

**OCCURRENCE AND POPULATION DYNAMICS OF  
*EOBANIA VERMICULATA* (Muller) INFESTING  
CERTAIN ORNAMENTAL PLANTS AT ZAGAZIG  
DISTRICT, SHARKIA GOVERNORATE**

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**ABSTRACT**

Host list, level of infestation and population dynamics of the brown garden snail with reflexed lip, *Eobania vermiculata* (Muller), were determined on ornamental plants at Zagazig district during two successive seasons of 2008/2009 and 2009/2010. Results revealed that *E.vermiculata* snail was found associated with some herbaceous and perennial plants at certain gardens and nurseries of Zagazig University. The majority of examined plants were found with low infestation especially sweet pea, dodonaea, watercress, zeninaria, spider plant, purple heart and palm beach bells. Marguerite and sprekelia showed low infestation during 2008 while they were detected with moderate infestation during 2009 season. Cineraria was found with moderate infestation during 2008 season and heavy infestation during 2009 season. Ficus as perennial ornamental plant indicated low infestation on soil and heavy infestation on plants during the two seasons. The population dynamics of *E.vermiculata* snail differed from host plant to another and from month to another. For instances, population density on some herbaceous plants reached its maximum values during February and March for sprekelia, March and May for sweet pea and during April for cineraria. Regarding perennial plants, the same trend was noticed, where population density of *E. vermiculata* snail reached its maximum values during May on gazania, April and September on ficus and July and August on rose.

**Keywords: Occurrence, population dynamics, *Eobania vermiculata*, ornamental plants, population density.**

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## INTRODUCTION

In recent years, land snails had become a real threat to field crops, vegetables and fruit orchards as well as ornamental plants. They cause severe damage and decreased the marketing values of infested crops especially those of consumed leaves or ornamental plants where they attack leaves or flowers and cause decline in its price or rejection when export (Baker, 1989). These pests attack seeds, seedlings, roots and tuber crops. The more succulent row leafy vegetables, fruits and buds were extraordinary attacked in addition to flower damage when land snails became abundant. Furthermore, these land molluscs leave unpleasant slimy traces on the injured parts (El-Okda, 1980).

In Sharkia Governorate, the previous studies indicated that the brown garden with reflexed lip *E.vermiculata* was more abundant mainly in the gardens or ornamental plants and cause severe damage to all plant parts (Ghamry *et al.*, 1993; Ismail *et al.*, 2003; Mahrous *et al.*, 2002 and Lokma, 2007). The present study aims to throw light on host list, level of infestation and seasonal population dynamics of *E.vermiculata* on ornamental plants at Zagazig district, Sharkia Governorate.

## MATERIALS AND METHODS

### Occurrence

Snail occurrence was conducted to study the distribution and population density of land snail species attacking numerous ornamental host plants (herbaceous and perennial) cultivated in Zagazig district during the period started from February to last May for herbaceous plants and from February to January for perennial plants in the two successive growing seasons of 2008/2009 and 2009/2010. To achieve this goal, 117 samples were taken from herbaceous ornamental plants and 84 samples from perennial ornamental plants. These plants include some herbaceous ornamental plants i.e. sweet pea, *Lathyrus odoratus*; marguerite, *Chrysanthemum futescens*; gerbera, *Gerbera jamsonii*; dodonaea, *Dodonaea* sp.; watercress, *Tropacolum majus*; marigold, *Calendula affinalis*; zeninaria, *Senecio cineraria*; cineraria, *Cineraria cruenta*; broad leaved bottle tree, *Sterculia platanifolia*; spider plant, *Phalangium liliastrum*; sprekelia, *Amaryllis formosissima*; purple heart, *Tradescanta pallid*; palm beach bells, *Kalanchoe* sp.

and some perennial ornamental plants as: rose, *Rosa hybrida*; lantana, *Lantana camara*; ficus, *Ficus nitida*; flowering bulbs, *Tulipa gesneriana*; yucca, *Yucca* sp.; gazania, *Gazania splendens* and salvia, *Salvia splendens*. Samples were taken in the early morning in the absence of rain from each ornamental plant species by using the quadrat sample size 50x50 cm (Staikou and Lazaridou-Dimitriadu 1990). Snails on plants and soil were counted and left in their initial places. Surveyed snails were identified according to the key given by Godan (1983).

