

Bovine pediculosis: prevalence and chemotherapeutic control in Pakistan

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Abstract

Six hundred cattle and buffaloes each were randomly selected from population in and around district Faisalabad and examined under field conditions for the prevalence of lice infestation. *Haematopinus eurysternus*, *Haematopinus tuberculatus*, *Linognathus vituli* were reported in this area. Prevalence of lice was higher (24%; 144/600) on cattle than buffaloes (18%; 113/600).

The prevalence was higher in adult age and lowest in older age in both the species. Closed houses were having highest infestation followed by cement type and open type houses. Month wise prevalence was found highest in months of March - April and lowest in August - September. For chemotherapeutic trial, thirty cattle and buffaloes each were randomly divided into three major groups (A thru C) each of which was further divided into two sub groups for cattle and buffaloes, respectively. The major group A was treated with ivermectin (Ivomec, MSD, Netherlands; S/C 200µg/kg b.wt.) and group B was treated with topical application of cypermethrin (Ecoflece, Bimeda, Ireland; 1mL/200mL water). The animals of group C1 were given a sham treatment of propylene glycol (S/C 8-10 mL/large animal) whereas the topical application of normal saline was done on the animals of group C2. Number of lice per animal before and after treatment was counted to determine the efficacy of drugs. It was observed that maximum control (100%) was achieved on day 28 post-treatment with the ivermectin-treated buffaloes.

Ivermectin was more effective insecticide than cypermethrin.

Key Words: Bovines, Cypermethrin, Ivermectin, Pakistan, pediculosis

Introduction

Pediculosis in cattle occurs throughout the world and is more common in cattle than in any other domestic animal (Urquhart et al 1987). Cattle lice are unable to survive for more than few days off their host (Matthysse 1946; Wall and Shearer 1997). Lice infestation causes weight loss up to 25-30 Kg and 15-25% per animal per year decrease in the milk production (Fadok 1984; Loomis 1986). The lice infested animals loose their conditions and production rapidly. In addition, lice infestation contributes to huge economic losses due to damage to skin and hide in form of light flecks and spots followed by secondary bacterial infection or scratching behaviour and inflammation of the skin (Ormazdi and Bakar 1980; Webster and Bugby 1990; Nafstad and Gronstol 2001b; 2001c). The frequency of cattle hides without light flecks and spots can be increased by lice control programme that indicates an association between them (Nafstad and Gronstol 2001c). Lice infested animals keep poor physical condition and develop an unthrifty, anemic appearance, discoloured greasy hair (Nelson 1984). Louse free animals are more profitable than infested animals due to increased rate of weight gain and more feed utilization (Collins and Dewhirst 1965). The present study was therefore, designed to (i) determine the prevalence of lice infestation (ii) study various determinants influencing the prevalence including breed, species, age, type of housing, climate etc. and (iii) determine the comparative efficacy of ivermectin and cypermethrine for the control of lice infestation in cattle and buffaloes.

Materials and methods

Study Area

Faisalabad district lies from 30°- 42' to 31°- 47' north latitudes and 72° - 40' to 73° - 40' east longitudes. It contains five tehsils i.e. Faisalabad, Jhumra, Jaranwala, Samundri and Tandlianwala and is bounded on north by Jhang, Hafizabad and Sheikhpura districts, on east by Sheikhpura, Okara and Sahiwal, on south by Sahiwal and Toba Tek Singh districts and on west by Toba Tek Singh and Jhang districts of Pakistan. A calendar year of Pakistan is divided into four seasons viz; spring (March to May), summer (June to August), autumn (September to November) and winter (December to February). The climate of the district touches two extremes.

The maximum temperature in summer reaches upto 44 °C. In winter, it goes down to 1.0 °C. The data on the environment of the year 2004-2005 of the study area was collected from the Metereological Department of Pakistan.

Sampling

Total population of cattle and buffaloes each in the Faisalabad district is approx. 6000. Out of total population, six hundred each cattle and buffaloes were sampled based on stratified random sampling method (Thrusfield 1995) and screened for the prevalence of lice infestation in the study area.

Collection, preservation and identification of lice

The samples were collected during the period of July 2004 to June 2005 using method as described by Soulsby (1982). The collection was done with the help of forceps or by combing the hair carefully to avoid any damage to the body of lice and skin of the host (Soulsby 1982). The total infested area was measured by counting the number of lice in different patches of one square inch (Chamberlain 1978). The collected samples were preserved in 70 per cent ethyl alcohol and brought to the Epidemiology laboratory of the Department of Veterinary Parasitology, University of Agriculture, Faisalabad. The preserved specimens were stained with acid fuschin and examined under the microscope for identification of species. The lice were identified based on morphological characteristics as described by Meleney and Kim (1974) and Soulsby (1982).

