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ECOLOGICAL STUDIES ON THE COMMON LAND SNAIL AND SLUG SPECIES IN MINUFIYA GOVERNORATE, EGYPT.

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ABSTRACT: *The goal of this study was to document the common species, geographical and horizontal distribution of land snails and slugs. The study was carried out at five districts in Minufiya Governorate. Total numbers and relative density of each species were arranged descendingly as follow, Monacha cartusiana (14448, 71.89%), Eobania vermiculata (3519, 17.51%), Helicella vestalis (752, 3.74%), Oxychillus alliavus (386, 3.41%), Deroceras reticulatum slug (428, 2.13%) and Cochlicella acuta (265, 1.32%). Relative percentages of different snail and slug species of each district were arranged descendingly as follow; Quesna (22.47%), El-Shohada (21.7%) Shibin El-Kom (19.54%), Ashmoon (19.52%) and Tala (16.76%).The horizontal distribution of different snails which were carried out on some host plants cleared that snail populations aggregate on the field edges.*

Key Word: *Land snails, slugs, invasive species, geographical and horizontal, distribution.*

INTRODUCTION

Terrestrial snails and slugs have been known to be destructive agricultural pests to many of different crops. Kassab and Daoud(1964); El-Okda et al. (1989); El-Wakil and Radwan (1991) and El-Wakil and Attia (1999).

Ecological studies for any pest consider to be the base line for any pest management program. In the current study, survey, geographical distribution at five districts in Minufiya Governorate were conducted to determine the occurrence of land snails and slugs. Horizontal distribution of snails was studied to figure out the most areas preferable for its aggregation and that will help managers to concentrate their control efforts on these areas.

MATERIALS AND METHODS

1-Survey and distribution of land snail and slug species:

The land snail and slug species surveyed in twenty five localities (villages) belonging to five districts during the period from September 2003 to August 2005, these localities were illustrated in Table (1).

The examined field crops were Egyptian clover, *Trifilium alexandrinum*; wheat, *Triticum aestivum*; horse bean, *Vicia faba*; while, the vegetable crops were lettuce, *Lactuca stavia*; cabbage, *Barssica oleracea*; potatoes, *Solanum tuberosum*. and, the fruit trees were navel orange, *Citrus sinensis*; grape, *Vitis vinfera*; pear. Also, ornamental plants were sansevieria, *Sansevieria guinensis*; duranta, *Duranta phumieri*; acalypha, *Acalypha marginata*.

Table (1). Surveyed districts and localities at Minufiya Governorate.

Governorate	Districts	Localities
El-Minufiya	Shibin El-Kom	Bakhaty Shanawan Met Mossa Shibin El-kom (country side) Met Afia (Meleg)
	El-Shohada	Zweit El-Naoura Kafr Ashma El-Eraquia Sahel El-Gwaber Kafr Hegazy
	Quesna	Begarim Quessna (country side) Damhoug Kafr Wahb Bany Ghrian
	Tala	Kafr Rabea Kafr El-Shorafa Kamshesh El-Bendaria Kafr El-Sokaria
	Ashmoon	El-Braniya Sakiet Abou Shara Kafr Mansour Shanshour Sentrees

Samples were randomly taken in early morning by using the quadrate of sample size 50 × 50 cm^2 from each locality (Baker, 1968 and Staikou *et al.*, 1990). In case of fruit trees and ornamental plants, the samples were taken from four areas 25 × 25 cm^2 under each of the tested trees and on five branches of different directions of the tree at 1 m height of tree trunk (Awad, 2000).

Collection of different land snail and slug species and their relative density were calculated according to the equations as follows:

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

$$\text{Relative density} = \frac{\text{Number of individuals of a species}}{\text{Sum of individuals of all species}} \times 100$$

All snails found on plants or on soil surface of sample area were collected in white plastic bags then transported to the laboratory, counted and identified according to the keys given by Godan (1983) and counted.

2- Horizontal distribution of land snail and slug species on different host plants:

Horizontal distribution of land snail species on surveyed host plants at Minufiya Governorate was studied during the activity periods of 2004. Three fields of each crop infesting different species of snail and slugs were selected.

Samples were taken horizontally from the three geographical directions (eastern north, center and western south) of field using quadrate of samples size 50×50 cm^2,five samples of each direction.Land snail and slug species were collected and counted (Staikou *et al.*, 1988).

