



Population characteristics of phthirapteran ectoparasites infesting cattle in Rampur district

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ABSTRACT: Three hundred cattle were sampled for the presence of phthirapteran ectoparasites in Rampur district. Three phthirapteran species (*Damalinea bovis*, *Linognathus vituli*, *Haematopinus eurysternus*) were recovered from the cattle. *Solenopotes capillatus* and *Haematopinus quadripertusus* were not noticed. As many as 16.3%, (n = 300) cattle were found infested with one or other species of Phthiraptera, during 2007, in Rampur district. Single species infestation was more common than double (16.3%) and triple species (14.2%) infestation. Prevalence of Phthiraptera on two sexes remained similar ($\chi^2 = 0.48$, $P = 0.05$). It was higher in younger cattle than adults and aged ones ($\chi^2 = 10.48$, $P = 0.05$). Correlation between mean monthly intensity and mean monthly relative humidity was significant. Out of the three species recovered, the biting louse, *D.bovis* remained the most prevalent louse (11.3%), followed by anopluran, *L.vituli* (11%). The other anopluran louse, *H.eurysternus* was least prevalent (5.07%). Intensity of infestation (recorded by counting total number of lice noted on 20 anatomical sites measuring per square inch) remained 4.6 for *D.bovis*, 3.7 for *L.vituli* and 2.8 for *H.eurysternus*. In case of all the three cattle lice, sex ratios were female biased (1:1.4 to 1:1.5). Nymphal population dominated over adults (A: N = 1:1.7 to 1:1.9).

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KEY WORDS: Phthiraptera, Lice, *Damalinea bovis*, *Haematopinus eurysternus*, *Linognathus vituli*

INTRODUCTION

Survey of literature shows that basic information regarding different bio-ecological parameters of different phthirapteran species parasitizing cattle, has been provided by Craufurd-Benson (1941), Matthyse (1946), Ourmazdi and Baker (1974), Chalmers and Charleston (1980) and Milness *et al.* (2003). As far as population ecology of cattle lice is concerned, selected workers have indicated the population levels of different species of cattle lice in different parts of the world, from time to time (Chalmers and Charleston 1980; Titchener 1983; Kennedy and Karlka, 1986; El-Metenawy *et al.*, 1997; Milnes and Green, 1999; Colwell *et al.*, 2001; Kakar and Kakarsulemankhel, 2009). Geden

et al. (1990) noted the effect of housing types on the population of cattle lice. Gibney *et al.* (1985) noted the effect of various infestation levels of lice on cattle feeding efficiency. Lewis and Christenson (1962) recorded the indices of the population of *D.bovis*. Watson *et al.* (1997) gave an indication of distribution patterns of cattle lice on their natural host. Nafstad (1998) also recorded the effect of various factors on the population of lice while talking of about their eradication measures. In India, Rawat *et al.* (1992) have noted the prevalence of lice on cattle in Dehradun. Seasonal variation in the population of cattle lice has been noted by Cumming and Graham (1982), De Vaney *et al.* (1992) and Geden *et al.* (1990).

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MATERIALS AND METHODS

The hosts were examined during January to December 2007 by the hair parting method (Lewis *et al.*, 1967), at 20 anatomical sites (measuring 1 square inch by placing the thick wire molded in square shape) normally inhabited by the lice. Each site was thoroughly checked for the presence of lice. Lice from infested hosts were placed in glass tubes containing 70% ethyl alcohol, using a separate vial for each host. Each tube contained information regarding host, sex age or stage, condition and locality. Later, identification and sexing provided the data for recording the lice population. Sampled specimens were treated with 10% KOH for 24 hrs, (to dissolve the visceral organs) washed in water and transferred to 10% acetic acid for 1 hour (for better differentiation). Specimens were then subjected to dehydration (ethanol series), clearing (clove oil) and mounting (Canada Balsam) for Microscopy.

RESULTS AND DISCUSSION

Out of the six phthirapteran species reported to occur on cattle (*Bos taurus* L.), only three species, *Damalinia bovis* (Linnaeus), *Linognathus vituli* (Linnaeus) and *Haematopinus eurysternus* (Nitzsch) have been found on the cattle in Rampur district, in 2007. *Solenopotes capillatus* (Enderlain) and *Haematopinus quadripertusus* could not be recorded.

