PREVALENCE OF GASTRO-INTESTINAL PARASITES OF HORSE (*EQUUS CABALLUS* LINNAEUS, 1758) IN SEVEN VILLAGE DEVELOPMENT COMMITTEE OF RUKUM DISTRICT, NEPAL

Naresh Oli and Janak Raj Subedi

Journal of Institute of Science and Technology

Volume 22, Issue 2, January 2018

ISSN: 2469-9062 (print), 2467-9240 (e)

JIST, **22** (2): 70-75 (2018)

Published by:

Institute of Science and Technology

Tribhuvan University

Kirtipur, Kathmandu, Nepal

JIST 2018, 22 (2): 70-75
ISSN: 2469-9062 (p), 2467-9240 (e)

Research Article

PREVALENCE OF GASTRO-INTESTINAL PARASITES OF HORSE (*EQUUS CABALLUS* LINNAEUS, 1758) IN SEVEN VILLAGE DEVELOPMENT COMMITTEE OF RUKUM DISTRICT, NEPAL

Naresh Oli and Janak Raj Subedi*
Central Department of Zoology, Tribhuvan University, Kirtipur, Kathmandu, Nepal
**Corresponding E-mail: janzoology@gmail.com*

Received: *19 September, 2017;* ***Revised:*** *12 October, 2017;* ***Accepted:*** *15 November, 2017*

ABSTRACT

This study aimed to determine the prevalence of gastro-intestinal parasites of horse in seven Village Development Committee (VDC) of Rukum district. It was carried out from March to November 2016. A total of 105 fecal samples of horses (79 males and 26 females) were collected by using opportunistic random method. The collected fecal samples were preserved in 2.5% potassium dichromate and microscopically examined using concentration techniques. The overall prevalence of gastro-intestinal parasites was 84.76% (89/105). The total number of genera observed during fecal examination was 12. Among them, *Strongylus* sp. showed the highest prevalence (51.42%) followed by *Eimeria* sp. (20%), *Trichostrongylus* sp. (14.28%), *Trichonema* sp. (13.33%), *Parascaris equorum* (10.47%), *Balantidium* sp. (9.52%), *Dictyocaulus* sp. (8.57%), *Triodontophorus* sp. (7.61%), *Gastrodiscus* sp. (6.66%), *Oxyuris equi* (4.76%), *Entamoeba* sp. (3.80%), *Shistosoma* sp. (1.90%) and unidentified nematode larvae (7.61%). Three genera of parasites; *Shistosoma* sp., *Triodontophorus* sp. and *Dictyocaulus* sp. have been reported for the first time in horses of Nepal. Present study showed higher infection rate in females (92.30%) than in male horses (82.27%). No significant association was observed between the prevalence of parasite rate with VDC ($\chi 2 = 5.7161$; $p>0.05$) and sex of animals ($\chi 2 = 0.3346$; $p>0.05$).

Keywords: Gastro-intestinal parasites, Horse, Fecal concentration, Strongylus, *Dictyocaulus* sp.

INTRODUCTION

Horses are prone to infestation by a mixture of internal and external parasites. They can harbor a great number of parasites without exhibiting any clinical signs (Claire & Masterson, 1987; Martin *et al*., 2007; Khan *et al.,* 2015). More than 50,000 horses/asses population have been reported from 51 districts of Nepal with around 2000 horses/asses from Rukum district (SIONA 2013/14). Horses are exposed to various types of gastro-intestinal parasites resulting in significant morbidity and mortality (Hodgkinson, 2006; Goraya *et al*., 2013; Tilahun *et al.,* 2014). Mortality of equines has been frequently associated with strongyles, tapeworms, ascarids, trypanosomes and *Babesia* sp. (Hodgkinson, 2006; Goraya *et al*., 2013; Tilahun *et al*., 2014). Research on gastro-intestinal parasites of horses/asses of Rukum district have not been done till date. Hence, present study was undertaken to determine the prevalence of gastrointestinal parasites in horses in seven eastern VDCs (Mahat, Morawang, Kankri, Kol, Taksera, Hukam and Ranmamaikot) of Rukum district, Nepal.

