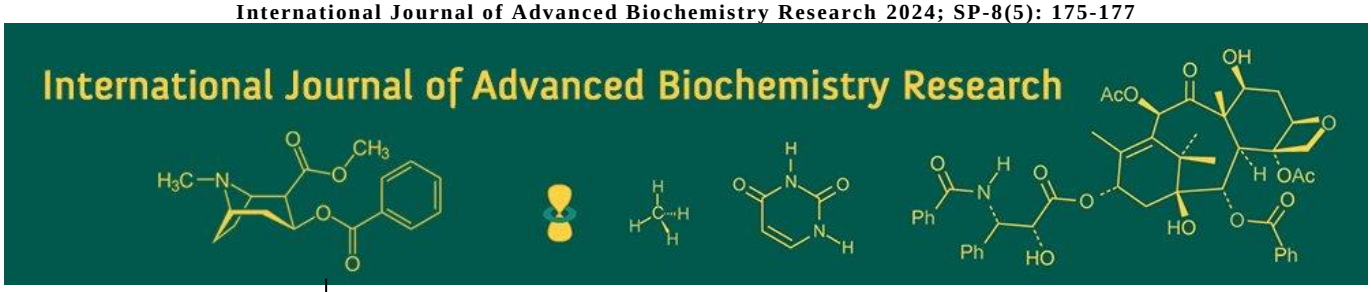

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Sustainable control of gastrointestinal parasites in goats of Reasi and Udhampur, India

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Abstract
Parasitic nematodes of the digestive tract remain one of the main constraints to goat production both in temperate and tropical countries. The climatic factor may favour the development of helminth parasites during nutritional stress and wet season in tropical and semitropical areas. Gastrointestinal parasitism especially Haemonchus contortus is a major problem in goat production worldwide, these parasites cause diarrhoea, anaemia, reduced weight gain and increased production costs. A total of 60 goats 1-3 years of age naturally suffering from gastrointestinal infection were selected and divided into 3 groups Group A containing 25 goats and group B containing 25 goats and Group C goats contain control group of 10 goats. Goats in group A were given 3% Morantel citrate oral solution (Banminth) and goats in group B were given Closantel bolus (Zyclose) and Group C goats were not given any treatment. The efficacy of the drugs was evaluated on the basis of reduction and absence of eggs as well as clinical improvement. The EPG count and clinical examination was made on 0th, 7th, 14th and 21st day of post treatment. General condition like anaemia, diarrhoea, loss of weight, alertness, appetite, feed consumption physical appearance etc was also observed. The observation revealed that EPG of group A and B goats was 380±30 before treatment which came down to almost 0±2 on day 21st post treatment and goats in group C still had high EPG till 14th and 21st day. It was also seen that some goats in group B showing symptoms of Liver fluke infection also responded to the treatment of Closantel. This indicated that there was mixed parasitic infection in these goats. The goats in hilly area mainly suffer from mixed parasitic infection which cannot be controlled by a single drug so there is a need of holistic approach for sustainable control of these parasites which can be done by regular deworming, improved pasture management and regular and timely check-up.
Thus the main objectives of this study were
1) To control the parasitic infection in goats and to find the kind of parasitic infection i.e single or mixed.
2) To check the efficacy of drugs used.
3) To find out the most effective drug.

