

تأثير إستخدام مبيد الحشائش علي قوقع البرسيم الزجاجي *Monacha cartusiana*
والبزاقة الأرضية *Deroceras reticulatum* التي تصيب
بساتين الفاكهة مقارنة ببعض المبيدات بمحافظة الدقهلية

محمد حامد عوض - عبد الرؤوف أحمد محمد مراد

معهد بحوث وقاية النباتات - مركز البحوث الزراعية- الدقي - الجيزة - مصر

الملخص العربي

تمت دراسة تأثير ثلاثة من المبيدات الكيميائية الراوند أب (كمبيد حشائش) واللانيت وكبريتات النحاس ضد قوقع البرسيم الزجاجي *Monacha cartusiana* والبزاقة الأرضية *Deroceras reticulatum* تحت الظروف المعملية والحقلية بمحافظة الدقهلية.

وقد أوضحت النتائج أنه لا يوجد تأثير معنوي للراوند أب علي قوقع البرسيم الزجاجي والبزاقات الأرضية بينما أعطيت كبريتات النحاس واللانيت تأثير معنوي ضد كل من النوعين تحت الظروف المعملية. وعلي العكس لوحظ تحت الظروف الحقلية أن مبيد الحشائش الراوند أب قد أعطي تأثير مقارب لمبيد اللانيت وكبريتات النحاس حيث بلغت النسبة المئوية للموت ٥٥ الي ٦٥% ويرجع ذلك لتأثير الراوند أب كمبيد حشائش تحت الظروف الحقلية الي تأثيره علي إزالة الحشائش التي تمثل بيئة وغطاء مناسب لإنتشار القواقع والبزاقات الأرضية والتي تشجعها علي الإنتشار والنمو ويعتبر غياب هذه الحشائش يعرض هذه الآفات للأعداء الحيوية والظروف البيئية غير المناسبة لنمو وإنتشار هذه الآفات مما يقلل من أعدادها ويعتبر وسيلة غير مباشرة للقضاء علي هذه الآفات. بالإضافة الي سمية مبيد الحشائش علي هذه القواقع وجعلها تفقد الكثير من محتواها المائي نتيجة إفراس الكثير من المخاط الذي يساعدها علي الحركة والنشاط مما يفقدها الكثير من سوائل الجسم ويؤدي الي موتها.

**EFFECT OF HERBICIDE APPLICATION ON LAND SNAIL,
MONACHA CARTUSIANA AND DEROCERAS RETICULATUM
SLUG INFESTING FRUIT ORCHARD COMPARED WITH SOME
PESTICIDES AT DAKAHLIA GOVERNORATE**

M. H. M. Awad and A. A. Mourad

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

(Received: Mar. 17 , 2012)

ABSTRACT: *The current studies were conducted under laboratory and field conditions, to study the effect of three compounds (Copper sulphate (0.5%), Lannate 90 (1%) and Round up max 75% (1%)) against the land snail, Monacha cartusiana and slug, Deroceras reticulatum slug on mixed fruit orchard (Lemon, Navel orange, Mandarin and Guava trees). Under laboratory conditions, tested animals fed on chicory leaves, Chichorium endivia which dipped in Copper sulphate, Lannate 90 and Round up max 75%, the obtained mortality represented 70.8% 87.5% and 20.8% for copper sulphate, Lannate 90 and Round up max 75% on M. cartusiana. While, recorded 78.3%, 95.7% and 26.1% for copper sulphate, Lannate 90 and Round up max 75% on D. reticulatum, respectively. On the other hand, under field conditions Abo-Galal, Ras El-Kalig and El-Saadia Villages were chosen for testing the previous compounds on snail, M. cartusiana and D. reticulatum, slug under fruit trees, dead snails and slugs collected and counted after 3, 5, 10 and 15 days, total mean of reduction percentages in M. cartusiana were 77.5%, 75.0% and 81.3% for Lannate 90 (1%) at Abo-Galal, Ras El-Khalig and El-Saadia, respectively while the copper sulphate recorded 62.5% for each of Abo-Galal, Ras El-Khalig, while Round up max recorded 56.3%, 62.5% and 56.3% on land snail at Abo-Galal, Ras El-Khalig and El-Saadia, respectively. On the other hand, effect of materials on D. reticulatum recorded (75%, 62% and 60%), (80%, 60% and 55%), (75%, 66% and 60%) by (Lannate 90, Copper sulphate and Round up max 75%) at (Abo-Galal, Ras El-Khalig and El-Saadia), respectively.*

