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**Evaluation of some environmentally safe methods for controlling common land snail species at Kafr El-Sheikh Governorate**  
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**Abstract:**

Several experiment under field condition were conducted to study some safe methods for population management of common land snail species on guava trees .During 2017 and 2018 land snail species were surveyed in guava orchard and some cultural and mechanical methods were evaluated against land snails in Sedy Salem district, Kafr El-Sheikh Governorate, *Monacha cantiana* (Montague) (Gastropoda: Hygromiidae) and *Cochlicella acuta* (Müller) (Gastropoda: Cochlicellidae) snails a dominant species on guava orchard and *M.cantiana* recorded the highest density then *C. acuta* .Through spring *M.cantiana* recorded 281.0 and 319.0 during while *C. acuta* recorded lowest density 171.0 and 202.0 animal during winter in two seasons. Controlling these species under field conditions by using some safety methods to avoid chemical control by applied soil ploughing process as agricultural control and using barriers as attractive baits and circles lime as a mechanical control. Results revealed that , soil ploughing process gave the highest reduction percentages where recorded decreasing in population from first day of application (82.7 and 70.6% ) , ( 82.2 and 72.0 % ) , (81.4 and 47.4%) , (58.9 and 46.4%) and (55.7 and 29.3% ) for *M. cantiana* and *C. acuta* and (69.0 and 32.6 % ) , (68.1 and 43.1%) ,(62,1 and 44.0 %) and (63.6 and 47.0 %) and (53.9 and 39.0 %) during two season 2017 and 2018. The applied of certain barriers as attractive baits and circles lime was more effective in reducing population where gave general mean(62.8 and 47.4 % ) for circle lime and ( 44.2 and 47,6 %) for attractive baits during two seasons , respectively . Generally, it could be recommended that soil ploughing processes as cultural control method gave high reduction in population density of land snail pests .

**Introduction**

Terrestrial molluscus has been become one of the most serious pests in different localities especially north Delta region . In addition to some gastropod are intermediate hosts for many parasitic worms investing man

and his domestic animals ( Godan,1983). In recent years terrestrial molluscus has been most serious pests years, terrestrial snails have increased rapidly in all crops causing economic damage in field crops ,vegetables

as well as horticultural crops. In Egypt ,land snails were detected in different governorate attacking many economic crops. For instance , *Helicella vestalis* ( Pfeiffer), *Monacha cantiana* (Montague) (Gastropoda: Hygromiidae) and *Theba pisana* (Müller) (Gastropoda: Helicidae) were most injurious in Egypt (Kassab and Daoud,1964). On the other hand, many authors surveyed land snail species at Kafr El-Sheikh Governorate and reclaimed lands at northern regions of Egypt ( Hashem *et al.*,1992; 1993a , b; Shahawy,1998 and Abd El-Karim, 2000) . They found different species of land snails on orchards , vegetables , ornamentals and field crops and it caused great damage crops , so control of these pests by safety methods to avoid environmental contamination was necessary .Roughly ploughed soil before sowing seeds was decreased the damage of seeds caused snails (Wouters,1970). Recent studies indicated that the snails , *M. cantiana* and *Cochlicella acuta* (Müller) (Gastropoda: Cochlicellidae) is the most abundant snails in all localities at Kafr El-Sheikh governorate. Therefore, we need applied some methods to control these pests. The present work was carried out to throw light on efficacy of some cultural and mechanical methods to decrease the population of snail species on guava trees during spring 2017 and 2018.

## Materials and methods

### 1. Survey and population densities of land snail species:

Monthly snail samples collected early morning from guava trees orchards through 2017 and 2018 in Abu Abdall village ,Sedy Salem district ,Kafr El-Sheikh Governorate .Ten trees were randomly chosen and marked as permanent sampling sites then snails collected from one meter around chosen trees 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 Godan (1983) .

### 2. Effect of soil ploughing process :

Six kirat cultivated with Guava trees at Abu-Abdalla village ,Sedy Salem district ,Kafr El-Sheikh Governorate during 2017 and 2018 seasons ,were chosen to estimate the efficacy of ploughing soil beside and under trees on the population of *M. cantiana* and *C. acuta* land snail species . In this respect ,three kirats were subjected to ploughing using hydrolic plough machine tractive by tractor at depth of 25-30 cm under soil under . On the other hand , the three kirats were left without plowing . five trees in both of plowing and unplowing were chosen . The population density of snails were recorded in area of 50x50 cm under chosen ten trees from each karate in both of plowing and un plowing areas before plowing and the first day after plowing then the count was continued weekly for six weeks ( during the period from April 13<sup>th</sup> till May 26<sup>th</sup> to first season 2017 and from 10<sup>th</sup> April to 24<sup>th</sup> May to second season after plowing ) . The percentage of reduction in population density of land snail species were calculated using formula of Handerson and Tilton (1955).

