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Dynamics, awareness and prevalence of gastrointestinal helminths of donkeys (*Equus asinus*) in Faisalabad

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Key words: Prevalence, awareness, donkeys, gastrointestinal helminthes.

Abstract

Out of 284 faecal samples, 81% were found to have gastro-intestinal parasites frequently with multiple infections in one donkey. Ten gastrointestinal helminthes species were identified in the fecal samples of donkeys directly collected from rectum. *Ascaris* sp., *Strongylus* sp., *Trichomenna* sp., *Paranoplocephala* sp., *Triodontophorus* sp., *Anoplocephala* sp., *Gastrodiscus* sp., *Strongyloides* sp., *Oxyuris* sp. and *Dictyocaulus* sp. were reported genera of helminthes. Majority of examined fecal samples showed mix infection and *Ascaris* nematode was in high number ($P < 0.05$) then in descending order *Trichonemma* sp. and *Strongylus* sp. However, *Paranoplocephala* species, *Oxyuris* species and *Anoplocephala* species were in low percentage. Awareness level was found more in urban area than rural area as literacy rate was also higher in the urban owners than rural donkey owners. Rural locations showed more helminthes level than urban. 208 RB showed highest infection percentage while 209 RB was with lowest infection percentage.

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Introduction

Out of 44 million donkeys population worldwide over 4 million are found in Pakistan (Siddique *et al.,* 2015) and Faisalabad district bears the highest population with 50,000 donkeys (Highest donkey population, 2012), while there are more than 1,000 donkey carts in the city of Faisalabad (Siddique *et al.,* 2015). Donkeys have a great economic value for most of the donkey-owning communities in Pakistan. Studies have shown that donkeys are host to a wide diversity of helminths parasites, which can lead to serious diseases under malnutrition and overwork stress.

Helminths species reported from donkeys are nematodes (roundworms), cestodes (tapeworms) and trematodes (flukes) (Svendsen, 2008). Among helminths, gastrointestinal nematodes (GINs) are one of the common problems of all grazing and stall feeders stocks. In donkeys, they are representative of five taxonomic families with more than fourty different species (Theiler, 1923; Malan *et al.,* 1982; Svendsen, 1989). Infections caused by end parasites may result in poor body condition, reduced power output, diarrhea, colic, emaciation, short life span, impaired growth, poor reproductive performance, and predisposition to other infectious diseases (Fikru *et al.,* 2005, Yoseph *et al.,* 2005, Ayele *et al.,* 2006, Getachew *et al.,* 2009). GINs are responsible for high morbidity due to decrease in feed intake, competence of nutrient use and low growth rate in young stock, poor body condition scoring which results in decrease in productivity and efficiency of the infected animal and many other hidden upshots (Irfan, 1984; Bekele, 2002). A heavy internal parasite burden can affect the health of a donkey adversely, particularly when they are working hard and undernourished (Herd, 1990; Love., 1992; Mair, 1994; Krecek & Gouthrie, 1999). Various factors contribute in high and persisting infection throughout the year like contaminated pasture, poor nutrition and management, low immunity of infected animals and poor efficacy of deworming agents (Saddiqi *et al.,* 2010). Despite their importance, several constraints hinder improvement including nutrition a free-range management system, lack of suitable donkey implements, farmer attitudes wondering diseases and poor health (Agananga & Maphorisa, 1994).

The knowledge of disease of donkeys is insufficient and their ability to thrive in harsh environment is derived from their immunity to certain disease (Coetzer & Erasmus, 1994; Conner, 1994). Very little attention has been focused on the helminthes infection of donkeys as compared to small ruminants in Pakistan (Ahmed *et al.,* 2010; Saddiqi *et al.,* 2010).

Keeping in view the parasitic research status on donkeys, the present study has been planned for assessment of the prevalence of helminths with respect nutrition, sex, area and type and pattern of feeding. The findings of this study reflect the natural transmission and prevalence of helminths of donkeys in the different study areas. Because donkeys were not restricted in a special group of study and were living in the routine conditions of their natural environment. However the exact reflection of the rate at which donkeys are infected and the degree to which donkeys are contaminating the environment is reflected by the average egg counts of the herd rather than individual's (Uhlinger, 1991).

