
ORIGINAL ARTICLE

Prevalence of Gastrointestinal Nematodiosis during summer and winter season in captive Asian elephants (*Elephas maximus*) of Tamil Nadu state

Senthilkumar¹ A, Jayathangaraj² M G, Valli³ A, Thangavelu⁴ A, Gomathinayagam⁵ S
Sribalaji⁶ N

Tamil Nadu Veterinary and Animal Sciences University,

1. Assistant Professor, Farmers Training Centre, Theni-625 531

2. Professor and Head, Professor, Department of Veterinary Clinical Medicine and Therapeutics, Madras Veterinary College, Chennai-600007

3. Professor, Department of Animal Nutrition, Madras Veterinary College, Chennai-600007

4. Professor, Department of Veterinary Microbiology, Madras Veterinary College, Chennai-600007

5. Professor, Department of Veterinary Parasitology, Madras Veterinary College, Chennai-600007

6. Assistant Professor, VUTRC, Salem

(Corresponding author **Email:senthilkumarwls@gmail.com**)

ABSTRACT

The study was carried out to assess the prevalence of nematodes in captive Asian elephants reared under captive conditions at various temples of Tamil Nadu state. A total of 50 dung samples were collected among them 25 samples during summer and winter season. All the samples (n=50) collected during the summer and winter seasons had single infections with *Strongyles* spp, *Strongyloides* spp or mixed infections with both. Comparison of nematodes prevalence in these two seasons revealed no significant difference.

Keywords: Asian elephant, nematodes, *Strongyles* spp, *Strongyloides* spp, Tamil Nadu state

Received 15.02.2018

Revised 10.04.2018

Accepted 17.06.2018

How to cite this article

Senthilkumar A, Jayathangaraj M G, Valli A, Thangavelu A, Gomathinayagam S Sribalaji N. Prevalence of Gastrointestinal Nematodiosis during summer and winter season in captive Asian elephants (*Elephas maximus*) of Tamil Nadu state. Adv. Biores., Vol 9 [4] July 2018.135-140.

INTRODUCTION

Parasitic diseases play an important role for wild animals in captivity. In captivity the health status of the animals depends on many factors, like feeding, keeping conditions, animal management and environmental conditions such as temperature and humidity. Mahouts and visiting publics plays an important role in the transmission of parasites through their cloths, hands, food or with working tools. Mixing different species brings additional risks of parasitic infections. In the wild, animals might have a natural resistance against parasitic infections or live in a balanced system with their parasites. But the change in environment and living conditions from freedom to captivity influences the animals ecology and might increase the sensitivity for parasitic infections [1]. The diverse agro-climatic conditions, management practices largely determine the incidence and severity of various parasitic infections [2 - 3]. Parasitic diseases are one of the main cause of death in wild animals in captivity [4]. The prevalence of Gastrointestinal Nematodiosis in captive Asian elephants (*Elephas maximus*) of Tamil Nadu state appears to be scanty. Hence, the present study was taken to elucidate the prevalence of Gastrointestinal Nematodiosis in captive Asian elephants (*Elephas maximus*) of Tamil Nadu state.

MATERIAL AND METHODS

The study was conducted for a period of one year from October 2012 to May 2013. A total of 25 elephants dung samples were collected from elephants reared under captive conditions at various temples of Tamil

Nadu state and sampling was carried out in summer and winter seasons. The dung samples were randomly collected and in each bolus of dung sample, sample was collected from the centre of the dung pile and samples were transferred to the clean glass containers, with 10% formalin and were sealed with parafilm, for the parasitological examination in the laboratory. The dung samples were subjected to qualitative and quantitative examination for gastrointestinal nematodes. The eggs were identified based on their morphology [5]. Quantitative analysis of dung samples to calculate the number of eggs per gram of faeces (EPG) of all positive samples was determined by McMaster slide technique [6]. During the studies seasonal prevalence was recorded during two seasons as summer and winter. Positive cases obtained from summer and winter seasons were compared statistically by using Chi-square-test [7].

RESULTS

In summer season, among the twenty five numbers of dung samples (Table 1), eggs of *Strongyles* were encountered in 24.00 % (n=6) and eggs of *Strongyloides* spp. in 12.00 % (n=3) and eggs of mixed parasitic infections comprising of *Strongyles* and *Strongyloides* spp. in 12.00 % (n=3). Thirteen dung samples were however found to be negative for endoparasitic prevalence. The percentage wise specific endoparasitic prevalence in the summer season was presented in Figure 1. The mean \pm S.E. values of egg per gram (EPG) of dung samples (Table 1) in summer season for *Strongyles*, *Strongyloides* spp. and mixed parasitic infections comprising of *Strongyles* and *Strongyloides* spp. were 153.17 ± 3.95 , 177.00 ± 4.75 and 243.33 ± 11.21 , respectively.