### Seasonal Population Dynamics

The population density of *E. vermiculata* snail was determined on certain ornamental plants (herbaceous and perennial) at nurseries and gardens of Zagazig University, Sharkia Governorate during two successive growing seasons 2008 and 2009 on three herbaceous ornamental plants namely sweet pea, cineraria and sprekelia. The population density of this snail was assessed biweekly during the period from February to May in the two successive years, 2008 and 2009. Regarding perennial ornamental plants, gazania, ficus and rose were chosen to study population behaviour during the two successive growing seasons of

2008 / 2009 and 2009 / 2010. The first inspection was undertaken at the first week of February 2008 and continued monthly until the last week of January 2009. Four replicates of quadrat sample size (50 x 50 cm) were randomly examined biweekly during the two growing seasons of each herbaceous plant species. Regarding perennial plants, snails on trunk of about one meter and on soil surface around tree trunks of about 50 cm were counted and recorded monthly during the two successive seasons of 2008/2009 and 2009/2010. Examination was carried out during early morning before sunrise. All snails found on either plants or soil surface in the quadrat were counted and left in their initial places (Baker, 1989). Data concerning temperature and relative humidity during the period of study were obtained from Meteorological Station of Abo-Kapeer. The obtained data were subjected to statistical analysis and correlation coefficient between snail population and each of temperature and relative humidity was calculated according to Little and Hills (1975).

## RESULTS AND DISCUSSION

### Occurrence

Occurrence studies were carried out on molluscs fauna infesting different ornamental plants at

Zagazig district, Sharkia Governorate. Data in Table 1 revealed that the land snail, *Eobania vermiculata*, belonging to the Family Helicidae was found associated with different ornamental plants in some gardens and nurseries at Zagazig University. Results showed that this species varied in its incidence and level of infestation. Generally, degree of infestation of this snail on the examined hosts can be classified into three categories according to number of counted snails. These categories were: heavy, moderate and low infestation. The majority of examined herbaceous plants were found with low infestation especially sweet pea, dodonaea, watercress, zeninaria, marigold, spider plant, purple heart and palm beach bells. On the other hand, cineraria was found with moderate infestation during 2008 season while it was found with heavy infestation during 2009 season. Gerbera and broad leaved bottle tree showed moderate infestation during the two seasons. Marguerite and sprekelia exhibited infestation during 2008 season as compared to moderate infestation during 2009 season.

Data in Table 2 show infestation levels of the land snail, *E.vermiculata* on different

perennial plants at Zagazig district, Sharkia Governorate. Results indicated that lantana, flowering bulbs, yucca and salvia were found with low infestation either on soil or plants during the two growing seasons. Gazania showed moderate infestation on soil or plants during the two seasons, while rose was recorded with low infestation on soil and moderate infestation on plants during the two seasons. Ficus was found with low infestation on soil and heavy infestation on plants during the two seasons. El-Okda (1979) collected *E.vermiculata* and other snail species from several ornamental plants in Alexandria Governorate during the period from 1975 to 1976. Ghamry *et al.* (1993) indicated that *E.vermiculata* snail was abundant on some fruit orchards and ornamental plants at Sharkia Governorate. Mohamed (1994) found that *E.vermiculata* and *Monacha obstructa* were more widely distributed on seedlings of citrus and ornamental plants as compared to *Helicella vestalis* and *Cochlicella acuta* snails at Big Cairo.

