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Ectoparasite species attacking chicken in eastern area of Bangkok, Thailand

Lakyat, A., Pumnuan, J.* and Thipmanee, K.

School of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand.

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Abstract Ectoparasites of chickens are important for poultry farming and other types of poultry rearing by ways of causing nuisance and being as transmitter of various diseases to poultry resulting in poor-quality and quantity products. From the directly survey result, it was found that *Megninia cubitalis* mostly attacked laying hens reared in a cage at neck, wing, chest, back and buttock with the average number of 52.1- 204.9 mites per chicken, and followed by injured on Rhode Island red with 85.0 mites, abundantly at buttock. And the louse, *Lipeurus caponis* was found in Polish chicken with 100.5 insects that mostly appeared at back of chicken, and followed by the appearance in Rhode Island red with 70.0 insects, abundantly at chest. This insect preferred to live at wing and chest. Whereas, result from suction method showed that *Megninia cubitalis* was also found in laying hen reared in a cage with the average number of 71.4-168.3 mites per chicken. It lives everywhere on the body as neck, head and buttock. Besides, *Cuclotogaster heterogoraphus* was observed on the body area equal to 43.8 insects, where the louse, *Menopon gallinae* was monitored in Polish chickens with totally, 22.5 insects, plenty at the buttock area.

Keywords: Ectoparasites, Chicken, Mites, Louse

Introduction

Thailand has situated in mainland Southeast Asia, the climate is subtropical with relatively high temperatures (24–36 ℃) and high humidity (66–83 %) and nearly 18.2 million households, mostly smallholders, are in rural areas. Most of them traditionally possess indigenous chickens (Choprakarn, 2007, United Nations, 2021). In 2020, Bangkok had 126,988 chickens based on total chicken data in Thailand, albeit a few numbers compared to the total number of chickens in the country. Most of the chickens raised in Bangkok were beautiful chickens, in which kept them for competitions or kept them as pets rather than industrial farming (Department of Livestock Development, 2020). A household kept one cock with three to five hens to form a throng,

* **Corresponding Author:** Pumnuan, J.; **Email:** jarongsak.pu@kmitl.ac.th

annually. This helps to maintain picking with the beak order and relieves fighting in the throng. In a year, such throngs can produce up to 90–150-day-old chicks, equivalent to 30–75 merchantable birds of 1.0-1.5 kg body weight at four to five months of age (Choprakarn, 1983; Choprakarn *et al.,* 1998; Laopaiboon and Jitpraneechai, 1999; Namdaeng, 1991). The number of chickens per household varies extremely relating to the time of the year and the ability of the farmers. From October to February (cold and dried), the number of day-old chicks running around is at its largest, and the chicks' growth rate is also uplifting. This is because of the upper hatching estimate, and the availability of plenty of natural feeds and plant by-products. However, the numbers tend to decrease from March to September (sizzling and moist) due to a down hatching rate, a famine of natural feeds, local diseases, and endo and ectoparasites (Choprakarn *et al.,* 1998; Klinhom *et al.,* 2005; Laopaiboon and Jitpraneechai, 1999).

Ectoparasites, even with their harmful effects, are often disregarded. Some of the ectoparasites ordinary in poultry are ticks, fleas, louse and mites (Amede *et al.,* 2011; Ikpeze *et al.,* 2008). The occurrence of decease and morbidity due to various ectoparasitic ailments in chicken demands serious attempts to keep down the ailments. However, notwithstanding their ravaging impacts, ectoparasites receive hardly more attention than endoparasites and infectious diseases in almost all the production systems. Even though, it has been attempted by few researchers (Belihu *et al.,* 2010; Mekuria and Gezahegn, 2010; Amede *et al.,* 2011; Tolossa and Tafesse, 2013; Dabasa *et al.,* 2017a, b). Ectoparasites may raise a clinical issue for humans, transmit several infectious ailments, and act as a transit/intermediate host for a range of helminthic parasites. Native fowl parasitic contagions, which can cause health and economic problems in poultry production, are considered a source of infection in industrial poultry, wild birds, and humans. Currently, there is a poorness of information considering the prevalence of ectoparasites in local chickens (Ebrahimi *et al.,* 2016). Many ectoparasites are known to suck blood thereby causing irritation and morbidity. They also contest for feed, serve as means of poultry ailments and germs, that can straight influence bird hygiene. Ectoparasites influence the productivity potential of indigenous chickens and helmeted guinea fowls thus ought to be given more heedfulness. Albeit helmeted guinea fowls are known to be more ailment resistant to ailments than chicken, ectoparasite infestation is still a significant concern (Bhat *et al.,* 2014; Okaeme, 1988). The fowl tick (*Argas persicus*) is known to affect pigeons, turkeys, geese, ducks and chickens in sub-tropical and tropical countries. the stick-tight flea (*Echidnophaga gallinacean*) is the only flea commonly affecting chicken (Mungube *et al.,* 2008). The louse species affecting chicken are yellow

