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MITES (ACARI, MESOSTIGMATA) IN THE NESTS OF FERAL PIGEONS (*COLUMBA LIVIA* F. *DOMESTICA*) IN SLOVAKIA

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Abstract: In 52 nests of *Columba livia* f. *domestica* we found 4,442 individuals of mesostigmatic mites belonging to 6 species. An eudominant species was blood-sucking species *Dermanyssus gallinae* with peak of abundance from April to July during the breeding period of their host. Nymphs had been occuring from March to July, what indicates a period of their reproduction. The occurence of *Dermanyssus gallinae* in nests was influenced by climatic factors and on the other hand by sufficiency of food in the breeding period of host.

Key words: Acari, Mesostigmata, nests, *Columba livia*, fauna, *Dermanyssus gallinae*.

INTRODUCTION

The mites in the nests of feral pigeons (*Columba livia* f. *domestica*) in Slovakia have been studied by several authors. In extensive material handled by Ambros et al. (1992) 12 nests of feral pigeons came up from Bratislava, Cyprich et al. (1992) studied the fauna of 107 nests from Bratislava and Skalica. Janiga (1997) presented the results of long-term monitoring for the roost mites in the colonies from Bratislava.

In Ukraine the mites in the nests of feral pigeons were studied by Piryanik & Akimov (1964) and Yavornitskii & Kharambura (1982), in Russia by Borisova (1977). The nest fauna is mentioned also in context of mass invasion of mites from feral pigeons‘ nests in people (Malinovskaya 1956, Semushkina 1960, Agafonova & Taturova 1961, Daniel & Černý 1971, Skierska 1968, Wegner 1973) or as a possible cause of erythemateous and sometimes pruritic skin reactions of humans (Beck & Pfister 2006, Rosen et al. 2002).

The aim of the present paper is to describe a species spectrum of mesostigmatic mites in the nests of *Columba livia* f. *domestica* in Slovakia.

MATERIAL AND METHODS

We have examined 52 nests of *Columba livia* f. *domestica*, all collected in 4 sites in Slovakia during the year 1997. The nests were collected in the following sites:

The Žiarska kotlina basin:

Lovča (48°34’ N, 18°49’ E, 242 m a.s.l.): Regular cleaned dovecot situated on the ceiling of old part of house (130 feral pigeons). The potteries were used for breeding, and there the nests were built. 8 nests collected;

Hliník nad Hronom (48°32’ N, 18°46’ E, 230 m a.s.l.): Regular cleaned dovecot situated on the roof of old part of shed (65 feral pigeons). For breeding were used potteries, too. 12 nests collected.

Lutila (48°36’ N, 18°50’ E, 300 m a.s.l.): Maintain dovecot situated on courtyard near by hen-house (45 feral pigeons). The dovecot was connected with a large cage. 4 nests collected.

The Podunajská rovina lowland:

Bratislava (49°09’ N, 17°09’ E, 130 m a.s.l.): Roofs on Šancová and Kutuzovova street. The roofs were abandoned, dry and dirty, everywhere were excrements, dust, feathers, skeletons and dead bodies of feral pigeons. 26 nests collected.

Generation nests of feral pigeons were heavy and they were clearly defined. New nests were different – the floor of ceilings was often covered by excrements of different thickness and a lot of nests dif-

fer from their surroundings only by presence of eggs or nestlings on negligible nest hole. The nestlings leaved the nests between 12th and 15th day about to 1 m distance, where they were fed. They came back to the nests during the night only (but it is not a rule).

Mites were extracted from the nests by the Tullgren's apparatus during 48 hours. The material was processed to yield microscopic preparations using chloralhydrate medium Liquid de Swan. In the evaluation of the material we used the terms according Margolis et al. (1982): abundance (mean number of mites per nest) and prevalence (the percentage of mite-positive nests and all nests).

RESULTS

There were 4,442 individuals of mesostigmatic mites (93.64% of all mites found in nests) in total of 6 species obtained from the material:

Ascidae

Blattisocius tarsalis (Berlese, 1918) 2 females, Bratislava, 21.7.1997.

Lasioseius penicilliger Berlese, 1916 1 female, Bratislava 12.3.1997.