Prevalence of phthirapterans on cattle was found to be 16.33%, as 49 animals (out of 300) carried three species of lice. Out of 300 cattle examined in different localities in Rampur district, forty were males and 260 females. Prevalence of Phthiraptera on males and females remained 12.5% and 16.9% respectively ($\chi^2 = 0.48$, $P < 0.05$, nonsignificant). Hence, prevalence of three cattle lice on two sexes remained nearly similar. Furthermore, out of the 300 cattle examined, 70 were young (below 04 years), 160 adults (04 -10 years in age) and remaining 70 older ones (above 10 years age). The prevalence of cattle lice on three groups remained 28.5%, 13.8% and 10.0%, respectively. Statistical analysis showed that difference in prevalence rate

in three groups was significant ($\chi^2 = 10.48$, $P < 0.05$). The data shows that maximum percentage of infested cattle bore single species infestation (69.4%). Double species infestation was noticed on 16.3% infested cattle. Simultaneous infestation by all the three species was recorded on only 14.2% hosts.

Damalinia bovis

Prevalence of *D.bovis* on cattle was 11.3%, (n = 300). Intensity of infestation remained 4.63. The value of sample mean abundance was 0.52 per square inch. A total number of 3152 specimens of *D. bovis* were recovered from 34 infested cattle. The range of infestation remained 45-228 (mean numbers collected from all the 20 sites). For recording the population structure at different levels of infestation, entire data was divided into four categories. Six cattle carried 45-65 specimens of *D.bovis* (mean number, 55.5; 8.3M, 12.3F, 34.8N; M: F = 1:1.5; A: N = 1:1.6). Maximum number of cattle (11) carried 66-86 lice (mean number, 76.6; 10.6M, 15.9F, 50.0N; M: F = 1:1.5; A: N = 1:1.8) (Fig. 1). Eight cattle were infested with 87-107 lice (mean number, 96.5; 13.6M, 20.5F, 62.3N; M: F = 1:1.5; A: N = 1:1.8). Nine cattle carried more than 107 lice (mean number, 133.7; 17.3M, 24.5F, 91.8N; M: F = 1:1.41; A: N = 1:2.1). The overall mean number remained 92.7 (12.7M, 18.6F, 61.3N; M: F = 1:1.5; A: N = 1:1.9). The overall ratio of three nymphal instars was found to be 1 : 1.2 : 2.

Back region was found to be the most heavily infested site (harboured 28.2% of the population obtained), followed by nape (20.8%). These two areas carried nearly 50% of total *D.bovis* population. Neck, abdomen and head were the next preferred sites (15.1%, 9.8% and 9.2%, respectively). The forelegs were the minimally infested site (3.9%) and carried lesser number of lice than tail and hind legs (7.1% and 5.6%, respectively). Our fields observations reveal that in case of heavy infestations, *D.bovis* could occur on any of the body parts but the back (also neck and nape) remain most lousy areas, during most parts of year.

