Winter breeding of the House Mouse Mus musculus (Muridae Rodentia) in Baghdad area

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Abstract

House mice were live-trapped in the orchards within the site of AL- Farabi University collage from Late of December 2017 till The end of March 2018. It was found that there was active normal reproduction during the winter months December, January, February and March. The pregnancy rates during these months ranging between 41 and 81 % with Litter size ranging between 4 and 8 pups. The numbers of embryos (M.± S.E.) for the months of the study were 6± 0.38, 5 ± 0.33, 4.81 ± 0.39 and 4.88 ± 0.33 respectively.

Keywords: Rodentia, Breeding, Mus musculus, House mouse, Reproduction

1. Introduction

The House mouse ***Mus musculus*** is a species belonging the order **Rodentia**, class **Mammalia**. It is one of the commensal rodents distributed all over the world; from the equator to the borders of the southern and northern pols.

This means that the house mouse can be in exist in different climatic and topographic zones, helped by its quick adaptation and a high level of ecological elasticity (kadhim, 1991; Phifer-Rixey et al., 2018 and Brown & Henry 2022).

M. musculus is economically important because of the different types of damage caused by this mouse to the crops in the fields and in the stores. This small rodent causes damage and losses in two ways:

a. By direct eating and gnawing leads to losses in the amount of the products and makes the products not acceptable for the consumer (Kadhim ,1983).
b. By contaminating the products with urine droppings, and leads to classifying the contaminated food staff as unfit for human consumption by health inspectors (Hopf *et al.*, 1976).

According to the reports of WHO and FAO, the damages by the two mentioned ways reach the number of millions of tones crops and foodstuffs (FAO/WHO, 77).

The House mouse is a polyestrous mammal, the breeds approximately all over the year, but this process may decrease during the cold or dry seasons (Bronson, 1979, Bronson, *et.al.*, 1987). The gestation period is short (19-21 days), and the litter size is 4-8 pups. The estrous cycle is observed as about 2-4 days (Bio-Integral resource center, 2005).

The study is a part of a major joint research project between Al- Farabi University College and Communicable diseases / MOH, which aims to have valuable information about the winter breeding activities of the commensal rodents species including the House mouse *M . musculus* in Baghdad area.

2. Materials and Methods

House mice were live-trapped every two weeks in orchards within the campus of AL-Farabi University College from late December 2017, till the end of March 2018. The trapped animals were transferred to the laboratory of zoology in the department of biology in the college. The specimens were sexed, weighed, differentiated in age, and then dissected.

The adult mice were sorted according the ranges of weights and according to the open vagina for females and the status of testes inside the scrotum for males. The subadults and juveniles were grouped according to the limits of the weight and to the density and color of the fur. The number of embryos and placental scars was counted in both the left and right horns of the uterus. Finally, the data was analyzed.

3. Results and Discussion

As shown in Figure-1, *M. musculus* is distinguished by its bio horned (bipartite) uterus, so the studies of the reproduction of the females must include the investigation of the function of the two ovaries because they act at the same time and the mature ova from each ovary are independently ovulated. In this way, the litter size was calculated as the total number of embryos in both horns. The placental scars were calculated in the same way.

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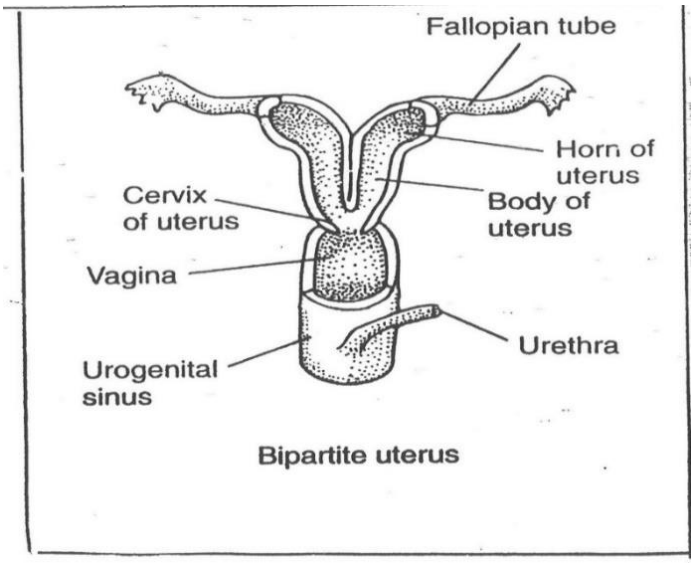

Figure.1: reproductive tracts of *Mus musculus (Kardong, 1995)*

Table-1, illustrates the numbers of each age group of the trapped females. This indicator is used usually to make sure that the trapped mice are within the studied breeding period, i.e. the winter breeding. Under this understanding, the data about the population structure included the trapped females in late December and the end of March (the winter season in Iraq lasts from the 21st. of December to 21st of March.

