Research in: Agricultural & Veterinary Sciences
Vol.6, No.1, 2022, pp.14-21

EFFECTS OF TURMERIC AND GARLIC ON THE INTESTINAL PARASITIC PREVALENCE OF CATTLE

Marufatuzzahan Marufatuzzahan[1*], Noushin Anika Khan[1], Mohammad Mehedi Hasan Khan[2], Tanjia Afrin Chowdhury[3]

[1]Department of Animal and Fish Biotechnology, Faculty of Biotechnology and Genetic Engineering, Sylhet Agricultural University, Sylhet-3100, Bangladesh
[2]Department of Biochemistry and Chemistry, Faculty of Biotechnology and Genetic Engineering, Sylhet Agricultural University, Sylhet-3100, Bangladesh
[3]Department of Microbial Biotechnology, Faculty of Biotechnology and Genetic Engineering, Sylhet Agricultural University, Sylhet-3100, Bangladesh

Abstract. This study aimed to evaluate the efficacy of garlic and turmeric against the prevalence of gastrointestinal parasites in cattle. Selected 25 cattle of different ages infected with parasites were brought under the study. These animals were treated with three different types of herbal tablets made of turmeric, garlic, and mixed (turmeric-garlic), respectively, and a commercial anthelmintic, LT-Vet. Fecal egg count determined parasite prevalence through EPG count. Fecal samples and body weight were examined before treatment and on the 7th, 14^{th,} and 28th day of the treatment for each animal. Prevalence of parasites was found at 37.588% in adults and 62.412% in yearlings before treatment. Most of the Farmers that were 83.33% used local herbs as a primary medication for their cattle. According to the research output, garlic had an elevated inhibitory effect against parasitic growth between turmeric and garlic. A significant reduction in EPG count was found on 7th, 14th, and 28th day of treated cattle with garlic, turmeric, mixed and LT-Vet, respectively. Bodyweight increased by 6.96kg, 5.38kg, 4.98kg, and 1.242kg on average for mixed, turmeric, garlic, and LT-Vet treated cattle. The present study reveals that garlic and mixed had remarkable effects while turmeric has a moderate impact against gastrointestinal parasites in cattle.

Keywords: *Gastrointestinal parasitic, garlic, turmeric, eggs per gram (EPG).*

Corresponding Author: *Marufatuzzahan Marufatuzzahan, Assistant Professor, Department of Animal and Fish Biotechnology, Faculty of Biotechnology and Genetic Engineering, Sylhet Agricultural University, Sylhet-3100, Bangladesh. Phone (office): +880821761837,*
e-mail: marufatuzzahan@gmail.com

Received: *28 March 2022;* ***Accepted****: 26 April 2022;* ***Published:*** *28 April 2022.*

1. Introduction

Livestock rearing is a common practice in low and middle-income countries worldwide. In our country, it is an essential component of crop cultivation and post-harvest operations and has been regarded as the main component of the mixed farming system for centuries (Islam *et al*., 2014). Cattle, one of the prominent domesticated livestock in Bangladesh, represents a valuable asset in traditional and modern agriculture, and almost every village home holds cattle (Hossain *et al*., 2011). The production system is compounded by the deficiencies of feeding and breeding practices which are aggravated by the effects of diseases and parasitic infections (Ilyas *et al*., 2016). Parasitic infection adversely affects the health and productivity of animals and thus is considered one of the significant constraints for the growth of livestock populations (Hesterberg *et al*., 2007). The current financial and agriculture losses

caused by parasites substantially impact farm profitability. Among the parasitic diseases, the most common species of gastrointestinal nematodes for Bangladesh are *Cooperia* spp., *Haemonchus* spp., *Trichostrongylus* spp., *Oesophagostomum* spp., *Trichuris* spp. and *Strongyloides* spp. (Rahman and Mondal, 1983). Parasitic infections are caused by various explorations, including ingestion of infected water and fecal-oral transmission skin absorption. The variation between the prevalence and origin of parasitic infection may be caused by geographical locations and climatic conditions of a particular area, the genotype of the animals, gender of the animal, age, living condition, and feeding type of animal, and availability of intermediate hosts (Jeyathilakan *et al*., 2008). To be more precise, poor farm management practice and poor immunogenic state of cattle are the most important predisposing factors for parasitic infections (Edosomwan *et al*., 2012). The most common control tool is commercial anthelmintics such as benzimidazole, ricobendazole, levamisole, and ivermectin. However, anthelmintic resistance is a significant concern worldwide in the intensive farming of horses, sheep, and cattle (Waller, 1994). Different countries like New Zealand, the UK, Brazil, and Argentina have reported the developed anthelmintic resistance in bovine nematodes (Coles, 2002). Although not from concern about developing anthelmintic resistance worldwide, the high cost of these commercial anthelmintic has made them mostly unavailable for the local livestock producers in Bangladesh. Thus, they are not interested in using these synthetic-commercial anthelmintics (Amin *et al*., 2009). That, in turn, resulted in the necessity of developing an alternative anthelmintic, particularly in rural areas among the smallholder farms.

