



E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2015; 3(5): 115-116
© 2015 JEZS
Received: 25-08-2015
Accepted: 29-09-2015

Siamak Yousefi

Associate Professor, Department of Biology, Faculty of Biologic Sciences, Islamic Azad University, Varamin (Pishva) Branch, Varamin, Tehran, Iran.

Mona Izadian

Department of Marine Biology, Faculty of Marine Science, Khorramshahr Marine Science and Technology University, P.O. Box : 669, Khorramshahr, Iran

Neda Kheradpir

Assistant Professor, Department of Plant Protection, Faculty of Agriculture, Islamic Azad University, Varamin (Pishva) Branch, Razi Square, Varamin, Tehran, Iran.

Correspondence:

Neda Kheradpir

Assistant Professor, Department of Plant Protection, Faculty of Agriculture, Islamic Azad University, Varamin (Pishva) Branch, Razi Square, Varamin, Tehran, Iran.

Hematological Characteristics of the Palm Squirrel (*Funambulus Pennantii*, Wroughton)

Siamak Yousefi, Mona Izadian, Neda Kheradpir

Abstract

Some of the hematological values were determined in palm squirrels *Funambulus pennantii*, as one of the unique zoological species in Iran (especially Sistan-Balouchestan Province). The data were collected through a year from February 2013- February 2014 in 40 squirrels (23 males and 17 females) without any clinical signs of disease. The results about the species type and its bioassay were obtained through trapping. The following results were obtained (mean± standard deviation): neutrophils 61.64 ± 3.24 , lymphocyte 36.91 ± 3.51 , monocyte 2 ± 0.57 , eosinophils 1.67 ± 0.81 , red blood cell count $6.2 \pm 0.58 \times 10^6/\mu\text{L}$ and white blood cell count $5.5 \pm 1.25 \times 10^3/\mu\text{L}$. there was not found any significant difference among the hematological values between two sexes through t-test.

Keywords: Palm squirrel, hematological values, *Funambulus pennantii*

1. Introduction

Persian or northern palm squirrel *Funambulus pennantii* is one of the common rodent species distributed in eastern south of Iran which is an arboreal species and usually found near urban areas ^[1]. Blood examination and testing hematological values are performed for several reasons in animal science. Recently many animals such as palm squirrel *Funambulus pennantii* are kept, bought and sold as companion animal in houses. This rodent is a wild species belonging to Rodentia: Sciuromorpha: Sciuridae ^[2]. The species is naturally distributed along the south-eastern barrier of Iran, and also reported from Pakistan, India and Nepal ^[3, 4].

Literature reviews showed that the hematological reference intervals are available for the Persian squirrel *Sciurus anomalus* ^[5], but there are no published studies about these values for the palm squirrels. Therefore, the present study was performed to find out the hematological reference intervals and their differences between two sexes for this species.

2. Materials and Methods

Forty healthy palm squirrels (23 males and 17 females) were captured by trapping in the wild habitat of Sistan-Balouchestan Province through a year from February 2013- February 2014. All the samples were weighed by digital weight and their body lengths were measured by couliss. All animals were physically restrained for blood collection. Approximately 1 mL of blood was collected from the saphenous vein of each animal by needle tip 25G in micro-hematocrit tube and then placed in an ethylene diamine tetra-acetic acid (EDTA) blood collection tube. The samples were transferred by cold transfer chain (dry ice and flask) to the laboratory of small animals in the faculty of veterinary medicine. The squirrels were released in their natural habitat after the blood collection ^[6].

Then the complete blood cell (CBC) was prepared and stained by Wright-Giemsa method ^[6]. In order to determine the white cell count, differential cell count was performed manually by the use of a cell counter ^[7]. In order to decrease the analytical error, both white and red blood cells were counted ^[8]. Cell diameters were determined by TSVIEW software.

Statistical analysis was performed with the SPSS (SPSS Inc, Chicago, IL, USA). Comparisons between the means for the different hematologic parameters were measured using a student t-test.

3. Results

The results of the study on forty palm squirrels are presented in table 1 (mean ± standard deviation). The palm squirrel heterophils were round cells characterized by the uniform cytoplasmic margins. The cell nucleus was oval or rarely biconcave and its chromatin was

Light purple which was concentrated in a cell pole. Cytoplasm consisted of distributed granules with variable purple granules that were mostly distributed vertically or star-shaped.

Table 1: The hematologic values of the palm squirrels

Hematologic value	Min.	Max.	Mean ± SE Mean
Neutrophil %	47	78	61.64±3.24
Lymphocyte %	21	52	36.91±3.51
Monocyte %	1	3	2±0.57
Eosinophil %	1	3	1.67±0.33
Red Blood Cell ×10 ⁶ /μL	3.4	7.8	6.2±0.2
White Blood Cell ×10 ³ /μL	4.25	7.25	5.5±0.48

Eosinophils were oval or occasionally round and their mean diameters were 14.9 μm and had the uniform cytoplasmic margin. The eosinophils had bilobed or elliptic nuclei with a huge branched chromatin which ends to a very sharp edge and were concentrated in one side of the cell and often made it swallowed. Some of the nuclei were located concentricity. The cytoplasm was light blue in color and only the pink granules were seen. Mostly, there were a few granules inside the nucleus.

