

Effect of Some Protective Procedures in Integrated Pest Management Against the Surveyed Land Snails Species to Avoid Using of Pesticides in Orange Orchard at Tanta District, Gharbiya Governorate.

Rizk, A.M.; Y.A. Eisa; Y.M.A. Abd El Galil and M.I. Abd-Azeem

Plant Protection Research Institute, A.R.C. Dokki, Giza, Egypt.

Received on: 13/8/2017

Accepted for publication on: 24/9 /2017

Abstract

During 2015 and 2016 land snail species were surveyed in orange orchard and some procedure protective, hand collection, service tree operation and distance setting attractive baited traps applied to late or reduce and avoid the chemical control against land snails in Tanta district Gharbiya Governorate. *Eobania vermiculata*, *Monacha cartusiana* and *Theba pisanawere* a dominant species on orange orchard and *E. vermiculata* recorded the highest density then *T. pisana* and *M. cartusinna*. Through spring *E. vermiculata* and *T. pisana* recorded the highest density and the lowest densities were in autumn, whereas density of *M. cartusinna* was highly through summer and recorded the lowest density in winter. Controlling this species by using setting attractive traps each 5 trees was more efficiency against three species, the population reductions were 55%, 51.3% and 48.9% to *E. vermiculata*, *T. pisana* and *M. cartusinna* than hand collection and service tree operation, (31.2% and 11.3%), (33% and 14.6%) and (29.7% and 13.4%) to each species, respectively. With applying their protective procedure consecutively the population reduced to 74.2%, 69.4 and 72 compared with using molluscicides metaldehyde bait 2% (73.2, 76.4 and 73.4 to each species respectively). So that can use this protective procedure consecutively through year as integrate pest management program against *E. vermiculata*, *M. cartusiana* and *T. pisana* with avoiding the chemical control in orange orchard trees.

Keywords: *Integrated Pest Management, Survey, Population Density, Orange Orchard, Land Snails, Eobania vermiculata, Monachacartusiana and Thebapisana.*

Introduction

The terrestrial snails are considered as agricultural pests cause economic damage and loss of crops resulted feeding in any part of plants and in all growing stages beside mucus which lead to fungi corruption. Currently snails adapted with different temperature and humidity and spreaded in many habitats. In Egypt Governorates many studies to survey species of land snails infested economic plants were attained. Az-zam-Karima (1995) found 15 species of snails infested medical, ornamen-

tal, vegetable plants, field crops and fruit orchards as in datepalm, banana, Citrus, Mongo, guava, grape, peach and pear were surveyed in 10 Governorates. Beshr, Sahar (2000) recorded that, the highest abundance of *Theba pisanawere* and *Eobania vermiculata* at Alexandria, Beheira and Kafr El-Sheikh Governorates occurred during spring and summer, whereas the lowest abundance occurred during autumn and winter on apricot, orange and plum trees. Hegab *et al.*, (1999) indicated that the population densities of *M. cortusiana* and *E. vermiculata*

were higher during March, April May and June months in Sharkia Governorate. Abd El-Aal (2001) used the oldest mechanical method, (handcollection) in an orchard in Sharkia, Governorate. He found that after four weeks from hand collection in July it lead to population reduction for *M. cartusiana* and *A. vestalis* up to 56 and 51%, respectively. Another search Abd El-Aal (2001) suggested that feenamphos was the most toxic compound for *M. cartusiana* followed by sethoxydim, oxamyl, monocrotophos, butachlor, biofly and seed grade and population reduction after 15 days of treatment were 48.81, 43.01, 36.01, 33.52, 29.08, 20.01 and 11.09% respectively when used as poisonous baits against *M. cartusiana* at Kafr Attalah locality, Zagazig District. Radwan (1993) reported that metaldehyde was similar in effectiveness against the two-common species of terrestrial snails, *T. pisana* and *H. aspersa* and was more effective than mesurol. Higher mortality were occurred when bait molluscicides were used at relatively lower concentration (3kg. a.i. /fed) than when applied at the recommended ones (6kg. a.i. /fed).

Salem *et al.*, (2007) reported that ploughing decreased the population of *M. cartusiana* and *E. vermiculata* snail species. Since, general means of reduction percentages in population *E. vermiculate* and *M. cartusiana* during six weeks after ploughing were 52.3 and 43.3%, respectively.