### 3.Effect of attractive bait barriers and circle lime :

The effect of attractive baits and circle lime in reducing population density of *M. cantiana* and *C.acuta* snails infesting guava trees were study during April and May in two seasons .This study was carried out in guava orchards highly infested ,an area of about half feddan was chosen for this study .Two types of barriers were used , the first consists of attractive baits and the second from lime .The circles from attractive baits and lime were put around trees trunks on ground ,five replicates to each treatment were chosen and five trees left without any treatment as a control .All snails on trees and leaves were recorded before application. The population were counted before application and in 1 , 7 ,14 ,21 and 28 days after applied . Percent of reduction of snails were calculated according to the formula of Handerson and Tilton (1955)

## Results and discussion

### 1. Population density of land snail species:

For two years 2017 and 2018 snail survey, defined and the number movement were recorded, and this survey showed that , two species of snails were found in the treated orchard , *M. cantiana* and *C. acuta* . The population density through the year monthly summarized in Table (1) and the obtained data cleared that *M. cantiana* recorded the highest number through May in two years 2017 and 2018 , respectively and the average density was 81 snails in Jun. The lowest average was 58.5 snail in December . The density of *C. acuta* reached maximum

through Apr. 96.0 snail in 2017 and 94.0 snail during May in 2018 (average were 108 snail ) then recorded the minimum number 54.0 snail in Dec. and 56.0 animal in Oct.( average number 58.0 animals in Dec. ,to each year respectively .Eshra (2004) found that, *Eobania vermiculata* (Müller) (Gastropoda: Helicidae), *T. pisana* , *H.vestalis* and *C. acuta* recorded the highest population during spring and summer in Jun , July and August on orange ,banana, guava and grape trees investigated area in Alexandria and El-Beheira Governorates through 1999 and 2000.

**Table (1) : Average density of land snail species infested guava orchard in Sedy Salem district ,Kafr El-Sheikh Governorate .**

Species Months	<i>Monacha cantiana</i>			<i>Cochlicella acuta</i>			Total
	2017	2018	Average	2017	2018	average	
Dec.	62	53	57.5	54	62	85	231
Jan.	58	66	62	60	74	67	258
Feb.	60	89	74.5	57	66	61.5	272
Winter	180	208	194	171	202	186.5	761
Mar.	69	83	76	91	125	108	368
Apr.	94	124	109	96	90	93	404
May	118	112	115	78	94	86	402
Spring	281	319	300	265	309	287	1174
Jun.	93	69	81	68	70	69	300
Jul.	69	74	71.5	54	62	58	259
Sept.	74	91	82.5	80	59	69.5	304
Summer	236	234	235	202	191	196.5	863
Oct.	86	69	120.5	80	56	68	291
Nov.	62	98	80	72	69	70.5	301
Dec.	54	63	58.5	70	62	66	249
Autumn	202	230	259	222	187	204.5	831
Total	899	991	988	860	889	874	3639
Average	224.8	427.8	247	215	222.3	218.5	909.8

### 2. Effect of soil ploughing process on reducing population snail species on guava trees :

The ploughing process is one of the most cultural method control of land snails specially during spring seasons where all snails reached their maximum activities . Data in Tables (2 and 3) showed that the soil ploughing process decreased the individuals of *M.cantiana* and *C.acuta* from the first day post treatment from (96.0 and 51.7 snail to16.6 and 15.6 snail/m<sup>2</sup> with reduction of 82.7 and 70.6% , respectively After 7 days

post treatment .The numbers of individual was decreased to ( 81.0 and 43.2 recording reduction 82.2 and 72.0 % ) in the first season 2017. Also, population of snails decreased from (102.0 to 31.0 individual recording 69.6% reduction for *M.cantiana* and 89.0 to 60.0 individuals with 32.6 %reduction for *C.acuta* . The present reduction was decreased after 21 and 28 day post treatment in two seasons , where recorded 58.9 and 55.7 for *M.cantiana* in first season , 63.6 and 53.9 in second season and recorded 46.4 and 29.3 in first season and

