ECOLOGY OF SOME TERRESTRIAL MOLLUSCS IN SHARKIA AND ISMAILIA GOVERNORATE

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Abstract

Field studies were carried out to survey, population density and importance value of terrestrial molluscs infesting some vegetable and field crops . Survey studies revealed that five species were found infesting different crops in Ismailia and Sharkia governorate. These species were *Monacha cartusiana*, *Cochlicella acuta*, *Succinea putris*, *Deroceras leave* and *Deroceras reticulatum,***.**The last species was recorded for the first time in Ismailia governorate. Population density were counted on host plants at three districts of Sharkia and Ismailia governorate during two successive growing seasons February to May 2008 and 2009 respectively. Generally, It is clear that the glassy clover snail *M. cartusiana* was the predominant species on field and vegetable crops. On the other hand population density of land snails differed from host plant to another and also from locality to another. Finally,. The land snail species can be arranged descedingly according to its importance values at Sharkia and Ismailia as follows: *M. cartusiana > S. putris > D. reticulatum* and *M. cartusiana > S. putris > D. reticulatum> D. leave> C. acuta,* respectively.

INTRODUCTION

Terrestrial molluscs has been become one of the most serious pests in different localities especially north and east delta region. In addition, some gastropods work as intermediate hosts for many parasitic worms infesting man and his domestic animals (Godan, 1983 In recent years, terrestrial snails have increased rapidly in all crops causing economic damage in the field crops, vegetables as well as horticultural crops. In some countries such as in Chile,1984,where find living snails *Cernuella virgata* in a shipment of barely from South Australia.this one rejection cost the Australian Barely Board 13 million A $ In compensation payment (Baker,1989). In Egypt, land snails were detected in different governorate attacking many economic crops. For instances, *H. vestalis, Theba pisana* and *M. cartusiana* were most in jurions in northern Egypt (Kassab and Daoud, 1964), *Monacha* sp. and *Oxychilus* sp. were detected in El- Ismaeilia governorate (El- Okda, 1984). On the other hand many authers surveyed land snails in Sharkia governorate (Ghamry *et al.,*1993, Ismail, 1997, Abdel Aal, 2001,Mahrous *et al*,2002, Arafa,2006 and Lokma, 2007). In Ismailia

Governorate, (Shoeib Maha, 2008). Recorded that *M. cartusiana, E. vermiculata, C. acuta, and H. vestalis, Theba pisana, D. leave and D. reticulatum* were surveyed in certain localities attacking many crops at Ismailia Governorate .The present study was to throw light on identity, population density as well as importance value of terrestrial molluscs at Sharkia and Ismailia governorate.

MATERIALS AND METHODS

1. Survey and population density of terrestrial gastropods in Sharkia and Ismailia governorate.

Survey study of terrestrial snail and slug species attacking numerous host plants, were curried out in some localities at two governorate, Sharkia (Abou-Hammad, Fakous and Mashtool-El Souk) and Ismailia (Ismailia El Balad, El- Kassasin El-Gadida, and Fayed) during two successive growing seasons through the activity period from February to May 2008 and 2009.

Four localities (villages) were chosen as representatives of each district.These localities in districts of Sharkia governorate were El-Kheis, El-Abbasa, El-Gaavaria and El-Qurain (Abou-Hammad), Fakous El-Balad, El-Khattara, Abou-Shalaby and EL-Fadadna (Fakous), and Mashtoul El-Balad, El- Monaier, Kafr Ebrash and El-Sahava(Mashtool –El-Souk) .While localites in distracts of Ismailia governorate were (Om-Azam, Al-Dawawis, El-Koqh and El-Mahsama El-Kadima (El –Kassasin El-Gadida), El-Firdan, El-Wasfia, Abou Atwa and Dabiaya (Ismailia EL-Balad) ,and (Fayed El-Balad, Kasfaryeet, Abou-Soltan and Sarabioum El-Mahata, (Fayed) .Numbers of snails were counted on certain field crops i.e broad bean *Vicia faba*, Egyptian clover, *Trifollium alexandrinum*, maize *Zae mays*, onion *Allium cepa*, wheat, *Triticum aestivum* and vegetable crops i.e. cabbage, *Brassica oleraceae* var. *cabitata*, cucumber *Cucumis sativus*, egg plant, *Solanum melongena*, pepper, *Capsicum annum*, squash C*ucurbita pepo* , strawberry, *Fragaria ananassa*, tomato *Lycopersicon esculentum*, watermelon, *Citrullus vulgaris*, kidney bean, *Phaseolus vulgaris* and taro, *Arum colocasia*.

