

Prevalence and seasonal variation of ectoparasite load in free-range chicken of Kashmir valley

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Abstract A faunistical study of ectoparasites was carried out for a period of two years from January 2005 to December 2006 in rural free-range chicken purchased from different areas of Kashmir valley. Screening of a total of 478 birds revealed only lice infestation with an overall prevalence of about 100% and 97.69% birds harboring multiple species. The prevalence for various species of lice, during winter, spring, summer, autumn and overall prevalence respectively, was 90.32%, 99.14%, 100%, 98.34% and 96.86% for *Lipeurus caponis*; 33.87%, 48.71%, 57.75%, 39.66% and 44.76% for *Goniodes gigas*; 29.83%, 32.47%, 45.68%, 32.23% and 34.93% for *Menopon gallinae*; 28.22%, 32.47%, 39.65%, 32.23% and 33.05% for *Menacanthus cornutus*; 16.12%, 19.65%, 25%, 18.18% and 19.66% for *Goniocotes gallinae* and 6.45%, 12.82%, 13.79%, 4.95% and 9.41% for *Eomenacanthus stramineus*. The seasonal influence on nature and intensity of infestation was evident.

Keywords Ectoparasites · Lice · Chicken · Epidemiology · Free-range · Prevalence · Season

Introduction

Indigenous fowl reared under traditional extensive (rural scavenging) system or improved traditional (semi-scavenging) production system constitutes one of the important component of rural economy. Under such conditions production is greatly influenced by vagaries of a number of diseases. Parasitic infections are ubiquitous and high infection load results in clinical disease. Ectoparasites are regarded as the basic causes of retardation in growth, lowered vitality and poor conditions of the birds (Ruff 1999). They can affect bird health directly by causing irritation, discomfort, tissue damage, blood loss, toxicosis, allergies and dermatitis which in turn alleviate quality and quantity of meat and egg production. Also, they act as mechanical or biological vectors transmitting a number of pathogens. A study conducted in free range chicken in Kashmir showed presence of lice *Lipeurus caponis*, *Goniodes gigas*, *Goniocotes gallinae*, *Cuclogaster heterographus* and *Menopon gallinae*; bug *Cimex lactularius*; flea *Echidnophaga gallinacean*; tick *Argas persicus*; and mites *Dermanyssus gallinae*, *Cnemidocoptes mutans* and *C. gallinae* (Mir et al. 1993).

The prevalence and intensity of parasitic infestations may be influenced by a number of epidemio-

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logical factors including host factors (age, sex, breed) and environmental factors (free-range management system and climatic conditions) (Nadeem et al. 2007). The state of Jammu and Kashmir lies between 32.17°–36.58° North latitude & 73.26°–80.30° East longitude. Kashmir valley is 100 kilometres wide, 15520.3 square kilometres in area and is about 1700 metres above sea level. It has a temperate climate with four seasons and temperature ranging from >30°C in summer to even < -10°C in winter. Annual rainfall averages 650.5 mm. The present paper reports the prevalence and intensity of lice infestation in relation to months and seasons.

Materials and methods

Study area

The cross-sectional study was carried out in villages of Bandipora, Sopur, Ganderbal, Sonamarg, Hazratbal, Nawakadal, Chari-Sharif, Shopiyan, Kokernag and Pahalgam, to make it representative of Kashmir valley. The maximum and minimum temperatures during the period of study ranged between -3.5°C to 32.5°C and -5.3°C to 22.6°C respectively. Monthly variation in mean maximum and minimum temperatures recorded is graphically shown in Fig. 1.

