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Dynamic Dispersal and Chemotherapy of Bovine Pediculosis in Selected Population of Central Punjab, Pakistan

[1]Asif Iqbal, [2]Faisal Siddique,
[2]Muhammad Shahid Mehmood and [3]Tayyab Zafar

[1]Department of Parasitology, University of Agriculture, Faisalabad, Pakistan
[2]Institute of Microbiology, University of Agriculture, Faisalabad, Pakistan
[3]Department of Clinical Medicine and Surgery,
University of Agriculture, Faisalabad, Pakistan

Abstract: A total of 1600 cattle and buffaloes (800 each) were randomly examined for lice infestation and its treatment in district Toba Tek Singh (T.T. Singh), Punjab, Pakistan. Over all, infestation rate was found 32.12% (514/1600). *Haematopinus eurysternus* (75.87%) and *Linognathus vituli* (24.13%) were the predominant lice species in bovine population. Between both species, cattle (36%) were found having significantly higher burden as compared to buffaloes (28.25%). Female (72.76%) and young (57.98%) animals were found significantly (P>0.005) more heavily infested as compared with males (27.24%) and adults (42.02%), respectively. December and January were more favorable months for lice proliferation in comparison with other months. For the assessment of different chemotherapeutic agents, animals were divided into four groups i.e. A (Ivermectin), B (Cypermethrine), C1 (Sham treatment) and C2 (Sham treatment) respectively. Ivermectin was found more effective insecticide than cypermethrin. These observations may lay foundation for future lice control programs in selected regions of Punjab Pakistan.

Key words: Lice · Cypermethrin · Ivermectin · Pakistan · Pediculosis

INTRODUCTION

Pediculosis in cattle occurs throughout the world and is more common in cattle than in any other domestic animal and these are unable to survive for more than few days off their host [1]. It causes weight loss up to 25-30 Kg, loose their conditions and 15-25% per animal per year decrease in the milk production [2]. Moreover, lice are responsible for massive economic losses by quality of hides and skin [3,4]. Lice control programme plays an important role in improving the quality of cattle hides [5].

Lousy animals possess poor physical condition and develop an unthrifty, anemic appearance, discoloured greasy hair [6]. Louse free animals are more profi and than infested animals due to increased rate of weight gain and more feed utilization [7]. Prevalence of bovine pediculosis has been reported 34.7% [8] and 18.8% [9] in buffaloes of Pakistan. More recently, prevalence of lice has been recorded 7.17% and 9.84% in cows and buffaloes [10], respectively. To this end, no study has been conducted so far in some districts of Pakistan.

The present study was therefore, designed to (i) define the prevalence of lice infestation (ii) study various determinants influencing the prevalence including, species, breed, sex and age and (iii) compare the efficacy of ivermectin and cypermethrine for the control of lice infestation in bovines.

MATERIALS AND METHODS

Study Area: District T.T. Singh is located in central Punjab, Pakistan. A detailed description about the study area has been highlighted by Iqbal *et al.* [11]. The majority of dairy farmers have traditional stall feeding systems with poor husbandry practices.

Corresponding Author: Asif Iqbal, Department of Parasitology, University of Agriculture, Faisalabad, Pakistan.
Cell: +923006560477.

Sampling: Total population of cattle and buffaloes in the T.T. Singh district is approx. 1600,000. Out of total population, eight hundred each cattle and buffaloes were screened based on stratified random sampling method [12].

Collection, Preservation and Identification of Lice: The specimens were collected during the period of April 2012 to March 2013. 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 [1]. The total infested area was measured by counting the number of lice in different patches of one square inch as described by Chamberlain [13]. The collected samples were preserved in 70 % 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 [1].

Prevalence and Chemotherapeutic Trial: The association of prevalence with temperature, rainfall and humidity of the study area during the study period was recoded. Various other host related determinants including the age, sex and breed were also studied. For the evaluation of comparative efficacy of two insecticides, sixty cattle and buffaloes each of different, age and sex positive for lice infestation were selected for a chemotherapeutic trial.