There is a great variety of plants or plant extracts suitable for treating almost every parasitic disease of livestock and poultry. The ancient medicinal practices based on these plants can help improve primary health care systems for humans and animals. In addition, the World Health Organization (1993) has acknowledged this and emphasized investigating more. It is a concerned understanding that the third world countries can make development in their livestock sector, fueling the improvement of the traditional system of medicine. For example, pineapple, turmeric, akanda, betel leaf, neem, garlic, and custard apple are the medicinal plants available in Bangladesh with anthelmintic activity (Amin *et al*., 2010).

The medicinal plant turmeric (Curcuma longa), a common spice in human food, contains active ingredients like curcumin, demethoxycurcumin, bisdemethoxycurcumin (Wuthi-Udomler *et al*., 2000), and tetrahydrocurcuminoids (Osawa *et al*., 1995). Plant extracts have long been known to have antifungal and antioxidative values. Nematocidal (Kiuchi *et al*., 1993) and anti-inflammatory (Ammon *et al*., 1993) activities have also been proved in different studies.

Another common medicinal herb, Garlic (Allium sativum), has been reported to be a parasiticide, amebicide, vermifuge, larvicide, fungicide, and immuno-stimulant properties (Duke, 2002).

The present study evaluated the efficacy of garlic, turmeric, and their combination against gastrointestinal nematodes based on fecal egg count in cattle. A commercial anthelmintic LT-vet was added to compare the efficacy of the commercial and herbal remedies. Consequently, this study also evaluated the effect of garlic, turmeric, their combination, and commercial anthelmintic on the bodyweight of the studied cattle.

2. Methods and materials

The experiment was carried out in Biotechnology and Genetic Engineering Lab-1 at the Faculty of Biotechnology and Genetic Engineering, Sylhet Agricultural University, Sylhet, between December 2017-February 2018. A total of 25 cattle were chosen for the experiment from randomly selected six small-scale dairy farms located in the nearby university area. Given the consent from the owner and after a preliminary confirmation of parasitic infection by floatation method (parasitic egg count), the animals were selected. All the farmers were asked thoroughly about some essential fundamental questions directly or indirectly related to the final output of parasite infection.

Fecal samples of all animals were collected in the early morning in a sterilized tube immediately after they were defecated and labeled. Labeled samples were transported to the laboratory and examined as soon as possible (within 24 hours). We followed the floatation method and modified stoll ova dilution technique for counting eggs per gram (EPG) (Islam *et al*., 2014; and Soulsby, 1982) to evaluate the efficacy of turmeric and garlic on intestinal parasites of cattle. Tablets prepared from turmeric and garlic paste were orally administered to the animals according to specific treatment groups. A commercial anthelmintic (LT-vet) was also used for a group of animals to make a comparative statement with the effect of garlic and turmeric. Each animal was weighed by width-girth method (Samad, 2001) during fecal sample collection. Data was appropriately recorded for further analysis if there were any effects of infection and the treatment. These animals were randomly divided into five groups, irrespective of their sex or age. Each group was managed with a particular treatment type according to the distribution listed in Table 1.

Table 1. Arrangement of treatment group

Group	Turmeric	Garlic	Mixed	LT-vet	Control
No. of animal	6	6	6	3	4
Treatment type	Oral administration, Turmeric Tablet (3 gm)	Oral administration, Garlic Tablet (3 gm)	Oral administration, Turmeric and Garlic mixed Tablet (3.25 gm) *	Oral administration, 500gm	No treatment

* Turmeric and garlic were used in equal proportion

Finally, the follow-up was carried out by regular examination of fecal samples and body weight on the 3rd, 7th, 14th, and 28th days of the treatment.