Keywords: Sustainable control, gastrointestinal parasites, EPG

Introduction
Sheep and goat production is a growing enterprise for small and limited resource farmers. Though small ruminants can be raised with relatively few inputs because of their adaptability to different production systems, they too face huge production challenges. In comparison to sheep that develops a strong natural immunity around 12 months of age, goats acquire a lower level of immunity to gastrointestinal parasites (Vlasoff *et al*. 2001) [12]. This often accounts for higher faecal egg output (Jaiswal *et al*., 2013) [16]. Control of gastrointestinal parasites especially *Haemonchus contortus* is a primary concern for sheep and goat producers throughout the globe (Perry *et al*., 2002) [13]. With the emergence of anthelmintic resistance against most the commercial available dewormers, the scenario has further worsen (Yadav and Uppal 1992; Laha *et al*. 1999; Ram *et al*. 2007; Jaiswal *et al*., 2013) [4, 10, 5, 16]. Annual treatment costs due to this parasite alone have been recently estimated to be $26million, $46million and $103million for Kenya (Anon., 1999) [11], South Africa (Horak, pers. comm.) and India (McLeod, 2004) [15] respectively. Although the free-living stages of *H. contortus* are not as tolerant to unfavourable climatic conditions as the other important nematode parasites of ruminants (Donald, 1968; Waller & Donald, 1970) [1, 2]. The very high

biotic potential and pathogenicity of the parasite ensure that it is a major problem in the humid tropics and subtropics (Anon, 1991; Waller *et al*., 1996; Chandrawathani *et al*., 1999; Anon, 2001; Perry *et al*., 2002) [3, 6, 7, 13]. The present study was designed with the aim of finding the prevalent parasitic species along with *H. contortus* in the migratory goats of Reasi and Udhampur district of Jammu and Kashmir and to evaluate the efficacy of morental and closantal against these parasites in naturally infected goats.

Materials and Methods

A total of 60 goats of 1-3 years age group, naturally suffering from gastrointestinal infection, were selected and divided into 3 groups *viz.*, group A and B each consisting of 25 goats and group C consisting of 10 goats. Goats of group A were given 3% Morantel citrate oral solution (Banminth) and group B were given Closantel bolus @15mg/kg b.wt (Zyclose) and group C served as untreated control. Regular and timely monitoring of health condition and recovery was observed. Health condition like alertness, appetite, feeding and conditions like anaemia, diarrhoea, dullness, etc were also observed. The efficacy of the drugs were evaluated on the basis of reduction in faecal egg count as well as clinical condition indicated by improvement in general condition of goats. The EPG count and clinical examination was made on 0^{th}, 7^{th}, 14^{th} and 21^{st} day post treatment. Drug showing low egg count and fast easy recovery was considered to be more efficient.

Results

Faecal examination revealed presence of mixed parasitic infection. Haemonchosis was found to be the main parasite present followed by trichostrongylosis and fasciolosis. Goats of both groups A and B responded well to both the drug. The EPG count and clinical examination was made on 0^{th}, 7^{th}, 14^{th} and 21^{st} day of post treatment revealed significant improvement. Naturally infected goats showed anaemia, diarrhoea, loos of weight, uneasiness, dullness, anorexia, dehydration, unthrift appearance, rough hair coat, depressed, low energy, lethargic and decreased reproductive performances. Post treatment general conditions like alertness, increase in appetite and physical appearance was observed. Recovery from anaemia, diarrhoea, loss of appetite, dullness, etc was also seen. Drug showing low egg count and fast easy recovery was considered to be more efficient. The observation revealed that EPG of group A and B goats was 350±30 before treatment which came down to almost 0±2 on day 21st post treatment. In both the group the decrease in egg count was almost same from 350±30before treatment which was seen decreasing on 7th day to 230±18 and came down to 80±9 on 14th day post treatment and on day 21st there was complete loss of egg count. The epg values on days 0, 7, 14 and 21 were 360, 200, 87 and 0, respectively. This indicated that both the drugs were equally effective in controlling gastrointestinal parasitic infection. Moreover, it was also observed goats in group B suffering from liver fluke infection also responded well to the Closantel bolus treatment which no such observation was observed in group A.

