

NUTRITIONAL PREFERENCE OF EGYPTIAN WEASEL, *MUSTELA NIVALIS SUPBLAMATA* HEMPRICH & EHRENBURG IN RELATION TO ITS CONTROL UNDER LABORATORY CONDITIONS

Y. A. E. Eisa

Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt

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ABSTRACT : *The food preference of weasels, Mustela nivalis supblamata under non-choice and free choice methods was investigated under laboratory conditions. To study food preference of weasels under non-choice method, beef liver, house sparrow, quail, doves, fish meat, chicken liver, chicken meat and gandofli meats were used as food materials. The obtained data recorded that weasels at mean body weight of 210, 200, 195, 180, 175, 200, 170 and 160 g, the average weight of consumed food were 133, 100, 119, 80, 100, 99 and 33.5 g / day , respectively with acceptance rate of 1.0, 0.75, 0.90, 0.89, 0.60, 0.75, 0.74 and 0.25 , respectively. As for food preference under free choice material, weasels with 180 g body weight consumed 130, 120, 128, 93.5, 105.5 and 33.0 g / day as beef liver, quail, doves, house sparrow, poultry chick and gandofli, respectively, with acceptance rate of 1.0, 0.92, 0.98, 0.71, 0.80 and 0.25, respectively. As for food preference under free choice material, weasels with 177 g body weight consumed 136, 118, 98, 37, 85 and 66 g / day as beef liver, chicken liver, chicken meat, chicken eggs, fish meat and corned beef, respectively, with acceptance rate of 1, 0.86, 0.72, 0.62 and 0.42, respectively. Beef liver and fish meat poisoned baits with 0.5 , 1.0, and 1.5 % zink phosphide killed 40 to 100 % of weasels under laboratory conditions , the best results was recorded with beef liver poisoned bait 1.0% giving 100 % mortality. Application of compressed date baits poisoned with 0.5, 1.0, 1.5, 2.0 % zinc phosphide against weasels under laboratory conditions recorded 30, 60, 90, 100 % mortality percentages , respectively.*

Key words : *Weasel, food preference, zinc phosphide, Mustela nivalis, poisoned baits .*

INTRODUCTION

In the natural environment, weasels play an important role in the food chains, whereas depression the small harmful mammals and birds by predation. The parlance between animals is continually when number of predators remain lower the prey. When man-intrusion to environments weasels' number increased due to food and shelter abundance and weasels problem began to appear. The increased number of weasels is accomplished by serious problems to man as it feed on domestic bird and carrying serious human and animal diseases and they are abhorred by most people. The Egyptian weasel lives in the same places as humans, including cities and villages. It is mostly nocturnal. The Egyptian weasel, together with its more common cousin, the least weasel (*Mustela nivalis*), is

considered to be the smallest carnivore in the world Hoath (2009). So similar are the Egyptian weasel and the least weasel that it was only recently, in 1992, that the two were determined to be separate species Dejong (1992). The female Egyptian weasel can have up to three litters a year. She gives birth to four to nine kits at a time, McDonald and Hoffmann (2008). Today, weasels are observed in many habitats, Jedrzejewski *et al.*, (1993) and Eissa (2001). So agreed efforts has been exerted by the Egyptian Government to control weasels. In Egypt, Osborn and Helmy (1980) observed and recorded weasels, *Mustela nivalis supblamata* in Cairo, Alexandria and Fayoum Governorates. Weasels are active at any time of day or night, and intersperse periods of activity with a rest period, The Environment Agency. (1998). They feed

mainly on small rodents, rabbits, birds and eggs, killing prey with a bite to the neck, Animal diversity web (July 2002). Their small size enables them to enter the tunnels of mice and voles whilst hunting, and they often take over the nests of their prey, lining their dens with fur from prey during cold weather, The Mammal Society, Weasel Fact Sheet. (July 2002).

