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Study on feeding preferences to the gastropod *Monacha obstructa* (pfeiffer,1842) on three types of vegetable crops

Anfas N. Okash

Department of Ecology, Collage of Science, University of Basrah

Anfas.okash@uobasrah.udu.iq

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Abstract:

The terrestrial gastropod *Monacha obstructa* was bred under laboratory conditions, and during the experiment, snails were fed three types of vegetable crops: lettuce, radish, and celery. The prepared food for the snails was weighed and the remainder was weighed to estimate consumption ratios, where there were significant differences between the quantities of food consumed, as radish had the highest consumption, followed by lettuce and celery, which had the lowest consumption rate. In addition, it was found through the experiment that there was a significant difference between the weights of the snails that fed on these crops, as the snails fed on lettuce had the highest weight ratios, followed by celery and radish with the lowest weight ratios for the snails' weight. There was also a noticeable decline in snail feeding during the summer months, as the snails closed the shell with sclerotic mucus and entered the stillness phase.

Keywords: terrestrial snail, consumption, weight, Mollusca

Introduction:

Mollusca is a large and diverse phylum of invertebrate animals, whose individuals are grouped into classes according to anatomical differences and the main differences in the shape of the shell and foot (Boss, 1971). It is not possible to develop a special and detailed definition of phylum without referring to the thin parts of the body (Yochelson, 1985). Gastropoda is the largest class of mollusks, with a distinct and clear head, which usually carries a pair or two antennae. When the eyes are present, they are located at the tips of the tentacles or at their bases, with a flat foot and a single coiled shell. Terrestrial mollusks have the advantage of a mantle cavity that can convert into a lung, and true Pulmonata is not considered the only gastropod that leaves water (Pechenik, 1985). These snails are considered harmless to the environment in which they live, but they cause damage to vegetables and nutrition on lettuce, celery, and cabbage; therefore, they are considered economically harmful animals. In addition, snails in motion cause an unwanted odor that prevents people and animals from feeding on contaminated plants (El-Okda, 1984; Kassab

and Daoud, 1964; Sallam et al., 2009). Crops contaminated with snails lose their marketability and export potential in many countries (Baker and Hawke, 1990; Ittah and Zisman, 1992). Terrestrial snails are mainly nocturnal; however, after rain, they may go out of hiding during the day. Temperature and humidity, which are more specific than light, are the main factors that explain nighttime habits. Adaptive snails can be found everywhere but prefer habitats that provide shelter, adequate moisture, abundant food supply, and an available source of lime. River valleys usually provide these habitats, especially places with limestone fractures, which are more abundant than various mollusk species (Baur & Baur, 1999). The white terrestrial snail *Monacha obstructa* was recorded for the first time in the Basrah Marshlands by Abdul-Sahib (2006). The aim of this study was to estimate the percentage of terrestrial snail *Monacha obstructa* consumption of three field crops: lettuce (*Lactuca sativa*), radish (*Raphauns sativus*), and celery (*Apium graveolens*). Aquatic snails had been studied by many researchers Shatt al-Arab River, , for example Qazar *et al.*(2015) studied freshwater snails in the East Hammar marshes and Shatt Al-Arab River, recording ten species of aquatic snails. Ali (2020) studied the life history of the aquatic snail *Pomacea canaliculata* and found that temperature had a major impact on the life of the snail. However, terrestrial snails have not been studied in southern Iraq, and information about their lives is very poor.

Materials and methods :

Snails were collected from Al-Dair, north of Basra province, during November 2020, and brought to the laboratory in plastic zipper bags. The diameter of snail shells was measured using a Vernier caliper.The snails were divided into three groups and it was incubated at a temperature of 25 ºC for all replicates, each group consisted of three replicates (five snails for each replicate), the first group fed on lettuce, the second on radish, and the third on celery, then they were placed for each replicate in 1/2 kg transparent plastic containers and covered with a lid with perforations to reduce the impact of air. The average weight of each replicate was measured weekly using a 3-digit sensitive balance. Each container was prepared with a weighed amount of lettuce, radish, and celery daily as the weight of the leaves was removed from the bottle.

Experimental design and statistical analysis

The experiment was conducted according to a randomized complete block design. The data were analyzed statistically according to the ANOVA table using the SPSS program version 24. The treatment means were compared using the revised least significant difference test, according to Al-Rawi and Khalaf Allah (2000).

Results:

The shell diameters of the snails ranged from 8-14 mm. Figures 1,2and 3 show snails fed on radish, lettuce, and celery. Fig. 4 shows that there were significant differences between vegetable crops in the food consumption rate of snails. The radish leaves were significantly superior to lettuce and celery crops, with consumption rates of 4.973. Lettuce consumption was significantly higher than that of celery (3.071 g). The celery crop had the lowest rate of snail consumption (1.855 g).