Prevalence of gastrointestinal helminthes has been studied in Faisalabad (Siddique *et al.,* 2015) but the recent study was aimed to explore the factors related to infestation i.e. sex of the individual, localities, awareness level of donkey owners, season wise infestation and difference in urban and rural areas as well as different feeding systems. Further factors including response of animals through changes in blood profile and other defense mechanisms adapted by the animals can be studied. Antihelminthic drugs and their comparative efficacies will be another major leap to be covered in the next studies.

Materials and methods

Study Area

The present study was conducted in and around Faisalabad city for the collection of fecal samples while the lab of G.C. University Faisalabad was used for sample anaylysis.

Sample Collection

284 donkeys belonging to different age and sex were randomly selected from different areas of Faisalabad.

2-5 grams, fresh fecal samples were collected in polythene bags and samples were transported to Research Lab. G.C. University, Faisalabad. Faecal samples were analyzed by modified McMaster Technique for eggs of helminthes and identification (Whitlock, 1948; Soulsby, 1982). A questionnaire was also filled at the time of sample collection from the owners regarding feeding habits of donkeys and awareness among the donkey owners about helminths parasites and their control. For the experiment, a complete randomized experimental design was used.

Analysis

Faecal egg counts were presented as Mean ± S.E. (Coles *et al.,* 2006) and the standard error was added on the percentage data by using the Microsoft Excel 2010 version keepingthe error bar at 10%.

Results and discussion

Awareness about gastrointestinal helminths in donkey owners

Majority of the farming community irrespective of literacy rate was aware about parasitic infections and their ill effects but they were found unaware about symptomless GINs infections.

More than 70% donkey owners/sale men were familiar about this dilemma while this ratio was about >50% in rural set up (Fig. 1). Questionnaire's respondents (100%) were not fully aware about the life cycles of different helminth species. Impact of education was noted relating to awareness about synthetic dewormers, their mode of application and treatment frequency but they were not practising regular deworming.

In rural area, most the donkey owners had got knowledge about different ailments of equines from their forefathers as a special community in villages had been domesticating these animals since centuries. It was noted that experience of domestication of donkeys had more impact than level of formal education while about 35% farming community was unaware about these diseases.

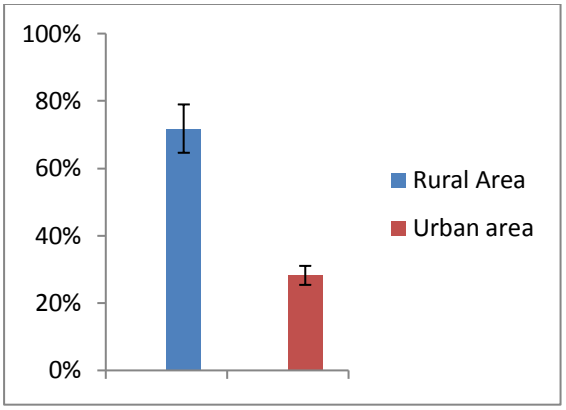

Fig. 1. Level of awareness about parasitic diseases in donkey related persons.

Level of education of donkey owners

Based on the collected data, majority of donkey owners were illiterate and ratio of illeteracy was relatively high in rural areas (53.29%) as compared to urban (45.3%). About 26% peoples involved in donkey carts had primary education and about 10% had matriculation (Fig.2). Ratio of intermediate was significantly low ($P < 0.05$) than other groups and it was about (4%) in both localities. Intermediate level education people were also involved in other government, semi-government and private jobs but had donkeys for agricultural purposes with other livestock. From middle to intermediate level of education, percentage of rural community was low that was in contrast to primary level. In city area, reading/writing of Urdu is helpful for reading the addresses, payment bills and cell numbers of different customers. Use of cell phones was an emerging trend in donkey owners.

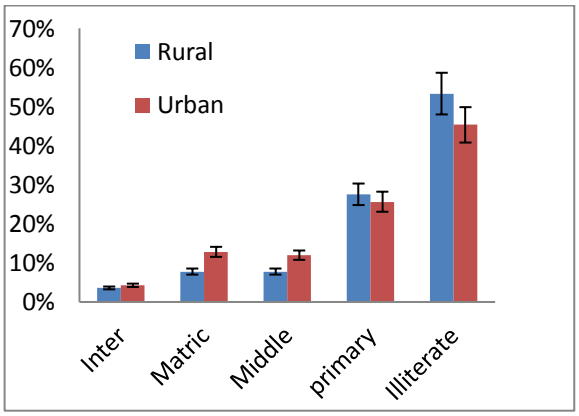

Fig. 2. Level of education of donkey owners in and around Faisalabad city.