MATERIALS AND METHODS

The study areas selected were Mahat, Morawang, Kankri, Kol, Taksera, Hukam and Ranmamaikot, which are situated in the eastern part of Rukum district. They are located at the distance between 58 km to 125 km from headquarter of Rukum. The altitude of study area varies from 1,000 m to 4,000 m above sea level and has subtropical to subalpine climate. (Thapa, 2012; Lilleso *et al.,* 2005).

The opportunistic random sampling study was conducted during March to November 2016. A total of 105 fecal samples of horses (79 from males and 26 from females) were collected from eastern seven VDCs of Rukum district. The fecal samples were

preserved in 2.5% potassium dichromate and packed in polythene bag having normal atmospheric temperature and transported to the laboratory of Central Department of Zoology, Kirtipur, Kathmandu. The fecal samples were subjected to the coprological examination by concentration technique (Floatation and Sedimentation). Approximately 3 gram of fecal sample was placed in a beaker with 42 ml of water and filtered. The filtrate solution was centrifuged for 5 minutes. The filtrate was saturated with NaCl and again centrifuged. The top mixture was examined by adding methylene blue and the sediment was stain with iodine solution to detect eggs, trophozoites and cysts of parasites. (Soulsby, 1982; Zajac & Conboy, 2012). The collected data were coded and entered into Microsoft Excel spread sheet. Data were statistically analyzed using Pearson's Chi-square test with Yates continuity correction, performed by "R", version 3.3.1 software packages.

RESULTS

Overall prevalence of gastro-intestinal parasites in horse

Out of 105 samples, 89 (84.76%) samples were found to be positive for parasitic egg, cyst and larvae. Among them, the *Strongylus* sp. showed the highest prevalence (51.42%) followed by *Eimeria* sp. (20%), *Trichostrongylus* sp. (14.28%), *Trichonema* sp. (13.33%), *Parascaris equorum* (10.47%), *Balantidium* sp. (9.52%), *Dictyocaulus* sp. (8.57%), *Triodontophorus* sp. (7.61%), *Gastrodiscus* sp. (6.66%), *Oxyuris equi* (4.76%), *Entamoeba* sp. (3.80%), *Shistosoma* sp. (1.90%) and unidentified nematode larvae (7.61%).

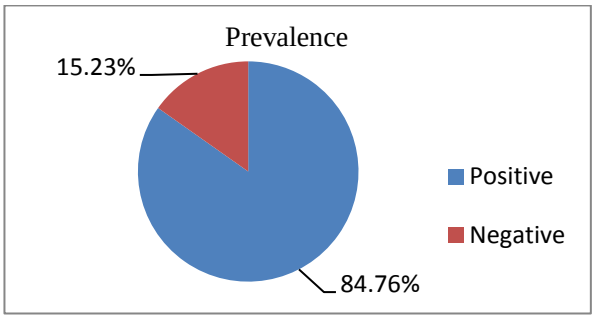

Fig. 1. Prevalence of GI parasites of Horses.

VDC-wise prevalence of GI parasites in horses

The highest prevalence (100%) was revealed in Kankri VDC followed by Ranmamaikot (96.42%), Kol (90%), Taksera (85.71%), Hukam (80%), Morawang (77.77%) and Mahat (64.70%). The study showed effects of VDCs (study areas) on the prevalence of gastro-intestinal parasite was not statistically significant ($\chi 2 = 5.7161$; $p>0.05$).

