed/snail/day (t-test) among the snails pretreated with the triazophos and cyolane. On the other hand, cypermethrin did not cause any significant effect on either the infection rate of snails or on the number of the cercariae shed/snail/day.

In the light of the data obtained the reduction in both the infection rate of snails and the number of S. mansoni cercariae shed could be correlated to the harmful effects of the applied insecticides on the developmental stages and subsequently on the rate of cercarial shedding. This suggestion agrees with the findings of Roushdy and his Co-workers [7] who found that the snails which had been

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treated with low concentrations of copper sulphate, sodium-pentachlorophenate and Bayluscide exhibit a slight decrease in the susceptibility to infection with S. mansoni. They also recorded that the molluscicides reduced the development of mother sporocysts to daughter sporocysts and hence reduced the number of cercarial shedding from the infected snails. Also, our results confirm the data obtained by Viyanant [8] who found that copper sulphate and tributyltin fluoride used at sub-lethal concentration showed significant harmful effect on the schistosome cercariae.

However, the reduction in the infection rate in the treated snails might partially be attributed to the reduction in the tissue glycogen, and haemolymph protein content in the infected snails recorded by the authors [4]. This reduction may be reflected on the overall metabolic activity and consequently on the development and maturation of the intramolluscan parasites, and their subsequent shedding rate. This proposal is supported by the view reported before [1] which stated that the amount of tissue glycogen of the snail hosts is a vital factor for the development of miracidia inside the tissues into cercariae [1]. Also, Mohamed and his co-workers [6] found that copper sulphate caused a reduction in the infection rate of B. alexandrina snails. They suggested that this reduction may be considered either as indirect effect of molluscicides on the tissue glycogen and subsequently on the developing parasites or

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due to the direct toxic effect on the mother and daughter sporocysts. Moreover, some workers [2,3], reported that the increase in the number of cercariae shed depended on the increase of the protein content of B. glabrata.

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Table (1): Effect of the sub-lethal concentrations of the various insecticides on susceptibility of *B. alexandrina* snails to *S. mansoni* infection.

	No. of survivors after infection	Survival rate	No. of snails shedding cercariae	Infection rate based on total snails used	Infection rate based on snails used	Infection rate based on total snails used	Mean No. of cercariae/snail/day
Control	74	49.33%	40	26.67%	54.05%	26.67%	466 ± 20.74
Triazophos	76	50.67%	20	13.3%	26.32% ⁺	13.3%	334 ± 34.35 ⁺⁺
Cyolane	73	48.67%	20	13.3%	27.40% ⁺	13.3%	332 ± 28.64 ⁺⁺
Cypermethrin	57	38%	25	18.66%	43.86%	18.66%	436 ± 39.12

+ Significant decrease at 5% level (χ^2 -test).

++ Significant decrease at 5% level (T-Test).

تأثير بعض مبيدات الحشرات على قواقع البيومفلاريا الكسندينا:
العائل الوسيط للبلهارسيا المانسونية فى مصر
٢- التأثير على قابلية القواقع للعدوى بالمانسونى

حسين الشيخ* - محمد على عبد الحميد* - أحمد مصطفى**
سونيا منجى*

* قسم علم الحيوان- كلية العلوم- جامعة طنطا .
** قسم علم الحيوان- كلية العلوم- جامعة المنوفية .

أجرى البحث الحالى لدراسة تأثير بعض مبيدات الحشرات وهى
الترايازوفس والسيولان (من المبيدات الفوسفاتية) والسييرمثرين (من البيريثرويدات)
على قابلية قواقع البيومفلاريا الكسندينا للاصابة بميراسنيديا البلهارسيا المانسونية
كذلك على معدل انتاج السركاريا .

وقد أوضحت الدراسة أن تعريض القواقع لمبيد الترايازوفس او السيولان-
بتركيز يعادل $\frac{1}{3}$ التركيز المميت لـ ٥٠ بالمائة من الحيوانات - لمدة اسبوع قبل
العدوى اظهر نقصا واضحا يقارب نحو ٥٠% عن المعدل الطبيعى للاصابة . وقد
طلب هذا النقص انخفاض فى عدد السركاريا التى ينتجها القوقع فى اليوم . هذا
ولم يظهر مبيد السييرمثرين تأثيرا واضحا كالمبيدين السابقين .