Journal

J. Biol. Chem. Environ. Sci., 2008, Vol. 3(1): 883-898
www.acepsag.org

EVALUATION OF THE PLANT PESTICIDES VERTIMEC AND MATCH AGAINST *BIOMPHALARIA ALEXANDRINA*, THE SNAIL VECTOR OF *SCHISTOSOMA MANSONI*

El-Emam, M. A.*, Atwa, W. A. **, Mahmoud, M. B.*, Ibrahim, W. L. ** and Youssef, A.A.*

** Medical Malacology Dept., Theodor Bilharz Research Institute*
*** Zoology Dept., Faculty of science., Al-Azhar University*

ABSTRACT

The molluscicidal activity of seven pesticides, commonly used as plant pesticides has been evaluated against adult *Biomphalaria alexandrina* snails. The tested pesticides are Basudin, Cidal, Imidor, Neomyl, Selecron, Match and Vertimec. The results showed that Match and Vertimec were the most toxic ones with LC_{90} values of 0.46 and 0.18 ppm, respectively after 24 hrs exposure. Therefore, they were evaluated against the hatchability of snail's eggs, snail's growth, and snail's fecundity; moreover, against *Schistosoma mansoni* miracidia and cercariae. It was noticed that the snails could not survive more than 2 weeks of continuous exposure to LC_{25} of Vertimec with a highly significant reduction in their reproductive rate 80.7% in comparison with control group. However, few snails survived 4 weeks of continuous exposure to LC_{25} of Match , their Lx was 0.3 (30% survival rate) under these conditions, the reduction in snail's reproduction rate was significantly high, being 53.8%.The hatchability of snail's eggs (of 1, 3 and 7 days old) was slightly suppressed by their exposure for 24 hrs to LC_{90} of Match or Vertimec , being 88.5% and 63.5%, respectively for eggs of 7 days old. Moreover, increasing the concentration of these pesticides to 2 LC_{90} caused more suppressive effect on egg's hatchability to be 55.2% and 52.5% respectively, compared to 95.4% for control eggs.

There are no obvious changes in growths of exposed snails throughout the exposure period (4 weeks). The survival rates of snails exposed to 0.06 ppm of Vertimec for 24 hrs / week or 72hrs / week could not survive more than three or one week respectively .

Vertimec was more effective against Schistosoma *mansoni* (miracidia and cercariae) than Match, as these larval stages were killed within one hour of exposure to LC_{25}, LC_{50} or LC_{90} of these pesticides.

INTRODUCTION

The control of schistosomes by the destruction of their intermediate hosts through mollusciciding operation offers a rapid mean for controlling the disease (Shiff 1961). However, it was noticed that after application of molluscicides some water bodies become reinfested with snails and could be attributed to snails transferred from untreated streams or from egg masses that had not been affected by the molluscicides.

Mahmoud (2006) observed that the low concentrations of insecticides Regent and Mimic were reduced the fecundity of *Biomphalaria alexandrina* snails and hence interrupt the transmission of bilharziasis.

In Egypt, many pesticides have been used to control the plant pests, e.g. Basudin, Cidal, Imidor, Neomyl, Selecron, Vertemic and Match. The pesticides usually reach the canals and drains either through seepage, runoff, or direct spraying. These chemicals often kill the snails, or a proportion of their population may receive only sub-lethal concentrations of these compounds (Sakran 2004) and (Abd El-Kader and Sharaf El-Din 2005).

A study of such sublethal concentrations on adult snails as well as their effect on the hatchability of their eggs and upon the miracidia and cercariae of S. *mansoni* is considered to be a desirable part of the characterization of potential molluscicides (WHO, 1965 and Ducan 1974). The present work aims to evaluate the molluscicidal activity of seven plant pesticides Basudin, Cidal, Imidor, Neomyl, Selecron, Vertemic and Match against *B. alexandrina* snails. The most promising ones will be evaluated against hatchability of snail's eggs, snail's growth, fecundity of snails and their toxicity against larval stages of *Schistosoma mansoni* (miracidia and cercariae).

MATERIALS AND METHODS

a-Snails:

Biomphalaria alexandrina snails were collected from the River Nile and the irrigation schemes at Giza Governonorate. They were

washed thoroughly with dechlorinated tap water, maintained in plastic aquaria (10 snails / L) and fed oven dried lettuce leaves. Snails were examined twice weekly for natural trematode infection for one month before being used in bioassay tests.

b-Plant Pesticides:

The tested plant pesticides were Basudin, Cidal, Imidor, Neomyl, Selecron, Vertemic and Match. They were obtained from The Plant Protection Research Institute, Ministry of Agriculture, Dokki, Cairo, Egypt.