In winter season, among the twenty five numbers of dung samples (Table 2) eggs of *Strongyles* were encountered in 16.00% (n=4) and eggs of *Strongyloides* spp. in 12.00 % (n=3) and eggs of mixed parasitic infections comprising of *Strongyles* and *Strongyloides* spp. in 4.00 % (n=1). Seventeen dung samples were however found to be negative for endoparasitic prevalence. The percentage wise specific endoparasitic prevalence in winter season was presented in Figure 2. The Mean \pm Standard Error values of eggs per gram (EPG) of dung samples (Table 2) in winter season for *Strongyles*, *Strongyloides* spp. and mixed parasitic prevalence comprising of *Strongyles* and *Strongyloides* spp. were 150.25 ± 5.57 , 165.67 ± 2.72 and 224.00 ± 0.00 , respectively

Positive cases of *Strongyles* and *Strongyloides* spp. and mixed parasitic infections comprising of *Strongyles* as well as the *Strongyloides* spp. obtained from summer and winter seasons were compared statistically revealed (Table 3 and Figure 3) only the non-significant variations ($P \geq 0.05$).

DISCUSSION

Prevalence of Nematodes in temple Asian elephants

Helminthosis are a big problem in zoo animals especially animals in captivity appear to be less resistant to parasitic infections than in their natural habitats. Some parasites (geohelminths) potentially accumulate in a captive environment, in particular in open soil enclosures, which cannot be easily disinfected. Their survival in the soil is strongly impacted by climatic factors.

In the dung samples obtained from the temple elephants (n=25) of Tamil Nadu state under study, the overall endoparasitic prevalence in summer season was 48 per cent (n=12) and in winter season, the endoparasitic prevalence was 32 per cent (n=8) in this study. The elephants like any other wild fauna might get affected by different endoparasitic fauna frequently and the seasons for the occurrence of various endoparasitic fauna which comprised *Strongyles*, *Strongyloides* spp. and mixed parasitic infections consisting of *Strongyles* as well as *Strongyloides* spp. might be attributed to the defective deworming activities, absence of regular as well as effective anthelmintic treatment, existence of stress factors which were variable in nature, compromised immune status of the concerned captive elephants, pathogenic ability of the associated parasitic fauna, existing body status of the concerned elephants in terms of health etc.

In this regard, it becomes noteworthy to mention the report furnished by earlier report [8] who linked the occurrence of parasitic fauna with the stress factors in animals like elephants. Encountering the *Strongyles* in dung samples of both the summer and winter season was in agreement with the report [9] who quoted about the encountering nematodes (*Murshidia* spp., *Quilonea* spp. etc.) in the elephants. Even though eggs of *Fasciola* spp. were encountered in the dung samples of elephants as opined by previous workers [10-11], throughout the course of this study, no eggs of *Fasciola* spp. were however found in the dung samples of twenty five elephants that were subjected to the standard parasitological examination. Encountering the *Strongyles* during the summer as well as the winter season was further in agreement with the reports [12] who encountered eggs of *Quilonea* spp., *Murshidia* spp. and *Decrusia* spp. among which the *Murshidia* spp. was observed to be the predominant one in which the mean EPG values ranged from the minimum of 38 to the maximum of 45 in the elephants studied. The EPG values pertaining to

Strongyles in the captive elephants under study were 153.17 ± 3.95 in the summer season (Table 1) and 150.25 ± 5.57 in the winter season (Table 2). These values were found to be in agreement with the range of EPG related values presented by early report [13] who encountered the occurrence of *Strongyles* in captive elephants at Nehru Zoological park of Hyderabad with EPG values ranging from 400 to 1200.

The comparison of the endoparasitic prevalence in the dung samples of captive elephants of temples during both the summer and winter seasons however did not reveal any significant variations (Table 3). Absence of any season based variations in the occurrence of parasitic fauna pertaining to *Strongyles*, *Strongyloides* spp. and mixed parasitic infections comprising of these endoparasites in the elephants in this study might be attributed to the more or less similar type of animal husbandry related practices maintained in the enclosures of elephants, existence of captive condition maintained for these elephants similarities in the general management measures pertaining to these elephants that were reared in various temples of Tamil Nadu etc during these seasons.

