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Survey of rodents and their ecto-parasites at some animal farms in Minia Governorate, Egypt

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Abstract

The main objective of this research is to recognize the rodent species prevailing under Minia region, Egypt conditions. The current study revealed the presence of three main species of rodents living in two animal farms (Salah El-Deen village and El-Minia district), El-Minia Governorate. These species of rodent were: *Rattus rattus frugivorous*; *Rattus norvegicus* and *Mus musculus*. The ectoparasites associated with these rodents were: two insects i.e., the louse, *Polyplax spinulosa;* the Flea, *Pullex irritans* as well as six mite species i.e., *Ornithonyssus bacoti*; *Glycyphagus* sp.; *Myobia murismusculi; Dermanssus gallinae*; *Liponyssoides sanguineus* and *Cheyletiella parasitivorax*. The mite species, *O. bacoti*; *Glycyphagus* sp. and *C. parasitovorax* were recorded on the bodies of *R. r. frugivorous* and *R. norvegicus*, but these species of mites were recorded from the body of the house mouse, *M. musculus*. The two mite species *M. murismusculi* and *D. gallinae* were recorded in association with the three surveyed rodent species. The fleas were more common with *R. r. frugivorous* and *M. musculus*, but completely disappeared with *R. norvegicus*. The louse, *P. spinulosa* was recorded on *R. r. frugivorous* and *M. musculus* and completely missed on *R. norvegicus*. In Shosha animal farm (Samalote district), only two rodent species were recorded (*R. r. frugivorus* and *R. norvegicus*), and the mite species accompanied with both rodent species were *O. bacoti*; *Glycyphagus* sp.; *M. murismusculi* and *C. parasitivorax*. While the lice, *P. spinulosa* were found only on the body of *R. r. frugivorous* and completely disappeared on *R. norvegicus.*

Introduction

Rodents are cosmopolitan in their distribution and they constitute the largest group of mammals represented about 40 % of all mammals in the world [1] and [2] surveyed 51 species of rodent in Egypt belonged to the suborder Myomorpha; eleven species fall under the family Muridae the species pertaining to these genera: (*Arvicanthis*, *Rattus*, *Acomys*, *Mus* and *Nesoke*) are domestic and commensal animals found of abundance, while five families presented are low abundance living in desert and semi desert. Some researchers in Upper Egypt studied on the dominant rate species (i.e., *R. norvegicus*; *R. rattus*; *A. cahirinus*; *A. niloticus*; *M. musculus*; *Geribilus* sp. and *Juculus* sp.). These dominant species and their densities are related to their habitats, crop installation, nearly reclamation land and abundance shelter and food and seasons [3,4,5,6,7,8,9]

In tropical and subtropical countries, at least 20 species of rodents have been recognized as pests of agricultural crops, including *R. norvegicus* and *R. rattus* [10**].** Rats cause destruction of foodstuff, electrical equipment and buildings by gnawing or contamination with excreta resulting in significant economic losses [11**].** Rats can carry a range of bacteria and viruses which lead to the spread of diseases such as plague, arena and Hanta virus, rat typhus and helminthasis as hymenolepiasis, schistosomiasis and lung worm[12**].** Screening of rodent's ectoparasites was carried out by [13] to assess their potential as reservoirs of zoonoses [14**].**

In Egypt, rodent's problem increased in the last two decades. The main reasons are due mainly to the diversion in agricultural ecosystem, land reclamation and construction of new cities in the desert areas. The wide usage of pesticides for controlling agricultural pests lead to rodent natural enemies reduction such as some reptiles and wild birds. Ectoparasites associated with rodents in Egypt were surveyed and the most abundance ectoparasites were different species of mites especially: *O. bacoti*, *Laelaps nuttalli*, *D. gallinae*, *Allodermanyssus sanguincus*, *Eulaelaps stabularis* and *Radfordia ensiifera*. In the other hand, fleas and lice were also detected [15-19**].** This study aims to survey the rodents and their associated ectoparasites in two animal farms in El-Minia Governorate.

2-Materials and Methods

2.1 Survey of rodents in some animal farms in El-Minia Governorate:

Twenty wire-box traps were baited and distributed twice every week at 6 pm and collected at 7 am in the surveyed areas. The captured rodents were classified morphologically and counted.