Dermanyssidae

Dermanyssus gallinae (De Geer, 1778) 4,336 individuals (1,130 males / 2,135 females / 1,176 nymphs). Bratislava abundance 20.48, prevalence 51.85; Lovča abundance 22.11, prevalence 55.56; Lutila abundance 769.25, prevalence 100; Hliník nad Hronom abundance 50.58, prevalence 83.33. *Dermanyssus gallinae* created 99.86% of mesostigmatic mites in the nests with abundance 85.31 (the highest number in one nest was 1642 individuals). The occurrence of *Dermanyssus gallinae* fluctuated through the year, with peaks between April and July during the breeding period of their host. We observed the peak of abundance in June (Lovča, Lutila and Bratislava), only in locality Hliník nad Hronom in April. The highest abundance was noticed in Lutila, what is probably caused by localisation of dovecot on courtyard near by hen-house (opportunity of migration from hens). Deutonymphs appeared in nests only between March and July and their peak of abundance was reached in May (Fig. 1). In this period protonymphs appeared in the nests too, but their number was markedly low, what was probably due to their high sensibility to failure in Tullgren's apparatus and maybe by their lower mobility, too (Fujikawa 1970). During winter, we noticed only negligible number of mites in nests.

Macrochelidae

Neopodocinum mrciaki Sellnick, 1968 1 female, Lovča 29.9.1997.

Macronyssidae

Ornithonyssus pipistrelli (Oudemans, 1904) 1 female, Bratislava 21.7.1997.

Pachylaelapidae

Onchodellus bibulus Mašán, 2007 1 female, Lovča 22.3.1997 [material revised by Mašán (2007)].

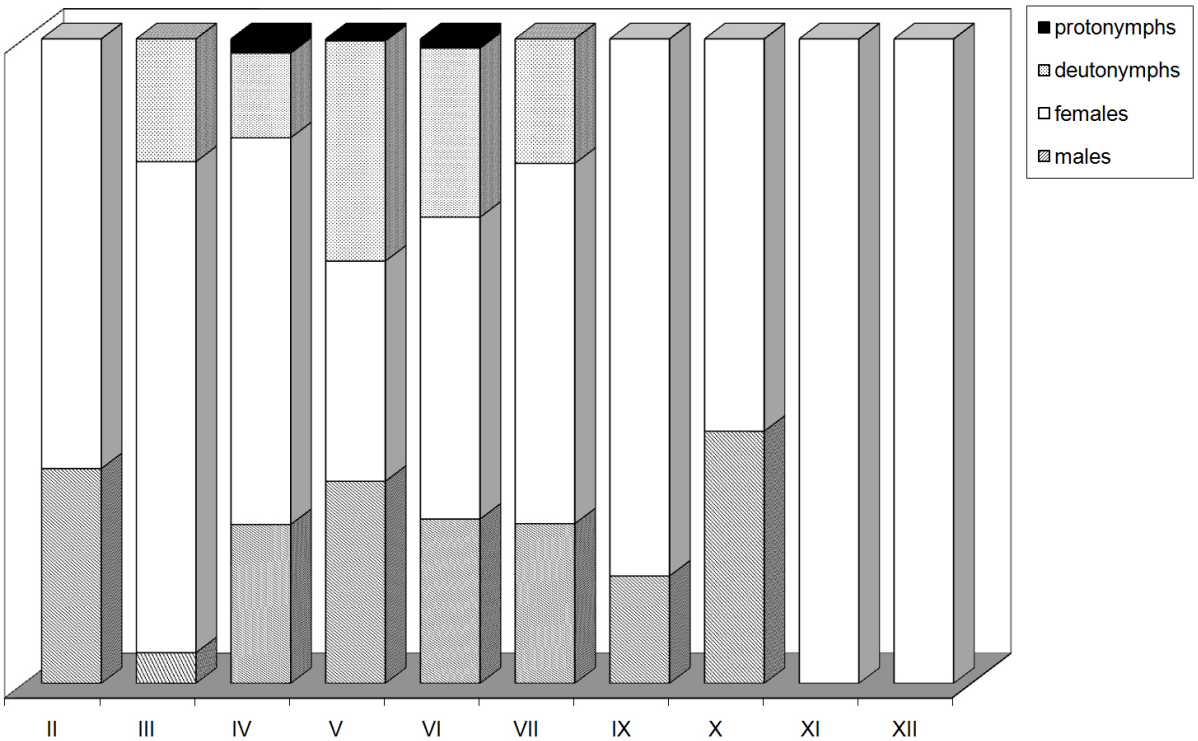

Fig. 1. The ratio between males, females and nymphs of *Dermanyssus gallinae* in examined nests during the year..