The two pesticides used in this study are Match 050EC (Lufenuron) and Vertimec 1.8% EC (Abamectin**).**

c-Laboratory Screening tests:

A stock solution of 1000 ppm was prepared from each pesticide on the basis of V/V using dechlorinated tap water of pH (7.0-7.5). According to the technique recommended by WHO (1961), a series of concentrations that would permit the computation of LC_{50} and LC_{90} values was prepared from each compound. Three replicates were used, each of ten adult snails (6-8mm), being immersed in one Liter of the compound concentration. The exposure and recovery periods were 24hr each; at room temperature (25°C±1) mortality rates were calculated. For each test, 3 replicates of control snails were maintained under the same experimental conditions in dechlorinated tap water .The effectiveness for each compound has been expressed in terms of LC50 and $LC_{90,}$ according to the procedure of Litchfield and Wilcoxon (1949).

d- Effect on egg laying capacity of *B. alexandrina*:

Three replicates were used for each concentration each of ten adult snails (5-8mm) per 1000 ml and a control group of snails was maintained in dechlorinated tap water under the same laboratory conditions. Fresh experimental concentrations ($LC_{0,}$ LC_{10} and LC_{25}) from the promising pesticides were weekly prepared to minimize the changes in their activities. The aquaria of treated and untreated snails were provided with thin plastic sheets for egg deposition. The snails were fed blue –green algae (*Nostoc muscorum*) and dried lettuce leaves. The egg clutches were collected and the eggs were counted weekly.

e- Effect on hatchability of snail's eggs:

Snail's eggs of 1,3,7 days old were counted and exposed to the concentrations LC_{50} , LC_{90} and 2 LC_{90} of the promising pesticides for

24hrs, then transferred to clean water to calculate the rate of hatching and length of developmental and hatching periods in each concentration. Another group of eggs was kept in clean dechlorinated water as control.

f-Effect on growth of newly hatched snails:

Groups of newly hatched snails (2.5±0.2mm) were prepared from the laboratory colony, each of 30 snails. a set of these groups was exposed to sublethal concentrations of the promising pesticides ($LC_{0,}$ LC_{10} and LC_{25}) for 24hrs weekly for four successive weeks. Another set of groups was exposed for 72hrs weekly to each concentration for four weeks. A third set of groups was maintained in clean dechlorinated tap water as control. The test and control sets were maintained for another four weeks in dechlorinated water for recovery and more observations. The tested cohorts of snails were maintained under constant water temperature and fed oven dried lettuce leaves and *Nostoc muscorum* algae were added weekly.

g-Effect on *Schistosoma mansoni* miracidia and cercariae:

(1) For miracidia, 25ml of dechlorinated tap water containing 100 freshly hatched miracidia were mixed with 25ml of double concentrations of $LC_{0,}$ $LC_{10,}$ $LC_{25,}$ LC_{50} and LC_{90} of these compounds. Microscopic observations on miracidial movement were periodically recorded. One hundred freshly hatched miracidia were maintained in 50ml dechlorinated tap water as control (Ritchie et al., 1974 and Abdel Kader *et al.,* 2005).

(2) For cercariae, 50ml dechlorinated tap water containing 100 freshly shed cercariae were mixed with 50ml of double concentrations of $LC_{0,}$ $LC_{10,}$ $LC_{25,}$ LC_{50} and LC_{90} of each compounds. A hundred ml dechlorinated tap water containing 100 cercariae was used as control. Mortality was recorded periodically under a dissecting microscope.

RESULTS AND DISCUSSION

1-RESULTS

The results of molluscicidal screening tests are presented in tables (1) & (2) for the tested compounds; it seems that Match and Vertimec have the highest molluscicidal effect against *B. alexandrina* snails with LC90 of 0.46 ppm and 0.18 ppm, respectively.

However, the tested pesticides Selecron, Basudin, Imidor and Cidal showed a considerable molluscicidal activity against *B.*

alexandrina snails. Their LC_{90} values were 3.7, 4.0, 6.7, 10.2 ppm respectively. The lowest toxic effect was recorded for the pesticide Neomyl, LC_{90} was 100 ppm.

