

EFFICIENCY OF POTASSIUM SULFONATE COMPARING WITH OTHER CHEMICALS AGAINST LAND SNAIL *Monacha cartusiana* SNAIL INFESTING CUCUMBER CROP AT SHARKIA GOVERNORATE.

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ABSTRACT

*Methomyl , potassium sulfonate solution salt and copper sulfate were tested against land snail *Monacha cartusiana* which was considered a main pest attacking cucumber crop.*

Under the laboratory conditions the incubation period influenced significantly by the three tested compounds. Methomyl, potassium sulfonate and copper sulfate prolonged incubation period to 22 . 75 , 21. 25 and 20.00 days comparing to 17.50 days in case of control. The tested chemicals concentrations decreased hatchability percentages to 38.38, 43.33 and 56.31% for methomyl, potassium sulfonate and copper sulfate, respectively. comparing to 97.00% in case of control. After one day of exposure mortality percentages were ranged between 23.75% - 43.25% 19.50 – 39.75% 18.50 – 37.50% and increased till reached 71.50 – 86.75%, 57.75 – 83.50% and 45.75 – 64.00% after 3 weeks of exposure for methomyl, potassium sulfonate and copper sulfate, respectively.

Under field conditions reduction percentages increased as the concentrations increased and reached the highest reduction after 3 weeks. Reduction percentages ranged between 52.75 – 77.50% , 47.50 – 74.75% and 40.00 – 61.25% for methomyl, potassium sulfonate and copper sulfate , respectively.

The effect of the three chemicals on cucumber yield showed positively increase compared with control. The increase percentages in cucumber yield were ranged between 24.00 – 42.91% , 16.6 – 35.14% and 3.38 – 22.30% for methomyl, potassium sulfonate and copper sulfate, respectively.

Key words: *M. cartusiana* population, infesting cucumber plant, cucumber yield, Sharkia Governorate.

INTRODUCTION

Clover glassy snail is become one of the most economic animal. Recently, snails have become well known for most of the Egyptian farmers because their serious damage to the most agricultural different crops. The loss to most vegetable crops to this snail specie may form a great damage if a large number of snails are present (El-Okda, 1981).

Land snail *Monacha cartusiana* attacks raw succulent vegetable and favorite saggy parts. Nature damage is manifested to showing soft vegetable growth, flower

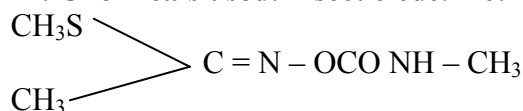
and fruits besides eating roots. Added to these, the fruit quality and beauty reduced and got poorer marketing ratings (El- Okda, 1980).

Potassium sulfonate solution salt is considered one of the components of best detergents used in washing and cleaning. The present work was carried out to evaluate the effect of this chemical comparing with other two chemicals against land snail *Manacha cartusiana* eggs and adults under laboratory conditions.

Also their effect on *M. cartusiana* population infesting cucumber plant and cucumber yield was also studied under field conditions at Mashtol El- Kady district Sharkia Governorate.

MATERIALS AND METHODS

A . Chemicals used: Insecticide: methomyl (Lanate) 90% W. P.



(S – methyl – N {(methyl carbamoyl) oxy} actimide).

2- Potassium sulfonate solution salt.

(Dedocyl benzene potassium sulfonate. One of the component for certain detergents.

3- Fungicide copper sulfate 98% W. P. (CuSO_4 .)

Fresh sample of the first and third chemicals were obtained from Central National Research, Dokki, Cairo. The Second chemical was prepared in plant protection Research Institute, Sharkia Governorate.

B- Laboratory experiments.

Laboratory experiments were conducted at plant protection research Institute Sharkia Governorate during the period from the first of February to the end of April 2005.

1-Rearing technique of tested snails M. Cartusiana.