El-Deeb *et al.* (1996) assured that *E.vermiculata* infested some ornamental plants at Dakahlia, Kafr EL-Shiekh and Domiat Governorates. Ismail (1997) reported

**Table 1. Occurrence of the land snail *Eobania vermiculata* infesting different herbaceous ornamental plants at Zagazig district, Sharkia Governorate during 2008 and 2009 seasons**

Host plant	Infestation levels	
	2008	2009
Sweet pea	+	+
Marguerite	+	++
Gerbera	++	++
Dodonaea	+	+
Watercress	+	+
Marigold	+	+
Zeninaria	+	+
Cineraria	++	+++
Broad leaved bottle tree	++	++
Spider plant	+	+
Sprekelia	+	++
Purple heart	+	+
Palm beach bells	+	+

+ = Low infestation (1 -10 snails / 50x50 cm.)

++ = Moderate infestation (10.1 – 20 snails / 50x50 cm)

+++ = Heavy infestation (up 20 snails / 50x50 cm.)

**Table 2. Occurrence of the land snail *Eobania vermiculata* infesting different perennial ornamental plants at Zagazig district, Sharkia Governorate during 2008 / 2009 and 2009 / 2010 seasons**

Host plants	Infestation levels			
	2008 / 2009		2009 / 2010	
	soil	plants	Soil	plants
Rose	+	++	+	++
Lantana	+	+	+	+
Ficus	+	+++	+	+++
Flowering bulbs	+	+	+	+
Yucca	+	+	+	+
Gazania	++	++	++	++
Salvia	+	+	+	+

+ = Low infestation (1 -10 snails / 50x50 cm.)

++ = Moderate infestation (10.1 – 20 snails / 50x50 cm)

+++ = Heavy infestation (up 20 snails / 50x50 cm.)

that *E.vermiculata* was counted with a relatively high numbers (heavy infestation) on certain ornamental plants as holly hock, nasturium, adhatoda and duranta in Zagazig region. Also, Arafa (2006) reported that *E.vermiculata* snail was found associated with ornamental onion, duranta and ornamental palm at Gharbia Governorate. Moreover, *E.vermiculata* snail was found on ornamental palm, jasminium and ornamental onions at Dakahlia Governorate. Finally, Pal and Sarkar (2009) recorded some land molluscs as pests on ornamental plants including gladiolus, gerbera, China rose, chrysanthemum, bird of paradise and straw flower in West Pangal.

### Seasonal Population Dynamics

#### On certain herbaceous ornamental plants

Seasonal population dynamics of the land snail, *E. vermiculata* in relation to temperature and relative humidity was studied on sweet pea, cineraria and sprekelia during the two successive growing seasons of 2008 and 2009 in Zagazig district, Sharkia Governorate. Results in Table 3 showed that the population fluctuated from plant to another

and from month to another. On sweet pea, the infestation started with a relatively low population density at the beginning of February (3.38 and 0.87 snails / sample) during 2008 and 2009 seasons, respectively. Thereafter, numbers showed slightly increase to reach its maximum values (8.22 snails/sample) at mid- May for 2008 season while it reached its maximum values at the third week of March (7.19 snails/sample) during 2009 season. The population density decreased until the end of the growing season to reach 4.32 and 3.09 snails for the two seasons, respectively.

On cineraria, the infestation appeared with a relatively low population density at the beginning of February showing 8.25 and 3.0 snails / sample during 2008 and 2009 seasons, respectively. The population density increased or decreased to reach its maximum values at the end of April indicating 49.2 and 10.2 snails during 2008 and 2009 seasons, respectively. Thereafter, snail numbers decreased at the end of growing seasons to reach 20.6 and 7.94 snails / sample during 2008 and 2009 seasons, respectively.