Anticoagulant rodenticides are widely used to control rodent populations but they also pose a risk of secondary poisoning in non-target predators. Zinc phosphide is an acute rodenticide having numerous agricultural applications. Studies on anticoagulant rodenticide exposure of non-target species have mainly reported on frequency of occurrence. Pesticides as zinc phosphide, aldicarb and some of natural poisonous plant were used to weasels control. Abdel-Rahman *et al.* (1990) reported that concentration 10, 20, and 30 % aldicarb gave high reduction in the population density of weasels. This study was conducted to throw some light on food palatability under free choice and non-choice method and effect of preferred foods as a poisoned bait zinc phosphide against *Mustela nivalis supblamata* under laboratory conditions

MATERIALS AND METHODS

Weasels :

The weasels, *Mustela nivalis supblamata* Hemprich & Ehrenberg were trapped from El-Khalafawy region, Cairo Governorate by using mist net Fig. (1) which was set at the sunset in weasels going place. In laboratory, collected weasels were weighted and sexed. Animals were retained individually in wire mesh hold cages. Laboratory experiments were conducted using special unit as shown in Fig. (1). The unit consists of modified the

hanging standard laboratory rat cages that described by United States Department of Agriculture (USDA, Marsh, 1972). The cage is about 45.1 cm long, 17.8 cm high and 17.8 cm wide. During acclination period, animals had access to water and chicken meat for 2 weeks.

Food preference:

Non- choice feeding method:

The relative preference of some foods and live small animal species as house sparrow, quail, doves, fish meat, chicken liver, chicken meat and gandofli in relation to beef liver were evaluated under no choice method. Weasels from each sex were individually caged. Ten individuals of each of the live animals or 10 g of chicken meat and 10 g of fish meat were individually caged with one weasel in the laboratory, with a supply source of water.

Choice feeding method:

Ten tested food materials were chosen and divided into two groups and beef liver used as standard as follows:

Group (1) Beef liver, Quail, Doves, house sparrow, chick poultry, and gandofli.

Group (2) Beef liver, Chicken liver, chicken meat, chicken eggs Fish meat and carned beef. Five animals from both weasels were used for each group. Five individuals of a each live animals and 70 g from the other tested materials were introduced to each individually caged weasel. The consumed amount from each food (g) as well as its relative acceptance rate to beef liver was estimated. Acceptance rates of different foods were estimated according the formula of (Buckle and Smith, 1994):

Acceptance rate =	average consumed of tested food (g)
	average consumed of standard food (g)



Fig. (1): Weasels collection cage

Toxic and baits:

Technical grade zinc phosphide (94 % active ingredient) was obtained from Kafr Elzayat (KZ) pesticide company, Egypt. Different baits were prepared where 0.5, 1.0, 1.5 and 2.0 g of zinc phosphide were weighed and mixed with 100 g of compressed dates , then douched good and balled (each ball 25 g). The second type of bait is prepared from the preferred beef liver and fish meat which were tested previously. The beef liver was slices (4 x 3 x 3 cm) and left in laboratory conditions up to have surface (3 hours); 0.5, 1.0 and 1.5 g of zinc phosphide mixed with 10 g of wheat flour .

Toxicity test:

Four groups (each 10 weasel) were used per each concentration of poisoned compressed date baits (0.5, 1.0, 1.5, 2.0, zinc phosphide). Five slides of baits (each 20 g) were put in cage. After one day the poisoned baits were removed and replaced by fresh diet and water. The consumed bait was calculated and dead animals were recorded during three days of treatment. Another experiment used the preferred beef liver and fish meat, as bait 0.5, 1.0, and 1.5 % zinc phosphide. Groups of 30 animals each were used. Each group was divided into three sub-groups of 10 animals per each concentration. The poisoned bait was removed, recorded during three days of treatment.

The obtained data was statistically analyzed using analysis of variance (ANOVA) at 5 % probability. The measurements were separated using Duncan's Multiple Range Test (DMRT) through CoStat software program (Version 6.400) 1998-2008.

RESULTS AND DISCUSSION

Food palatability of weasels under non-choice and free choice methods

The food palatability of weasels, *Mustela nivalis supblamata* under non-choice and under free choice methods was evaluated.