2.2 Studies on the population density of ectoparasites associated with rodent species in the tested animal farms in El-Minia Governorate:

Rodents were collected alive and classified to species and subspecies, male and female of each as well as the distribution frequency of each species (%). For collecting the rodent ectoparasites, the captured rodent bodies will be dipped in bowl filled partially with liquid soap solution (water with few drops of detergent) to kill rodents by asphyxia and to remove the ectoparasites attached to the rodent bodies, then these ectoparasites were delivered to small jar contained 75% ethyl alcohol for identification by to aid of the stereoscopic microscope. The ectoparasites were classified as fleas, lice and mites.

Identification of the ectoparasites was done by using different keys constructed by [20-24]**.** One rodent represented one replicate. The average numbers of the detected animal organisms of four replicates recorded and general mean was estimated and recorded.

3-Results and Discussion

3.1 Rodents and their associated ectoparasites in animal farms of Salah El-Deen village, El-Minia district of El-Minia Governorate:

The surveyed rodents at animal farms in Salah El-Deen village and El-Minia district were tested during 2017 and 2018 for detecting their associated ectoparasites **(Table 1)**. The surveyed rodents were: (*R. r. frugivorous*, *R. norvegicus* and *M. musculus*), and their associated ectoparasites were the louse, *P. spinulosa*; the flea, *P. irritans* and different mites species (*O. bacoti*, *Glycyphagus* sp., *M. murismusculi*, *D. gallinae*, *L. sanguineus* and *C. parasitovorax*).

Data in **Table (1),** show that both *O. bacoti* and *Glycyphagus* sp. were detected with *R. r. frugivorous* and *R. norvegicus* and completely disappeared on *M. musculus* also, *C. parasitivorax* mite was detected on *R. r. frugivorous* and *R. norvegicus* but missed on *M. musculus*. While *M. murismusculi* and *D. gallinae* were recorded on all surveyed rodents. Flea was recorded with *R. r. frugivorous* and *M. musculus* and completely disappeared on *R. norvegicus*. The louse, *P. spinulosa* was attached on *R. r. frugivorous* and *M. musculus*, but not observed on *R. norvegicus*. The lice were disappeared on *R. norvegicus* that may be attributed to the contamination of Norwegian rat bodies by ammonia resulting from their continuous visiting the closets. [25] found that ammonia may be kill lice.

Table (1): Survey of rodent ectoparasites in farm animals in both farms of El-Minia Governorate, during, 2017 and 2018

Rodents/ Ectoparasites	*R. r. frugivorus*	*R. norvegicus*	*M. musculus*
Lice	*Polyplax spinulosa*	_	*Polyplax spinulosa*
Fleas	*Pullex irritans*	_	*Pullex irritans*
Mites	*Ornithonyssus bacoti*	*Ornithonyssus bacoti*	_
	Glycyphagus sp.	*Glycyphagus* sp.	_
	Myobia murismusculi	*Myobia murismusculi*	*Myobia murismusculi*
	Dermanssus gallinae	*Dermanssus gallinae*	*Dermanssus gallinae*
	_	_	*Liponyssoides sanguineus*
	cheyletiella parasitivorax	*Cheyletiella parasitivorax*	_

Data in **Tables (2, 3 & 4),** explain the monthly and seasonal abundance of some ectoparasites collected from the body surface of *R. r. frugivorus*, *R .norvegicus* and *M. musculus* in three animal farms (Salah El-Deen village, El-Minia district, El-Minia city, during, 2017 and 2018. Total numbers of lice on *R. r. frugivorus* in 2017 and 2018 were 30 and 20/rat. While these numbers were on *M. musculus* 11 and 7/mouse. **(Table 4),** this difference may be due to the increase in hair length on the Norwegian rats compared to the house mouse in agreement with [26]. Total number of fleas on *R. r. frugivorous* in 2017 and 2018 were 24 and 21/ rat, and 42 and 37/mouse on *M. musculus*. This difference may be due to the visiting of *M. musculus* to the human building. *D. gallinae* surpassed other mites with the tested rats recording 225, 317 and 49/rat in 2017 and 178, 200 and 29 in 2018 on *R. r. frugivorus*, *R. norvegicus* and *M. musculus*, respectively **(Tables 2, 3 & 4).** This result explained that on *R. norvegicus* the highest number of the *D. gallinae* recorded perhaps it is due to the fact that the Norwegian rat used to live inside poultry farms. The *C. parasitivorax* was completely disappeared on *M. musculus*. Conversely, for both rodent species recorded 65, 78, 43 and 48/rat in 2017 and 2018, consecutively. This is due mainly to the frequently presence of *C. parasitovorax* with rabbits, as well as for the Norwegian rat, which used to attach rabbits and feed on their bodies.

