*Persian Journal of Acarology, Vol. 2, No. 2, pp. 253–263.*

**Article**

# Fauna and diversity of the manure-inhabiting Mesostigmata (Acari) in Kerman County, South Eastern Iran

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## Abstract

A faunistic survey was carried out on the manure-inhabiting mesostigmatic mites in Kerman County, South Eastern Iran, during 2011–2012. In this research, 36 species belonging to 23 genera and 14 families were collected and identified of which *Ameroseius pavidus* (C.L. Koch) (Ameroseiidae) and *Trachytes baloghi* Hirschmann & Zirngiebl-Nicol (Trachytidae) are considered here as new records for Iran mite fauna. The Shannon-Wiener's diversity index was also calculated for these mite communities within cow, poultry, and sheep manures in nine different districts of the County. Mite community within cow manures, with 31 species, was more diverse than poultry and sheep manures which had 14 and 13 species, respectively. The highest (2.2±0.07) and the lowest (0) mean values of diversity index were calculated for Sekonj and Langar districts, respectively. Based on relative frequency, *Uroobovella marginata* (C.L. Koch), *U. difoveolata* Hirschmann & Zirngiebl-Nicol, and *Androlaelaps casalis* (Berlese) were the most dominant species in cow, sheep, and poultry manures, respectively. On the other hand, *Macrocheles merdarius* (Berlese) and *Androlaelaps casalis* (Berlese) were the most widespread species.

**Key words**: Manure-inhabiting mites, Mesostigmata, *Ameroseius pavidus*, *Trachytes baloghi*, diversity, Kerman, Iran.

## Introduction

The Mesostigmata comprises mites with a large diversity of lifestyles and habitats. Some of them are symbionts of birds, mammals and reptiles or associated with arthropods, but a large majority of them are free-living predators and live in various habitats such as manure (Lindquist *et al.* 2009).

Domestic animals and poultry manures are suitable habitats for the dung-breeding fly species like *Musca domestica* L. and some other dipterans which lay their eggs in the animal droppings. Coprophilous Mesostigmata like some members of the families Macrochelidae, Parasitidae, Laelapidae, Eviphididae, Pachylaelapidae and also uropodid mites that usually feed on nematodes, oligochaetes, eggs and early instars larvae of Diptera, especially muscid flies, so they have an important role as biological control agents in these habitats (Ito 1970; Krantz 1983; Gerson *et al*. 2003).

There are several studies on manure-inhabiting mesostigmatic mites and their capability to control arthropods population (i.e., pest flies in livestock manures). Hyatt (1956), Axtell (1963, 1990), Willis and Axtell (1968), Peck and Anderson (1970), Rodriguez *et al*. (1970), Ito (1970) and Halliday & Holm (1987) have investigated the Acari fauna and their role in biological control in manure. Kazemi & Rajaei (2013) reported 57 manure-inhabiting Mesostigmata from Guilan, Mazandaran, Golestan, Fars, North Khorasan, Tehran and Semnan Provinces of Iran that were collected from cow, sheep, chicken, poultry and camel manures. These species include almost 16% of all recorded mites of the order Mesostigmata (excluding the family Phytoseiidae) from Iran.

With regard to the importance of manure-inhabiting mesostigmatic mites and their role in biological control of pests (especially fly pests), and due to the fact that there has been no comprehensive research on the fauna of these mites in Kerman, the present study has been done in this County. The main objectives of this research was a faunistic study on the manure-inhabiting Mesostigmata and also calculate the diversity indexes of these mite communities within cow, poultry and sheep manures in Kerman County, South Eastern Iran. Also, two new records of the genera *Trachytes* Michael, 1894 and *Ameroseius* Berlese, 1903 for Iran acarofauna are reported.