Therefore, Vertimec and Match were selected for testing against snail's fecundity, hatching of snail's eggs, miracidia and cercariae of *S. mansoni*.

Table (1): List of commercial name, form of application and precent of active ingredient for tested pesticides, molluscicidal activity of these pesticides against adult *Biomphalaria alexandrina*.

Pesticides	Form and % of active ingredient		LC_{50} (ppm)	LC_{90} (ppm)	slope
Basudin	E.C.*	60%	2.2	4.0	1.94
Cidal	E.C.	50%	5.0	10.2	1.85
Imidor	E.C.	20%	2.7	6.7	1.74
Neomyl	E.C.	90%	72.0	100	1.30
Selecron	E.C.	72%	2.0	3.7	1.60

Table(2) : Molluscicidal activities (ppm) of Match and Vertimec against *Biomphalaria alexandrina* snails

Pesticides	Form and %of activeingredient		LC_0 (ppm)	LC_{10} (ppm)	LC_{25} (ppm)	LC_{50} (ppm)	LC_{90} (ppm)	slope
Match	E.C.*	60%	0.05	0.08	0.12	0.18	0.46	2.03
Vertimec	E.C.	50%	0.016	0.045	0.06	0.065	0.18	2.20

* E. C = emulsion compound

From table (3) it was noticed that after 4 weeks of snails continuous exposure to the sublethal concentrations of these two pesticides the survival rate (Lx) of the control group was higher than

those for snail exposed to 0.08 and 0.12 ppm of Match and 0.045 ppm of Vertimec being 0.95, 0.45, 0.30 and 0.10 respectively. Moreover, the snails exposed to 0.06ppm of Vertimec were dead after two weeks of exposure.

These pesticides caused a marked reduction of *B.alexandrina* reproductive rate (R_o) after four weeks of continuous exposure compared to control ones. Thus, the reduction rates of (R_o) for snail groups exposed to 0.12 ppm of Match and 0.045 ppm of Vertimec were 53.8% and 63.9%, respectively, compared to control snails. However, increasing Vertimec concentration to 0.06 ppm don't raise the reduction in the snail's reproductive rate, (R_o) being 59.9%by the 2^{nd} week of exposure.

The hatchability of snail's eggs of (1,3 and 7 days old) exposed to LC_{50} , LC_{90} and 2 LC_{90} of Match and Vertimec was present in table (4). The results revealed that the rate of hatching for eggs of 7 days old was slightly suppressed by their exposure for 24hrs to LC_{90} of Match and Vertimec being 88.5% and 63.5%, respectively in comparison with 96.4% for control group. Moreover, increasing the concentration of these pesticides to $2LC_{90}$ caused a more suppressive effect on egg's hatchability being 55.2% and 52.5% respectively, it was noticed that eggs of 3 days old was more tolerant to the tested concentrations than these of 7 days old as their hatchability was 75.7% & 52.5% post exposure to $2LC_{90}$ of Vertimec, respectively.

From table (5) the results indicated that the survival rate of treated juvenile snails was highly reduced by their exposure for 24hrs weekly for four successive weeks to 0.08 ppm of Match and 0.045 ppm of Vertimec at the end of exposure period. Thus, their survival rates by the 4^{th} week were 36.7% and 23.3%, respectively, compared to control group 90%. Moreover, the group exposed to 0.06 ppm of Vertimec did not tolerate more than 3 exposure periods, each of 24hrs/week and dead by the third week of experiment.

Results in table (5) revealed that the growth rates of snails exposed for 24hr./week for four successive weeks to Match or Vertimec was less than that of control after the exposure period (4 weeks), being 16.0% and 14.8% for snails exposed to LC_{25} (0.12ppm) of Match and LC_{10} (0.045ppm) of Vertimec, respectively, compared to 38.5% for control group. The same effect was recorded for these two concentrations throughout the following 4 weeks of recovery. Although, the growth of snails exposed to low concentrations (LC_0 &

LC_{10}) of Match was less than that of control throughout the 1st 4weeks of the experiment, it was higher than that of control during the 2nd 4weeks (recovery period), being 65.5% and 48.3% respectively, compared to 41.7% for control group. However, the snails survived exposure to LC_{25} of Vertimec exhibited a low growth rate throughout their survival period (2 weeks), being 8% compared to 11.5% for control group during that period. Table (6) showed that the growth of snails exposed to both pesticides exhibited, approximately, the same pattern as in table (5). However, the survival rates for snails exposed to LC_{10} and LC_{25} of Vertimec in this treatment were less than those recorded in table (5) and this could be due to elongation of snail's exposure to the pesticides from 24hrs to 72hrs weekly.

