

EFFECT OF TEMPERATURE ON THE MOLLUSCICIDAL ACTIVITY OF VICTOBACK₁₂AS AGAINST *EOBANIA Vermiculata* MÜLLER

Azzam, Karima M. * and M. H. Belal**

* Plant Protection Institute, Agricultural Research Center, Dokky, Giza

** Environmental Chemistry and Natural Resources Laboratory. Fac. Agric. Cairo Univ.

ABSTRACT

Molluscicidal activity of Victoback₁₂ AS (*B.t*) was affected by temperature LT₅₀ and LT₉₀ decreased as temperature and concentration increased. Time needed to reach 100% snails mortality, LC₅₀ and LC₉₀ are decreased with the increase of temperature from 20-35C⁰. At 35C⁰, 100% mortality occurred after 24hr. for only the concentration 2.5%. The last concentration gave the same mortality but in a longer time (120 hrs. or 5 days) at 20 C⁰

Keywords: Bacterial exotoxin, *Bacillus thuringiensis*, Victoback₁₂AS, snail, *Eobania vermiculata* Müller.

INTRODUCTION

Land snails are prevalent in many Governorates in Egypt. *Eobania vermiculata* Müller causes severe damage to different economic plants (EL-Okda, 1979, 1980, 1984 and Azzam, 1995). Work in India on control of the snail *Achatina fulica* with a bacterial pathogen showed that a microbial molluscicide can be useful (Sharama and Agarwal, 1989). Osman and Mohamed (1991) investigated the molluscicidal activity and bio-efficacy of (Tuncide) *Bacillus thuringiensis* against *Bulinus truncatus* and *Biomphalaria alexandrina*. They also found that *B. truncatus* was more sensitive, and that increasing exposure time resulted in an increasing mortality rate for *B. alexandrina*. Kienlen et al. (1996) studied the toxicity of various *Bacillus thuringiensis* Berliner strains on three species of slugs; *Deroceras reticulatum*, *Arion distinctus* and *Limax valentianus*. Two of the tested products included beta exotoxin. They found also that no strain of *B.t* was toxic to the slug species. In China, an unidentified strain of actinomyces (named as 218 powder) was extracted from snail inhabited soil and identified as *Streptomyces diatotochromogenes*. *Onchomelania* snails exposed to 10 mg/litre of 218 powder for 48 hr. in the laboratory showed mortality of 98%. The corrected mortality rate of snails exposed to 75 Mg/litre for 48 hr. in the field was 96.98%. This biological molluscicide did not damage plants but had some slow acting toxicity to fish. (Hu-DaiYan et al 1995). Azzam (1987) found that *Bacillus* sp. which was isolated from *Bulinus truncatus* snails, caused a high mortality of this snail in the laboratory. Abdel-Megeed et al (2000) studied the bio-activity of *B. thuringiensis* against *Biomphalaria alexandrina* snails and found that LT₅₀ decreased as the concentration increase for Bactospin and Florbac, and Bactospin had more effect on egg hatchability, while Certan had lower effect on egg laying capacity. Azzam and Belal

(1999a) studied the effect of combinations of the snail parasitic nematode *Rhabditis* sp. and the bacterial exotoxin Victoback₁₂AS on *Biomphalaria alexandrina* and found that 50 I.S of nematode \ snail in 5% Victoback solution caused 100% snails mortality within 15 hr. The same authors (1999b) studied also the effect of the aforementioned combination on *Lymnaea cailliaudi* and found that 10 I.S of the nematode \ snail in 2% of Victoback solution caused 100% snails mortality within 24 hr. They also studied (2000) , the effect of the combination on the production of the nematode from *B. alexandrina* and *L. cailliaudi* and found that maximum number of the nematode were produced from both snails at the concentration of 10 I.S of nematode \snail in 2% Victoback solution . The same authors (2002) studied the molluscicidal activity of the same combination against *E.vermiculata* and found that time needed to reach 100% snail mortality is decreased with increasing concentration either of Victoback or the nematode .

