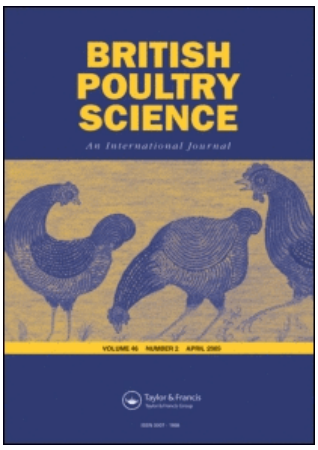


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# Determinants influencing prevalence of louse infestations on layers of District Faisalabad (Pakistan)

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**Abstract** 1. This paper describes the influence of some epidemiological determinants on the prevalence of louse infestation on layers in Faisalabad (Pakistan).
2. Seventy layer farms were screened to determine the prevalence of louse infestation and its determinants including age of the bird, availability of space per bird and frequency of litter change. Prevalence of *Lipeurus caponis* was highest (53·2%), followed by *Menacanthus stramineus* (22·16%), *Goniodes dissimilis* (12·37%) and *Goniodes gallinae* (12·37%).
3. Older birds (36 to 74 weeks of age) were found with a significantly higher prevalence of louse infestation than younger birds.
4. Month-wise prevalence of louse infestation was higher during the summer months (from April to August) and at older age.
5. Birds kept at floor area allowances ranging from 0·43 to 0·55 $m^2$ were highly infested with lice as compared to those provided with a space of 0·61 $m^2$ or higher per bird.
6. Litter change frequency after every 8 weeks resulted in a reduced chance of louse infestation as compared to less frequent litter changing practice.
7. It was concluded from the study that the louse infestation is a menace for the poultry production industry in Pakistan and age, space per bird and litter change frequency are the influencing determinants.
8. Further research on the chemotherapeutic trials and resistance in poultry should be continued for an effective lice control program.

## INTRODUCTION

Poultry are an economic and effective source of animal protein produced within the shortest possible time, and play a vital role in narrowing down the animal protein supply gap (Khan *et al*., 2003). Poultry can easily be infected with several types of bacterial, viral, fungal and parasitic pathogens (Soulsby, 1982). Among various parasites, ectoparasite infestations are of great importance. Ectoparasites of poultry live on the skin or penetrate within the skin or even into the air sacs and some live under the feathers. Pandey *et al*. (1992) reported that in extensive management systems, where the chickens have access to outdoor areas and are not confined, they have a greater diversity of ecto- and endoparasites. Ectoparasites are of great economic importance (Panda and Ahluwalia, 1983). They consume dead cells of skin and tissue fluids, while others suck blood (Urquhart *et al*., 1987). They cause high morbidity by sucking blood and causing irritation to the birds, which adversely affects the economical production of poultry (Pavlovic *et al*., 1989). Haemoglobin and erythrocyte values are reduced leading to hyperchromic anaemia. Moreover, these parasites may serve as mechanical carriers of poultry diseases and pathogens, for example, *Aegyptinella* spp., *Plasmodium* spp., etc.; or can act

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as intermediate hosts for a range of helminthes infections such as *Heterakis gallinarum*, *Choanotaenia infundibulum*, etc. (Permin and Hansen, 1998).

In Pakistan, the reported species of lice in poultry include *Menacanthus stramineus*, *Lipeurus caponis* (Iqbal *et al*., 1971; Shafique, 1979; Ahmad, 1991; Shahjehan and Iqbal, 1995; Rafiq, 2000), *Cuclotogaster heterographus*, *Goniodes dissimilis* (Shahjehan and Iqbal, 1995), *Columbicola colombae* (Hashmi, 1971), *Lipeurus lawrensis tropicalis*, *Goniocotes hidentatus* (Buriro, 1982), *Menopon gallinae* (Shafique, 1979; Buriro, 1982; Bilqees and Khan, 1985; Ahmad, 1991; Shahjehan and Iqbal, 1995; Rafiq, 2000), *Goniocotes gigas* (Buriro, 1982; Bilqees and Khan, 1985; Shahjehan and Iqbal, 1995), *Goniocotes gallinae* and *Goniodes gigas* (Ahmad, 1991; Rafiq, 2000). The productivity of poultry can be enhanced by achieving effective control of some important ectoparasites. This has been widely reported throughout the world (Shah *et al*., 2006). The impact of louse infestation on layers is on the general health, growth and productivity of the birds, providing a big challenge for veterinarians and poultry farmers. Therefore, in the current study, the determinants including age of birds, space per bird and litter change frequency were studied and associated with the prevalence of louse infestation. The results of the current study will provide data that can be used in making objective decisions in control strategies.

## MATERIALS AND METHODS

### Characteristics of study area

The study area (Faisalabad district) lies from 30°42′ to 31°47′ north latitudes and 72°40′ to 73°·40′ east longitudes. A calendar year of Pakistan is divided into 4 seasons, namely, spring (March to May), summer (June to August), autumn (September to November) and winter (December to February). The climate of the area touches two extremes. The maximum temperature in summer reaches up to 44°C. In winter, it goes down to 1·0°C. The hot and humid temperature of the study area has been found favourable for the growth and reproduction of the poultry ectoparasites (Shah *et al*., 2006).