Table (2) and Figure (1), represented the percentage of ectoparasites associated with *R. r. frugivorous* overall the year. The high percentage overall the year was 24.75 with *D. gallinae* in 2017 while the lowest one was 2.31 % for *P. irritans* in 2018. **Table (3) and Figure (2)** represent the percentage of ectoparasites associated with *R. norevegicus* overall the year. The highest percentage was 33.51% for *D. gallinae* in 2017, while the lowest one was 4.2 % *M. murismusculi* in 2018.

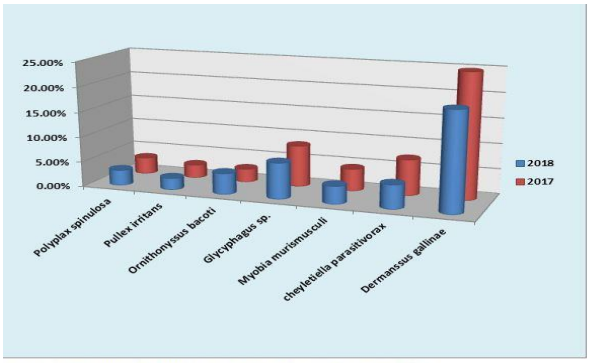

Fig., (1): Percentage of each ectoparasite species associated with *R. r. frugivorous* at Salah Eldeen village, Minia district, Minia Governorate overall the year of 2017 & 2018

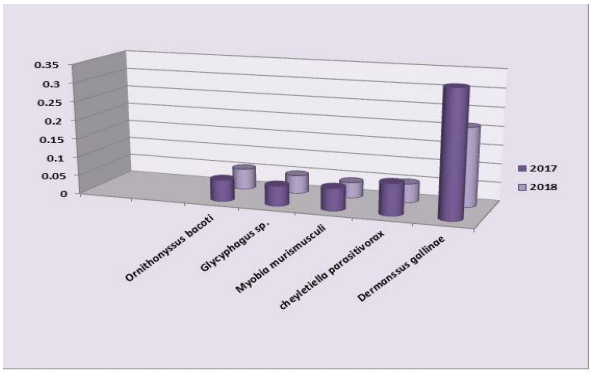

Fig. (2): Percentage of each ectoparasite species associated with *R. norvegicus* at Salah Eldeen village, Minia district, Minia Governorate, overall the year of 2017 & 2018

Table (2): Monthly abundance of some ectoparasites (No./rat) collected from the body surface of R. r. frugivorus in both farms in El-Minia governorate during, 2017 and 2018

Species	*P. spinulosa*		*P. irritans*		*O. bacoti*		*Glycyphagus* sp.		*M. murismusculi*		*D. gallinae*		*C. parasitivorax*	
Year	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
Jan.	2	1	1	1	1	0	2	1	0	1	4	3	2	0
Feb.	0	1	2	0	2	3	5	4	3	2	10	9	0	1
March	3	2	1	0	2	3	6	5	2	3	5	7	0	2
April	4	2	3	2	3	4	7	6	5	4	20	15	6	4
May	3	1	2	3	5	3	10	8	10	6	33	29	8	5
June	2	3	4	3	6	5	13	10	6	4	35	24	9	6
July	3	2	3	2	5	6	6	7	5	3	30	25	10	5
Aug.	4	5	4	3	7	6	8	7	4	3	37	30	12	9
Sept.	2	5	1	2	5	4	2	4	0	2	25	20	7	5
Oct.	4	6	2	4	5	3	6	6	2	1	15	10	5	4
Nov.	1	0	1	0	2	1	6	4	2	3	5	4	4	2
Dec.	2	0	0	1	2	0	4	3	1	0	6	2	2	0
Total	30	28	24	21	45	38	75	65	40	32	225	178	65	43
% of each species overall the yea	3.30%	3.08%	2.64%	2.31%	4.96%	4.18%	8.25%	7.15%	4.40%	3.52%	24.75%	19.58%	7.15%	4.73%