All information collected from farmers was checked carefully. Different measurements, findings, and other output were listed and entered into a computer spreadsheet for further analysis. Necessary calculations like average or mean and percentage were done by IBM SPSS-22.

3. Results and Discussion

All 25 cattle brought under the study were indigenous breeds, with 11 males and 14 females. According to the age group, 60% of animals are yearlings of 12-24 months old, and the other 40% are adults more than 24 months old.

3.1 Prevalence of parasite and body weight

Every sample collected from each animal showed parasitic egg under the microscopic examination. Therefore, all 25 animals were found to be infected with parasites. In addition, each of their preliminary body weight prior to the onset of treatment was recorded. Age-based distribution (Yearlings, n=15, Adults, n=10) of collected data shows a wide range of Standard Deviation (SD) at the group level.

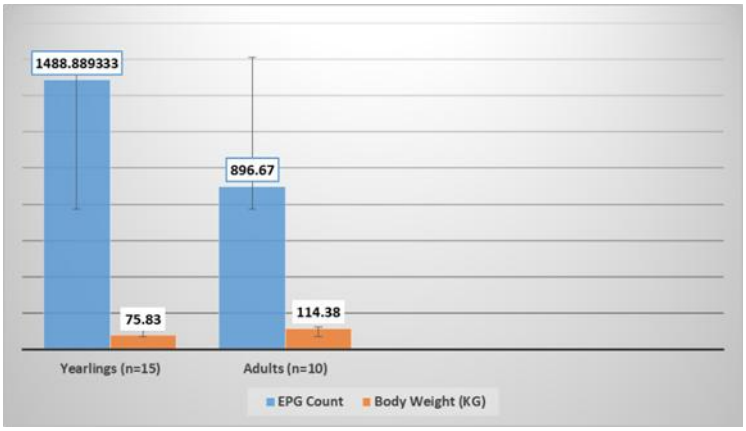

Figure 1. Preliminary prevalence of parasite and body weight in two different age group of animals

3.2 Important factors with relevance to parasite infection

Our study found a high prevalence of parasite infection in the yearlings (12-24 months) with an approximate mean value of 1489. Several studies like ours stated similar results where yearlings were found to be highly vulnerable to parasite infection (Islam *et al*., 2014; Waruiru, 2000; Nath *et al*., 2016). Nath *et al*. (2016) specified in their study that cattle in the age group of 6-18 months were more infected than any other age group. Even yearlings were found to be much more susceptible than calves in some studies (Islam *et al*., 2014)).

This high prevalence of parasite infection could be for many reasons. Irrespective of the definite cause behind the infection rate, our study encountered several poor farming practices that might be some of the reasons for causing infection, as well as for spreading. Sharing the same house with animals or having an adjunct home to an animal shed is a common and unhygienic practice in several parts of the world. Most of the farms (83%) were adjacent to the main household in our study. Besides, an unhealthy rearing environment (such as shed type) can make the animal vulnerable to parasite infection to some extent. In the case of this present study, about 67% of the farm with earthen shed floors and high humidity could be potential causes of parasite infection if not properly cleaned (Bern, 2000; Madke *et al*., 2010).

Along with improper housing, Kumar *et al*. (2013) stated that a common local grazing land can act as the source of parasite transmission. A mean count of EPG 1488

in yearlings or 897 in adults could be the results of such free animal grazing practice as all the farms (100%) under our study practice this behavior. Introducing a new animal directly to the existing stock without prior check-up or isolation is an alarming threat of parasite infection for any animal farm. Such practice was found in most of the farms in our study, and only 33% of farm practices isolated the new animal for a short period.

Accepting all the limitations of our study, our treatments products' efficacies were evaluated based on the percentage of reduction in mean egg count compared to the mean egg count per gram of feces. A significant ($P<0.001$) reduction of EPG count was found on the 7th, 14th, and 28th day for the treatment group of garlic, turmeric, turmeric-garlic mixture, and synthetic anthelmintic LT-Vet.

