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EVALUATION OF GENETIC RESISTANCE TO *HAEMONCHUS CONTORTUS* INFECTION IN PAKISTANI SHEEP BREEDS

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ABSTRACT

This study was conducted on four sheep breeds, Karakul, Kajli, Thalli and Kachhi for their natural resistance against *Haemonchus contortus.* After deworming, 13 animals of each breed were ingested with doses of 5000 L3 of *Haemonchus contortus* and then evaluation of each was made on the basis of fecal egg count (FEC), body weight, FAMACHA score and packed cell volume (PCV) at different days of interval. Out of four sheep breeds, Thalli sheep showed significant decrease ($P<0.05$) in fecal egg count, higher PCV and less anemic score of FAMACHA thus presented greater resistance against *Haemonchus contortus* whereas Karakul, Kajli and Kachhi were seen susceptible to the infection. It was concluded that Thalli sheep have greater genetic tendency to resist against the *Haemonchus contortus* infestation and this breed could be kept and bred from the economic point of view.

Key words: FAMACHA, Genetic resistance, *Haemonchus contortus,* Sheep breeds, Pakistan

INTRODUCTION

Importance of small ruminants could not be denied in meat and leather industry of Pakistan. Sheep play an integral role in generating income and provide financial support for poor farmers in developing countries. Endo-parasites represent a major constraint to the production and growth of small ruminants and among those, *Haemonchus contortus (H. contortus)* is of major concern in tropical and sub-tropical regions (Paraud *et al.,* 2010). Significant morbidity characterized by anemia, weight loss, unthriftiness and mortality in hyper acute infection have been observed (Notter *et al.,* 2003). Importance of anthelmintics against haemonchsosis could not be ignored but due to anthelmintic resistance against *H. contortus (*Kamaraj *et al.,* 2011), rise in prices of drugs, residues of anthelmintic in meat, preference of using organic meat are the major contributing factors in using this traditional approach. So, alternative possibilities are being sought to overcome the problem of haemonchosis. An alternative viable solution is the selection of resistant breed for proper control of this malady (Saddiqi, 2010b). This approach will not only overcome the problem of anthelmintic resistance but will also help in selection of genes regulating the resistance mechanism (Miller *et al.,* 2006). It has been observed by researchers that different sheep breeds show different resilience against internal parasites. Lot of studies has been conducted actively to find the genetic resistance among different breeds of sheep and goat in different regions of the world but there is dearth of literature regarding this in Pakistan. So, this study was aimed to evaluate the four important breeds of Pakistan (Karakul, Kajli, Thalli and Kachhi) to find the genetic resistance among them against haemonchosis.

MATERIALS AND METHODS

The study was conducted in the Pakistan's biggest small ruminant farm with an area of 14472 Acres (Angora Goat Farm, Rakh Khairewala, District Layyah in Punjab province). Thirteen healthy animals of each breed from both sexes were selected for this study from 4 sheep breeds Karakul (m=7; f=6), Kajli (m=6; f=7), Thalli (m=8; f=5), and Kachhi (m=4; f=9), having average age of 4-6 months. Two animals of each breed were designated as control. All selected animals were kept under same management system. Animals were not allowed for open grazing to minimize the chances of getting the internal nematodes infestation from field and all animals under captivity were offered Total Mixed Ration (TMR) at 3% body weight daily. All selected animals were dewormed with Albendazole @ 10 mg/kg orally (Albenzole granules; Selmore Agency, Pakistan).

L3 larvae of *H. contortus* were produced and used as challenge to the selected animals with controlled dosage. The *H. contortus* was obtained from the positive field sample from sheep after Fecal Egg Count. The eggs were cultured in the laboratory up to L3 stage. At day 0 initial readings from all animals were taken and doses of 5000 L3 were administered to the animals except controls. Data on body weight, fecal egg counts (FEC), packed cell volume (PCV) and FAMACHA were recorded for evaluating the susceptibility and resistance

of breed against *H. contortus* on days 0, 28, 35 and 42 during the study.

Statistical package (SAS) was used to analyze data to find sheep breed resistance against *H. contortus* in term of FEC, PCV, body weight and FAMACHA through analysis of variance. Results are presented in the form of mean and standard error. Significant factor level was considered at $P < 0.05$.

RESULTS AND DISCUSSION

The mean values of all the recorded readings of Fecal Egg Count, FAMACHA, Body weight and Packed Cell Volume showed that there was variation in response of all the sheep breeds to internal *H. contortus.* The mean FECs in Thalli and Kachhi sheeps were lower ($P < 0.05$) than Krakul, Kajli (Table 1). No significant difference ($P >0.05$) was found between sex for FEC. FEC is considered an important phenotypic marker *(*Bricarello *et al.,* 2002) along with other parameters to find resistant sheep breed against *H. contortus* (Amarante *et al.,* 2004; Vanimisetti *et al.,* 2004). Previously, this method has been used extensively to evaluate resistance (Douch *et al.,* 1996; Saddiqi *et al.,* 2010a).