### Selection of layer farms

Out of the total 668 commercial layer farms, 70 typical farms in the Faisalabad district were screened in this study for the prevalence of louse infestation. The mixed bird population in these farms totalled 48 000. Of this population, 4850 mixed layers were examined on the basis of stratified random sampling. The number of sampling units selected from each stratum was determined by a common method of proportional allocation (Thrusfield, 1995). The following were the characteristics of the selected farms: (i) minimum layer population = 500, (ii) farm to farm distance = 5 to 10 km, (iii) farms located within the radius of 100 km of Faisalabad City, (iv) 1-d-old birds started between March and April and (iv) history of louse infestation during the last 5 to 10 years.

### Collection of samples

A survey was conducted on the selected poultry farms in such way that every farm was visited weekly to examine the presence of louse over a period of one year. A complete record of louse-infested birds and the species of louse was maintained. Lice were collected with the help of forceps and preserved in 70% ethyl alcohol in separate bottles from each farm. The permanent mounts were prepared following the standard parasitological procedures (Iqbal *et al*., 2006) and identified on the basis of their taxonomic characters (Soulsby, 1982).

### Epidemiological parameters

The prevalence of louse infestation was recorded on the basis of age and seasonal conditions. The selected farms were housing 1-d-old birds in the months of March or April. To observe the effect of epidemiological determinants including the age of birds, space per bird and litter change frequency on the prevalence of louse infestation, the information was recorded on a pre-designed questionnaire (Thrusfield, 1995). Month-wise prevalence data were recorded starting from the brooding (1 to 6 weeks) to the laying period (72 weeks).

### Statistical analysis

Data thus obtained were analysed through variance, chi-square, regression analyses (Petrie and Watson, 1999) and Kenadall's tau-b analysis (Cohen, 1988) to measure the association of age with space per bird and litter change frequency.

## RESULTS

### Prevalence

Of the total 4850 birds examined for the prevalence of louse infestation, 970 (20%) birds were found infested with different species of louse. The recovered louse included *Lipeurus*

*caponis* (517/970; 53·2%), *Menacanthus stramineus* (215/970; 22·16%), *Goniodes dissimilis* (120/970; 12·37%) and *Goniodes gallinae* (120/970; 12·37%). No bird was found with more than one species of louse. On the monthly basis, the prevalence of louse infestation was significantly ($P = 0{\cdot}0056$) higher during the late spring and summer months (from April to August) and lower during the autumn and winter months (September to March). Irrespective of the age of birds, the percentage of louse infestation increased from late April and reached its peak in August (Figure 1).

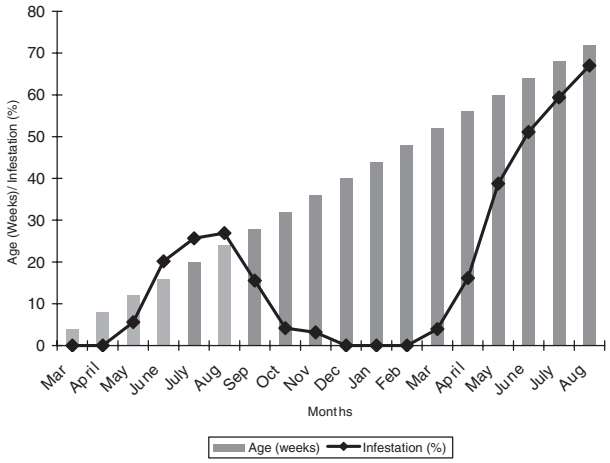


**Figure 1.** *Seasonal prevalence of louse infestation on layers of District Faisalabad (Pakistan).*

## Determinants

### *Age of birds*

It was found that the prevalence of louse infestation irrespective of the species was significantly higher ($P < 0{\cdot}05$) in older birds ranging from 36 to 72 weeks of age and lower in younger birds of less than 36 weeks of age. The graph of the regression analysis shows a positive association of age with prevalence of louse infestation ($y = 0{\cdot}3382x - 4{\cdot}3103$; $R^2 = 0{\cdot}9693$) (Figure 2).

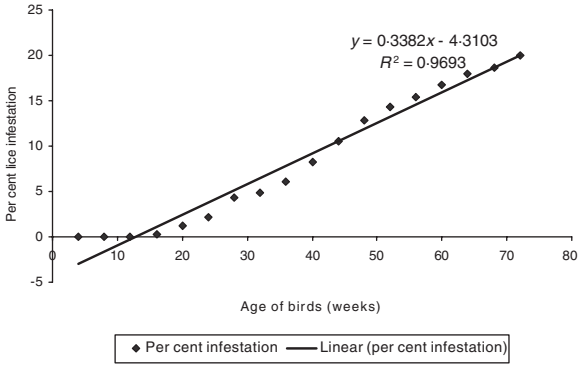


**Figure 2.** *Influence of age on the lice infestation in poultry.*

### *Availability of space per bird*

Data collected on the space provided per bird on each farm was correlated with the prevalence of louse infestation. It was found that only those birds provided with 0·43 to 0·55 $m^2$ space per bird were infested with the louse infestation. No bird provided with more than 0·55 $m^2$ space per bird was found positive for louse infestation (Figure 3). An insignificant positive association (Kenadall's tau-b $= -0{\cdot}038$; $P = 0{\cdot}162$) was found between age and space per bird as analysed through Kenadall's tau-b analysis.