Adult snails of *M. cartusiana* were collected from crops at Mashtol El-kady Zagazig district, Shorkia Governorate and transported in white cloth bags to the laboratory. Healthy individuals were kept in round plastic boxes (13 cm. in diameter) contained moistened clay soil obtained from the same area which snails were collected and provided with discs of cabbage leaves for three weeks for acclimatization. Adult snails of a similar size in diameter were paired and each pair was put into one of prepare plastic box. Each box contained ½ kg. clay soil to a depth of 10 cm. These boxes covered with muslin cloth and secured with rubber bands to prevent escaping. Day after day snails in each box provided with discs of fresh cabbage and the clay soil moisture were readjusted to 75% of field cabacity (El-Massry, 1997 and Iismail, 1997).

2- Effect of the chemicals used on eggs and adult stages.

To evaluate the effect of methomyl, potassium sulfonate and copper sulfate on eggs and adult stages of clover glassy snail *M. cartusiana*, aqueous concentration of 1, 2 and 3% a.i were prepared from each chemical. Eighty plastic boxes 13 cm. diameter each were used in these experiments and in each box ½ kg. clay soil of 75% water field capacity was added. The plastic boxes were divided into two batches, the first batch was used for the eggs treatments and the second one for the adults and each treatment was replicated four times as well as the control. The soil moisture content in each box was adjusted at 75% of water field capacity (El-Massry, 1997).

a: Effect on eggs.

One hundred eggs of the land snail; *M. cartusiana* of 1-6 hours age was dipped in each concentration for 10 seconds using a piece of white cloth and they were transferred to the boxes at a depth of about 3-5 cm. (the same depth of eggs laying) **according to** El-Massry (1997). The boxes covered with muslin cloth and secured with rubber band. The eggs of control treatment were dipped in water only. All eggs were examined daily for a period of one month to record the incubation period and hatchability (El-Massry, 1997).

b: Effect on adults:

Snail adults were sprayed with water before application of chemicals solutions to be active. After one hour they were sprayed with the corresponding solution of the tested chemical (5 ml /10 snails) using a hand sprayer atomizer.

The snails of check were sprayed with water only. The treated snails were supplied with fresh cabbage leaves. The moisture content in all boxes contain eggs or adults was readjusted to 75% of field capacity . EL-Massry,2002. All boxes were examined after one day , one week , two weeks and three weeks.

The mortality percentages were calculated. Data obtained were subjected to statistical analysis according to Snedecor (1957).

c- Field experiments.

Experiments were carried out during 2005 spring plantation at Mashtol El-Kady Zagazig district Sharkia Governorate. Area of ten kerat was cultivated with cucumber, *Cucumis sativus*, (variety, Beta alfa) was chosen. Three kerats were chosen for each chemical contain three concentrations. (Kerat for each concentration) and one kerat left as control. Each kerat contain four plots 6 x 7m. = 1/100 feddan. The plots of such area were arranged in completely randomized blocks design. Motorized knapsack sprayer was used. Each plot was sprayed with the tested concentration and the check control was sprayed with water only. Population density of the snails was counted before treatment in square 50 x 50 cm. and the alive and dead snails were counted after one day, two and three weeks. The reduction percentages were calculated according to the formula of Handerson and Tilton (1955).

Fruits of cucumber in treated and untreated plots were weighed to calculate the increase percentages in crop yield.

RESULTS AND DISCUSSIONS

1- Laboratory experiments.

a: Effect on eggs.

Data in Table 1 show the activities of methomyl, potassium sulfonate and copper sulfate at different concentrations of 1, 2 and 3% on eggs of *Monacha cartusiana* under the laboratory conditions. It is obvious that the incubation period influenced significantly by the three tested chemicals. The tested chemicals and their concentrations prolonged the incubation periods to 22.75, 21.25 and 20.00 days, respectively, comparing to 17.50 days of control. The incubation period increased gradually as the concentration increased from 1 to 3% in three tested chemicals. Regarding the effect of the tested chemicals on hatchability percentages show decreased significantly compared that in control. Data also show that hatchability decreased as concentration increased till reached the lowest percentag 13.5% in methomyl followed by 22.50 and 36.00 in potassium sulfonate and copper sulfate at concentration of 3% respectively, Statistically analysis show significant difference between the effect of concentrations tested and both of incubation period and hatchability percentages. These agree with those obtained by El-Massry (1997) who reported that the incubation period and hatchability percentages affected by methamidophos and malathion while chloropyrifos concentrations had no effect. In case of methamedophos the concentration of 250 and 500 pp prolonged incubation period significantly while other two concentrations 100 and 10 ppm did not differ than the control. Also El. Massry (2002) reported that under laboratory conditions, potassium sulfonate and zylex concentrations prolonged the incubation period to 23 and 24 days comparing to 18.75 days in case of control while nabu –S concentrations shorted the incubation period to 11.50 days. The tested chemicals decreased hatchability percentages to 78.25 – 45.00%, 71.50 – 40% and 66.52 – 32.00% comparing to 98.5% of control for zylex, potassium sulfonate and nabu – S, respectively.