Prevalence of gastrointestinal helminthes

Assessment about the prevalence of gastrointestinal nematodes was the main segment of current trial. For this purpose, 284 donkeys were randomly selected from both villages and city area. Among these, 58.8% were sampled from city and remaining 41.2% were from urban area. Among randomly selected donkeys, about 81% were found positive based on analysis of fecal samples (Fig. 3).

Among these, significantly high prevalence ($P < 0.05$) was observed in rural area that may be due to grazing environment. Management of the donkeys varies in rural and urban areas and grazing is considered as main factor of high prevalence in villages.

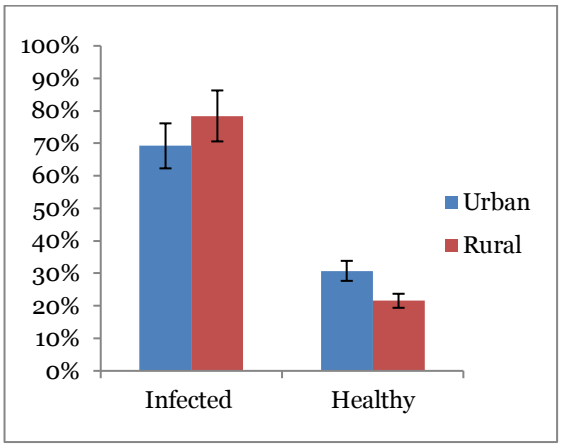

Fig. 3. Prevalence of helminths in donkeys of urban and rural set up.

Ratio of different helminths of equines

Based on the available eggs identification keys of helminthes, ten gastrointestinal helminthes species were identified in the fecal samples of donkeys directly collected from rectum or fresh fecal material. *Ascaris* sp., *Strongylus* sp., *Trichomenna* sp., *Paranoplocephala* sp., *Triodontophorus* sp., *Anoplocephala* sp., *Gastrodiscus* sp., *Strongyloides* sp., *Oxyuris* sp. and *Dictyocaulus* sp. were reported genera of helminthes. Majority of examined fecal samples showed mix infection and *Ascaris* nematode was in high number ($P < 0.05$) then in descending order *Trichonemma* sp. and *Strongylus* sp. However, *Paranoplocephala* species, *Oxyuris* species and *Anoplocephala* sp. were in low percentage.

Prevalence of helminth species in different localities

All of the species observed during the study were present in donkeys of both major goups. The percentage of *Ascaris* sp., *Strongylus* sp., *Anoplocephala* sp., *Gastrodiscus* sp., *Oxyuris* sp. and *Parancocephala* sp. was higher in the donkeys of the urban areas. While fecal samples taken from the rural areas showed the relative high prevalence of *Trichomenna* sp., *Triodontophorus* sp., *Strongyloides* sp., and *Dictyocaulus* sp. as clearly from Fig. 4.

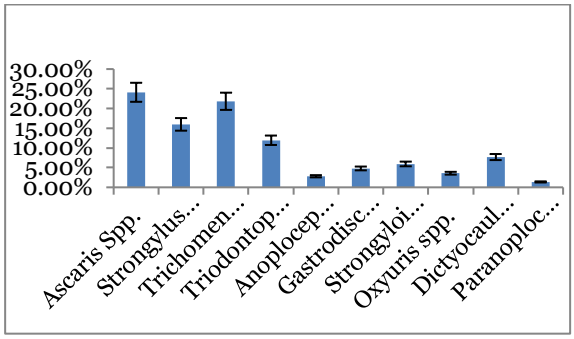

Fig. 4. Prevalence of different helminthes species in donkeys.

Prevalence of helminthes species with respect to different locations

In current trial, fecal samples were analyzed from eighteen (18) different locations in and around Faisalabad city. Highest prevalence was observed in the donkeys of 208-RB followed by 233-RB, Abdullahpur, 67-JB Sadhar, Saif Abad, Satyana Road, Madina Town, 238-RB, Niamuana, Khanowana, 210-RB, Sargodha Road, Canal Road, Sannat Pura, Fruit Markeet Jhang Road, Ghalla Mandi and Eid-Gah Road respectively. None of the fecal sample was found positive in 209-RB (Fig. 5).