To evaluate the acceptance rate of house sparrow, quail, doves, fish meat, chicken liver, chicken meat and gandofli comparing with beef liver under non choice method, each food was introduced to weasels singly. Results in Table (1) indicated that weasels had mean body weight of 210, 200, 195, 180, 175, 200, 170 and 160 (g), the average daily consumed food were 133, 100, 119, 80, 100, 99 and 33.5 g from Beef liver , house sparrow , Quail , Doves , Chicken liver , Chicken meat , and Gandofli , respectively and the relative consumption of introduced food were, 1.0, 0.75, 0.90, 0.89, 0.60, 0.75, 0.74 and 0.25 , respectively as mentioned before.

Table (1): Food preference of weasels, *M. nivalis supblamata* under non-choice option

Food material	Mean of body weight (g)	Average daily consumed (g)	Acceptance rate
Beef liver	210	133 a	1.0 a
House sparrow meat	200	100 b	0.75 c
Quail meat	195	120 a	0.90 b
Doves meat	180	119 a	0.89 b
Fish meat	175	80 c	0.60 d
Chicken liver	200	100 b	0.75 c
Chicken meat	170	99 b	0.74 c
Gandofli meat	160	33.5 d	0.25 e
LSD 5%		18.3	0.096

Means in each column followed by the same letter (s) are not significantly different at 5% level.

Statistical analysis of the obtained data in Table (1) indicated that there were significant differences in the daily weight of consumed food between beef liver, Quail, Doves and all other foods. As for the acceptance rate, there were significant differences between Beef liver and all other tested foods. The highest acceptance rate was recorded with Beef liver 1.0 followed by Quail 0.9 Doves 0.89, while the least rate was recorded with Gandofli 0.25.

To evaluate the acceptance rate of chicken liver, chicken meat, chicken eggs, fish meat, and corned beef comparing with beef liver under free choice method, all tested food types were introduced to weasels. Results in Table (2) indicated that weasels with 180 g as mean of body weight, the daily consumed food were 130, 120, 128, 93.5, 105.5 and 33 g from beef liver, quail, doves, house sparrow, poultry chick, and gandofli, respectively and the relative acceptance of introduced food were, 1.0,

0.92, 0.98, 0.71, 0.80, and 0.25, respectively as mentioned before.

Furthermore, to evaluate the acceptance rate of quail, doves, house sparrow poultry chick and gandofli comparing with beef liver under free choice method, all tested food types were introduced to weasels. Results in Table (2) indicated that weasels with 177 g as mean of body weight, the daily consumed food were 136, 118.8, 98, 37, 85 and 66 g from beef liver, chicken liver, chicken meat, chicken eggs, fish meat, and corned beef, respectively and the relative acceptance of introduced food were, 1.0, 0.86, 0.72, 0.27, 0.62, and 0.48, respectively as mentioned before.

Statistical analysis of the obtained data in Table (2) indicated that there were significant differences in the daily weight of consumed food between beef liver, quail, doves and all other introduced foods.

Nutritional preference of Egyptian weasel, *Mustela nivalis supblamata*

Table (2): Food preference of weasels *Mustela nivalis supblamata* to free choice food materials

Food material	Average daily consumed (g)	Acceptance rate
Mean of body weight (g) 180.0		
Beef liver	130 ab	1.0 a
Quail meat	120 c	0.92 b
Doves meat	128 b	0.98 a
House sparrow meat	93.5 e	0.71 e
Poultry chick meat	105.5 d	0.80 d
Gandofli meat	33 h	0.25 h
Mean of body weight (g) 177.0		
Beef liver	136.0 a	1.0 a
Chicken liver	118.8 c	0.86 c
Chicken meat	98.0 de	0.72 e
Chicken eggs	37.0 h	0.27 h
Fish meat	85.0 f	0.62 f
Corned beef	66.0 g	0.48 g
LSD 5%	7.85	0.12

Means in each column followed by the same letter (s) are not significantly different at 5% level.

As for the acceptance rate, there were significant differences between Beef liver and doves and all other tested foods. The highest acceptance rate was recorded with Beef liver and doves 1.0 & 0.98 followed by Quail 0.92, while the least rate was recorded with chicken eggs and Gandofli 0.27 & 0.25.