## Materials and methods

Mites were removed from three kinds of manure samples (cow, sheep and poultry) collected from Sirch, Sekonj, Koohpayeh, Ekhtiar-Abad, Joopar, Sarasiab, Mahan and Langar districts in Kerman County during 2011-2012 by means of Berlese-Tullgren funnels. The Mesostigmata was extracted from alcohol 70% under the stereomicroscope, then cleared in Nesbitt's fluid and finally mounted into Hoyer's medium on microscopic slides.

The Shannon-Wiener's (Equation 1) and Pielou's (Equation 2) indices (Price 1997), were used to calculate the diversity and evenness of mite communities, respectively.

$$H' = -\sum_{i=1}^{S}(p_i)(\log_e p_i) \quad (1)$$

$$J = \frac{H'}{Ln(S)} \quad (2)$$

Where, $p_i$ is the proportion of $i$th species in the all collected samples, and $s$ is the total number of species in the community. All biodiversity calculations were made using SDR IV software (Seaby and Henderson 2006).

## Results

*Systematics*

In this investigation, a total of 36 species belonging to 23 genera and 14 families were collected and identified from cow, sheep and poultry manures in nine districts of Kerman County (Table 1). Among the collected species in present study, *Ameroseius pavidus* (C.L. Koch, 1839) and *Trachytes baloghi* Hirschmann & Zirngiebl-Nicol, 1969 were considered as new records for Iran mite fauna.

***Ameroseius pavidus*** (C.L. Koch, 1839)
*Ameroseius pavidus*.— Bregetova, 1977: 154–155, 157; Karg, 1993: 230–231.

*Studied material.* One female, from poultry manure, Kerman Province, Sekonj (29º 59' N, 57º 25' E), altitude 2351 m, E. Arjomandi col., 17 Aug 2011, deposited in Acarological Collection, Institute of Science and High Technology and Environmental Sciences, Graduate University of Advanced Technology, Kerman, Iran (ACISTE).

***Trachytes baloghi*** Hirschmann & Zirngiebl-Nicol, 1969
*Trachytes baloghi*.— Hirschmann & Zirngiebl-Nicol, 1969: 98-100; Kadite & Petrova, 1977: 624, 626; Karg, 1989: 71; Mašán, 2001: 64-66, 2003:440.

*Studied materials.* Four females, from cow manure, Kerman Province, Jupar (30º 27' N, 57º 68' E), altitude 1907 m, E. Arjomandi col., 15 Dec 2011, deposited in Acarological collection, Department of Plant Protection, College of Agriculture, University of Agricultural Sciences and Natural Resources, Gorgon, Iran; one female from same locality and data, deposited in ACISTE; one female from same locality and data, deposited in the Acarological Collection, Acarological Society of Iran, Faculty of Agriculture, University of Tehran, Karaj, Iran.

*Diversity*

The numbers and relative frequencies of mites collected from cow, sheep, and poultry manures have been shown in tables 1, 2 and 3, respectively. The highest species richness (31 species) and mean value of diversity index (2.33±0.04) were calculated for cow manure, but there was no significant difference between diversity indices of mites' community within poultry and sheep manures. Based on relative frequency, *Uroobovella marginata*, *U. difoveolata*, and *Androlaelaps casalis* were the dominant species within cow, sheep, and poultry manures, respectively. On the other hand, *Macrocheles merdarius*, and *Androlaelaps casalis* were the most widespread species that were collected from six districts, while some species such as *Gaeolaelaps nolli*, *Gaeolaelaps kargi*, and *Gymnolaelaps myrmecophila* were found only in one district. On the whole, the families Laelapidae with 10 species, Parasitidae with five species, Macrochelidae and Ameroseiidae with four species have the most species diversity among 14 collected families. There was a significant difference among estimated diversities for different districts (Table. 4). The highest species richness (21 species) and mean value of diversity index (2.2±0.07) were calculated for Sekonj district. This region has mountain climate, and also using pesticides is relatively restricted compared with other regions, whereas the lowest species richness (one species) and mean value of diversity index (0) were obtained for Langar district.