Sample size and sampling procedure

A total of 478 domestic fowl of different age groups and of either sex were randomly selected from the

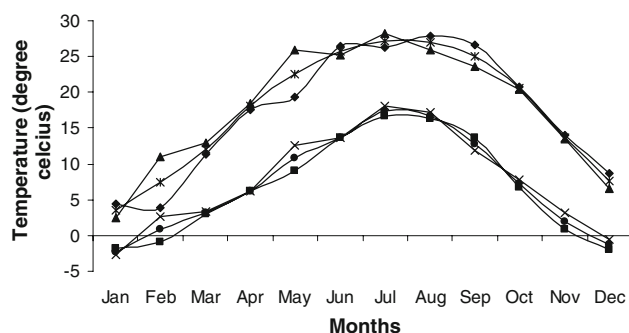


Fig. 1 Mean monthly maximum and minimum temperatures in the Kashmir Valley as recorded from January 2005 to December 2006 (Data provided by Indian Metrological Department, Metrological Centre Rambagh, Srinagar, J&K) —◆— 2005 Max; —■— 2005 Min; —▲— 2006 Max; —×— 2006 Min; —*— 2005-06 Max; —●— 2005-06 Min

area under study over two year's period from January 2005 to December 2006. No more than two birds were purchased from single house hold during the entire period of study.

Parasitological examinations

Ectoparasites were collected from live hosts by placing them in a large jar with a special lid that permitted head of the bird to protrude. A filter paper dipped in chloroform was placed at the bottom of the jar. The bird was restrained with its body in the jar for about 20 minutes. During this time many dying parasites detached and fell off. On removal, the bird was held over the jar and its feathers were ruffled to dislodge additional parasites. In birds suspected for infestation with mites, deep scrapings were collected by using a scalpel or knife blade dipped in acetic glycerine (1% glacial acetic acid in glycerine). In fact not all the parasites could be collected, so the numbers of ectoparasites recovered are rather estimations. Nestlings and temporary ectoparasites inhabiting nests were not involved in the study. All types of ectoparasites thus collected were categorized. Permanent preparations were made and then the slides were identified on the basis of their morphological characters as per Fabiyi (1980) and Soulsby (1982).

Data analysis

Prevalence of individual parasite species was calculated as a percentage of the host population that was infested with a specific parasite at a point in time (Thrusfield 1995). Mean intensity was calculated as number of parasites per infested bird.

Results

A total of six species of ectoparasites belonging to six different genera were recovered from the domestic fowl. These parasites were identified as *Lipeurus caponis*, *Goniodes gigas*, *Menopon gallinae*, *Menacanthus cornutus*, *Goniocotes gallinae* and *Eomenacanthus stramineus*.

Prevalence of ectoparasites as observed in domestic fowl and their monthly pattern over the two years period of study is presented in the Table 1. In general 477 out of 478 birds examined were found to be

Table 1 Month wise prevalence of ectoparasites on domestic fowl during the year 2005 and 2006