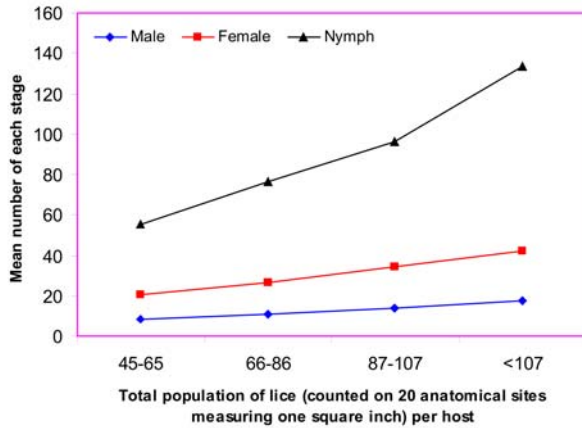


Fig. 1. Population composition of *Damalinia bovis* on cattle

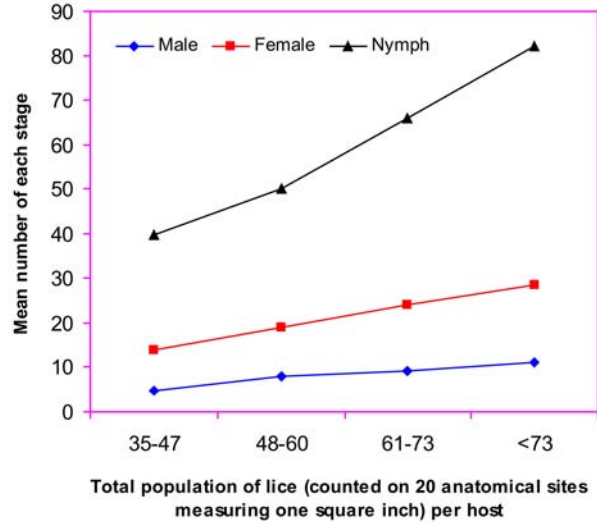


Fig.2. Population composition of *Haematopinus eurysternus* on cattle

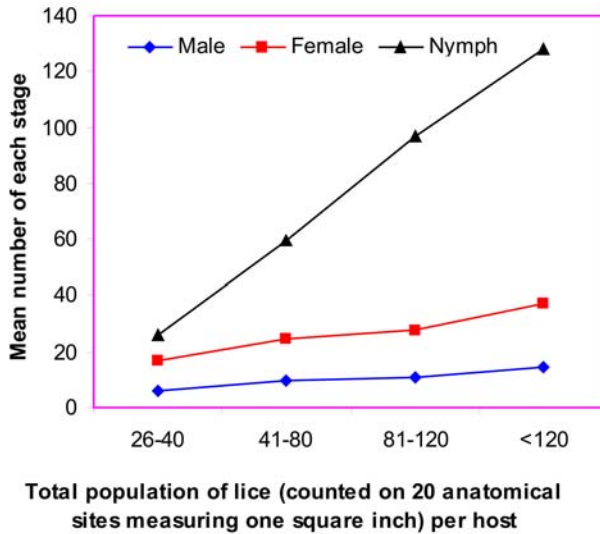


Fig. 3. Population composition of *Linognathus vituli* on cattle

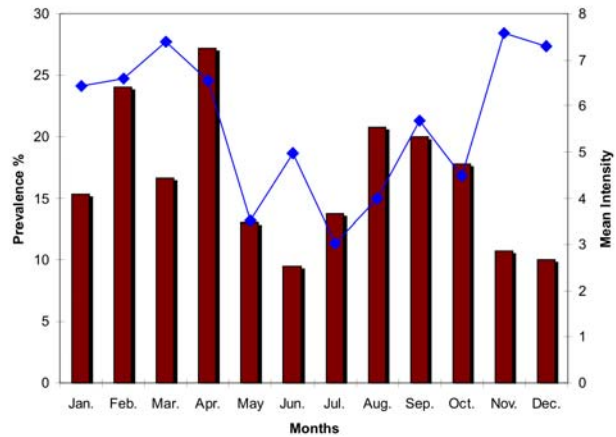


Fig. 4. Prevalence and intensity of infestation (based on mean of numbers counted on 20 sites per host) of phthirapterans on 300 cattle during different months of the year 2007, in the Rampur district (U.P.)

Haematopinus eurysternus

Prevalence of *H.eurysternus* on cattle was 5.3%, as 16 animals (out of 300) carried this louse. As many as, 892 lice were collected from the infested cattle (mean intensity, 2.8 per square inch) and value of sample mean abundance remained 0.14 per square inch.

For the sake of description, entire data was divided into four classes. Five cattle carried 35-47 (mean

numbers collected from all the 20 sites) lice (mean number, 39.6; 4.8M, 9.0F, 25.8N; M: F = 1:1.8; A: N = 1:1.8). Four cattle carried 48-60 specimens of *H.eurysternus* (mean number, 50.2; 8.0M, 11.0F, 31.2N; M: F = 1:1.3; A:N = 1:1.6) (Fig. 2). Five cattle were infested with 61-73 lice (mean number, 65.8; 9.2M, 14.8F, 41.8N; M: F = 1:1.6; A: N = 1:1.7). Only two cattle carried more than 73 lice (mean intensity, 82.0; 11.0M, 17.5F, 53.5N; M: F = 1:1.5; A: N = 1:1.8). Thus, overall sex ratio of

H.eurysternus population remained 1:1.5. The adult nymph ratio was 1:2 and the ratio of the nymphal instars remained 1: 1.6: 1.7.

Maximum percentage of *H.eurysternus* (23.9%) occurred on the back region, narrowly followed by neck region (17.3%). Abdomen (13.0%), nape (11.7%) and head (9.6%) were the next preferred sites. The tail was minimally infested site (7.3%) as it harboured lesser number of lice than fore and hind legs (8.0% and 8.9%, respectively). In case of heavy infestation, *H.eurysternus* could occur on any of the body parts but the back region remains most lousy area.

Linognathus vituli

Twenty one (7.0%) of the cattle was found infested with *L.vituli*. A total number of 1545 lice (all stages) were recovered from the infested cattle (mean intensity, 3.6 per square inch). The sample mean abundance was found to be 0.25 per square inch (mean of total numbers collected from all the 20 sites).

Two cattle were infested with 26-40 lice (mean number, 26.0; 6.0M, 11.0F, 9.0 N; M: F = 1:1.8; A:N = 1:0.5) (Fig. 3). Maximum number of cattle (11) carried 41-80 specimens of *L.vituli* (mean number, 59.5; 9.6M, 15.23F, 34.6N; M: F = 1:1.5; A:N = 1:1.3). As many as, six cattle were found infested with 81-120 lice (mean number, 97.0; 10.6M, 17.0F, 69.3N; M: F = 1:1.5; A: N = 1:2.5). Only two cattle could be placed in more than 120 lice category (mean number, 128.0; 14.5M, 22.5F, 91.0N; M: F = 1:1.5; A:N = 1:2.4). In overall population composition, mean number (mean of lice collected from all the 20 sites) remained 73.6 (10.0M, 16.0F, 47.4N; M:F = 1:1.5; A:N = 1:1.8). The overall ratio of three nymphal instars was found to be 1: 1.4 : 1.8.