Fig.1: Snail *M. obstructa* fed on radish

Fig.2: Snail *M. obstructa* fed on lettuce

Fig.3: Snail *M. obstructa* fed on Celery

Fig. 5 shows that the rate of food consumption was significantly different during the experimental period, as the rate of consumption in the first week was 4.130 g. The rate of consumption by snails increased and reached its peak during the seventh week, which was 4.557 g. The rate of food consumption decreased for the rest of the week until it reached its lowest rate in the fifteenth week, when there was no consumption of food.

As for the results shown in Figure 6, there are significant differences at a 0.05 probability level in the interactions between the types of crops under study and the periods of food consumption. The interaction between the radish crop and the sixth week was significantly superior to the other interactions in terms of the rate of food consumption, which recorded the highest value at 6.930 g. As for the interaction between lettuce, radish, or celery crop, the fifteenth week had the lowest consumption rate, which was zero.

Fig. 7 shows that there were significant differences between vegetable crops in the mean weights of the snails. The results showed that the lettuce crop was significantly superior to the radish and celery crops in terms of the mean weights of the two snails, which reached 2.924 g. The results also indicated the significant superiority of the celery crop compared to the radish crop, which reached 2.785 g. Radish had the lowest average snail weight (2.706 g).

Fig. 8 shows that there were significant differences in the mean weights of the snails during the weeks of the experiment. The eighth week recorded the highest average weight of the snails, which reached 2.890 g, whereas the first week recorded the lowest average weight (2.730 g).

Figure 9 indicates the presence of significant differences between the interaction factors. The results indicated the significant superiority of the interaction between the lettuce crop and the eighth week of the mean weights of the snails, which reached 3.070 g. In the interaction between the radish crop and the third week, the lowest mean weight for the snails was 2.600 g.

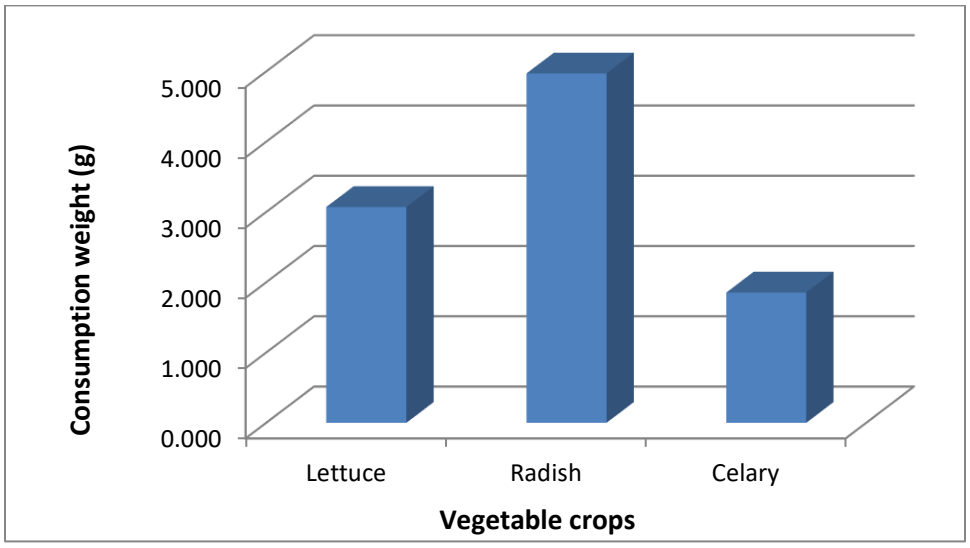

Fig.4 : The effect of the type of vegetable crop on the snail's food consumption(RLSD 0.05)=0.017

