Efficacy of chemical and herbal anthelmintic drug against naturally infested gastrointestinal helminthiasis in mithun calves (Bos frontalis)

J.K. Chamuah, A. Mech¹ and P. Perumal² and P.R. Dutta²
ICAR-National Research Centre on Mithun,
Jharnapani, Nagaland-797 106, India
Received: 15-10-2013 Accepted: 24-05-2014 DOI:10.5958/0976-0555.2015.00038.2

ABSTRACT
An investigation was conducted to study the efficacy of commonly used chemical as well as few new herbal anthelmintic drugs against gastrointestinal parasite infestation in growing mithuns raised under semi domesticated management system at the Institutes livestock farm. The drug, Ivermectin showed 99.59% efficacy against Toxocara vitulorum. While the herbal drugs i.e. Vet worm and Ficus hirta have shown efficacy of 88% and 84.88% respectively, which was below the recommended standard efficacy of 98%. Nevertheless the Neem (Azadirachta indica) was found to be effective (98.52%) against Toxocara vitulorum infection. The efficacy rate of anthelmintics drugs like Albendazole, Fenbendazole and a combination of Fenbendazole and Praziquantel was 100% and all the treatments were observed to be effective from day 14th.

Key words: Anthelmintic, Drug efficacy, Helminth parasites, Herbal drug, Mithun

Mithun (Bos frontalis) is the pride animal of north eastern region of India. This bovine species has got a special place in the socio-economic and cultural life of the tribal people of this region. Mithun is regarded as the sign of superiority and prosperity among the local tribal people of the region (Heli, 1995). Presently utmost emphasis is being given to exploit maximum meat and milk production potentiality of this prized bovine species by introducing recent scientific managemental strategies. However, the persistence of congenial atmosphere in the region accelerates propagation of parasites and mithuns are frequently infected with helminthes parasites that have become a major managemental hindrance. There have been several reports of various helminth parasite infestations in mithuns (Rajkhowa et al., 2005; Chamuah et al., 2009; Chamuah, 2005). Until now various anthelminthic drugs were used as an attempt to control gastrointestinal parasites in mithun which showed variable efficacy rates (Rajkhowa et al., 2003a; Rajkhowa et al., 2003b; Rajkhowa et al., 2002a and Rajkhowa et al., 2002b). However, the present investigation has been designed to study the efficacy of common chemical as well as few new herbal anthelmintic drugs against gastrointestinal parasite infestation in mithun. The outcome of the study would be helpful in preparing effective anthelmintic schedule for controlling parasitic infestation in mithun that may further assist in improving the production and reproduction performance of this magnificent animal.

Thirty six growing mithuns (2-6 months age) were divided into nine groups consisting of four animals per group in a completely randomized design. These animals selected for the anthelmintic efficacy study were naturally infected with gastrointestinal helminth parasites.

The choice of anthelmintic drugs for each group and its route of administration have been mentioned below (Table 1).

Faecal samples were collected per rectally from the animals before treatment and then at 0, 7, 14 and 21st day post-treatment. Following collection the fresh fecal samples were subjected to examination under microscope for the presence of helminth eggs by standard methods (HMSO, 1979). The number of eggs per gram of faecal sample (EPG) was measured according to Stoll’s technique (Svensby, 1986). The faecal samples that were found positive for strongylo group of parasites were subjected to coproculture for recovery of infective third stage larvae (L₃) by standard protocol (Roberts and O’Sullivan, 1949). Further identification of the larvae was carried out according to HMSO (1979).

Generally, the efficacy of an anthelmintic drug is expressed as percent reduction test either in faecal egg count or number of worms during slaughter. In the present study,

¹Corresponding author email: drjayantavet@gmail.com, ¹Animal Physiology Lab., National Institute of Animal Nutrition and Physiology (ICAR), Bangalore-560 030, ²NRC on Mithun (ICAR), Porba, Nagaland-797 105, India
Nevertheless, there was presence of fecal parasitic eggs even after 21st day of treatment in animals treated with other drugs like Piperazine and herbal drugs like Vetworm bolus, F. hirta and A. indica. However, the variation with respect to EPG count was not significant among the treatment groups. On the contrary, irrespective of treatment groups EPG count was significantly (P<0.01) less at 14th and 21st day of treatment as compared to the 0 and 7th day of treatment. The control group showed no EPG reduction during the entire period of experiment.