Regarding sprekelia, the same behaviour was noticed, since low

**Table 3. Population dynamics of the land snail *Eobania vermiculata* infesting certain herbaceous ornamental plant species at Zagazig district, Sharkia Governorate during 2008 and 2009 seasons**

Dates	Number of snails / quadrat sample size (50 x 50 cm )									
	Sweet pea		Cineraria		Sprekelia		Temperature		R.H.%	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
February,1 <sup>st</sup> week	3.38	0.87	8.25	3.0	5.19	4.62	16.7	23.9	66.6	59.7
February,3 <sup>rd</sup> week	4.69	3.25	14.1	3.57	27.4	5.12	14.4	22.5	65	61.3
March,1 <sup>st</sup> week	5.32	5.44	24.1	6.75	26.7	9.03	16.4	22.5	65.2	59.8
March,3 <sup>rd</sup> week	6.32	7.19	9.38	9.63	2.5	12.9	19.1	22.9	64.9	62.6
April,1 <sup>st</sup> week	4.13	6.31	9.1	6.63	2.81	8.94	22.5	20.1	59.9	64.0
April,3 <sup>rd</sup> week	4.5	5.5	22	5.07	2.13	6.07	39	22.0	56.3	59.9
April,4 <sup>th</sup> week	5.4	5.5	49.2	10.2	17.8	3.75	31.1	21.3	55.7	61.7
May,2 <sup>nd</sup> week	8.22	5.47	30.8	8.77	12.8	1.69	30.2	23.8	54	58.0
May,4 <sup>th</sup> week	4.32	3.09	20.6	7.94	12.2	4.62	28.8	23.0	56.7	58.7
General mean	5.14	4.74	20.84	6.84	12.17	6.3				

numbers were detected at the beginning of February with the values of 5.19 and 4.62 snails / sample during 2008 and 2009 seasons, respectively.

The population density after the initial occurrence increased to reach its maximum values in different dates, for example it recorded the highest values at the third week of February during 2008 season while it recorded the highest values at the third week of March during 2009 season revealing 27.4 and 12.9 snails /

sample, respectively. The population increased and decreased to reach 12.2 and 4.62 snails / sample at the end of growing season, respectively.

When the numbers of *E.vermiculata* snail on the three crops were compared, it was found that cineraria harboured the highest numbers followed by sprekelia while sweet pea was the lowest one in this respect. The general means of counted snails during the growing seasons of these crops were (20.84 and 6.84), (12.17 and

6.3) and (5.14 and 4.74) snails / sample in the two seasons of 2008 and 2009, respectively. It was noticed that the population density in the first season of study (2008) was relatively higher as compared with that in the second season (2009). Generally, it could be concluded that population density of *E.vermiculata* snail increased during February and March months on sprekelia, March and May on sweet pea and April on cineraria.

#### **On certain perennial ornamental plants**

Seasonal population dynamics of the land snail, *E.vermiculata* in relation to temperature and relative humidity were studied on gazania, ficus and rose during the two successive seasons of 2008 / 2009 and 2009 / 2010 at Zagazig district, Sharkia Governorate. Results in Table 4 revealed that the population fluctuated from host plant to another and from month to another. On gazania the infestation beginning with low numbers of *E.vermiculata* snail in February which exhibited 9.25 and 6.88 snails / sample during the two seasons of 2008 / 2009 and 2009 / 2010, respectively. The population density increased or decreased to reach its maximum values in May and April with values of 48.25 and

33.78 snails / sample during 2008 / 2009 and 2009 / 2010 seasons, respectively.

At December, the corresponding lowest values of 19.75 and 12.3 snails / sample were recorded. On ficus, it was noticed that different population density occurred, where the highest value (75.78 snails/sample) were recorded in September during 2008/2009 season, while it was in April during 2009 / 2010 showing 46.5 snails / sample. Afterwards, the population density decreased until reaching its minimum values at the end of each season where gave 16.75 and 6.8 snails/sample at January in the two seasons, respectively. On rose, the population density appeared with a relatively low numbers of *E.vermiculata* snail at February which gave 23.3 and 4.93 snails / sample during 2008 / 2009 and 2009 / 2010 season, respectively. Thereafter the population density decreased or increased to reach its maximum values at July in 2008 / 2009 season while at August in 2009/2010 season with values 42.65 and 29.45 snail / sample, respectively. Thereafter, the population density fluctuated with decrease or increase to reach 25.25 and 13.75 snails / sample at the end of experiment (January) during the two seasons, respectively.