Toxicity of zinc phosphide baits against weasels:

The four tested compressed date poisoned baits of zinc phosphide (0.5, 1.0, 1.5 and 2 %) caused different mortality

percentages in weasels. Results in Table (3) showed that the concentration of 0.5 % killed 30 % of treated animals; the mean consumption bait was 11.5 g, while 60 % from treated animals diet after consumption 10.0 g of poisoned bait of 0.1 % other concentration: 1.5 and 2 % caused the same mortality percentage (90 & 100.0 %); the concentration; bait was 7.7 and 7.3 g to each concentration respectively. In vision to enhancing the mortality percentage with low concentration of zinc phosphide by increasing the lethal dose intake of the preferred beef live and fish meat were used as bait compared with compressed date. Data in

Table (3) show that liver meat poisoned baits with 0.5, 1 and 1.5 % zinc phosphide caused 70, 100 and 100 % mortality and the bait consumption were 17.5, 15.3 and 15.5, while fish meat poisoned baits of the same concentrations caused 40, 70 and 90 % mortality of treated animals.

Results in Table (4) revealed that when the mean body weight of weasel was 160, 140, 155 and 150 g and the concentrations of compressed date poisoned with zinc phosphide (0.5, 1.0, 1.5 and 2.0 %) the consumed bait was 11.5, 10.9, 7.7 and 7.3 g and the mortality percentages were 30, 60, 90 and 100 %, respectively.

The mortality percentages of weasels were the highest at beef liver poisoned baits compared with fish meat and compressed date, this may be due to fish water content which attributed to loss of phosphide gas from zinc phosphide and

reduced the toxic effect. By using the biological methods, Rezk (2000) found that the poisoned bait of zinc phosphide 2.5 % lost 20 % and 50 % of its effectiveness when exposed to 80 % RH for 2 and 7 days, respectively. Elmeros *et al.* (2011) examine the occurrence and concentrations of five anticoagulant rodenticides in liver tissue from 61 stoats (*Mustela erminea*) and 69 weasels (*Mustela nivalis*) from Denmark, and found that anticoagulant rodenticides were detected in 97% of stoats and 95% of weasels. They found that chemical rodent control in results in an extensive exposure of non-target species and may adversely affect the fitness of some stoats and weasels.

It could be concluded that the use of liver meat poisoned with 1.0 % of zinc phosphide successively controlled the Egyptian weasels.

Table (3): Effect of beef liver and fish meat baits poisoned with zinc phosphide against weasels under laboratory conditions

Food	Zinc phosphide					
	0.5 %		1.0 %		1.5 %	
	consumed bait (g)	mortality %	consumed bait (g)	mortality %	consumed bait (g)	mortality %
Beef liver	17.5	70.0	15.3	100	15.0	100
Fish meat	20.4	40.0	20.4	70	18.7	90

Table (4): Toxicity of compressed date baits poisoned with zinc phosphide against weasels under laboratory conditions

Mean of body weight (g)	Zinc phosphide concentration	Consumed bait (g)	Mortality %
160	0.5 %	11.5	30
140	1.0 %	10.9	60
155	1.5 %	7.7	90
150	2.0 %	7.3	100

