

Trap Night Index (TNI), Prevalence and Parasitological Importance of Rodents in Two Rural Areas of Baghdad Province, Iraq

Mohammed J. Al-Obaidi*, Ahmed Y. Hanoon, Hanan J. Nayef, Iftikhar AbdulWahab Jassim and Samer S. Al-Khafaji

Trop. Biol. Res. Unit, College of Science, University of Baghdad, Iraq.

* Corresponding author: Mohammed J. Al-Obaidi; e-mail: lfta2001@yahoo.com

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ABSTRACT

The aim of this work is to determine the diversity and parasitological importance of Rodents around Baghdad city. Five Rodent species were collected in 20-night traps at two sites through one year (2016). The collected species were *Tatera indica*, *Rattus rattus*, *Rattus norvegicus*, *Meriones crassus*, *Meriones libycus*, *Mus musculus*, and *Nesokia indica*. Total trapped number of rodents was 490 mammals. The type *T. indica* was the highest dominant type (17.4%). The type *N. indica* was the lowest dominant type (0.5%). The highest trap index was 0.31 for *T. indica* species and 0.01 for *N. indica* species. High prevalence of rodent trapped showed in May and low in January, February and December months. The captured species were infected with three types of parasites *Cryptosporidium varpum*, *Entamoeba histolytica* and *Hymenoleps nana* with different percentages. The study concludes parasitological importance of rodent was founded, rodent numbers vary and there is a need to make more studies to account the whole numbers of rodents in Iraq.

Keywords: Rodents; parasites; Iraq.

1. INTRODUCTION

Rodents are living contact with humans in different habitats. They play an important role in the public health and economy. They have spread over 35 diseases and have important reservoirs for parasitic zoonosis such as Trichinellosis, Capillariosis, Plague and Visceral Leishmaniasis [1].

The Order Rodentia includes 30 families with 1700 species and a big number of subspecies [2]. The most common rodent species in Iraq are *Rattus rattus*, *R. norvegicus*, *Tatera indica*, and *M. musculus*. Twenty-three Rodent species belonging to 17 genera attributed to seven families were recorded in Iraq [3]. The Indian gerbil (*Tatera indica*) is distributed in India, Afghanistan, Pakistan, Nepal, Sri Lanka, Iran, Iraq, Kuwait, and Syria. The black rat (*R. rattus*) is distributed in India, Southeast Asia, Egypt, Great Britain, and spread throughout the world. The Rodents

are distributed in a rural circle area (100 km diameter) around Baghdad. The prevalence of the Rodents depends on the climate conditions [4].

The climate of Iraq is characterized by a hot dry summer and a cool rainy winter. Summer temperatures are 110° to 120°F. Generally, the central region of Iraq is a wide alluvial plain. The elevation varies from 36 to 300 m. a. s. l. The main rainfall widely varies from year to another but was about 200 mm/y. The soil is fertile with many kinds of vegetation such as barley, maize, wheat, melon, watermelon, pumpkin, tomato, cucumber, etc. The orchards of date palm trees are widely scattered in the area with the trees of citrus, figs, apricot, peach etc. Human activities are mainly agriculture, poultry, and cattle breeding. Also, irrigation and drainage canals are widely developed in the region around Baghdad. Therefore, the climate of the region is

a favorite place for feeding and breeding of Rodents [4-6].

The Rodents are one of the most successful and abundant mammals on the earth, they may be utilized as biological indicators [5]. Although, no dependent estimation to the number of rodent species in Iraq. So that, the geographical distribution of these species needs more studies [7].

The aim of this study is to estimate the Trap Night Index (TNI) and prevalence of common species of Rodents distributed in rural areas around Baghdad city and estimates their parasitological importance.

2. MATERIALS AND METHODS

2.1 Study area

Four hundred ninety rodents were trapped around Baghdad city. Two sites were randomly selected to trap the samples. The first site is Al-Rasheed district (30km south of Baghdad), and the second site is Agrgoof sub-district (30-km west of Baghdad).

2.2 Trapping of samples

Samples' trapping was from January to December 2016. The Rodents were trapped by 10 Sherman live trap-nights (7.5x9x22 cm) using bread covered by animal fat mixed with onion sore. The traps were distributing near human dwellings and animal shelters, one night every week [8].

2.3 Experimental design

The trapped samples were brought to laboratories of the Tropical Biological Research Unit, College of Science at the University of Baghdad. Rodents were identified and classified based on the body weight and length [9].

Trap Night Index (TNI) was used in this work to estimate the prevalence of rodents. TNI is calculated by converting the number of animals captured to the number captured per trap-night or per 10 traps. TNI is achieved by dividing the numbers of animals captured by the number of traps used and the number of nights trapping [10].

