

Effect of Food Type on Some Biological Aspects Of *Monacha Cartusiana* (Muller) Snail Under Laboratory Conditions

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Abstract

The Effect of different food types on numbers of clutches, eggs and clutch size as well as growth pattern of *Monacha cartusiana* snail as indicated by shell diameter and body weight were studied under laboratory conditions. Results revealed that when adults of *M. cartusiana* snail were fed on leaves of different plant species during the breeding season, numbers of clutches, eggs and clutch size were significantly differed from one plant to another. Regarding general means, the highest numbers of clutches, eggs and clutch size were recorded with pea leaves with values of 2.66, 133.26 and 48.05, respectively, while lowest values were obtained with carrot which gave 1.2, 29.06 and 24.03, respectively, during February, 2013.

Regarding, the effect of the tested plant species on growth of *M. cartusiana* snail, those could be arranged descendingly according to their suitability as follows: pea, lettuce, cabbage, Egyptian clover and carrot leaves.

Keywords: Food Type, Biological Aspects, Snail.

Introduction

Land molluscs have been increased rapidly in the late years and considered as serious pests attack all crops and caused severe damage to all plant parts and subsequently reducing marketing values of these crops (Barker, 2002). The gastropods including snails and slugs are of economic importance to man where they caused several damage in agriculture, horticulture and forestry. In addition, their importance in medical and veterinary practice since they serve as intermediate hosts for certain parasitic worms of man and his domestic animals. Snail and slug pests are essentially vegetarian and feed on a wide variety of plant materials both wild and cultivated which include field, vegetable and fruit crops as well as ornamental plants (Godan, 1983).

In Egypt, up till 1980's it was established that certain land molluscs has been concentrated mostly in northern governorates of Delta region. Gastropods left viscous liquids on the plants giving a bright trace film, since farmers complained that their cattles refused feeding on berseem (Egyptian clover) due to unaccepted glistening slimes of the infested plants making farm animals to refuse eating on these plants (El-Okda 1980). In Sharkia governorate many authors investigated ecological and biological aspects of some land snails as economic pests that cause severe damage on vegetable and field crops (Nakhla and Tadros, 1995, EL-Masry 1997, Ismail 1997, Arafa, 1997, Mahrous *et al.*, 2002 and Lokma, 2013).

The effect of food type on fecundity of some land snails was studied by many authors under laboratory conditions at Sharkia governorate (Ismail 1997 and Abed 2011). Moreover, the effect of food type on growth as indicated by weight and shell diameter was determined by many investigators in Egypt

(Asran 1994, Ismail 1997, Ismail 2004 and Lokma 2007).

The present work aimed to study the effect of different food types on some biological aspects and growth of *M. cartusiana* during the breeding season.

Material and Methods

1.1. Tested animals:

Subadult snails of *M. cartusiana* less than 12mm in shell diameter were collected in March, 2012 from highly infested field cultivated with sugarcane plants at Mymouna village, Meniet El-Kamh district, Sharkia governorate. Collected snails were transferred in plastic bags to the laboratory of Plant Protection Research Institute, Sharkia branch and then placed in glass containers (50 × 30 × 30 cm) and fed on cabbage leaves until they reached maturity.

1.2. Effect of food type on some biological aspects of *M. cartusiana* snails under laboratory conditions:

The effect of food types (pea, *Pisum sativum*, lettuce, *Lactuca sativa*, cabbage, *Brassica oleracea*, Egyptian clover, *Trifolium alexandrinum* and carrot, *Daucus carota*) was investigated on number of clutches, eggs and clutch size of *M. cartusiana* snails. Clay soil was obtained from sugarcane field at Mymouna village. Twenty five plastic pots of 10-cm diameter (3/4 kg capacity) were filled with sieved and steam sterilized soil to a depth of about 8 cm. Equal volume of distilled water was added to each plastic pot to keep soil moisture near field capacity (Ismail, 1997). Five replicates were used for each treatment. Each, treatment was supplied with amount of fresh leaves of the mentioned five plant species for feeding. One pair of the snails. adults recognized by

white end and reddish strip was introduced into each pot. The plastic pots were closed with muslin cloth and secured with rubber bands to prevent snails from escaping and kept at laboratory temperature (**El-Okda, 1981**).