Prevalence

The prevalence of lice infestation was determined in cattle and buffaloes of district Faisalabad. The month wise record of prevalence was maintained from July 2004 to June 2005 to determine the variations with respect to seasonal and climatic changes. The prevalence was associated with the temperature, rainfall and humidity of the study areas during the study period. Various other determinants affecting the prevalence of lice infestation were also studied including the age and breed of host and type of housing of animals.

Chemotherapeutic trials

Comparative efficacy of the two antiparasitic drugs was conducted in this study. To this end, thirty cattle and buffaloes each of different breed, age and sex positive for lice infestation were selected for a chemotherapeutic trial. These animals were divided into three major groups (A thru C) each of which was further divided into two sub groups A1 and A2, B1 and B2 and C1 and C2 having 10 animals in each sub group. Groups A1, B1 and C1 were for Cattle and A2, B2 and C2 were for buffalo. The animals of group

A (A1 and A2) were treated with ivermectin (Ivomec, MSD, Netherlands; 200µg/Kg, sub cutaneous) and those of group B with topical application of cypermethrin (Ecoflece, Bimeda, Ireland) in a concentration of 1mL of cypermethrin/200mL of water. The animals of group C1 were given a sham treatment of propylene glycol (vehicle) at a dose of 1 mL/50Kg sub cutaneous whereas the topical application of normal saline was done on the animals of group C2. The efficacy of ivermectin and cypermethrin was determined by counting the number of lice on neck, shoulder, back and tail of infested animals before and after treatment.

The per cent control of lice on cattle and buffaloes treated with ivermectin and cypermethrin at different days of treatment were calculated by following formula.



Statistical Analysis

The data on the prevalence of lice infestation in the study area were subjected to one way analysis of variance (ANOVA) and represented by means \pm standard error (SE). The association of lice infestation with various determinants of host and environment was calculated by regression analysis (Steel et al 1997).

Results

Prevalence

The prevalence of lice infestation was recorded as 24% (144/600) and 18.83% (113/600) on cattle and buffaloes, respectively. The results showed a significantly higher ($p < 0.05$) prevalence of lice infestation in cattle as compared to buffaloes. The breed wise prevalence of lice was recorded as highest (27.33%; 41/150) in Friesian and lowest (22.18%; 71/320) in Sahiwal cattle. The intermediate values of prevalence were found in Jersey cattle (24.61%; 32/130) and Nili-Ravi (20.33%; 61/300) and Kundi (17.33%; 52/300) buffaloes. With respect to area, the prevalence of lice infestation was significantly ($p > 0.05$) higher in cattle of Jhang (28%; 56/200) followed in order by Jaranwala (24.44%; 33/135), Faisalabad (21.42%; 30/135) and Chak Jhumra (20%; 25/125). The same trend of lice infestation was found in buffaloes being the highest in Jhang (21.57%; 41/190) followed in order by Faisalabad (18.58%; 26/140), Jaranwala (17.14%; 24/140) and lowest in Chak Jhumra (16.92%; 22/130). The data of lice infestation was observed for the age wise prevalence. It was found highest in adult cattle (25%; 50/200) and buffaloes (24.5%; 49/200) followed by young cattle (20%; 40/200) and buffaloes (17.5%; 35/200) with the least in older cattle (22.5%; 45/200) and buffaloes (14.5%; 29/200).

The prevalence of lice infestation based on house type was recorded significantly ($p > 0.05$) highest (31.33%; 47/150) each in close type housing and mud plastered housing and lower (16.66%; 25/150) each in open type and cement plastered housing of cattle. In buffaloes, prevalence of lice was recorded highest (24%; 36/150) each in close type and mud plastered type of houses followed in order by open type housing (13.33%; 20/150) and cement plastered housing (14%; 21/150). The prevalence of lice on the basis of animal species was recorded significantly higher ($p > 0.05$) in cattle (24%; 144/600) than buffaloes (18.83%; 113/600). The infestation in cattle was found highest in the month of March (94%; 47/50) and lowest (20%; 10/50) in August. In buffaloes, the highest prevalence was recorded in April (84%; 42/50) and lowest in September (12%; 6/50). In the current study, three types of sucking lice were identified viz; *Haematopinus eurysternus*, *Haematopinus tuberculatus* and *Linognathus vituli*.

Chemotherapeutic trial

Comparative efficacy of two drugs viz; ivermectin and cypermethrin was studied for the control of lice infestation in cattle and buffaloes. The evaluation of efficacy of ivermectin and cypermethrin was based on the number of lice observed on infested treated and vehicle control groups of animals before and after treatment. The day-wise per cent control of lice infestation on cattle and buffaloes are presented in table 1 and 2, respectively. These results indicated the better control of lice infestation in ivermectin treated animals than those treated with cypermethrin.