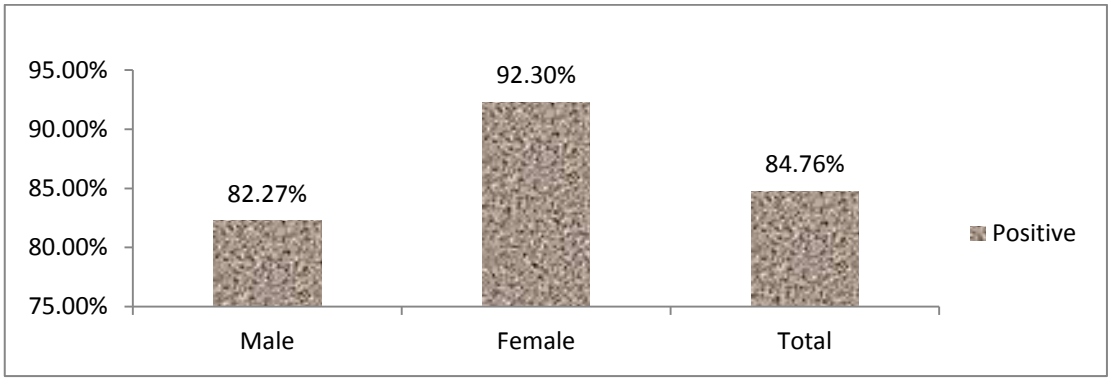

Fig. 2. Overall sex-wise prevalence of GI parasites in horses.

Prevalence of GI parasites in horses: Sex wise

Out of 105 horse samples collected, 79 were males and 26 were females. Sex-wise 65 males (82.27%) and 24 females (92.30%) were found to be positive. The study shows higher prevalence of gastro-intestinal parasite infection in females but, there the difference was not statistical significant ($\chi 2 = 0.3346$; $p>0.05$).

Type of GI parasites infection in horses

Figure 3 describes infection status of GI parasites in horses. According to study the highest prevalence rate (42.85%) was noted for double infection followed by single (27.61%), triple (10.47%) and multiple (3.80%) but, there was no statistical significance in the difference among infection status ($\chi 2 = 84.277$; $p<0.05$).

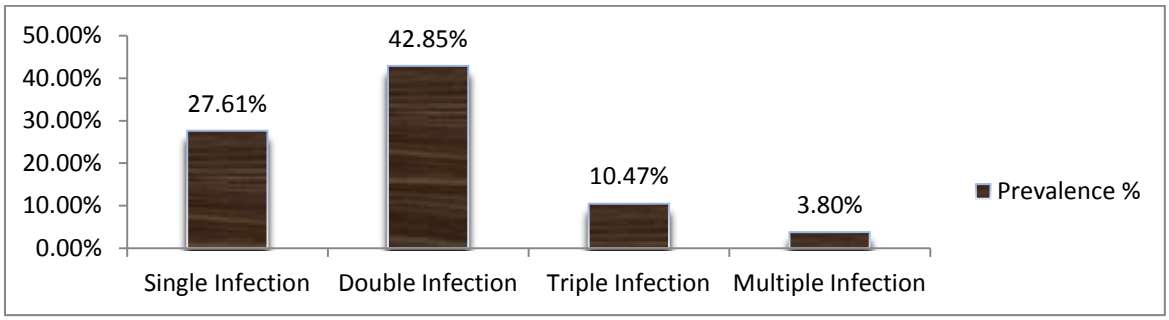

Fig. 3. Overall infection status of GI parasites in horses.

DISCUSSION

In the present study, the prevalence of gastro-intestinal parasites of horses (*Equus caballus*) has been carried out for the first time from Rukum district. The prevalence of gastro-intestinal parasites in the horses in Rukum was 84.76%. The high prevalence observed in this study agrees with the works of Aypak and Bergu (2013), Adeppa *et al.* (2014), Mezgebu *et al.* (2013), Sultan *et al.* (2014) and Wosu and Udobi (2014), who reported 88.6%, 84%, 92.71%, 75.62% and 76.1% in Aydin region of Torkey, Schimoga of Karnataka, Gondar town, Kurfa chale Ethiopia and Savannath zone of Nigeria respectively. The prevalence of infection in horses (84.76%) observed in the present study is lower than Wannas *et al.* (2012), Tilahun *et al.* (2014) and Hassan (2014), who reported 100%, 97.9% and 100% in Aldiwaniyah Governate, Hawassa town and Baquba city respectively and higher than Saeed *et al.* (2010), Adam *et al.* (2013), Regassa and Yimer (2013), Yadav *et al.* (2014), Tesfu *et al.* (2014), Shiret and Samuel (2015), Samuel *et al.* (2015), Molla *et al.* (2015) and Sokol *et al.* (2015), who reported 65.1%, 24.6%, 60.68%, 59.25%, 63.7%, 59.3%, 55.7%, 69% and 51.7% in Kurfa Chale of Ethiopia, North Darfun, South Wolla Ethiopia, Jabalpur of North Indea, Hawassa town, Mekelle Region, Kombolchu town, Menzkeya Gerbil district and Warmia of Mazury respectively. The high prevalence rate of present study could be due to samples collection during spring because eggs excretion during spring and summer season was high (Saeed *et al.*, 2010; Nielsen, 2012). The high prevalence rate (84.76%) of present study is also characterized by poor husbandry practice of the study area (Adebabay, 2009; Sisay *et al.*, 2007; Mezgebu *et al.*, 2013; Adeppa *et al.*, 2014). The differences among these findings from different regions might be due to variation in management system, geo-graphical climatic condition, sample size, sample collection period and sampling method differences (Wannas *et al.*, 2012; Tilahun *et al.*, 2014; Yadav *et al.*, 2014).