b: Effect on adults.

Effect of three different concentrations of methomyl, potassium sulfonate and copper sulfate against adults of *M. cartusiana* under laboratory conditions is given in Table 2. Results showed a possitive correlation between tested concentrations and the mortality pereentages. Also, this phenomenon was noticed between the exposure period and percentages of adult mortality. After one day of exposure (Initial effect) the mortality percentages ranged between 23.75 – 43.25, 19.50 – 39.75 and 18.50 – 37.5% for methomyl, potassium sulfonate and copper sulfate, respectively, after which gradually increase took place till reached 71.50 – 86.75, 57.75 – 83.50 and 45.75 – 64.00 % after three weeks of exposure. Curiously enough to note that methomyl was more active against land snail *Monacha cartusiana* adults follwoed by potassium sulfonate solution salt while copper sulfate was lowest one. These results agree with those obtained by El- Massry *et al* (1998) who reported that Ferrous sulfate showed the highest reduction percentages of land snail *Helicella vestalis* (82.21%)

Table 2. Efficacy of certain chemicals against clover glassy snail *Monacha cartusiana* under laboratory conditions (75% clay Soil moisture and 20 c.).

Chemicals	Concentrations (%)	Mortality percentages after				
		One day	One week	Two weeks	Three weeks	Means
Methomyl	1.00	23.75de	35.00 d	41.00 cd	71.50	42.80
	2.00	31.25 ac	41.00 c	44.50 cd	77.75 bc	48.62
	3.00	43.25 a	57.50 a	66.25 a	86.75 a	36.44
	Means	32.75	44.5	50.58	78.67	38.71
Potassium sulfonate	1.00	19.50 e	27.75 e	35.25 e	57.75 f	35.06
	2.00	28.00 cd	37.50 cd	41.25 cd	70.25vcde	44.25
	3.00	39.75 a	56.25 a	62.50 a	83.50 ab	60.50
	Means	29.00	40.58	46.33	70.50	34.90
Copper sulfate	1.00	18.50 e	25.50 e	30.75 cde	45.75 ef	30.13
	2.00	28.00 cd	36.00 cd	44.75 cde	63.25 ef	34.00
	3.00	37.50 ab	49.75 b	55.25 b	64dab	51.63
	Means	27.90	37.08	43.58	57.66	31.19
	General mean	22.45	30.52	35.12	51.71	
L.S.D at 0.05 level	Chemicals	Time	Concent.	Means of concentrations		
				1.00	2.00	3.00
	0.626	1.902	1.426	36.5	44.89	58.52

after two weeks of treatment while calcium super phosphate showed the lowest one 61.47% , urea showed an intermidate effect (77.85%). Also, El – Massry (2002) recorded that after one day mortality percentages were ranged between 15.00 – 52.00% , 7.5 – 32.5% and 7.5 – 32.5% and increased till reached 30.00 – 95.00 % , 25.00 – 70.00% and 17.50 – 67.50% after 3 weeks of exposure to different concentratoins of potassium sulfonate, nabu – S and Zylex, respectively.

2- Field experiments.

Efficiency of the three tasted chemicals namely methomyl, potassium sulfonate and copper sulfate at three concentrations were tested against the clover glassy snail, *M. cartusiana* infesting cucumber plants (Table 3). The tested chemicals were sprayed at concentrations of 1.00, 2.00 and 3.00 % of active ingredient.