Samples were taken in early morning by using the quadrated sample size 50 × 50 cm (Staikou and Lazaridou-Dimitriadou 1990). Five randomly samples were taken from each crop in the surveyed localities. All snails and slugs found on plants or on soil surface in the qauadrate were counted.

2. Importance value of the identified gastropods in sharkia and Ismailia governorate.

The total numbers of 360 samples were randomly collected from the examined crops mentioned before in three districts of Sharkia and Ismailia governorate. Samples were conducted in early morning during the activity period started from February to May in 2008 and 2009. Samples were taken in field and vegetable crops according to(Staikou and Lazaridou-Dimitriadou 1990). Ten adult snails collected from each of the surveyed districts were weighed and average biomass for each species was calculated. Absolute and relative frequency occurrence as well as population density were determined according to Norton (1978) as follows:

Absolute frequency occurrence=

$$\frac{\text{Numberof samples containing a species}}{\text{Numberof sample examined}} \times 100$$

Relative frequency occurrence =

$$\frac{\text{Absolute frequency occurrence of species}}{\text{Sum of frequency occurrence of all species}} \times 100$$

Absolute density =

$$\frac{\text{Total number of individuals of species}}{\text{Number of samples containing this species}}$$

Relative density =

$$\frac{\text{Number of individuals of species}}{\text{Sum of individuals of all species}} \times 100$$

Absolute biomass = weight of the snail within its shell

Relative biomass = $\frac{\text{Absolute biomass of species}}{\text{Sum of biomass of all species}} \times 100$

Importance value = Relative frequency + Relative density + Relative biomass.

RESULTS AND DISCUSSION

1. Survey studies of land gastropods in certain districts in Sharkia and Ismailia governorate.

The objective of the present study is to determine land gastropod species occurred in the infested localities of Sharkia and Ismailia governorate. Results revealed in that five species of terrestrial gastropods belonging to different families of order: Stylommatophora, were found in different localities of Sharkia and Ismailia governorate. These families were Hygromiidae, Helicidae, Succineidae and Limicidae.

The family Hygromiidae was presented by the glassy clover snail*, Monacha cartusiana* (Muller), the family Helicidae, conical snail, *Cochlicella acuta* (Muller), the family: succineidae contained, *Succinea putris*, (Linnaeus) while the family: Limicidae included two slug species i.e., the field slug, *Deroceras reticulatum* (Muller) and the Smooth (marsh) slug, *D. leave* (Muller). The infested localities (villages) with land gastropods in 3 districts of Sharkia and Ismailia governorate are the infested Data in Table (1) showed that host plants infested with land moullsc species in tested localities at three districts of Sharkia and Ismailia governorate during two successive seasons 2008 and 2009. It is clear that the glassy clover snail,*Monacha cartusiana* infested most of the examined field and vegetables crops i.e. Egyptian clover, broad bean, wheat, onion, maize and cucumber, egg plant, squash, strawberry, tomato and kidney bean in Sharkia and Ismailia governorate. On the other hand, the amber snail *Succinia putris* was found on broad bean, Egyptian clover, wheat, and onion (field crops) and cabbage, strawberry and tomato (vegetable crops) at Sharkia governorate. Regarding at Ismailia Governorate, the amber snail was found on Egyptian clover and wheat (field crops) and vegetable crops i.e tomato and watermelon. The conical snail *Cochlicella acuta* was detected mainly on Egyptian clover and kidney bean (field crops) and on tomato and kidney bean (vegetable crops) in Kasfaryt, locality, Fayed district, Ismailia governorate.The other identified species were determined with limited occurrence in the inspected localities of Sharkia and Ismailia governorate. For instances, the field slug *Deroceras reticulatum* was detected on Egyptian clover and tomato in El-Sahava village, Mashtool- El-Souk district, Sharkia Governorate. Finally *Deroceras leave* was found on Egyptian clover in El-Mahsama El-Kadima locality,El-Kasassin El-Gdida district and Sarabyoum El-Mahata, Fayed district, Ismailia governorate, while it was found on wheat at Sarabyoum El-Mahata, Fayed district, Ismailia governorate, while it was found on wheat at Om-Azzam,village, El-Ksassin El-Gdida district, Ismailia governorate, and on tomato in Om -Azzam and watermelon in El-Mahsama El-Kadima and El- Kassasin El-Gdida districts, Ismailia governorate ,respectively. It is necessary to mention here that the field slug *Deroceras reticulatum* was recorded for the first time on strawberry and Egyptian clover in El-Mahsama El-Kadima and El-Dabaya (El-Ksasin El-Gadida and Ismailia El-Balad districts), respectively at Ismailia governorate.