Material and Methods

1-Survey and population densities of land snail's species:

Monthly snail samples collected early morning from orange trees orchard through 2015 and 2016 in three Villages founding in small overlapping ears with field crops at Tanta District Gharbiya Governorate. Ten trees were randomly chosen and marked as permanent sampling sites then snails collected from one meter around chosen tree and on five branches of the different direction of the tree at one-meter height of trunk, (Awad, 1994). Collection snails were identified according to the systemic keys given by Godan, (1983). The total number and mean was calculated and the population densities of the identified species were calculated as follows:

$$\text{Population density} = \frac{\text{Total number of individuals of a species}}{\text{Number of samples containing this species}}$$

2- Control methods:

Some protective efficiency against snail species in orange orchard was estimated according to the population reduction that calculated as follows:

$$\text{Population reduction} = \frac{A - B}{A} \times 100$$

A= Average number of snail's species in the first year.

B= Average number of snail species in the second year.

2.1. Hand collection efficiency:

Twenty trees were chosen in 100 m² (5 replicates) approximately, then the rest snail was handily collected on trunk and branches each 15 days from Jun up Sep. by workers during the day hours from 10 AM to 4 PM. Another area contains 20 trees similar in dynasties of snails were chosen and left without collected snails as control with counted rest snails in trunk and branches. After one

month from treatment the numbers were counted in treated and control areas and then average numbers and the population reduction, were calculated.

2.2. Service tree operation efficiency:

Two feddan of orange orchard convergent density of snail species were chosen. Snail numbers to twenty trees (5 replicate) counted on one meter around and on five branches of the different direction of the tree at one meter height of trunk then different service operation i.e. Tillage and turn soil, trim trees, spray and paint trees by Bordeaux mixture and fertilization soil were applied through Nov. up Jan in one feddan but another feddan was leaved as control. After one month from treatment the numbers of snail's species were counted in each feddan as the same previous way and the population reduction werecalculated.

2.3. Attractive traps efficiency:

During spring and winter months the towsettingdistances of attractive traps (each 5 and 10 trees) were tested on orange orchard (one feddan to each treatment). The attractive traps were distributed each 5 trees in the first feddan and each 10 trees in the second feddanand the third untreated as control. Each 10-day traps were checked up with counted snails then removed. After one month from treatment, population reduction of snails was calculated. The attractive trape consisting of wheat straw covered by howling canvas and baited with ¼kg attractive bait, (5kg bran + ½ kg molasses + 2½l water).

2.4. Integrated pest management efficiency:

In this treatment above experiments applied respectively in one infection feddan to one year then the snail's reduction calculated in the end year. Another Feddan treated with molluscicides, metaldehyde bait 3%. This bait prepared by mixing 2 (gr) metaldehyde + 5 (gr) sugar cane honeys + 39 (gr) a fine fraction of wheat bran. Twenty trees were treated by 10 grams of bait on blue plastic sheets, in heaps in early morning on the damp soil after one-day irrigation. Numbers of snails on trees and around them were counted before and after 15 days from treatment then calculated the population reduction and compered with the IPM application. In the same time, the population of snails in 20 trees at another feddan calculated as a check control.

Results and Discussion

1. Population density of land snail's species:

For two years 2015 and 2016 snail survey, defined and the number movement were recorded in three villages at Tanta distract Gharbiya Governorate in orange orchard top repaired successful control program at snail specie's. This survey showed that three species of snails were found in the treated orchard, *Eobaniavermiculata*, *Monacha cartusiana* and *Theba pisana*. The population density through the year were monthly summarized in Table (1) and the obtained data cleared that *E. vermiculata* recorded the highest number through Apr. and Jun in 2015 and 2016, respectively and the average density was 80 animals in Jun. The lowest average was 56 snails in Dec. (54 and 58) to each year, respectively. The density of *M. cartusiana*

reached to the maximum through Aug 74 and 73 animals (average were 73.5 animals) then recorded the minimum number in Sep. (31 and Oct. (34) animals, (average numbers 34.5 animals) in Oct., to each year, respectively. The third specie *T. pisana* were 63 and 93 and the average number 78 animals through Mar., but recorded 34 and 32 animals in Nov. and Oct. to each year respectively. The minimum average were 34.5 animals in Oct., so that *E. vermiculata* was the predominant species average numbers recording 848.5 animals then *T. pisana* 632.5 animals and *M. cartusiana* 552 animals. Also, *E. vermiculata* and *T. pisana* recorded the highest density through spring, 236.5 and 179 animals and the lowest density were 192.5 and 107 animals in fall season. In the other season the recorded number were (195.5 and 155.5) and (224 and 129.5) in summer and winter to each species respectively, while *M. cartusiana* was in highly density during summer 160.5 animals and the minimized number recorded through fall was 114 animals and reach to 126 and 151 animals in winter and spring respectively. Eshra (2004) found that through 1999 and 2000 year *E. vermiculata*, *T. pisana*, *H. vestalis* and *C. acuta* recorded the highest population during spring and summer in June, July and August on orange, banana, guava and grape trees at investigated areas in Alexandria and El-Beheira Governorates. While, El-Deeb et al. (1996) clear that *M. cartusiana* reached its peak during April month, but *E. vermiculata* was in maximum during Autumn and spring seasons. On the other hand,