Joopar and Sirch districts had the same numbers of species (13 species) but the coefficient of evenness in Joopar was greatly higher than Sirch that resulted in higher value of diversity in this district. Mahan and Ekhtiar-Abad had also the same number of species, but the mean value of evenness in former district was greatly higher than the latter that resulted in significantly higher diversity in Mahan district. Although, Hejin district had the highest coefficient of evenness (0.92), only two species were collected from this area which is resulted in the lower diversity index than other districts, except for Langar.

**Table 1.** Total number of specimens and relative frequency of the manure-inhabiting mites collected from cow manure in Kerman County.

| Species | Family | Number | Relative Frequency (%) |
|---|---|---|---|
| *Uroobovella marginata* (C.L. Koch, 1839) | Urodinychidae | 158 | 21.5 |
| *Macrocheles merdarius* (Berlese, 1889) | Macrochelidae | 142 | 19.3 |
| *Macrocheles* sp. | Macrochelidae | 119 | 16.1 |
| *Parasitus fimetorum* (Berlese, 1903) | Parasitidae | 78 | 10.6 |
| *Dendrolaelaps presepum* (Berlese, 1918) | Digamasellidae | 51 | 6.9 |
| *Parasitus consanguineus* Oudemans & Voigts, 1904 | Parasitidae | 48 | 6.5 |
| *Cornigamasus lunaris* (Berlese, 1882) | Parasitidae | 47 | 6.4 |
| *Androlaelaps casalis* (Berlese, 1887) | Laelapidae | 13 | 1.8 |
| *Macrocheles glaber* (Müller, 1860) | Macrochelidae | 12 | 1.6 |
| *Uroobovella difoveolata* Hirschmann & Z.-Nicol, 1969 | Urodinychidae | 10 | 1.3 |
| *Androlaelaps* sp. | Laelapidae | 9 | 1.2 |
| *Pneumolaelaps sclerotarsus* (Costa, 1968) | Laelapidae | 6 | 0.8 |
| *Trachytes baloghi* Hirschmann & Z.-Nicol, 1969 | Trachytidae | 6 | 0.8 |
| *Nenteria stylifera* (Berlese, 1904) | Trematuridae | 5 | 0.7 |
| *Pneumolaelaps lubrica* (Voigts & Oudemans, 1904) | Laelapidae | 4 | 0.55 |
| *Pneumolaelaps asperatus* (Berlese, 1904) | Laelapidae | 4 | 0.55 |
| *Proctolaelaps pygmaeus* (Müller, 1859) | Melicharidae | 4 | 0.55 |
| *Ameroseius eumorphus* Bregetova, 1977 | Ameroseiidae | 4 | 0.55 |
| *Euandrolaelaps karawaiewi* Berlese, 1903 | Laelapidae | 2 | 0.28 |
| *Gamasiphis lanceolatus* Karg, 1987 | Ologamasidae | 2 | 0.28 |
| *Parasitus hyalinus* (Willmann, 1949) | Parasitidae | 2 | 0.28 |
| *Laelaspis vitzthumi* (Womersley, 1956) | Laelapidae | 1 | 0.14 |
| *Gymnolaelaps myrmecophila* (Berlese, 1892) | Laelapidae | 1 | 0.14 |
| *Gaeolaelaps nolli* (Karg, 1962) | Laelapidae | 1 | 0.14 |
| *Halolaelaps sexclavatus* (Oudemans, 1902) | Halolaelapidae | 1 | 0.14 |
| *Dermanyssus gallinae* De Geer, 1778 | Dermanyssidae | 1 | 0.14 |
| *Macrocheles muscaedomesticae* (Scopoli, 1772) | Macrochelidae | 1 | 0.14 |
| *Scarabaspis inexpectatus* (Oudemans, 1903) | Eviphididae | 1 | 0.14 |
| *Alliphis halleri* (G. & R. Canestrini, 1881) | Eviphididae | 1 | 0.14 |
| *Antennoseius bacatus* Athias-Henriot, 1961 | Ascidae | 1 | 0.14 |
| *Sertytimpanum aegyptiacus* Nasr & Abou- Awad, 1986 | Ameroseiidae | 1 | 0.14 |