Direct smear Technique (DST) for helminths searching was used in this study [11]. The Rodents were dissected and the small intestine was opened and emptied the contents. Intestinal contents were isolated and washed with normal saline. A dissecting microscope was used to search for the presence of parasites [12].

2.4 Statistical analysis

The results were analyzed by SPSS v23 to calculate the t-test, ANOVA, and percentages.

3. RESULTS AND DISCUSSION

The total captured Rodents in this work were 490 individuals. The trapped samples were distributed as 277 individuals (56.5 %) from the first site and 213 individuals (43.5%) from the second site. The dominant captured species in the two sites was *Tatera indica* contributing about 85 (17.4%) and 68 (13.9%) respectively. The lowest number that captured in the two sites was *Nesokia indica* representing about four (0.8%) and one (0.4%) respectively (Table 1). The means and standard deviations of Rodent distribution were recorded as (39.57±35.7 and 30.43± 29.5) for sites 1 and 2 respectively. High values of variance between the sites have been recorded in this work. Minimum number of Rodent captured was one Rodent in the Agrgoof site while the maximum number of Rodent captured was 85 Rodents in the AL-Rasheed site (Table 2).

Table 1: Overall Rodent Numbers Captured in the Study.

Species	Site 1 (AL-Rasheed)	Site 2 (Agrgoof)	Total
	No. of individuals (%)	No. of individuals (%)	
<i>Tatera indica</i>	85 (17.4)	68 (13.9)	153
<i>Rattus rattus</i>	74 (15.1)	57 (11.6)	131
<i>Rattus norvegicus</i>	73 (14.9)	60 (12.2)	133
<i>Merionus carssus</i>	16 (3.2)	10 (2.04)	26
<i>Merionus libycus</i>	13 (2.7)	10 (2.04)	23
<i>Mus musculus</i>	12 (2.4)	7 (1.4)	19
<i>Nesokia indica</i>	4 (0.8)	1 (0.4)	5
Total	277 (56.5)	213 (43.5)	490

Table 2: Statistical Analysis of Total Captured Rodents in the Study.

Statistics	Site 1 (AL-Rasheed)	Site 2 (Agrgoof)
N	7	7
Mean	39.57	30.43
Std. Deviation	35.716	29.557
Variance	1275.619	873.619
Minimum	4	1
Maximum	85	68
Sum	277	213

In general, the male distribution in the Al-Rasheed site was more than in the Agrgoof site. The total number of male Rodents captured in the Al-Rasheed site was 195 mammals while the female Rodents captured was 82 mammals. The results of the study showed that the males of *Tatera indica* species were the highest recorded 60(30.7%) in both study sites. In opposite, the females of *Nesokia indica* species were the lowest

recorded zero (0%) in both study sites (Table 3). The mean and standard deviation of Rodent males' distribution in the site 1 was (27.8±25.3). While the mean of males distribution in site 2 was (21.4±20.7). In opposite, the mean of females' distribution in the site 1 was (11.7±10.3). The mean of female's distribution in site 2 was (9±8.8) (Table 4).

Table 3: The Sex Distribution of Rodents in Site 1 (Al-Rasheed).

Species	Site 1 (Al-Rasheed)		Site 2 (Agrgoof)	
	Male (%)	Female (%)	Male (%)	Female (%)
<i>Tatera indica</i>	60 (30.7)	25 (30.5)	48 (32.0)	20 (31.8)
<i>Rattus rattus</i>	52 (26.7)	22(26.9)	40 (26.7)	17(26.9)
<i>Rattus norvegicus</i>	52 (26.7)	21 (25.6)	42 (28)	18 (28.6)
<i>Merionus carssus</i>	11 (5.6)	5 (6)	7 (4.7)	3 (4.8)
<i>Merionus libycus</i>	9 (4.6)	4 (4.9)	7 (4.7)	3 (4.8)
<i>Mus musculus</i>	8 (4.1)	4 (4.9)	5 (3.3)	2 (3.1)
<i>Nesokia indica</i>	3 (1.6)	1 (1.2)	1 (0.6)	0 (0.0)
Total	195 (100)	82 (100)	150 (100)	63 (100)

Table 4: Statistical Analysis of Sex Rodent Captured in the Study.

