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

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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: (Arvicanius, 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 Jaculus 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 helminthiasis 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 nutalli, D. gallinae, Allodermanyssus sanguineus, Euraelaps stabularis and Radfordia ensiferu. 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. bactoi, Glycyphagus sp., M. murismusculi, D. gallinae, L. sanguineus and C. parasitivorax). Data in Table (1), show that both O. bactoi 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

| Ectoparasite | R. r. frugivorus | R. norvegicus | M. musculus |
|--------------|----------------|--------------|-------------|
| Lice         | Polyplax spinulosa | Polyplax spinulosa | –           |
| Fleas        | Pullex irritans | Pullex irritans | –           |
| Mites        | Ornithonyssus bactoi | Ornithonyssus bactoi | –           |
|              | Glycyphagus sp. | Glycyphagus sp. | –           |
|              | Myobia murismusculi | Myobia murismusculi | Myobia murismusculi |
|              | Dermanss gallinea | Dermanss gallinea | Dermanss gallinea |
|              | – | – | 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. frugivorous, 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. frugivorous 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. frugivorous, 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 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. parasitivorax 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. norvegicus 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.
### 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            |
|                 | Feb          | March       | Apr       | May             | June            | July        | Aug             | Sept            | Oct             | Nov             | Dec             | Jan             |
|                 | 7            | 7           | 8         | 7               | 8               | 7           | 8               | 7               | 8               | 7               | 8               | 7               |
|                 | 2            | 1           | 1         | 0               | 1               | 0           | 1               | 0               | 1               | 0               | 0               | 1               |
| % of species    | 0%           | 0           | 0%        | 0%              | 0%              | 0%          | 0%              | 0%              | 0%              | 0%              | 0%              | 0%              |
| overall         | 5.81%        | 5.6         | 5.39%     | 4.9             | 6.02%           | 4.2         | 3.3             | 21              | 8.52%           | 5               | 2               | 20              |
| % of overall    | 0%           | 0%          | 0%        | 0%              | 0%              | 0%          | 0%              | 0%              | 0%              | 0%              | 0%              | 0%              |

#### 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 accompanied by R. r. frugivorus were: the lice, P. spinulosa and four mite species (i.e., O. bacoti; Glycyphagus sp.; M. murismusculi and C. parasitivorax). These mites were recorded also with R. norvicsic while P. spinulosa was completely disappeared on the body of R. norvicsic.

### 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         | P. spinulosa | P. irritans | O. bacoti | Glycyphagus sp. | M. murismusculi | D. gallinae | L. sanguineus |
|-----------------|--------------|-------------|-----------|-----------------|-----------------|-------------|--------------|
| Year            | 2017         | 2018        | 2017      | 2018            | 2017            | 2018        | 2017         | 2018         |
|                 | Feb          | March       | Apr       | May             | June            | July        | Aug          | Sept         |
|                 | 0.8          | 7           | 8         | 7               | 8               | 7           | 8            | 7            |
| % of species    | 0%           | 0%          | 0%        | 0%              | 0%              | 0%          | 0%           | 0%           |
| overall         | 5.81%        | 5.6         | 5.39%     | 4.9             | 6.02%           | 4.2         | 3.3          | 21           |
| % of overall    | 0%           | 0%          | 0%        | 0%              | 0%              | 0%          | 0%           | 0%           |

#### Figure (3): Percentage of each ectoparasite species associated with M. musculus at Arab Elleen 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, Shosha district as each 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

| Species         | P. spinulosa | P. irritans | O. bacoti | Glycyphagus sp. | M. murismusculi | D. gallinae | L. sanguineus |
|-----------------|--------------|-------------|-----------|-----------------|-----------------|-------------|--------------|
| Year            | 2017         | 2018        | 2017      | 2018            | 2017            | 2018        | 2017         | 2018         |
|                 | Feb          | March       | Apr       | May             | June            | July        | Aug          | Sept         |
|                 | 0.8          | 7           | 8         | 7               | 8               | 7           | 8            | 7            |
| % of species    | 0%           | 0%          | 0%        | 0%              | 0%              | 0%          | 0%           | 0%           |
| overall         | 5.81%        | 5.6         | 5.39%     | 4.9             | 6.02%           | 4.2         | 3.3          | 21           |
| % of overall    | 0%           | 0%          | 0%        | 0%              | 0%              | 0%          | 0%           | 0%           |

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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. parasitivorax 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 and 77/rat in 2017 and 2018 with Glycyphagus sp.

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 | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 |
| Jan.             | 2    | 1    | 0    | 1    | 0    | 4    | 3    | 0    | 3    | 0    | 0    |
| Feb.             | 1    | 0    | 2    | 0    | 6    | 5    | 2    | 0    | 1    | 0    | 0    |
| March            | 1    | 0    | 2    | 0    | 5    | 3    | 2    | 1    | 1    | 0    | 0    |
| April            | 3    | 2    | 4    | 3    | 8    | 7    | 4    | 2    | 2    | 2    | 2    |
| May              | 0    | 1    | 3    | 4    | 12   | 10   | 5    | 3    | 3    | 2    | 3    |
| June             | 3    | 2    | 5    | 4    | 15   | 13   | 6    | 3    | 5    | 3    | 3    |
| July             | 2    | 3    | 6    | 3    | 9    | 8    | 4    | 2    | 4    | 2    | 2    |
| Aug.             | 4    | 5    | 5    | 4    | 10   | 8    | 5    | 4    | 5    | 4    | 4    |
| Sept.            | 3    | 4    | 6    | 4    | 14   | 9    | 2    | 2    | 3    | 3    | 3    |
| Oct.             | 6    | 5    | 2    | 3    | 10   | 6    | 1    | 2    | 2    | 2    | 2    |
| Nov.             | 2    | 1    | 3    | 2    | 5    | 3    | 2    | 1    | 3    | 1    | 1    |
| Dec.             | 1    | 0    | 1    | 0    | 4    | 2    | 2    | 0    | 0    | 0    | 0    |
| Total            | 28   | 24   | 40   | 23   | 88   | 77   | 35   | 20   | 29   | 19   | 19   |
| % of each species overall the year | 7.31% | 6.2% | 10.44% | 6.0% | 22% | 19% | 10% | 5% | 7.5% | 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          | O. bacoti | Glycyphagus sp. | M. murismusculi | C. parasitivorax |
|------------------|-----------|-----------------|-----------------|-----------------|
| Year             | 2017 | 2017 | 2018 | 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% | 10.0% | 13.71% | 11.2% | 20.21% | 19.75% |

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. frugivorus; R. norvegicus 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. irritans) and six species of mites (i.e., O. bacoti; Glycyphagus sp.; M. murismusculi; D. gallinae; L. sanguineus and C. parasitivorax).

These results are in agreement with those obtained by [3,6,7,16,17,18,9].

Table 5: Percentage of each ectoparasitic species associated with R. norvegicus at animal farms in Shosha village, Samalote district overall the year of 2017 & 2018

![Figure 5: Percentage of each ectoparasitic species associated with R. norvegicus at animal farms in Shosha village, Samalote district overall the year of 2017 & 2018](image-url)
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