Seasonal fluctuation of parasitic infestation in donkeys (*Equus asinus*) in Oodi village, Kgatleng District, Botswana

E Z Mushi[a*], M G Binta[b], R G Chabo[a] and L Monnafela[a]

ABSTRACT

During the period March to September 2000, a study was conducted in Oodi village, Kgatleng District, Botswana, to investigate the seasonal fluctuation of internal, external and blood parasites of donkeys. Twelve adult donkeys were randomly selected from a farmer with a herd of 15 donkeys. Monthly visits were made to the farmer when the donkeys were examined for parasites. The only ectoparasites recovered from the donkeys were instars of various tick species. The most prevalent tick was *Rhipicephalus evertsi evertsi* (98.4 %), followed by *Amblyomma hebraeum* and *Hyalomma* species. The only haemoparasite seen on microscopy was *Babesia equi* at low parasitaemia in 26.8 % of the donkeys. However, no clinical babesiosis was evident. Coprological examination showed the presence of strongyle eggs in moderate numbers. Very low numbers of coccidia oocysts were found in the faecal samples. High tick numbers and worm egg counts coincided with the warm, wet months in contrast to the low numbers recovered during the cold, dry months. An interview conducted by the authors indicated that donkeys were nutritionally marginalised by owners. Supplementary feeding was therefore recommended, especially during the winter months when grazing is poor.

Key words: *Babesia equi,* Botswana, donkeys, helminths, ticks.

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Donkeys (*Equus asinus*) are used as draft animals and beasts of burden in many developing countries, including Botswana[1,2,10]. According to statistics from the Ministry of Agriculture, in 1990 the population of donkeys in Botswana was 158 000 compared with 145 900 in 1988. Most of the donkeys (98.2 %) were kept in rural areas, with 17.4 % of this population in the Gaborone district.

In rural Africa, donkeys provide an alternative to mechanisation in resource-limited communities[18] and are a source of cheap, readily available transport. They are easy to maintain and are an affordable alternative to tractors for ploughing. The docile nature of donkeys lends itself to easy handling by women and children[11]. They are economical for use in small-scale farming and are handy in third world countries with a poor infrastructure[10]. For example, in northeastern parts of Kenya, donkeys are the only means of transport[19].

In Botswana, more than 50 % of the donkeys roam freely until they are needed for work, for which they are either brought to an enclosure (*kraal*) next to the farmer's homestead, cultivated fields or to a 'cattle post'. There is a dearth of information on the socioeconomic role and health status of donkeys in rural communities in Botswana.[1]

The main objective of the present study was to investigate the incidence of haemo-, endo- and ectoparasites of donkeys (*Equus asinus)* at Oodi village, Kgatleng District, Botswana. The management and welfare of these donkeys were assessed through an author-structured interview.

Twelve adult donkeys (8 males and 4 females) with an average weight of about 80 kg, were randomly selected on a smallholding in Oodi. The farmer used them for traction and for transporting water drums. Monthly visits were made to the farmer, from March to September 2000. The farmer was subjected to an author-structured interview about the management of the donkeys on the farm. The donkeys in this study were grazing freely, only returning to the owner during the ploughing season. They fed mainly on coarse pastures, thorn bushes and thistles, and sometimes browsed *Acacia* leaves. There was no supplementation and the donkeys were given water when it was available at the farmer's homestead.

During each visit, the 12 donkeys were examined for the presence of ectoparasites. Whenever ticks were found, they were collected with a pair of forceps, ensuring that the mouthparts were not damaged, and thereafter preserved in 70 % methyl alcohol. The ticks were identified using an indentification key[18].

Faecal samples collected from the rectum were placed in capped bottles, preserved on ice at 4 °C and transported to the laboratory within 1–2 hours of collection to prevent hatching of eggs. Qualitative and quantitative coprological examination was carried out to estimate the endoparasite burden using a modified McMaster slide technique[19].

Prior to pricking the ear to obtain a drop of blood, the site was cleansed, shaved and disinfected with methanol. Thick and thin air-dried blood smears were fixed in methanol and stained with 10 % Giemsa (v/v) stain solution[7]. Microscopic examination for blood parasites was done at a magnification of ×1000.