Therefore, the present investigation deals with the effect of temperature on the activity of Victoback₁₂ AS aiming to know the optimum temperature conditions for this bio-molluscicide application.

MATERIALS AND METHODS

The terrestrial snails *E. vermiculata* was reared according Azzam (1995). The molluscicidal activity of the bacterial exotoxin was tested by the technique previously described by Azzam and Belal (2002). Bioassays with LC₅₀ and LC₉₀ and slope values were carried out according to Litchfield and Wilcoxon (1949) and Azzam and Belal (1999).

RESULTS AND DISCUSSION

The effect of temperature on the molluscicidal activity of Victoback₁₂ AS against *Eobania vermiculata* Müller was summarized in tables(1-4). Table (1) showed a high correlation between concentration and mortality($r = 0.95$)at 35 C⁰ and an inverse relation between the time needed for total mortality (100%) and concentration($r = 0.99$) at this temperature .The concentration 20% cause(100%) mortality after only 24 hr., while the lowest concentration 2.5 % gave the same result after 72 hr. After 24 hr. the LC₅₀ of Victoback₁₂ AS at 35C⁰ was 7.24%, LC₉₀ was (27%) and the slope was 3.99 . It was also noticed that LT₅₀ and LT₉₀ also decreased with increasing concentration at the same temperature and as temperature increased as shown in tables (1-4). The last three tables show the same trend for the relation between mortality and concentration at the temperatures of 30 ,25 , and 20 C⁰ ($r = 0.99, 0.94$ and 0.93), respectively. The relation between concentration and time needed for 100% mortality takes also the same trend , $r = 0.95, 0.96$, and 0.91 respectively . Values of the LC₅₀ and LC₉₀ and slope after 24 hr. were varied under the three temperatures. At 30 C⁰ these values averaged 12.16%, 23.24% and 3.61 respectively (Table ,2), but they were

recorded 18.38, 5.31% and 3.17 at 25 C° while these values were 39.84%, 69.93% and 1.33 at 20 C°, respectively (Tables 3 and 4).

The highest concentration 20% of Victobak₁₂ AS reported 100% mortality after 24, 36, 43 and 72 hr. at the four degrees of temperatures 35, 30, 25 and 20°C respectively, while the lowest concentration (2.5%) gave the same result after 72, 84, 96 and 120 hrs. respectively. Thus it was evident that time needed for 100% mortality was decreased as temperature and concentration increased, also LT₅₀ and LT₉₀ decreased as concentration increased. The same conclusion concerning concentrations was reported also by Azzam and Belal (2002) for the bacterial exotoxin in (*B.t*) Victobak₁₂ AS and same snail *E. vermiculata* under laboratory conditions. The results of LT₅₀ and LT₉₀ agreed with those reported by Abdel-Megeed *et al.*, (2000) on the Bactospine and florbac against *Biomphalaria alexandrina*.

Table (1): Effect of 35 C° temperature on the molluscicidal activity of Victoback₁₂ AS against *E. vermiculata*.

Time in hr.	Mortality of <i>E. vermiculata</i> at the concentrations				
	20%	15%	10%	5%	2.5%
12 hr.	70	60	35	20	20
24hr.	100	80	60	55	20
36 hr.		100	90	65	40
48hr.			100	85	80
60				100	95
72					100
r	1	1	98	98	96
slope	2.5	1.67	1.88	1.58	1.58
LT ₅₀	4 hr.	6 hr.	18.67 hr.	26.53 hr.	36.21 hr.
LT ₉₀	20 hr.	30 hr.	40 hr.	51.79 hr.	61.47 hr.
LC ₅₀	7.24%				
LC ₉₀	17.27%				
Slope	3.99				
r	0.95				

Table (2): Effect of 30 C° temperature on the molluscicidal activity of Victoback₁₂ AS against *E. vermiculata*.

