UDC 619:616.98:576.89:636.52/.58(470.62)

DOI 10.29326/2304-196X-2019-1-28-39-42

ECTOPARASITE SPECIES COMPOSITION AND SEASONAL DYNAMICS IN DOMESTIC FOWL IN THE KRASNODAR KRAI

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SUMMARY

One of the topical veterinary problems is infestation of domesticated chickens with ectoparasites. Permanent and temporary ectoparasites are vectors and reservoirs of more than 100 poultry infectious disease agents; they cause outbreaks of contagious diseases, thus decreasing performance and increasing economic losses. The results of ectoparasite fauna study in domesticated chickens in private backyards of the Krasnodar Krai are given. The research was carried out in 2017–2018 in 600 chickens of different breeds and ages in four settlements: Gorkhutor (250 chickens), Industrialny (150), Yuzhny (100) and Svyazist (100). The results of the analysis demonstrated that chickens were infested with the following ectoparasite species: shaft louse *Menopon gallinae* with the highest invasion extensity of 100% and average invasion intensity of 18.6 parasites; poultry red mite *Dermanyssus gallinae* (55.7%) with average invasion intensity of 12.5 parasites; two species of scaly leg mites – *Knemidocoptes mutans* (17.7%) with average invasion intensity of 39.4 parasites; and *Knemidocoptes gallinae* (17.7%) with average invasion intensity of 35 parasites. Seasonal dynamics of fowl infestation with ectoparasites showed that shaft louse *Menopon gallinae* was found in spring, summer and autumn on all farms. Mites *Dermanyssus gallinae* were found more often in spring with maximum invasion extensity of 74.4%. The prevalence of scaly leg mites *Knemidocoptes mutans* and *Knemidocoptes gallinae* was as high as 76%. The results of the tests indicate that infestation of domesticated chickens with different species of ectoparasitres can be linked with bad hygiene practice and free access system, creating favourable and stable environment for them. That is why it is necessary to use scientifically justified control measures, involving modern insecticides and tools.

Key words: ectoparasites, biting lice, mites, chickens, seasonal dynamics.

INTRODUCTION

Poultry farming is an intensive and dynamic industry of agricultural sector supplying the population with high-energy products containing proteins, fats and carbohydrates [5]. Development of backyard poultry farming requires ensuring no less animal health welfare than large poultry-processing plants. One of the major animal health issues of today is high infestation of domesticated chickens with ectoparasites [12], among which – poultry red mite *Dermanyssus gallinae* (family *Dermanyssidae*) common in Russia and causing dermanyssiosis – an invasive disease of domesticated, synanthropic and wild birds. Birds are affected regardless of age and gender. The disease is characterized with an acute or chronic progress. *Dermanyssus gallinae* colonies are registered in premises where chickens are kept regardless of the mode of the industry production – industrial or small-scale. However, populations of the mite *Dermanyssus gallinae* are often found on holdings specializing in breeding chickens and other poultry species [2, 9].

Parasitizing of poultry red mite *Dermanyssus gallinae* on birds causes anxiety of birds and accompanying clinical signs: anaemia, feather loss, feather pecking, egg drop in commercial flocks – on average every thousand of laying hens undersupplied 36 thousand eggs a year [8]. The young stock is fairly severely affected with registered mortality cases among week-old chicks. In cases of low and medium invasion intensity with poultry mite the egg production drops by 40% and in case of mixed infestation with shaft louse – by 90% [17].

Shaft louse (*Mallophaga*) of family *Menoponidae* is one of the most common permanent bird parasites, the infestation with which incurs considerable economic losses of holdings of different forms of ownership [13, 15]. Being permanent external parasites, shaft louse harm their hosts during their movement and by eating epidermal particles and blood causing irritation and itching. Skin injuries constitute pathways for pathogenic microorganisms which results in decreased immunity [4].

Permanent and temporary parasites are vectors and reservoirs of more than 100 poultry infectious disease agents [7], such as spirochaetosis, mycoplasmosis, orni-

thosis, plague, salmonellosis, pasteurellosis, etc., causing outbreaks of the above-mentioned diseases and resulting in major economic losses [1].

Having regard to the above-mentioned, the aim of the work is to study the fauna of poultry ectoparasites on backyard poultry farms in Krasnodar Krai.

MATERIALS AND METHODS

The research was carried out on farm holdings in the vicinity of the city of Krasnodar from 2017 to 2018. In total, 600 domesticated chickens of different breeds and age were examined in four settlements: Gorkhutor – 250 chickens, Industrialny – 150, Yuzhny – 100 and Svyazist – 100.

Diseased and dead birds were delivered for testing to the laboratory of the Parasitology, Animal Health Inspection and Animal Hygiene Department (Kuban SAU). They were put in cuvettes and thoroughly inspected for ectoparasites starting from the head and going to the neck, back, wing feathers, abdomen, tail and legs. All insects were collected with forceps or a brush wetted in 70% alcohol from every infected part of the host's body. The ectoparasites collected were put in tubes and fixed in 70% alcohol. Temporary preparations were prepared for a detailed study of the ectoparasites. Parasites were transferred on the object glass in a glycerin drop and covered with a coverglass.

Swipes from deep layers of the leg skin on tarsometatarsus and fingers were taken with a scalpel from each diseased chicken. After temporary preparations were ready, the swipes were put on the object glass, then 40% solution of lactic acid was added, after 1–2 hours the materials were thoroughly splitted with a dissecting needle and mites were taken out.

The species of ectoparasites was determined with an ocular micrometer (7 × 10) using micrometry method [6]. The identification by D. I. Blagoveshchensky classification (1959, 1964) [3, 10] was carried out according to their morphological characteristics.