The EPG counts of the animals treated with Albendazole came down to zero on day 14th of treatment. The efficacy of Albendazole and Ivermectin against mixed nematode infection was respectively 87-100% and 76.19-96.19% between day 7th and 14th day of treatment. According to a previous report on faecal egg count reduction test (FECRT) that was conducted for investigating the efficacy of Ivermectin and benzimidazole against gastrointestinal nematode infection, an efficacy level of 69-100% was recorded between 7 and 14 days interval (Demeler et al., 2009). Furthermore, Rajkhowa et al. (2003b) recommended Albendazole@ 15mg/kg body weight orally as most effective drug for treating Haemonchosis and Strongyloides papillosus infection in mithun. In the present study, the drug Piperazine and Ivermectin given against Toxocara vitulorum showed an efficacy of 33.33 to 89.24 % and 92.74 to 99.59% between day 7th and 14th day of treatment. Earlier Piperazine citrate @200mg/kg body weight was found to be efficient for treating ascariasis in mithun calves (Rajkhowa et al., 2002). Few reported early recovery from parasitic infection with Piperazine treatment as compared to Albendazole or Ivermectin (Hafiz and Bhattacharya, 2009). Whereas, some

faecal egg count reduction test (FECR) was carried out according to Dash et al. (1988) and the percentage efficacy of the drug was expressed by percentage reduction of eggs per gram of fecal sample (EPG).

Pre treatment EPG - Post treatment EPG x100
FECR (\%)=--------------------------------------------------------
Post treatment EPG

**Statistical analysis:** Data were analyzed using the SPSS 14.0 software package (SPSS Inc., Chicago, Illinois, USA) and presented as mean ± SE. To determine whether the effect of anthelmintic drugs were effective, the data were subjected to GLM multivariate analysis to find out the trend of fecal egg count followed by multiple pair wise mean comparisons for EPG count on different days after treatment by using Student-Newman-Keuls (SNK) test. The model included EPG count on day ‘0’ as covariate and the anthelmintic drugs as source of variation.

The study was designed to observe the effect of nine different anthelmintic drugs on mixed gastrointestinal parasitic infestation in growing mithuns. The efficacies of the drugs were evaluated by the parasitic egg count per gram (EPG) in fecal samples of treated animals from the day of treatment (0 day) till day 21st of treatment (Table 2). The EPG count was found zero on 14th day of treatment in the animals that were treated with Albendazole, Fenbendazole and combination of Fenbendazole and Praziquantel. On the contrary, the animals under Ivermectin treatment, that were infected with mixed parasites as well as T. vitulorum, the EPG count came down to zero only on day 21st of treatment. Nevertheless, there was presence of fecal parasitic eggs even

<table>
<thead>
<tr>
<th>Group (N=36)</th>
<th>Type of infection</th>
<th>Anthelmintic Drug (Active ingredient with brand name)</th>
<th>Dose</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-1 (n=4)</td>
<td>Mixed infection</td>
<td>Albendazole (Albomar)</td>
<td>5mg/Kg body wt.</td>
<td>Orally</td>
</tr>
<tr>
<td>Group-2 (n=4)</td>
<td>Mixed infection</td>
<td>Ivermectin (Neomec)</td>
<td>200mg/Kg body wt.</td>
<td>S/C ly</td>
</tr>
<tr>
<td>Group-3 (n=4)</td>
<td>Monieziasis</td>
<td>Piperazine Citrate (Piperazine)</td>
<td>200mg/Kg body wt.</td>
<td>Orally</td>
</tr>
<tr>
<td>Group-4 (n=4)</td>
<td>Monieziasis</td>
<td>Fenbendazole (Panacur)</td>
<td>10mg/Kg body wt.</td>
<td>Orally</td>
</tr>
<tr>
<td>Group-5 (n=4)</td>
<td><em>Toxocara vitulorum</em></td>
<td>Fenbendazole + Praziquantel (Praziplus)</td>
<td>10mg /Kg body wt.</td>
<td>Orally</td>
</tr>
<tr>
<td>Group-6 (n=4)</td>
<td><em>Toxocara vitulorum</em></td>
<td>Ivermectin (Neomec)</td>
<td>1ml/50 Kg body wt.</td>
<td>S/C ly</td>
</tr>
<tr>
<td>Group-7 (n=4)</td>
<td>Mixed infection</td>
<td>Vetworm (<em>Embelia ribes, Ocimum sanctum, Acacia Arabica, Clerodendrum infortunatum and Mallotus philipinensis</em>)</td>
<td>2 bolus/day</td>
<td>Orally</td>
</tr>
<tr>
<td>Group-8 (n=4)</td>
<td>Mixed infection</td>
<td><em>Crude extract of Ficus hirta</em></td>
<td>150mg/Kg body wt.</td>
<td>Orally</td>
</tr>
<tr>
<td>Group-9 (n=4)</td>
<td><em>Toxocara vitulorum</em></td>
<td><em>Crude extract Neem (Azadirachta indica)</em></td>
<td>300mg/Kg body wt.</td>
<td>Orally</td>
</tr>
</tbody>
</table>