An extensive survey was carried out on terrestrial molluscs infesting different crops at 12 localities representing 3 districts belonging to Sharkia and Ismailia Governorate.

Table 1. Terrestrial molluscus species infesting major crops in certain localities at three districts of Ismailia and Sharkhia governorate.

Governorate	Districts	Localities	Field crops					Vegetables crops									
			Broad bean	Egyptian clover	maize	Onion	Wheat	Cabbage	Cucumber	Egg plant	Papper	Squash	Strawberry	Tomato	Water melon	potatos	Kidney bean
Sharkhia	Abou-Hammad	El-Khais	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	-
		El-Abasa	S	S	-	-	-	-	M	-	-	M	-	MS	-	-	-
		El-Gavaria	-	SM	-	-	M	-	-	M	-	-	-	M	-	-	-
		El-qurana	-	SM	-	-	S	-	-	-	-	-	-	-	-	-	-
	Fakous	El-Khataraha	-	M	-	M	M	-	-	-	-	-	-	M	-	-	M
		Abou-Shlaby	M	M	-	M	M	-	-	M	-	-	-	-	-	-	-
		Fakous El-balad	M	-	-	M	M	-	-	-	-	-	-	-	-	-	-
		El-Fdadna	M	MS	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mashtooul –El Souq	Moniuer	-	MS	-	M	-	S	-	-	-	-	-	S	-	-	-
		Kafr-Ebrash	-	M	-	-	-	-	-	-	-	-	-	-	-	-	-
		Mashtooul El-balad	-	M	-	M	M	-	-	-	-	-	-	-	-	-	-
		El-Sahava	-	MSD_2	-	S	SM	-	-	-	-	-	MS	MSD_2	-	M	M
Ismailia	El-Ksasin –ElGdida	Om-Azam	-	M	-	-	D_1M	-	-	-	-	-	D_1M	M	-	-	-
		Al-Dawawis	-	MS	-	-	S	-	-	-	-	-	-	-	-	-	-
		El-Qoua	-	MS	-	-	MS	-	-	-	-	-	-	-	M	-	-
		El-Mahsama El-Kadima	-	MSD_1	-	-	M	-	-	-	-	-	D_2M	MS	MSD_1	-	-
	Ismailia	El-Firdan	-	M	-	-	-	-	-	-	-	M	M	-	-	-	-
		El-wasfia	-	MS	-	-	-	-	-	-	-	-	-	-	-	-	-
		Abou atwa	M	MS	-	-	M	-	-	-	-	-	M	-	-	-	-
		El-Dabaya	-	MD_2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fayed	Kasfaryt	-	MSC	M	-	M	-	-	-	-	-	-	MC	-	-	MC
		Fayed EL-balad	-	MSC	-	-	MS	-	-	M	-	-	-	MS	-	-	-
		Abou-Soltan	-	M	-	M	M	-	-	-	M	-	-	M	-	-	-
		Srabyoum El mahata	-	MSD_1	-	-	M	-	-	-	-	-	M	D_1M	-	-	MD_1

M= *M. cartusiana* **S=** *Succinea* sp. **C =** *C. acuta* **D1 =** *Deroceras leave*

D2 = *Deroceras reticulatum* **- =** No infestation

Data presented in Table (2) revealed that the identified species mentioned previously varied in their incidence and level of infestation according to locality and host plant. It is obvious that *M. artusiana* has the upper one in snails incidence compared to other species, since it was recorded in all surveyed localities.