From table (7) it was noticed that the sublethal concentrations LC_0 and LC_{10} of these pesticides did not affect miracidia and cercariae of *Schistosoma mansoni* after 2hrs. of exposure while LC_{50} , LC_{90} and 2 LC_{90} of these pesticides killed them through one hour of exposure.

2-DISCUSSION

The present study showed the plant pesticides Vertimec and Match to be the most effective assayed pesticides against *B. alexandrina* snails. The survival rates of these snails were considerably reduced post their exposure continuously for 4 weeks to sublethal concentrations of these two pesticides. This finding agrees with that of El-Gindy *et al.*,(1993) using the pesticides Hostaquick and Kelthane, Bakry and Sharaf El-Din (2000) using sublethal concentrations of Bayluscide, also Sharaf El-Din *et al.*, (2004) using the herbicide dithiopyridine and Mahmoud(2006) using the insecticides Regent and Mimic against *B.alexandrina* snails.

The reproductive rate (R_o) and fecundity (Mx) of *B.alexandrina* snails were significantly decreased by their exposure to the sublethal concentrations of the tested plant pesticides Vertimec and Match. This observation is parallel to that of Gawish (1997) using sublethal concentrations of Bayluscide and copper sulphate, Ibrahim *et al.*,(2004) using the dry powder of the plants *Dyzygotheka kerchoveana*, *Solanum nigrum* and *Panicum repens* also Badawy (2007) using the dry power of the plants *Viburnum tinus and Draceana drago* against the egg laying capacity of *B. alexandrina* snails.

Table (3) survival rate (Lx) and fecundity (Mx) of *Biomphalaria alexandrina* snails after 4 weeks of continous exposure to sublethal concentration of Match and Vertimec :

Conc. (ppm)		1st week			2nd week			3rd week			4th week			Ro. Σ Lx Mx (reproductive rate)	% reduction of Ro.
		Lx	Mx	Lx Mx	Lx	Mx	Lx Mx	Lx	Mx	Lx Mx	Lx	Mx	Lx Mx		
Control		1.0	17.1	17.1	1.0	13.4	13.4	0.95	14.3	13.6	0.95	21.9	20.8	64.9	
Match	Lc_0 (0.05ppm)	1.0	17.8	17.8	1.0	17.8	17.8	0.85	5.8	5.0	0.65	6.0	3.9	44.5	- 31.4
	Lc_{10} (0.05ppm)	0.90	15.2	13.7	0.70	17.2	12.0	0.55	8.2	4.6	0.45	0.0	0.0	30.3	-53.3
	Lc_{25} (12ppm)	0.85	16.1	13.7	0.75	10.5	7.9	0.70	12.0	8.4	0.30	0.0	0.0	30.0	-53.8
Vertimec	Lc_0 (0.016ppm)	0.85	13.8	11.7	0.85	13.8	11.7	0.75	8.0	6.0	0.75	6.0	4.5	33.9	-47.8
	Lc_{10} (0.045ppm)	0.70	22.6	15.8	0.40	13.9	5.6	0.20	6.0	1.2	0.10	8.0	0.8	23.4	63.9
	Lc_{25} (0.06ppm)	0.65	15.9	10.3	0.25	8.9	2.2	0.00	0.0	0.0	0.00	0.0	0.0	12.5	59.9

Table (4) Effect of sublethal concentrations of Match and Vertimec (24hr. exposure) on hatchability of *Biomphalaria alexandrina* eggs of 1, 3 and 7 days old:

		One day		3 days		7 days	
Conc. (ppm)		Incubation period (days) Mean ±S.D	% of hatchability	Incubation period (days) Mean ±S.D	% of hatchability	Incubation period (days) Mean ±S.D	% of hatchability
Control		12.7 ± 1.9	95.4	12.7 ± 1.9	95.4	12.7 ± 1.9	95.4
Match	Lc_{50} (0.18ppm)	13.6 ± 2.3	86.7	13.7 ± 2.4	100	13.8 ± 1.9	89.1
	Lc_{90} (0.46ppm)	12.13±1.8	81.6	12.4 ± 1.7	89.4	14.6 ± 2..2	88.5
	$2Lc_{90}$ 2 (0.46ppm)	13.03± 1.8	58.1	14.0 ± 2.3	73.8	12.7 ± 1.7	55.2
Vertimec	Lc_{50} (0.065ppm)	16.2 ± 2.4	94.0	10.98±1.2	92.6	15.3 ± 3.1	91.5
	Lc_{90} (0.18ppm)	14.2 ± 0.9	67.8	13.0 ± 2.8	92.5	14.1 ± 2.2	63.5
	$2Lc_{90}$ 2 (0.18ppm)	17.3 ± 1.5	54.4	12.0 ± 2.1	75.7	13.6 ± 1.6	52.5