Key words: *Land snail, slug, control, mollusca, fruit crops.*

INTRODUCTION

Land snails and slugs are very dangerous agricultural pests on field crops, vegetables, and orchards. They are found in high numbers attacking weeds under fruit trees or between crops (Barry, 1969; Miller *et al.*, 1988 and South, 1992). These weeds act as a shelter substrate for animals hiding. Many studies were carried out on weed control by chemicals, agricultural and mechanical ways. Guiseppe (2006) used glyphosate herbicide in managed forest ecosystem and their effects on non target organisms. The land molluscs were inspected with a relatively high population

density attacking various crops and fruit trees causing great direct damage to all plant parts, chewing soft vegetative growth, flowers, roots and tubers or indirect damage by left viscous liquids upon the plants making humans and farm animals refuse eating these plants (El-Okda, 1980). Therefore, the total income and benefits of yield of infested crops are decrease. The harmful land snails as *Monacha cartusiana* and slug, *Deroceras reticulatum* cause direct bad effect on the economy resulting from their feeding on various plants (Foad, 2005). Therefore, the biologists working in this field were concerned with investigation of new

Effect of herbicide application on land snail, *monacha cartusiana*.....

methods and technique to control these pests (Kassab and Doaud, 1964, El-Okda, 1978, 1980, 1982, Hegab, 2003, Ismail, 2008 and Ismail and Shetaia, 2009).

The present work aimed to study the effect of the herbicide (Round up max 75% (1%)), (Copper sulphate (0.5%)) and (Lannate 90 (1%)) as pesticide on both snail, *M. cartusiana* and *D. reticulatum* slug populations under both laboratory and field conditions.

MATERIALS AND METHODS

Experimental studies were carried out under laboratory conditions at El-Serw Agricultural Research Station during 2009/2010, also under field conditions in three different villages (Abo-Galal, Ras El-Khalig and El-Saadia) at Sherbien district in fruit orchard.

1. Under laboratory conditions:

Individuals of snail, *Monacha cartusiana* and *Deroceras reticulatum* slug collected from field and transferred to laboratory and reared on Chicory, *Chichorium endivia* for three months during the period from November to January 2009/2010 under laboratory conditions at El-Serw Agricultural Research Station, Deimyatta governorate.

During February, these individuals were exposed to leaves of *C. endivia* dipped in solution of treated compounds and used for feeding animals for 24 hours. The three compounds were Round up max 75% (1%) (herbicide) and compared with copper sulphate (0.5%), Lannate 90 (1%).

Technique used:

This trial was conducted in El-Serw Agricultural Research Station Laboratory. Three replicates were used for each treatment and the 4th used as a control (25 individuals for each replicate), 75 animals were put in three plastic jars for each treatment fed on three leaves of Chicory, *Chichorium endivia* were dipped in Copper sulphate (0.5%), Lannate 90 (1%) and Round up max 75% (1%) for 24 exposure and then transferred to clean jars feeding on clean leaves of *C. endivia* for 3, 5, 10 and 15 days, respectively, dead animals were collected and counted after each period. The

mortality percentages were calculated and corrected for natural mortalities (Godan (1983) and Abbott's formula (1925)).

2. Under field conditions:

This study was carried out in Sherbein district, Dakahlia Governorate in three villages (Abo-Galal, Ras El-Khalig and El-Saadia), three trees/each fruit variety was treated with the previous tested compound in plots under trees of Lemon, Navel orange, Guava and Mandarin, dead individuals were counted and separated from total collected 80 individuals of *M. cartusiana* or 100 individuals of *D. reticulatum* in a circle of one meter around each tree after 1, 3, 5, 10 and 15 days after application. Reduction percentages were calculated, also statistical analysis according to Fisher (1944).