DISCUSSION

Except *Dermanyssus gallinae* (obligatory ectoparasite of birds) we found another 5 species of mesostigmatic mites in the nests: *Ornithonyssus pipistrelli* (obligatory ectoparasite of bats), *Onchodellus bibulus* (an euhygrophilous detriticole, in Slovakia distributed mainly in lowlands), *Lasioseius penicilliger* (nidicolous species), *Blattisocius tarsalis* (common species in seed stores, often found also in nests of birds), *Neopodocinum mrciaki* (edaphic species, in Slovakia also often found on small mammals). In the examined nests of *Columba livia* f. *domestica* was *D. gallinae* an eudominant species (99.86 %) with peak of abundance between April and July (during the breeding period of their host). The autumn peak of abundance (known from literature) was not observed.

The biology of ectoparasitic mite *Dermanyssus gallinae* was described in detail by Zemskaya (1951): the mites contact with host only in time of blood sucking, the rest of time they spend in the nests or in the gapes of hen houses or dovecots. They can survive 6–7 months without food and a long starvation leads to polyphagy. The activity of mites depends on temperature conditions of surroundings, an optimum temperature appears 20–25 °C. During winter period the mites clamber into the gapes of walls and they keep there in large groups. The duration of embryonal stage depends on temperature (an optimum temperature appears 23–24 °C, when the duration of development is 50–70 hours, at temperature under 10 °C the most of eggs die). Larva is able to move, it is negative phototaxic and it exists usually 24–30 hours. In this period the adaptation for parasitic way of life is missing. Protonymph is very active stage and it is the first blood sucking stage that is adapting to a long starvation. After sucking protonymph clambers into the gapes, where it occurs in the rest estate (at optimum temperature 24 °C it is 24 hours, at 17 °C it is 90 hours). At deutonymph digestion of blood fleet within 24–50 hours and usually weakly sucking nymph consumes blood faster (at optimum temperature 24 °C to 36 hours) and it turns into male. At stronger sucking nymph is the process of digestion longer (at optimum temperature 24 °C to 50 hours) and it turns into female. The male captures on female‘s deutonymph and it remains on it until the moment of metamorphosis into adult female. After female‘s metamorphosis the copulation follows. After blood sucking a female clambers into gapes, usually already during day and it starts to strike the eggs in 8–10 hours interval (in female's body one egg developed in one time only). The number of laying eggs fluctuates from 3 to 20 in relation of amount of sucking blood and of season. After each sucking the eggs are matured and stroked and during whole life is female able to realise several gonotrophic cycles. After laboratory observations of Tucci & Guimaraes (1998) oviposition begun at 45.2 hours after a blood meal and incubation time was 57.1 hours. Larvae stage took 26.1 hours, protonymphs molted to deutonymphs 29.2 hours after a blood meal, and deutonymphs molt to adult stage 31.9 hours after meal. A life cycle period adult-adult was 189.6 hours. The mites survived 68 days without blood meal. According Nordenfors et al. (1999) female mites laid eggs at temperatures between 5 and 45 °C with the highest numbers laid at 20 °C and 70 % humidity, but development to larvae and protonymphs was only observed at temperatures ranging from 20 to 25 °C. The average duration of oviposition varied from 1.0 to 3.2 days within the temperature range 20–45 °C. Specimens survived for up to 9 months without access to food. Temperatures up to the 45 °C and at -20 °C were found to be lethal. This study showed that *D. gallinae* can survive for a long time without feeding if the microclimate is suitable, but it does not thrive at low relative humidity and at temperature extremes.