Moreover, the majority of the examined plants were liable to be infested with this snail. Generally, the listed hosts can be classified according to the degree of infestation into three categories. These categories were, heavy, moderate and light infestation.The majority of the examined field and vegetables crop at Sharkia governorate were found with moderate infestation by *M. cartusiana* especially Egyptian clover in El-Khatarah (Fakous district), Abou Hamad El-balad and Mashtoul El-Balad. On the other hand, wheat, broad bean, onion, tomato, cucumber, squash, cabbage and eggplant were found with light infestation in different localities.Regarding *S. putris* it was detected with moderate infestation on Egyptian clover in El-Abbasa and Abou Hammad El-balad (Abou –Hammad district) and El-Sahava (Mastoul El-Souk district). It was recorded with light infestation on broad bean, wheat, onion, tomato and strawberry. Regarding the field slug *D. reticulatum,*it was found with light infestation on clover and tomato in El-Sahava (Mashtoul –El –Souk) only.Data in Table (3) show that the heavy infestation with *M. cartusiana* was found in Fayed EL-Balad while it was detectedwith moderate infestation in Om-Azzam (El- Kssasin El-Gadida district) on Egyptian clover, however the rest different examined crops were found with light infestation like broad bean, wheat, maize, watermelon, tomato, strawberry, kidney bean and pepper. Regarding *S. putris* it was found with light infestation on clover and wheat (El-Dawawis, El-Qoua and El-Mahsama villages at El-Ksasin El-Gadida district),(El-Wasfia and Abou-Atwa, Ismailia district) and (Kasfaryt, Fayed village, Fayed district) .

Table 2. Level infestation with terrestrial molluscs on different crops at certain districts of Sharkhia governorate.

Location county/village	Land gastropod species	level of infestation on host plants
Abou-Hammad		
El-Khaeis	*Succinea putris*	Clover (+)
	Monacha cartusiana	Clover (+)
El-Abasa	*Succinea putris*	Clover (++)& broad bean (+) & Tomato (+)
	Monacha cartusiana	Cucumber (+)& squash(+) & Tomato (+)
El-Gavaria	*Succinea putris*	Clover (+)
	Monacha cartusiana	Clover (+) & wheat (+)
Abou-Hammad	*Succinea putris*	Clover (+ +) & wheat (+)
El-balad	*Monacha cartusiana*	Clover (+ +)
Fakous		
El-Khataraha	*Monacha cartusiana*	Clover (+ +) & wheat (+ +) & Onion (+) & Tomato (+) & Kidney bean (+)
Abou-Shalaby	*Monacha cartusiana*	Clover (+) & wheat (+) & Broad bean (+) & onion (+) Egg plant (+)
Fakous El-balad	*Monacha cartusiana*	Clover (+) & wheat (+) & onion (+)
	Succinea putris	Clover (+)
El-Fadadna	*Monacha cartusiana*	Clover (+)
	Succinea putris	Clover (+)
Mashtooul-El Souk		
Moniuer	*Monacha cartusiana*	clover (+) & onion (+)
	Succinea putris	clover (+) & cabbage (+) & tomato (+)
Kafr-Ebrash	*Monacha cartusiana*	clover (+)
Mashtoul-El-balad	*Monacha cartusiana*	clover (+ +) & onion (+) & wheat (+)
El-Sahava		
	Monacha cartusiana	clover (+) & wheat (+) & strawberry (+) & tomato (+) & taro (+) & kidney bean (+)
	Succinea putris	clover (+ +) & onion (+) & wheat (+) strawberry (+) & tomato (+)
	Deroceras reticulatum	clover (+) & tomato (+)

(+) = low infestation, 1- 15 snails/ 50 × 50 cm.

(+ +) = moderate infestation, 16 -30snails / 50 × 50 cm.

(+ + +) = heavy infestation, more than 30 snails / 50 × 50 cm.

Table 3. Level of infestation with terrestrial molluscs on different crops at certain districts of Ismailia governorate.