These animals were divided into three major groups (A through C) each of which was further divided into two sub groups A1 and A2, B1 and B2 and C1 and C2 having 20 animals in each sub group. Groups A1, B1 and C1 were for Cattle and A2, B2 and C2 were for buffaloes. The animals of group A (A1 and A2) were treated with ivermectin (Ivomec, Merial, France; 200µg/Kg, sub cutaneous) and those of group B with pour-on application of cypermethrin (Cipermetriven, Ivan Labs, Spain; 1ml/200ml water) in a concentration of 1ml of cypermethrin/200ml of water. The animals of group C1 were given a sham treatment of propylene glycol at a dose of 1ml/50Kg sub cutaneous whereas the pour-on 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 percent control of lice on cattle and buffaloes treated with ivermectin and cypermethrin at different days of treatment were calculated.

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 ± standard error (SE). The association of lice infestation with various determinants of host was calculated by regression analysis [14].

RESULTS

Prevalence: Over all prevalence of bovine louse infestation was 32.12% (514/1600) and rate of infestation was recorded higher ($p<0.05$) on cattle (36%; 288/800) than buffaloes (28.25%; 226/800). Among them, *Haematopinus eurysternus* and *Linognathus vituli* were the predominant species. Among various host related determinants, breed wise prevalence of lice was recorded as highest in Friesian (57.50%; 115/200) and lowest (24.11%; 82/340) in Sahiwal cattle. The intermediate values of prevalence were found in Jersey cattle (35.0%; 91/260), Nili-Ravi (28.50%; 114/400) and Kundi (28.0%; 112/400) buffaloes. Prevalence was found higher in adult animals (57.98%; 298/514) as compared to the young animals (42.02%; 216/514).

With respect to area, the prevalence of lice infestation was significantly ($p>0.05$) higher in cattle of T.T. Singh (40.07%; 107/267) followed in order by Kamalia (36.46%; 97/266) and Gojra (31.57%; 84/266). The same trend of lice infestation was found in buffaloes being the highest in T.T. Singh (39.32%; 105/267) followed in order by Kamalia (34.95%; 79/266) and lowest in Gojra (15.78%; 42/266). Significantly ($p> 0.05$) highest infestation rate was recorded in closed houses (40.2%; 201/500) followed by semi-closed type (32.5%; 195/600) and open type houses (23.6%; 118/500) as shown in Table 1.

The infestation in cattle was found highest in the month of March 79% and lowest 20% in August. In buffaloes, the highest prevalence was recorded in April (64%) and lowest in September (12%) as shown in Figure 1.

Chemotherapeutic Trial: 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 percent control of lice infestation on cattle

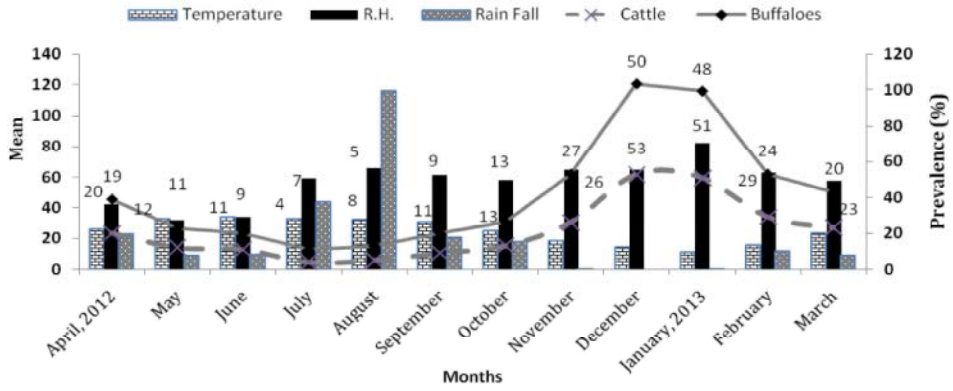

Fig. 1: Prevalence of Bovine Pediculosis with respect to environmental factors in district Toba Tek Singh

