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Seasonal variations in the prevalence and intensities of infestation of phthirapteran ectoparasites of domestic fowl

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ABSTRACT: In the present paper an attempt has been made to observe the impact of four ecofactors (RH, Temperature, Heat index and Photoperiod) on the prevalence and infestation intensity of five phthirapteran species infesting domestic fowl (*Lipeurus caponis, Lipeurus tropicalis, Menopon gallinae, Goniocotis gallinae, Goniodes dissimilis*). By and large the ecofactor taken into consideration did not have significant impact on the prevalence. However the RH and photoperiod appeared to have influence on intensities of *L. caponis* and *L. tropicalis* which prefer wing feathers. On the other hand temperature and heat index seem to have influence on intensities of *G. gallinae*, *G. dissimilis* and *M. gallinae* which generally prefer body feathers of host bird.

Key words: Phthiraptera, Ischnoceran, Amblyceran, Infestation intensity, Prevalence.

INTRODUCTION

In spite of the fact that pthirapteran ectoparasites live in a microclimate of considerable constancy (made up of feathers / hair), they are not able to escape from the climax of seasonal changes, selected workers have noted the seasonal variations in the populations of phthiraptera infesting few host birds Foster (1969), Agarwal and Saxena (1979), Chandra *et al*., 1990, Clark *et al*., 1994, Srivastava *et al*., 2003). Workers like Marshall (1981) and Price and Graham (1997) have made attempts to review the work done on this aspect. In the present study an attempt has been made in the different months of the year to record the variations in

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the mean monthly prevalence and mean monthly intensity of five phthirapteran species infesting domestic fowl in district Rampur and adjoining areas.

MATERIALS AND METHODS

One hundred domestic fowls were deloused (Fumigation method) every month during the year 2012 in five localities (Rampur proper, Swar, Tanda, Bilaspur and Rudrapur) of district Rampur and adjoining areas. The louse load obtained from every bird was placed in separately labeled vials and was separated according to species. The mean monthly prevalence and intensity of infestation was computed every month throughout the year. At the same time mean monthly temperature, relative humidity, photoperiod and heat index was also taken into consideration. Finally, attempts were made to record the degree of correlation between the mean monthly prevalence (as well as mean monthly intensity) and the four aforesaid eco-factors (mean monthly temperature, relative humidity, photoperiod and heat index).

RESULTS

In different months of year from January to December, the prevalence and mean monthly intensities of five different phthirapteran ectoparasite on domestic fowls of district Rampur and adjoining areas during the year 2012 is indicated in table 1. The values of Karl Pearson's Coefficient of Correlation (r) between prevalence, mean monthly infestation intensities of five phthirapteran ectoparasite and the mean monthly ecofactors have been discussed below-

Lipeurus tropicalis: Moderate correlation existed between prevalence of *Lipeurus tropicalis* and R.H, heat index and photoperiod (r = 0.41, 0.41 and -0.46, respectively). However strong positive correlation existed between prevalence of *Lipeurus tropicalis* and heat index (r = 0.56) (Table 2). Strong positive (significant) correlation existed between infestation intensity of *L. tropicalis* and RH, temperature as well as heat index (r = 0.64, 0.60 and 0.67, respectively), The value of correlation between infestation intensity and photoperiod remained, 0.51, (Table 2).

Menopon gallinae: Moderate correlation existed between prevalence of *Menopon gallinae* and R.H as well as photoperiod (r = -0.56 and 0.48. However correlation with prevalence and temperature as well as heat index remained negligible (r = 0.15 and 0.12, respectively, (Table 2). Strong positive correlation existed between Intensity of infestation of *M. gallinae* and temperature as well as heat index (r = 0.64, in both cases). However correlation between Intensity of infestation of *M. gallinae* and RH as well as photoperiod remained non-significant (r = -0.29 and -0.24, respectively) (Table 2).

