

FOOD PREFERENCE AND FEEDING BEHAVIOUR OF LAND MOLLUSCS UNDER LABORATORY CONDITIONS

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Abstract

The preferability of some food materials to *Eobania vermiculata* snails and *Limax maximus* slugs was investigated under the laboratory conditions. The obtained results revealed that bran bait was the most preferable one for both snails and slugs followed with crushed wheat and bread. Crushed sorghum bait showed the lowest one for snails and completely refused by slugs, while both snails and slugs did not approach crushed maize. Regarding the preference of leaves of some fruit trees to snails and slugs, grape leaves were more preferred to the others, followed with leaves of citrus, guava, fig and apple, while pear leaves ranked the least.

On the other hand, treacle and molasses are considered the most promising additives mixed with the poisoned bait for snails and slugs.

INTRODUCTION

Snails and slugs belong to the phylum Mollusca, a group of animals with soft, unsegmented bodies. As members of the class Gastropode, they possess a distinct head with tentacles and eyes, a ventral muscular foot and a dorsal visceral hump. A calcareous shell covers the visceral hump of a snail and a tough, leathery skin known as the mantle covers the viscera of a slug (Quick., 1960).

The land mollusca including snails and slugs are considered of an economic importance among the animal pests attacking different types of plants. In recent years, the land snails are becoming serious pest in Egypt, infesting numerous agronomic, horticulture and ornamental plants. These animals cause serious reduction in yield production of infested crops and fruits, as well as destroying plant seedling (Crowell, 1967; El-okda, 1981). Land mollusca attack raw succulent vegetable and preferably soggy parts. Nature of damage was manifested in chewing soft vegeta-

tive growth, flowers and fruits, beside eating seeds, roots, and tubers after sowing or during ripening stage.

In Egypt, the land snails *Theba pisana*, *Helicella vestalis* and *Eobania vermiculata* are known as dangerous pests to ornamental plant truck crops.

The present work aimed to throw light on food preference and consumption of land snails and slugs under laboratory conditions.

MATERIALS AND METHODS

The preferability of some food materials for *Eobania vermiculata* snails and *Limax maximus* slug was studied under the laboratory conditions. The tested food materials included three groups, the first group comprised crushed wheat, maize, sorghum, bread and bran. While the second one included leaves of grapes, apple, pear guava, fig and navel orange. The third group included five attractive additives to study their effect on palatability of bran baits to snails and slugs. These additives were sugar, vanilla, salt, treacle and molasses mixed with bran bait at 5% level.

Animals of both *E.vermiculata* snails and *L.maximus* slugs were collected from untreated nursery plant and transported into plastic bags to the laboratory and the healthy animals were individually caged in small plastic boxes for two weeks before treatments, fed on fresh lettuce leaves. For each treatment, ten healthy adults, either for snails or slugs, were chosen and starved 24 hours before starting the experiments.

Two grams from each food material of each group were offered in small glass dish to ten caged individuals of snails or slugs for five successive days.

RESULTS AND DISCUSSION

1. Food Preference

The relative acceptance of the two tested groups of food materials for both *E.vermiculata* snail and *L.maximus* slug are shown in Tables 1 and 2.

Data in Table 1 revealed that among the five food materials of the first group, bran bait proved to be the most preferable one for both snails and slugs. The order of preferability of the tested five food material for *E.vermiculata* based on the average daily consumption was as follows: Bran bait (93.0 mg) > crushed wheat (63.0 mg) > crushed bread (26.6 mg) and crushed sorghum (8.8 mg), while crushed maize

Table 1. Bait preference and consumption of different crushed bait for two gastropods.

Baits	<i>Eobania vermiculata</i>		<i>Limax maximus</i>	
	Average daily Consumption/animal (mg)	Ratio relative to crushed sorghum	Average daily consumption/animal (mg)	Ratio relative to crushed bread
Bran	93.0	10.57	84.0	5.00
Crushed wheat	63.0	7.16	55.4	3.30
Crushed bread	26.6	3.02	16.8	1.00
Crushed sorghum	8.8	1.0	0.0	0.0
Crushed maize	0.0	0.0	0.0	0.0

bait completely did not approach by snails. The same trend was observed in the case of *L. maximus*, where bran bait was the most attractive one for slugs (84.0 mg) followed by crushed wheat (55.4 mg), while crushed bread ranked the least. On the other hand, slugs completely refused the feeding on crushed sorghum and maize baits.

Regarding the preferability of some fruit leaves for both snails and slugs, data shown in Table 2 revealed that grape leaves were most preferable one to snails and slugs, whereas they consumed 56.0 and 28.0 mg daily from these leaves, respectively, followed with citrus leaves (43.6 and 21.8 mg), guava leaves (29.6 and 18.2 mg), fig leaves (24.4 and 14.4 mg), apple leaves (16.0 and 9.8 mg) and pear leaves (8.4 and 7.8 mg).

Table 2. Food preference and consumption of different fruit leaves by two gastropods.

Fruit leaves	<i>Eobania vermiculata</i>		<i>Limax maximus</i>	
	Average daily Consumption/animal (mg)	Ratio relative to pear	Average daily consumption/animal (mg)	Ratio relative to pear
Grape	56.0	6.66	28.0	3.59
Citrus	43.6	5.19	21.8	2.79
Guava	29.6	3.52	18.2	2.33
Fig	24.4	2.90	14.4	1.85
Apple	16.0	1.90	9.8	1.26
Pear	8.4	1.0	7.8	1.0

Generally, it is cleared that fruit leaves are more vulnerable to snails than slugs and the attractiveness of these leaves considerably differed according to species of fruit trees.