Time in hr.	Mortality of <i>E. vermiculata</i> at the concentrations				
	20%	15%	10%	5%	2.5%
12 hr.	50	40	20	0	0
24hr.	80	60	40	20	20
36 hr.	100	80	80	50	40
48hr.		100	100	75	65
60 hr.				95	80
72hr.				100	95
84hr.					100
r	0.99	1	0.99	0.97	0.99
slope	2.08	1.67	2.33	1.47	1.46
LT ₅₀	11.2hr.	18 hr.	25.71	41.43	43.1
LT ₉₀	30.4 hr.	42 hr.	42.86 hr.	68.73	70.5
LC ₅₀	12.16				
LC ₉₀	23.24%				
Slope	3.61				
R	0.99				

Table (3): Effect of 25 C° temperature on the molluscicidal activity of Victoback₁₂ AS against *E. vermiculata*.

Time in hr.	Mortality of <i>E. vermiculata</i> at the concentrations				
	20%	15%	10%	5%	2.5%
12 hr.	40	5	0	0	0
24hr.	65	30	15	10	5
36 hr.	90	50	40	35	30
48hr.	100	85	65	60	50
60 hr.		100	85	80	65
72 hr.			100	95	85
84 hr.				100	90
96 hr.					100
r	0.98	0.87	0.99	0.97	0.99
slope	1.71	1.74	1.75	1.53	1.30
LT ₅₀	16.1 hr.	26.01 hr.	41.52 hr.	45.2 hr.	51.59 hr.
LT ₉₀	39.5 hr.	48.95 hr.	64.83 hr.	71.3 hr.	82.48 hr.
LC ₅₀	18.38%				
LC ₉₀	31%				
Slope	3.17				
R	0.94				

Table (4): Effect of 20 C° temperature on the molluscicidal activity of Victoback₁₂ AS against *E. vermiculata*.

Time in hr.	Mortality of <i>E. vermiculata</i> at the concentrations				
	20%	15%	10%	5%	2.5%
12 hr.	0	0	0	0	0
24hr.	20	20	15	0	0
36 hr.	50	45	35	25	5
48hr.	70	65	55	40	25
60 hr.	90	85	70	60	40
72 hr.	100	100	90	75	45
84 hr.			100	90	65
96 hr.				100	75
108 hr.					90
120 hr.					100
r	0.99	0.99	0.99	0.99	0.99
slope	1.73	1.70	1.44	1.31	1.01
LT ₅₀	39.59 hr.	40.53 hr.	46.52 hr.	54.96 hr.	71.43 hr.
LT ₉₀	62.76 hr.	64.03 hr.	74.23 hr.	85.5 hr.	110.93 hr.
LC ₅₀	39.94%				
LC ₉₀	69.93%				
Slope	1.33				
r	0.93				

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تأثير درجات الحرارة على فاعلية الفيكتوباك (١٢ ايه اس) كقاتل لقواقع ايوباتيا فيرميكولاتا

كريمه محمود عزام* ، محمد حلمي بلال**

- * معهد بحوث وقاية النباتات ، مركز البحوث الزراعيه - دقى - جيزه
** معمل كيمياء البيئه والمصادر الطبيعيه ، كلية الزراعة ، جامعة القاهره

تتأثر فاعلية مركب فيكتوباك بتغير درجات الحرارة، حيث يقل الوقت القاتل لـ ٥٠%، ٩٠% من أفراد قوقع ايوباتيا فيرميكولاتا ، مع ارتفاع درجات الحرارة من ٢٠-٣٥ م و زيادة تركيز محلول الفيكتوباك من ٢٥%-٢٠%
ووجد أيضا أن الوقت اللازم للوصول إلى نسبة موت ١٠٠% ، والتركيز القاتل لـ ٥٠% ، ٩٠% أيضا يقل مع زيادة درجة الحرارة من ٢٠-٣٥ م .
وعند درجة ٣٥ م يحدث نسبة موت ١٠٠% بعد ٢٤ ساعة فقط عند تركيز ٢,٥ % بينما نفس التركيز يعطى نفس نسبة الموت بعد ١٢٠ ساعة أو خمسة أيام عند درجة ٢٠ م .