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Susceptibility and Consumption Rates of *Monacha cartusiana* and *Helicella vestalis* Land Snails to Certain Plants

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ABSTRACT

Land snails especially *Monacha cartusiana* and *Helicella vestalis* caused many problems to most of the economic plants in Egypt. The presented study was carried out to estimate the susceptibility and consumption rates of snails infesting cabbage (*Brassica oleracea var capitat*), lettuce (*Lactuca sativa*), egyptian clover (*Trifolium alexandrinum*) and orange (*Citrus sinensis*) plants. Besides, certain elements of these plants were analytically assessed. Data showed that cabbage and lettuce were most attracting compared to other plants [(63.3, 67.3) and (57.9, 42.9) individuals] for the two snails, respectively. Cabbage and lettuce had, also, the highest quantity consumed by two species of snails with means (34.8, 41.5) and (30.9, 33.3) gm., for the two animals, respectively. Results cleared that cabbage has the highest percentages of protein, sugar, carbohydrates, P and Na elements, while orange has the least percentages of most elements.

Key words: Land snails, susceptibility, food consumption, plant elements, analysis.

Introduction

Animals of phylum: Mollusca are invertebrates and probably the third most important after Arthropods and Vertebrates animal groups.

Land snails have extended their geographical distribution with many species. In Egypt, land snails become very important pests of many fruit and vegetable crops and ornamental plants (El-Okda, 1984). Land snails caused high damage to the plants, resulting serious reduction in yield production of attacked crops (Asran, 1999 and Abd-El-Aal, 2001).

The present work aimed to study the preference of some plant leaves by two species of land snails *Monacha cartusiana* and *Helicella vestalis* under laboratory conditions. On the other hand, the study included certain elements analysis of *B. oleracea var capitat*, *L. sativa* , *T. alexandrinum* and *C. sinensis* leaves.

Material and Methods

Succeptibility and daily consumption of snails:

Adults of *M. cartusiana* snails were collected by hand from *T. alexandrinum* plants, while *H. vestalis* from *C. sinensis* trees during spring 2015. Animals were put in transparent bags and transported to the Zoology laboratory of Plant Protection Department, Faculty of Agriculture, Benha University to be washed with fresh water (Godon, 1983 and Badawey, 2002). The snails were kept under laboratory conditions, 30 healthy adult snails were chosen from each species. The animals were vest starved for 24 hours before starting the experiment (Miller, *et al.,* 1988 and Shetaia, 2005). Test plants were *B. oleracea var capitat*, *L. sativa*, *T. alexandrinum* and *C. sinensis* leaves. Three wooden boxes (80 × 60 × 20 cm) were used for each species and contained mixed soil with 10cm depth and 80% moisture. Each box contained 10 animals which were placed in the middle of the box, and around the snails 30 gm of fresh leaf samples of each plant were placed in the four sides of the box. The food materials and their sides were altered daily to avoid preference for a certain location (Mohamed, 2004). Number of snails was counted in each food material and the tested leaf samples were changed daily after being weighed. The corrected reductions in weight by snails consumption were estimated for seven successive days.

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Analysis studies of tested plants:

The percentages of certain elements (moisture, total protein, carbohydrates, total lipids, calcium Ca , phosphorus P, Potassium K, sodium Na, magnesium Mg) of *B. oleracea var capitat* , *L. sativa* , *T. alexandrinum* and *C. sinensis* plants were analyzed in the Central Laboratory of the Faculty of Agriculture , Benha University.

Results and Discussion

Susceptibility of snails to some plant leaves:

Data presented in table (1) cleared that, leaves of *B. oleracea var capitat* were the best for *M. cartusiana* and *H. vestalis* attracting, followed by *L. sativa* with average number 63.3, 67.3 and 57.9, 42.9 snails for the two plants after seven days, respectively. Means of numbers in the same table showed that *T. alexandrinum* was most preferable for *M. cartusiana* than *H. vestalis* with means 42.6 and 25.1 snails, respectively. While, *C. sinensis* leaves were more attracting for *H. vestalis* with16.3 individuals.Generally, data indicated that the most preferable food for the two tested snails was *B. oleracea var capitat* followed by *L. sativa* under laboratory conditions and *C. sinensis* was the least favorable. (Asran *et al.,* 2016) showed that *E. vermiculata* preferred lettuce followed by squash, carrots and potatoes.

Table 1: Preference of *M. cartusiana and H. vestalis* to some plant leaves under laboratory conditions.