The prevalence rate variations in the present study from seven VDCs could be mainly due to altitudinal variations and habitat variations in their respective VDCs. We found that highland of cooler region and habitat near river or water source had higher prevalence than lowland (Courtney, 1999; Holland *et al.*, 2001). The highest prevalence of *Strongylus* sp. was 51.42% in the current study which is in close agreement with works of Wosu and Udobi (2014), Adeppa *et al.* (2014) and Poudel (2007), who reported 55.3%, 52.38% and 48.78% in North Nigeria, Schimoga Kornataka and Sainik stud farm of Chitwan respectively but was lower than Nigeria (68.8%) by Umar *et al.* (2013) and higher than Baquba city (44%) by Hassan (2014). The prevalence of *Trichonema* sp. was 13.33% which is similar to 17.07% recorded by Poudel (2007) from Bharatpur, Chitwan. The prevalence of *Triodontophorus* sp. (7.61%) reported in the present study is close to 11% (Sapkota, 2009) but was lower than 33.2% (Tilahun *et al.*, 2014). The prevalence (6.66%) of *Gastrodiscus* sp. reported in the present study is in close agreement with 7.14% (Adeppa *et al.*, 2014), 7.31% (Poudel, 2007), 6% (Karki & Manandhar, 2006) from Schimoga of Kornataka, Chitwan and Udyapur district respectively. The *Shistosoma* sp. was reported for the first time in horse from Nepal. The prevalence (1.90%) of *Shistosoma* sp. reported in present study agrees with 0.31% (Matto *et al.*, 2015) from Mumbai and Pune India. The prevalence of *Trichostrongylus* sp. in horses was found 14.28%. *Trichostrongylus* sp. reported in the present study was very less than finding of Poudel (2007) who reported 80.48% from Bharatpur, Chitwan. The prevalence rate of *Parascaris equorum* is (10.47%) almost similar to 10.71% (Adeppa *et al.*, 2014), 7.9% (Kornas *et al.*, 2010), 6.3% (Umar *et al.*,

2013), 13.9% (Ionita *et al.,* 2013) and 15.51% (Sultan *et al.,* 2014) but lower than 40.90% (Wannas *et al.,* 2012), 43.8% (Mezgebu *et al.,* 2013) 18.75% (Yadav *et al.,* 2014), 26.2% (Tesfu *et al.,* 2014), 55.8% (Tilahun *et al.,* 2014) and was higher than 4.5% (Regassa & Yimer, 2013), 3.9% (Hasson, 2014), 1.8% (Shiret & Samuel, 2015), 4.7% (Samuel *et al.,* 2015) and 5% (Tiroshlevy *et al.,* 2015). The lower prevalence of *Parascaris equorum* in the present study could be due to collection of fecal samples from adult working horses with only few from young horses. *P. equorum* mainly occurs in young horses less than 3 years old and infection with this parasite is restricted to animals less than 5 years old (Bucknell *et al.,* 1995). The prevalence of *Oxyuris equi* was 4.76% in horses.