Month & Year of collection	Total number of birds screened	Total number of birds infested (Prevalence %)	Number of birds infested with a particular ectoparasitic species (Prevalence %)					Number of birds with mixed infestations (% age)	
			<i>Lipeurus caponis</i>	<i>Goniodes gigas</i>	<i>Menopon gallinae</i>	<i>Menacanthus cornutus</i>	<i>Goniocotes gallinae</i>		<i>Eomenacanthus stramineus</i>
Jan. 2005	20	20(100)	18(90)	08(40)	07(35)	06(30)	04(20)	01(05)	20(100)
2006	20	20(100)	17(85)	07(35)	06(30)	06(30)	05(25)	03(15)	20(100)
Total	40	40(100)	35(87.5)	15(37.5)	13(32.5)	12(30)	09(22.5)	04(10)	40(100)
Feb. 2005	16	16(100)	14(87.5)	05(31.25)	05(31.25)	05(31.25)	03(18.75)	01(6.25)	16(100)
2006	23	23(100)	22(95.65)	09(39.13)	08(34.78)	08(34.78)	05(21.73)	02(08.69)	21(91.3)
Total	39	39(100)	36(92.3)	14(35.89)	13(33.33)	13(33.33)	08(20.51)	03(07.69)	37(94.87)
Mar. 2005	18	18(100)	17(94.44)	08(44.44)	06(33.33)	06(33.33)	04(22.22)	03(16.66)	18(100)
2006	18	18(100)	18(100)	07(38.88)	05(27.77)	05(27.77)	03(16.66)	04(22.22)	18(100)
Total	36	36(100)	35(97.22)	15(41.66)	11(30.55)	11(30.55)	07(19.44)	07(19.44)	36(100)
Apr. 2005	19	19(100)	19(100)	09(47.36)	06(31.57)	06(31.57)	03(15.78)	02(10.52)	18(94.73)
2006	20	20(100)	20(100)	10(50)	06(30)	06(30)	02(10)	02(10)	20(100)
Total	39	39(100)	39(100)	19(48.71)	12(30.76)	12(30.76)	05(12.82)	04(10.25)	38(97.43)
May 2005	23	23(100)	23(100)	13(56.52)	08(34.78)	08(34.78)	06(26.08)	03(13.04)	23(100)
2006	19	19(100)	19(100)	10(52.63)	07(36.84)	07(36.84)	05(26.31)	01(05.26)	19(100)
Total	42	42(100)	42(100)	23(54.76)	15(35.71)	15(35.71)	11(26.19)	04(09.52)	42(100)
June 2005	21	21(100)	21(100)	11(52.38)	07(33.33)	07(33.33)	04(19.04)	02(09.52)	21(100)
2006	23	23(100)	23(100)	14(60.86)	09(39.13)	09(39.13)	06(26.08)	03(13.04)	23(100)
Total	44	44(100)	44(100)	25(56.81)	16(36.36)	16(36.36)	10(22.72)	05(11.36)	44(100)
July 2005	17	17(100)	17(100)	11(64.70)	08(47.05)	07(41.17)	05(29.41)	04(23.52)	17(100)
2006	19	19(100)	19(100)	12(63.15)	11(57.89)	09(47.36)	06(31.57)	04(21.05)	19(100)
Total	36	36(100)	36(100)	23(63.88)	19(52.77)	16(44.44)	11(30.55)	08(22.22)	36(100)
Aug. 2005	15	15(100)	15(100)	09(60)	6(40)	06(40)	03(20)	01(06.66)	15(100)
2006	21	21(100)	21(100)	10(47.61)	12(57.14)	08(38.09)	05(24.80)	02(09.52)	21(100)
Total	36	36(100)	36(100)	19(52.77)	18(50)	14(38.88)	08(22.22)	03(08.33)	36(100)
Sep. 2005	20	20(100)	20(100)	09(45)	07(35)	07(35)	04(20)	02(10)	20(100)
2006	19	19(100)	19(100)	07(36.84)	06(31.57)	08(42.10)	04(21.05)	01(05.26)	19(100)
Total	39	39(100)	39(100)	16(41.02)	13(33.33)	15(38.46)	08(20.51)	03(07.69)	39(100)
Oct. 2005	18	18(100)	18(100)	08(44.44)	06(33.33)	05(27.77)	02(11.11)	Nil	17(94.44)
2006	18	18(100)	18(100)	07(38.88)	06(33.33)	06(33.33)	03(16.66)	01(05.55)	18(100)
Total	36	36(100)	36(100)	15(41.66)	12(33.33)	11(30.55)	05(13.88)	01(02.77)	35(97.22)

Table 1 (continued)