RESULTS AND DISCUSSION

1- Survey and distribution:

Survey of land snail and slug species conducted in field crops, vegetables, fruit trees and ornamental plants during the period of study from September 2003 to August 2005 in five districts of Minufiya Governorate as follows: Shibin El-Kom, Quesna, Tala, Ashmoon and El-Shohadaa.Data in Table (2) showed presence of five species of land snails and one slug belonging to family; limacidae in surveyed localities (villages) at Minufiya Governorate

Total population density and percentage of abundance of these species at Minufiya Governorate were arranged descendingly as follows: *Monacha cartusiana* (14448, 71.89%), *Eobania vermiculata* (3519, 17.51%), *Helicella vestalis* (752, 3.74%), *Oxychillus alliavus* (686, 3.41%), *Deroceras reticulatum* (428, 2.13%) and *Cochlicella acuta* (265, 1.32%).

It was obvious that *Monacha cartusiana* land snail was the most predominant species compared with the other species for all surveyed localities.

Table (2): The relative density of land snail and slug species collected from 5 disticts at Minufiya Governorate, during the period of 2003-2004.

Collection	Species						Total
	Snails					Slugs	
	Monacha cartusiana	*Eobania vermiculata*	*Helicella vestalis*	*Oxychillus alliavus*	*Cochlicella acuta*	*Deroceras reticulatum*	
Total	14448	3519	752	686	265	428	20098
Relative density	71.89	17.51	3.74	3.41	1.32	2.13	100%

These results agree with Bishara (1968) recorded *Euparpha pisana, Theba* sp., *Helicella* sp., *Cochlicella acuta, Eobania vermiculata* and *Rumina decollate* on different host plants in the northern region of Delta, Also El-Okda (1979) recorded three land snails in Alexandria Governorate *E. vermiculata* (Muller), *H. vestalis* (Pfeiffer) and *T. pisana* (Muller) on several ornamental plants and found that, *E. vermiculata* snail was more abundant than others. Also, in 1980 El-Okda surveyed land snails, *E. vermiculata, T. pisana, H. vestalis, M. obstructa, C. acuta, R. decollate* and *O. alliavus* on 32 vegetable crops. Al-Akra (2005) surveyed five land snail species, *M. cartusiana, E. vermiculata, H. vestalis, C. acuta, O. alliavus* and one slug belonging to family Limacidae, *D. reticulatum* in Minufiya Governorate.

Results at Table (3) cleared that density of land snail and slug species different from district to other according to the geographical distribution and may be due to the variation in the soil type at districts of Minufiya Governorate.

Average and percentage of these species were arranged as follows: Quesna (752.7, 22.47%), El-Shohadaa (727, 21.7%), Shibin El-Kom (654.5, 19.54%), Ahsmoon (654, 19.52%) and Tala (561.5, 16.76%), respectively.

Table (3): Population density of land snail and slug species in 5 districts at Minufiya Governorate and their relative density(R.D)during the period of 2003-2004.

Species		Districts									
		Shibin El-Kom		Quesna		El-Shohadaa		Talaa		Ashmoon	
		Total	R.D.	Total	R.D.	Total	R.D.	Total	R.D.	Total	R.D.
Snails	*Monacha cartusiana*	2751	70.05	3161	70.0	2982	68.36	2691	79.87	2863	72.96
	Eobania vermiculata	785	19.99	937	20.75	820	18.79	468	13.89	509	12.97
	Helicella vestalis	0	0	0	0	398	9.12	0	0	354	9.02
	Oxychillus alliavus	216	5.5	272	6.02	0	0	0	0	198	5.04
	Cochlicella acuta	0	0	0	0	162	3.71	103	3.06	0	0
Slug	*Deroceras reticulatum*	175	4.46	146	3.23	0	0	107	3.18	0	0
Average		654.5		752.7		727		561.5		654	
R.D. %		19.54		22.47		21.7		16.76		19.52	

The gained results cleared that, *M. cartusiana* and *E. vermculata* land snails were occurred in all five districts. While, *Helicella vestatis* land snail was recorded in two districts El-Shohadaa and Ashmoon.*Oxychillus alliavus* was found in Shibin El-Kom, Quessna and Ashmoon districts. Also, *Cochlicella acuta* was registered in El-Shohadaa and Tala district. Finally, the slug *Derocarus reticulatum* was found in Shibin El-Kom, Quesna and Tala districts(table,3).

Obtained results were in agreement with those of Ismail (1997) who surveyed four species of land snails belonging to family Helicidae at 17 localities in Sharkia Governorate. These species were *M. cartusiana, H. vestalis, E. vermiculata* and *C. acuta* land snails. Hashem *et al.* (1992) surveyed four land snail species *T. pisana, H. vestalis, C. acuta* and *E. vermiculata* on citrus orchards in Beheira Governorate. These species were *M. cartusina, H.*

vestalis, E. vermiculata and *C. acuta* land snails. Also, Awad (2000) surveyed the terrestrial gastropods in many different locations at Dakahlia Governorate on different host plants during the period from November 1997 to December 1998.Abd El-Aal (2001) surveyed five species of land snails in different localities of 12 districts in Sharkia Governorate, these snails were *M. cartusiana, H. vestalis, C. acuta, E. vermiculata* and *Succinea* sp. Metwally *et al.* (2002) stated that, six species of terrestrial snails belonging to families of Helicidae and Limacidae were recorded on different crops at 23 localities representing 10 districts at Minufiya and Gharbia Governorates,these species were *M. cartusiana, E. vermiculata, C. acuta, O. alliavus, R. decollate* and two slugs, *L. flavus* and *D. reticulatum.*

2- The Horizontal distribution of land snail species on different host plants in Minufiya Governorate.