The old leaves were changed daily and soil remoisted as needed. The soil within each pot was inspected weekly for searching clutches using fine pair of forceps during the period from December, 2012 to February 2013. The clutches were removed carefully and the number of eggs in each clutch was counted. Obtained data were subjected to statistical analysis using F test and means were separated by Duncan's multiple range test (**Duncan's, 1955**).

1.3. Effect of feeding on leaves of five plant species on growth parameters of *M. cartusiana* under laboratory conditions:

The effect of food type (pea, lettuce, cabbage, Egyptian clover and carrot) on growth of *M. cartusiana* snails as indicated by shell diameter and weight was determined during the period from January 2013 to June 2013 under laboratory conditions. Two newly hatched juveniles of a similar shell size were weighed and introduced into a plastic pot. Five replicates were used in each treatment. Each pot was supplied with two grams of fresh leaves of the different five plant species mentioned previously. Food was introduced daily and soil was remoisted as needed. The pots were closed with muslin cloth and secured with rubber band to prevent snails from escaping and kept at laboratory temperature (**El-Okda 1981**). Weight (mg) and shell diameter (mm) of each snail were recorded monthly during the period from January to June 2013. Data were subjected to statistical analysis according to one way analysis of variance (ANOVA) and Duncan's multiple range test of means (**Duncan's, 1955**).

Results and Discussion

I- Effect of food type on some biological aspects of *M. cartusiana* snails.

The effect pea, lettuce, cabbage, Egyptian clover and carrot leaves on numbers of clutches, and eggs and clutch size of *M. cartusiana* snails were studied under laboratory conditions. Data in Table (1) showed that when adults of *M. cartusiana* snails were fed on different plant leaves during the breeding season, the numbers of clutches, eggs and clutch size were significantly differed from one plant to another. The numbers of clutches and eggs as well as clutch size during December 2012 were differed significantly from food type to another. The highest numbers were noticed when *M. cartusiana* snails

were fed on pea, while the lowest were noticed with carrot leaves which gave 3.2, (1.4), 178.6 (34.8) and 55.81, (24.85), respectively. The same trend was observed during January and February 2013 where the highest numbers of clutches, eggs and clutch sizes (eggs/ clutch) were found with pea leaves, while the lowest values were observed with carrot leaves. The highest values during January and February were 2.8 (2), 155.8 (65.4) and 55.64 (32.7) for pea leaves where the lowest values were 1.2 (1.0), 31.4 (21) and 26.16 (21) for carrot leaves, respectively.

Regarding general means, it was noticed that pea resulted the highest numbers of clutches, eggs and clutch size while carrot leaves gave the lowest ones with values of 2.66 (1.2), 133.26 (29.06) and 48.05 (24.03), respectively. Generally, the efficiency of food type on the numbers of clutches and eggs could be arranged descendingly as follows: pea, lettuce, cabbage, Egyptian clover and carrot leaves, where they gave 2.66 clutches (133.26 eggs,) 2.26 (94.33), 1.66 (64), 1.4 (44.6) and 1.2 (29.06), respectively.