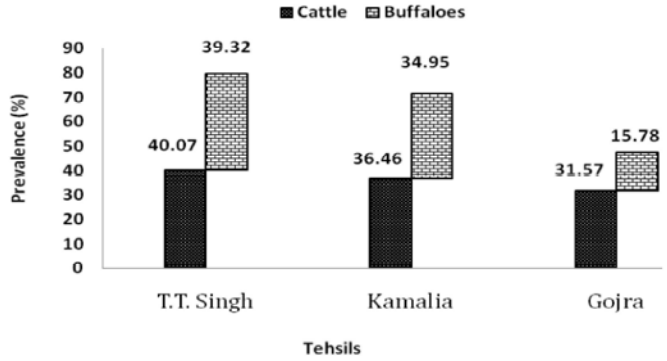

Fig. 2: Tehsil wise Prevalence of Lice in Bovines of District T.T. Singh

Table 1: Association of determinants with the prevalence of lice in bovine population of district T.T. Singh

Overall prevalence (%)			32.12% (514/1600)		
Associated determinants	Variables	Levels	Prevalence (%)	Odds Ratio	P-value
Agent	Species	*Haematopinus eurysternus*	75.87% (390/514)	1.39	0.132
		Linognathus vituli	24.13% (124/514)		
Host	Sex	Female	72.76% (374/514)	2.03	0.010
		Male	27.24% (140/514)		
	Age	Young	57.98% (298/514)	1.33	0.304
		Adult	42.02% (216/514)		
	Species	Cattle	36% (288/800)	2.11	0.011
		Buffaloes	28.25% (226/800)		
	Breed	Friesian	57.50% (115/200)	1.30	0.439
		Jersey	35% (91/260)	1.20	0.635
		Nili-Ravi	28.50 % (114/400)	1.50	1.000
		Kundi	28% (112/400)	1.91	0.009
		Sahiwal	24% (82/340)	-	-
Other Determinants	Cattle	T.T. Singh	40.07% (107/267)	2.11	0.010
		Kamalia	36.46% (97/266)	1.46	0.023
		Gojra	31.57% (84/266)	-	-
	Buffaloes	T.T. Singh	39.32% (105/267)	2.23	0.001
		Kamalia	34.95% (79/266)	1.12	0.003
		Gojra	15.78% (42/266)	-	-
	Housing system	Close	5.12% (41/800)	2.41	0.002
		Semi close	4.12% (33/800)	1.94	0.031
		Open	2.12% (17/800)	-	-

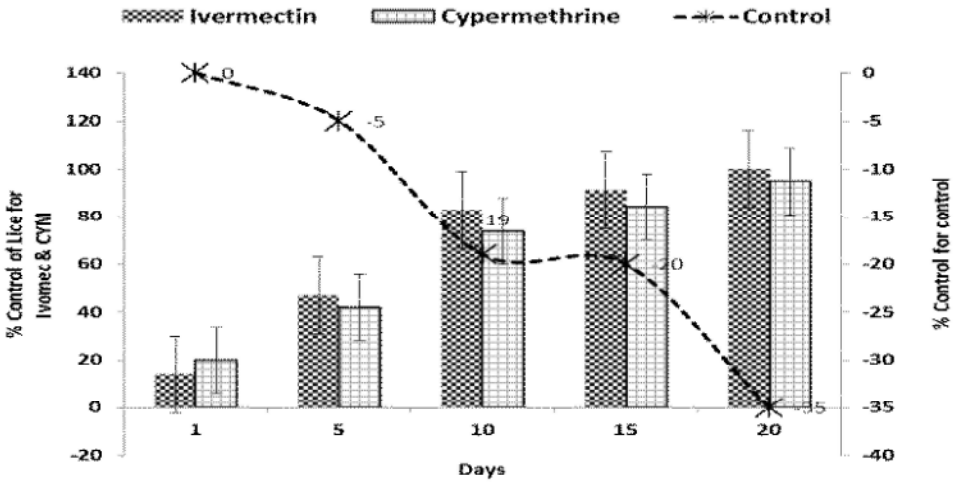

Fig. 3: Percent control of lice infestation on cattle treated with ivermectin and cypermethrine