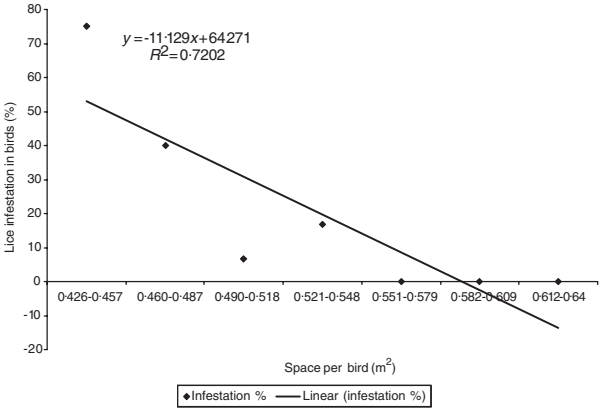


**Figure 3.** *Influence of space per bird on the lice infestation in poultry.*

### *Frequency of changing litter*

It was found that the prevalence of lice infestation was significantly higher ($P < 0{\cdot}05$) in farms with lower litter change frequency ranging from 0 to 3. Farms with higher litter change frequency of 3 to 6 times had a lower prevalence of lice infestation ($y = -8{\cdot}7137x + 47{\cdot}141$; $R^2 = 0{\cdot}7665$) (Figure 4). However, older animals were having less frequency of litter change. To investigate the relationship between litter change frequency and age, Kenadall's tau-b analysis was conducted which revealed a significant negative association between the two parameters (Kenadall's tau-b $= -0{\cdot}129$; $P < 0{\cdot}001$).

## DISCUSSION

In the current study, the reported species are *Lipeurus caponis*, *Menacanthus stramineus*, *Goniodes dissimilis* and *Goniodes gallinae*. The same species have also been reported by Trivedi *et al.* (1991).

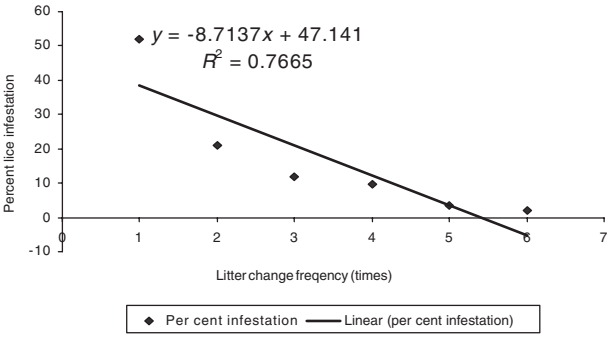


**Figure 4.** *Influence of litter change frequency on the lice infestation in poultry.*

The results of age-wise prevalence of lice infestation of the current study are not different from the previously reported data (Bilqees and Khan, 1985; Saxena *et al*., 1995). This trend of lice infestation in older birds might be due to the poor quality of litter and irregular use of insecticides during these age groups, that is, the litter change frequency was low and the insecticides were not used according to the proper schedule.

The data on the month-wise prevalence of louse infestation in birds indicating a higher intensity and percentage of birds during the summer months is not different from the previous reports (Saxena *et al*., 1995; Islam *et al*., 1999). The temperature range of the study area during the late spring and summer months is 30 to 44°C. The higher intensity of louse infestation during these months may be due to the favourable environmental temperature for their growth and reproduction, for example, the optimum temperature for the development of *Menacanthus stramineus* is 37·7 to 41·5°C (Brown, 1970).

No published data could be found on the influence of space per bird on the prevalence of lice infestation. However, in the current study, the results showed that infestation was significantly higher in farms with less than 0·61 $m^2$ space per bird. Hence, proper space availability according to the age of the birds may reduce the chances of lice infestation. Low frequency of litter change favoured the prevalence of louse infestation on layers of the study farms. Moreover, the older birds of the study farms were subjected to fewer litter changes than younger ones and the Kenadall's tau-b analysis does not clarify the true impact of litter change frequency on the prevalence of louse infestation. However, Ugochukwu and Omije (1986) and Islam *et al*. (1999) have reported higher ectoparasitic infestations in farms with poor litter change frequency and lower levels in those with a battery-cage system of management.

## CONCLUSIONS

It was concluded from the study that the louse infestation is a menace for the poultry production industry in Pakistan and age, space per bird and litter change frequency may be the influencing determinants on the prevalence of louse infestation. Further experimentation is required to determine the extent of impact of age, space per bird and litter change frequency on the prevalence of louse infestation. Moreover, further research on the chemotherapeutic trials and antiparasitic resistance in poultry should be continued for the effective lice control programme at the national level.

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