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Estimation of damage and losses caused by different species of snails on certain crops at Kafr El-Sheikh Governorate

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Abstract:

Different land snail species caused many problems to most of the economic plants. The presented study was carried out to estimate damage and losses caused by *Monacha cantiana* (Montagu) (Gastropoda: Hygromiidae) , *Eobania vermiculata* (Müller) (Gastropoda:Helicidae),*Succinea putries* (Gastropoda: Succineidae) and *Thipa pisana* (Müller) (Gastropoda:Helicidae) on Egyptian clover and some vegetable crops and fruits trees in Kafr El-Sheikh Governorate during the period from October 2019 to September 2020 seasons. Results revealed that, the main Reduction weight in clover plants by different levels of *Monacha cantiana* snails during spring 2021 were (76.3 , 45.5 , 47.5) for *M. cantiana* snails ,and (86.4 , 74.7 , 90.0) for *S. putris* snails in first ,second and third cut, respectively and loss percentages caused by artificial infesting levels ,i.e:10,15,20,25 snail /level , beside control (Without infection) in first ,second and third cut were (60.5 ,64.0 ,68.4, 74.6 %), (57.1 , 60.0 ,69.4 ,74.2 %) , (64.1 ,73.4 , 81.3 , 78.1 %) for *M.cantiana* and (52.3 , 60.2 , 64.1 , 74.6 %) , (60.9 , 62.2 , 63.1 , 65 .7 %) ,(61.9 , 64.3 , 70.0 , 73.0 %) for *S. putris* snails ,respectively . On the other hand, *M. cantiana* and *T. pisana* caused damage in leaves of sweet orange and mandarin , percentage of reduction were 21.6 and 17.0%, respectively, *E. vermiculata* and *T.pisana* caused 9.3 % damage in apple leaves, while *M. cantiana* and *T.pisana* were caused loss percentages 18.7, 14.7 and 9,0 % for lettuce, cabbage leaves, and cucumber fruits, respectively.

Introduction

In Egypt, land snails become very important pests of many fruits, vegetables, field crops, and ornamental plants Different species of terrestrial molluscs in different localities in the Delta region have become one of the most pests. These species cause damage to the majority of field crops, vegetables and fruit crops (Ismail,1997). Resulting in a serious reduction in yield production of attacked crops (Kassab and Daoued, 1964; Bishara *et al*., 1968; El-Okda,1984, El-Deeb *et al* ., 1996 , Asran,1999; Abd-El-Aal, 2001; Zedan *et al* ., 2005 and Abd-El-Maboud, 2008) .

The more succulent raw leafy vegetables, fruits, and buds were extraordinarily attacked in addition to lower damage when land mollusca

became abundant. These land mollusca leaves unpleasant tracks on the injured parts (El-Okda, 1980).

The present work aims to throw light on the situation and size damage of terrestrial gastropoda pests in the Northern and Eastern Delta regions.

Materials and methods

The ecological studies of land snails were conducted under field conditions at Abu-Abdalla village – Sedy Salem district, Kafr El-Sheikh Governorate. In this respect, new plantations of field crops such as Egyptian clover (*Trifolume alexandrinum*) , horticultural crops as sweet orange (*Citruce singensis*) , mandarin (*citruce clementine*) and apple (*Malus domistica)* in addition to vegetable crops as cabbage (*Brassica oleracea* var.*capitata*) , lettuce (*Lactuca sativa*) and cucumber (*Cucumis sativus)* were chosen to estimate the damage under field conditions were run as the following :