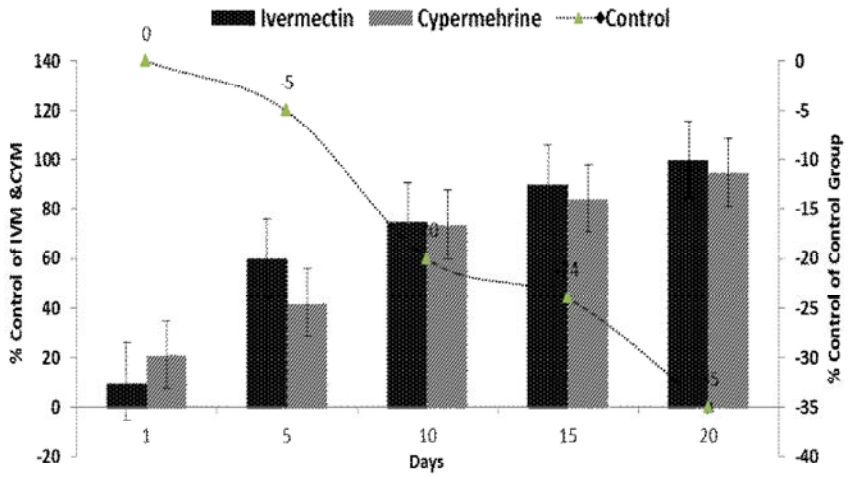

Fig. 4: Percent control of lice infestation on buffaloes treated with ivermectin and cypermethrine

and buffaloes are presented in Figure 3 and 4, respectively. These results indicated the better control of lice infestation in ivermectin treated animals than those treated with cypermethrin.

DISCUSSION

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 another district of Punjab, where the lice infestation was recorded as 17% and 20% in cattle and buffaloes [15]. Prevalence of lice infestation in bovines has been reported by various workers from different countries e.g. [16, 17] but the rate of infestation is varied that may be due to the ecological, managemental, geographical and seasonal factors.

Area wise prevalence has a similar trend to that recorded by Iqbal [15]. Breed wise prevalence was found highest in Friesian and lowest in Sahiwal cattle, that is line with the findings of Chalmers and Charleston [18] who reported that lice infestation was more in Friesian cattle than any other breed of cattle which may be due to its exotic nature and difference and geo-climatic habitat. Similarly higher lice infestation in young animals [18, 19] may be due to lesser development of immune system in neonate.

In the current study, closed type, housing made the animals more prone to lice infestation. Similar findings have been reported by Geden *et al.* [20] 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 plastid houses. Regarding the seasonal occurrence of lice

infestation, [18, 20] 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 favorable environmental factors (Temperature, humidity). *Haematopinus eurysternus* and *Linognathus vituli* have been identified and reported by various scientists including [16,18,21,22].

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. The biochemistry, structure, mode of action and safety of ivermectin has been reported in detail [23]. The efficacy of a single S/C administration of ivermectin at the dose rate of 200µg/kg was found 100% on 20th day of medication, which has also been defined by other researchers [24, 25]. The results of the present study are not in accordance with the studies of Clymer *et al.* [26] and Skogerboe *et al.* [27] 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 [28].

In the light of results from the present study, the following recommendations are advisable for the small holder: (a) preventive therapy may be useful to minimize lice infestations before the start of winter, focusing on the most frequently infested parts of body (b) young and female animals should be given special attention as they are more prone to lice infestation.

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