Sex	Site	N (species)	Mean	Std. Deviation	Std. Error Mean
Male	AL Rasheed	7	27.8571	25.33396	9.57534
	Agrgoof	7	21.4286	20.72725	7.83417
Female	AL Rasheed	7	11.7143	10.38772	3.92619
	Agrgoof	7	9.0000	8.83176	3.33809

The results of the study showed no significant differences between the sex of Rodents captured in both situation equal and non-equal of variances. In addition, same signification (2-tailed), mean differences, stander error of differences between male and female captured in the study. Furthermore, same lower and upper CID showed in the analysis of the

results of this study (Table 5). The TNI of Rodents in the two sites of the study was referring to the species *T. indica* as the highest captured one in this study. The TNI of the species was 0.31, while the TNI of the species *N. indica* was 0.01, which consider as the lowest captured species in this work (Table 6).

Table 5: Independent Samples T-Test Analysis for the Rodent Sex.

		Levene's T.		t	df	Sig. (2-tailed)	t-test for Equality of Means			
		F	Sig.				M Dif.	SE Dif.	95% CID Lo.	Up.
M	Equal var. assumed	2.806	.120	.520	12	.613	6.42857	12.37179	-20.52725	33.38439
	Equal not assume			.520	11.547	.613	6.42857	12.37179	-20.64497	33.50212
F	Equal var. assumed	1.601	.230	.527	12	.608	2.71429	5.15343	-8.51407	13.94264
	Equal not assume			.527	11.697	.608	2.71429	5.15343	-8.54638	13.97495

Table 6: Trap Night Index (TNI) of Rodents for One Year.

Species	Site 1 (Al-Rasheed)	Site 2 (Agrgoof)	Total TNI
	No. of individuals (TNI)	No. of individuals(TNI)	
<i>Tatera indica</i>	85(0.17)	68 (0.14)	0.31
<i>Rattus rattus</i>	74 (0.15)	57(0.11)	0.26
<i>Rattus norvegicus</i>	73(0.15)	60 (0.12)	0.27
<i>Merionus carssus</i>	16(0.03)	10 (0.02)	0.05
<i>Merionus libycus</i>	13(0.02)	10 (0.02)	0.04
<i>Mus musculus</i>	12(0.02)	7 (0.01)	0.03
<i>Nesokia indica</i>	4(0.008)	1(0.002)	0.01
Total	277 (0.548)	213 (0.422)	0.97

The results of the study showed no significant differences between the sites of Rodent captured in both situation equal and non-equal of variances. In addition, same signification (2-tailed), mean

differences, standard error of differences between the sites of Rodent captured in the study. Furthermore, same lower and upper CID showed in the analysis of the results of this study (Table 7).

Table 7: Independent Samples T-Test Analysis for Rodents Captured Sites in the Study.

		Levene's Test		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Difference	Error95% CI D	Lower
Rodent	Equal var. assume	2.417	.146	.522	12	.611	9.14286	17.52239	-29.03514	47.32086
	Equal not assume			.522	11.594	.612	9.14286	17.52239	-29.18381	47.46952

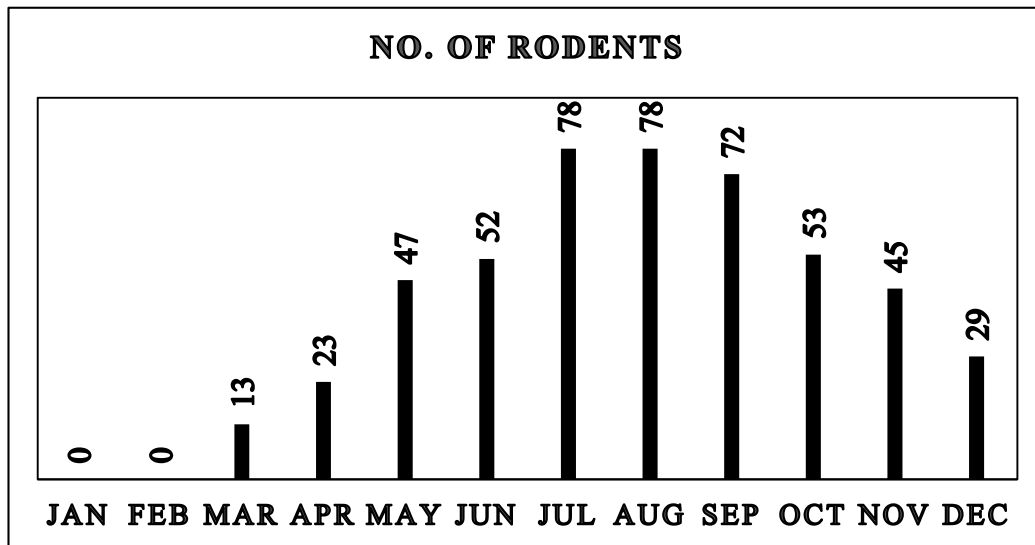


Figure 1: Monthly Distribution of Rodents Total Number Captured in the Study.