body louse (*Menacanthus stramineus*), shaft louse (*Menopon gallinae*), chicken head louse (*Cuclotogaster heterographus*), wing louse (*Lipeurus caponis*), large chicken louse (*Goniodes gigas*) and fluff louse (*Goniocoites gallinae*). Mites are among the most ordinary of all the ectoparasites watched in poultry. Some of the species found on the skin of most poultry birds consist of common red mite (*Dermanyssus gallinae*), northern fowl mite (*Ornithonyssus sylviarum*) and tropical fowl mite (*Ornithonyssus bursa*). Mites of the family Dermanyssidae are the most economically important of the numerous ectoparasites of poultry. Severe infestations of mites in chicken consequences abated reproductive potential in males and egg production in females. (Salam *et al.,* 2009; Ikpeze *et al.,* 2008). From the foregoing, therefore, the infestation of ectoparasites attacking beautiful chickens in the eastern area of Bangkok was studied. This study was designed to examine the prevalence of ectoparasites in chickens that invaded each beautiful chicken species by surveying different parts of the chicken both on the skin and feathers as well as to identify the specific habitats of each species of ectoparasites.

Materials and methods

Survey area

The process of surveying ectoparasites of beautiful chicken reared in various farms in the east of Bangkok area, including Minburi, Nong Chok and Lat Krabang districts from November 2020 to May 2021. Survey methods were adapted from Al-Saffar and Al-Mawla, (2008) by collecting samples from various beautiful chickens raised on breeding (Table 1).

Table 1. Name of farm, chicken variety chicken number of surveying

Name of Farm[1/]	Chicken variety[2/]										
	LH	**HR**	**SK**	**JB**	**PO**	**RI**	**BR**	**PB**	**SB**	**SE**	**Total**
KMITL.	10	10	6	-	-	-	-	-	-	-	**26**
Bang-Zeek	-	-	2	2	2	2	2	-	-	-	**10**
Pongsak	-	-	1	-	-	-	-	2	2	2	**7**
Bang-Keang	-	-	-	5	-	-	-	-	-	-	**5**
Total	**10**	**10**	**9**	**7**	**2**	**2**	**2**	**2**	**2**	**2**	**48**

[1/]Farms in the eastern area of Bangkok [2/] LH= Laying hens in a cage, HR= Hens reared in free cage, SK= Silkie, JB= Japan bantam, PO= Polish, RI= Rhode Island red, BR= Brahma, PB= Phu Phan black bone, SB= Serama bantam, SE= Sebright

Survey on the chicken feather

The ectoparasites were taken randomly from 5 points of each chicken body as neck, wing, breast, back and buttocks. Amount of 20 feathers were

randomly collected from the object areas with about 5 cm^2 as follows: hackles are the feathers around the neck along the front of the neck and surrounding necklaces, wings are the area of soft and hard feathers both on the outside and inside of the chicken, the breast is the area where the feather in the front of the breast is located, the back is the part between the cape and saddle and the buttocks are the soft hairs around the anus (cloaca).