3.2 Rodents and their associated ectoparasites in Shosha farm (Samalote), El-Minia Governorate during 2017 and 2018:

Table (5) Surveyed and the three rodent species and their associated ectoparasites in Shosha farm in Samalote district, during 2017 and 2018. Two rodent species were detected in Shosha animal farms (*R. r. frugivorus* and *R. norvegicus*). The detected ectoparasites accompanyed with *R. r. frugivorus* were: the lice, *P. spinulosa* and four mite species (i.e., *O. bacoti*; *Glycyphagus* sp.; *M. murismusculi* and *C. parasitovorax*). These mites were recorded also with *R. norvigicus* while *P. spinulosa* was completely disappeared on the body of *R. norvigicus.*

Table (3): Monthly abundance of some ectoparasites collected from the body surface of Rattus norvegicus in both farms of El-Minia Governorate during, 2017 and 2018

Species Year	*O. bacoti*		*Glycyphagus* sp.		*M. murismusculi*		*D. gallinae*		*C. parasitivorax*	
	2017	2108	2017	2108	2017	2108	2017	2108	2017	2108
Jan.	2	0	1	0	2	1	10	8	2	0
Feb.	1	2	1	2	4	2	11	5	3	1
March	2	3	3	2	3	4	15	7	4	2
April	4	5	5	3	6	5	22	10	2	2
May	5	4	8	7	11	9	30	15	8	5
June	5	6	9	10	5	4	40	30	10	7
July	7	8	7	5	7	5	45	35	15	11
Aug.	8	6	5	6	6	3	38	28	12	9
Sept.	6	7	3	2	5	4	35	24	9	6
Oct.	7	5	4	5	3	2	36	22	6	3
Nov.	5	4	3	4	3	1	20	9	4	2
Dec.	3	3	2	1	2	0	15	7	3	0
Total	55	53	51	47	57	40	317	200	78	48
% of each species overall the year	5.81%	5.60%	5.39%	4.97%	6.02%	4.23%	33.51%	21.14%	8.52%	5.07%

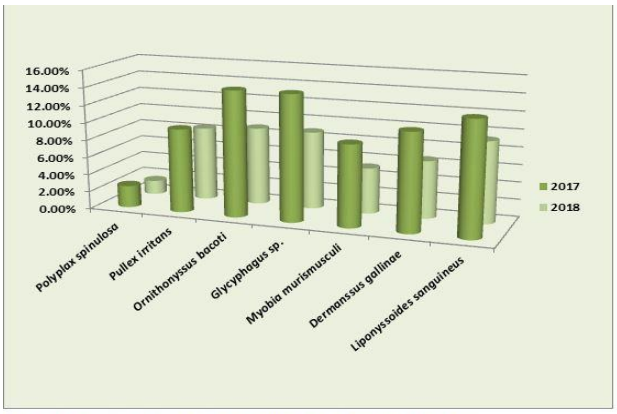

Fig. (3): Percentage of each ectoparasite species associated with *M. musculus* at Salah Eldeen village, Minia district, Minia Governorate, overall the year of 2017 & 2018

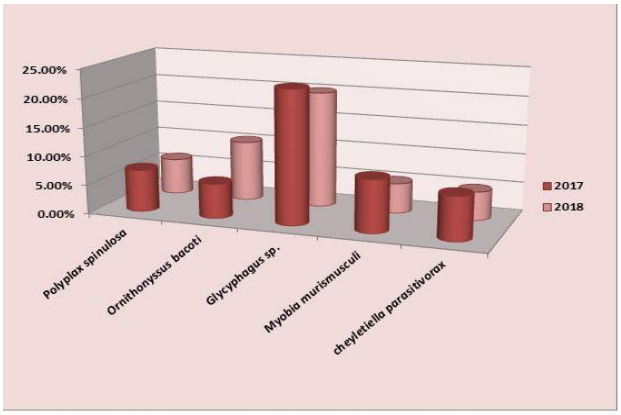

Figure (4). Percentage of each ectoparasite species associated with *R. r. frugivorus* at animal farms in Shosha village, Samalote district overall the year of 2017 & 2018