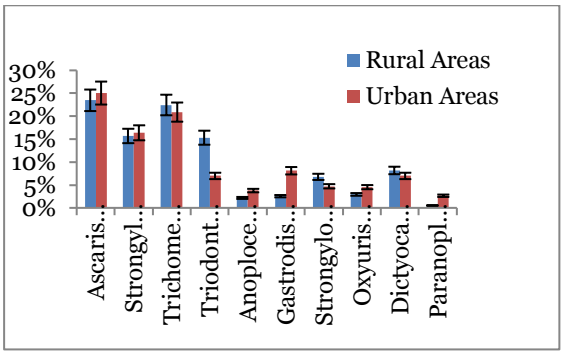

Fig. 5. Prevalence of helminth species in urban and rural area.

Month wise prevalence of different helminth species

Prevalence of parasites was more than 60% throughout the study duration ranging from September 2012 to January, 2013. A pilot project study data (January, 2011) was also added for statistical analysis and to compare the prevalence during different months. No specific trend was observed relating to prevalence of helminths. It is clear from Fig. 6 that highest prevalence was in December, 2012 and a gradual increase/decrease was observed from January 2011 to January 2013. Most of the collected data was of winter season, otherwise, highest prevalence should be in rainy season. Here effect of other factors like area, feeding, grazing could be potent agents.

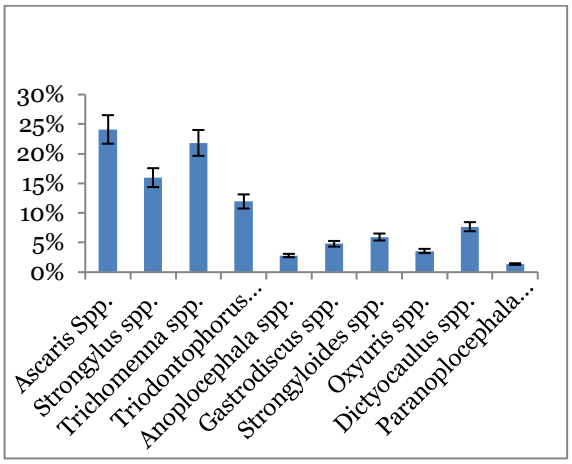

Fig. 6. Prevalence of helminths in different locations of study area.

Prevalence of helminths in different feeding systems

All the donkeys were also grouped according to their feeding management. Three groups were categorized as first group having donkeys which are grazers; second group was comprised of donkeys having stall feeding while the third group had donkeys which were kept on mixed feeding. Grazers (Fig. 7-8) carried the highest percentage of eggs ($P < 0.05\%$) as there are more chances for a grazer to get the parasitic infection by ingesting eggs or larvae from contaminated grass blades. Stall fed donkeys represented a relative low rate of infection owing to confinement in a specific area. Donkeys kept on mix feeding system had medium level of helminths infection.

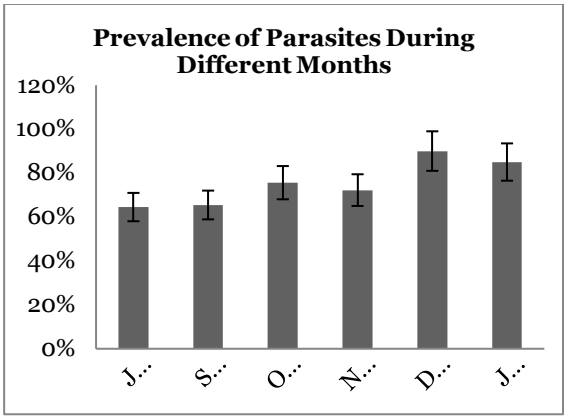

Fig. 7. Prevalence of helminths in donkeys in different months.

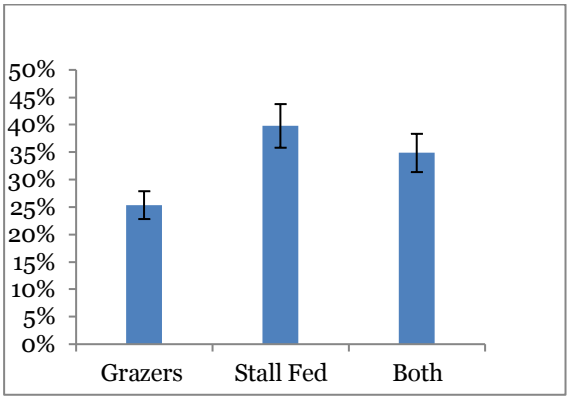

Fig. 8. Prevalence of helminths in donkeys kept on different feeding system.

