

## **MECHANICAL AND CULTURAL CONTROL METHODS FOR LAND SNAIL *Monacha cartusiana* (Müller) INHABITING SOME ORCHARDS AT SHARKIA GOVERNORATE**

**Shetaia, S. Z. S.**

**Plant Protection Research Institute, ARC, Dokki, Giza, Egypt**

### **ABSTRACT**

The effect of some mechanical and cultural control methods were evaluated against *Monacha cartusiana* (Müller) snails under field conditions. Results revealed that ploughing and flattening process gave the highest reduction percentages compared with ploughing only where recorded 68.3% and 41.3% reduction, respectively. The effect of certain barriers such as attractive baits, circles lime and netting wire was investigated under field conditions in lemon and mango orchards. The netting wire was more effective in reducing population density where gave general mean 87.8% compared with 55.4 for circles lime and 40.5% for attractive bait, respectively. Moreover, hand collection was determined as mechanical control methods against such land snails in some orchards. Results show that hand collection gave reduction percentage in the end of the five weeks 22% while general mean was 43.1%. Generally it could be recommended that ploughing and flattening process as cultural control methods gave high reduction in population density of injurious land snail pests. The netting wire and hand collection were the best mechanical control methods in reducing population density *M. cartusiana* snail in some orchards cultivated with lemon and mango trees.

### **INTRODUCTION**

Land snails are considered group of the most serious pests attacking agricultural crops around the world. They cause costly damage to field crops, vegetables and fruit trees as well as ornamental plants (Godan, 1983). In addition to their economic importance the increased pest status has been associated with cultivation of new crops. Furthermore, in some crops the significance of land snail gastropods are only now becoming apparent with the decline in the importance of other pest groups such as insects, for which effective control strategies have been developed (Barker, 2002).

Recent studies indicate that the glassy clover snail, *Monacha cartusiana* is the most abundant snail in all localities at Sharkia Governorate (Ghamry *et al.*, 1993; Ismail 1997, Arafa, 1997 and Mahrous *et al.*, 2002). Therefore the first step in an integrated approach to control this pests is the application of molluscicide to reduce the land snails population BarKer (2002). This initial step is the most critical in orchards control of land snails in the outbreak time of the land snails, then began to control these residual populations with other methods *i.e.* mechanical or natural control. The present work aims to throw light on some mechanical and cultural control of land snail *Monacha cartusiana* inhabiting some orchards at Sharkia Governorate.

## MATERIALS AND METHODS

### **Effect of ploughing and soil flattening process:**

The effect of ploughing and soil flattening was evaluated as natural control methods in reducing population of *Monacha cartusiana* (Müller) snail infesting lemon and mango trees during February and March 2009.

An experiment was conducted at Kafr Sakr district, Sharkia Governorate. An area of about half feddan was chosen and divided into three treatments, the first one was subjected to ploughing and the second to ploughing and soil flattening using disk harrow while the third one was left without any process as control treatment. Five replicates from each treatment were carried out. Individuals of the land snail *Monacha cartusiana* counted in the early morning in a quadrat of 50×50 cm under one tree randomly chosen in each plot and on the lower portion in the trunk of the same tree to about one meter height in treated and untreated area. Population counts were entailed 24 hours before ploughing and after one day then at weekly intervals during five weeks beginning in February and March 2009. The reduction percentages were calculated according to the formula of Handerson and Tilton 1955.

### **Effect of netting wire, circle lime and attractive bait barriers:**

The effect of natural, chemical and bait barriers in reducing population density of *Monacha cartusiana* snail infesting lemon and mango orchards was studied during April and May 2009. This study was carried out in lemon and mango orchards highly infested with *M. cartusiana* snail. An area of about half feddan was chosen for this study. Three types of barriers were used, the first consists of netting wire 20 mesh [30cm×80cm] broad which made a circle shape around the tree trunk on 50cm high curl to down above soil surface. While the circles from lime and bait around trees trunk on soil surface, five replicates to every treatment were used and five trees left without any barriers as a control. All snails on trees trunk and leaves were removed before application. Number of snails was calculated before application and after one day and then at weekly intervals during five weeks during the period from March to April 2009. Percent reduction of snails were calculated according to the formula giving by Handerson and Tilton 1955.