Table 2. All treatment groups with E.P.G. counting result (In all cases, $p<0.0001$)

Treatment Group	Without Treatment	3rd Day	7th Day	14th Day	28th Day
Mixed	1216.67	888.883	511.112	377.78	227.777
Turmeric	1283.34	911.112	683.333	427.778	288.89
Garlic	1611.11	972.223	655.557	394.443	100
LT-Vet	733.337	222.223	100.003	44.4433	44.4433
Control	783.335	991.668	1300	1358.34	1550

3.3 Effect of treatment

All animals showed off the effect of treatment on the prevalence of parasites in different ways. Almost all animals from all groups except the control group showed a gradual decrease in the EPG counting. Different EPG counting data (Table 2) from the 3^{rd}, 7^{th}, 14^{th}, and 28^{th} day of the treatment showed that, unlike turmeric or garlic, LT-Vet made an effective reduction from the 1st week. Post-treatment results (Table 3) on the final day (28th day) show that EPG reduction levels of garlic, turmeric, mixed, and LT-VT is 93.79%, 77.49%, 81.28%, and 93.93%, respectively. Although turmeric and mixed tablets showed almost similar results, mixed tablets were found to be more effective than turmeric. In addition to the lower EPG count on the 28^{th} day than the turmeric group, a gradual high reduction rate of EPG count was found for the mixed tablet group animals.

Table 3. Efficacy of garlic, turmeric, mixed, and commercial anthelmintic tablets against parasite in cattle

Treatment Group	Without Treatment	Post Treatment		P-Value
	'0' Day	'28' Day	E.P.G.	
Mixed	1216.667	227.7767***	(+)81.28 (↓)	<0.0001
Turmeric	1283.335	288.89***	(+)77.49 (↓)	
Garlic	1611.11	100***	(+)93.79(↓)	
LT-Vet	733.3367	44.44333***	(+)93.93(↓)	
Control	783.335	1550***	(-)93.24(↑)	

***: $P<0.0001$, "+"= Decrease, "-"= Increase, Mixed=Turmeric+Garlic.

The present finding was in agreement with the work of Amin *et al*. (2008), which found that a significant ($p < 0.01$) reduction of EPG counts on the 3rd, 10th, 17th, and 28th day following garlic and turmeric treated cattle. Besides, in the present study, garlic tablets showed a better and more consistent effect than turmeric or mixed tablets in reducing parasite eggs. Moreover, not only in cattle, other studies found significant anthelmintic effects of garlic on sheep and goats (Mostofa & Amin, 2005). Garlic extract had shown a better impact than any other herbal element, like betel leaf.

Above all these herbal extracts, the synthetic anthelmintic LT-Vet presented the lowest EPG (reduction level of EPG is 93.93%) on the final day, even lower than the garlic tablet. Despite the best performance by LT-Vet in EPG reduction, it had the most insufficient influence on the bodyweight gaining of cattle (Table 4). The mixed tablet group made the highest average (6.96 kg) body weight increase while the control group animal faced a gradually decreased body weight.

Table 4. Efficacy of mixed, turmeric, garlic, and commercial anthelmintic tablets against body weight in cattle

Treatment Group	Without Treatment (Kg) (Average)	'28' Day (Kg)	Increase/Decrease (Kg) (Average)
Mixed	78.8126	85.7729	(+)6.9603(↑)
Turmeric	86.3755	91.7553*	(+)5.3798(↑)
Garlic	97.9316	102.913	(+)4.9814(↑)
LT-Vet	78.0711	79.3131	(+)1.242(↑)
Control	107.69	93.11	(-)14.58(↓)

Generally, gastrointestinal parasites directly affect the cattle in different ways, where losing body weight with less profitability is the ultimate result (Fox *et al*., 1989; Taylor *et al*., 1989; Kyriazakis *et al*., 1998; Forbes *et al*., 2004; Szyszka *et al*., 2013). Our study found that cattle with a high EPG load had a low body weight while the same one had an increased weight with a low EPG load. In harmony with other studies by Forbes *et al*. (2000) and Berk *et al*. (2016), it was found that a large load of parasites negatively impacts gaining body weight. Our control group's mean 1st EPG count was 783.335, which increased two times to 1550 on the 28th day. At the same time, the mean average body weight of 107.69 was reduced to 93.11 for the same group. Hence, all the other groups with anthelmintic treatment showed increased body weight and a reduced EPG count at different rates.

Gasbarre *et al*. (2001) stated that the goal of using anthelmintic is to increase profitability avoiding the deterioration of animal welfare caused by intestinal parasites. A similar significant improvement was found for all anthelmintic (turmeric, garlic, mixed and LT-Vet) used in our study.