A total of 132 ixodid ticks was collected. The average number of ticks per donkey was 5.4, with an infestation rate of 39.3 % (Table 1). The most common tick species was *Rhipicephalus evertsi evertsi* with a prevalence of 98.4 %, followed by *Amblyomma hebraeum* and members of the genus *Hyalomma.*

The most common predilection site for the ticks was the perineum. Most of the ticks collected were adult females with a male:female ratio of 1:8. The effect of rainfall and temperature on infestation rates is depicted in Fig. 1. Heavy rainfall together with cold weather were significantly ($P < 0.5$) correlated ($r^2 = 0.95$). By contrast, there was no significant ($P < 0.5$) correlation ($r^2 = 0.62$) between monthly average maximum temperature and tick recruitment. There was, however, a significant positive correlation ($r^2 = 0.92$) between average maximum temperature and tick infestation. Tick recruitment and hence infestation were therefore correlated with higher rainfall and lower

[a]Botswana College of Agriculture, Private Bag 0027, Gaborone, Botswana.

[b]National Veterinary Laboratory, Private Bag 0035, Gaborone, Botswana.

*Author for correspondence. E-mail: ezmushi@bca.bw

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Table 1: **Ticks collected from donkeys.**

Month	*Rhipicephalus evertsi evertsi*	*Hyalomma species*	*Amblyomma hebraeum*	Total	Average ticks/donkey
March	80	0	0	80	10
April	28	0	0	28	3.5
May	3	0	0	3	0.38
June	0	0	0	0	0
July	0	0	0	0	0
August	7	1	0	8	1
September	9	0	1	10	1.25
Total	127	1	1	129	

temperatures.

The only haemoparasite seen in Giemsa-stained blood smears was *Babesia equi* at low parasitaemia in 25.0 % (n = 18) of 72 blood smears. However, no signs of clinical babesiosis or pale mucous membranes were observed during clinical examination of the donkeys.

Faecal analysis revealed the presence of only strongyloid eggs whose counts seemed to increase during the warm, wet months (Table 2). Coccidia oocysts were rarely found and the counts were generally low.

Table 2: **Average worm egg and coccidia oocyst counts of faecal samples.**

Month	Strongyle	Others	Coccidia	Average endoparasites/ donkey
March	18 504	21	10	2 316.88
April	18 000	0	0	2 250.00
May	11 100	0	0	1 387.63
June	11 509	2	0	1 438.88
July	3 300	0	0	412.50
August	6 250	0	0	781.25
September	10 350	0	0	1 293.75
Total	79 013	23	10	1 411.55

Malpractices such as beating, denial of therapeutic and prophylactic intervention, shelter and feeding were observed.

During the interview, it became apparent that the donkeys never showed signs of sickness and the farmer never sought veterinary assistance. No therapeutic, prophylactic or ethnoveterinary intervention was ever carried out. This contrasted with treatment of other livestock on the farm for which an extensive herd health programme had been established.

Finding *B. equi* parasites at low parasitaemia may have been indicative of 'carrier' status whereby parasites are released from the spleen into blood circulation under the influence of adrenalin as a result of stress. In endemic areas, reports have indicated that *B. equi* is more pathogenic in equids than *B. caballi* and the former is usually at low parasitaemia[17,6,16]. However, no clinical babesiosis was observed, perhaps suggestive of enzootic stability. *R. evertsi evertsi,* the red-legged tick, was the most common parasite on the donkeys. This tick is a known vector of *B. equi*[21]. Heavy infestations of a population of *R. evertsi evertsi* could predispose donkeys to clinical babesiosis. The tick is also commonly found on cattle, sheep, horses and goats in the same *kraals* in the district[23].