Location county/village	Land gastropod species	level of infestation on host plants
El-Ksasin El-Gdida		
Om-Azzam	*Monacha cartusiana*	clover (++) & wheat (+) & strawberry (+) tomato (+)
	Deroceras leave	wheat (+) & strawberry (+)
Al-Dawawis	*Monacha cartusiana*	clover (+)
	Succinea putris	clover (+) & wheat (+)
El-Kouq	*Monacha cartusiana*	clover (+) & wheat (+) & watermelon (+)
	Succinea putris	clover (+) & wheat (+)
El-Mahsama El-Kadima	*Monacha cartusiana*	clover (+) & wheat (+) & Strawberry (+) & tomato (+) & watermelon (+)
	Succinea putris	clover (+) & tomato (+) & watermelon (+)
	Deroceras leave	wheat (+) & watermelon (+)
	Deroceras reticulatum	strawberry (+)
Ismailia El-Balad		
El-Firdan	*Monacha cartusiana*	Clover (+) & strawberry (+) & Squash (+)
El-wasfia	*Monacha cartusiana*	Clover (+)
	Succinea putris	Clover (+)
Abou atwa	*Monacha cartusiana*	Clover (+) & broad bean (+) & wheat (+) & strawberry (+)
El-Dabaya	*Succinea putris*	Clover (+)
	Monacha cartusiana	Clover (+)
	Deroceras reticulatum	Clover (+)
Fayed		
Kasfaryt	*Monacha cartusiana*	clover (+) & maize (+) & wheat (+) & tomato (+ +) & kidney bean (+)
	Succinea putris	clover (+)
	Cochlicella acuta	clover (+)&tomato(+)& kidney bean (+)
Fayed EL-Balad	*Monacha cartusiana*	clover (+ + +) & wheat (+ +) & eggplant (+) & tomato (+) &
	Succinea putris	clover (+) & wheat (+) & tomato (+)
Abou-Soltan	*Monacha cartusiana*	clover (+) & onion (+) & wheat (+) & pepper (+) & tomato (+)
Srabyoum El-Mahata	*Monacha cartusiana*	clover (+) & wheat (+) & strawberry (+) & kidney bean (+)
	Deroceras leave	clover (+) & tomato (+) & kidneybean (+)

(+) = low infestation, 1- 15 snails/ 50 × 50 cm.

(+ +) = moderate infestation, 16 -30snails / 50 × 50 cm.

(+ + +) = heavy infestation, (more than 30 snails / 50 × 50 cm.

Other identified snails showed limited distribution since they were detected in few localities, whereas, *D. leave* abundantly found on strawberry, and wheat and watermelon in (Om Azzam and El-Mahsama El-Kadima village) El-Ksasin El-Gadida

district respectively, and on Egyptian clover, tomato and kidney bean in Fayed village. However, strawberry was found with light infestation in El-Mahsama El-Kadima village, whereas the slug *D.reticulatum* was detected for the first time in Ismailia governorate. On the other hand, *C. acuta* was counted with a relatively low number on Egyptian clover, tomato and kidney bean at Kasfaryt village, Fayed district, Ismailia governorate. Discussing the foregoing results, it is well know that land snails and slugs were recorded as serious pests to agricultural crops in different places in Egypt. The terrestrial snails were found at different governorate attacking many economic crops. For instances, *Monacha* sp. and *Oxychilus* sp. were detected in Ismaelia Governorate (El-Okda, 1984), *Eobania vermiculata*, *T. pisana*, *Hellicella vestalis*, *M. obstructa*, *C. acuta*, *Rumina decollate* and *Oxychilus* sp. were found in Alexandria and Beheira governorate (El-Okda, 1980). Moreover, *E. vermiculta*, *Succinia putris* and *C. nemoralis* were determined at Kafr El-Shiekh, *M. cartusiana*, *C.nemoralis*, *C. acuta*, *O. alliavus*, and *Helicella* sp. at Damiatta Governorate and *M. cartusiana*, *S. putris*, *E. vermiculata*, *C. acuta* and *C. nemoralis* at Dakahlia governorate (El-Deeb *et al.* 1996). On the other hand, at Sharkia governorate Ghamry *et al*., 1993, Ismail 1997, Mahrous *et al.,* 2002 and Lokma, 2007 detected certain land snail species on field and vegetable crops.Ismail (1997) reported that Egyptian clover, wheat and broad bean were heavily infested with *M. cartusiana* in six counties while maize and rice were found with light infestation by the same species in Zagazig district. Whereas, Mahrous *et al.* (2002) reported that *M. cartusiana* was the main pest of field crops in most districts of Sharkia governorate, while *H. vestalis* and *E. vermiculata* were detected on Egyptian clover, broad bean, wheat and maize in Belbies and El-Hussainia districts. However, *Succinia* sp. was observed on Egyptian clover at Fakous district only. Moreover, Ismail (2004) revealed the snail *E. vermiculata* were found throughout allover the whole year with low numbers in January and gradually increased to reach to peak in May in orange orchad in Sharkia governorate and the highest numbers were recorded on tree trunks during spring season compared with soil surface. Ismail *et al*. (2011) reported that *M. cartusiana* and *S. putris* snails were found at Hehia and Meniet El-kamh while *M. cartusiana* was found with higher density than *S.putris* on agricultural crops and weeds at Sharkia governorate. finally Awad (2013) surveyed the existence of four species of land snails *M.theba cartusiana,M.cantiana, S.putris* and *S.elegans* in south district of Port Saied region, Port Saied governorate .The population density of all observed land snails was heavier on Egyptian clover followed by wheat and sugar beet,also recorded highest numbers through spring season followed by Autumn and Winter.