## Discussion

Pesticides application can cause direct and indirect effects on the mite populations. Mites are influenced by toxin effects directly and may be killed or their longevity or reproduction rate will decrease. Also, the prey populations such as nematodes and collembolans will reduce after the pesticide application and the food chain will change, thus predatory mites will suffer from lack of food that could be an important indirect effect of pesticides (Gerson & Smiley 1990).

The lowest species richness and the mean value of diversity index were obtained for Langar district. Only one mite specimen (a deutonymph of *Uroobovella marginata*) was collected from poultry manure in this district. Total life duration of uropodid mites is approximately one year and deutonymphs play an important role in the persistence of this family's members, because of their ability to pass unsuitable environmental conditions, to live a long life and to have potential for phoresy (Athias-Binche, 1984). Therefore, finding only one deutonymph specimen of *U. marginata* in Langar district is may be related to indiscriminate application of organophosphorous pesticides, especially Diazinon in orchards and fields of this region.

**Table 2.** Total number of specimens and relative frequency of the manure-inhabiting mite collected from sheep manure in Kerman County.

| Species | Family | Number | Relative Frequency (%) |
|---|---|---|---|
| *Uroobovella difoveolata* Hirschmann & Z.-Nicol, 1969 | Urodinychidae | 72 | 46.4 |
| *Dendrolaelaps presepum* (Berlese, 1918) | Digamasellidae | 35 | 22.6 |
| *Parasitus mycophilus* Karg, 1971 | Parasitidae | 15 | 9.6 |
| *Parasitus fimetorum* (Berlese, 1903) | Parasitidae | 12 | 7.7 |
| *Nenteria stylifera* (Berlese, 1904) | Trematuridae | 5 | 3.2 |
| *Macrocheles* sp. | Macrochelidae | 4 | 2.6 |
| *Androlaelaps casalis* (Berlese, 1887) | Laelapidae | 3 | 2.1 |
| *Antennoseius bacatus* Athias-Henriot, 1961 | Ascidae | 2 | 1.3 |
| *Ameroseius eumorphus* Bregetova, 1977 | Ameroseiidae | 2 | 1.3 |
| *Halolaelaps sexclavatus* (Oudemans, 1902) | Halolaelapidae | 2 | 1.3 |
| *Gaeolaelaps kargi* (Costa,1968) | Laelapidae | 1 | 0.64 |
| *Pneumolaelaps sclerotarsus* (Costa, 1968) | Laelapidae | 1 | 0.64 |
| *Sertytimpanum aegyptiacus* Nasr & Abou- Awad, 1986 | Ameroseiidae | 1 | 0.64 |

During the sampling from a sanitized cow stable, in spite of the consecutive use of pesticides, the population of the pest flies was still considerable, but no mesostigmatic mites were found there. It illustrates this fact that the use of consecutive pesticides may cause pest flies to evolve resistance, while having a spectacular effect on the population of the predaceous mites could be related to direct and indirect influence of pesticides application.

**Table 3.** Total number of specimens and relative frequency of the manure-inhabiting mites collected from poultry manure in Kerman County.