Suction on the skin by using aspirator

The suction was made randomly from each chicken at head, neck, body and buttocks, by using a vacuum aspirator connected to a test tube sizing 20*150 mm. As specified areas, 5 minutes suction was performed in 5 cm^2. Where, the head is the cockscomb area down to the eyes and neck below. The neck is the area from the hackle to the front neck plumage or around the necklaces. The body is part of the breast to the insides of the point where there are soft feathers. Buttocks are the same area as mentioned above.

Sample retention and classification

Totally, 48 beautiful chickens were randomly selected to collect the ectoparasites according to the regularities by experimental samples that specimen preparation of ectoparasite should not exceed 72 hours after sample collection (Paliy *et al.*, 2018) and the samples must be cleaned of dirt debris skin of the body with a paintbrush. The louse and mite got the same method of preserving specimens. Innitially, the sample was placed in a 20*150 mm test tube with approximately 2 ml of 70% ethanol to kill the ectoparasite and wrapped by the parafilm tightly to prevent alcohol evaporation and then, labeling was made. The specimen preparation was made by positioning those ectoparasites on slides, dropped previously with Hoyer's medium. In the case of louse, maybe pierced on the abdomen with a small needle to allow Hoyer's medium to infiltrate. This makes the body of the louse with more transparent. If louse stomach was full of blood, it could be pierced and cleaned with a solution of potassium hydroxide at a concentration of 10%. This method would be appropriate for large body mite as well. After that sample was rinsed with distilled water to remove potassium hydroxide (Krantz, 1970). The position of the ectoparasite placed on the slide was arranged by using a sterile needle and put with a coverslip, and information labeling should be placed. The sample slides were classified under a stereomicroscope according to their morphological characteristics after entomological keys as described such as

Furman and Catts, 1970; Soulsby, 1982; Lapage, 1968; Baker and Wharton, 1964.

Data and statistical analysis

All collected data were entered into Microsoft Excel 365 program. Analyzed Pearson's chi-square(X^2) logistic regression was applied to assess the association of different variables and statistical analysis, a confidence level of 95% and P-values less than 5% were judged as significant by using SPSS statistics V.20 package. The prevalence was calculated as a percent of infected animals from the total number of animals examined.

Results

The obtained result informed that 8 species of ectoparasites were found attacking beautiful chicken namely, *Megninia cubitalis, Megninia ortari, Pterolichus obtusus*, *Cuclotogaster heterographus*, *Menopon gallinae, Lipeurus caponis, Goniocotes gallinae* and *Menacanthus stramineus*. The most prevalent ectoparasite found in feather of laying hens in a cage was *Megninia cubitalis*, with the average amount 103.88 mites, in which found on the neck, wing, chest, back and buttocks, with 52.1, 5.7, 119.8, 136.9 and 204.9 mites, respectively, followed by the attacking on Rhode Island red chicken, where on feather presented an average number of 32.40 mites per chicken, with the greatest number found on the buttocks with the average of 85.00 mites. *Pterolichus obtusus* was also found in only two types of chickens, Japan bantam and Polish, with an average of 0.12 and 7.80 mites, respectively. Remarkably *Megninia ortari*, found only in silkie chickens which was observed in the neck, wings and buttocks, with an average of 0.8, 0.7 and 0.3 mites, respectively. The louse *Lipeurus caponis* was the most common parasite found in back Polish chickens, with an average of 100.5 insects and 35.90 insects per chicken, followed by appeared in Rhode Island red chickens on the chest and wings, with 70.0 and 50.5 insects, respectively with an average of 28.90 insects per chicken. The other louse, *Menopon gallinae*, most commonly found in hens reared in free cage, and normally occured in the buttocks for 21.1 insects, with an average number of 21.1 insects per chicken, followed by *Cuclotogaster heterographus* found in laying hens in a cage, with an average of 4.36 insects per chicken. For *Menacanthus stramineus* was most common in Japan bantam chickens with a total average of 0.52 insects. Whereas, *Goniocotes gallinae*, found in Silkie chickens had an average of only 0.52 insects (Table 2).