Table (5) survival rate (%) and mean shell diameters (mm) of Juvenile *B. alexandrina* snails exposed to sublethal concentration of Match and Vertimec for 24hr. exposure weekly for four successive weeks followed by another four weeks of recovery:

Weeks post exposure	Control		Match						Vertimec					
			Lc_0		Lc_{10}		Lc_{25}		Lc_0		Lc_{10}		Lc_{25}	
	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D
0	100.0	2.6±0.3	100	2.3±0.2	100	2.7±0.3	100	2.5±0.2	100	2.7±0.2	100	2.7±0.2	100	2.5±0.3
1**	96.7	2.8±0.3	93.3	2.4±0.2	83.3	2.7±0.3	76.7	2.6±0.3	93.3	2.8±0.3	83.3	2.8±0.3	40.0	2.6±0.4
2	93.3	2.9±0.4	86.7	2.5±0.3	60.0	2.7±0.2	63.3	2.6±0.2	76.7	3.0±0.2	70.0	2.9±0.3	3.3	2.7±0
3	90.0	3.1±0.4	80.0	2.6±0.3	46.7	2.7±0.2	43.3	2.6±0.3	66.7	3.0±0.2	53.3	2.9±0.2	0.0	-----
4	90.0	3.6±0.3	80.0	2.9±0.3	33.3	2.9±0.3	3.6.7	2.9±0.2	63.3	3.5±0.2	23.3	3.1±0.3		
5	90.0	3.9±0.5	73.3	3.5±0.3	26.7	3.1±0.2	30.0	3.1±0.2	56.7	3.7±0.2	10.0	3.2±0.2		
6	86.7	4.3±0.4	73.3	4.0±0.4	23.3	3.7±0.2	23.3	3.2±0.2	56.7	3.9±0.2	6.7	3.8±0.07		
7	80.0	4.8±0.4	70.0	4.4±0.4	20.0	3.9±0.2	20.0	3.4±0.2	56.7	4.2±0.2	0.0	-----		
8	80.0	5.1±0.4	70.0	4.8±0.3	13.0	4.3±0.3	13.0	3.4±0.2	56.7	4.9±0.2				
Growth % 1st 4weeks	38.5		26.1		7.4		16.0		29.6		14.8		8.0	
Growth % 2nd 4weeks	41.7		65.5		48.3		17.2		40.0		22.6			

Table (6) survival rate (%) and mean shell diameters (mm) of Juvenile *B. alexandrina* snails exposed to sublethal concentration of Match and Vertimec for 72hr. exposure weekly for four successive weeks followed by another four weeks of recovery:

Weeks post exposure	Control		Match						Vertimec					
			Lc_0		Lc_{10}		Lc_{25}		Lc_0		Lc_{10}		Lc_{25}	
	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D	Survival %	Mean ± S.D
0	100.0	2.6±0.3	100.0	2.5±0.2	100.0	2.5±0.2	100.0	2.7±0.2	100.0	2.6±0.3	100.0	2.7±0.3	100.0	2.7±0.2
1**	96.7	2.8±0.3	93.3	2.5±0.2	80.0	2.6±0.2	46.7	2.8±0.3	90.0	2.8±0.3	76.6	2.6±0.3	0.0	-----
2	93.3	2.9±0.4	90.0	2.6±0.2	73.3	2.7±0.2	20.0	2.9±0.2	76.7	2.9±0.2	50.0	2.7±0.3		
3	90.0	3.1±0.4	90.0	2.6±0.3	66.7	3.0±0.2	10.0	3.1±0.4	70.0	3.1±0.3	13.3	2.7±0.4		
4	90.0	3.6±0.3	83.3	2.9±0.3	60.0	3.1±0.3	10.0	3.3±0.3	66.7	3.4±0.3	0.0	-----		
5	90.0	3.9±0.5	80.0	3.3±0.2	53.3	3.4±0.2	10.0	3.7±0.3	66.7	3.5±0.3				
6	86.7	4.3±0.4	80.0	3.5±0.2	53.3	3.8±0.2	6.7	3.9±0.07	63.3	3.7±0.3				
7	80.0	4.8±0.4	76.7	3.9±0.3	50.0	4.2±0.2	6.7	4.2±0.07	60.0	4.0±0.3				
8	80.0	5.1±0.4	76.6	4.4±0.4	43.3	4.6±0.2	6.7	4.3±0.07	60.0	4.4±0.3				
Growth % 1st 4weeks	38.5		16.0		24.0		22.2		30.8		0.0		0.0	
Growth % 2nd 4weeks	41.7		51.7		48.4		30.3		29.4		0.0		0.0	