Snail species	Days after / Plants	Average number of collected snails at							Mean
		1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	
M. cartusiana	*B. oleracea var capitat*	23.3	30.0	43.3	36.7	26.7	46.7	30.0	63.3
	L. sativa	30.0	40.0	30.0	26.7	43.3	16.7	43.3	57.9
	T. alexandrinum	30.0	23.3	20.0	30.0	16.7	20.0	13.3	42.6
	C. sinensis	00.0	03.0	00.0	00.0	6.7	3.3	00.0	3.1
H. vestalis	*B. oleracea var capitat*	36.7	30.0	36.7	20.0	53.3	43.3	30.3	67.3
	L. sativa	26.7	20.0	40.0	16.7	10.0	26.7	20.0	42.9
	T. alexandrinum	6.7	16.7	6.7	30.0	13.3	6.7	26.7	25.1
	C. sinensis	10.0	6.7	3.3	13.3	10.0	10.0	6.7	16.3

Daily consumption of some plant leaves by snails:

The tabulated results in table (2) showed the daily consumption of *B. oleracea var capitat* , *L. sativa* , *T. alexandrinum* and *C. sinensis* leaves during seven days by *M. cartusiana* and *H. vestalis* under laboratory conditions. Data indicated that the biggest quantity of consumed plant by the two snails was for *B. oleracea var capitat* with 34.8 and 41.5gm, followed by *L. sativa* and *T. alexandrinum* with means (30.9 and 33.3) and (21.6 and 30.3) gm., for the two animals respectively. On contrary, *C. sinensis* plant was the least preferred for snails, with means 0.33 and 1.80gm, of consumed food. (Khalifa-Rasha, 2008) revealed that grape leaves were the most preferable food for both the snail *E. vermiculata* and the slug *Limax maximus*

Table 2: Daily consumption of some plant leaves by *M. cartusiana and H. vestalis* under laboratory conditions.

Snail species	Days after / Plants	Corrected food stuffs consumptions in weight (g) of tested plants							Mean
		1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	
M. cartusiana	*B. oleracea var capitat*	6.3	5.4	7.1	4.2	6.2	4.8	5.3	34.8
	L. sativa	5.5	4.7	6.4	3.9	4.4	5.4	4.6	30.9
	T. alexandrinum	2.7	3.9	4.1	3.2	2.9	4.5	2.2	21.6
	C. sinensis	0.30	0.01	0.01	0.20	0.00	0.00	0.00	0.33
H. vestalis	*B. oleracea var capitat*	7.1	6.8	6.9	6.4	7.9	5.7	4.6	41.5
	L. sativa	8.3	6.1	6.2	3.4	4.5	4.1	5.4	33.3
	T. alexandrinum	4.8	5.3	4.1	3.8	5.4	6.1	5.9	30.3
	C. sinensis	0.90	0.50	0.01	0.00	0.30	0.10	0.10	1.80

Analysis for certain elements of the tested plants:

Data in table (3) cleared the percentages of some elements in the leaf parts of *B. oleracea var capitat*, *L. sativa*, *T. alexandrinum* and *C. sinensis* plants. Results showed that the highest percent of total protein, sugar, carbohydrates, P and Na were recorded for *B. oleracea var capitat* leaves with 13.85, 8.44, 14.91, 0.77 and 0.84%, respectively. While, total lipids and K were the highest in *L. sativa* with 3.34 and 28.16%. On the other hand, *T. alexandrinum* leaves contained the highest percent of moisture, Ca and Mg with 11.44, 10.59 and 0.34% respectively.

Data indicated also that the least percent of most elements were recorded for *C. sinensis* leaves with 3.92, 6.46, 4.49, 0.32, 8.38, 0.29 and 0.20% for total moisture, protein, Ca, P, K, Na and Mg, respectively. Also, the least sugar and carbohydrates percentages were in *T. alexandrinum* leaves with 2.71 and 10.75%. In the same respect, the least percent of total lipids was recorded for *B. oleracea var capitat* with 1.75%. (Aksoy., *et al* 2014) were determined 11 elements in the white cabbage, they found that, Ca and K contents were high levels. Also (Cristina., *et al* 2009) were analyzed 21 elements in lettuce plants in 11 sites in the area of Castelfiorentino (Tuscany, Central Italy)

Table 3: Analysis for certain elements of Cabbage, Lettuce, Egyptian clover and Citrus leaves

Elements / Plants	Moisture %	Total protein %	Sugar %	Carbohydrates %	Total lipids %	Calcium (Ca)%	Phosphorus (P)%	Potassium (K) %	Sodium (Na)%	Magnesium (Mg) %
B. oleracea var capitat	8.27	13.85	8.44	14.91	1.75	7.86	0.77	21.13	0.84	0.31
L. sativa	7.05	13.43	8.21	10.88	3.34	7.42	0.74	28.16	0.59	0.30
T. alexandrinum	11.44	12.53	2.71	10.75	2.99	10.59	0.54	23.06	0.44	0.34
C. sinensis	3.92	6.46	3.60	11.29	2.89	4.49	0.32	8.38	0.29	0.20

From presented data, it could be deduced that the best food for *M. cartusiana* and *H. vestalis* was *B. oleracea var capitat* followed by *L. sativa* and *T. alexandrinum*. While, the least important food for these snails was leaves of *C. sinensis* plant. It could be derived also that, by planting *B. oleracea var capitat* or *L. sativa* or *T. alexandrinum* near *C. sinensis* trees attacked with *M. cartusiana* or *H. vestalis*, of course the snail individuals will move from citrus to these plants. On the other hand, traps from these plants especially *B. oleracea var capitat* could be used under the attacked trees to attract snails as a mechanical control method.

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