1. Damage estimation in Egyptian clover:

During 2021 spring season, field experiments were carried out to estimate the damage caused by *Monacha cantiana* (Montagu) (Gastropoda: Hygromiidae) and *Succinea putries* (Gastropoda: Succineidae) on Egyptian clover *(Trifolium alexandrinum)* at Abu-Abdala village. The area of (3 x3 m) was cultivated with clover, forty days after germination, and when plants were about 20 cm in length, they were reduced to 20 plants of almost similar size, six groups were caged with wire box (30 cm wide x 30 cm length x 50 cm high). The soil under cages was cleaned carefully from grass, snails, and snail clutches to obtain free –snail plants. The artificial infestation was induced with four levels of adult *M. cantiana* and *S. putris* (i.e.,10, 15, 20, and 25 adults), in addition to the cage was used as a check control unit without snails. Each treatment was replicated 3 times. One month after infestation, fresh weight of shoots (First cut) was detected, this procedure was repeated two times after one month of cutting reduction percentage of fresh weight was calculated using the formula:

$$\text{Damage \%} = \frac{\text{A.W. Control} - \text{A.W. Infestation}}{\text{A.W. Control}} \times 100$$

A.W. Control = Average weight of Control
A.W. Infestation = Average weight of Infestation

2. Damage estimation on different fruit trees:

The experiments were carried out in Sedy Salem district in one feddan orchard area cultivated with sweet orange, mandarin, and apple trees. Ten trees were randomly chosen to estimate leaves damage due to *M. cantiana* , *Thipa pisana* (Müller) (Gastropoda:Helicidae) and *Eobania vermiculata* (Müller) (Gastropoda:Helicidae) snails .Each tree was divided into three parts, top middle, and bottom. Twenty leaves were randomly chosen and collected from each part and transported to the laboratory. The whole leaf and whole damage area were estimated and damage percentages were calculated according to the equation adopted by El-Deeb *et al.* (1985):

$$\text{Damage \%} = \frac{\text{Area damage leaf surface}}{\text{Whole area of leaf}} \times 100$$

3. Damage estimation on a different vegetable:

To estimate the damage caused by different species of snails in lettuce and cabbage, half karate cultivated with lettuce, cabbage and cucumber were chosen and divided into plots, ten leaves from each plot randomly were chosen, while cucumber fruits, 100 fruit were collected randomly. The damage caused by snails on fruits was considered a loss. Each treatment was repeated three times. Total area /leaf in

addition to eating areas by snails were determined by planimeter apparatus. In the case of cucumber fruits, percent damage was calculated using the following formula with slight modification, El-Deeb *et al.* (1990) :

$$\text{Damage \%} = \frac{\text{Total number of rasped fruits}}{\text{Total number of investigated fruits}} \times 100$$

Results and discussion

1. Estimation of damage caused by certain land snail species to different host plants:

Damage caused by *M. cantiana* , *S. putris* ,*T. pisana* and *E. vermiculata* against different hosts was estimated . Data in Table (1) show that infestation of Egyptian clover plants with different levels of *M.cantiana* and *S. putris* reduced clover fresh weight of variable values of reduction . At 10 snails damage levels were 60.5, 57.1 and 64.0 % at first cut, second and third cutting, respectively.

These values were gradually increased with the increase of infestation level to reach 74.6 ,74.3, and 78.1 % for 25 snail level at first, second and third cutting, respectively. Average reduction rates were 66.9, 56.2, and 74.2 % at 10 ,15 ,20 and 25 snails /20 plants levels of infestation during the three cutting. Data in Table (2) show the reduction in Egyptian clover weight resulting from different infestation levels of *S. putris* . At 10 snails level, % reduction in fresh weight were 52.3, 60.9, and 61.9 % at first second and third cutting respectively. When the infestation increased to 25 snail/20 plant, %reduction in fresh shoots weight reached 74.6, 65.7 and 78.o % and at first, second and third cutting, respectively.

From previous results, reduction caused by different levels in the two snail species infestation was changed from cutting to another. So, it increased in the first cut at any level of infestation whereas on average respectively, percent of reduction values caused by all levels of infestation at the first, second, and third cuttings were 66.9, 56.2, and 74.2 % for *M. cantiana* , 62.9, 63.0 and 68.0 % for *S.putris* .

It is interesting to mention that the percentage of weight reduction of clover plants was higher in the third cutting compared to the other two cuttings. Zedan *et al.* (2005) found the mean reduction caused by *M. cartusiana* in fresh weight of shoots for three cutting of Egyptian clover were 38.22, 33.59 and 35.12 %and the general mean losses were 35.65 % while losses percentages were 10.9, 14.2 and 17.25 % in leaves of mandarin, cabbage and lettuce crops, respectively. Metwally *et al*. (2018) show, that the mean reduction caused by *Monacha* spp. in fresh weight of shoots for the cuttings of Egyptian clover were 24.15,9.09, and 16.185 %, respectively, and the general mean loss was 16.476 %.