Discussion

In present trial, awareness in farming community was assessed by a questionnaire survey. Such studies have been conducted earlier in Pakistan to assess the management practices of parasitism in small ruminants (Saddiqi *et al.,* 2011).

Awareness

More than 70% donkey owners/salesmen had knowledge about ill effects of internal parasitism but they were not fully aware about the life cycles of different helminth species same as was noted for small ruminants. No relation between education and awareness was seen in present study. About 35% farming community was unaware about these diseases. It is not in conformity with a study conducted previously which states uneducated people had no awareness regarding the health, housing and feeding of their animals (Khan, 2000).

Questionnaire's respondents (100%) were not fully aware about the life cycles of different helminth species. Impact of education was noted relating to awareness about synthetic dewormers, their mode of application and treatment frequency but they were not regularly using these plans.

Prevalence

In present trial, 81% were found positive based on analysis of fecal samples. The present study is not in agreement with Ibrahim *et al.* (2011) who revealed 96.9% overall infection rate and Seri *et al.* (2004) who reported 70.1% infection rate. Difference could be due to the different climatic conditions and study area. Significantly high prevalence ($P < 0.05$) was observed in rural area that seems to be affected by grazing environment.

Species Prevalence

Siddiqui *et al.,* (2015) reported 94 fecal samples out of 120 (78.33%) were observed have different gastro-intestinal parasites with *Triodontophorus* sp. (2.5%), *Dictyocaulus* sp. (3.33%), *Oxyuris* sp. (5.03%), *Parafilaria multipapillosa* (8.33%), *Trichonema* sp. (14.12%), *Strongyloides* sp. (14.17%), *Parascaris* sp. (19.17%) and *Strongylus* sp. (25%) which was similar to this study in aspects with multiple infections in one animal and was different somehow due to the difference in few parasitic infections which may be explained on the basis that there was a difference in the animal samples harbouring different infections. Ten gastrointestinal helminthes species were identified in the fecal samples of donkeys directly collected from rectum. *Ascaris* spp. (24.11%), *Strongylus* spp. (15.97%), *Trichonemma* spp. (21.83%), *Triodontophorus* spp. (11.94%), *Dictyocaulus* spp. (7.68 %) *Strongyloides* spp. (5.93 %), *Gastrodiscus* spp. (4.79%), *Oxyuris* spp. (3.57 %), *Anoplocephala* spp. (2.81%), *Paranocephala* spp. (1.37 %) were the common helminth species found during the study. Prevalence of *Ascaris* sp., *Strongylus* sp., *Gastrodiscus* sp., *Dictyocaulus* sp., and *Oxyuris* sp. have also been reported by Abebew *et al.* (2011) which are consistent with the present study, except *Fasciola* sp. reported in the same study.

Our findings are in agreement with Wells *et al.* (1998), who reported *Strongylus vulgaris, Strongylus equinus, Strongylus edentate, Strongyloides westeri, Parascaris equorum, Oxyuris equi, Trichostrongylus axei, Gastrodiscus aegyptiacus* in South Africa.

Our findings were also according to a report in turkey with a little difference in prevalence percentage as *Strongylidae* spp. 96.77%, *P. equorum* 22.58%, *Strongyloides westeri* 22.58%, *Fasciola* spp. 16.13%, *Dictyocaulus arnfieldi* 9.67%, *O. equi* 6.45%, *Anoplocephala* spp. 6.45%, *D. dentriticum* 3.22%, and *Draschia/Habronema* spp. 3.22%;, were present in donkeys (Umur & Acici, 2009). The species findings of the present trial also differed from the previous findings made by Hosseini *et al.* 2009, Shrikhande *et al.* (2009) Sousa *et al.* (2010), Asefa *et al.* (2011). Majority of examined fecal samples showed mix infection and *Ascaris* nematode was in high number ($P < 0.05$) then in descending order *Trichonemma* sp. and *Strongylus* sp. However, *Paranoplocephala* species, *Oxyuris* species and *Anoplocephala* spp were in low percentage.

Mathee *et al.* (2002) reported. Strongyle eggs represented approximately 95% of those counted in the bimonthly fecal egg counts; the remaining 5% consisted of *Strongyloides westeri*, *Parascaris equorum* and *O. equi.* The cyathostomes were the most abundant larvae in the cultures followed by *Strongylus edentatus* and *S. westeri* . The two least abundant species were *S. vulgaris* and *Trichostrongylus axei.* These findings differ from the results of current trial and the difference seems to be related with the difference in area and climatic conditions.