RESULTS AND DISCUSSION

1. Under laboratory conditions:

Data in Table (1) revealed that the highest mortality percentages of *Monacha cartusiana* after 15 days was recorded when Lannate 90 was used (87.5%) followed by Copper sulphate gave (70.8%) and the least was recorded when Round up max was used (20.8%), the same trend was observed on *Deroceras reticulatum* where the total mortality percentages were 95.7, 78.3 and 26.1% for Lannate, Copper sulphate and Round up max, respectively. Statistical analysis recorded significant difference between dead individuals of both experimental pests in Round up max treatment when compared with the other two compounds one day after treatment, while after 3, 10 and 15 days there was significant differences between dead numbers in Lannate treatment compared with Copper sulphate and Round up max treatments.

Results showed that Round up max gave 20.8% *M. cartusiana* and 26.1% on *D. reticulatum* after 15 days exposure, while after 24 hours exposure Lannate 90 recorded 72% percent mortality on *D. reticulatum* slug and 56% on land snail, *M. cartusiana*, also copper sulphate recorded 48% on *D. reticulatum* slug and 40% on land snail, *M. cartusiana*. Whereas, Round up max gave 16% on the *D. reticulatum* slug

Awad and Mourad

and only 8% reduction on land snail, *M. cartusiana* this low effect due to its smell of Round up, which acts as repellent effect on snails and slugs, which lead to did not eat cichoria leaves treated with Round up. These results were supported by that obtain by El-Gendy and Radwan (2009) who made an evaluation of oxidative stress biomarkers

in the land snail, *Theba pisana* exposed to copper-based pesticides.

Table (1)

2. Under field conditions:

Data in Table (2) stated that the pesticide; Lannate 90 recorded significant percent reduction, which recorded 70 dead from 80 individuals in Ras El-Khalig Village, Sherbien district, in the same time Round up max recorded 50 individuals from 80 at the same location.

Reduction percentage, which caused from Lannate 90 was recorded by counting the number of snails under trees as all number and testing, which dead individuals and separate them from all numbers, same number of snails under each tree 80 individuals as a maximum number of land snail, *M. cartusiana* was examined to measuring the percentage of dead individuals, copper sulphate recorded 55 dead individuals from 80 as a highest effect on land snails, *M. cartusiana*, while the lowest effect was 45 dead individuals under guava trees at Ras El-Khalig. On the other hand, noticed that Round up max as herbicide recorded 55 dead snails from 80 under navel orange at El-Saadia Village, Sherbien district.

Results in Table (3) showed that more effect of Lannate 90 on the slug, *D. reticulatum*, which recorded 85% of dead slugs under navel orange at Ras El-Khalige and under guava trees at Abo-Galal also the equal number of dead individuals recorded under lemon trees at Ras El-Khalige but the lowest effect of Lannate counted under mandarine trees at Abo-Galal and El-Saadia Village, Sherbien when recorded 75 dead individuals from total numbers of 100 individuals. On the other hand, copper sulphate gave equal effect, which obtained from Round up max, recorded 55-65% dead slugs at most tested locations of the experiment.

Round up max was affecting on land snails and slugs not by poisoning effect of this herbicide but resulting from its effect on

weeds, which act as shelter of these animals protected them from natural enemies and

save more relative humidity which is necessary for these animals. Therefore, controlling these weeds effect on slug numbers more than land snails due to shortage of relative humidity of soil effecting on activity of these animals mobility, losing their slam and body water content causing death (Guiseppe, 2006).