### **Effect of hand collection:**

The effect of hand collection was evaluated on reducing population density of *M. cartusiana* snail during May 2009. This study was carried out in lemon and mango orchard heavy infestation with *M. cartusiana* snail. An area of about half feddan was chosen to this purpose. This area was divided into ten plots each about 10 trees. Five plots were subjected to hand collection application by workers during the day hours from 10 AM to 4 PM. Six days after irrigation especially on the lower portion in the trunk of the trees during May 2009, while the other were left without collection. Snails were counted in a randomly quadrat size sample of 50×50cm under the trees and on lower portion of the trunk at about one meter height before and after one day and then weekly intervals during five weeks during April to

May 2009. Percent reduction in population density of each snail was calculated according to the formula of Handerson and Tilton (1955).

## RESUTLS AND DISCUSSION

### Effect of soil ploughing and flattening process:

Theses experiments were carried out to investigate the effect of ploughing and flattening in reducing *M. cartusiana* population density .Data tabulated in Table (1) show that ploughing and flattening reduced snails population with reduction percent (64.4 , 66.1 , 55.9 , 54.3, 48.1 and 40.7%) and (72.4, 75.1, 69, 67.7, 65.9 and 60.1%) , snails/sample after one day, and 1, 2, 3, 4 and five weeks in compared with that of control (40.8%) during February and March 2009, respectively .

**Table (1): Effect of ploughing and flattening process on reduction population of *Monacha cartusian* snail infesting lemon and mango tress at Kafr Sakr district, Sharkia Governorate during February and March 2009.**

Periods after treatment	No. of snails in untreated areas	Mean number of snails in treated areas and reduction percentages			
		Plowed area		Plowed and flattening	
		Mean	R%	Mean	R%
Before treatment	39.8	39.8		40.2.	
One day	38.2	12	64.4	9.4	72.4
One week	40.6	13.8	66.1	10.2	75.1
Tow weeks	39	17.2	55.9	12.2	69
Three weeks	41.2	18.8	54.3	13.4	67.7
Four weeks	43.6	22.6	48.1	15	65.9
Five weeks	44.2	26.2	40.8	17.8	60.1
General mean	40.8	18.4	41.3	13	68.3

From values of general mean reduction, it is interesting to stated that ploughing and flattening processes reduced snail population more than of soil ploughing alone where, the percentage general mean reduction values were 41.3 and 68.3 % snail /sample, respectively. These results are in agreement with those obtained by Woultrers (1970) who mentioned that, rough ploughing of the soil before sowing of winter wheat protected seeds from damage caused by land snails. Moreover, EL Masry (1997) illustrated that the ploughing process decreased individuals of the land snail *H vestalis* after one day post ploughing while the highest reduction percentage after 15 days post ploughing was 91.6%. Finally Salem *et al.* (2007) reported that ploughing decreased the population of *M. cartusiana* and *Eobania vermiculata* snail species. Since general means of percent reduction in population *E. vermiculata* and *M. cartusiana* during six weeks after ploughing were 52.3 and 43.3%, respectively.

### Effect of netting wire, circle lime and attractive bait barriers:

The effect of certain barriers as netting wire, lime circle and attractive baits was studied in reducing population density of *M. cartusiana*

snail infesting lemon and mango trees during March and April 2009. Data presented in Table (2) show that the netting wire circle was the most effective on reducing population of *M. cartusiana* compared with the live lime circle and attractive bait barriers. The netting wire circle were recorded percentage reduction (96 ,93 , 90.2 , 85.8 , 83.9 and 78.2%) after one day and 1, 2, 3, 4 and 5 weeks, respectively, while the live lime circle were recorded percentage reduction (86.4 , 81.4 , 63.5 , 50.2 , 32.4 and 18.8%), respectively. On the other hand, the lowest values were recorded with the attractive bait where gave (75.1, 57.8, 44.6, 34.5, 23.2 and 8.1%), respectively. Regarding general mean percentage reduction were 87.8, 55.4 and 40.5% for the three tested methods, respectively. These results are in harmony with those reported by many authors. Nakhla (1995) illustrated that a band of metal sheets around the tree trunk could protect orchard trees from land snails, The metal rings tested were in the shape of cornea and were made of copper sheet, aluminum sheet, wire screen gauze (14 mesh )and a fiber cord. Hata *et al.* (1998) reported that using physical barriers composed of copper or fiberglass screen repelled both slug species i.e. *Vaginuta plebeian* and *Veronicella cubensis*. Lush, Angela (2007) reported that the use of copper trunk bands to prevent snails movement into the canopy of citrus trees has some promise copper sheeting decreased snail abundance in the citrus for up to two years, and have been effective past the life of the experiment. This product was the most effective of all methods tested.