The horizontal distribution of land snail species were studied during the period of activity (March, April and May) on field crops, vegetables, fruit trees and ornamental plants at Minufiya Governorate.

Data in Table (4) cleared that, the highest average of land snail species was recorded in eastern north and western south as edges of different fields with values 18.9 and 17.4 individuals while, the lowest average was found in center of exprimental fields with value 13.7 individuals, respectively.

Table (4): The horizontal distribution in average of land snail species on different host plants at Minufiya Governorate.

Directions of samples	Host plants												General average
	Field crops			Vegetable			Fruit trees			Ornamental plants			
	E. clover	Wheat	H. bean	Lettuce	Cabbage	Potatoes	N. orange	Pear	Grape	Sanseveira	Duranta	Acalypha	
Northern east	28.6	21.0	16.5	26.3	19.1	10.8	23.0	17.0	15.1	20.4	17.0	12.2	18.9
Center	23.6	14.5	11.7	20.3	14.5	5.0	15.0	12.5	10.5	15.0	11.8	10.5	13.7
Southern west	27.9	21.0	17.6	22.7	17.6	8.3	20.2	14.2	11.4	20.1	15.0	13.1	17.4

These result are in agreement with Cowie (1984) who reported that, aggregation of *T. pisana* was of 39 to 202 m^{-2} for adults and 13 to 436 m^{-2} for Juveniles.

Aggregation has previously been reported for *T. pisana* and other species of snails (e.g., Baker, 1968; Pomeroy, 1969 and Crook, 1980). It can result in two ways: selection of preferred areas within the habitat, and /or some form of interaction among individuals. Metwally *et al.* (2002) mentioned that, the

density of snail populations are increase at field edges, specially beside field water canals, in Tall herbs and under weeds.

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دراسات إيكولوجية على أنواع القواقع والبزاقات الأرضية الشائعة فى محافظة المنوفية- مصر

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الملخص العربي:

تهدف هذه الدراسة إلى إلقاء الضوء على بعض الصفات البيئية للقواقع والبزاقات الأرضية من حيث الأنواع المهمة ومدى انتشارها وكذلك طريقة توزيع أعدادها في الحقول وحيث أنها أصبحت من الآفات الهامة التي تضر بالعديد من المحاصيل فإن هذه الدراسة تساعد في كيفية مكافحتها والحد من أضرارها وقد اشتملت هذه الدراسة على ما يلي:

١- أنواع القواقع والبزاقات السائدة في الخمسة مراكز التي تم دراستها في محافظة المنوفية بمعدل خمس قرى في كل مركز على محاصيل الحقل والخضر والزينة والفاكهة وقد اتضح أن الأنواع الأكثر انتشارا هي:

قوقع البرسيم الزجاجي (٧١,٨٩%) - قوقع الحدائق البني (٣,٧٤%) القوقع المفترس (٣,٤١%) - بزاقة الحقل (٢,١٣%) وأخيرا قوقع النخيل المخروطي بنسبة (١,٣٢%).

٢- تم دراسة التوزيع الجغرافي للقواقع والبزاقات السابقة فى الخمسة مراكز وذلك لتقدير النسبة المئوية لها في كل مركز وكانت النسبة ٢٢,٤٧% فى مركز قويسنا يليه مركز الشهداء بنسبة ٢١,٧% ثم مركزي شبين الكوم وأشمون بنسب متساوية تقريبا ١٩,٥٤%، ١٩,٥٢% على التوالي وأخيرا مركز تلا بنسبة ١٦,٧٦% مما يدل على تفاوت نسبة انتشار القواقع من مركز إلى آخر بشكل واضح.

٣- تم دراسة التوزيع الأفقي لأنواع القواقع المختلفة على بعض العوائل النباتية، وأسفرت الدراسة عن زيادة أعداد القواقع في الاتجاهات الجغرافية لحواف الحقول المختلفة ورتب معدل تعداد القواقع في المتر المربع كالآتي في الحقول المختلفة: شمال شرقي (١٨,٩) > الوسط (١٣,٧) < الجنوب الغربي (١٧,٤) مما يدعو إلى تركيز عمليات المكافحة على حواف الحقول أكثر من الوسط.