1. Importance value of some terrestrial molluscs at Sharkia and Ismailia governorate.

The objective of the present study is to characterize communities of land gastropod species infesting major crops at Sharkia and Ismailia governorate using some ecological parameters i.e. frequency of occurrence, population density and biomass. To accomplish this goal, a total of 360 samples were randomly collected from 3 districts in each of Sharkia and Ismailia governorate. Data in Tables (4&5) indicated that according to frequency of occurrence *M. cartusiana* was the most frequently species followed by descendingly *S. putris* and *D. reticulatum*. Their absolute frequencies of occurrence were 21.66, 12.50 and 1.11% respectively at Sharkia governorate. On the other hand ,according to frequency of occurrence, *M. cartusiana* was the most frequently species followed descendingly by *S. putris* **>** *D. leave* **>** *D. reticulatum* **>***C. acuta*, with absolute frequency of occurrence of 28.61, 5.55, 1.11, 0.83 and 0.27 % respectively at Ismailia governorate. According to population density it was found that *M. cartusiana* gained the highest value (10.80) (8.24) followed descendingly by *Succina putris* (8.82) (5.40) and *D. reticulatum* (2.25) (4) snails per sample) at Sharkia and Ismailia governorate respectively. While *D. leave* and *C. acuta* were detected with values (1.25) and (1) at Ismailia governorate. The relative population density for the identified species at Sharkia and Ismailia Governorate were *M. cartusiana* (49.38%) & (41.42%), *Succina putris* (40.32%) & (27.14%) and Slug, *D.reticulatum* (10.28%) & (20.11%) respectively. However, according to biomass criterion *D. reticulatum* weighed 0.500 gm /slug followed by *M. cartusiana* (0.475) **>** *C. acuta* (0.220) **>** *D. leave* (0.200) **>** *Succinea putris* 0.191 (gm / snail). Consequently relative biomass showed the same arrangement. Descending orders of land snail species as evaluated by frequency of occurrence, population density, biomass and importance value at Sharkia and Ismailia governorate. It is clear that they showed different arrangement. For example, *M. cartusiana* was the first one according to frequency of occurrence and apopulation density and biomass at Ismailia governorate.While according to biomass it was the second. Moreover, *S.putris* changed its position from second according to frequency of occurrence or population density to light based on biomass.Since frequency of occurrence, population density and biomass gave different results.

Table 4. Importance value of some terrestrial molluscs species at Sharkia governorate.

Snail species	Frequency occurrence %		Population Density		Biomass (gm)		Importance value
	Absolute	Relative	Absolute	Relative (%)	Absolute	Relative (%)	
M. cartusiana	21.66	61.41	10.80	49.38	0.475	40.70	151.49
S. putris	12.50	35.44	8.82	40.32	0.192	16.45	92.21
D. reticulatum	1.11	3.14	2.25	10.28	0.500	42.84	56.26

Table 5. Importance values some terrestrial molluscs species at Ismailia governorate.

Snail species	Frequency occurrence %		Population Density		Biomass (gm)		Importance value
	Absolute	Relative	Absolute	Relative (%)	Absolute	Relative (%)	
M. cartusiana	28.61	78.66	8.24	41.42	0.475	029.93	150.01
S. putris	5.55	15.25	5.40	27.14	0.192	12.09	54.48
D. reticulatum	0.83	2.28	4	20.11	0.500	31.50	53.89
D. leave	1.11	3.05	1.25	6.28	0.200	12.60	21.93
C. acuta	0.27	0.74	1	5.02	0.220	13.86	19.62

*Importance value = Relative frequency + relative density + relative biomass.