As stated earlier, LT-Vet showed the highest reduction in EPG. Still, herbal extracts are the most significant anthelmintic in terms of profitability, avoiding the deterioration of animal welfare. Furthermore, all other groups except the LT-Vet animals showed remarkable bodyweight improvement.

4. Conclusion

Taking into account the limitations of our study, turmeric and garlic, both are found to be effective against intestinal parasite infection in cattle. Though

comparatively, garlic is found to be more effective than turmeric against parasite infection. It is essential to note that the effect of the mixed tablet in recovering body weight was found to be the highest and performed just next to garlic in reducing infection. The commercial anthelmintic LT-vet might have the highest reduction rate of infection but has the lowest profile for bodyweight recovery. Hence, following the availability to farmers and the efficacy level, local and herbal treatment with garlic or turmeric for intestinal parasite infection in cattle could be preferable. Moreover, the efficacy of such a treatment in the long term should be studied and considered carefully.

References

Akerele, O. (1993). Summary of WHO guidelines for the assessment of herbal medicines. *Herbal gram*, *28*(13), 13-9.

Amin, M. R., Mostofa, M., Awal, M. A., & Sultana, M. A. (2008). Effects of garlic, turmeric and betel leaf against gastrointestinal nematodes in cattle. *Bangladesh Journal Veterinary Medicine, 6*(1), 115–119.

Amin, M. R., Mostofa, M., Hoque, M. E., & Sayed, M. A. (2009). In vitro anthelmintic efficacy of some indigenous medicinal plants against gastrointestinal nematodes of cattle. *Journal of the Bangladesh Agricultural University, 7*(452-2016-35486).

Amin, M.R., Mostofa, M., Islam, M.N., & Asgar, M. (2010). Effects of neem, betel leaf, devil's tree, jute and turmeric against gastrointestinal nematodes in sheep. *Journal of Bangladesh Agricultural. University, 8*(2), 259–263.

Ammon, H.P.T., Safayhi, H., Mack, T., & Sabieraj, J. (1993). Mechanism of antiinflammatory actions of curcumine and boswellic acids. *Journal of Ethnopharmacology, 38*(2-3), 105-112.

Berk, Z., Bishop, S. C., Forbes, A. B., & Kyriazakis, I. (2016). A simulation model to investigate interactions between first season grazing calves and Ostertagia ostertagi. *Veterinary parasitology*, 226, 198-209.

Bern, C., Joshi, A. B., Jha, S. N., Das, M. L., Hightower, A., Thakur, G. D., & Bista, M. B. (2000). Factors associated with visceral leishmaniasis in Nepal: bed-net use is strongly protective. *The American journal of tropical medicine and hygiene, 63*(3), 184-188.

Coles, G.C. (2002). Cattle nematodes resistant to anthelmintics: why so few cases?. *Veterinary Research, 33*(5), 481-489.

Duke, J. A. (2002). *Handbook of medicinal herbs*. CRC press.

Edosomwan, E. U., Gabaolu, C., & Enabulele, E. E. (2012). Ecto and gastrointestinal parasites of captured wild pigeons in Benin city, Nigeria. *Nigerian Journal of Parasitology, 33*(1).

Forbes, A. B., Huckle, C. A., & Gibb, M. J. (2004). Impact of eprinomectin on grazing behaviour and performance in dairy cattle with sub-clinical gastrointestinal nematode infections under continuous stocking management. *Veterinary Parasitology, 125*(3-4), 353-364.

Forbes, A.B., Huckle, C.A., Gibb, M.J., Rook, A.J., & Nuthall, R. (2000). Evaluation of the effects of nematode parasitism on grazing behaviour, herbage intake and growth in young grazing cattle. *Veterinary Parasitology, 90*(1-2), 111-118.

Fox, M.T., Gerrelli, D., Pitt, S.R., Jacobs, D.E., Gill, M., & Gale, D.L. (1989). Ostertagia ostertagi infection in the calf: effects of a trickle challenge on appetite, digestibility, rate of passage of digesta and liveweight gain. *Research in Veterinary Science, 47*(3), 294-298.

Gasbarre, L.C., Leighton, E.A., & Sonstegard, T. (2001). Role of the bovine immune system and genome in resistance to gastrointestinal nematodes. *Veterinary Parasitology, 98*(1-3), 51-64.