**Table (2): Effect of certain barriers as a mechanical control methods on *M. cartusiana* snail infesting lemon and mango tress during March and April 2009 at Kafr Sakr district, Sharkia Governorate.**

Periods after treatment	No. of snails in untreated areas	Mean number of snails in treated areas and reduction percentages					
		Attractive bait		Circles lime		Netting wire	
		Mean	R%	Mean	R%	Mean	R%
Before treatment	39.4	40		39		39.4	
One day	40.4	10.2	75.1	5.4	86.4	1.6	96
One week	40.2	17.2	57.8	7.4	81.4	2.8	93
Two weeks	38.8	21.8	44.6	14	63.5	3.8	90.2
Three weeks	38.2	25.4	34.5	18.8	50.2	5.4	85.8
Four weeks	39.8	31	23.2	26.6	32.4	6.4	83.9
Five weeks	38.6	36	8.1	31	18.8	8.4	78.2
General mean	39.3	23.6	40.5	17.2	55.4	4.7	87.8

**Effect of hand collection:**

The effect of hand collection as mechanical control method was evaluated in reducing population density of *M. cartusiana* snail in some orchards. The obtained data in Table (3) clear that hand collection obviously decreased population of *M. cartusiana* since one day post treatment, the mean number of snails was decreased after one day from 42.8 to 15 snail/sample size, while after 1, 2, 3, 4 and 5 weeks post treatment were

decreased from (46.2, 42.2, 40.6, 44.8 and 41.8 ) to ( 18.4, 22.2, 24.8, 27.6 and 31 snails per samples size), respectively. Regarding percentage reduction of snail after 1, 2, 3, 4 and 5 weeks post treatment were (58, 45, 36, 35 and 22%), respectively. On the other hand, percentage reduction after one day was (63%). Finally the hand collection method gave significant effect on percent reduction for *M. cartusiana* where, recorded (43.1%) reduction as a general mean during the experimental period.

**Table (3): Effect of hand collection control method in reducing populations of *M. cartusiana* snail infesting lemon and mango trees during the period from April and May 2009 at Kafr Sakr district Sharkia Governorate.**

Periods after treatment	No. of snails in untreated areas	Mean number of snails in treated areas and reduction percentages	
		Mean	R%
Before treatment	45.2	43	
One day	42.8	15	63
One week	46.2	18.4	58
Tow week	42.2	22.2	45
Three week	40.6	24.8	36
Four weeks	44.8	27.6	35
Five weeks	41.8	31	22
General mean	43.1	23.1	43.1

Hand collection method was investigated for controlling land snails by many authors *i.e.* Carman (1965), Bishara *et al.* (1968), Woulters (1970), Shah (1992), Tillier *et al.* (1995), Abd El-Aal (2001), Mahrous *et al.* (2002) and El Deeb *et al.* (2003 ) applied the hand collection method as mechanical control method against two land snails *i.e.* *M. cartusiana* and *E. vermiculata*.

## REFERENCES

- Abd El-Aal, E. M. (2001). Studies on certain land snails at Sharkia Governorate, M.Sc. Thesis, Fac. Agric., Zagazig Univ.;160pp.
- Arafa, A. A. (1997). Studies on some molluscs at Sharkia Governorate. M.Sc. Thesis, Fac. Agric. Al- Azhar Univ., 137 pp.
- Barker, G. M. (2002). Molluscs as crop pests. (CAP International) Walling forti Dxon 10 DE. UK. 468 pp.
- Bishara, S.I.; M. S. Hassan and A. S. Kalliny (1968). Studies on some land snails injurious to agriculture in U, A, R, Rev.Zool, Bot, Afr.,77 (3-4):239-252.
- Carman, G. E. (1965). Electrical trapping device for land snail, j, Econ ,Entomol.,58: 786-787.
- El-Deeb, H. I.; Sobeih, A. K.; Maha, M. Foud and Fawkyia, D. A. Asran (2003). Utilization of some mechanical and cultural control measures against teirestrial snail, Zagazig., J,Agric, Res., 30 (6): 2321-2335.