**Table 4. Population dynamics of the land snail *E.vermiculata* infesting certain perennial ornamental plant species at zagazig district, Sharkia Governorate during 2008 / 2009 and 2009 / 2010 seasons**

Dates	Number of land snails / sample									
	Gazania		Ficus		Rose		Temperature		R.H.%	
	2008/ 2009	2009/ 2010	2008/ 2009	2009/ 2010	2008/ 2009	2009/ 2010	2008/ 2009	2009/ 2010	2008/ 2009	2009/ 2010
Feb.2008	9.25	6.88	11.03	7.63	23.3	4.93	16.7	19.7	66.6	60.5
March	20.58	21.78	10.5	22.07	9.55	14.58	20.8	18.8	62.4	61.2
April	6.75	33.78	44.13	46.5	17.7	22.0	31.6	22.7	56	62
May	48.25	21.88	22.88	18.88	31.8	19.65	29.5	25.3	55.3	59.9
June	44.55	18.3	62.83	19.88	40.8	27.07	30.7	29.1	59.3	56.7
July	42.38	28.33	72	19.35	42.65	27.9	30.7	19	66.1	60.9
August	32.78	29.3	68.75	14.8	28.5	29.45	33.1	32.8	67.9	65.8
September	32.93	20.88	75.78	10.78	10.6	29.4	32.2	31.8	60	59.5
October	32.8	31.88	58.58	16.28	9.47	23.6	27.9	31.2	62	69.26
November	34.6	13.88	55.15	14.08	15.15	17.0	25.5	23.6	59.4	68.67
December	19.75	12.3	32.05	10.95	25.6	15.88	21.3	22	62.1	69.07
Jan. 2009	39.33	14.75	16.75	6.8	25.25	13.75	17.4	22.4	59.3	64.69
General mean	26.79	20.71	44.26	17.33b	23.36	20.44				

Regarding general means, it was noticed that ficus harboured the highest numbers of snail followed by gazania and rose. The general means of counted snails during the two growing seasons of these plants were (44.26 and 17.33), (26.79 and 20.71) and (23.36 and 20.44) snails / sample in the two seasons of 2008/2009 and 2009/2010, respectively. It was obvious that the general means in the first season of study (2008/2009) were higher than those in the second one (2009/2010).

#### Effect of temperature and relative humidity

The relationship between population densities of the land,

snail, *E.vermiculata* and both ambient temperature and relative humidity is presented in Table 5. Results revealed insignificant negative correlation values in most cases. Herbaceous plants exhibited insignificant negative correlation values between *E.vermiculata* population densities and temperature in case of sprekelia (2008 season) and both sweat pea and sprekelia (2009 season), while insignificant positive correlation values were detected in other cases. The correlation coefficient was insignificant positive between population densities and relative humidity and significant positive correlation values on sprekelia

**Table 5. Correlation coefficient between the population density of *E. vermiculata* snail and each of temperature and relative humidity on certain ornamental plants at Zagazig district, Shar'kia Governorate**

Host plants		Temperature	R.H. %	Temperature	R.H. %
Season		2008		2009	
Herbaceous plants	Sweet pea	0.285	-0.107	-0.194	0.472
	Sprekelia	-0.047	0.163	-0.249	0.705*
	Cineraria	0.637	-0.198	0.389	0.099
Season		2008 / 2009		2009 / 2010	
Perennial plants	Gazania	0.422	-0.255	0.547	-0.397
	Ficus	0.835*	0.141	0.938**	0.048
	Rose	-0.052	-0.304	-0.032	-0.456

Each value represents correlation coefficient

during 2008 and 2009 seasons, respectively. Regarding perennial plants, there are inconsistent and insignificant negative or positive correlation values between snail population densities and both temperature and relative humidity. The correlation values of *E. vermiculata* snails and temperature on ficus trees were positive significant and highly significant for 2008 / 2009 and 2009 / 2010 seasons, respectively.