Table 1. Per cent control of lice infestation on cattle treated with Ivermectin and Cypermethrin

Insecticides	No. of lice before treatment	Number of lice after treatment with percent control				
		Days Post treatment				
		1	7	14	21	28
Ivermectin	20	17 (15%)	9 (55%)	4 (80%)	2 (90%)	0 (100%)
Cypermethrin	19	15 (21.1%)	11 (42.1%)	5 (73.7%)	3 (84.2%)	1 (94.7%)
Control	20	20 (0%)	21 (-5%)	24 (-20%)	24 (-20%)	27 (-35%)

Figures in parenthesis indicate percent control of lice in treated and in un-treated control groups

Table 2. Per cent control of lice infestation on buffalo treated with Ivermectin and Cypermethrin

Insecticides	No. of lice before treatment	Number of lice after treatment with percent control				
		Days Post treatment				
		1	7	14	21	28
Ivermectin	20	18 (10%)	8 (60%)	5 (75%)	2 (90%)	0(100%)
Cypermethrin	19	16 (15.8%)	10 (47.4%)	6 (68.4%)	3 (84.2%)	1 (94.7%)
Control	20	20 (0%)	22 (-10%)	24 (-20%)	25 (-25%)	29 (-45%)

Figures in parenthesis indicate percent control of lice in treated and in un-treated control groups

Discussion

Pediculosis is one of the notorious diseases affecting livestock production and efficiency at global level. Lice infestation has been reported to cause blood loss (Shemanchuk et al 1963; Butler 1985), weight loss upto 25-30 Kg (Scharff 1962; Nickel 1971; Cummins and Graham 1982; Fadok 1984; Gibney et al 1985; Loomis 1986), stress, decrease in milk production (Fadok 1984; Loomis 1986) and transmission of various pathogens (Loomis 1986).

In the current study, the prevalence of lice infestation was found significantly ($p > 0.05$) higher in cattle than buffaloes. These findings are not in accord with the previous studies conducted in the same study area where the lice infestation was recorded as 17% and 20% in cattle and buffaloes (Iqbal 1971). Prevalence of lice infestation in bovines has been reported by various workers from different countries e.g. Nafstad and Gronstol (2001a), Colwell et al (2001), Topgu (1999) but the rate of infestation is varied that may be due to the ecological, managerial, geographical and seasonal factors. Area wise prevalence has a similar trend to that recorded by Iqbal (1971). Breed wise prevalence was found highest in Friesian and lowest in Sahiwal cattle, that is line with the findings of Chalmers and Charleston (1980) who reported that lice infestation was more in Friesian cattle than any other breed of animal. This highest rate of prevalence of lice infestation is found in Friesian due to its exotic nature and difference and geo-climatic habitat. Lice infestation has been found higher in younger animals than older ones (Chalmers and Charleston 1980; Milnes and Green 1999). In the current study, closed type, mud plaster housing made the animals more prone to lice infestation. Similar findings have been reported by Geden et al (1990) with higher infestation in close type of mud plastered housing than open type cement plastered housing because of less exposure to sunlight of animals of close type mud plastered houses. Regarding the seasonal occurrence of lice infestation, Chalmers and Charleston (1980) and Geden et al (1990) reported that population of sucking lice starts increasing in late winter and reaches its highest level in spring but lowest in summer and autumn months.

The current findings are in accord with these reports. The population of lice reaches its highest level in the month of February, March and April due to favourable environmental factors (temperature, humidity). Three species of lice viz; *Haematopinus eurysternus*, *Linognathus vituli* and *Haematopinus tuberculatus* have been identified in the current study. These species have been identified and reported by various scientists including: Chalmers and Charleston (1980), Yeruham et al (1982), Topgu (1999), Rothwell et al (1999), Colwell et al (2001) and Nafstad and Gronstol (2001a). However, in Pakistan, *Haematopinus tuberculatus* had not previously been reported (Iqbal 1971).

Ivermectin is a drug which contains ivermectin 1% w/v solution. It is active at extremely low dosage against a wide variety of nematode and arthropod parasites. Campbell et al (1983) reported the biochemistry, structure, mode of action and safety of ivermectin in detail. In this study, the efficacy of ivermectin (Ivomec, MSD, Netherlands) and cypermethrin (Ecoflece, Bimeda, Ireland) was evaluated under the local field conditions on cattle and buffaloes. The efficacy of a single S/C administration of ivermectin at the dose rate of 200µg/kg was found 100% on 28th day of medication (Leaning 1984; Logan et al 1993; Chick et al 1993; Titchener et al 1994; Phillips et al 1996; Hossen and Mostofa 1999; Colwell 2002). The results of the present study are not in accordance with the studies of Clymer et al (1998) and Skogerboe et al (2000) who treated affected cattle by topical, oral, S/C and I/M routes of administration of Ivermectin.

In present study the control groups treated with propylene glycol for ivermectin control and normal saline for cypermethrin control were having an increasing trend of lice infestation during the course of study period (Manurung et al 1987).

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[Go to top](#)