As far as the distribution of *L.vituli* on the body of host is concerned, the nape was found to be the most heavily infested site (harboured 25.6% of the population), followed by breast (22.8%) and neck (13.0%). Abdomen and head were the next preferred sites (11.6% and 10.6% respectively). The hind legs were minimally infested (4.2%) as it

harboured lesser number of lice than tail and forelegs (5.9% and 5.6% respectively). In case of heavy infestation, *L.vituli* could occur on any of the body parts but the nape (also breast and neck) remain most lousy areas throughout the year.

The mean monthly prevalences and intensities of infestation of Phthiraptera on three hundred cattle in Rampur district during January to December 2007 have been depicted in Fig.4. The prevalence of lice on the cattle was maximum (27.2%) in April and minimum in June (9.52%). Likewise, the intensity of infestation was maximum in March (7.3 per square inch) and minimum in July (3.0 per square inch).

The correlation between prevalence and temperature ($r = -0.034$) and relative humidity were found nonsignificant ($r = -0.31$). The correlation between intensity and mean monthly temperature also remained nonsignificant at 5% level ($r = 0.24$).

Reports relating to prevalence of different phthirapteran species on the cattle in different parts of the world have appeared in literature from time to time. As far as, species wise prevalence is concerned, *D.bovis* reportedly occurred on 36.3% cattle in Alberta (USA) (Kennedy and Karlka, 1986), 52.8% ($n = 1970$) cattle in U.K (Milnes and Green, 1999), 23.6% cattle ($n = 1752$) in Turkey (El-Metenawy *et al.*, 1997), 36.9% cattle ($n = 1230$) in Canada (Colwell *et al.*, 2001) and 94% cattle ($n = 33$) in Norway (Nafstad and Gronstol, 2001). There is single report on the prevalence of Phthiraptera on Indian cattle (Rawat *et al.*, 1992). Latter, recorded the presence of *D.bovis* on 6.2% cattle ($n = 1176$) in Dehradun. Recently, Kakar and Kakarsulemankhel (2009) recorded the prevalence of *D.bovis* on cattle (38.3%, $n = 990$) in Pakistan. However, during present studies *D.bovis* was found to be more prevalent species on the cattle in Rampur district. This ischnoceran Phthiraptera is a minute non-haematophagous lice and feeds upon skin derivatives of its host. As far as, prevalence of *L.vituli* is concerned it is reported to occur on 37.2% cattle in Alberta, USA (Kennedy and Kralka, 1986), 1.6% cattle ($n = 1752$) in Turkey (El-Metenawy, 1997), 69% ($n = 1230$) in Canada

(Colwell *et al.*, 2001), and 42% cattle in Norway (n= 33) (Nafstad and Gronstol, 2001). Rawat *et al.*, (1992) found that 62.3% cattle (n = 1176) in Dehradun carried *L.vituli*. The haematophagous anopluran *L.vituli* is capable of causing considerable blood loss to host animals. However, its prevalence on the cattle in Rampur district appears to be quite low.

H.eurysternus is a robust haematophagous anopluran, capable of causing considerable annoyance to cattle. It is reported to occur upon 1.9% cattle (n = 1752) in Turkey (El-Metenawy 1997) and 4.4% cattle (n = 1230) in Canada (Colwell *et al.*, 2001). In India, as many as, 9.3% cattle (n = 1176) were found infested by this louse in Dehradun (Rawat *et al.*, 1992). During present studies *H.eurysternus* was found to be the least prevalent louse occurring on the cattle in Rampur district during the year 2007. However, another important louse *S. capillatus*, which is reported to occur upon cattle of most of the part, has yet not been recovered in India. Most of the workers agree that prevalence of lice increases on cattle during winter months (November to February) but during present studies correlation between mean monthly prevalences and mean monthly intensities with mean monthly temperature and R.H. was not found significant.

As far as, intensity of infestation is concerned different workers have adopted different coding system for describing the intensity. Hence, it is difficult to compare the results obtained during present studies. Data shows that mean intensity of *D.bovis* appeared to be higher (4.62 per square inch) in contrast that of *L.vituli* (3.7 per square inch) and *H. eurysternus* (2.8 per square inch). Present study further shows that in case of all the three species of cattle, females outnumbered the males in natural population, as the male, female ratio remained 1:1.4 to 1:1.5. The adult nymph ratio also appeared to be quite similar as it varied from 1:1.7 to 1:1.9. During present studies sex related differences in prevalence were not noted and the lice were more prevalent on younger cattle than older ones.

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