Indian Journal of Animal Sciences **78** (12): 1321–1324, December 2008

Influence of breed on susceptibility of goats to natural infection with *Haemonchus contortus*

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Received: 15 November 2007; Accepted: 10 June 2008

ABSTRACT

The influence of breed on susceptibility to natural infection with *Haemonchus contortus* infection was compared in 12–15 months old Barbari, Jamunapari and local hill goats. The local hill goats exhibited highest weight gain of 1.42 kg on 14 days post infection (DPI) compared to other breeds. The mean haemoglobin and PCV values of local hill goats remained significantly higher than other breeds of goats from 30 to 70 DPI. The mean eosinophil count and mean serum albumin values were significantly higher in local hill goats than other 2 breeds from 10 to 70 DPI and 20 DPI, respectively. The mean serum calcium was significantly lower for local hill goats than Jamunapari on 20 DPI but significantly higher than Barbari on 70 DPI. Mean serum iron levels were significantly higher for local hill than Barbari and Jamunapari on day 10 to 30 and on day 10, 20, 30 and 60, respectively, whereas mean copper values were significantly higher than Barbari goats on 10, 30, 40, 60 and 70 DPI. However, no significant differences were observed in serum zinc levels among breeds. The above parasitological, haemato-biochemical investigations suggested that local hill goats were more resistant to natural infection of *H. contortus* than Barbari and Jamunapari.

Key words: Barbari, Goats, *Haemonchus contortus*, Jamunapari, Local hill goats, Parasitic infection

The gastrointestinal parasites of small ruminants dominated by *Haemonchus contortus* cause considerable production losses (Jas *et al.* 2007). Resistance to broad-spectrum anthelmintics in *H. contortus* (Yadav *et al.* 1996, Chaudhri *et al.* 2007) is the single most important factor for the need to develop alternative control approaches of which exploitation of resistant breeds of sheep and goats is one such component. While considerable reports are available on the influence of breed on resistance to *H. contortus* infection in sheep (Courtney 1986), little information could be traceable about the susceptibility of different breeds of goats to haemonchosis. The present study was carried out with the objective of comparing the susceptibility of 3 indigenous breeds of goats to natural infection with *H. contortus*.

MATERIALS AND METHODS

Local hill (7), Barbari (7) and Jamunapari (4) goats, 12–15-month-old, naturally infected with *H. contortus* were used. Before the start of the experiment, all the animals were dewormed with ivermectin @ 0.2 mg/kg body weight s/c to remove the existing infection. When their eggs per gram of faeces (EPG) became zero, they were allowed to graze together for 7–9 h daily for 10 weeks on fields which had been grazed by sheep and goats during the previous years. Supplementary feeding of 250g of concentrate per animal daily was practiced. Faecal examination and recording of body weight was carried out before the start of experiment and subsequently at 7-day-interval. The blood for haematological and biochemical analysis was collected at 10 days interval for 70 days. EPG was done by modified McMaster technique (Anonymous 1984). Following coproculture, the larvae were harvested (Anonymous 1977) and identified (Keith 1953).

Blood collected in 1% EDTA was subjected to haemoglobin percentage (Hb%), packed cell volume (PCV%), total leucocyte count (TLC) and differential leucocyte count (DLC) by standard techniques.

The blood was collected without anticoagulant, serum separated and stored at –20° C. Total serum proteins and albumin were estimated by antoanalyser (biuret method). Albumin was subtracted from total serum proteins to obtain globulin. The serum calcium, iron, copper and zinc contents were estimated by atomic absorption spectrophotometer.

The data were analysed statistically using students't' test (Snedecor and Cochran 1994).

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RESULTS AND DISCUSSION

The 3 breeds of goats, viz. local hill, Barbari and Jamunapari picked up infection while grazing on fields. None of the Barbari and local hill goats exhibited signs of clinical haemonchosis. One Jamunapari goat suffered with mild symptoms like weakness, anaemia, pale mucous membrane and diarrhoea from 35 day onwards. None of the goats died.

The mean EPG of local hill goats were lower as compared to Barbari and Jamunapari (Fig. 1). However, there were no significant differences (P<0.05) between 3 breeds of goats. The mean body weight gain was poor in all breeds of goats and differed significantly (P<0.05) between Barbari and Jamunapari goats on 14 and 21 DPI and local hill and Jamunapari goats on 28 DPI.

The faecal egg counts of local hill goats remained lower. Rout *et al.* (2002) have suggested EPG to be a good indicator of naturally acquired nematode infections. The difference in body weight gains might be due to difference in number of worms established. This in turn indicates the extent of damage and hence low weight gains. Highest weight loss (–0.7±0.47 kg) was observed in Jamunapari goats on 28 DPI. The influence of breed on the susceptibility of sheep and goats to *H. contortus* infection on the basis of EPG and weight gain has been studied by different workers. Rout *et al.* (2002) reported Barbari to be more resistant than Jamunapari goats. Yadav *et al.* (1993) observed Hisardale lambs to be more susceptible than Munjal lambs to experimental *H. contortus* on the basis of EPG and worm recovery.

