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Comparative efficacy of ivermectin and moxidectin against gastrointestinal nematode infection in horses

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Abstract

The present study was undertaken to assess the efficacy of ivermectin and moxidectin against gastrointestinal nematode infection in horses. Total 21 faecal samples of adult horses were examined for presence of parasitic ova. Out of which, 12 samples were found positive for mixed and single infection of *Strongylus* spp. and *Parascaris* spp. These 12 positive horses were randomly divided into two equal groups. The first group (T1) was treated with single dose of ivermectin @ 0.2 mg/kg body weight orally. Second group (T2) was treated with single dose of moxidectin @ 0.4 mg/kg body weight orally. Both the drugs recorded 100% reduction in faecal egg count (FEC) on 14th day post-treatment. The study concluded that both drugs found effective and safe anthelmintic drugs in eliminating worm burden of *Strongylus* spp. and *Parascaris* spp. However, the FEC reduction by moxidectin was rapid than ivermectin against *Strongylus* spp. and *Parascaris* spp.

Keywords: Anthelmintics, horses, ivermectin, moxidectin, parascaris, strongylus

Introduction

The mixed species nematode infection is most common in horses such as *Parascaris equorum*, *Strongylus edentatus*, *S.equinus*, *S.vulgaris*, *Strongyloides westeri* and a range of *Cyathostoma* spp^[1]. Among all these parasites *Strongyle* group of round worm are most common GI nematode species affecting equids^[2]. The most common symptoms of GI helminth infection in horses are poor or rough hair coat, coughing, weakness, reduced absorption of nutrients, emaciation, intoxication, mechanical obstruction, diarrhoea, weight loss, colic, pruritus, pot-belly and decreased performance and finally death of animal^[3]. The GI helminth infection may also cause haemobiochemical alteration such as eosinophilia, anemia, hypoproteinemia & hypoalbuminemia^[4].

Recently GI nematode especially *Strongyle* & *Cyathostomins* have been reported resistant to widely prescribed anthelmintics such as fenbendazole & ivermectin in horses because of indiscriminate and continues use of these anthelmintics over year together^[5]. In view of the above fact, the present study was undertaken to assess the comparative efficacy of ivermectin and moxidectin against gastrointestinal nematode infection in horses.

Materials and methods

In the present study total 21 adult horses irrespective of sex in and around Akola district were screened for gastrointestinal nematode infection by examination of faecal sample by sedimentation and flotation methods^[6]. Out of which 12 horses were found positive for GI nematodes infection. These 12 positive animals were randomly divided into two equal groups comprising of six animals in each group. First group (T1) of six horses positive for nematode infection was treated with single dose of ivermectin (IVM) @ 0.2 mg /kg body weight in the form of paste orally. Second group (T2) of six horses positive for nematode infection was treated with single dose of moxidectin (MOX) @0.4 mg/kg body weight in the form of paste orally.

The eggs per gram (EPG) of faeces was determined by Stoll's dilution method on '0' day (before treatment) and on 5th and 14th day post treatment. EPG value was calculated by using following formula ^[6].

EPG= Number of eggs present in 0.15 ml of faecal suspension x 100

Efficacy of anthelmintic was calculated by the faecal egg count reduction (FECR) test as described by according to the following formula. ^[7].

$$\text{FECR (\%)} = \frac{\text{EPG before treatment} - \text{EPG after treatment}}{\text{EPG before treatment}}$$

The significance of EPG of faeces between '0' day (before treatment) and 5th day after treatment in both the groups were compared by using paired 't' test. All statistical analyses were carried out using software SPSS version 21.0 and WASP version 2.0.

Results and discussion

Out of 12 positive horses, 3 horses had a mixed infection of *Strongylus* spp. & *Parascaris* spp. and 9 horses had single infection of *Strongylus* spp. & *Parascaris* spp. The EPG of faeces before treatment ('0' day) and on 5th day and 14th day post treatment with its per cent efficacy after treatment is presented in Table 1.

In group (T1), the overall mean EPG of faeces at pre-treatment was 1350.00 ± 76.38 , which was significantly reduced on 5th day post treatment (200 ± 36.51). The treatment with single dose of IVM demonstrated 85.91% FECR on 5th day post treatment. All these horses were completely free from GI nematode on 14th day, as EPG was zero on 14th day post treatment (Table 1). Thus, single dose of IVM demonstrated 100% efficacy against *Strongylus* spp. and *Parascaris* spp. in horses on 14th day post treatment.