47.0 and 39.0 in second season for *C.acuta* , respectively .Generally , It is concluded that, the ploughing process was the simplest and effective method for reducing the numbers of common snail species during spring season .These results agree with those obtained by Wouters (1970) , who mentioned that,

**Table (2): Effect of ploughing soil process on reducing of *Monacha cantiana* and *Cochlicella acuta* snails infesting guava trees in Sedy Salem district ,Kafr El-Sheikh Governorate during spring 2017.**

Days after ploughing	Mean number of snails							
	Untreated area		Treated area		% Reduction		L.S.D 0.05	
	<i>Monacha cantiana</i>	<i>Cochlicella acuta</i>	<i>Monacha cantiana</i>	<i>Cochlicella acuta</i>	<i>Monacha cantiana</i>	<i>Cochlicella acuta</i>	<i>Monacha cantiana</i>	<i>Cochlicella acuta</i>
1	102.0	89.0	31.0	60.0	69.6	32.6	15.5	8.8
7	91.0	102.0	29.0	58.0	68.1	43.1	9.2	10.1
14	95.0	116.0	35.0	65.0	62.1	44.0	10.0	10.8
21	98.0	96.0	35.6	51.0	63.6	47.0	10.9	17.9
28	89.0	103.0	41.0	63.0	53.9	39.0	17.9	9.2
Total	475.0	506.0	172.6	297.0	317.3	205.7		
Mean	95.0	101.2	101.2	59.4	63.5	41.1		

**Table(3):Effect of soil ploughing process on reducing population of *Monacha cantiana* and *Cochlicella acuta* snails infesting guava trees in Sedy Salem district , Kafr El-Sheikh Governorate during spring 2018.**

Days after ploughing	Mean number of snails							
	Untreated area		Treated area		% Reduction		L.S.D. 0.05	
	<i>Monacha cantiana</i>	<i>Cochlicella acuta</i>	<i>Monacha cantiana</i>	<i>Cochlicella acuta</i>	<i>Monacha cantiana</i>	<i>Cochlicella acuta</i>	<i>Monacha cantiana</i>	<i>Cochlicella acuta</i>
1	96.0	51.7	16.6	15.6	82.7	70.6	10.4	16.9
7	81.0	43.2	14.4	12.1	82.2	72.0	6.8	12.3
14	83.0	36.4	15.4	19.0	81.4	47.4	7.0	7.0
21	72.0	31.7	29.6	17.0	58.9	46.4	10.2	17.3
28	70.0	39.6	31.0	28.0	55.7	29.3	10.4	9.0
Total	402.0	202.4	106.0	91.3	360.9	266.9		
Mean	80.4	41.0	21.2	18.3	72.2	53.4		

### 3. Effect of attractive baits barriers and circles lime :

The effect of certain barriers as a bait barriers and lime circle as a mechanical method was studied in reducing population density of snail species infesting guava trees during March and April in two season 2017 and 2018. Data in Table (4) showed that the attractive baits were the most effective on reducing population of snail species compared with the live lime circle. The attractive baits barriers were recorded percentage reduction (75.1 , 57.8 , 44.6 , 34.5

roughly ploughed soil before sowing seeds of winter weather protected seeds from damage caused by land snails. Salem *et al.* (2007) mentioned that the ploughing process decreased the population of *H. vestalis* after one day with reduction 87.8 % , that was increased to 91.6 % after two weeks .

and 8.1% after 1 ,7 ,14 ,21 and 28 , respectively .The live lime circles were recorded percentage reduction , 86.4 ,81.4 ,63.5 ,50.2 and 32.4% , respectively , during 2017 ,while the attractive baits barriers were recorded reduction 74.0 ,51.8 ,42.4 ,38.5 and 31.4% and the live lime circles recorded reduction 63.0 ,58.0 ,45.0 , 36.0 and 35.0% after 1 ,7, 14, 21 and 28 day, respectively. Regarding general mean percentage reduction were 47.6 and 47.4% for two tested methods , respectively during 2018 (Table,5) . These results were agreement with those reported

by many authors. Godan (1983) recorded that , dehydrating substances as protective barriers , such as cattle salt , caustic soda , kainite or completely dry quick lime can act as a barrier. The same author mentioned for slugs, a ridge of finely ground lime around seed beds but moist air is enough to slake the lime and make it effective . Nakhla (1995)

illustrated that, a band of metal sheets around trees trunk such as aluminum sheet, copper sheet wire screen gauze (14 mesh)and fiber cord for protect orchard trees from different land snails .The wire screen rings gave the highest protection followed by copper sheet rings, while aluminum sheet rings gave poor protection.