Month & Year of collection	Total number of birds screened	Total number of birds infested (Prevalence %)	Number of birds infested with a particular ectoparasitic species (Prevalence %)					Number of birds with mixed infestations (% age)	
			<i>Lipeurus caponis</i>	<i>Goniodes gigas</i>	<i>Menopon gallinae</i>	<i>Menacanthus cornutus</i>	<i>Goniocotes gallinae</i>		<i>Eomenacanthus stramineus</i>
Nov. 2005	24	24(100)	24(100)	09(37.50)	07(29.16)	07(29.16)	04(16.66)	02(08.33)	22(91.66)
2006	22	22(100)	20(90.90)	08(36.36)	07(31.81)	06(27.27)	05(22.72)	Nil	21(95.45)
Total	46	46(100)	44(95.65)	17(36.95)	14(30.43)	13(28.26)	09(19.56)	02(04.34)	43(93.47)
Dec. 2005	22	22(100)	20(90.90)	06 (27.27)	06(27.27)	05(22.72)	02(09.09)	Nil	22(100)
2006	23	22(95.65)	21(91.30)	07(30.43)	05(21.73)	05(21.73)	01(04.34)	01(04.34)	19(82.60)
Total	45	44(97.77)	41(91.11)	13(28.88)	11(24.44)	10(22.22)	03(06.66)	01(02.22)	41(91.11)
Jan. to Dec. 2005	233	233(100)	226(96.99)	106(45.49)	79(33.90)	75(32.18)	44(18.88)	21(09.01)	229(98.28)
2006	245	244(99.59)	237(96.73)	108(44.08)	88(35.91)	83(33.87)	50(20.40)	24(9.79)	238(97.14)
G. Total	478	477(99.79)	463(96.86)	214(44.76)	167(34.93)	158(33.05)	94(19.66)	45(9.41)	467(97.69)

infested with one or more types of parasites. Further, 97.69% (467/478) birds harboured more than one type of parasite. The annual prevalence rates of mixed infections were comparable i.e 98.28% and 97.14% respectively during the years 2005 and 2006.

Among the ectoparasites, *Lipeurus caponis* was found to be most prevalent with an overall prevalence of 96.86% (463/478) and annual occurrence of 96.99% (226/233) and 96.73% (237/245) respectively. The parasite was prevalent throughout the year with 85–100% birds infested at any point of time. *Goniodes gigas* was found to be the second most prevalent ectoparasite, although its overall prevalence of 44.76% (214/478) was much lower than *Lipeurus caponis*. Annual occurrence of *Goniodes gigas* was 45.49% (106/233) and 44.08% (108/245) respectively during the 1st and 2nd year of study and the monthly occurrence ranged from 27.27% (6/22) to 64.7% (11/17). The prevalence was comparatively lower during winter. *Menopon gallinae* was also found to be prevalent throughout the year, with an annual occurrence of 33.9% (79/233) and 35.91% (88/245) during the 1st and 2nd year of study respectively. Overall prevalence observed during the two years of study was 34.93% (167/478) and monthly occurrence varied between 21.73% (5/23) and 57.89% (11/19). Overall prevalence of *Menacanthus cornutus* was observed to be 33.05% (158/478) and its annual occurrence for 1st and 2nd year of study was respectively 32.18% (75/233) and 33.87% (83/245). The monthly occurrence varied between 21.73% (05/23) observed in December 2006 and 47.36% (09/19) observed in July 2006. The occurrence of *Goniocotes gallinae* during the 1st and 2nd year of study was observed to be 18.88% (44/233) and 20.4% (50/245) respectively, with an overall prevalence of 19.66% (94/478). The monthly distribution over the two years revealed the occurrence range between 04.34% (1/23) and 31.57% (6/19). *Eomenacanthus stramineus* was found to be least prevalent among the ectoparasites recovered, with an overall prevalence of 9.41% (45/478) and annual occurrence of 9.01% (21/233) and 9.79% (24/245) during the 1st and 2nd year respectively.

Seasonal pattern of parasite prevalence and mean intensity of infestation is given in Table 2. In general total number of parasites recovered were highest for *Lipeurus caponis* (14436) followed by *Goniodes gigas* (869), *Menacanthus cornutus* (508), *Menopon gallinae* (429), *Goniocotes gallinae* (333) and *Eome-*

Table 2 Seasonal pattern of ectoparasite prevalence and mean intensity of infestation on domestic fowl