The obtained results are in agreement with that reported by Godan (1983) found that the increasing of the mucous secretion is one of the first reaction of gastropods to many stressors including mechanical irritation caused by molluscicidal chemical leading to death (El-Gendy and Radwan, 2009). The tested compounds seem to affect the terrestrial snail, *M. cartusiana* by contact or stomach poisoning and may effect on other species as well. This may help to diminish the need of specific molluscicides in the field area and decrease the environmental pollution and total cost of pest control programs (Radwan and El-Wakil, 1991). Hegab (1998) who found that the organophosphates included the highest effect when were evaluated under field conditions. Aioub *et al.* (2000) found that the carbamate compounds appeared to be the most toxic ones while the organophosphorous and herbicides were the least toxic ones. El-Masry (2007) tested that the effect of Copper sulfate against land snail, *M. cartusiana* after one day of exposure, mortality percentages ranged between 18.50-37.50%, while it increased after three weeks of exposure. Also, Hilmy and Hegab (2010) found that the higher sensivity of *M. cartusiana* was observed towards the organophosphorous and triazinon compounds.

According to the obtained results, it could be concluded that controlling of *Cynodon*

Effect of herbicide application on land snail, monacha cartusiana.....

dotylon, *Convolvulus arvensis* and *Imperta cylindrical* weeds in mixed gardens showed high reduction in land snail numbers through the period of 2010 during the spring season.

Table (2)

Effect of herbicide application on land snail, monacha cartusiana.....

Table (3)

REFERENCES

- Abbott, W. S. (1925). A method of computing the effectiveness of an insecticides. *J. Econ. Entomol.*, 18: 265-267.
- Aioub, A. A., S. A. A. Ismail and Amal A. Mohamdein (2000). Toxicological and histological studies on some pesticides treated land snails proc. The International Conference on Biological Sciences 1 (2): 19-38.
- Barry, B. D. (1969). Evaluation of chemicals for control of slugs on field corn in Ohio. *J. Econ. Entomol.*, 62: 1277-1279.
- El-Gendy, K. S. and M. A. Radwan (2009). In vivo evaluation of oxidative stress biomarkers in the land snail, *Theba pisana* exposed to copper based pesticides. *Chemosphere*, 2009, El-Sevier.
- El-Masry, S. A. A. (2007). Efficacy of potassium sulfate comparing with other chemicals against land snail, *Monacha cartusiana* snail infesting cucumber crop at Sharkia Governorate. *J. Product. And Dev.*, 12 (2): 487-496.
- El-Okda, M. M. K. (1978). Land snails of economic importance at Alexandria region: 11, seasonal activity and habitance in several types of soil. The 3rd Pest Cont. Conf., Ain-Shams Univ., 2-5 Oct.: 355-359.
- El-Okda, M. M. K. (1980). Land snails of economic importance on vegetable crops at Alexandria and neighbouring regions. *Agric. Res. Rev. Egypt*, 58: 79-96.
- El-Okda, M. M. K. (1982). Efficacy of certain local formulated bran baits against the land Mollusca under pear and orange trees in Egypt. *Egypt's National Conf. Entomology*, Dec., 11: 589-597.
- Fisher, R. A. (1944). *Statistical methods for research workers*. Oliver and Boyed, Edinburgh and London.
- Foad, M. M. (2005). Histological changes induced in the mucus glands of Brown garden snail, *Eobania vermiculata* treated with malathion and methomyl pesticides. *Egypt J. Agric. Res.*, 83 (1): 251-259.
- Godan, D. (1983). *Pest slugs and snails biology and control*, (1-443): Springer-Verlg Berlin Heidelberg, Neo York.
- Guissepe, K. F. L. (2006). The use of glyphosphate herbicides in managed forest ecosystems and their effects on non target organisms with particular reference to ants and bioindicators, wiki community-harvest. Org.
- Hegab, A. M. I. (1998). The efficacy of certain pesticides against the land snail, *Eobania vermiculata* (Muller) under field conditions at Sharkia Governorate. *Egypt J. Appl. Sci.*, 13 (12): 266-276.
- Hegab, A. M. I. (2003). Efficacy of certain pesticides against *Monacha cartusiana* (Muller) snail under laboratory and field conditions in Sharkia Governorate. *Zagazig J. Agric. Res.*, 30 (5): 2009-2020.
- Hilmy, A. and A. M. I. Hegab (2010). Sensitivity of two land snail species (*Monacha cartusiana* and *Eobania vermiculata*) against some pesticides under laboratory and field conditions at Sharkia Governorate. *Egypt. J. Agric. Res.*, 88 (4): 1185-1195.
- Ismail, Sh. A. A. (2008). Daily activity, movement and food consumption of *Monacha cartusiana* snail under laboratory and field conditions in Sharkia Governorate. *Egypt J. Appl. Sci.*, 23 (10B): 227-236.
- Ismail, Sh. A. A. and S. Z. S. Shetaia (2009). Preliminary studies on *Monacha cartusiana* snail infesting cotton seedlings at Sharkia Governorate. *Zagazig J. Agric. Res.*, 36 (4): 560-569.
- Kassb, A. and H. Doaud (1964). Notes on the biology and control of land snails of economic importance in UAR. *Agric. Res. Rev.*, Cairo, Egypt, 42: 47-88.
- Miller, E., D. Swails, F. Olson and R. T. Staten (1988). White garden snail (*Theba pisana* Muller): Efficacy of selected bait and spray able molluscicides. *J. Agric. Entomol.*, 5: 189-197.
- Radwan, M. A. and H. B. El-Wakil (1991). Impact of certain carbamate and