When discussing the foregoing results, it was found inconstant results concerning the effect of different food types on numbers of clutches and eggs, for example **Baker, (1991) and Arafa, (1997)** found that the highest numbers of eggs / clutch laid by *M. cartusiana* snail were detected in the case of lettuce followed by cabbage and pea. **Mohamed, (1999)** reported that *Eobania vermiculata* snails fed on mixture food gave the highest number of eggs followed by lettuce, cucumber and potato. **Mahrous, et al. (2002)** found that egg lying of *M. cartusiana* and *Helicella vestalis* snails started from the beginning of December until mid February in the next year. **Lokma, (2007)** reported that *M. cartusiana* gave the highest values of eggs and egg clutches when fed on lettuce leaves followed by cabbage, Egyptian clover and broad bean, descendingly. Whereas few eggs and clutches were laid when snail were fed on pea leaves. **Abed, (2011)** found that *M. cartusiana* gave the highest values of number of eggs and clutches when fed on lettuce leaves followed by cabbage comparing with those recorded by pea leaves and potato tubers. Total number of eggs and clutches when fed on lettuce and cabbage leaves were 471.8 eggs and 21.4 clutches as well as 253 eggs and 13.6 clutches, respectively. Clutch size during the breeding season was 22 and 18.6 eggs for lettuce and cabbage leaves. The total number of eggs, clutches and clutch size when snails were fed on pea leaves and potatoes tuber were (136.2 & 30.4 eggs), (6.6 & 2.2 clutches) and (20.6 & 13.8 as clutch size), respectively.

Table 1. Effect of food type on numbers of clutches, eggs and clutch size of *Monacha cartusiana* snail under laboratory conditions.

Treatments	Examination date													
	December 2012			January 2013			February 2013			General mean				
	No. of clutches	No. of eggs	Clutch size	No. of clutches	No. of eggs	Clutch size	No. of clutches	No. of eggs	Clutch size	No. of clutches	No. of eggs	Clutch size		
Pea	3.2	178.6	55.81	2.8	155.8	55.64	2	65.4	32.7	2.66 ^a	133.26 ^a	48.05		
Lettuce	2.8	122.4	43.71	2.4	110.2	45.91	1.6	50.4	31.5	2.26 ^a	94.33 ^b	40.37		
Cabbage	2.0	78.8	39.4	1.8	76.8	42.66	1.2	36.4	30.33	1.66 ^b	64 ^c	37.46		
Egyptian clover	1.8	54.4	30.22	1.4	51.4	36.71	1.0	28	28	1.4 ^{b c}	44.6 ^{cd}	31.64		
Carrot	1.4	34.8	24.85	1.2	31.4	26.16	1.0	21	21	1.2 ^c	29.06 ^d	24.03		
				L.S.D _{0.05}								0.42	25.13	--

* Data in the columns followed by the same letter were not significantly different ($P < 0.05$), according to Duncan's multiple range test.

Table 2. Effect of feeding on leaves of five plant species on growth parameters of *M. cartusiana* under laboratory conditions.

Plant species	January,		February,		March,		April,		May,		June , 2013	
	Weight (mg)	Shell diam (mm)										
Pea	2.28	1.4	4.69	2.24	13.40	5.52	40.87	6.56	119.37	8.51	200.80a	11.51A
Lettuce	2.04	1.02	3.80	1.79	11.30	3.82	31.55	4.31	90.30	6.39	173.45b	9.35B
Cabbage	1.74	0.9	2.88	1.48	9.27	2.70	23.43	3.43	75.43	5.30	145.26c	8.17C
Egyptian clover	1.32	0.8	2.59	1.31	8.25	2.21	18.7	3.34	64.38	4.23	120.35d	7.29D
carrot	1.0	0.72	2.11	1.24	6.34	1.86	12.91	2.26	49.67	3.21	94.63e	6.41E

* Means in columns not followed by the same letter are significantly different at $P < 0.05$ by Duncan's multiple range test

2- Effect of feeding on leaves of five plant species on growth parameters of *M. cartusiana* under laboratory conditions.

Data presented in Table (2) showed the effect of food type on growth pattern of *M. cartusiana* as indicated by weight and shell diameter under laboratory conditions at Sharkia governorate. Results revealed that when the newly hatched juveniles of *M. cartusiana* were reared on leaves of 5 different plant species during 6 months, weight and shell diameter of snails differed significantly from one food to another. The highest values of weight (mg) and shell diameter (mm) were recorded with pea, during June, 2013 (200.80 & 11.51), respectively. On the other hand, the lowest values were noticed by feeding on carrot which gave 94.63 mg and 6.41 mm for weight and shell diameter, respectively.