Table (4): Monthly abundance of some ectoparasites collected from the body surface of M. musculus in farm animals in both farms of El-Minia Governorate, during, 2017 and 2018

fSpecies	*P. spinulosa*		*P. irritans*		*Glycyphagus* sp.		*M.murismusculi*		*D. gallinae*		*L. sanguineus*	
Year	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
Jan.	0	0	2	1	0	0	0	1	0	0	1	0
Feb.	0	0	0	2	5	3	0	0	0	0	3	2
March	0	1	0	2	4	2	0	0	0	0	4	5
April	1	0	4	3	6	5	4	2	5	3	6	4
May	1	0	5	4	9	7	6	3	5	4	7	6
June	2	2	4	5	10	6	5	4	7	5	5	4
July	2	1	5	4	5	3	5	2	10	6	6	4
Aug.	1	1	7	5	7	4	6	3	8	5	6	5
Sept.	2	2	6	4	3	2	7	4	6	3	7	5
Oct.	2	0	4	3	7	5	5	3	4	2	6	4
Nov.	0	0	3	3	5	2	2	1	3	1	3	2
Dec.	0	0	2	1	2	0	1	0	1	0	3	0
Total	11	7	42	37	63	39	41	23	49	29	57	41
% of each species overall the year	2.50%	1.59%	9.57%	8.43%	14.35%	8.88%	9.33%	5.24%	11.16%	6.60%	12.98%	9.33%

Table (5): Survey of rodent ectoparasites in Shosha farm (Samalote), El-Minia Governorate during, 2017 and 2018

Rodents/ Ectoparasites	*R. r. frugivorus*	*R. norvegicus*
Lice	*Polyplax spinulosa*	_
Mites	*Ornithonyssus bacoti*	*Ornithonyssus bacoti*
	Glycyphagus sp.	*Glycyphagus* sp.
	Myobia murismusculi	*Myobia murismusculi*
	Cheyletiella parasitivorax	*Cheyletiella parasitivorax*

Data in Table (6**)** explained the monthly abundance of some ectoparasites collected from the body surface of *R. r. frugivorus* in Shosha farm in Samalote district during 2017 and 2018. The total number of *P. spinulosa* was 28 and 24/rat during 2017 and 2018. As for the mite, *O. bacoti* the recorded number was 40 and 23/rat in 2017 and 2018. *C. parasitovorax* recorded 29 and 19 /rat in 2017 and 2018. *M. murismusculi* recorded 35 and 20/rat in 2017 and 2018. The highest number detected was 88 and77 /rat in 2017 and 2018 with *Glycyphagus* sp.**Table (6) and Figure (4),** represented the percentage of associated ectoparasites on *R. r. frugivorous* overall the year. The highest percentage was 22.98 with *Glycephagus* sp. in 2017, while the lowest percentage was 4.96 % that recorded with *C. parasitovorax* in 2018.

Data in Table (7) explained the monthly abundance of ectoparasites collected from the body surface of. *R. norvegicus* in Shosha farm in Samalote district during 2017 and 2018. The louse, *P. spinulosa* was completely disappeared on the Norwegian rat as for the mite species, *O. bacoti* recorded 32 and 17 individuels. *M. murismusculi* 55 and 47 individuels and *Glycyphagus* sp. recorded 47 and 42 individuals on *R. norvegicus* the highest number of ectoparasites on *R. norvegicus* was 81 and 79/rat with *C. parasitivorax* in 2017 and 2018. Table (7) and Figure (5), represented the percentage of ectoparasite species associated on *R. norevegicus* overall the year. The highest percentage was 20.25 with *C. parasitivorax* in 2017, while the lowest one was 4.25 % recorded with *O. bacoti* in 2018.