Table (7) effect of sublethal concentrations of Match and Vertimec on *Schistosoma mansoni* miracidia and cercariae:

		Miracidia						Cercariae					
Time / Conc.		15 min	30 min.	45 min.	60 min.	90 min.	120 min.	15 min.	30 min.	45 min.	60 min.	90 min.	120 min.
Control		Living	Living	Living	Living	Living	Living	Living	Living	Living	Living	Living	Living
Match	LC_0 (0.05ppm)	Living	Living	Living	Living	Living	Living	Living	Living	Living	Living	Living	Living
	LC_{10} (0.08ppm)	Living	Living	Living	Living	Living	Living and slow moving	Living	Living	Living	Living	Living	Living
	LC_{50} (0.12ppm)	Living	Living	Living	Living and slow moving	Living and slow moving	Dead	Living	Living	Living	Living	Dead	
	LC_{90} (0.18ppm)	Living	Living and slow moving	Living and slow moving	Dead			Living	Living	Living	Dead		
	LC_{99} (0.46ppm)	Living and slow moving	Dead					Living	Dead				
Vertimec	LC_0 (0.016ppm)	Living	Living	Living	Living	Living	Living	Living	Living	Living	Living	Living	Living
	LC_{10} (0.045ppm)	Living	Living	Living	Living	Living and slow moving	Living and slow moving	Living	Living	Living	Living	Living	Living
	LC_{50} (0.06ppm)	Living	Living and slow moving	Dead				Living	Living	Living	Dead		
	LC_{90} (0.18ppm)	Living and slow moving	About 90% dead	Dead				Living	Living	Dead			
	LC_{99} (2.20ppm)	Living and slow moving	Dead					Living	Dead				

The present results showed that hatchability of *B.alexandrina* eggs was slightly suppressed by their exposure for 24hrs to Vertimec and Match concentrations that kill 90% of adult snails. Moreover, 50% of snail's eggs survived and hatched after their exposure to $2LC_{90}$ of adult snails. This means that snail's eggs are more tolerant to these plant pesticides than adult snails. It was observed, also, that eggs of 7 days old were more sensitive to these pesticides than these of 3 days old. This could be due to the yolk layer surrounding the embryo of 3 days old that acts as a barrier for suppressing the toxic effect of such compounds to the embryo. These findings are in accordance with those of Otiefa *et al.,* (1975) using insecticides against snail's eggs, Gawih (1997), Mossalem(2003) using the Bayluscide and the dry powder of the plant *S. nigrum* and Badawy (2007) using the dry powder of the plant *V. tinus* against *B. alexandrina* eggs.

For the growth of juvenile *B.alexandrina* snails, it was significantly reduced by their exposure to the sublethal concentration of these two plant pesticides. However, a long recovery period (4weeks) enables the survived snails to overcome the harmful effect of these concentrations and start to grow better than that during the exposure period. It was noticed that juvenile snails were more sensitive to these pesticides than adult ones. This agrees with Mahmoud (1993) on *B.alexandrina* snails exposed to Hostaquick and kelthane. However, Otiefa *et al.,* (1975) stated that juvenile *B.alexandrina* snails were more tolerant than adult ones to Bayluscide and certain insecticides.

The present study showed that *S. mansoni* miracidia and cercariae were killed within one hour by their exposure to sublethal concentrations of the tested pesticides, e.g. a concentration that kills 25% of adult snails (LC_{25}). Similar observation were recorded by Mossalem (2003) after using of *Dyzygotheka kerchoveana*, *Solanum nigrum* and *Panicum repens* as water suspensions of their dry powder and found that they killed miracidia and cercariae of *S. mansoni* after few hours. El-Ansary *et al.,* (2001).