However, it becomes noteworthy to mention the report furnished by previous report [14] who recorded highly significant parasitic loads related to the elephants during the dry season than the wet season in the free ranging conditions and similarly, early report [13] encountered predominant *strongylosis* associated with the captive elephants during the summer period than the winter period. In this regard, however, previous worker [15] opined about the occurrence of different factors pertaining to the environment and these different environmental factors were found to affect the occurrence of helminth loads in the host species and encountered increased parasitic prevalence during the rains in the dung samples of elephants, in addition to other herbivorous wild animals like gaurs.

Encountering of *Strongyles* during both summer and winter seasons in the captive elephants under study might be probably attributed the long survivability of the third stage larvae of *Strongyles* which was considered as one of the significant features, pertaining to the life cycle of the *Strongyle* nematodes in these mega herbivores and this was in agreement with the finding [16]. Supporting the encountering of evidences on the prevalence of *Strongyles* in the temple elephants studied, early reporter [17] opined about the encountering of various *Strongyles* in case of elephants of Tamil Nadu state and the *Strongylids* with the group of nematodes that caused disease related problems in the elephants, in addition to the recording about the occurrence of nematodes like *Ascarids*, *Oxyurids*, *Paramphistomes*, *Ancylostomes*, *Syngamids* and *Filarids*. [10]

The encountering of *Strongyloides* spp. in the study elephants as revealed by the EPG values of 177.00 ± 4.75 in the summer season (Table 1) and 165.67 ± 2.72 in the winter season (Table 2) was in agreement with the report furnished by earlier worker [18] who encountered *Strongyloides* sp. in addition to the *Decrusia* sp., *Pseudodiscus* sp. etc. in the parasitism affected megaherbivores. The findings of *Strongyloides* sp. in the captive elephants of temples under study was in agreement with the report [19] who additionally encountered evidences of multiple endoparasites like *Fasciola* sp., *Paramphitomum* spp., *Oesophagostomum* spp. and *Murshidia* spp. in elephants that were reared in the temples located at Gujarat state. However, throughout the period of study in the temple elephants of Tamil Nadu state under study, helminthic fauna other than *Strongyles* and *Strongyloides* sp. were not encountered. With regard to the encountering of *Strongyloides* spp. in this study, it also appeared to be noteworthy to mention the report furnished by earlier reporter [10] who opined that severe *Strongyloides* and *Strongylus* infections caused signs similar to those witnessed in horses.

Nematodes prevalence related measures

In this study, eggs of *Strongyles* as well as *Strongyloides* spp. in addition to the mixed parasitic infections comprising both of these were revealed in the dung samples of temple elephants (Table 1 and Table 2). All these findings indicated the requirement of proper deworming activities pertaining to these elephants that were reared in the temples belonging to different places of Tamil Nadu state.

Though different anthelmintics were available, drugs like Fenbendazole or ivermectin may be chosen for the proper deworming in the captive elephants and Fenbendazole may be administered at the dose rate of 5 mg per kg body weight orally. In this regard, it becomes significant to mention the report furnished by earlier reporter [10] who quoted about the usage of Fenbendazole at the dose rate of 3.5 to 5.0 mg per kg body weight by oral route, against various parasitic conditions, affecting the elephants and emphasized about the clinical usage of Fenbendazole in detail.

The dose rate recommended in this study was further in agreement with the findings of earlier reporter [11] who quoted the Fenbendazole as one of the effective anthelmintic drugs for use in elephants at the dose rate of 5mg per kg body weight. Ivermectin may be used at dose rate of 0.2-0.4 mg per kg body weight by oral route preferably and usage of ivermectin in elephants was in agreement with the report presented by earlier reporter [18] who recommended about the usage of ivermectin against the *Strongyles* as encountered during this study programme with elephants reared at various temples of

Tamil Nadu state and Ascarids, in addition to the grubs, lice and mites affecting the elephants. Recommended the usage of ivermectin and quoted about the administration of 0.2-0.4 mg per kg body weight orally as the appropriate one for eliminating many types of parasites in elephants and this could minimize the development of parasite resistance [20].