This result is similar with Regassa and Yimer (2013), Adeppa *et al.* (2014), Mezgebu *et al.* (2013) and Sultan *et al.* (2014) who reported 4%, 4.7%, 0.95% and 1.47% respectively. But, lower than the results of Wannas *et al.* (2012), Umar *et al.* (2013), Wosu and Udobi (2014) and Tilahun *et al.* (2014) who reported 11.36%, 27.1%, 30.2% and 34.2% respectively. The lower result (4.76%) of *Oxyuris equi* in present study might be due to low temperature and collection methods because samples were not collected directly from rectum. Similarly, *Dictyocaulus* sp. was reported for the first time from horse in Nepal. The prevalence of 8.57% of *Dictyocaulus* sp. was recorded in the present study, which is similar to the report of Umar *et al.* (2013), who reported 10.4% in Nigeria but, was higher than 3.7% (Tilahun *et al.,* 2014) and 2.5% (Saeed *et al.*, 2010). The prevalence rate of *Balantidium* sp. (9.52%) is nearly similar to 15.90% (Wannas *et al.,* 2012) in Al Diwaniyah Governorate. The prevalence of 20% of *Eimeria* sp. was recorded in the present study, which is higher than the reports of Wannas *et al.* (2012), Alharis (2001).

Besides, we also found that there was no significant association ($\chi 2 = 0.3346$; $p>0.05$) of parasitic prevalence between male and female horse, which was estimated 82.27% and 92.30% respectively. The finding of this type of result was reported by Saeed *et al.* (2010), Mezgebu *et al.* (2013). But opposite result was reported by Umar *et al.* (2013) and Hasson (2014). In the current study, mixed infection was detected in 57.14% of horses which is almost similar with the finding of Tolossa and Ashenafi (2013) in horses of Arsi-Bale highlands of Oromiya region and Uslu and Guclu (2007) in Turkey, who reported 59.1% and 50% respectively. In the present study area, most of the respondents were found to be not enough qualified for management of equines. Most of them used river water source for equines which made the horses vulnerable to different parasitic infections.

CONCLUSION AND RECOMMENDATIONS

The present study shows that horses in Rukum district have mixed parasite infection. The horses were found to be susceptible to various GI parasites. Management practices and geographical differences can be considered as the important factors which influence the prevalence of GI parasites. Veterinary health program and appropriate prevention and control strategy actions supported by both government as well as private sector is necessary to minimize the gastro-intestinal parasites of horses.

REFERENCES

Adam, A. A.; Suleiman, S. E. and Seri, H. I. (2013). The prevalence and intensity of gastrointestinal helminths in North Dardfur, Sudan. College of Vet. Med. *Journal of Sciences and Technology,* **14**: 102-107.

Adebabay, K. B. (2009). Characterization of milk production systems, marketing and on farm evaluation of the effect of feed supplementation on milk yield and milk composition of cows at Bure district, Ethiopia. M.Sc. Thesis. Bahir dar University.

Adeppa, J.; Ananda, K. J.; Krishna C. M. and Satheesha, G. M. (2016). Incidence of gastrointestinal parasites in horses of schimoga region, Karnataka state. *Journal of Parasitic Diseases,* **40** (3): 919–921.

Alharis, K. M. (2001). Survey of the intestinal protozoa in the horses in Baghdad city. M.Sc. Thesis. Veterinary Medicine Baghdad.

Aypak, S. and Bergu, A. (2013). Prevalence of stomach helminths in equines. *Veterinary Medicine,* **24** (1): 29-35.

Bucknell, D. G.; Gasser, R. B. and Beveridge, I. (1995). The prevalence and epidemiology of gastrointestinal parasites of horses in Victoria, Australia. *International Journal for Parasitology,* **25** (6): 711-724.

Claire, N. I. and Masterson, W. J. (1987). Molecular and Biochemical Characterisation of surface antigens of *Strongylus vulgaris* of

potential immunodiagnostic importance. *Parasitology*, **25**: 29-38.

Courtney, C. H. (1999). Seasonal transmission of equine cyathostomes in warm climates. *Veterinary Parasitology*, **85**: 173-180.

Goraya, K.; Iqbal, Z.; Sajid, M. S. and Muhammad, G. (2013). Frequency distribution of equine diseases in three metropolises of the upper Punjab, Pakistan. *International Journal of Agriculture & Biology*, **15** (6): 1067-1074.

Hasson, R. H. (2014). A study in the prevalence of horse's helminthes parasitic infection in Baquba city, Digala. *International Journal of Recent Scientific Research*, **5** (10): 1810-1813.