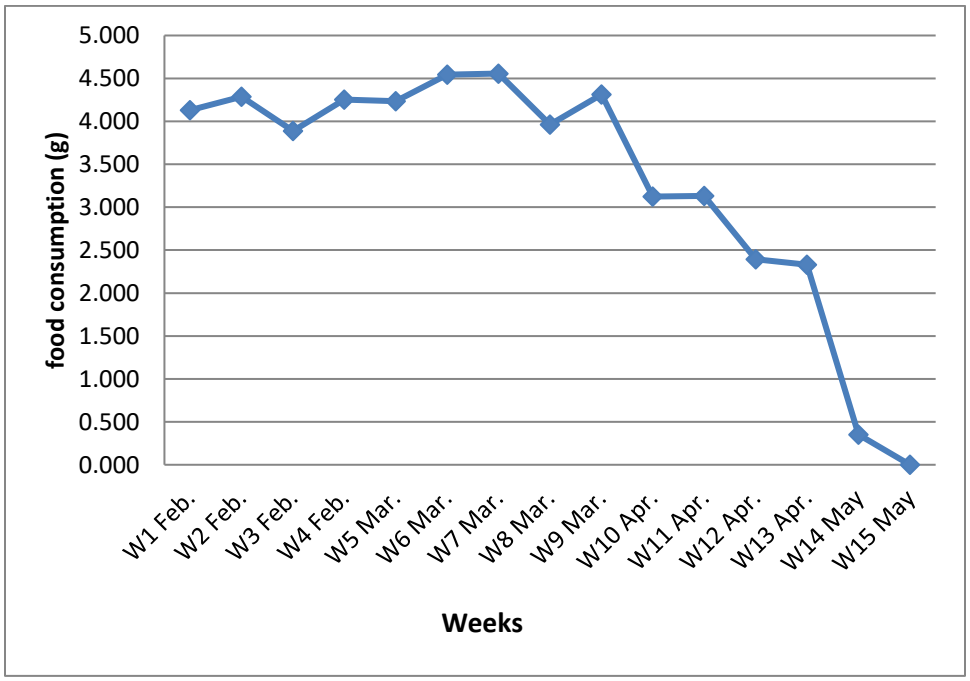

Fig.5: The amount of food consumed by the snail during February-May 2020 (RLSD 0.05)=0.037

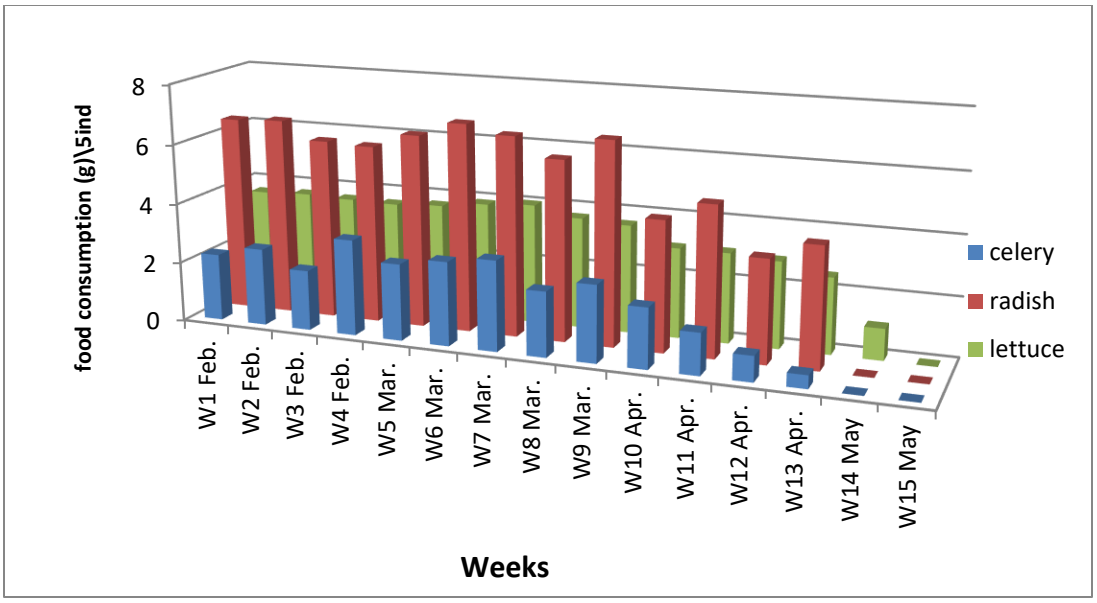

Fig.6 :The consumption average of the snail *M. obstructa* on the three crops paper per week during February –May2020 (RLSD 0.05)=0.064