**Table (4) : Effect of certain barriers as a mechanical control method on *Monacha cantiana* and *Cochlicella acuta* snails infesting guava trees in Sedy Salem district ,Kafr El-Sheikh Governorate during spring 2017.**

Days after treatment	No. of snails in untreated areas	Mean number of snails in treated areas and reduction percentage			
		Attractive baits		Circle time	
		Mean	Reduction%	Mean	Reduction%
1	40.4	10.2	75.1	5.4	86.4
7	40.2	17.2	57.8	7.4	81.4
14	38.8	21.8	44.6	14	63.5
21	38.2	25.4	34.5	18.8	50.2
28	39.8	31.9	8.1	26.8	32.4
<b>Total</b>	196.4	106.5	220.1	72.4	313.9
<b>Mean</b>	39.4	21.3	44.2	14.5	62.8

**Table (5): Effect of certain barriers as a mechanical control method on *Monacha cantiana* and *Cochlicella acuta* snails infesting guava trees in Sedy Salem district ,Kafr El-Sheikh Governorate spring 2018 .**

Days after treatment	No. of snails in untreated areas 43.1	Mean number of snails in treated areas and reduction percentage			
		Attractive bait		Circle time	
		Mean 41	Reduction%	Mean 43	Reduction%
1	42.0	7.3	74.0	15.0	63
7	42.3	13	51.8	18.0	58
14	36.7	19.2	42.4	23.2	45
21	35.2	28.6	38.5	25.0	36
28	38.6	23.2	31.4	27.6	35
<b>Total</b>	194.8	91.3	238.1	108.2	237.0
<b>Mean</b>	39.0	18.3	47.6	21.6	47.4

### References

**Abd El-Karim, N. (2000):** Ecological and biological studies on some terrestrial African agricultural snail pests . M.Sc. Thesis Inst. of African. Res. Cairo University.

**Awad, M.H.(1994):** Studies on agricultural mollusks at Domiat Governorate M.Sc. Thesis ,Fac. Agri. Mansoura University.

**Eshra , E.(2004):** Studies on terrestrial mollusks at some Governorate s of west Delta with species referenced its

integrated management . Ph. D. Thesis Fac. Agric. Al-Azhr University.

**Godan (1983):** Pest slugs and snails, Biology and control, Fedral biological Res. Center of Agric. And forest Konigin Luisestrabe 19D-400 Berlin (113),(110).

**Handerson, G.F. and Tilton, E.W. (1955):** Test with acarides against the brown wheat mite. J. Econ. Entomol.,48:157-161.

**Hashem ,A.G; Nakhla ,J.M. and Tadros, A.W. (1993a):** Monitoring land snails on sweet orange trees in Behira

Governorate .Zagazig . J. Agric. Res.,  
20(24):691-698.

**Hashem ,A.G; Nakhla, J.M. and Tadrose ,A.W. (1993b):** population dynamics of the land snails in Banana orchards at Behira Governorate. Alex Sci.Exch.,14(3):373-390.

**Hashem ,A.G; Nakhla, J.M. and Tadrose, A.W.(1992):** Seasonal fluctuations in population of the land snails on citrus in the northern reclaimed lands .Al-Azhar . J. Agric .Res ., (16):325-340.

**Kassab, A. and Daoud, H. (1964):** Notes on the biology and control of land snail of economic importance in the U.A.R. Journal of Agricultural Research Review, Cairo, 42: 66-98.

**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. ; Ibrahim, M.H. and Abd El-Aal, S.M.(2007):** Different control measures for controlling certain land snails in Sharkia Governorate. Zagazig J. Agric. Res., 34 (2) :291-305.

**Shahawy, W. A. (1998):** Ecological studies and some control methods for land snail *Monacha cantiana* (Montagu) at Kafr El-Sheikh Governorate. M. Sc. Thesis, Fac. Agric. Kafr El-Sheikh, Tanta University.

**Wouters, L. (1970):** Schneckenbc Kampfungin oostflevoland pflamzen .Schutz .Nachhhhhhr, Bayer, 23:173-177.