| Species | Family | Number | Relative Frequency (%) |
|---|---|---|---|
| *Androlaelaps casalis* (Berlese, 1887) | Laelapidae | 47 | 37.9 |
| *Parasitus fimetorum* (Berlese, 1903) | Parasitidae | 31 | 25.0 |
| *Macrocheles merdarius* (Berlese, 1889) | Macrochelidae | 12 | 9.67 |
| *Macrocheles glaber* (Müller, 1860) | Macrochelidae | 8 | 6.45 |
| *Macrocheles* sp. | Macrochelidae | 7 | 5.64 |
| *Dendrolaelaps presepum* (Berlese, 1918) | Digamasellidae | 7 | 5.64 |
| *Pneumolaelaps lubrica* (Voigts & Oudemans, 1904) | Laelapidae | 3 | 2.42 |
| *Trichouropoda patavina* (G. Canestrini, 1885) | Trematuridae | 2 | 1.61 |
| *Macrocheles muscaedomesticae* (Scopoli, 1772) | Macrochelidae | 2 | 1.61 |
| *Ameroseius eumorphus* Bregetova, 1977 | Ameroseiidae | 1 | 0.81 |
| *Ameroseius pavidus* (C.L. Koch, 1839) | Ameroseiidae | 1 | 0.81 |
| *Ameroseius lidiae* Bregetova, 1977 | Ameroseiidae | 1 | 0.81 |
| *Dermanyssus gallinae* De Geer, 1778 | Dermanyssidae | 1 | 0.81 |
| *Uroobovella marginata* (C.L. Koch, 1839) | Urodinychidae | 1 | 0.81 |

Manure type can have a significant effect on mites' diversity (Table 5). The highest species richness and mean value of diversity index were determined for cow manure, but there was no significant difference between diversity indices of mites' community within poultry and sheep manures. Cow manure has the higher humid content than sheep and poultry ones, and this high humid capacity maybe affects density and diversity of coprophilous mesostigmatic mites. Several water soluble attractants have been reported in manures that help the mites in habitat or host selecting. When the moisture decreases these substances will precipitate and will be ineffective, therefore mites are transferred from one habitat to another with more appropriate moisture content by phoresy phenomenon (Farish & Axtell 1971). Also, Carbon-to-Nitrogen (C/N) ratio is high in cow manure (19:1), higher than sheep's (16:1) and poultry's manures (4:1) (Augustin & Rahman 2010) which can probably be another reason for more diversity and frequency of manure-inhabiting mesostigmatic mites in cow manure.

**Table 4.** Species numbers, diversity index (Shannon-Wiener's *H'*), and evenness coefficient (Pielou's *J*) of the manure-inhabiting Mesostigmata community in different districts of Kerman County.

| Districts | Number of samples | Number of species | *H'±SD* | Pielou's *J* |
|---|---|---|---|---|
| Sekonj | 25 | 21 | 2.20±0.07 *a* | 0.72 |
| Joopar | 20 | 13 | 1.91±0.06 *b* | 0.74 |
| Sarasiab | 10 | 9 | 1.68±0.15 *b* | 0.76 |
| Sirch | 20 | 13 | 1.31±0.09 *c* | 0.51 |
| Koohpayeh | 20 | 8 | 1.26±0.13 *c* | 0.60 |
| Mahan | 10 | 6 | 1.16±0.05 *c* | 0.72 |
| Ekhtiar-Abad | 20 | 6 | 0.86±0.13 *d* | 0.44 |
| Hejin | 5 | 2 | 0.64±0.30 *e* | 0.92 |
| Langar | 5 | 1 | 0.0 *e* | 0.0 |

*Means within columns followed by the same letter are not significantly different (P<0.05)

**Table 5.** Species numbers, diversity index (Shannon-Wiener's *H'*), and evenness coefficient (Pielou's *J*) of the manure-inhabiting mites' community within different habitats in Kerman County.

| Habitats | Number of samples | Number of species | *H'±SD* | Pielou's *J* |
|---|---|---|---|---|
| Cow manures | 50 | 31 | 2.33±0.04 *a* | 0.68 |
| Poultry manures | 35 | 14 | 1.86±0.10 *b* | 0.70 |
| Sheep manures | 50 | 13 | 1.66±0.09 *b* | 0.65 |

*Means within columns followed by the same letter are not significantly different (P<0.05)

Regarding to mentioned information in Table 6, although the members of the families Eviphididae and Ologamasidae are particularly nematophagous Mesostigmata (Karg 1971; Lindquist *et al*. 2009), the Ameroseiidae comprises mites that feed on fungi spores and hyphal fragments, and the dermanyssid species are often ectoparasits of birds and small mammals (Lindquist *et al*. 2009), but the majority of the mesostigmatic mites which were found in this study comprise predatory species feed on none adult stages of small arthropods in addition to nematodes.