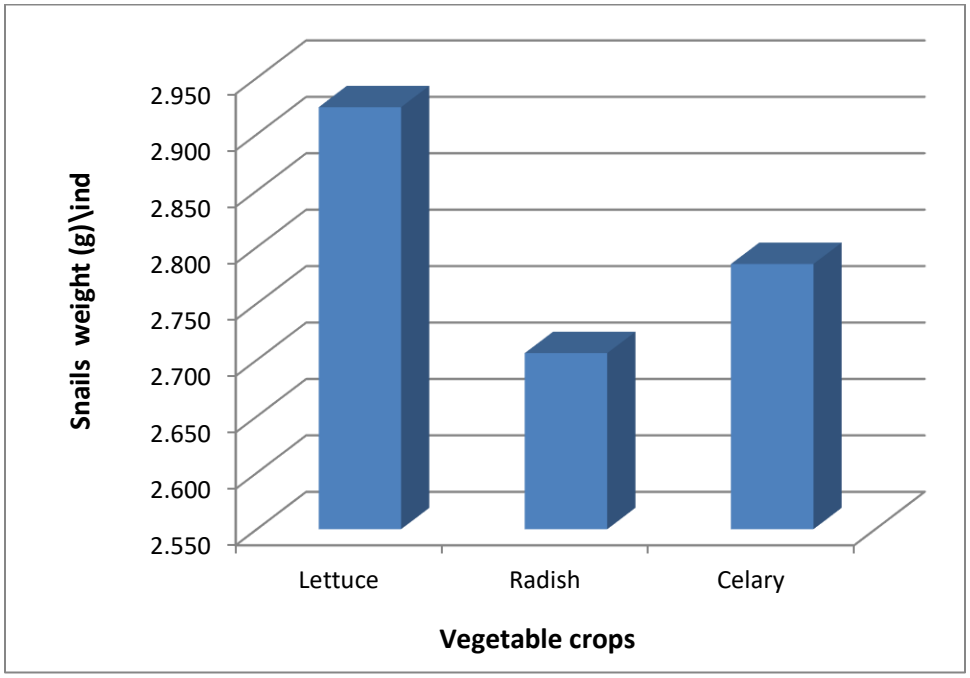

Fig.7 : The effect of the type of vegetable crop on the snail weight (RLSD 0.05)=0.012