However, prolonged use of same anthelmintic drug in a repeated manner, in general might be prevented in order to prevent the drug related resistance. The floor surface of the enclosures pertaining to the temple-elephants need to be applied with effective disinfectants like the glutaraldehyde solution on a periodical basis and the dung materials need to be disposed off, frequently in a hygienic manner by using gloves, in order to avoid the zoonosis related problems pertaining to the elephants that were reared under captive conditions, like the case with the elephants reared in different temples of Tamil Nadu state. Further, care is required to avoid the stagnation of urine on the floor-surface and instant cleaning of the surface of the floor is highly recommended.

TABLE 1 PREVALENCE OF NEMATODES IN SUMMER SEASON

S. No.	Endoparasites	No. of positive cases	Mean±SE value of EGG
1	<i>Strongyles spp</i>	6 (24 %)	153.17±3.95
2	<i>Strongyloides spp.</i>	3 (12 %)	177.00±4.35
3	<i>Strongyle + Strongyloides spp.</i>	3 (12 %)	243.33±11.21

TABLE 2 PREVALENCE OF NEMATODES IN WINTER SEASON

S. No.	Endoparasites	No. of positive cases	Mean±SE value of EGG
1	<i>Strongyles spp</i>	4 (16%)	150.25±5.57
2	<i>Strongyloides spp.</i>	3 (12%)	165.67±2.72
3	<i>Strongyle + Strongyloides spp.</i>	1 (4%)	224.00±0.0

TABLE 3 COMPARISON OF NEMATODES PREVALENCE IN TWO DIFFERENT SEASONS

Season	<i>Strongyle spp</i>		<i>Strongyloides spp.</i>		Mixed Infections		(n=25)
	Positive	Negative	Positive	Negative	Positive	Negative	
Summer	6	19	3	22	3	22	
Winter	4	21	3	22	1	24	
Chi-square	0.50 NS		NS		1.09 NS		

NS – Non significant

a. Egg of *Strongyloides spp.*(40x)



b. Egg of *Strongyles spp.*(40x)

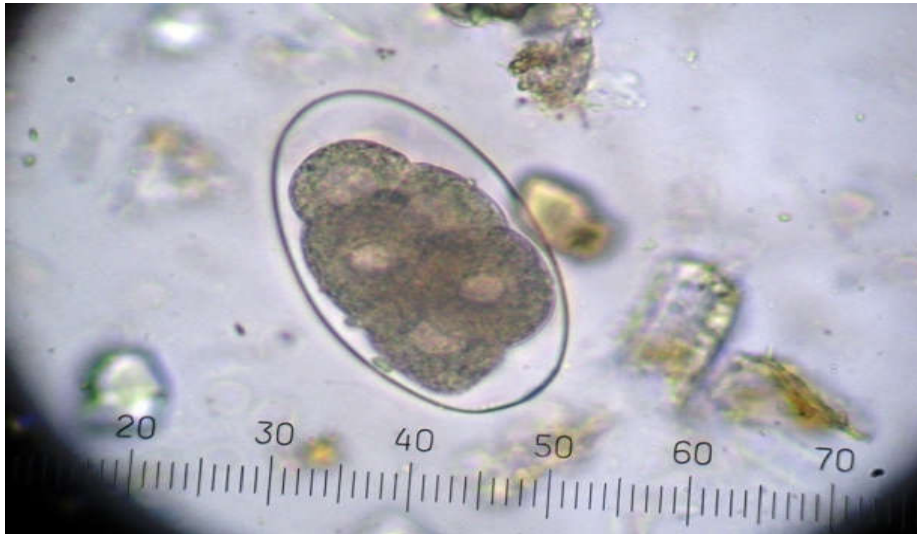


Plate 1 : Nematode Eggs In Asian Elephant

Figure 1: Prevalence of Nematodes during summer season in temple elephants of Tamil Nadu (n=25)