2.a Reduction percentages after time of exposure:

Data in Table 3 indicated that the reduction percentages after one day increased as the concentration increased it was ranged between 21.75 – 37.75% , 20.50 – 35.75% and 20.50 – 32.50% for methomyl, potassium sulfonate and copper sulfate, respectively.

Table 3. Efficacy of certain chemicals against clover glassy snail, *monacha cartusiana* infesting cucumber plants under field conditions.

Chemicals	Concent. %	Reduction percentages after					Means
		One day	One week	Two weeks	Three weeks		
Methomyl	1.00	21.75	34.75	41.75	52.75	37.75	A
	2.00	27.50	40.25	49.75	60.25	44.44	B
	3.00	37.75	48.25	40.50	77.50	56.00	C
	Means	29.00	41.08	50.67	63.50	46.06	a
Pottassium sulfonate	1.00	20.50	30.75	40.50	47.50	34.81	A
	2.00	25.50	37.00	46.75	56.75	41.50	B
	3.00	35.75	46.25	58.75	74.75	54.00	C
	Means	27.25	38.00	48.83	59.67	43.44	b
Copper sulfate	1.00	20.50	27.50	39.25	40.00	31.81	A
	2.00	25.00	32.50	41.00	41.00	34.88	B
	3.00	32.50	43.50	58.75	61.25	49.06	C
	Means	25.83	34.58	46.33	47.42	38.58	c
Grand means		20.63 d	28.46c	36.44b	42.44a		
L.S.D at 0.05 level	Chemicals	Time	Concent.	Mean of concentrations			
	1.310	3.029	2.571	38.58	43.44	46.06	

Also, there was a positive correlation between reduction percentages and time after exposure. Reduction percentages increased as the time after exposure increased till reached the highest reduction after three weeks of exposure, it was ranged between 52.75 – 77.00%, 47.50 – 74.75 % and 40.00 – 61.25% for methomyl, potassium sulfonate and copper sulfate, respectively.

It was cleared that methomyl gave highest reduction in population of *M. cartusiana* after 3 weeks of exposure followed by potassium sulfonate solution salt while copper sulfate gave lowest reduction in population after the same period. These results agree with those obtained by El-Massry (2002) who reported that under field conditions reduction percentages increased after one day as the concentrations increased till reached the highest reduction after 3 weeks and ranged between 55.00 – 82.50%, 42.50 – 72.50% and 52.50 – 65.00 % for potassium sulfonate solution, Nabu – S and Zylex, respectively. Shetaia (2005) tested some nematicides against the land snail *M. cartusiana* on clover (spraying technique) under field conditions. Nema-cur appeared to be more active against *M. cartusiana* snails than Vydate at the three tested concentrations i.e 0.5, 1.00 and 1.5 from recommended dose. (values of I. K,G) residual effect and general reduction were (78.27, 84.13, 86.78), (57.61, 66.42, 70.34), and (67.94, 75.18, 78.56% reduction) while vydate were (71.70, 78.17, 78.99), (50.78, 61.36, 63.61), and (61.24, 69.76, 71.30% reduction) respectively,

Hegab *et al* (2006). tested the effects of four pesticides namely metaldehyde, methomyl, abamectin and alphacypermethrin against the land snail (*M. cartusiana*) under laboratory and field conditions. Results revealed that the highest concentration

of metaldehyde gave 100% mortality after 7 days compared with the other pesticides which gave 75.00, 30.00 and 17.50 for methomyl, abamactin and alphacypermethrin, respectively.

Regarding the obtained in Table 4 show that the three tested chemicals at their concentrations used increased yield of cucumber fruits. The effect on yield was pronounced when concentrations of chemicals increased from 1% to 3% a.i. of chemicals used and their concentrations could be arranged according to their effect on yield as follow: methomyl 1, 2 and 3% , potassium sulfonate 1, 2 and 3% and copper sulfate 1, 2 and 3%, respectively. Increase percentages were 24% , 31.00% and 42.91% for methomyl concentrations of; 16.6% - 20.27.0 % and 35.14 % and 3.38% , 20.27% and 22.30% for potassium sulfonate and copper sulfate concentrations, respectively. These results agree with those obtained by Ahamed (1992) reported that pesticides increased significantly yield of cucumber fruits. The effect on yield was more pronounced when pesticides were applied in binary anixtures with zylex foliar fertilizer.