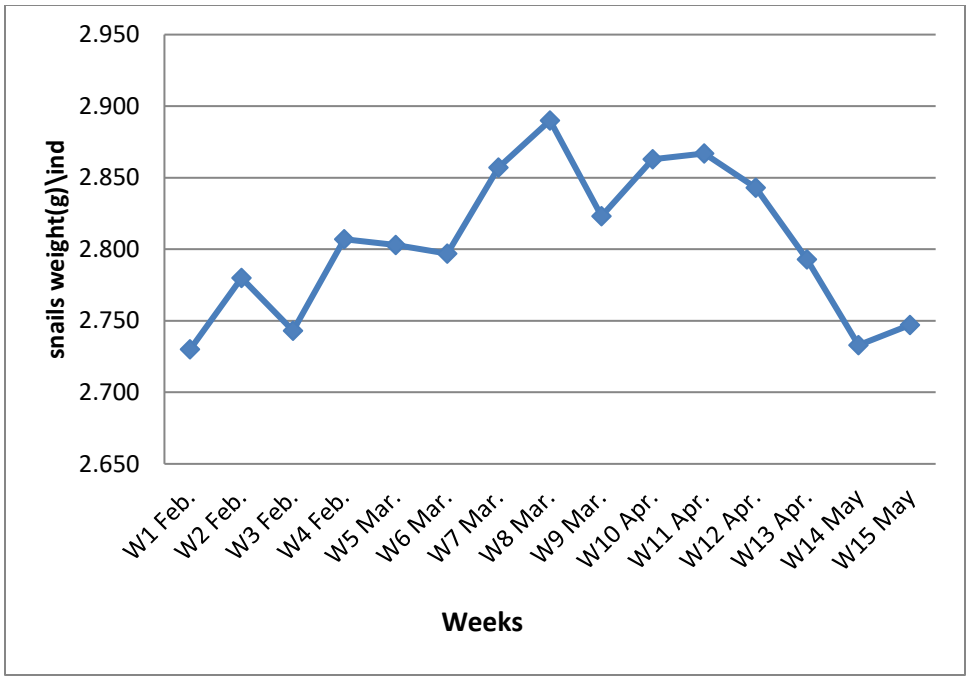

Fig.8: The mean snails weight during February-May 2020 (RLSD 0.05)=0.026

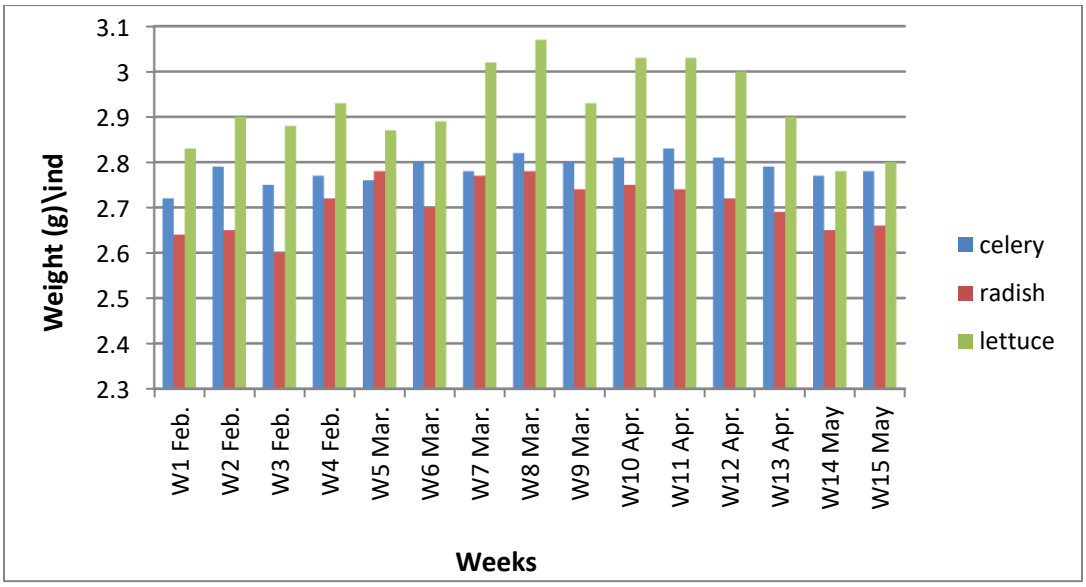

Fig.9 : The change in the weight of the snail *M. obstructa* during February-May2020 (RLSD 0.05)=0.045

Fig.10: The closes of the shell of the snail *M. obstructa* by sclerotic mucous secretions in the week 15th in May 2020

Discussion:

The study results agreed with those of Abdul-Sahib(2006) that the *Monacha obstructa* shell can reach 14 mm. The results were also in agreement with the studies of Bishara *et al*.(1968) and El-Okda(1981), who indicated that terrestrial snails cause a huge loss to many leaf crops, are considered harmful to the quality of plants, and lead to large losses in agricultural crops. The results of the study showed great feeding activity of snails during February and March, then the activity decreased during the month of April until all the snails had completely closed their shells with sclerotic mucous (fig10) and stopped feeding during the month of May, which agrees with the results of Desoky(2015), who showed that snails increase their activity when the humidity is high and the temperature is moderate, but during the summer months, most of the snails stick to the plant stems and branches where they enter the resting phase and stop feeding and movement, while the shell opening is closed with a membrane that protects the body of the snail from losing moisture, which agrees with the farmers' opinions that snails disappear from their lands during the summer season. Radish had the highest consumption rate, which may be due to its fresh leaves or to its richness in vitamin C, monosaccharides, fibers, and many minerals, as mentioned in the Kopta and Pokluda study(2013). The results of the experiment showed a significant increase in the weights of snails fed on lettuce leaves, which may be due to its richness in fatty acids, vitamins, and minerals, as stated in the study by Sularz et al. (2020), and its decrease in the of radish crops. This may also be due to the low percentage of dry matter in radish leaves.

Conclusions

Terrestrial snails are considered harmful organisms that cause significant damage to crops, whether they are fruits or vegetables, leading to a reduction in crop prices. Many farmers in southern Basrah farms complain of crop damage because they do not know their sources; therefore, they need many studies on their lives because they have been found to be affected by temperature.

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دراسة عن التفضيل الغذائي لبطني القدم ***Monacha obstructa*** **(Pfeiffer,1842) على ثلاثة أنواع من محاصيل الخضرية**

أنفاس نعمة عكاش

قسم البيئة، كلية العلوم، قسم البيئة

المستخلص

تم تربية بطني القدم الأرضي Monacha obstructa في ظروف مختبرية، وتم خلال التجربة تغذية القواقع على ثلاثة أنواع من محاصيل الخضروات ، وهي الخس والفجل والكرفس. تم وزن الطعام المجهز للحلزون ومن ثم المتبقي أيضًا لتقدير نسب الاستهلاك ، حيث كانت هناك فروق معنوية بين كميات الطعام المستهلكة ، حيث حصل الفجل على أعلى استهلاك ، يليه الخس ، ثم الكرفس الذي حصل على أقل معدل الاستهلاك. كما تبين من خلال التجربة وجود فروق معنوية بين أوزان القواقع التي تتغذى على هذه المحاصيل ، حيث حصلت القواقع التي تتغذى على الخس على أعلى نسب للوزن ، يليها الكرفس ثم الفجل الذي حصل على أقل نسب وزن القواقع. . كان هناك أيضًا انخفاض ملحوظ في تغذية الحلزون خلال أشهر الصيف ، حيث أغلقت القواقع القشرة بطبقة من المخاط المتصلب ودخلت مرحلة السكون.