Generally, the tested food types could be arranged descendingly according to their suitability for growth of *M. cartusiana* snails as measured by weight and shell diameter as follows: pea and lettuce were more favorable, followed by cabbage and Egyptian clover, while the lowest effect was obtained with carrot leaves.

Discussing the foregoing results, it could be concluded that variation in growth patterns (weight and shell diameter) of *M. cartusiana* snails after feeding on different food types for 6 months, may be attributed to difference in nutrient compositions of the tested foods. The present results agree to certain extent with results obtained by many authors.

For instance, **Cobbinah and Osei-Nkrumah (1988)** studied the growth rate of *Achatina achatina* as measured by snail weight and shell diameter. The four tested food stuffs were arranged for their suitability as follows: green pawpaw (*Carica papaya*), cocoyum leaves (*Xanthosoma mafaffa*), flam flower leaves (*Taliman triangolare*) and ripe palm fruits (*Elaeis guineansis*). **Arafa (1997)** found that the highest values of weight of *Monacha* sp. increment were recorded during spring months. On the other hand, leaves of sweet pea gave the highest weight average / month followed by lettuce while cabbage leaves were the lowest one. **Ismail (1997)** reported that leaves of lettuce and cabbage were more favorable for *M. cartusiana* snails followed by broad bean and Egyptian clover, while navel orange was the lowest one in this respect. **Ismail, (2004)** reported the five tested plant leaves and potato tubers could be arranged descendingly according to their effect on growth of *E. vermiculata* that measured by shell diameter as follows: potato slices, lettuce and cabbage leaves were more favorable, followed by navel orange leaves, while the lowest effect was obtained with banana and mango leaves. Finally, **Abed, (2011)** found that when juveniles of *M. cartusiana* snails were maintained on soil containing 4% of CaCO_3 gave the highest shell diameter and body weight (3.7 mm and 26.3 mg), respectively. Regarding snail maintained on soil containing 8%

and 2% CaCO_3 , the shell diameter were 3.49 and 2.67 mm, respectively while body weight were 23.4 and 9.6 mg respectively. The lowest shell diameter and body weight were recorded in juveniles maintained on soil free from CaCO_3 , those where recorded 2.6 mm and 7.1 mg, respectively.

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تأثير نوع الغذاء علي بعض النواحي البيولوجية لتوقع موناكا كارتوسيانا تحت الظروف المعملية

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أجريت هذه الدراسة بهدف معرفة تأثير خمس انواع من الغذاء وهي اوراق نباتات البسلة - الخس- الكرنب- البرسيم المصري- اوراق الجزر علي بعض النواحي البيولوجية لتوقع البرسيم الزجاجي (موناكا كارتوسيانا) معمليا- اتضح أن لنوع الغذاء تأثير معنوي علي عدد كتل البيض وكذا عدد البيض و حجم الكتلة كما أشارت الدراسة ان التغذية علي اوراق البسلة اعطي اعلي معدل من كتل البيض وعدد البيض حيث كان المتوسط العام 2.66 كتلة و 133.26 بيضة بمعدل 48.5 بيضة/ كتلة بينما كانت أقل معدل مع اوراق الجزر حيث كانت القيم 1.2 كتلة - 29.6 بيضة بمعدل 24.03 بيضة/ كتلة. أما بخصوص تأثير نوع الغذاء علي نمو قوقع موناكا كارتوسيانا فقد اوضحت الدراسة ان البسلة اعطت اعلي معدل للنمو بينما أدت التغذية علي اوراق الجزر اقل معدل للنمو ويمكن ترتيب النباتات المختبرة تنازليا طبقا لتأثيرها علي النمو كما يلي: البسلة -الخس الكرنب البرسيم المصري ثم الجزر في المرتبة الاخيرة.