Helicella sp. and *C. acuta* appeared with high numbers during May and January months in certain Governorates of Egypt. Metwally et al. (2002) found that, six species of terrestrial mollusca belonging to family Helicidae and limacidae were recorded on different crops at 23 localities 10 Districts at Monofia and Gharbia Governorates. These species were *M. cartusiana*, (the glassy Clover snail), *E. vermiculate*, (the Brown garden snail), *C. acuta*, (the conical snail) *O. alliarus*, the slugs, *Limax flavus* and *Derocerasre ticutatum*, (the gray garden slug) and *M. cartusiana*.

2. Efficiency of some protective procedure against land snail species:

Latent or avoiding the chemical control, methods of mechanical and agriculture procedures were applied singly against land snails in orange orchard, hand collection, service tree operation and distance setting attractive traps to reach the integrated pest management program.

2.1: Hand collection:

During Jun. up Sep. each 15 days resting land snails were hand collected and the population reduction summarized in Table (2) and the obtained data showed that the population reduction of the three species were 33%, 29.7% and 31.2% at *T. pisana*, *M. cartusiana* and *E. vermiculata* respectively the number of animals reduced from 134, 185 and 154 animals to 89, 127 and 108 animals compared to the untreated area, 120, 192 and 137 to each species, respectively. In this method collected adult snails and middle ages lead to minimizing the reproduction and re-

ducing the population in the next season's activity. Carman (1965) reported that hand collection with subsequent squashing of the snails was the oldest mechanical method and was the only measure used up to the middle ages. Eshra (2004) showed that hand collection method obviously decreased population of land snails infesting the fruit trees banana, grape, guava and navel orange in four localities belonging to Alexandria and El-Beheria Governorates. The reduction range was 27.7% and 54.6%.

2.2: Service tree operation:

Data in Table (3) revealed that after service orange tree the numbers of *T. pisana*, *M. cartusiana* and *E. vermiculata* decreased to 111,84 and 118 animals compared with 123, 102 and 140 animals of untreated area and population reduction at treated area were 14.6%, 13.4% and 11.3% to each species, respectively. Salem *et al* (2007) reported that ploughing decreased the population of *M. cartusiana* and *E. vermiculata* to 52.3 and 43.3% during six weeks after ploughing.

2.3: Distance setting attractive traps:

Beginning season activity of land snails, the attractive traps setting in two distances each 5 or 10 tree and the illustrated data in Table (4) pointed out that when traps setted each 5 trees the reduction in land snails animals were 51.3, 48.9 and 55% to *T. pisana*, *M. cartusiana* and *E. vermiculata*, while the population reduction were 29.3, 33.3 and 32% when traps setting each 10 tree to each species, respectively. Also, the attractive rate of *E. vermiculata* were

highest than *T. pisana* and *M. cartusiana* when traps setting each 5 trees but the attractive rate were convergent to all species when setting each 10 trees. Eshra (2004) clear that the blue buckets more attractive than other colored buckets and *T. pisana* was the highly attracted followed by *E. vermiculata* *H. vestalis* and *M. obstructa*. The same order snails attracted to bran + sugar + cane honey bait then lettuce and water under nursery in Abbis locality.

Generally, setting attractive traps each 5 trees gave the highest reduction percentages compared with hand collection, which ranked in second and in the end service tree operation caused the lowest reduction.

Shetaia (2010) found that the effect of mechanical and cultural control methods against *M. cartusiana* in lemon and mango orchards ranked as follow, the ploughing and flattening, netting wire, circles time attractive bait and hand collection, the reduction percentages were 68.3% , 87.8%, 55-4, 40.5 and 43.1% to each treatment respectively in Sharkia Governorate.