Effect of herbicide application on land snail, monacha cartusiana.....

synthetic pyrethroid insecticide on the non-target terrestrial snail, *Eobania vermiculata*. Alex. Sci. Exch., 2 (12): 47-88.

South, A. (1992). Terrestrial slugs: biology, ecology and control. Chapman of Hall, London. J. exp. Biol.,39(3): 263-268.

تأثير إستخدام مبيد الحشائش علي قوقع البرسيم الزجاجي *Monacha cartusiana* واليزاقة الأرضية *Deroceras reticulatum* التي تصيب بساتين الفاكهة مقارنة ببعض المبيدات بمحافظة الدقهلية

محمد حامد عوض - عبد الرؤوف أحمد محمد مراد

معهد بحوث وقاية النباتات - مركز البحوث الزراعية- الدقي - الجيزة - مصر

الملخص العربي

تمت دراسة تأثير ثلاثة من المبيدات الكيميائية الرواند أب (كمبيد حشائش) واللانيت وكبريتات النحاس ضد قوقع البرسيم الزجاجي *Monacha cartusiana* واليزاقة الأرضية *Deroceras reticulatum* تحت الظروف المعملية والحقلية بمحافظة الدقهلية.

وقد أوضحت النتائج أنه لا يوجد تأثير معنوي للرواند أب علي قوقع البرسيم الزجاجي واليزاقات الأرضية بينما أعطيت كبريتات النحاس واللانيت تأثير معنوي ضد كل من النوعين تحت الظروف المعملية. وعلي العكس لوحظ تحت الظروف الحقلية أن مبيد الحشائش الرواند أب قد أعطي تأثير مقارب لمبيد اللانيت وكبريتات النحاس حيث بلغت النسبة المئوية للموت ٥٥ الي ٦٥% ويرجع ذلك لتأثير الرواند أب كمبيد حشائش تحت الظروف الحقلية الي تأثيره علي إزالة الحشائش التي تمثل بيئة وغطاء مناسب لإنتشار القواقع واليزاقات الأرضية والتي تشجعها علي الإنتشار والنمو ويعتبر غياب هذه الحشائش يعرض هذه الآفات للأعداء الحيوية والظروف البيئية غير المناسبة لنمو وإنتشار هذه الآفات مما يقلل من أعدادها ويعتبر وسيلة غير مباشرة للقضاء علي هذه الآفات. بالإضافة الي سمية مبيد الحشائش علي هذه القواقع وجعلها تفقد الكثير من محتواها المائي نتيجة إفراز الكثير من المخاط الذي يساعدها علي الحركة والنشاط مما يفقدها الكثير من سوائل الجسم ويؤدي الي موتها.

Effect of herbicide application on land snail, monacha cartusiana.....

Table (1): Effect of tested pesticides compared with Round up max as herbicide against land snail, *Monacha cartusiana* and *Deroceras reticulatum* slug under laboratory conditions at El-Serw Agricultural Research Station, Deimyatta governorate during November 2009 to January 2010.