**Table 6.** Food and habitat preferences of the collected mesostigmatic mites (Karg 1971; Kohler 1997; Lindquist *et al*. 2009)

| Family | Preferred habitats | Preferred food |
|---|---|---|
| Ameroseiidae | soil, humus and leaf litter | Fungi spores and hyphal fragments |
| Ascidae | soil, plants and stored products | eggs and first larval stages of dipters, Collembola |
| Laelapidae | nest of mammals, birds and arthropods, litter and soil substrates, stored products | nematodes, eggs of arthropods, ectoparasit of mammals, birds & insects |
| Macrochelidae | habitats by a large amount of decaying organic material like composts leaf litter and different types of animal dung | eggs and first instars of arthropods especially dipters, nematodes |
| Eviphididae | nests of galleries of mammals, birds and social insects | nematodes oligochaetes, insect's eggs and larvae of arthropods |
| Dermanyssidae | nests of birds or mammals, rarely nest of rodents, litter layer under trees with bird's nests | ectoparasit of vertebrate animals |
| Melicharidae | soil, leaf litter and aboveground habitats | fungi, pollen, nectar, parasitic on cockroaches, eggs and immature of acarid mites |
| Parasitidae | organic and forest soils, animal dropping and seashore wrack, nests of birds and rodents | small arthropods, nematodes, eggs and juvenile microarthropods, Collembola |
| Trematuridae | Habitats rich in decaying organic material like compost and manure | fungi, organic debris in nests and insect galleries, nematodes, fly larvae and other mites |
| Urodinychidae | decaying organic substrates including rotting wood and manure, nests of birds, mammals and insects, moss, humus, beach wrack and plant debris | nematodes, greenhouse pests, larvae of Diptera |
| Ologamasidae | soil, humus and compost, nest of small mammals | nematodes and mites |
| Trachytidae | leaf litter, tree holes, moss, decaying woods in moist temperature, forest soils, limestone areas, ant hills, pieces of woods | omnivorous species, hyphal segment, decaying vegetation from forests and etc. |
| Digamasellidae | surface and subsurface soils, decaying organic material such as compost, manure and tidal debris | Collembola, nematodes, eggs of arthropods and fungi |
| Halolaelapidae | compost, manure, tidal debris, forest soils, marine algae and beach wrack | unknown |

Actively feeding on fly eggs and newly hatched first instars have been observed in the parasitid mites. For example, *Poecilochirus monospinosus* Wise *et al*., 1988 is a manure-inhabiting mite that its predation on eggs and first larval stages of house flies were determined in both deutonymph and adult stages (Wise *et al*. 1988).

Also, members of the family Urodinychidae, especially *U. marginata*, which are found in poultry and cattle manures are common predators of eggs and first instars of filth flies, but due to reproduction rate, slow movement and spotty distribution in the manure substrates, their potential for biological control is not considerable compare to the reduction of the pest flies population (Krantz 1983; Gerson *et al*. 2003).

There are many laboratory studies on the macrochelid species of the genus *Macrocheles* that indicate their significant role in decreasing pest fly population (Krantz 1983; Halliday & Holm 1987). For instance, *Macrocheles muscaedomesticae* (Scopoli, 1772) is a well known predator on eggs and young larvae of house fly, *Musca domestica* and significantly decreases the pest flies population (Krantz 1983). Furthermore, the juveniles of the filth flies like the face fly, *Musca automnalis* De Geer, and the stable flies, *Stomoxys calcitrans* (L.), are also attacked by a number of *Macrocheles* species (Gerson, *et al*. 2003). Rodriguez *et al*. (1970) confirmed that when macrochelid species were added to manure with a large number of pest flies, they could reduce the pest population by about 90%. Also, Axtell (1963) demonstrated that *Macrocheles* species could reduce the pest fly population more than any pesticide.