Goniodes dissimilis: Moderate correlation existed between the prevalence of *G. dissimilis* and RH as well as photoperiod (r = -0.55 and 0.33, respectively). However, correlation between prevalence of *G. Dissimilis* and Temperature as well as heat index was negligible (r = -0.08 and -0.11, respectively) (Table 2). Strong positive correlation existed between infestation intensity

Table 1: Prevalences and intensity of infestation of five phthirapteran species on domestic fowls during different months of the year 2012.

Species and months	Prevalence						Infestation intensity					
	Menopon gallinae	*Lipeurus caponis*	*Lipeurus tropicalis*	*Goniocotes gallinae*	*Goniodes dissimilis*	*Overall*	*Menopon gallinae*	*Lipeurus caponis*	*Lipeurus tropicalis*	*Goniocotes gallinae*	*Goniodes dissimilis*	*Overall*
January	44	39	25	39	37	**58**	42.09	49.13	5.63	30.25	27.59	**105**
February	56	38	10	51	29	**61**	98.05	65.3	19.4	31.26	28.16	**175**
March	48	39	19	41	30	**64**	69.29	38.69	9.36	32.12	32.36	**114**
April	52	34	26	40	33	**68**	100.3	137.23	14.15	43.82	53.12	**195**
May	63	52	17	53	35	**75**	179.5	191.7	41.33	61.62	63.4	**368**
June	58	46	23	51	25	**81**	187.25	261.15	65.08	115.62	93.04	**402**
July	42	37	33	31	23	**80**	127.8	34.23	103.7	84.32	23.78	**157**
August	21	23	32	28	21	**62**	101.5	23.61	62.21	92.89	23.47	**123**
September	30	19	21	14	16	**59**	72.93	35.47	123.95	49	19.75	**110**
October	17	18	18	12	15	**61**	30.58	52.82	43.94	58.33	51.66	**66**
November	15	16	21	14	16	**60**	46.8	62.3	39.2	37.1	52.6	**52**
December	18	12	13	17	13	**54**	31	43.58	41.61	52.52	36.23	**74**

Table 2: Values of Karl Pearson's Coefficient of correlation between mean monthly prevalences, mean monthly infestation intensity of five phthirapteran species and four ecofactors.

Species Name	Prevalence				Infestation intensity			
	Relative Humidity	Temperature	Heat index	Photoperiod	Relative Humidity	Temperature	Heat index	Photoperiod
Meopon gallinae	-0.56	0.149	0.124	0.485	-0.287	0.639	0.643	-0.239
Lipeurus caponis	-0.46	0.163	0.156	0.408	-0.569	0.377	0.339	0.724
Lipeurus tropicalis	0.411	0.411	0.56	-0.463	0.64	0.603	0.669	-0.513
Goniocotes gallinae	-0.514	0.05	0.033	0.44	0.334	0.652	0.695	-0.067
Goniodes dissimilis	-0.551	-0.083	-0.11	0.331	-0.538	0.288	0.24	0.788

of *G. dissimilis* and photoperiod (r = 0.79). The correlation with RH was moderate (r = -0.53). However, the correlation with temperature as well as heat index was insignificant (r = 0.29 and 0.24, respectively), (Table 2).

Lipeurus caponis: Moderate correlation 'non-significant' existed between the mean monthly prevalence and RH (r = 0.46) and photoperiod (r = 0.41). The correlation between prevalence and mean monthly temperature as well as heat index (Table 2) remained negligible (r = 0.16 each). Moderate correlation (non-significant) existed between the infestation intensity and temperature as well as heat index (r = 0.38 and 0.34). However, correlation between infestation intensity and photoperiod (r = -0.57), (Table 2) was found significant.

Goniocotes gallinae: Moderate correlation 'non-significant' existed between the prevalence of *G. gallinae* and RH as well as photoperiod (r = 0.51 and 0.44 respectively). Negligible correlation existed between the prevalence of *G. gallinae* and temperature as well as heat index (r = 0.05 and 0.03, respectively) (Table 2). Strong positive correlation existed (significant) between the intensity of infestation of *G. gallinae* and temperature as well as heat index (r = 0.65 and 0.69, respectively). Correlation with RH was moderate (r = 0.33). Negligible correlation existed between the intensity of infestation of *G. gallinae* and photoperiod (r = 0.07) (Table 2).