Hodgkinson, J. E. (2006). Molecular diagnosis and equine parasitology. *Veterinary Parasitology*, **136** (2): 109-116.

Holland, W. G.; Geurden, T.; Do, T. T.; Dorny, P. and Vercruysse, J. (2001). Strongyle infections in horses from North Vietnam. *Medical Veterinary Pays Tropical*, **54** (1): 29-31.

Ionita, M.; Buzato, M. C.; Enachescu, V. and Mitrea, I. L. (2013). Coprological prevalence and intensity of gastrointestinal parasites in horses in Romanian studs: preliminary data. *Agrolite Scientific Journal*, **2** (1): 207-212.

Karki, K. and Manandhar, P. (2006). Preliminary investigation of prevalence of gastro-intestinal parasites of mules in Udayapur district. *Veterinary World Research*, **1** (4): 107-109.

Khan, M. A.; Roohi, N. and Rana, M. A. A. (2015). Strongylosis in equines: A review. *Journal of Animal and Plant Sciences*, **25** (1): 1-9.

Kornas, S.; Marta, B.; Vitalij, K. and Marta, S. (2010). Infection with large gastrointestinal parasites in slaughtered horses. Ukrainian National Academy of Science. *Bull Veterinary Institute polawy*, **54**: 577-580.

Lilleso, J. P. B.; Shrestha, T. B.; Dhakal, L. P.; Nayaju, R. P. and Shrestha, R. (2005). The map of potential vegetation of Nepal. University of Copenhagen. Development and Environment, **2**.

Martin, K.; Ray, N.; Kaplan, M.; Thamsborg, M.; Susanne, J. M. and Olsen, N. (2007). Climatic influences on development and survival of free-living stages of equine strongyles. *Veterinary Journal*, **174**: 23-32.

Matto, T. N.; Bharkad, G. P. and Bhat, A. (2015). Prevalence of gastrointestinal helminth parasites of equids from organized farms of Mumbai and Pune. *Journal of Parasitic Diseases*, **39** (2): 179-185.

Mezgebu, T.; Tafesi, K. and Tamiru, F. (2013). Prevalence of gastro-intestinal parasites of horses and donkeys in and around Gondar town, Ethiopia. *Open Journal of Veterinary Medicine*, **2**: 267-272.

Molla, B.; Worku, Y.; Shewaye, A. and Mamo, A. (2015). Prevalence of strongyles infection and associated risk factors in equine in Menz keya gerbil district, North-eastern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, **7** (4): 117-121.

Nielsen, M. K. (2012). Sustainable equine parasite control: Perspectives and research needs. *Veterinary Parasitology*,**185**: 32-44.

Poudel, S. (2007). Prevalence of gastrointestinal parasites in horses with special references to Strongylus species of sainik stud farm centre Bharatpur, Chitwan. *Blue–cross Annual Bull Nepalese Veterinary Science and Animal Husbandary*, **9**: 04-15.

Regassa, A. and Yimer, E. (2013). Gastrointestinal parasites of equines in south Wollo zone, north eastern Ethiopia. Hawasa University, School of Vet. Med., *Global Veterinaria* **11**(6): 824-830.

Reinemeyer, C. R. and Nielsen, M. K. (2013). Handbook of equine parasite control. ames, Iowa. John Wiley and Sons. Blackwell Publishing. pp. 45-60.

Saeed, K.; Qadir, Z.; Ashraf, K. and Ahmad, N. (2010). Role of intrinsic and extrinsic epidemiological factors on Strongylosis in horses. *Journal of Animals and Plant Sciences*, **20** (4): 277-280.

Samuel, E.; Ashenafi, A.; Natnael, M. and Shiret, B. (2015). Prevalence of Gastro-intestinal nematode parasitic infections of horses and donkeys in and around Kombolcha town. *American-Eurasian Journal of Scientific Research*, **10** (4): 228-234.

Sapkota, R. C. (2009). Prevalence of helminthes parasites in mules in Brick Kiln of Lalitpur district. Bacheolor Veterinary Science Thesis. Himalayan College of Agricultural Sciences and Technology, Purbanchal University, Gatthaghar, Bhaktapur.