Initially, the PCV values showed no significant difference ($P> 0.05$) among sheep breeds but at the 35th day of experiment, significant difference ($P< 0.05$) was found (Table 2). Lower values of PCV in Karakul and Kajli as compared to Kachhi and Thalli were indicative of heavy parasitic infestation in these breeds subsequently showing more susceptible to the infection. Present observations correlate with the findings of Notter *et al*. (2003), who reported the gradual decrease in PCV in susceptible breeds. Many Blood sucking parasites including *H. contortus* often lead to the lower PCV values and other hematological disturbances and this is attributed to the loss of blood through GIT by the injuries caused by these parasites (Mugambi *et al.,* 2005). So, Hematocrit is taken as valuable tool to check the GIT blood sucking parasites (Taylor *et al.,* 1990).

FAMACHA score at different days after infection is given in Table 3. Breed differences were detected for FAMACHA scores ($P< 0.05$) at different day intervals. Thalli breed showed less anemic score of FAMACHA as compared to other breeds. FAMACHA system is indicative of anemic condition of an animal (Van Wyk and Bath, 2002; Vatta *et al.,* 2001) and useful tool for identification of sheep breeds with parasite resistance or resilience to *H. contortus.* Higher FAMCAHA score in other sheep breeds showed the susceptibility of those breeds towards blood feeding parasites that led to the anemia of an animal (Burke and Miller, 2008).

Maximum mean weight was gained by Thalli breed followed by Kachhi, Karakul and Kajli (Table 4). Although Kachhi and Thalli remained heavier during the experimental period, Karakul and Kajli lost their weights at the mid of trial that showed these breeds are less capable to cope the stress of parasitic burden of GIT. Moreover, it might be due to haematophagous nature of *H. contortus*. These findings are in line with Mugambi *et al*. (2005), who observed overall less weight in Dorper and Red Maasai breeds during trial but Vanimisetti *et al*., (2004); Burke and Miller, (2004), contradicted these results by concluding no significant difference in body weight gain. This might be due the genetic variability of these breeds for body weight gain against internal nematodes infestation.

Table 1. Fecal Egg count in different sheep breeds

Breeds	MEAN ±S.E at different days of post infection			
	1	28	35	42
Karakul	123.08± 20.45	5347.69± 597.47	6300.69± 680.43	6546.69± 707.31
Thalli	62.86±22.86	569.52 ±68.28	670.52 ±76.18	680.52 ±80.33
Kachhi	125.00 ±27.29	1121.33±205.53	1521.33±256.34	1921.33±275.62
Kajli	49.23 ±21.32	4940.00±580.55	5942.00±663.21	6132.00±694.15

Table 2. PCV of different sheep breeds naturally infected with *H. contortus*

Breeds	MEAN ±S.E at different days of post infection			
	1	28	35	42
Karakul	24.42± 1.83	21.28±1.40	18.63±0.89	16.61±0.77
Thalli	23.90 ± 1.19	23.75± 1.12	21.36±0.98	25.84±1.35
Kachhi	25.00±2.10	21.33± 1.11	20.00±0.55	21.67 ±1.13
Kajli	24.23±1.42	19.00±0.95	20.00±0.99	20.00±0.99

Table 3. FAMACHA of different sheep breeds

Breeds	MEAN ± S.E at different days of post infection			
	1	28	35	42
Karakul	2.12± 0.08	3.72± 0.11	4.21±0.18	4.81±0.19
Thalli	1.52±0.11	3.25±0.09	3.05±0.15	2.73±0.10
Kachhi	1.62±0.12	3.18 ±0.13	2.93±0.14	2.75±0.14
Kajli	1.69±0.17	3.69± 0.13	3.61±0.18	3.53±0.18

Table 4. Weight gain/ loss in different sheep breeds at different days of post infection

Breeds	MEAN ± S.E at different days of post infection			
	1	28	35	42
Karakul	0.00±0.00	-0.60±0.57	-1.01±0.55	1.09±0.55
Thalli	0.00±0.00	0.65±0.63	2.30±0.92	2.31± 0.75
Kachhi	0.00±0.00	0.43±0.31	2.06±0.44	2.12±0.14
Kajli	0.00±0.00	-1.15±0.37	-0.23±0.42	-0.30±0.51

Conclusion: Breed differences exist in response to artificial infection with *H. contortus*. The recorded data showed that Karakul sheep has more tendencies to get infestation from this parasite. This breed is not native to our environment and was imported in Pakistan in the past. Out of our local sheep breeds Kajli sheep showed less resistant behavior. On the other side Thalli sheep showed better tendency to resist against *H. contortus* infestation. Nevertheless, the most commonly employed phenotypic parameters used in this study showed that Thalli sheep performed better with respect to its natural resistance to *H. contortus*. Further studies involving more number of animals and other phenotypic and genetic parameters are required to complement the findings of the present study.

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