Table 2. The ectoparasite species found on feather at in different parts of various chicken in eastern area of Bangkok

Ectoparasite	Part of chicken	Mean of ectoparasite[1/]									
		Chicken variety[2/]									
		LH	HR	SK	JB	PO	RI	BR	PB	SB	SE
Mite											
Megninia cubitalis	Neck	52.1	-	1.7	11.2	12.0	5.0	17.5	-	5.0	-
	Wings	5.7	-	0.9	8.8	5.0	19.5	-	-	-	4.0
	Chest	119.8	-	1.7	13.8	3.5	36.0	28.0	3.0	4.5	1.5
	Back	136.9	-	1.8	16.9	0.5	16.5	15.5	-	3.0	-
	Buttocks	204.9	1.8	2.6	2.5	24.0	85.0	25.0	-	19.0	-
Mean per chicken		**103.88**	**0.36**	**1.74**	**10.64**	**9.00**	**32.40**	**17.20**	**0.60**	**6.30**	**1.10**
Megninia ortari	Neck	-	-	0.8	-	-	-	-	-	-	-
	Wings	-	-	0.7	-	-	-	-	-	-	-
	Chest	-	-	-	-	-	-	-	-	-	-
	Back	-	-	-	-	-	-	-	-	-	-
	Buttocks	-	-	0.3	-	-	-	-	-	-	-
Mean per chicken		**-**	**-**	**0.36**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Pterolichus obtusus	Neck	-	-	-	-	17.0	-	-	-	-	-
	Wings	-	-	-	-	22.0	-	-	-	-	-
	Chest	-	-	-	-	-	-	-	-	-	-
	Back	-	-	-	0.3	-	-	-	-	-	-
	Buttocks	-	-	-	0.3	-	-	-	-	-	-
Mean per chicken		**-**	**-**	**-**	**0.12**	**7.80**	**-**	**-**	**-**	**-**	**-**
Louse											
Cuclotogaster heterographus	Neck	3.3	-	-	4.3	-	2.0	-	-	-	-
	Wings	3.5	-	-	-	-	-	-	-	-	-
	Chest	4.7	-	-	-	-	-	-	-	-	-
	Back	7.7	-	-	-	-	-	-	-	-	-
	Buttocks	2.6	-	-	-	-	-	-	-	-	-
Mean per chicken		**4.36**	**-**	**-**	**0.86**	**-**	**0.40**	**-**	**-**	**-**	**-**
Menopon gallinae	Neck	-	1.7	0.8	1.7	2.0	-	-	-	-	-
	Wings	-	10.6	1.1	4.7	1.0	2.0	-	-	-	-
	Chest	-	2.5	0.7	1.6	3.0	5.0	1.5	-	-	-
	Back	-	2.0	0.4	0.6	5.5	-	2.0	-	-	-
	Buttocks	-	21.1	1.0	1.6	-	-	-	-	5.0	-
Mean per chicken		**-**	**7.58**	**0.80**	**2.04**	**2.30**	**1.40**	**0.80**	**-**	**1.00**	**-**
Lipeurus caponis	Neck	-	-	9.8	24.0	3.5	6.0	1.5	-	7.5	-
	Wings	-	-	2.8	18.0	6.0	50.5	-	-	1.5	-
	Chest	-	-	0.1	2.6	12.5	70.0	0.5	-	2.5	-
	Back	-	-	0.6	21.1	100.5	12.0	1.5	-	-	-
	Buttocks	-	-	1.3	5.1	57.0	6.0	1.0	-	1.0	-
Mean per chicken		**-**	**-**	**2.92**	**14.16**	**35.90**	**28.90**	**0.90**	**-**	**2.50**	**-**
Goniocotes gallinae	Neck	-	-	2.4	1.6	-	-	-	-	-	-
	Wings	-	-	-	0.9	-	-	-	-	-	-
	Chest	-	-	0.1	-	-	-	-	-	-	-
	Back	-	-	0.1	-	-	-	-	-	-	-
	Buttocks	-	-	-	-	-	-	-	-	-	-
Mean per chicken		**-**	**-**	**0.52**	**0.50**	**-**	**-**	**-**	**-**	**-**	**-**
Menacanthus stramineus	Neck	-	-	-	-	1.0	-	-	-	-	-
	Wings	-	-	-	0.6	-	-	-	-	-	-
	Chest	-	-	-	0.7	-	-	-	-	-	-
	Back	-	-	-	1.1	-	-	-	-	-	-
	Buttocks	-	-	-	1.0	-	-	-	-	-	-
Mean per chicken		**-**	**-**	**-**	**0.68**	**0.20**	**-**	**-**	**-**	**-**	**-**