Table 4. Effect of three chemicals on yield of cucumber crop during spring plantation of 2005 year

	Chemicals								
	Methomyl			Potassium sulfonate			Copper sulfate		
Concentrations	1	2	3	1	2	3	1	2	3
Average weight	36.7	38.9	42.3	34.5	38.0	40.5	30.6	35.6	36.2
Increase Percentages	24.0	31.4	42.9	16.6	28.38	35.14	3.38	20.27	22.30
Control	29.6			29.6			29.6		

The tested compounds induced 48.8 to 8.8, and 55.4 to 15.4% increase in yield as pesticides were applied alone and in binary mixtures with zylex in 1988 summer plantation. Pesticides could be arranged according to their effect on yield as follow. Methamidophos, malathion, dicofol, pirimicarb, dimethoate and pirimiphos methyl.

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فعالية البوتاسيوم سلفونيت علي قوقع البرسيم الزجاجي موناكا كارتوسيانا الذي يصيب محصول الخيار في محافظة الشرقية مقارنة بمركبات أخرى

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تمت دراسة فعالية مركب سلفونيت البوتاسيوم مقارنة ببعض المركبات الأخرى مثل الميثوميل وكبريتات النحاس علي القوقع الأرضي موناكا كارتوسيانا الذي يعتبر من أهم الآفات التي تصيب محصول الخيار في محافظة الشرقية

تحت ظروف المعمل:- كان تأثير المركبات الثلاث معنوياً على فترة الحضانة للبيض وأظهرت تركيزات الميثوميل وسلفونيت البوتاسيوم وكبريتات النحاس إطالة لفترة الحضانة وصلت إلى ٢٢.٧٥ و ٢١.٢٥ و ٢٠ يوم مقارنة بـ ١٧.٥٠ يوم في المقارنة وكذلك أظهرت تركيزات المركبات المختبرة خفضاً لنسبة الفقس وصلت إلى ٣٨.٣٨ و ٤٣.٣٣ و ٥٦.٣١% لكل من الميثومايل والبوتاسيوم سلفونيت وكبريتات النحاس على الترتيب. مقارنة بـ ٩٧% في المقارنة بعد يوم من معاملة الافراد البالغة تراوحت نسب الموت بين ٢٣.٧٥ - ٤٣.٢٥ - ١٩.٥٠ - ٣٩.٧٥% - ١٨.٥٠ - ٣٧.٥% ثم زادت نسب الموت حتى وصلت إلى ٧١.٥٠ - ٨٦.٧٥% و ٥٧.٧٥ - ٨٣.٥٠% و ٤٥.٧٥ - ٦٤% وذلك بعد ثلاثة أسابيع من التعرض لمركبات الميثومايل والبوتاسيوم سلفونيت وكبريتات النحاس على الترتيب.

وتحت ظروف الحقل:- أظهرت النتائج زيادة نسبة الخفض في التعداد بزيادة تركيزات المركبات المختبرة فبعد يوم من المعاملة وصلت نسبة الخفض إلى ٣٧.٥ و ٣٢.٥ ثم زادت بعد ثلاثة أسابيع من المعاملة حيث تراوحت ما بين ٥٢.٧٥ - ٧٧.٥٠% و ٤٧.٥٠ - ٧٤.٧٥% و ٤٠.٥٥ - ٦١.٢٥% وذلك لكل من الميثومايل والبوتاسيوم سلفونيت وكبريتات النحاس على الترتيب.

كما تراوحت نسبة الزيادة في محصول الخيار بين ١٦.٦ - ٣٥.١٤% و ٢٤ - ٤٢.٩١% و ٣.٣٨ - ٢٢.٣٠% كيلو جرام عن المقارنة لكل من الميثومايل والبوتاسيوم سلفونيت وكبريتات النحاس على الترتيب.