**TABLE 1:** Group wise drug of choice against specific parasitic infection

The study was designed to observe the effect of nine different anthelmintic drugs on mixed gastrointestinal parasitic infestation in growing mithuns. The efficacies of the drugs were evaluated by the parasitic egg count per gram (EPG) in fecal samples of treated animals from the day of treatment (0 day) till day 21st of treatment (Table 2). The EPG count was found zero on 14th day of treatment in the animals that were treated with Albendazole, Fenbendazole and combination of Fenbendazole and Praziquantel. On the contrary, the animals under Ivermectin treatment, that were infected with mixed parasites as well as *T. vitulorum*, the EPG count came down to zero only on day 21st of treatment. Nevertheless, there was presence of fecal parasitic eggs even after 21st day of treatment in animals treated with other drugs like Piperazine and herbal drugs like Vetworm bolus, *F. hirta* and *A. indica*. However, the variation with respect to EPG count was not significant among the treatment groups. On the contrary, irrespective of treatment groups EPG count was significantly (P<0.01) less at 14th and 21st day of treatment as compared to the 0 and 7th day of treatment. The control group showed no EPG reduction during the entire period of experiment.

The EPG counts of the animals treated with Albendazole came down to zero on day 14th of treatment. The efficacy of Albendazole and Ivermectin against mixed nematode infection was respectively 87-100% and 76.19-96.19% between day 7th and 14th day of treatment. According to a previous report on faecal egg count reduction test (FECRT) that was conducted for investigating the efficacy of Ivermectin and benzimidazole against gastrointestinal nematodes in cattle, an efficacy level of 69-100% was recorded between 7 and 14 days interval (Demeler et al., 2009). Furthermore, Rajkhowa et al. (2003b) recommended Albendazole@ 15mg/kg body weight orally as most effective drug for treating Haemonchosis and *Strongyloides papillosus* infection in mithun. In the present study, the drug Piperazine and Ivermectin given against *Toxocara vitulorum* showed an efficacy of 33.33 to 89.24 % and 92.74 to 99.59% between day 7th and 14th day of treatment. Earlier Piperazine citrate @200mg/kg body weight was found to be efficient for treating ascariasis in mithun calves (Rajkhowa et al., 2002). Few reported early recovery from parasitic infection with Piperazine treatment as compared to Albendazole or Ivermectin (Hafiz and Bhattacharya, 2009). Whereas, some
recorded the efficacies of Piperazine against immature and mature parasites were as 42% and 57% respectively. In the present study the mithuns infected with monieziasis which were administered with Fenbendazole and a combination of Fenbendazole + Praziquantel, the respective rates of efficacy were 86.04 - 100% and 87 - 100%. Comparatively lower efficacy rates were recorded for the two herbal drugs i.e. Azadirachta indica and Ficus hirta. Likewise, Vetworm bolus showed an efficacy of 45.04 - 80% between day 7th - 14th of treatment. The anthelmintic drugs like, Levamisole@7.5mg/kg body wt. and Ivermectin@0.2mg/kg body wt. administered S/C ly has been reported to be satisfactory in treating Toxocara vitulorum in bovines (Hamza and Ibrahim, 2011; Rajkhowa et al., 2002a and Rajkhowa et al., 2003c). The same study recorded 99.90% reduction of T. vitulorum eggs on 8th days of Ivermectin treatment.

As per the final efficacy rate shown by the drugs under the present study on day 21st post treatment all the chemical drugs were found more effective (99.59-100%) as compared to the herbal drugs (84.88-98.52%). The final efficacy of the two herbal drugs namely, Vetworm and Ficus hirta (88% and 84.88%) was below the recommended standard efficacy rate of 98%. Comparatively, another herbal drug Azadirachta indica could show better efficacy (98.52%). However, according to the present study, the most efficient anthelmintic drug against mixed infection in mithun has been found to be Albendazole. Whereas, either Fenbendazole alone or in combination with Praziquantel was found to be most effective against monieziasis in mithun. Similarly oral administration of Fenbendazole@10mg/kg body wt. was found to be effective in treating mithun calves infected with Monieziasis. In this region monieziasis is a common problem in mithun calves due to prevalence of orbatid mites around the year. However, the variation among efficacy rate of various drugs used under the present study was not significant. In contrast irrespective of treatment groups EPG count was found significantly (P<0.01) less at 14th and 21st day of treatment as compared to the 0 and 7th day of treatment.

The persistence of congenial atmosphere in the region accelerates propagation of parasites and mithuns are frequently infected with helminthes parasites. However, based on the previous reports and present study, anthelmintic drugs like Albendazole, Piperazine, Fenbendazole and Praziquantel may be the drug of choice that can be effectively used alone or in combination to combat the various gastrointestinal parasitic menaces in mithuns. Whereas, among the herbal drugs tested under the present study, only Neem (Azadirachta indica) has the potentiality to be used against gastrointestinal parasites in mithun and further study has been recommended for evaluating different medicinal plants which will be effective against gastrointestinal helminthiasis.

ACKNOWLEDGEMENT

The authors duly acknowledge the Director, National Research Centre on Mithun (ICAR), Jharnapani, Nagaland, India for providing facilities required for the study and proper guidance as and when needed.
REFERENCES