It was found that there was an approximately active breeding process, as shown in Table-2. The percentage of pregnant females can be taken as normal in general, but it is clear that this percentage was higher during March. This fact can be explained by the intensive hormonal management during the early spring in mammals (Kardong, 1995; Chen, J., Okimura & Yoshimura 2020).

Table 1: Numbers of the different age groups of the House mouse *Mus musculus* during early winter and early spring 2017/2018

Month	Numbers of trapped females			Total for month
	juvenile	Sub adults	Adult	
December	-	10	15	25
January	2	16	18	36
February	8	15	30	53
March	6	22	26	54

Table2:pregnancy rates of females House mouse *Mus musculus* during early winter and early spring 2017\2018

Month	No. of adult females	No. of pregnant females	Pregnancy rate
December	15	7	41%
January	18	10	51%
February	30	16	51%
March	26	17	81%

It is well known, that the status of the population size and structure is the final result of the equality or non-equality relationship between the rates of birth and those of mortality (Olenov and grigorkina, 2011). So any abnormal increase in the population size which is called ‘’outbreak" or ‘’pluge’’ is the true indicator that the dominance is the birth rates because of several factors among which the first place is the climatic factors, food abundance, and number of the natural predators or the level of rodent control. With other words, the outbreaks of one or many rodents species including *M. musculus*, are a particularly graphic example of the failure of population regulation (singleton *et al.*, 2001).

The winter season of 2017/2018 was very mild, and the amounts of rain were very limited. The mean maximum and minimum temperatures during December, January, February and March were apparently higher than the mean of the same months of the last years.

The absence of regular rodent control and the low level of environmental sanitation may be taken as early alarm about the possibility of an outbreak among the populations of the commensal rodents spp. including that of the House mouse, in Baghdad or other provinces.

The damage of the winter breeding -if it is outside the normal timing of the breeding of any mammal- is within the fact that an additional number of females will take a role in increasing of the reproduction potential of the vertebrate pest. When we put in mind the fact about large ability to producing very big numbers of offspring resulting from several estrous cycles all over the year, the picture

will be very clear about the economic damages caused by this small mammal, and its zoonic role in the transmission of disease (Rowe *et el.*, 1983; Bomford and Redhed, 1987; Kadhim, 1991).

Table-3 shows the number of embryos and placental scars in the uterus of the females during the study period. the litter sizes ranged between 4-8 (6 ±0.338 for December; 5±0.33 for January; 4.81±0.93 for February and 4.88±0.33 for March).

The weights of the pregnant females ranged between 16 – 22 gr.

Conclusions

The results of this short-term study could be taken as confirmation or indicator for the opportunity of active winter breeding of *Mus musculus* in the presence of suitable climatic factors and available food.

Table 3: Numbers of embryos and placental scars in females House mouse *Mus musculus* during early winter and early spring 2017/2018

Month	No. of examined pregnant females	No. of embryos in both horns M±S.E.	No. of placental scar in both horns M±S .E
December	7	6 ± 0.38	1.29±0.18
January	10	5 ± 0.33	1.10± 0 .23
February	16	4.81 ±0.39	0.69 ± 0.11
March	17	4.88 ± 0.30	0.65 ± 0.11

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التكاثر الشتوي لفأر البيت Mus musculus (Muridae-Rodentia) في منطقة بغداد

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الخلاصة

تم اصطياد فئران البيت حية في بساتين كلية الفارابي الجامعة للفترة من اواخر شهر كانون الاول 2017 ولغاية نهاية شهر اذار 2018. لقد وجد ان هنالك تكاثر طبيعي نشط خلال اشهر الشتاء كانون الاول و كانون الثاني و شباط واذار. تراوحت نسبة الحمل خلال فترة الدراسة بين 41-81% بحجم حضنة تتراوح بين 4-8 جراو. اما اعداد الاجنة (المتوسط ± الخطأ المعياري) في الاشهر المذكورة على التوالي 6±0.38, 5±0.33، 4.81±0.39, 4.88±0.3.