The results of this study showed the highest number of Rodents captured in summer months (July and August) while the lowest number of Rodents captured in winter months (January and February) as we see in Fig.1.

The results of this study showed that all captured rodent species were infected with parasites. We found 54 individuals of 490 captured rodents were infected with parasites in percentage as 11.02%. Three species of rodents were infected with *C. varpum* protozoan,

which was *R. rattus*, *R. norvegicus* and *M. libycus*. Three species of rodents were infected with *E. histolytica*, which were *T. indica*, *R. rattus*, and *M. libycus*. Five species of rodents were infected with *H. nana*, which were all types in this study except *M. libycus*. The species *R. rattus* was the highest infected type with *C. varpum* (9.16%). The species *M. libycus* was the highest infected type with *E. histolytica* (13.04%). The species *T. indica* was the highest infected type with *H. nana* (6.53%) (Table8).

Table 8: Numbers and percentages of parasite species infected rodent species.

Rodent Species	No. Examined	Number Infected	%	Parasite Species	Rodent Infected	%
<i>T. indica</i>	153	16	10.45	<i>C. varpum</i>	0	0
				<i>E. histolytica</i>	6	3.92
				<i>H. nana</i>	10	6.53
				<i>C. varpum</i>	12	9.16
<i>R. rattus</i>	131	21	16.03	<i>E. histolytica</i>	3	2.29
				<i>H. nana</i>	6	4.58
				<i>C. varpum</i>	3	2.25
<i>R. norvegicus</i>	133	9	6.76	<i>E. histolytica</i>	0	0
				<i>H. nana</i>	6	4.51
				<i>C. varpum</i>	0	0
<i>M. carssus</i>	26	2	7.69	<i>E. histolytica</i>	0	0
				<i>H. nana</i>	2	7.69
				<i>C. varpum</i>	1	4.34
<i>M. libycus</i>	23	4	17.38	<i>E. histolytica</i>	3	13.04
				<i>H. nana</i>	0	0
				<i>C. varpum</i>	0	0
<i>M. musculus</i>	19	1	5.25	<i>E. histolytica</i>	0	0
				<i>H. nana</i>	1	5.26
				<i>C. varpum</i>	1	20
<i>N. indica</i>	5	1	20	<i>E. histolytica</i>	0	0
				<i>H. nana</i>	0	0
Total	490	54	11.02			

The rodents represented some important links in the ecosystem food chains and they often been exposed to human and may represent as transmitters of different pathogens. The recent study was attempted to assess the prevalence, abundance, and parasitological importance of rodents in Iraq. From available information, little ecological studies deal with the account of total numbers of rodents. Seven common species were found to be prevalent in the sampling sites in Iraq providences in this work. All the species trapped in this study were reported in Iraq previously. The species *T. indica* and *N. indica* were trapped in Iraq by Hasson R H (2010) [3,14]. The species *R. rattus* and *R. norvegicus* were trapped and used in different types of studies in Iraq by Jassim SY (2016) [14]. The species *Nesokia indica* was widely distributed in many countries, Iraq is among them Wilson D. E. and Reeder D. M (2005) [15]. The mammal *Meriones crassus* was trapped in Iraq by Granjon L (2016) [16]. The prevalence of Rodents is relating with their species preference inhabited areas, which have crowded vertical buildings with basements nearby rivers, mass markets stores, abundant food etc. [1].

The results of this study were demonstrated that the species *Tatera indica* is the highest trapped type; this finding was in agreement with other studies [7][17]. Generally, *M. musculus* mean numbers were lowest than *R. rattus* mean numbers on both sites of the study, this result was supported by another study [12].

In addition, the results of the study noticed that the abundance of rodents in summer were more than in winter. Many factors have effect on the prevalence of rodents. Other researchers studied these factors. Rainfall, food available, competition unavailable suitable habitats, climate are the most effect factors to the prevalence of rodents. Our results were in agreement with other studies, which found that the seasonal variations have effect on population of small mammals. In general, the factors that determine population dynamics can be varied over the months of the year (McMillan et al., 2005).

The highest prevalence of 6.53 % for *H. nana* in *T. indica* in the present study was low when compared to reported prevalence of 19.50 % [12] and high when compared to reported prevalence of 6.34% [18]. We have noticed that the prevalence of parasite in rodents was more varied from one study to another. This variation may be due to the differences in sample size, study design, study area, and the nature of study area. The variation of parasites prevalence was demonstrated to it by another study, which supported our findings [12].

4. CONCLUSION

We conclude that the numbers of rodents were varying depending on many factors. No significance differences

observed between male and female rodents as well as differences between the two areas studied. There is parasitological importance of rodents species trapped in this work. We recommend making more studies to account the whole numbers of rodents in Iraq.

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