[1/] Means of ectoparasite found on 10 feathers per part of chicken. [2/] LH= Laying hens in a cage, HR= Hens reared in free cage, SK= Silkie, JB= Japan bantam, PO= Polish, RI= Rhode Island red, BR= Brahma, PB= Phu Phan black bone, SB= Serama bantam, SE= Sebright, - Not found

Table 3. The ectoparasite species found on different skin parts of various chicken varieties in eastern area of Bangkok

Ectoparasite	Part of chicken	Mean of ectoparasite[1/]									
		Chicken variety[2/]									
		LH	HR	SK	JB	PO	RI	BR	PB	SB	SE
Mite											
Megninia cubitalis	Head	71.4	-	6.6	17.0	1.5	13.5	-	6.0	-	22.5
	Neck	99.4	-	4.6	5.7	0.5	8.5	18.5	4.0	-	1.5
	Body	163.6	-	22.5	7.0	0.5	18.5	18.0	1.5	10.0	17.0
	Buttocks	168.3	-	12.6	17.3	4.5	42.6	30.5	-	2.0	0.5
Mean per chicken		**125.68**	**-**	**11.58**	**11.75**	**1.75**	**20.78**	**16.75**	**2.88**	**3.00**	**10.38**
Megninia ortari	Head	-	-	0.4	-	-	-	-	-	-	-
	Neck	-	-	0.3	-	-	-	-	-	3.5	-
	Body	-	-	-	-	-	-	-	-	-	-
	Buttocks	-	-	8.9	-	-	-	-	-	-	-
Mean per chicken		**-**	**-**	**2.40**	**-**	**-**	**-**	**-**	**-**	**0.88**	**-**
Pterolichus obtusus	Head	-	-	-	-	1.5	-	-	-	-	-
	Neck	-	-	-	-	-	-	-	-	-	-
	Body	-	-	-	-	2.5	-	-	-	-	-
	Buttocks	-	-	-	-	-	-	-	-	-	-
Mean per chicken		**-**	**-**	**-**	**-**	**1.00**	**-**	**-**	**-**	**-**	**-**
Louse											
Cuclotogaster heterographus	Head	-	-	-	-	-	-	-	-	-	-
	Neck	8.2	-	0.6	-	-	-	-	-	-	-
	Body	43.8	-	-	-	-	-	-	-	-	-
	Buttocks	4.0	-	-	-	-	-	-	-	-	-
Mean per chicken		**14.0**	**-**	**0.15**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Menopon gallinae	Head	-	0.7	-	0.3	1.5	-	-	-	-	-
	Neck	-	22.0	8.2	0.9	-	1.5	1.0	-	-	-
	Body	-	9.6	1.8	-	11.0	2.5	1.5	-	-	0.5
	Buttock	-	2.8	1.8	1.3	22.5	-	-	-	23.0	-
Mean per chicken		**-**	**8.78**	**2.95**	**0.63**	**8.75**	**1.00**	**0.63**	**-**	**5.75**	**0.13**
Lipeurus caponis	Head	-	-	-	0.9	1.0	1.0	1.5	-	-	-
	Neck	-	-	-	5.6	-	-	-	-	-	-
	Body	-	-	-	2.9	-	-	-	-	-	-
	Buttock	-	-	0.1	-	-	0.5	2	-	-	-
Mean per chicken		**-**	**-**	**0.03**	**2.35**	**0.25**	**0.38**	**0.88**	**-**	**-**	**-**
Goniocotes gallinae	Head	-	-	-	-	-	-	-	-	-	-
	Neck	-	-	-	-	-	-	-	-	-	-
	Body	-	-	-	-	-	-	-	-	-	-
	Buttock	-	-	0.2	-	-	-	-	-	-	-
Mean per chicken		**-**	**-**	**0.05**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Menacanthus stramineus	Head	-	-	-	0.3	-	-	-	-	-	-
	Neck	-	-	-	-	-	-	-	-	-	-
	Body	-	-	-	0.4	-	-	-	-	-	-
	Buttock	-	-	-	8.0	3.0	-	-	-	-	-
Mean per chicken		**-**	**-**	**-**	**2.18**	**0.75**	**-**	**-**	**-**	**-**	**-**