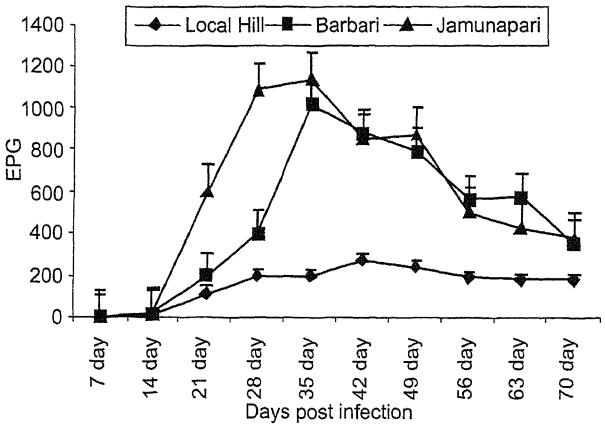

Fig. 1. EPG (mean±SE) of 3 breeds of goats naturally infected with *Haemonchus contortus*

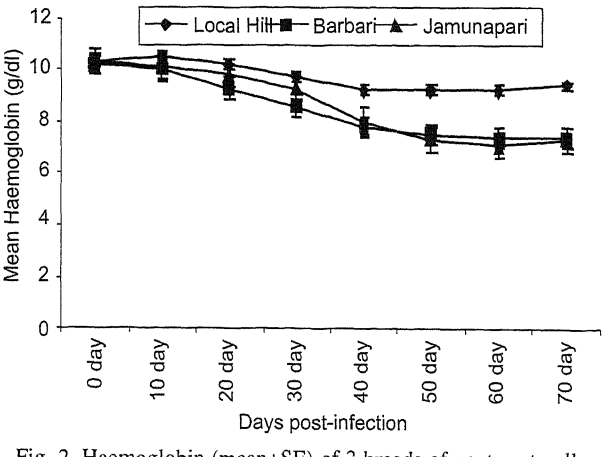

Fig. 2. Haemoglobin (mean±SE) of 3 breeds of goats naturally infected with *Haemonchus contortus*

The mean Hb% of local hill goats was significantly higher (P<0.05) from Barbari goats from 10 to 70 DPI and with Jamunapari from 40 to 70 DPI (Fig. 2). The PCV values of local hill goats were significantly (P<0.05) higher than those of other breeds from 30 to 70 DPI. The mean TLC of local hill goats varied significantly from Barbari goats on 30 DPI and Barbari goats from Jamunapari goats on 30 and 40 DPI (Fig. 3). The local hill goats had a significantly higher eosinophil count and varied significantly (P<0.05) from Barbari and Jamunapari from 10 to 70 DPI. The Barbari goats had significantly higher eosinophil counts as compared to Jamunapari goats on 20 DPI.

Haemoglobin and PCV% levels of all animals were found decreased following natural infection of *H. contortus.* However, the decrease was lowest for local hill goats than Barbari and Jamunapari. Courtney *et al.* (1985a) observed lower haemoglobin and PCV values in exotic breeds (Florida Native, St-Croix and Barbados Blackbelly) than domestic Dorset/Rambouillet crossbred lambs infected with *H. contortus* suggesting variation in susceptibility to its infection. Similarly, Matika *et al.* (2003) have also reported greater resistance of Sabi breed of sheep than Dorper in Africa.

Eosinophil count in peripheral blood was higher in local hill goats as compared to other breeds though the mean eosinophil count increased in all breeds indicating stimulation of immune response. Buddle *et al.* (1992) reported that eosinophilia is a good indicator of parasitic infection and protective immunity against parasites. Huntley *et al.* (1995) have correlated high eosinophilia with low EPG in sheep resistant to *H. contortus* infection. Difference in ability of

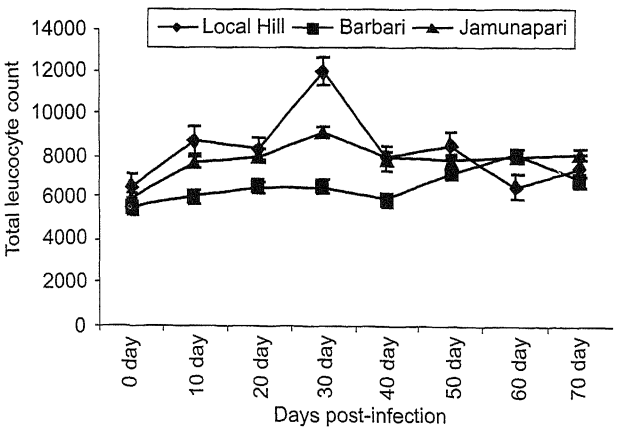

Fig. 3. Total leucocyte count (10^3/mm^3) (mean±SE) of 3 breeds of goats naturally infected with *Haemonchus contortus*