Previously these species had been reported in different groups of equines from different parts of the world (Lichtenfels *et al.,* 2002). *Strongylus (S.) vulgaris*, *S. edentatus*, *S. equinus* and *Triodontophorus* are commonly reported large strongyes while *Cyathostomes*, *Cylicocyclus*, *Cylicostephanus* and *Gyalacephalus* are small strongyles.

Apart from these, prevalence of large roundworms (*Parascaris equorum*), pinworms (*Oxyuris equi*), threadworm, (*Strongyloides westeri),* stomach worms (*Trichostrongylus axei, Draschia megastoma* and *Habronema musca*. Donkeys also have to face lungworms (*Dictyocaulus arnfieldi*), tapeworms (*Anopolocephalus magna, Anopolocephalus perfoliata* and *Paranoplocephala mammillana*), eyeworms (*Thelazia lacrimalis*), body cavity worms (*Setaria equina*), bots (*Gasterophilus intestinalus*) (Mair and Pearson, 1995; Reid *et al.,* 1995) parasites. *Dictyocaulus arnfieldi* is a relatively well adopted parasite of donkeys (*Equus assinus*) but its pathogenicity is more in horses, where this parasite is widespread (Bowman, 2003). This highest incidence could be explained by the fact donkey in the investigated area is used as a mean of transportation of people and goods from the boundary of the city to the central market places (Pearson *et al.,* 1999).

Sex Wise Prevalence

Most of the fecal samples which were analyzed belonged to the male donkeys. Out of 284 randomly selected animals, about 86% were male and remaining 14% were females. Male donkeys are preffered by the donkey owners due to their better working stamina and durable health.

Rate of infection was a bit higher in male donkeys as compared to the female. It has been studied earlier that prevalence of lungworms was relatively low female equines (12.66%) when compared with males (18.80%) but non-significant difference was noted (Solomon *et al.,* 2012).

All reported parasitic species in the study was present in both sexes but a few were more prevalent in one sex than the other. *Ascaris* sp.*, Strongylus* sp.*, Trichomenna* sp.*, Strongyloides* sp.*,* and *Oxyuris* sp.*,* is present in high percentage in females than in the males. *Anoplocephala spp*., were not seen in fecal samples of female donkeys. *Triodontophorus* sp.*, Anoplocephala* sp.*, Gastrodiscus* sp.*, Dictyocaulus* sp.*,* and *Paranoplocephalus* sp. were having relatively high percentage in male group.

Effect of sex has also been reported in small and large ruminants where female group was relatively more resistant to GINs that may be due to hormonal diffference (Saddiqi *et al.,* 2011). Variabilty in GINs in different locations was due to different husbandary practices and level of contamination of soil, yard and contaminated pasture.

Effect of season

In present study no specific trend was observed in the infection which is not in agreement with the studies which shows effect of season. According to Saeed *et al.* (2010), season has a significant difference on the prevalence of nematode infection. It has been reported that fecal egg count was high in spring and summer seasons that results due to hypobiosis in winter (Saeed *et al.,* 2010).

Feeding Systems

In current trial, it was noted that prevalence of helminths was different in different feeding systems. Grazers carried the highest percentage of eggs ($P < 0.05\%$) as there are more chances for a grazer to get the parasitic infection by ingesting eggs or larvae from contaminated grass blades. Stall fed donkeys represented a relative low rate of infection owing to confinement in a specific area. Donkeys kept on mix feeding system had medium level of helminths infection. Among donkeys, well-nourished animals were found to be more resistant to GI parasitism and the physiological stress caused by working long hours also appears to lead to greater susceptibility (Mattioli *et al.,* 1994).

Conclusion

Helminths are the major constraints in donkeys present in significant amount in both rural and urban area despite of various differences in their feeding and management system. Various factors contribute in prevalence and abundance of gastrointestinal helminthes including lack of proper care, awareness and effective deworming programs; which ultimately halts the growth of donkeys and their working ability.

Recommendations

Donkeys and donkey carts owner depends on good working of their animals so there is a need to care about the health of these animals which are the source of livelihood for many peoples. More prevalence and efficient treatment with the available antihelminthic drug should be planned to improve the health of animals; sanitary conditions and awareness about helminthes can increase the level of protection of these animals.

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