[1/] Means of ectoparasite found on 5 cm^2 per part of chicken. [2/] LH= Laying hens in a cage, HR= Hens reared in free cage, SK= Silkie, JB= Japan bantam, PO= Polish, RI= Rhode Island red, BR= Brahma, PB= Phu Phan black bone, SB= Serama bantam, SE= Sebright, - Not found

The study of ectoparasites found on different parts of chicken skin, indicated that the most common mite was *Megninia cubitalis*, abundantly attacking laying hens in a cage which could be found in all parts of the chicken. The most prefered area was the buttock with an average of 168.3 mites followed by attacking the body, neck and head, with an average of 163.6, 99.4

and 71.4 mites, respectively. This mite species appeared in all chickens except for hens reared in free cage. *Megninia ortari* was predominantly found in Silkie chickens with an average of 2.40 mites per chicken, followed by happening on Serama bantam chicken with an average of 0.88 mites per chicken. *Pterolichus obtusus* mite was found in only one type of chicken, Polish chicken with an average of 1.0 mites per chicken. In case of louse ectoparasites, *Cuclotogaster heterographus*, most commonly found on laying hens in a cage on the body, neck and the buttock, with averages of 43.8, 8.2 and 4.0 insects, respectively (but not found on the head) with an average of 14.0 insects per chicken. Few was found in Silkie chickens at the average of 0.15 insects per chicken. *Menopon gallinae*, found mainly in hen reared in free cage with an average of 8.87 insects per chicken. It was found in almost chicken species except for laying hen in a cage and Phu Phan black bone. As for lice, *Lipeurus caponis*, lived in Japan bantam chickens with an average of 2.35 insects per chicken and was also living with 4 chicken varieties as Brahma, Rhode Island red, Polish and Silkie, with averages of 0.880.38, 0.25 and 0.03 insects per chicken, respectively. *Menacanthus stramineus*, lice were found only two varieties of chicken, Japan bantam and Polish, with an average of 2.18 and 0.75 insects per chicken, respectively. Finally, *Goniocotes gallinae*, this louse species could be detected in a silkie chicken with a total average of 0.05 insects per chicken (Table 3).

The prevalent factors analysis of ectoparasites between the feather and skin areas of the chickens indicated that the prevalence of *Megninia cubitalis* found on the feather and skin had an abundance of 77.08 and 66.66%, respectively (X^2 = 0.2110; P = 0.6460). When, *Megninia ortari* was observed on the feather and skin area with 14.58 and 10.41%, respectively (X^2 = 0.2964; P = 0.5861). *Pterolichus obtusus*, mite was presented on feather and skin with prevalence of 6.25 and 2.08%, respectively (X^2 = 0.9604; P = 0.3271). Whereas, the prevalence of the three mites species were non-significant differences at a confidence level of 0.05. As for the lice, it was found that the *Cuclotogaster heterographus*, was abundant on both feather and skin at 29.16 and 25.00%, respectively (X^2 = 0.1211; P = 0.7278). For *Menopon gallinae*, the prevalences were 60.41 and 64.58%, respectively (X^2 = 0.0410; P = 0.8394). The prevalences of *Goniocotes gallinae* louse were 12.50 and 2.08%, respectively (X^2 = 3.3366; P = 0.6775), as well as *Menacanthus stramineus*, the prevalences were 8.33 and 8.33%, respectively (X^2 = 0; P = 1.0000). All the above lice were found with non-significant at a confidence level of 0.05. In the end, *Lipeurus caponis*, the prevalences were 47.91 and 16.66 %, respectively (X^2 = 5.5640; P = 0.0183), it was the only ectoparasite with a statistically significant difference at 0.05 (Table 4).