They can be combined together in hope of having a figure that would relate aspects of the three parameters.Therefore, the relationship of three parameters was calculated as importance value according to Norton (1978). Generally, terrestrial gastropods can be arranged descendingly according to their importance value of Sharkia Governorate as follows: *M. cartusiana* > *Succinia putris* > *D .reticulatum,* while the repection values it Ismailia Governorate were: *M. cartusiana* > *Succinia putris* > *D. reticulatum* > *D. leave* > *C. acuta*. Regarding frequency of occurrence and population density of terrestrial snails infesting field crops in five districts of Sharkia Governorate Lokma (2007) showed that based on frequency occurrence, for instances, on clover. *M. cartusiana* occurred more frequently in Meniet El-Kamh, Fakous and Zagazig compared to Belbies and Kafr –Sakr. On the other hand, the highest values of population density for such snail were found in Fakous and Meniet El-Kamh followed by Belbies, Kafr-Sakr and Zagazig. However, Shoieb Maha (2008) showed that the white snail *Theba pisana* the common terrestrial snails at Suez Canal area, while *Monacha obstructa* was recorded highly abundance in Ismaelia governorate and caused economic damage on Egyptian clover and several vegetable crops.She reported that the garden snail *Eobania vermiculata* recorded only on ornamental plants in public gardens. The conical snail *C. acuta* was recorded with heavy infestation on mango trees in Ismaelia Governorate, *Xeroptica vestalis* recorded at North Sinai Governorate in Raffah area, the snail *Succinea campestris* was noticed as the first time in Ismaelia Governorate.

Consequently, determination of the infested localities and dispersal to neighboring edge of Govenorates can be very useful in suggestion to make local quarantine to prevent dispersal of land snail all over plantations of Sharkia and Ismailia governorate. Moreover, during the last few years, land snails were dispersed quickly at Sharkia governorate.For example, Ismail (1997) showed that 17 localities representing 7 districts were infested with land snail species. However, AbdEL-Aal (2001) indicated that 44 localites representing 12 districts were infested with land snails at Sharkia governorate. Furthermore, Lokma (2007) showed that the infestation with land snails was obviously increased in the last few years at Sharkia governorate. Number of infested localities was 84 villages with percent infestation of 18.14% during 2003. These figures were increased to 111 villages with percent infestation of 23.97% during 2004.Finally, Shetaia *et al.* (2009) reported that the glassy clover snail *Monacha cartusiana* and the amber snail, *Succinea putris* were found at Awlad-Sakr and Abo-Kapeer counties, Sharkia governorate. *M. cartusiana* sanil was found with higher density than *S. putris*. The majority of examined crops were found with heavy infestation with *M. cartusiana* snail while *S. putris* were recorded with moderate or light infestation in the examined localities.The land snail species can be arranged descedingly, according to its importance values as follow: *E.vermiculata>, M. cartusiana>,C.acuta>,H.vestalis*.

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دراسات بيئية على بعض الرخويات الأرضية في محافظتى الشرقية والاسماعيلية

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أجريت التجارب الحقلية لحصر وكثافة التعداد وقيمة الأهمية للرخويات الارضية التي تصيب بعض محاصيل الخضر والحقل بمحافظتى الشرقية والاسماعيلية . تم تحديد خمس انواع من الرخويات تصيب مختلف المحاصيل في محافظتى الاسماعلية والشرقية هذه الأنواع هى قوقع البرسيم الزجاجى *Monacha cartusian*, والقوقع الذهبي *Succinea putris* والقوقع المخروطي *Cochlicella acuta* والبزاقة الملساء *Deroceras leave* وأخيرا *بزاقة الحقل Deroceras reticulatum* والتي سجلت لأول مرة في محافظة الأسماعيلية .كما تحديد الكثافة العددية لأنواع الرخويات الأرضية داخل ثلاثة مراكز بمحافظتى الشرقية والأسماعيلية علي المحاصيل المختلفة وذلك خلال موسمي النشاط في الفترة من فبراير إلي مايو ٢٠٠٨ و ٢٠٠٩ .ويعتبر قوقع البرسيم الزجاجي هو الأكثر شيوعا علي محاصيل الحقل والخضر. وعموما إختلفت الكثافة العددية من عائل إلي أخر وكذلك من منطقة الي اخري،. وكان ترتيبها تنازليا كالآتي قوقع البرسيم الزجاجي ثم قوقع الذهبي وأخيرا بزاقة الحقل . وقوقع البرسيم الزجاجي ثم القوقع الذهبي ثم بزاقة الحقل ثم البزاقة الملساء وأخيرا القوقع المخروطي في محافظتى الشرقية والإسماعيلية علي الترتيب.