In this study, only three female specimens of *Macrocheles muscaedomesticae* were collected, two of them from poultry manure and one from cow dung, but other species of the genus *Macrocheles* like *M. merdarius* and *M.* sp. were found in a large population. Also, similar proportion of these macrochelid species has been found in other investigations on edaphic mites of the region that could indicates some other conditions such as climate condition which is warm and dry in the region may be influence on these mite population. It also shows that *M. merdarius* and *M.* sp. seem to have ability to adapt to this climate and may be they are the winners of the competition in these situations.

A well known pest in poultry industries is poultry red mite, *Dermanyssus gallinae* De Geer, 1778, which has been reported as ectoparasit of birds and small mammals (Lesna *et.al* 2009). Two common species of the family Laelapidae including *Gaeolaelaps aculiefer* (Canestrini, 1884) and *Androlaelaps casalis* (Berlese, 1887) have an important role in controlling the poultry red mite (Lesna *et al*. 2009).

In present study, only two female specimens of poultry red mite were collected from poultry and cow manures whereas, the laelapid predatory species like *A. casalis* found in large numbers in manure samples. So, low numbers of poultry red mite can be related to presence of its predators in the substrate. In cow manures, although *A. casalis* was not found, another predatory laelapid mite, *Gaeolaelaps nolli*, and some parasitid mites were collected from it, and the activity of these predatory mites may explain the low density of the poultry red mite within the examined cow manures.

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*Received: 26 April 2013*
*Accepted: 9 May 2013*



## معرفی فون و تنوع کنه‌های میان‌استیگمای کودزی (Acari: Mesostigmata) در شهرستان کرمان، جنوب شرق ایران

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## چکیده

بررسی فونستیک کنه‌های میان‌استیگمای کودزی در شهرستان کرمان، جنوب شرق ایران، در سال‌های ۱۳۹۱–۱۳۹۰ انجام شد. در این پژوهش ۳۶ گونه متعلق به ۲۳ جنس و ۱۴ خانواده جمع‌آوری و شناسایی شد که از بین آنها دو گونهٔ *Ameroseius pavidus* (C.L. Koch) (Ameroseiidae) و *Trachytes baloghi* Hirschmann & Zringiebl-Nicol (Trachytidae) برای فون کنه‌های ایران جدید هستند. همچنین شاخص تنوع شانون–وینر برای جمعیت کنه‌های جمع‌آوری شده از کودهای گاو، طیور و گوسفند در نه منطقهٔ مختلف شهرستان نیز محاسبه شد. جمعیت کنه‌ها در کودهای گاوی با ۳۱ گونه متنوع‌تر از کنه‌های موجود در کودهای طیور (۱۴ گونه) و گوسفندی (۱۳ گونه) بود. بیشترین (۰/۰۷±۲/۲) و کمترین (۰) میانگین‌های شاخص تنوع، به ترتیب برای مناطق سه‌کنج و لنگر محاسبه شد. براساس فراوانی نسبی، *Uroobovella marginata* (C.L. Koch)، *U. difoveolata* Hirschmann & Zirngiebl-Nicol و *Androlaelaps casalis* (Berlese) به ترتیب گونه‌های غالب در کودهای گاوی، گوسفندی و طیور بودند. از سوی دیگر *Macrocheles merdarius* (Berlese) و *Androlaelaps casalis* (Berlese) بیشترین پراکندگی را در بین گونه‌های جمع‌آوری شده داشتند.



**واژگان کلیدی:** کنه‌های کودزی، میان‌استیگمایان، *Ameroseius pavidus*, *Trachytes baloghi*، کرمان، ایران

تاریخ دریافت: ۱۳۹۱/۲/۶

تاریخ پذیرش: ۱۳۹۲/۲/۱۹