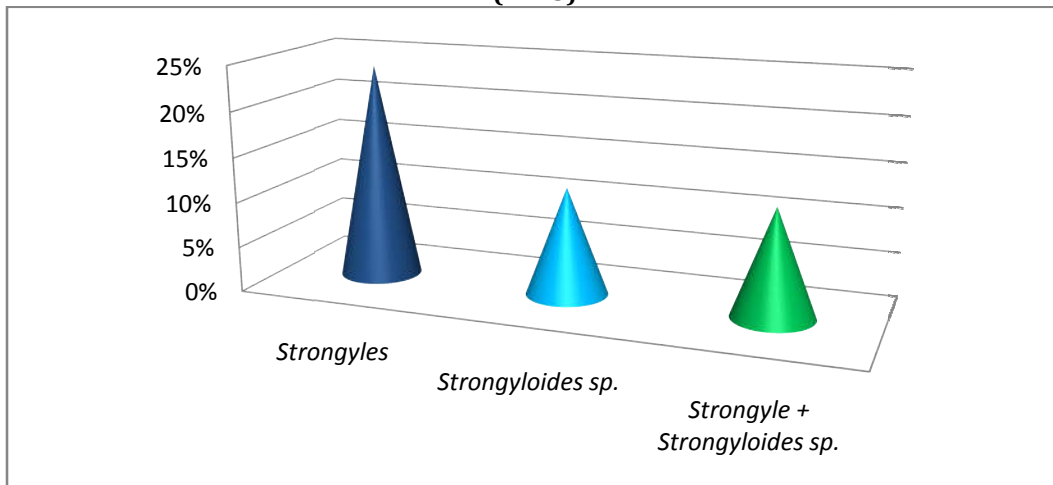


Figure 2: Prevalence of Nematodes during winter season in temple elephants of Tamil Nadu (n=25)

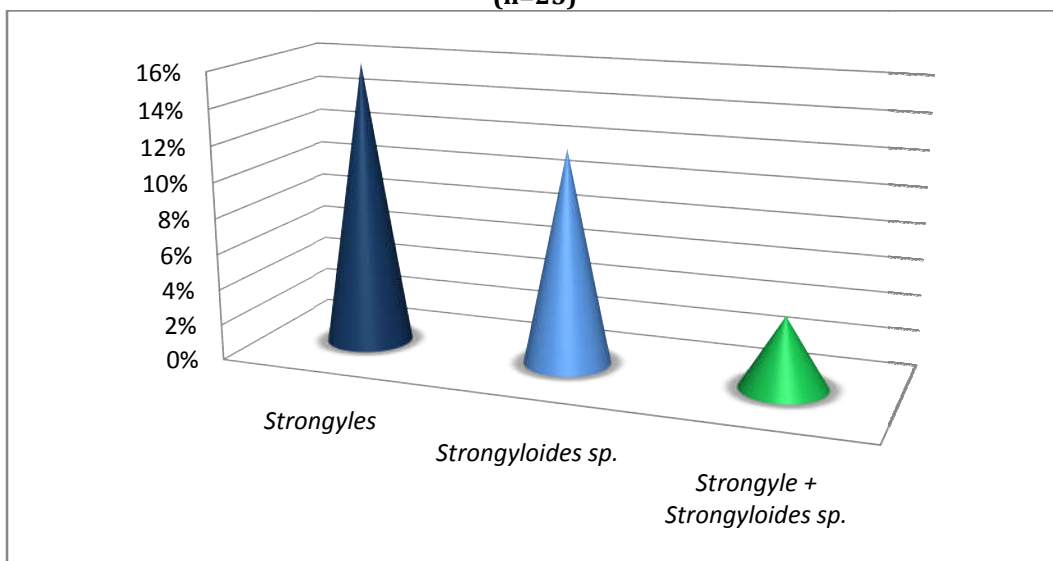
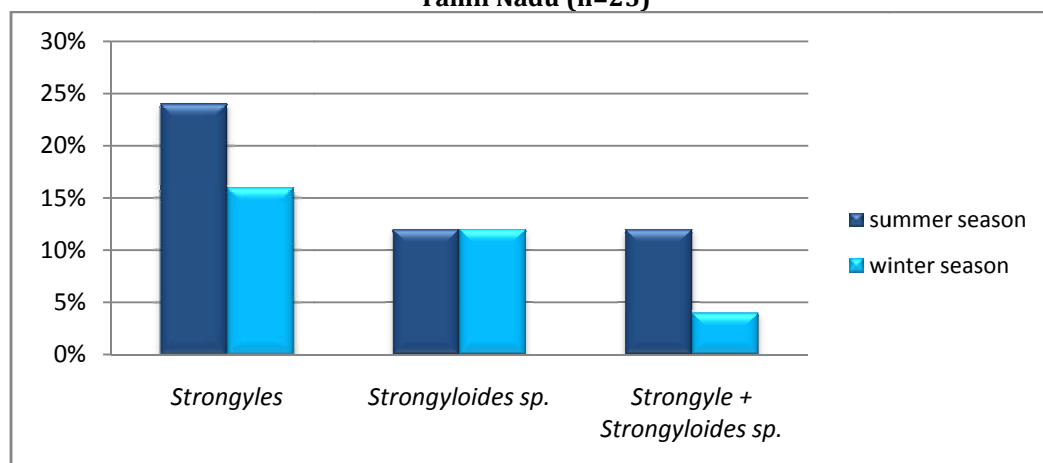