Table 4. Distribution of various ectoparasite found on feather and skin of different of chickens in eastern area of Bangkok

Ectoparasite		Part of chicken	Number examined	Number positive	Prevalence (%)	χ^2	P value*
Mite	***Megninia cubitalis***	**Feather**	48	37	77.08	0.2110	0.6460^{ns}
		Skin	48	32	66.66		
	Megninia ortari	**Feather**	48	7	14.58	0.2964	0.5861^{ns}
		Skin	48	5	10.41		
	Pterolichus obtusus	**Feather**	48	3	6.25	0.9604	0.3271^{ns}
		Skin	48	1	2.08		
Louse	***Cuclotogaster heterographus***	**Feather**	48	14	29.16	0.1211	0.7278^{ns}
		Skin	48	12	25.00		
	Menopon gallinae	**Feather**	48	29	60.41	0.0410	0.8394^{ns}
		Skin	48	31	64.58		
	Lipeurus caponis	**Feather**	48	23	47.91	5.5640	0.0183^{*}
		Skin	48	8	16.66		
	Goniocotes gallinae	**Feather**	48	6	12.50	3.3366	0.6775^{ns}
		Skin	48	1	2.08		
	Menacanthus stramineus	**Feather**	48	4	8.33	0	1.0000^{ns}
		Skin	48	4	8.33		

*The P values were calculated by Chi-square (X^2) test. ns= non-significant (typically ≤ 0.05), *= A p-value less than 0.05 is statistically significant difference.

Discussion

The obtianed results regarding the infestation of ectoparasites of beautiful chickens in the eastern Bangkok area informed that *Megninia cubitalis* was the most common mite found in both the feather and skin areas with the prevalent rate of 77.08 and 66.66%, respectively, and were found abundantly all types of chickens. An outbreak of *M. cubitalis* was reported in laying flocks from the State of Minas Gerais, Brazil (Rezende *et al.,* 2015), where it has a climate similar to that of tropical Thailand. Consistent with Sangvaranond (2003) who reported that *M. cubitalis* was found in domesticated chickens in central Thailand. They lived on the body and wings of chickens. Its outbreak in chickens was also raised in private farms in Chachoengsao province and it appeared in many provinces of Thailand. If it infested in large numbers, may cause the host with pyodermatitis, and finally resulting in the death of chicken (Sangvaranond, 2009). Another mite species was *Megninia ortari* that could be found in some species of chicken, such as in silky chickens on the neck, wings and buttocks, and in Sebright chickens on the neck with the prevalent rates of 35.41 and 25.00%, respectively. In the laying hen industry, mite of the genus *Megninia* was very importance, by causing the birds cannot produce eggs or getting less productivity. The saliva of the mite causes itching and can cause pyodermatitis. Futhermore it can also damage other species of poultry such as parrots, turkeys and pigeons (Guimarães *et al.,* 2001; Tucci *et al.,* 2005;

Rezende *et al.,* 2013). The outbreak of *Megninia spp.* may vary according to climatic and geographical conditions, such as varying from 2.6% in Israel to 89.6% in Cuba. In Brazil, an occurrence of 18.09% of the Megninia genus was observed in chicken houses of poultry farms posture in the state of Minas Gerais (Mumcuoglu and Lutsky, 1990; Hernández *et al.,* 2006; Rezende *et al.,* 2015). Additionally, the infestation of *Pterolichus obtusus* was found in some chicken species surveyed, Silky and Polish chickens, on feather and skin with 6.25 and 2.08%, respectively. A study by Sangvaranond (1993) found that the *Pterolichus obtusus* mite was the most abundant naturally occurring mite in native chickens, accounting for up to 70% of the population. The ectoparasites play an important role in bird life. Feather mites are ectoparasites that specialize in living on plumage and skin, which adapted to inhabit the microhabitats on the bird's body (Dabert and Mironov, 1999). Feather mites *P. obtusus* were found in 2 dead black grouse feathers from the monitored area with 40 mites in 20 g of feathers and 13 mites in 1 g of feathers, respectively. This was in the plumage and rarely caused problems, unless it was presented in large numbers (Jankovska *et al.*, 2012).