Table (1) : Reduction weight in clover plants by different levels of *Monacha cantiana* snails during spring 2021.

Level of infestation	First cut			Second cut			Third cut			Average			L.S.D 0.05
	Weight	Reduction	% Reduction	Weight	Reduction	% Reduction	Weight	Reduction	% Reduction	Weight	Reduction	% Reduction	
10 snails	45	69	60.5	30	40.0	57.1	23.0	41	64.0	33.0	50.0	60.5	12.1
15 snails	41	73.0	64.0	8	42.0	60.0	17.0	47.0	73.4	29.0	54.0	65.8	6.7
20 snails	36	8.0	68.4	22	48.0	69 .4	12.0	52.0	81.3	23.3	59.3	73.0	9.8
25 snails	29	85.0	4.6	18	52.0	74.3	14.0	50.0	78.1	20.3	62.3	75.7	7.2
Control	114			70			64.0						
Mean		76.3	66.9		45.5	56.2		47.5	74.2				

Table (2): Reduction weight in clover plants by different levels of *Succinea putris* snails during spring 2021.

Level of infestation	First cut			Second cut			Third cut			Average			L.S.D 0.05
	Weight	Reduction	% Reduction	Weight	Reduction	% Reduction	Weight	Reduction	% Reduction	Weight	Reduction	% Reduction	
10 snails	65.8	72,2	52.3	50.2	76.4	60.9	48.0	78.0	61.9	54.8	76.0	58.4	9.8
15 snails	55.8	82.2	60.2	48.0	79.0	62.2	45.0	81.0	64.3	49.6	86.0	62.3	10.1
20 snails	49.6	88.4	64.1	46.8	80.2	63.1	38.0	88.0	70.0	44.8	35.3	65.7	12.3
25 snails	35	103	74.6	43.2	83.2	65.7	28.0	98.0	78.0	35.6	94.7	73.0	7.16
Control	138			127			126						
Mean		86.4	62.9		79.7	63.0		9.0	68.0				

2. Damage and losses estimation in different fruits and vegetable crops:

Data in Table (3) revealed that *T. pisana* and *M. cantiana* snails caused a loss in leaves of sweet orange trees 21.6 % and 17.0 % to mandarin leaves, while *E. vermiculata* snails on apple induced 9.3 % damage to leaves. On the other hand, Data in Table (4) showed that, *M. cantiana* and *T. pisana* snails were responsible of the damage in cucumber fruits 9.0 % while 21.6 % in lettuce leaves. Also, the snails acted 17.2 % loss in cabbage leaves at Sedy Salem district. Asran (1999) recorded that, the attack by *Helix aspersa* Müller snails caused a slight damage to fruit leaves. The highest damage of snails was recorded in navel orange 9.3% followed by sour orange 8.4%, mandarin 7.3%, while the lowest were recorded on the leaves of seedless grape and pear, i.e 5.64 and 5.1 %, respectively.

Table (3) : Damage caused by certain land snails for different fruits crops.

Snail species	Plant hosts	Total area leaf (cm^2)	Damage area (cm^2)	%Reduction
Monacha cantiana Theba pisana	Sweet orange	22.16	4.78	21.6
Monacha cantiana Theba pisana	Mandarin	18.6	3.16	17.0
Eobania vermiculata Monacha cantiana Theba pithana	Apple leaves	33.6	3.12	9.3

Table (4) : Damage caused by *Monacha cantiana* and *Thipa pisana* snails for certain vegetable crops under field conditions.

Vegetable crops	Plant part	Total area /leaf (cm2)	Damage area (cm2)	% Reduction
Lettuce leaves	Leaves	15.7	2.9	18.7
Cabbage leaves	Leaves	56.4	8.3	14.7
Cucumber fruits	Leaves	10.0	0.9	9.0

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