2.4: Integrated land snail's management in orange orchard:

To reduce the chemical treatment against land snails, protective procedure, hand collection, service tree operation and distance setting attractive bated traps each 5 tree (IPM.) tested compared with using metaldehyde bait 2% for one year and the obtained results summarized in Table (5). The data indicated that, *T. pisana* were lowest affection by (I P M.) procedure the reduction percentage was 69.4% compared metaldehyde bait 2% application 76.7%.

While the population reduction at *M. cartusiana* and *E. vermiculata* when use (IPM.) procedure was nearly from metaldehyde baits 2% application. The reduction percentages were (72% and 74.2%) and (73.4% and 73.2%) to each application, respectively.

In conclusion, the above mentioned results indicated that protective procedure consecutively through year is of great importance as integrated pest management program against *E. vermiculata*, *M. cartusiana* and *T. pisana* with avoiding the chemical control in orange orchard tree.

Acknowledgement

Thanks for the reviewers of the present manuscript. Also, Many thanks for the editorial board of the present journal.

References

- Abd El-Aal, S.M. (2001): Studies on certain land snails at Sharkia Governorate. M.Sc. Thesis, Fac. Agric. Zagazig Univ.
- Awad, M.H. (1994): Studies on agricultural mollusks at Domiat Governorate. M.Sc. Thesis, Fac. Agri. Mansoura Univ.
- Beshr, M.Sahar (2000): Ecotoxicological studies on two species of snails and associated insects, infesting fruit tree-in three Egyptian governorates. Ph.D. thesis Fac. Sc., Alexandria Univ.
- Carman, G.E. (1965): Electrical trapping device for land snail. J. Econ. Entomol., 58: 786-787.
- Eshra, E. (2004): Studies on terrestrial mollusks at some Governorates of west Delta with species reference to its integrated management. Ph.D. Thesis Fac. Agric. Al-Azhar Univ.
- Godan, D. (1983): Pest slugs and snails biology and control (1-165) Springer. Verlag Berlin. Heidelberg New York.
- Hegab, A.M.; Ghamry, E.M. el-Massry, S.A.A. and Hassan, Afafa I. (1999): Ecological studies on certain land snails in some localities at Sharkia Governorate Zagazig J. Agric. Res., 29: 787-795.
- Metwally, A.M., Zedan, H.A., El-Saeid, A.B. & El-Akra T.M.M.(2002): Ecological studies 2nd On, certain land snails in Monofia & Gharbia Governorate International Conference, Plant Protection Research Institute, Cairo, Egypt: 65-79.
- Radwan, M.A (1993): A technique for testing the efficacy of molluscicidal baits against land snails. Comi and Deve. Res. 43:17-26.
- 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.
- Shetaia, S.Z.S. (2010): Mechanical and cultural control methods for land snail *Monacha cartusiana* (Müller) inhabiting some orchards at Sharkia Governorate. J. Plant Prot. and Path., Mansoura Univ., 11: 869-875.

تأثير بعض الاجراءات الوقائية ضمن برامج مكافحة المتكامله لأنواع القواقع الأرضيه المتواجده لتجنب استخدام المبيدات بحدائق برتقال مركز طنطا محافظه الغربيه

احمد محمد رزق، يونس احمد عيسي ، ياسر محمد عبد القوى عبد الجليل ومحمد ابراهيم عبد العظيم
معهد بحوث وقايه النباتات - مركز البحوث الزراعيه- دقى - جيزة