The louse, *Menopon gallinae*, can be found commonly in domesticated chickens. In the study, its prevalent rates observed in the feather and skin areas were as high as 60.41 and 64.58%, respectively. This was consistent with report of Sangvaranond (2009), who stressed that amblycerans as louse bites were important ectoparasites of domestic and native chickens found in many provinces of Thailand. This insect species is the most important and widely distributed species, the prevalences of this louse were reported from many areas as its occurring 35.9% in Bulgaria, 34.4% in Kashmir valley and 33.3% in Malawi (Banda, 2011; Prelezov *et al.,* 2006; Salam *et al.,* 2009). *Lipeurus caponis* is an ectoparasite species that can be found also on feather, with a prevalence of 47.91%, but with few prevalence of 16.66% on the skin, with a statistically significant difference. It could be said that *L. caponis* lives mainly on the hairs and therefore are rarely found on the skin. Likewise, Pumnuan *et al.* (2020) mentioned that many chicken lice (*L. caponis*) were found from native chickens at Learning Center and Management System Integrated with Urban Livestock Farm Learning, School of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand. Moreover, Sangvaranond (2003) reported that *L. caponis* was found inferior to Menopon gallinae. Both ectoparasite species are common in domesticated and native chickens in Thailand.Similar results were reported by Rahman and Haziqah (2015) who mentioned that in Penang Island, Malaysia, number of *M. gallinae* was found more than that of *L. caponis*, with the prevalent values of 76.7 and 63.3%, respectively. These 2 species were very important in the infestation of

chickens. In additional outbreaks were also observed in other countries such as Libya (14.29%), USA (20%), Algeria (41.6%), Bangladesh (48%) and Ethiopia (18.75%) (Mansur *et al.,* 2019). The next louse species was *Cuclotogaster heterographus* with its prevalent values on feather and skin were 29.16 and 25.00%, respectively, which coincided with the survey of Shanta *et al.* (2006) and Belihu *et al.* (2009), also reported prevalence of 25 and 25%, respectively, with predominantly found in the head and neck of chickens. Most of the chickens surveyed indicated that at least one species of lice, such as *M. gallinae, M. pallidulus, L. caponis, G. gallinae* and *G. dissimilis* was dicovered. These lice tend to live in the fluff of the body's feathers, especially the neck, back, abdomen and wings (Rahman and Haziqah, 2015). In Libya, there was an outbreak of chicken lice parasites. When the abundance of louse in the environment was happened for more than 70% composed of *M. gallinae, M. stramines* and *L. caponis*. There were occasionally outbreaks in other countries such as Algeria, USA and Bangladesh (Mansur *et al.*, 2019). Subsequently, *Goniocotes gallinae*, this louse was observed on feather and skin with 12.50 and 2.08% prevalence, respectively, similar to that reported by Shanta *et al.* (2006) with the prevalence on feather at 14%. This louse spcies distributed widly in many provices of Thailand such as Roi-Et, Surin and Buriram. It lives in the thighs of the chicken feathers (Nopwinyoowong and Sukolapong, 1994). Finally, louse species was *Menacanthus stramineus*, found in some species of chickens surveyed, with the same prevalence on feather and skin of 8.33% also, predominantly on the buttocks. This was in accordance with Jassim and Hadi, (2019) who reported that louse species often lives on the fluff around the tail, chest and thighs. Likewise, Dik and Halajian. (2013) showed of this species could be found on the skin, ventral feathers of the wings, chest and abdomen. The prevalence surveyed in Iran was 22.7%. Sangvaranond (2009) also reported this louse species found in Thailand with a 3.80% rate of lice in native chickens. From this study, it could be concluded those the prevalent rates of ectoparasites in beautiful chickens was vary depending on region with different climate conditions.

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