All experiments on birds were performed in accordance with the requirements of Directive 2010/63/EU of the European Parliament and of the Council of 22 September 2010 on the protection of animals used for scientific purposes.

RESULTS AND DISCUSSION

The following ectoparasites were found during the research: shaft louse of family *Menoponidae* of species *Menopon gallinae*; gamasid mites family *Dermanyssidae* of species *Dermanyssus gallinae*; scaly leg mites of family *Sarcoptidae* of two species – *Knemidocoptes mutans* and *Knemidocoptes gallinae*. Species of ectoparasites, invasion extensity (IE) and invasion intensity (II), index of abundance (IA) are presented in the table.

In the course of the research shaft louse *Menopon gallinae* were detected in all birds with IE – 100%, II_{min} – 5 specimens, II_{max} – 125 specimens, $II_{avg.}$ – 18.6 specimens and IA – 18.6 specimens, poultry mites *Dermanyssus gallinae* were found in 334 (55.7%) chickens with II_{min} – 2 specimens, II_{max} – 78 specimens, $II_{avg.}$ – 12.5 specimens and IA – 7 specimens. Infestation with scaly leg mites *Knemidocoptes mutans* was detected in 106 (17.7%) chickens *Knemidocoptes mutans* with II_{min} – 10 specimens, II_{max} – 150 specimens, $II_{avg.}$ – 39.4 specimens and IA – 7 specimens, *Knemidocoptes gallinae* was present in 106 (17.7%) chickens with II_{min} – 7 specimens, II_{max} – 119 specimens, $II_{avg.}$ – 35 specimens and IA – 6.2 specimens.

Study of seasonal dynamics of poultry infestation with ectoparasites in the vicinity of the city of Krasnodar was carried out in spring, summer and autumn. It was established that in all above-mentioned seasons and on all farms *Menopon gallinae* was detected in all poultry with IE – 100%.

Maximum IE (74.4%) of *Dermanyssus gallinae* on poultry farms of Gorkhutor settlement was registered in spring, minimal (46.8%) – in autumn and 69.9% – in summer. In Industrialny settlement maximum IE (63.3%) was registered in spring, minimum (53.3%) – in autumn, and in summer IE stood at 57.8%. In Yuzhny settlement IE of 42% and 36% was observed in spring and in summer respectively. In Svyazist settlement 38% of chicken in spring and 54% of chicken in summer were infested.

Infestation with mites *Knemidocoptes mutans* was registered only in settlements Yuzhny and Svyazist. In spring and summer 44% and 76% of chicken were infested in Yuzhny settlement respectively and in Svyazist settlement – 48% and 44% of poultry. In autumn *Knemidocoptes mutans* was not detected.

Knemidocoptiasis caused by mites *Knemidocoptes gallinae* was registered only in Yuzhny and Svyazist settlements. In Yuzhny settlement in spring 44% of chicken were infested, in summer – 76%; in Svyazist settlement – 48% in spring and 44% in summer. In autumn *Knemidocoptes gallinae* was not detected.

The research results demonstrate that infestation of domesticated chickens with various ectoparasite species can be linked to poor hygiene practice and free access system

Table
Species composition of ectoparasites and invasion parameters of poultry in 2017–2018
(*n* = 600)

Ectoparasite species	Infested		II_{min}–II_{max} ($II_{avg.}$), specimens	IA, specimens
	Number of specimens	IE, %		
Menopon gallinae	600	100	5–125 (18.6)	18.6
Dermanyssus gallinae	334	55.7	2–78 (12.5)	7
Knemidocoptes mutans	106	17.7	10–150 (39.4)	7
Knemidocoptes gallinae	106	17.7	7–119 (35)	6.2

which creates favourable and stable environment for ectoparasites [14, 16]. The most widespread species was shaft louse *Menopon gallinae* (100%) which was found throughout the body of a bird, mostly under wings, in breast and thigh area. A similar pattern was observed in Dagestan by V. Sh. Pashaev in 2009 where invasion extensity stood at 38 up to 100% [11].

Poultry red mite *Dermanyssus gallinae* was detected in chicken from almost all inspected poultry farms. Local skin inflammation with characteristic redness, papular rash and scratches were observed. Maximum infestation was registered in spring. Invasion extensity reached 74.4%. In natural habitats mites spend autumn-winter season in «chill coma». *Dermanyssus gallinae* are known to be thermophilic and hygrophilic. This explains the hyperactivity and rapid development of mites in spring and summer leading to massive infestation of poultry farms [2].

Knemidocoptes mutans and *Knemidocoptes gallinae* parasitized on feathered parts of legs and under chicken leg spurs, mite infestation of poultry attained 76%. Maximum infestation was observed during the warm season of the year. Chickens with knemidocoptiasis were inactive, weak, often tucked their legs, had no appetite, suffered from itching, often picked its feathering with the beck. Claws were deformed, thickened and covered with a grey and brown layer.

CONCLUSION

Experimental research established that chickens on small farms in the vicinity of Krasnodar were infested with different species of ectoparasites. Shaft louse *Menopon gallinae* (100%) was detected in all poultry in spring, summer and autumn, gamasid mite *Dermanyssus gallinae* showed high invasion extensity in spring (74.4%), infestation with mites *Knemidocoptes mutans* and *Knemidocoptes gallinae* attained 76% during warm parts of the year. Ectoparasites are known to have an adverse effect on the health condition of poultry and cause productivity drop. For that reason it is necessary to use scientifically justified measures involving modern insecticides and tools to deal with the problem.

Conflict of interest. The authors declare that there is no conflict of interest.

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Submitted on 12.01.19
Approved for publication on 16.01.19