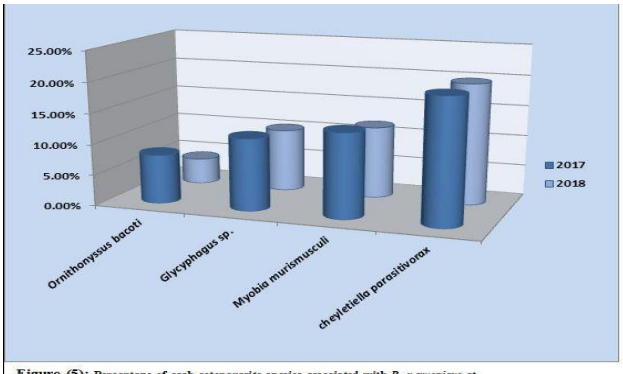

Figure (5): Percentage of each ectoparasite species associated with *R. norvegicus* at animal farms in Shosha village, Samalote district overall the year of 2017 & 2018

4- Conclusion

For recognizing the problems caused by rodents and their associated ectoparasites the surveying of these pests become imperative. This research aimed to survey rodents and their ectoparasites in some animal production farms located in Minia region. The current study showed the presence of three rodent species that used to feed inside animal production farms (i.e., *R. r. frugivorous*; *R. norevegicus* and *M. musculus*). It was also possible to identify several species of ectoparasites on the bodies of these three rodent species which are: single species of lice (*P. spinulosa*); one species of flea (*P. irritanus*) and six species of mites (i.e., *O. bacoli*; *Glycyphagus* sp.; *M. murismusculi*; *D. gallinae*; *L. sanguineus* and *C. parasitovorax*) these results are in agreement with those obtained by [3,6,7,16,17,18,9]

Table (6): Monthly abundance of some ectoparasites collected from the body surface of R. r. frugivorus in Shosha farm (Samalote), during, 2017 and 2018

Species	*P. spinulosa*		*O. bacoti*		*Glycyphagus* sp.		*M. murismusculi*		*C. parasitivorax*	
Year	2017	2018	2018	2017	2017	2018	2017	2018	2017	2018
Jan.	2	1	1	0	4	3	0	0	0	0
Feb.	1	0	2	0	6	5	2	0	1	0
March	1	0	2	0	5	3	2	1	1	0
April	3	2	4	3	8	7	4	2	2	2
May	0	1	3	4	12	10	5	3	3	2
June	3	2	5	4	15	13	6	3	5	3
July	2	3	6	3	9	8	4	2	4	2
Aug.	4	5	5	4	10	8	5	4	5	4
Sept.	3	4	6	4	14	9	2	2	3	3
Oct.	6	5	2	3	10	6	1	2	2	2
Nov.	2	1	3	2	5	3	2	1	3	1
Dec.	1	0	1	0	4	2	2	0	0	0
Total	28	24	40	23	88	77	35	20	29	19
% of each species overall the year	7.31 %	6.27%	10.44 %	6.00%	22.98 %	20.10 %	9.14 %	5.22%	7.57%	4.96%

Table (7): Monthly and seasonal abundance of some ectoparasites collected from the body surface of R. norvegicus in Shosha farm (Samalote), El-Minia Governorate during, 2017 and 2018

Species Year	*O. bacoti*		*Glycyphagus* sp.		*M. murismusculi*		*C. parasitivorax*	
	2017	2018	2017	2018	2017	2018	2017	2018
Jan.	0	0	1	0	2	1	2	2
Feb.	1	0	2	1	2	2	3	4
March	2	0	1	2	4	3	3	3
April	4	2	4	2	6	7	5	6
May	4	3	8	6	7	5	9	7
June	5	3	6	5	5	5	10	8
July	3	2	8	6	3	4	12	11
Aug.	4	2	7	5	5	6	9	9
Sept.	5	3	5	6	6	4	10	8
Oct.	2	1	3	4	7	5	8	10
Nov.	2	1	2	3	5	3	6	7
Dec.	0	0	0	2	3	2	4	4
Total	32	17	47	42	55	47	81	79
% of each species overall the year	8.00 %	4.25 %	11.75 %	10..	13.75%	11.	20.25%	19.75%

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