Tested compounds		Tested animals	Dead numbers/25 individuals after application					Total of dead individuals	%Mortality	
			1 day	3 days	5 days	10 days	15 days		1 day (initial effect)	15 days (residual effect)
Pesticides	Copper sulphate 0.5%	<i>Monacha cartusiana</i>	10.0	13.0	18.0	18.0	18.0	18.0	40	70.8
		<i>Deroceras reticulatum</i>	12.0	14.0	16.0	18.0	20.0	20.0	48	78.3
	Lannate 90	<i>Monacha cartusiana</i>	14.0	16.0	18.0	18.0	22.0	22.0	56	87.5
		<i>Deroceras reticulatum</i>	18.0	19.0	20.0	20.0	24.0	24.0	72	95.7
Herb-icide	Round up max 75%	<i>Monacha cartusiana</i>	2.0	4.0	4.0	4.0	6.0	6.0	8	20.8
		<i>Deroceras reticulatum</i>	4.0	4.0	6.0	8.0	8.0	8.0	16	26.1
Control		<i>Monacha cartusiana</i>	0	0	0	0	1.0	1.0	0	4.0
		<i>Deroceras reticulatum</i>	0	0	0	0	2.0	2.0	0	8.0
LSD 5%		-	5.18	1.92	0.93	0.80	0.75	-	-	-

Table (2): Effect of Round up max as herbicide against land snail, *Monacha cartusiana* compared with two compounds in fruit orchard at Sherbien district, Dakahlia governorate.

Locality	Tested compounds	Mean number and %reduction of <i>M. cartusiana</i> under fruit trees after 15 days of application											
		Navel orange			Lemon			Guava			Mandarine		
		Live	Dead	% Reduction	Live	Dead	% Reduction	Live	Dead	% Reduction	Live	Dead	% Reduction
Abo-Galal	Lannate 90	20	60	75.0	20	60	75.0	15	65	81.3	18	62	77.5
	Copper sulphate	30	50	62.5	30	50	62.5	30	50	62.5	30	50	62.5
	Round up max	30	50	62.5	40	40	50.0	30	50	62.5	35	45	56.3
Ras El-Khalig	Lannate 90	10	70	87.5	15	65	81.3	20	60	75.0	20	60	75.0
	Copper sulphate	25	55	68.8	30	50	62.5	35	45	56.3	30	50	62.5
	Round up max	30	50	62.5	30	50	62.5	35	45	56.3	30	50	62.5
El-Saadia	Lannate 90	18	62	77.5	20	60	75.0	15	65	81.3	15	65	81.3
	Copper sulphate	25	55	68.8	30	50	62.5	30	50	62.5	30	50	62.5
	Round up max	25	55	68.8	35	45	56.3	35	45	56.3	35	45	56.3
LSD 5%		-	-	4.50	-	-	4.70	-	-	4.11	-	-	3.25

Table (3): Effect of Round up max as herbicide against slug, *Deroceras reticulatum* compared with pesticides in fruit orchards at Sherbien district, Dakahlia governorate.

Locality	Tested compounds	%Reduction of <i>D. reticulatum</i> under field fruit trees after 15 days of application							
		Navel orange		Lemon		Guava		Mandarine	
		Live	%Reduction	Live	%Reduction	Live	%Reduction	Live	%Reduction
Abo-Galal	Lannate 90	20	80	20	80	15	85	25	75
	Copper sulphate	35	65	40	60	35	65	38	62
	Round up max	40	60	40	60	40	60	40	60
Ras El-Khaliq	Lannate 90	15	85	15	85	20	80	20	80
	Copper sulphate	35	65	35	65	35	65	40	60
	Round up max	40	60	40	60	40	60	45	55
El-Saadia	Lannate 90	20	80	15	85	20	80	25	75
	Copper sulphate	40	60	40	60	40	60	40	60
	Round up max	40	60	45	55	40	60	40	60
LSD 5%		-	4.70	-	4.80	-	4.9	-	3.50