Hesterberg, U.W., Bagnall, R., Perrett, K., Horner, R., & Gummow, B. (2007). A questionnaire survey of perceptions and preventive measures related to animal health amongst cattle

owners of rural communities in KwaZulu-Natal, South Africa. *Journal of the South African Veterinary Association, 78*(4), 205-208.

Hossain, M.M., Paul, S., Rahman, M.M., Hossain, F.M.A., Hossain, M.T., & Islam, M.R. (2011). Prevalence and economic significance of caprine fascioliasis at Sylhet district of Bangladesh. *Pakistan Veterinary Journal, 31*(2), 113-116.

Ilyas, N., Hossain, M.M., Bhuyan, M.J.U., & Khan, M.M.H. (2016). Prevalence of Gastro-intestinal Nematodes Infection of Cattle in Bangladesh. *AJPCT, 4*(03), 091-097.

Islam, M.R., Yasin, G.M., Noman, A.A., Begum, N., & Mondal, M.M.H. (2014). Prevalence of gastrointestinal parasites in cattle at Vanguraupazila in Pabna district of Bangladesh. *International Journal of Natural and Social Sciences, 1*(2), 45-52.

Jeyathilakan, N., Latha, B.R., & Basith, S.A. (2008). Seasonal prevalence of Schistosoma spindale in ruminants at Chennai. *Tamil Nadu J. Vet. & Anim. Sci., 4*(4), 135-138.

Kiuchi, F., Goto, Y., Sugimoto, N., Akao, N., Kondo, K., & Tsuda, Y. (1993). Nematocidal activity of turmeric: synergistic action of curcuminoids. *Chemical and Pharmaceutical Bulletin, 41*(9), 1640-1643.

Kumar, N., Rao, T.K.S., Varghese, A., & Rathor, V.S. (2013). Internal parasite management in grazing livestock. *Journal of Parasitic Diseases, 37*(2), 151-157.

Kyriazakis, I., Tolkamp, B.J., & Hutchings, M.R. (1998). Towards a functional explanation for the occurrence of anorexia during parasitic infections. *Animal Behaviour, 56*(2), 265-274.

Madke, P.K., Lathwal, S.S., Singh, Y., Kumar, A., & Kaushik, V. (2010). Study of behavioural and physiological changes of crossbred cows under different shelter management practices. *Indian J. Anim. Sci., 80*(8), 771-774.

Nath, T.C., Islam, K.M., Ilyas, N., Chowdhury, S.K., & Bhuiyan, J.U. (2016). Assessment of the prevalence of gastrointestinal parasitic infections of cattle in hilly areas of Bangladesh. *World Scientific News*, 59, 74-84.

Osawa, T., Sugiyama, Y., Inayoshi, M., & Kawakishi, S. (1995). Antioxidative activity of tetrahydrocurcuminoids. *Bioscience, Biotechnology, and Biochemistry, 59*(9), 1609-1612.

Rahman, M.H., Mondal, M.M.H. (1983). Helminth parasites of cattle (Bos indicus) in Bangladesh. *Indian journal of Parasitology, 7*(2), 173-174.

Samad, M.A. (2001). *Poshu Palon O Chikitsavidya*. LEP Publication, Bangladesh.

Soulsby, E.J.L. (1982). *Helminths. Arthropods and Protozoa of domesticated animals*, 291.

Szyszka, O., Tolkamp, B.J., Edwards, S.A., & Kyriazakis, I. (2013). Do the changes in the behaviours of cattle during parasitism with Ostertagia ostertagi have a potential diagnostic value?. *Veterinary Parasitology, 193*(1-3), 214-222.

Taylor, L.M., Parkins, J.J., Armour, J., Holmes, P.H., Bairden, K., Ibarra-Silva, A.M., ... & McWilliam, P.N. (1989). Pathophysiological and parasitological studies on Ostertagia ostertagi infections in calves. *Research in Veterinary Science, 46*(2), 218-225.

Waller, P.J. (1994). The development of anthelmintic resistance in ruminant livestock. *Acta Tropica, 56*(2-3), 233-243.

Waruiru, R.M., Kyvsgaard, N.C., Thamsborg, S.M., Nansen, P., Bøgh, H.O., Munyua, W.K., & Gathuma, J.M. (2000). The prevalence and intensity of helminth and coccidial infections in dairy cattle in central Kenya. *Veterinary Research Communications, 24*(1), 39-53.