**Shetaia, S. Z. S.**

- El –Masry, S. A. (1997). Studies on control of some land snails infesting certain fruit trees. Ph.D, Thesis, Fac. Of Agric., Zagazig Univ., 150pp.
- Ghamry, E. M.; El-Deeb, H. I. And Katab, Y. A. (1993). Ecological and morphological studies on certain land snails at Sharkia Governorate. Egypt. J. Appl. Sci., 8(11): 213-225.
- Godan, D. (1983). Pest slugs and snails, biology and control, Federal Biological Res. Center of Agric. and Forest. Korigin Luisestrale, 19 d 400 Berlin, 345 pp.
- Hata,T.Y.; Kara, A. H. and HU, B. K. (1998). Molluscicids and mechanical barriers against slugs ,*vaginula plebeian* fischer and *veronicella cubensis* [stylommatophora;veronicellidae].Crop protection, 16(6): 501-506.
- Henderson, C. F. and E. W. Tielton (1955). Test with acaricides against the brown wheat mite, J. Econ. Entomol., 48:157-161.
- Ismail, Sh. A. A. (1997). Ecological, biological and control of certain terrestrial infesting some vegetables and field crops in Sharkia Governorate. Ph.D. Thesis, Fac. Of Agric., Zagazig Univ., 130 pp.
- Lush, Angela L. (2007). Biology and ecology of the introduced snail *Microxeromagna armillata* in south eastern Australia. Ph.D. thesis, Univ. Of Adelaide, Australia: 228 pp.
- Mahrous, M. E.; Mervar H. Ibrahim and E. M. Abd El- Aal (2002). Occurrence, population density and importance value of land snails different crops at Sharkia Governorate, Zagazig J. Agric. Res., 29(2): 613-629.
- Mahrous, M. E.; Mervat, H. Ibrahim and E. M. Abd EL –Aal (2002). Control of certain land snail under field condition in Sharkia Governorate .Zagazig J. Agric. Res., 29(3):1041-1054.
- Nakhla, J. M. (1995). A mechanical method for controlling land snails on pear trees in Egypt. J. Agric. Res., 73 (2) : 357-363.
- Salem, A. A.; Mahrous, M. E.; Mervat H. Ibrahim and Abd El-Aal, S. M. (2007). Different control measures for controlling certain land snail in Sharkia Governorate. Zagazig J. Agric. Res., 34(2): 291-305.
- Shah, S. (1992). Management of the giant African snail, Rev. Agric. Entomol., 81(7): 744.
- Tillier, S. G.; V. Jackson and R. Macffarlance (1995). Giant African snail. Rev. Agric. Entomol., 85(5): 457.
- Woulters, L. (1970). Schneckenbc kampfung in oost flevoland pflanzen schutz, nachr, Bayer, 23: 173-177.

**المكافحة الميكانيكية والزراعية للقواقع الأرضية مونكا كارتوسيانا المتواجد في  
بعض البساتين بمحافظة الشرقية  
سباعي زياد سليمان شتيه  
معهد بحوث وقاية النباتات- الدقى - مصر**

اجريت هذه التجربة بهدف تقييم بعض طرق مكافحة الآفة القواقع الأرضية في احد البساتين بمركز كفرصقر محافظة الشرقية والمنزرع بأشجار الليمون والمانجو وذلك في فترة نشاط القواقع وكذلك فترة وضع البيض حتى ينتهي لعملية مكافحة ان تؤتى ثمارها على اكمل وجه وذلك خلال الفترة ما بين شهرى فبراير ويونيه. وأوضحت النتائج ان عمليتي الحرث والتزحيف كأحد الطرق الزراعية للمكافحة كانتا أعلى كفاءة في خفض تعداد قواقع المونكا كارتوسيانا من عملية الحرث منفردا حيث بلغت نسبة الخفض 68.3 و 41.3% علي التوالي. أيضا تم تقييم الحواجز الطبيعية والجمع باليد كأحد الطرق الميكانيكية في حماية الأشجار من آفة القواقع الأرضية. اتضح ان الحواجز المكونة من السلك المثقب (عشرون ثقب في البوصة المربعة) كانت أعلى كفاءة في حماية الأشجار من الحواجز المكونة من حلقات الجير الحي والطعوم الجاذبة حيث اعطت نسب خفض فى التعداد كالتالي: 87.8% للسلك المثقب بالمقارنة بنسبة 55.4% للجير الحي و 40.4% للطعوم الجاذبة.

أما بالنسبة لطريقة الجمع باليد اتضح انها اعطت نسبة خفض فى نهاية التجربة وصلت الي 22% وكان المتوسط العام للخفض 43.1% هذا ويمكن التوصية باستخدام بعض العمليات الزراعية مثل الحرث والتزحيف وكذلك بعض الطرق الميكانيكية مثل الحواجز الطبيعية من الجير الحي والطعوم الجاذبة والسلك المثقب والجمع باليد لخفض تعداد القواقع الأرضية وذلك ضمن برامج مكافحة متكاملة للقواقع الأرضية.

**قام بتحكيم البحث**

**كلية الزراعة – جامعة المنصورة  
مركز البحوث الزراعية**

**أ.د / عمر عبد الحميد نصار  
أ.د / على عبد العزيز الشيخ**