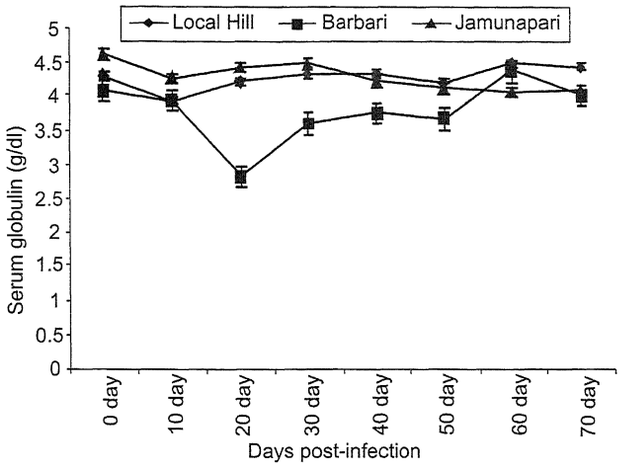

Fig. 4. Serum globulin (gm/dl)(mean±SE) of 3 breeds of goats naturally infected with *Haemonchus contortus*

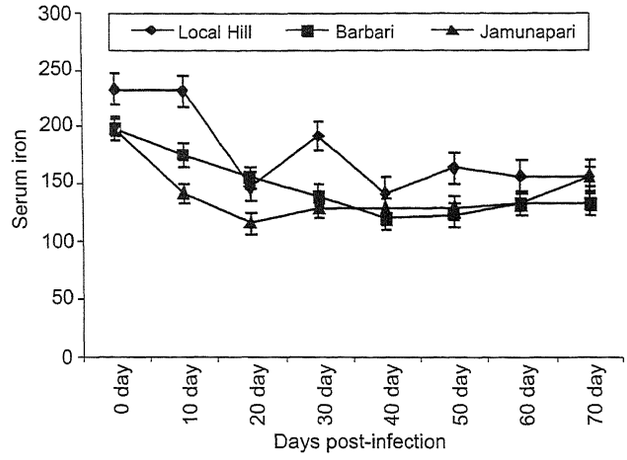

Fig. 5. Serum iron (µg/dl) (mean±SE) of 3 breeds of goats naturally infected with *Haemonchus contortus*

different breeds to produce immune response against *H. contortus* may be responsible for varying degree of breed susceptibility as observed in this study.

The mean total serum proteins of Local Hill goats were recorded significantly higher ($P<0.05$) than those of Barbari goats on 20 and 30 DPI. Jamunapari goats had significantly higher serum proteins than Barbari goats on 20 DPI. Local Hill goats had significantly higher ($P<0.05$) mean serum albumin values as compared to Barbari and Jamunapari goats on 20 DPI. Likewise, the mean serum globulin values of Local Hill and Jamunapari goats were significantly higher ($P<0.05$) than that of Barbari goats on 20 DPI (Fig. 4).

The mean serum calcium level decreased gradually in all breeds from day 20 to 60 (except in local hill goats where it decreased from day 20 to 40). The higher levels of copper were recorded for local hill goats which differed significantly ($P<0.05$) with Barbari goats on 10, 30, 40, 60 and 70 DPI. The average decrease in serum copper level was the highest in Barbari goats on 60 DPI.

The mean serum iron levels (Fig.5) were recorded higher for local hill goats and were significantly higher ($P<0.05$) than those of Barbari and Jamunapari goats on 10 and 30 and on 10, 20, 30 and 60 DPI respectively. Insignificant differences were observed in serum zinc levels among the breeds.

Biochemical parameters as indicators of breed variations in susceptibility to *H. contortus* are limited. The loss of total serum proteins and serum albumin can be due to protein losing gastroenteropathy caused by gastrointestinal parasites (Murray *et al.* 1971). The parasites sensitize the gut mucosa increasing its permeability leading to impaired absorption and leakage of proteins and hence low serum proteins. Yadav *et al.* (1997) recorded a decrease in mean serum protein in exotic crossbred Hisardale and pure Nali sheep experimentally infected with *H. contortus*.

Serum calcium, iron and copper levels decreased following infection with *H. contortus*. However, it was low in local hill goats indicating lower establishment of worms and blood sucking activities in them. Courtney *et al.* (1985a) have suggested that resistant breeds of sheep were able to develop immunocompetence to gastrointestinal nematodes earlier than susceptible breeds. Iron deficiency and drop in PCV results from dyshaemopoiesis following *H. contortus* infection. Gastrointestinal parasitism induces disorders in mineral metabolism (Bal *et al.* 2004). Reduced calcium, phosphorus and magnesium absorption results in reduced deposition of these elements in skeletal bones leading to reduced bone growth in young animals.

In the present study, all the animals were of same age-group and maintained under identical managemental conditions. Low EPG and higher haematological values indicate that local hill goats were less susceptible to *H. contortus* infection as compared to Barbari and Jamunapari goats. Thus, they are genetically more resistant to *H. contortus* infection.

ACKNOWLEDGEMENT

The authors are thankful to Indian Council of Agricultural Research for providing financial assistance through "All India Network Programme on Gastro-intestinal Parasitism" for carrying out the present study. Thanks are also due to Director, Experiment Station and Dean, C.V.A.Sc., Pantnagar, for the facilities provided during the course of study.

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