Also Janiga (1997) has mentioned about short breeding cycle of *D. gallinae*, requiring only 7 days to change from eggs to adults. The dispersal ability of mites is great and they may be potentially dangerous for people. This fact can be illustrated by the cases of mass invasion of *D. gallinae* from feral pigeons‘ nests to humans from Russia (Malinovskaya 1956, Semushkina 1960, Agafonova & Taturova 1961), from September in Poland (Skierska 1968, Wegner 1973), and from July in the Czech Republic (Daniel & Černý 1971). Adult female of *D. gallinae* also can also transmit many pathogenic agents (Durden et al. 1993, Moro et al. 2005, 2009).

Mites feed mainly during night upon breeding adult birds and young chicks (Yavornitskii & Kharambura 1982). The cost of parasitism can either be paid by the offspring (reduced survival or growth of nestlings), the parents (reduced survival or future reproductive performance), or by increased levels of resource acquisition by parents (Möller 1994). According Janiga (1997) one of environmental factors exercising an influence on feral pigeons is the relative presence of mites. The potential for mites to weaken a squab is considerable and they may be extremely abundant in certain circumstances, causing anaemia. In feral pigeons, the mites did not appear to be direct causes of death of pigeon chicks. The nestlings infested by mites grow poorly as judged by growth allometry.

From the faunistical point of view, Ambros et al. (1992) investigated 12 nests of *Columba livia f. domestica* from Bratislava and they have found *Dermanyssus* sp. only (prevalence 17; abundance 1.7). Cyprich et al. (1992) have found in feral pigeons‘ nests only one mite species – *D. gallinae* (prevalence 51.42; abundance in Bratislava 4.96 and in Skalica 110.5). It is noteworthy that the mites occurred exclusively in April. The mites were missing in the nests situated at dry and dusty places and also in regular

cleaned dovecots. Hygiene had a large influence on the occurrence of *D. gallinae* (Maurer et al. 1993). Similar data are known from Ukraine (Yavornitskii & Kharambura 1982, Piryanik & Akimov 1964) and from Russia (Borisova 1977).

According to our observations the values of abundance fluctuated from 20.48 (Bratislava) to 769.25 (Lutila) and the values of prevalence fluctuated from 51.85 (Bratislava) to 100 (Lutila and Hliník nad Hronom), what are considerable higher values. According to Janiga (1997) three important peaks of pigeon breeding occur in Bratislava – two are usually before September, in spring and summer, when the majority of young fledges. In September at this time only a few pairs breed in Bratislava. The third and significant peak in the number of clutches is in October, and many chicks from these clutches die at the start of November. According to our results the mites were occurring in nests mainly in spring, and it seems that the presence of chicks in nest is not sole condition for mass occurrence of mites. The climatic factors are playing an important role too, how it was mentioned by Janiga (1997): despite the general trends of breeding activity in summer, the mites mainly occur in spring and autumn, and less in summer. The warm and wet spring and autumn weather probably causes that the mites are extremely abundant at that time, although we did not observe this autumn peak of abundance.

Bird ectoparasite *D. gallinae* rarely occurs also on small mammals [mainly *Rattus norvegicus* and *Mus musculus* in Slovakia (Mrciak 1963) and in Egypt (El Kady et al. 1995, Bakr et al. 1995)]. Probably phoresy on beetles seems to be one of the patterns of distribution *D. gallinae* [for example, there are known data from Slovakia on *Geotrupes stercorarius* (Mrciak 1963) and passalid beetles in Brasil (Flechtmann & Baggio 1993)].

SUMMARY

We have examined 52 nests of *Columba livia* f. *domestica*, all collected at 4 localities in Slovakia during the year 1997. From the material we obtained 4,442 individuals of mesostigmatic mites of 6 species. Species *Ornithonyssus pipistrelli*, *Onchodellus bibulus*, *Lasioseius penicilliger*, *Blattisocius tarsalis*, *Neopodocinum mrciaki* were in nests of *Columba livia* f. *domestica* recorded for the first time in Slovakia. An eudominant species was haematophagous mite species *Dermanyssus gallinae* with peak of abundance from April to July during the breeding period of their host. The autumn peak of abundance known from literature was not observed. Nymphs were occurred from March to July, what indicates a period of their reproduction.

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