DISCUSSION

Phthirapteran ectoparasites reportedly exhibit seasonal variation in populations. A scrutiny of literature reveals that bird lice generally peak in summers and mammalian lice exhibit maxima during the winter months (Marshall, 1981). The factors responsible for variations in natural population of lice have been discussed from time to time and there is considerable dispute among the phthirapterists. Variety of factors reportedly affects the population levels of the avian and mammalian lice. In addition to environmental factors many host factors (viz., host grooming / preening, moulting, nesting activity, breeding and transference of lice after the hatch) and physiological factors (i.e. host hormone level) also reportedly influence the lice population. For instance, temperature reportedly causes "high intensities" in two phthirapteran species occurring on starling, *Sturnus vulgaris* (Boyd, 1951). Peak in population of one ischnoceran louse infesting house sparrows (*Passer domesticus*) has been attributed to summer temperature and photoperiod (Woodman & Dicke, 1954). Host moulting and breeding period caused "high incidence" of 6 species (in summer and spring) infesting black birds, *Turdus m. merula* (Baum, 1968). Environmental temperature and breeding habits causes marked increase in infestation of 15 species parasitizing chaffinches, robbins, black birds, blue tits and great tits (Ash, 1960). High infestations of three phthirapterans occurring on alcids during summers have been attributed to increased nesting activity and the temperature. Rise in temperature and breeding periods reportedly influence summer population build up of one amblyceran parasitizing common myna, *Acridotheres tristis* (Chandra *et al.*, 1990). Foster (1969) suspected that the breeding time of two haematophagous species (*Ricinus picturatus* and *Menacanthus sp.*) might be controlled by the reproductive hormones of the host bird, orange crowned warbler (*Vermivora cellata*). However, while working on the population of three lice infesting

common myna, *Acridotheres tristis* (Srivastava, 2003) concluded that in case of haematophagous *Menacanthus eurysternus* the effect of testicular weight on egg index of lice can be quite high but the ovarian weight appeared to have negligible effect. They further concluded that it is quite unlikely that the gonadal hormone would influence the reproductive potential of lice on male bird and not on female birds.

The analysis of correlation between the prevalence of five poultry lice and the eco-factors indicated that none of the eco-factors (viz. temperature, relative humidity, heat index and photoperiod) taken into consideration had any significant impact. On occasional instances moderate correlation existed between the prevalence of lice and RH, temperature, heat index and photoperiod but the values of correlation coefficient were not found statistically significant. As the prevalence of lice is dependent on transmission by direct contact among lousy and louse free birds. On the other hand, significant correlation existed between the mean intensity of infestation of *L. caponis* and RH and photoperiod. In case of *L. tropicalis* significant correlation existed between RH, temperature and heat index (correlation with photoperiod was moderate). In case of poultry fluff louse, *G. gallinae* significant correlation existed between intensity of infestation and temperature as well as heat index (correlation with RH and photoperiod were found non-significant). In case of *G. dissimilis*, significant correlation existed between intensity of infestation and photoperiod only (correlation with RH was moderate). Lastly in case of poultry shaft louse, *M. gallinae*, significant correlation existed between intensity of infestation and heat index (correlation between RH and photoperiod were non-significant).Thus, the aforesaid results indicate that in case of *L. caponis* (poultry wing louse) and *L. tropicalis (*also prefers wings), the RH and photoperiod may have influence on the population build up (since both are frequently exposed to the outer atmosphere). On the other hand, *G. gallinae*, *G. dissimilis* and *M. gallinae* (which typically reside inside body feathers and appear to prefer high temperature zone offered inside the plumage by the host. The present studies provides preliminary clue regarding the impact of environmental factors on the population levels of different poultry lice, the temperature and heat index may promote the population build up.

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