Nutritional preference of Egyptian weasel, *Mustela nivalis subblamata*

REFERENCES

- Abdel-Rahman, A., M. H. Alimi and M. A. Affifi (1999). Preference of the Egyptian weasels *Mustela nivalis subblamata* to food items. Egypt J.Appl. Sci., 14 (7): 602-610.
- Animal diversity web. (July 2002). [http://animaldiversity.ummz.umich.edu/accounts/mustela/m._nivalis\\$narrative.html](http://animaldiversity.ummz.umich.edu/accounts/mustela/m._nivalis$narrative.html)
- Buckle A. P. and R. H. Smith (1994). Rodent pests and their control. Cab. Inter. UK. CAB International 161-181.
- CoStat version 6.400 Copyright © 1998-2008 . Cohort Software. 798 Lighthouse Ave. PMB 320 , Monterey, CA, 93940, USA.
- Dejong, C.G.V. (1992). A morphometric analysis of cranial variation in Holarctic weasels (*Mustela nivalis*). *Zeitschrift für Säugetierkunde*, 57(2): 77-93.
- Eissa, Y.A (2001). Ecological, biological studies on weasels *Mustela nivalis subblamata*. M. Sc.Thesis, Fac. Agric. Al-Azhar Univ.,111 p.
- Elmeros, M., T. K. Christensen and P. Lassen (2011). Concentrations of anticoagulant rodenticides in stoats *Mustela erminea* and weasels *Mustela nivalis* from Denmark. *Sci Total Environ*. 2011 May 15; 409(12): 2373-2378.
- Hoath, R. (2009). The Weasel. The American University in Cairo Biology Club, Cairo. Available at: <http://bioclub.wordpress.com/2009/10/09/the-weasel/>.
- Jedrzejewski, W., B. Jedrzejewska and M. Brezezinski (1993). Winter habitat selection and feeding habits of polecat *Mustela putorius* in the Bialowieza National Park. *Zeitschn für Säugetierkunde*, 58 (2): 75-83.
- Marsh, R. E. (1972). Recent developments in Tracking Dusts. Proc. Rod. Control, Conf. New York, State Department of Health. J.E. Book ed., Glens Falls, N.Y. 18-20 October, 60-62.
- McDonald, R. and M. Hoffmann (2008). *Mustela subpalmata*. In: IUCN 2008. IUCN Red List of Threatened Species. Retrieved 21 March 2009. Database entry includes a brief justification of why this species is of least concern.
- Osborn, D. J. and I. Helmy (1980). The contemporary land mammals of Egypt. Field Museum of Natural History. New Series, U.S.A., (5): 395-410.
- Rezk, A. M. (2000). Comparative studied zinc phosphide (Rodenticide). M. Sc. Thesis, Fac. Agric. Al-Azhar Univ., 97 p.
- The Environment Agency (1998). Species and Habitats Handbook: Look-up chart of species and their legal status. The Environment Agency, Bristol.
- The Mammal Society. Weasel Fact Sheet. (July 2002): <http://www.abdn.ac.uk/mammal/weasel.shtml>

التفضيل الغذائي للعرس المصرى *Mustela nivalis supblamata* وعلاقتها بالمكافحة تحت الظروف المعملية

يونس احمد السيد عيسى

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - جيزة - مصر

الملخص العربى

تم دراسة التفضيل الغذائى للعرس المصرى *Mustela nivalis supblamata* تحت الظروف المعملية وقد وجد ان افضل غذاء مفضل لها تحت الظروف الاجبارية non-choice method هو التغذية على كبد البقر ثم لحم السمان ثم لحم الحمام ثم لحم العصفور وكبد الدجاج ثم لحم الدجاج يليه لحم السمك واخيرا لحم الجندوفلى حيث كان معدل الاستهلاك اليومى له 133 ، 120 ، 119 ، 100 ، 100 ، 99 ، 80 ، 33.5 جم عندما كان متوسط وزن الجسم 210 ، 195 ، 180 ، 200 ، 200 ، 170 ، 175.5 ، 160 جم على الترتيب وحينما تم تقديم الاغذية المختلفة بطريقة الاختيار الغذائى الحر Free choice method بمتوسط وزن مقداره 180 ، 177 جم فكان اعلى متوسط استهلاك يومى مسجل كان لكبد البقر بمتوسط مقداره 130 ، 136 جم على الترتيب اما اقل معدل تغذية كان عند تقديم لحم الجندوفلى بمتوسط وزن مقداره 180 جم حيث استهلك الحيوان متوسط يومى مقداره 33 جم فقط. أعطى طعم كبد البقر المسمم ب 1.0 % من فوسفيد الزنك موت 100 % من العرس بينما اعطى طعم لحم السمك 70 % موت .
أعطى طعم البلح المجفف المسمم ب 0.5 ، 1.0 ، 1.5 ، 2.0 % من فوسفيد الزنك موت 30 ، 60 ، 90 ، 100 % من العرس تحت الظروف المعملية.
يوصى البحث بكفاءة إستخدام طعم كبد البقر المسمم ب 1.0 % من فوسفيد الزنك فى مكافحة حيوان العرس المصرى.