Basophiles were not visible in the blood samples of palm squirrels. Basophiles had round cells with an external irregular pattern. They were stained in dark purple or reddish purple and

had some round granules. Usually a nucleus was seen in them. The granules were located peripheral or arborescent inside the nucleus.

Lymphocytes are divided into three types in squirrels: small, medium and large. They were usually round or elliptic with the diameter of 10.7 μm, but some irregular patterns have been reported. The nucleus was large, light purple with a branched chromatin, and full of cells. Cytoplasm was a thin, greyish or light blue rod beside the nucleus. Sometimes a dust of red granules or a number of small lucid vacuoles were distributed in cytoplasm. The external edge of the cell could be uniform or irregular and mostly had blister-like cytoplasm.

Monocytes in palm squirrels blood were elliptic or round with a diffuse external edge and many cytoplasmic vacuoles were seen inside them. The greyish blue cytoplasm had many fragile vacuoles with the diameter of 1.2 μm. Many cells had dusty granules which are located in grain side pattern. The monocytes had a large elliptic nucleus which was usually located in concentricity and occasionally one-sided. The nucleus was light purple in color and its corrugated chromatin was clearly visible. In addition to monocytes, some large cells with the diameter of 20 μm with diffuse external edge and blue stained cytoplasm were seen which had a large horseshoe shaped nucleus.

Table 2: The hematologic parameter mean in male and females of the palm squirrels.

Hematologic para.	Neutrophil	Lymphocyte	Monocyte	Eosinophil	R. B. C.	W. B. C.
Male	56±4.69	43±4.61	1	1.33±0.33	7.15±0.21	5±0.031
Female	66.33±4.455	31.83±4.44	2.5±0.5	2±0.57	5.95±0.147	5.3±0.2

The frequency of each hematological parameter is shown in table 2. There was no significant difference in hematological values between two sexes. The results regarding to the mean differences between two sexes are also presented in table 2.

4. Discussion

There were forty palm squirrels which were trapped through this study, 23 males and 17 females, so the sex ratio for the experimental population was 1: 1.3; according to the obtained data, there was no significant difference in hematologic parameters between two sexes at the 1% error value; similar results were presented in other studies on Persian squirrel [5]. Significant difference in hematologic parameters can be due to some factors such as species, environmental condition, food and evenly stress [9].

Comparing the obtained results of this study for red blood cell count with similar studies on *Sciurus anomalus* (7.18 ×10⁶/μL) [5] and rats *Rattus rattus* (6.76×10⁶/μL) [6], ends to a similar picture. The obtained data for mean white blood cell count for the palm squirrel (5.5×10³/μL) was according to similar data obtained in studies on rat, *R. rattus* (6.6×10³/μL) [6] and on ferret *Mustela putorius furo* (5.10×10³/μL) [10] and on *S. anomalus* (4.35×10³/μL) [5]. But the mean count of white blood cell in rabbits *Lepus capensis* (7×10³/μL) was so different of the compared rodents [11].

On the other hand, previous studies showed that eosinophils and monocytes in squirrels are similar to the other rodents [8] and the mean count of neutrophil in squirrels has no relation to the other rodents which can be due to some environmental factors such as climate and food or species differences like physiological condition or genetics [9].

5. References

1. Prakash I, Kametkar LR, Purohit KG. Home range and territoriality of the northern palm squirrel. *Mammalia*

1963; 32(4):603-611.
 2. Etemad A. Iranian mammals: 1st. the rodents and the key to identification. National association for preserving natural resources and human habitat, 1977, 278.
 3. Thorington RW, Ferrell K. Squirrels. The animal answer guide, The John Hopkins University press, 2006, 204.
 4. Ziaee H. Field Guide for Iranian Mammals. Publisher of Environment Protection Organization of Iran, 1997, 298.
 5. Khazraiiinia P, Rostami A, Haddadzadeh HR, Nassiri SM. Hematological Characteristics and Hemoglobin Typing of the Persian Squirrel (*Sciurus anomalus*). *Journal of Exotic Pet Medicine*. 2008, 17:44-48.
 6. Atyabi N. Clinical Pathology for Veterinary Medicine; Laboratorial Methods. Tehran University Publication, 2006, 421.
 7. Ameri M. Laboratorial Methods for Veterinary Hematology. Tehran University Publication, 2000, 126.
 8. Campbell TW. Mammalian hematology: laboratory animals and miscellaneous species, in Thrall MA (ed): *Veterinary Hematology and Clinical Chemistry*. Philadelphia, Lippincott Williams and Wilkins, 2004, 211-224.
 9. Breazile JE. The physiology of stress and its relationship to mechanism of diseases and therapeutics. *Veterinary Clinics of North America* 1988; 4:441-447.
 10. Watkins BM, Nowell F. Hepatozoon in grey squirrels (*Sciurus carolinesis*) trapped near Reading, Berkshire. *Journal of Zoology*. 1991; 224:101-112.
 11. Moore DM. Hematology of rabbits, in Felman BF, Zinkl JG, Jain NC (eds): *Schalm’s Veterinary Hematology*, (ed5). Philadelphia, Lippincott Williams and Wilkins, 2000, 1100-1106