Many researchers reported 100% efficacy of IVM against GI nematodes infection in horses ^[8, 5, 9]. The anthelmintic action of IVM is attributed to its action on Gamma-amino- butyric acid (GABA), neurotransmitter substance which mediates transmission of inhibitory signals from the interneurons to the motor neurons in the parasites. The ivermectin acts as a GABA agonist. Thus, block the interneuronal stimulation of inhibitory motor neurons, leading to paralysis of worms and finally death of parasite ^[10].

In group (T2), the overall mean EPG of faeces at pre-treatment was 1433.33 ± 120.19 , which was significantly reduced on 5th day post treatment (50.00 ± 22.36). There was 96.51% reduction in faecal egg count on 5th day post treatment. Average EPG of faeces was zero on 14th day post treatment, indicated that single dose of moxidectin eliminated worm burden completely and showed 100% reduction in FEC on 14th day post treatment. Many studies also reported similar observation on high efficacy of MOX against wide range of nematode in horses ^[11, 12, 13, 14]. Many researchers reported its efficacy against the adult and larval stages of *Cyathostomes* mainly encysted *Cyathostomins* as compared to other equine anthelmintic. Therefore, it makes moxidectin one of the potent anthelmintic preparations available for the treatment of equine *Cyathostomins* ^[15].

Moxidectin is a second generation macrocyclic lactone with highly potent nematocidal activity use for GI nematode parasite in horses in an oral gel preparation. It is a semisynthetic methoxime derivative of F-alpha or nemadectin, a 16-member pentacyclic lactone of the

milbemycin class. F-alpha possesses strong anthelmintic activity. The mode action of MOX on parasites is attributed to its action by binding to ligand-gated chloride channels, more specifically the subtypes that are gamma-aminobutyric (GABAA) mediated and glutamate-gated which resulted to an increased permeability, leading to an influx of chloride ions and causes flaccid paralysis of the parasite leading to death ^[15]. The MOX also provide rapid absorption, broad distribution throughout body tissue and long half-life which allow for its high efficacy and longer treatment interval against all nematode.

In the present study, the treatment with single dose of IVM demonstrated 85.91% reduction in faecal egg count on 5th day post treatment, whereas treatment with single dose of MOX recorded 96.51% reduction in faecal egg count (FEC) on 5th day post treatment (Table 1). Both the drugs reduced FEC to zero on 14th day post treatment, indicated that IVM and MOX both achieved 100% FECR on 14th day post treatment. From these observations it is evident that both the anthelmintic drugs found highly effective in reducing the FEC, however, faecal egg count reduction (FECR) brought by single dose of MOX was rapid and more remarkable than the treatment with IVM. Both the drugs showed 100% reduction in FEC on 14th day post treatment, indicated complete elimination of parasitic populations of GI nematodes in horses of Akola district and no evidence of resistance to IVM and MOX was observed in the present study.

Many researcher studied the comparative efficacy of IVM and MOX against wide range of GI nematode in horses and reported greater efficacy and egg reappearance period (ERP) of MOX as compared to IVM ^[16, 17, 18, 19]. The greater efficacy of MOX demonstrated by many researchers might be due to its action against encysted *Cyathostomins* as ivermectin is not effective against this larval stage. Anthelmintic resistance is a serious problem in controlling *Cyathostomins*. Many studies demonstrated evidence of resistance to class of anthelmintic benzimidazoles. The moxidectin is the probably only anthelmintic drug with high efficacy against encysted *Cyathostomin* larvae. Moxidectin resistance has not yet been reported so far. Thus, it is essential to preserve the routine use of moxidectin as anthelmintic to maintain equine health and welfare. Its use should be reserved for specific encysted *Cyathostomins* rather than as a routine nematocidal drug or prophylactic anthelmintic use in horses.

Overall study concluded that the single dose of ivermectin @ 0.2mg/ kg b.wt and moxidectin @ 0.4 mg/kg b.wt. proved 100% effective and safe anthelmintic drugs in eliminating worm burden of *Strongylus* spp. and *Parascaris* spp. However, the treatment with MOX demonstrated early and remarkable effect against *Strongylus* spp. and *Parascaris* spp. than treated with IVM.

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Conflict of interests

There is no conflict of interest.

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