Mahmoud (2006) recorded also that low concentrations of two insecticides Regent and Mimic killed 100% of *S .mansoni* miracidia and cercariae after 90 minutes and 60 minutes, respectively. Abdel Kader *et al.,* (2005) recorded that low concentration of certain molluscicides (synthetic and plant origin) killed 100% of *S .mansoni* miracidia and cercariae after 6 hours.

From this study it was concluded that if these pesticides accendently reach the water courses during control of plant pests at very low concentrations, they will negatively affect the transmission of shistosomiasis through killing the free living larval stages of the parasite (miracidia and cercariae) and reducing the reproductive rate of the snail borne diseases.

REFERENCES

Abd El-Kader, A. and Sharaf El-Din, A.T. (2005). Effect of the pesticides Carbofuran (carbamate) and Profenophos (organophpsphorus) on *Biomphalaria alexandrina* and its infection with *Schistosoma mansoni* miracidia. Egypt .J. Schistosomiasis Infect. Endem. Dis., 27:71-83.

Abd El-Kader, A.; Hamdi, S. A. and Rawi, S. M.(2005). Biological and biochemical studies on *Biomphalaria alexandrina* snails treated with low concentrations of certain molluscicides (synthetic and of plant origin). J. Egypt. Soc. Parasitol. 35(3) : 841-858.

Badawy, A. M. S. (2007). Studies on *Dracaena draco* (Agavaceae) and *Viburnum tinus* (Caprifoliaceae) as plant molluscicides against the snail vectors of schistosomiasis and the larval stages of this parasite. Ph .D. thesis, Zoology dept. Girls college for Arts, Science and Education, Ain shams University, Cairo, Egypt.

Bakry,F.A. and Sharaf El-Din, A.T. (2000). Effect of sublethal concentrations of Baylucide on *Biomphalaria alexandrina*. J. Egypt. Germ. Soc. Zool., 31(D) : 15-25.

Ducan, J. (1974). The ideal molluscicides. In " Molluscicides in Schistosomiasis control " . Thomas C. cheng (ed) AD. New York & London.

El-Ansary, A.; Sammour, E.M.; Soliman, M. S. and Gawish, F. A. (2001). In vivo attenuation of schistosome cercarial development and disturbance of egg-laying capacity in *Biomphalaria alexandrina* using sublethal concentrations of plant molluscicides. J. Egypt. Soc. Parasitol. 31 (3) : 657-669.

El-Gindy, H.A.; El-Assal, F.M.; El-Emam, M. A. and Mahmoud, M. B. (1993). Effect of sublethal concentrations of some pesticides on *Biomphalaria alexandrina* snails. Proc. Egypt. Acad. Sci., 43 : 215 – 227.

Gawish, F. M. (1997). Evaluation of combination of certain molluscicides against *Biomphalaria alexandrina* and the free

living stages of *Schistosoma mansoni.* Ph. D. thesis. Zoology Dept. Girls Coll. For Arts & Sci. Ain Shams University, Cairo, Egypt.

Ibrahim, A.M.; El Emam, M. A.; El-Dafrawy, S.M. and Mossalem, H.S. (2004). Impact of certain plant species on *Schistosoma mansoni* - *Biomphalaria alexandrina* system. Proc. I.C.B.S., 3(II) : 390-413.

Litchfield, J. T. and WiLCoxon, F. (1949). A simplified method of evaluating dose – effect experiment. J. Pharmcol. Exp. Ther., 96 : 99-113.

Mahmoud, M. B. (1993). Effect of certain pesticides on *Biomphalaria alexandrina* and the intramolluscan larval stages of *Schistosoma mansoni*. M. Sc. Thesis, Fac. Sci., Cairo University, Egypt.

Mahmoud, M. B. (2006). Biological and histological impacts of the insecticides Regent and Mimic on *Biomphalaria alexandrina* snails. Egypt. J. Zool., 46:11 – 21.

Otiefa, B.A., Mousa, A. H.; Abou El-Hassan, A. A., Mohamed, A.M. and El-Emam, M.A. (1975). Effect of certain insecticides in the control of fresh water snails *Biomphalaria alexandrina* and *Bulinus trancatus*. Egypt. J. Bilh., 2(2): 2210- 243.

Ritchie, L.S.; Lopez, V. and Cora, T.M.(1974). Prolonged application of an organtin against *Biomphalaria glabrata* and *Schistosoma mansoni*. In "Molluscicides in schistosomiasis control" Thomas C. cheng.(Ed)., Academic press, Newyork and London.