Discussion and Recommendations

The main aim of the present study was to control the unsustainable parasitic infection occurring in the area. Now a day's goats mainly show mixed parasitic infection which is the main reason for drug failure and resistance as result of which farmers are not able to control heavy losses due to this parasitic infection. This study suggests that there is a need of sustainable approach for controlling this parasitic infection which not only includes drug treatment but also pasture management, regular health check-up, doe treatment etc. If all these things are kept in mind, then it is possible to control these mixed parasitic infection

Feeding Practices

Following are few things to be kept in mind for sustainable parasitic control in goats:

- Keep stocking rates low.
- Provide clean water and minerals.
- Use gravel or concrete in the feedlot area to break the worm life cycle and to prevent re-infestation.
- Provide high-quality hay for goats raised in areas where forage is not available year-round or when the pasture conditions are poor. Hay should be kept off of the ground to avoid contamination by faeces.

Pasture Maintenance

- Incorporate browse plant species when possible. Goats love to browse and prefer shrubs and forages to grass. If goats consume forages at least 6 inches tall, infestation from barberpole worms is reduced.
- Try a mixed species grazing program using cattle and goats.
- When possible, use the pasture for hay cutting after grazing. This will help to break the
- Worm life cycle and prevent re-infestation. Direct sunlight during the summer months or during freezes in the winter will also help decrease the population of larvae that remain in the soil.
- When possible, alternate the pasture with a short cycle crop, such as culture alfalfa. This management practice will help to break the worm's life cycle, and decrease larvae population in the pasture and prevent re-infestation.
- Use clean feeders and continue to practice good hygiene in the pens and pasture.

Doe Treatment

- Provide good nutritional management. Well-nourished animals are better able to respond to H. contortus infestation. Doe with good nutrition at late pregnancy have an increased immune response to parasites.
- Deworm the doe soon after she has kidded. The pregnancy hormone progesterone and the lactate hormone prolactin have been shown to reduce the ability of does to fight worm infestation. Progesterone suppresses the doe's immune system. Does that are lactating and raising kids are more susceptible to worms. Monitor the herd closely from kidding to weaning.
- Goat genetic is an important component that will determine an animal's ability to resist H. contortus infestation. Resistance can be measured by faecal egg counts (FEC). The resistance to worm infestation is heritable. The doe's ability to withstand infestation is defined as resilience and is measured by blood hematocrit or packed cell volume (PCV).

Researchers are exploring the use of plants to control barber pole worm. Forages, such as clover, vetches, chicory, and sericea lespedeza, contain condensed tannins. Condensed tannins reduce the number of stomach worms and egg production. Feeding sericea lespedeza hay to goats can reduce faecal eggs counts by 80 percent and create a higher packed cell volume. Where possible the dependency on anthelmintics should be reduced by good grazing management, faecal egg count monitoring, alternative forages and breeding for immunity. When it is necessary to use anthelmintic check that the drench gun is properly calibrated, weigh the heaviest goat and drench the whole group at this dose, change the type of anthelmintic annually and check the withdrawal period.

Therefore it is suggested to keep these management aspects in mind for sustainable control of gastro-intestinal parasites in goats of hilly areas in Reasi and Udhampur districts of Jammu and Kashmir.

Conclusion

In conclusion, the study revealed a significant presence of mixed parasitic infections in goats, with haemonchosis, trichostrongylosis, and fasciolosis being predominant. Both groups A and B responded well to treatment, displaying notable improvements in clinical conditions and egg count reduction. Notably, goats in group B, suffering from liver fluke infection, also responded positively to Closantel bolus treatment, unlike group A. This underscores the importance of a multifaceted approach to parasite control, encompassing drug treatment, pasture management, and regular health check-ups. Sustainable practices such as maintaining low stocking rates, providing clean water and minerals, incorporating browse plant species, and implementing good hygiene measures are crucial. Additionally, attention to doe treatment, including deworming post-kidding and genetic selection for resistance, is vital. Embracing alternative forages and grazing management alongside judicious use of anthelmintics can help mitigate the risk of drug resistance and ensure sustainable parasite control. These recommendations hold particular relevance for the hilly areas of Reasi and Udhampur districts in Jammu and Kashmir, where effective parasite management is essential for goat health and productivity.

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