Name of parasitic species recovered	Spring (N=117)			Summer (N=116)			Autumn (N=121)			Winter (N=124)		
	No. Infested	Prevalence (%)	Mean intensity	No. Infested	Prevalence (%)	Mean intensity	No. Infested	Prevalence (%)	Mean intensity	No. Infested	Prevalence (%)	Mean intensity
Total number of birds infested	117	100	-	116	100	-	121	100	-	123	99.19	-
<i>Lipeurus caponis</i>	116	99.14	29.5±1.5	116	100	40.1±2.3	119	98.34	39±1.6	112	90.32	15.2±1.3
<i>Goniodes gigas</i>	57	48.71	2.5±1.1	67	57.75	7.5±1.9	48	39.66	3.4±1.8	42	33.87	1.4±0.1
<i>Menopon gallinae</i>	38	32.47	3.2±2.2	53	45.68	1.9±0.7	39	32.23	3.1±1.9	37	29.83	2.1±0.6
<i>Menacanthus cornutus</i>	38	32.47	2.9±1.7	46	39.65	4.8±1.7	39	32.23	2.6±0.9	35	28.22	2±0.9
<i>Goniocotes gallinae</i>	23	19.65	2.2±1.2	29	25.00	3.9±1.8	22	18.18	6.2±1.7	20	16.12	1.4±0.3
<i>Eomenacanthus stramineus</i>	15	12.82	1.4±0.3	16	13.79	2±0.2	06	04.95	6.1±2.2	08	06.45	2.4±0.8

N: Total number of birds screened

nacanthus stramineus (109) in that order. Seasonal studies revealed that mean intensity of infestation was highest during summer for *Lipeurus caponis*, *Goniodes gigas* and *Menacanthus cornutus*. For *Goniocotes gallinae* (333) and *Eomenacanthus stramineus* (109) *Goniocotes gallinae* and *Eomenacanthus stramineus* mean intensity was higher during autumn.

Discussion

In the present study lice were the only ectoparasites observed. Almost all the birds were found to be infested with one or the other type of lice throughout the year and each bird was found to harbour more than one type of lice. This observation is in accordance with earlier observations from Kashmir and other places (Mir et al. 1993; Prelezov and Koinarski 2006; Sychra et al. 2008). Although *Menopon gallinae* has been previously reported from the valley in domestic fowl (Mir et al. 1993), but the overall prevalence (34.93%) for the parasites observed in the present study was much higher than 2% reported previously. The ectoparasites recorded from the fowl like *Lipeurus caponis*, *Goniodes gigas*, *Menacanthus cornutus*, *Goniocotes gallinae* and *Eomenacanthus stramineus* have also been reported by other workers (Mir et al. 1993; Permin et al. 2002; Sychra et al. 2008). The overall prevalence of various parasites differed greatly among the previous reports as well as when compared with present observation. This may be attributed to difference in the geographical areas and period of study.

In the present study, *Lipeurus caponis* was found to be most prevalent (96.86) followed by *Goniodes gigas* (44.76%), *Menopon gallinae* (34.93%), *Menacanthus cornutus* (33.05%), *Goniocotes gallinae* (19.66%) and *Eomenacanthus stramineus* (9.41%). The parasite load and mean intensity studies also revealed a significantly high infection rates for *Lipeurus caponis*. In general, prevalence was highest during summer and lower during winter. Also the parasitic load was higher during summer for *Lipeurus caponis*, *Goniodes gigas* and *Menacanthus cornutus* and during autumn for others. The observations could be related to the higher temperature and humidity during these months. Mir et al. (1993) also reported that *Lipeurus caponis* was the most prevalent among ectoparasites in domestic fowl of Kashmir valley.

Almost similar ectoparasito-fauna and similar infestation percentages as that of our study were also recorded by Prelezov and Koinarski (2006) in Bulgaria. The seasonal pattern observed is in agreement with earlier reports from different regions (Mungube et al. 2008). Prevalence and intensity of infestation has been found to be positive correlated to temperature, both being higher in summer followed by autumn and least in winter (Nadeem et al. 2007). The increased prevalence of ectoparasites during summer months can be attributed to the requirement of optimum temperatures for the development of parasites and decreased resistance of birds to the parasites in high temperatures resulting in heavy infections.

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