Shiret, B. and Samuel, D. (2015). Prevalence of major gastro-intestinal parasites of horses in around Mekelle. *World Journal of Animals and Sciences Research,* **3** (3): 1-10.

SIONA (2013-14). Agri-business promotion and statistics section, Singh Durbar, Kathmandu, Nepal.

Sisay, A.; Maria, W.; Azage, T. and Wemer, Z. (2007). Urban and peri-urban farming systems and utilization of the natural resources in the North Ethiopian Highlands, pp. 5.

Sokol, R.; Malgorzata, R. N.; Moria, M.; Andezej, R.; Anna, R. L. and Sylwia, K. (2015). Eestimation of infection of internal parasites in horses from different types of farms. *Annals of Parasitology Journal,* **28** (2): 76-78.

Soulsby, E. J. L. (1982). Text of veterinary clinical parasitology vol. I, Helminth Oxford Blackwell scientific, London. pp. 766-771.

Sultan, A.; Ayele, G.; Tadese, B. and Ahmad, A. (2014). Prevalence of gastrointestinal parasites of horeses and donkeys in Kurfa chale district, east Hararghe Ethiopia. school of vet. Med., college of medical and health sciences, Wollega university, Nekemte, Ethiopia. *Livestock Research for Rural Development*, **26**.

Taylor, M. A.; Coop, R. L. and Wall, R. L. (2007). Text book of veterinary parasitology 3rd edition Blackwell publishing Ltd. Oxford, U. K.

Tesfu, N.; Asrade, B.; Abebe, R. and Kasaye, S. (2014). Prevalence and risk factors of gastro-intestinal nematodes of horses and donkeys in Hawassa, Town, Ethiopia. *Veterinary Science Technology,* **5** (50): 1-4.

Thapa, M. B. (2012). Effects of climate change on vegetable seed production in some selected pockets of Nepal. Vegetable Seed Project (VSP) III Center for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED).

Tilahun, B.; Nuraddis, I.; Benti, D. and Tadele, T. (2014). Prevalence of helminth parasites of Horses in and around Hawasa town, southern Ethiopia. *College of Agriculture and Veterinary Medicine,* **5** (1): 07-11.

Tiroshlevy, S.; Kaminiski, P. Y.; Hom, M. H.; Sutton, G. A.; Marcovics, A. and Steinman, A. (2015). Prevalence and risk factors analysis of equine infection with gastro-intestional parasites in Israel. *Israel Journal of Veterinary Medicine,* **70** (3): 32-40.

Tolossa, Y. H. and Ashenafi, H. (2013). Epidemiological study on gastro-intestinal helminthes of horses in Arsi-bale highlands of Oromiya region, Ethiopia. *Ethopian Veterinary Journal,* **17**: 51-62.

Umar, Y. A.; Maikaje, D. B.; Garba, U. M. and Alhassan, M. A. F. (2013). Prevalence of gastro-intestinal parasites in horses used for cadets training in Nigeria. *Journal of Veterinary Advances,* **3** (2): 43-48.

Uslu, U. and Guclu, F. (2007). Prevalence of endo-parasites in horses and donkeys in Turkey. *Veterinary Institute Pulawy,* **51**: 237-240.

Wannans, H. Y.; Dawood, K. A. and Gassem, G. A. (2012). Prevalence of gastro-intestinal parasites of horses and donkeys in Diwaniyah. *Al-Qadisiya Journal of Veterinary Medical Science,* **11** (1): 147-155.

Wosu, M. and Udobi, S. O. (2014). Prevalence of gastro-intestinal helminths of horses (*Equus caballus*) in the southern Guiea savannanth zone or northeern Nigeria. *College of Veterinary Medicine,* **20** (4): 277-280.

Yadav, K. S.; Shukla, P. C.; Gupta, D. V. and Mishra, A. (2014). Prevalence of gastro-intestinal nematodes in horses of Jabalapur region. *Research Journal for Veterinary Practioner,* **2** (3): 44-48.

Zajac, A. M. and Conboy, G. A. (2012). Veterinary clinical parasitology. Eighth edition. American association of veterinary parasitologist. Blackwell publishing, Oxford, U. K. pp. 3-14.