Seasonal population behaviour of some land snails was studied by many investigators in Egypt. Beshr, 2000; EL-Wakeil *et al.*,

2000; and Mortada 2002 studied the population dynamics of the land snails; *Theba pisana*, *E. vermiculata*, *Monacha cartusiana*, *H. vestalis* and *Succinea* sp. at Kafr EL-Sheikh, Alexandria, Beheira and Dakahlia Governorates.

At Sharkia Governorate, Ismail (2004) reported that land snail *E. vermiculata* was found throughout allover the whole year with low numbers in January and gradually increased to reach its peak in May. Arafa (2006) reported that the population density of *M. cartusiana* snails showed more increase during spring months

(March, April and May) as compared to low numbers during the other seasons. Lokma (2007) found that the population densities of *M. cartusiana* snail increased during spring months as compared to low or moderate values during autumn and winter months. Shetaia *et al.* (2009) reported that *M. cartusiana* snail was recorded with high density during spring months (March, April and May) as compared with winter or autumn months.

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تواجد وديناميكية التعداد لقوقع إيبواتيا فيرميكولاتا الذي يصيب بعض نباتات

الزينة في منطقة الزقازيق محافظة الشرقية

عاطف عبد الفتاح أحمد عبد الله - شحاته أحمد علي إسماعيل

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أجريت دراسات على تواجد وديناميكية التعداد لقوقع إيبواتيا فيرميكولاتا الذي يصيب بعض نباتات الزينة الحولية (بسلة الزهور- مارجریت - جرييرا - دودنيا - أبوخنجر - أقحوان - سكرانيا - سناتير - أستريكوليا - فلنجم - سبريكليا (زهرة الثالوث الإرجوانية) - كلاشييو (أجراس نخيل الشاطئ) والمستديمة (الورد البلدي - لاتانا - فيكس - الأبصال المزهرة - يوكا - جزانيا - سالفيا) خلال موسمي ٢٠٠٨/٢٠٠٩ ، ٢٠٠٩/٢٠١٠ في منطقة الزقازيق بمحافظة الشرقية . أظهرت الدراسات أن قوقع إيبواتيا فيرميكولاتا (الذي يسمى قوقع الحدائق البني ذو الشفة المنعكسة) يصيب نباتات الزينة الحولية والمستديمة وتلاحظ أن معظم نباتات الزينة الحولية وبصفة خاصة بسلة الزهور تصاب إصابة خفيفة في موسم ٢٠٠٨ وإصابتها متوسطة في موسم ٢٠٠٩ بينما وجد أن نبات السناتير يصاب بدرجة متوسطة في موسم ٢٠٠٨ وإصابة شديدة في موسم ٢٠٠٩ ، وبخصوص نباتات الزينة المستديمة وجد أن أشجار الفيكس تصاب إصابة قليلة على الأرض وإصابة شديدة على النبات خلال موسمي الدراسة. بخصوص ديناميكية التعداد لقوقع إيبواتيا فيرميكولاتا فقد وجد أنه يختلف من عقل نباتي لآخر وكذلك من شهر لآخر حيث وجد أنه يزداد خلال فبراير ومارس على النباتات العشبية مثل نبات سبريكليا، وخلال مارس ومايو على نبات بسلة الزهور وخلال أبريل على السناتير، أما بالنسبة للنباتات المستديمة فقد وجد نفس السلوك تقريبا مع إختلاف في الشهور حيث تزداد أعداد القواقع خلال شهر مايو على الجزائريا، وخلال شهر أبريل وسبتمبر على الفيكس وخلال يوليو وأغسطس على نبات الورد. على هذا الأساس يمكن إختيار برنامج المكافحة المناسب لقوقع إيبواتيا فيرميكولاتا الذي يصيب بعض نباتات الزينة في التوقيت المناسب.