Experiments were conducted by Duthoit (1964) on the feeding performance of snails. He found that slugs given a choice of wheat and barely but oats was hardly touched. Also, *Deroceras reticulatum* showed a preference for feeding on wheat (85%), on barley (56%) and oats (4%). Also, in other experiments, he found that *Arion rufus* shows a preference for solanaceae and compositae, *D.reticulatum* for leguminosae, cruciferae, compositae, carrot and potato leaves.

Ricou and Ferret (1973) found that the different species of land mollusca display preferences for many different types of food. Rye, wheat flour and wheat bran were the most preferred ones for *Helix pomata*. Also, they mentioned that the attractiveness of bran had been observed in the case of celler and field slugs. Freshly prepared orange-pulp had proved to be an effective bait for garden snails.

2. Role of additive on enhancing bait consumption

Results in Table 3 show that both *E.vermiculata* and *L.maximus* species consumed the highest amount of bran bait when mixed with 5% treacle followed by bran mixed with molasses, sugar, vanilla and salt with the same levels. The average amount of food mixture eaten for *E.vermiculata* and *L.maximus* were 145.0 & 118.4; 114.0 & 104.6; 57.8&74.8; 23.2 & 25.0, and 10.4 & 5.2 mg/animal, respectively.

Table 3. Attractiveness of different additives on bran bait to the gastropods.

Food additives	Average daily Consumption/animal (mg)	
	<i>Eobania vermiculata</i>	<i>Limax maximus</i>
Bran + treacle	145.0	118.4
Bran + molasses	114.0	104.6
Bran + Sugar	57.8	74.8
Bran + vanilla	23.2	25.0
Bran + Salt	10.4	5.2

Reviewing the results, it could be concluded that treacle and molasses are considered the most promising additives mixed with the poisoned bait of snails and slugs.

Daxl (1968) tested the dried blood, fish meal, casein and protein (carcass meal) on the attractiveness of slugs species *Deroceras reticulatum*, *Lehmannia marginata*, *Arion hortensis* and *Limax flavus* to bran baits and found that better results were obtained when casein was added, gastropods attracted to bait which contained dry blood meal or has a meat odour.

REFERENCES

- 1 . Crowell, H.H. 1967. Slug and snail control with experimental poison baits. J. Econ. Entom. 60: 1048 - 1050.
2. Crowell, H.H. 1977. Chemical control of terrestril slugs and snails. Experim. Stat. Oregon state Univ. Gorrallis, Bull. 62s, 69 P., July.
- 3 . Daxl, D. 1968. Abhangigkeit der wirkung molluskizider substanzen (Metaldehyd, Isolan,loxynil) Vonendogenen und exogenen Faktoren auf Nacktschnecken. Diss Berrlin D 83, 252, 1-162 Fakultat landbauder Tu.
- 4 . Duthoit, C.M. 1964. Slugs and food preferences. plant pathol., 13: 73-78.
- 5 . El-Okda, M.M.K. 1981. Locomotion activity and infestation abundance of certain terrestrial mollusca in fruit orchards, Alexandria province, ARE, Proc. 4th Arab pesticide conf. Tanta, 11: 279-288.
6. Quick, M.E. 1960. British slugs (Pulmonata: Arionidae, Limacidae). Bull. Br. Mus. (Nat. Hist.) Zool., London, 6 (3): 186-187.
7. Ricou, G. and R. Ferret. 1973. Methodologie experimental du control defficacite des molluscides a homologuer. Haliois 3: 113-123.

دراسات على أفضلية الغذاء وطبيعة التغذية لبعض القواقع الارضية والبيزاقات تحت الظروف المعملية

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إجريت هذه الدراسة على أفضلية الطعوم وحساب المستهلك منها لبعض القواقع الارضية والبيزاقات تحت الظروف المعملية، حيث اوضحنا النتائج ان طعم الردة أفضل غذاء للقواقع والبيزاقات يليه جريش حبوب القمح ثم جريش الذره الرقيقة، هذا ولم تتغذى القواقع من جريش الذره الشاميه. وكان متوسط استهلاك الفرد من الاغذية السابقة للقواقع *Eobania vermiculata* ٩٣ ، ٦٣ ، ٦٠،٢٦ ، ٨،٨ ملليجرام على التوالي، بينما كان متوسط الأستهلاك للقواقع *Limax maximus* وهى ٨٤ ، ٥٥،٤ ، ١٦،٨. كما اثبتت النتائج ان اوراق العنب كانت اكثر الانواع افضلية بالنسبه لكل من *Eobania vermiculata*، *Limax max-* يليه اوراق كل من الموالح والجوافة والتين ثم اوراق التفاح. بينما كانت اوراق الكمثرى اقل الانواع فى الافضليه. وكان متوسط استهلاك الفرد من الغذاء السابق للقواقع *Eobania vermiculata* ٥٦ ، ٤٣،٦ ، ٢٩،٦ ، ٢٤،٤ ، ١٦،٠ ، ٨،٤ ملليجرام ولقواقع *Limax maxi-* ٢٨ ، ٢١،٨ ، ١٨،٢ ، ١٤،٤ ، ٩،٨ ، ٧،٨ ملليجرام على التوالي. اما بالنسبه للمواد المضافه فقد كان لكل من العسل الاسود والمولاس دور كبير فى زيادة استهلاك القواقع والبيزاقات للطعم السام إذا ما قورن بالاضافات الاخرى مثل السكر والفانيليا والملح حيث كان متوسط استهلاك الفرد من الغذاء كالاتى ١٤٥ ، ١١٤ ، ٥٧،٨ ، ٢٣،٢ ، ١٠،٤ ملليجرام للقواقع *Eobania vermiculata* وكان ١١٨،٤ ، ١٠٤،٦ ، ٧٤،٨ ، ٢٥ ، ٥،٢ ملليجرام على التوالي للبيزاقه *Limax maximus*