الملخص

لتأجيل أو منع استخدام الطرق الكيميائية ضد أنواع القواقع تم بعض الإجراءات الوقائية مثل الجمع اليدوي والعمليات الزراعية ووضع المصائد كل ٥ شجرات في حدائق البرتقال في مركز طنطا محافظة الغربية وكذلك استخدام هذه الإجراءات متتالية بعد حصر الأنواع وتحديد كثافتها. أظهرت النتائج أن الأنواع السائدة خلال عامي ٢٠١٥-٢٠١٦ هي قواقع الحدائق البنى *E. vermiculata* وقواقع الحدائق الصغير *T. pisana* وقواقع اليرسيم الزجاجي *M. cartusinna* في حدائق البرتقال حيث كانت أعلى كثافة لقواقع *E. vermiculata* ثم *T. pisana* و *M. cartusiana*. ولقد سجلت أعلى كثافة لقواقع *E. vermiculata* وقواقع *T. pisana* خلال فصل الخريف وأقل كثافة كانت خلال شهر الصيف بينما كانت أعلى كثافة لـ *M. cartusiana* خلال فصل الصيف وأقل كثافة خلال الشتاء. ولقد كان وضع المصائد كل ٥ شجرات الأكثر فاعلية حيث كان معدل تراجع إعداد القواقع ٥٥% و ٥١,٣% و ٤٨,٩% لكل نوع على الترتيب من استخدام الجمع اليدوي أو تنفيذ للعمليات الزراعية حيث كان معدل التراجع (٣١,٢% و ١١,٣%) و (٣٣% و ١٤%) لكل من قواقع *T. pisana* و *M. cartusiana* على الترتيب. وباستخدام هذه الإجراءات بالتتابع خلال سنة تراجع تعداد الأنواع إلى ٧٢% ، ٦٩,٤% ، ٧٤,٢% لكل نوع على الترتيب مقارنة باستخدام مبيد القواقع الميتالدهيد ٢% على شكل طعوم حيث كان معدل التراجع في الإعداد ٧٣,٢% ، ٧٦,٤% و ٧٣,٤% على الترتيب. ولذلك يمكن استخدام هذه الإجراءات لوقاية متعاقبة ضمن برامج مكافحة المتكامله لتجنب استخدام المبيدات ضد قواقع *E. vermiculata* وقواقع *T. pisana* وقواقع *M. cartusiana* في حدائق أشجار البرتقال.

Table 1. Average density of land snails species infested orange orchard in Tanta District Gharbiya Governorate.

Species months	<i>E. vermiculata</i>			<i>M. cartusiana</i>			<i>T. pisana</i>			Total
	2015	2016	Average	2015	2016	Average	2015	2016	Average	
Jul.	67	48	57.5	54	47	50.5	41	36	38.5	293
Aug.	69	72	70.5	74	72	73	45	33	39	365
Sep.	65	70	67.5	31	52	41.5	37	39	38	294
Summer	201	190	195.5	150	171	60.5	123	188	155.5	1023
Oct.	80	63	71.5	35	34	34.5	37	32	34.5	281
Nov.	67	63	65	37	41	39	34	37	35.5	279
Dec.	54	58	56	41	41	41	35	39	37	268
Fall	201	184	192.5	113	116	114.5	106	108	107	828
Jan.	72	57	64.5	45	35	40	40	37	38.5	286
Feb.	45	77	61.5	34	53	43.5	46	41	43.5	297
Mar.	81	85	83	44	41	42.5	46	49	47.5	346
winter	228	219	224	123	129	126	132	127	129.5	959
Apr.	91	66	78.5	49	45	47	60	50	55	361
May	88	68	78	51	50	50.5	63	93	78	413
Jun.	82	78	80	54	53	53.5	45	47	46	359
Spring	261	212	236.5	154	148	151	168	190	179	1133
Total	891	806	848.5	540	564	552	652	613	632.5	2033
average	222.8	201.5	212.2	135	141	138	163	153.3	158	508.3

Table 2. Effect of hand collection on land snail's population.

Population Land Snails species	Numbers of snails species				Population reduction %
	Untreated area	Treated area			
		Before treat	After treat		
<i>T. pisana</i>	120	134	89	33%	
<i>M. cartusiana</i>	173	154	108	29.7%	
<i>E. vermiculata</i>	192	185	127	31.2%	

Table 3. Effect of service tree operation on land snail's population.

Population Land Snails species	Numbers of land snails species				Population reduction %
	Untreated area	Treated area			
		Before treat	After treat		
<i>T. pisana</i>	123	130	111	14.6%	
<i>M. cartusiana</i>	102	97	84	13.4%	
<i>E. vermiculata</i>	140	133	118	11.3%	

Table 4. Effect of two distances setting attractive traps on land snail's population.

Population Snail species	Numbers of land snails species						
	Untreated area	Treatment each 5 trees			Treatment each 10 trees		
<i>T. pisana</i>	154	127	62	51.3	123	87	29.3
<i>M. cartusiana</i>	130	111	57	48.9	112	80	28.6
<i>E. vermiculata</i>	175	180	81	55%	140	195	3.2%

Table 5. Effect of use integrated pest management program and metaldehyde bait 2% against land snail's species.

Population Land Snails species	Numbers of snails species				
	Untreated area	Treated area		Reduction % with (I.P.M)	Reduction % With metaldehyde
		Before	After		
<i>T. pisana</i>	113	121	37	69.4	76.7
<i>M. cartusiana</i>	130	136	38	72	73.4
<i>E. vermiculata</i>	147	163	42	74.2	73.2