Sakran, A. M. A., (2004). Biological and physiological studies on *Biomphalaria alexandrina* snails exposed to two herbicides. Egypt. J. Zool., 24 : 205- 215.

Sharaf El-Din, A.T.; El-Sayed, K. and Mahmoud, M.B.(2004). Effect of dithiopyridine carboxylic acid (herbicide) on *Biomphalaria alexandrina* and the free larval stages of *Schistosoma mansoni.* J. Egypt. Ger. Sci. Zool., 34D: 215 – 229.

Shiff, C. J. (1961). Trials with a new molluscicide, Bayer 73 in Southen Rhodesia. Bull. Wld. Hlth. Org. 25: 533 – 542.

(WHO). (1961). Expert committee on Bilharziasis. WHO Tech. Rep. Ser. 214,30.

(WHO). (1965). Mollucicide screening and evaluation. Bull. Wld. Hlth. Org. 33: 567-581.

تأثير مبيدات آفات النباتات الڤيرتمك و الماتش على قواقع البيومفلاريا الكسندرينا الناقلة للشيستوسوما مانسونى

محمد عبد الوهاب الإمام* – وداد أحمد عطوة – مؤمنة بيومي محمود* – وفاء لبيب فكرى إبراهيم **آلاء أحمد يوسف***

* قسم الرخويات الطبية بمعهد تيودور بلهارس للأبحاث.
** قسم علم الحيوان – كلية العلوم – جامعة الأزهر.

فـي هـذا البحـث تـم اختبـار سـبعة مبيـدات للآفـات النباتيـة كمبيـدات لقواقـع بيومفلاريـا الكـسندرينا و هـي الباسـودين، سـيدال، إميـدور، نيوميـل، سـليكرون، ڤيرتمـك و المـاتش. و أوضحت النتـائج أن كـلا من الڤيرتمك و المـاتش هما أقوى المبيدات المختبرة و أن التركيز المميت لنسبة 90% من القواقع (LC_{90}) لكلا منهما 18، 0 و 46، جزء في المليون على التوالي. و لذلك تم اختبارهما على معدل فقس البيض لقواقع بيومفلاريا الكسندرينا و نموها و معدلات وضعها للبيض و كذلك تأثيريهما على الأطوار الحرة لطفيلي البلهارسيا المعوية (الميراسيديا و السركاريا) و أوضحت الدراسة أن قواقع بيومفلاريا الكسندرينا لم تتحمل البقاء أكثر من أسبوعين بتعريضها المستمر لتركيز (LC_{25}) من الڤيرتمك مع حدوث انخفاض شديد في معدل وضع البيض بنسبة 80,7% بالمقارنة بالمجموعة الضابطة في حين استطاعت نسبة صغيرة(30%) من القواقع الاستمرار في الحياة بعد 4 أسابيع من التعريض المستمر لتركيز (LC_{25}) من مبيد الماتش كما انخفض بالتالي معدل وضع البيض بنسبة 53,8% بالمقارنة بالمجموعة الضابطة.

كما أوضحت النتائج حدوث انخفاضا بسيطا في معدل فقس بيض القواقع عمر 7 أيام عند تعرضه لتركيز LC90 من كل مبيد حيث كان معدل الفقس هو 63,5% ، 88,5% لكلا من الڤيرتمك و الماتش على التوالي عند تركيز (LC90) لكلا منهما و بزيادة التركيز إلى 2LC90 لكلا منهما كان معدل فقس البيض 52,5% و 55,2% على التوالي بالمقارنة بالمجموعة الضابطة كان 95,4%.

و بالنسبة لتأثير كلا من المبيدين على نمو القواقع الصغيرة فقد أوضحت الدراسة أن مبيد الماتش ليس له تأثير ملحوظ في حين تسبب تركيز LC_{10} من الڤيرتمك في خفض معنوي في نمو القواقع و مع زيادة التركيز لم تتحمل القواقع الاستمرار في الحياة و ماتت بعد 3 أسابيع.

كما وجد أن مبيد الڤيرتمك أكثر سمية للأطوار الحرة لطفيلي البلهارسيا المعوية (ميراسيديا و سركاريا) من الماتش فقد ماتت خلال ساعة من تعرضها لتركيزات $LC_{50,}$ LC_{25}أو LC_{90} .