Figure 3: Comparison of prevalence of Nematodes in two different seasons in temple elephants of Tamil Nadu (n=25)**REFERENCES**

- Goossensa, E., Dornya, P., Boomkerd, J., Vercammen, F. and Vercruyssen, (2005). A 12-month survey of the gastrointestinal helminths of antelopes, gazelles and giraffes kept at two zoos in Belgium. *Veterinary Parasitology*, 127:303-312.
- Joshi, B.R. (1998). Gastrointestinal nematode infection of small ruminants and possible control strategies in the hills and mountains of Nepal. *Vet. Rev.*, 13:23-25.
- Jothedran, K.P. and Bhat, T.K. (1999). Epidemiology of parasitoses in dairy animals in the north west Humid Himalayan Region of India with particular reference to gastrointestinal nematodes. *Trap. Anim. Hlth. Prod.*, 31:205-214
- Rao, A.T. and Acharjyo, L.N. (1984). Diagnosis and classification of common diseases of captive animals at Nandankanan Zoo in Orisa (India). *Indian journal of Animal Health* 33:147-152.
- Soulsby, E.J., 1982. *Helminths, Arthropods and Protozoa of domestic animals*. 7th Edn., ELBS, Bareilly Tindall, London. pp. 169-173.
- Reinecke, R.K. (1983). *Veterinary heminthology*. Durban: Butterworths.
- Snedecor, G. W. and Cochran, W.S. (1994). *Statistical Methods* 9th Edn. Low state university press. Ame. Iowa
- Fernando, A and Fernando, C.H. (1961). Some Helminths from Elephants in Malaya. *Bull. National* 30: 40-43.
- Wallach, J.D. and Boever, W.J. (1983). *Diseases of Exotic Animals – Medical and Surgical Management*. W.B. Saunders Company, Tokyo. pp: 766-771.
- Fowler, M.E. (1986). *Zoo and Wild Animal medicine*, 2nd edn. W.B. Saunders Company, Hong Kong
- Mikota, S.K., Sergeant, E.L. and Ranglack, G.S. (1994). *Medical management of elephants*. Indira publishing house, Michigan, USA.
- Jayathangaraj, M.G., Raman, M and John, M.C. (2001). *In-vitro* survivability of *Strongyloides* Larvae in elephants. *Indian. J. Anim. Sci.* 71: 1043-1044.
- Suresh, K., Choudhuri, P.C., Nalinikumara, K., Hafeez, M. and Hamza, P.A. (2001). Epidemiological and clinico-therapeutic studies of strongylosis in elephants. *Zoos Print* 16(7): 539-540.
- Vidya, T.N.C. and Sukumar. R. (2002). The effect of some ecological factors on the intestinal parasite intensities of the Asian elephant (*Elephas maximus*) in southern India. *J. Bioscie.* 27: 521-528.
- Dharamarajan, G., Raman, M. and John, M.C. (2005). Effect of season on helminth loads of wild herbivores and cattle in the Mudumalai Wildlife Sanctuary, Southern India. *Zoos' Print* 20(2): 1766-1769.
- Raman, M., Jayathangaraj, M.G. and Malik, P.K. (2001). *In vitro* survivability of strongyloid larvae of elephants. *Indian Journal of Animal Sciences* 71(11): 1043-1044.
- Ramanujachari, G and Alwar, V.S. (1954). A checklist of Parasitic classes Trematodes, Cestodes and Nematodes in the Department of Parasitology, Madras Veterinary College. *Indian Veterinary Journal* 31: 46-56.
- Fowler, M.E. and Mikota, S.K. (2006). *Biology, Medicine, and Surgery of Elephants*. Blackwell Publishing, London.
- Jani, R.G. (2008). Prevalence of gastrointestinal parasites of Indian elephants (*Elephas maximus*). *Veterinary World* 1(10): 296-298.
- Gandolf, R.A., Lifschitz, A., Stadler, C., Watson, B., Galvanek, L., Ballent, M and Lanusse, C. (2009). The pharmacokinetics of orally administered Ivermectin in African elephants (*Loxodonta africana*): implications for parasite elimination. *J. Zoo and Wildl. Medi.* 40(1): 107-112.

Copyright: © 2018 Society of Education. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.