Other possible tick vectors of equine babesiosis include *Hyalomma* species. The finding of *A. hebraeum* was paradoxical in the sense that it is a common vector of *Cowdria ruminantium,* the causal rickettsial organism of heartwater in ruminants. In view of this, it is of the utmost importance to control ticks on donkeys not only to prevent equine babesiosis but also to prevent the possible maintenance of *A. hebraeum* that harbours *C. ruminantium.*[23]

The strongylids did not seem to exert deleterious effects on the donkeys as judged by their bodily appearance. Donkeys have been shown to have normocytic or macrocytic anaemia but in some cases this was not severe even when egg counts were relatively high and the body score extremely low[13,3]. Strongylid nematodes are known to cause haemorrhage, resulting in persistent low-grade normocytic or macrocytic anaemia sequel to gut damage and loss of iron[20]. Anaemia caused by helminth parasites has also been reported as common in younger horses than older ones[17]. This could be

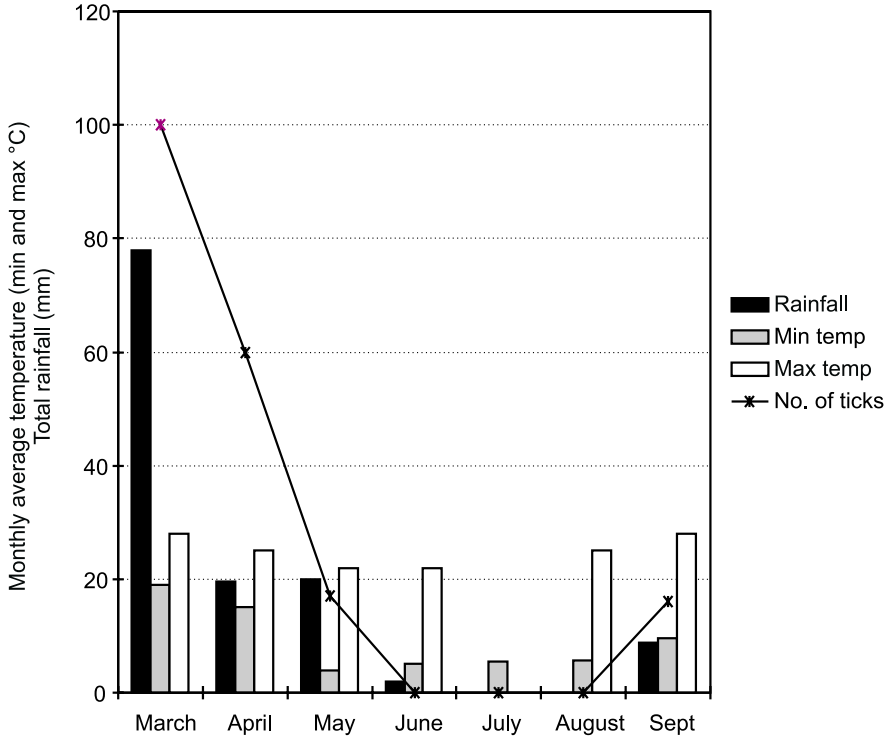

Fig. 1: **Correlation of number of ticks with monthly rainfall, and minimum and maximum temperatures** (°C)**.**

related to the fact that the haemoerythrocytic potential of the bone marrow has not yet developed to maximum capacity to respond to low erythron indices. This may in part account for the absence of anaemia among the donkeys in the present study. The donkeys examined in this study did not show any of the conventional signs of anaemia such as weakness and lethargy. While unthriftiness and rough hair coat have been associated with heavy endoparasitism, especially with small strongyles (Cyathastominae) which exert deleterious effects even in small numbers, donkeys in this study were surprisingly in good bodily condition[4,14,22]. Moderate worm egg counts have been shown to exert deleterious effects on donkeys[8,9,12,20]. Small strongyles have previously been recovered form donkeys in Zimbabwe[5].

In the present study, worm egg counts were recorded during warmer weather and seemed to be of no clinical consequence since they did not cause anaemia or malabsorption syndrome. A plausible explanation for low endoparasite burdens could be the management system under which the donkeys are kept, especially out of the ploughing season. This is in agreement with observations in South Africa[24]. Keeping donkeys in larger enclosures apparently reduces their worm burdens. Nevertheless, donkeys should be dewormed at the beginning of the rainy season to prevent a build-up of worm eggs and larvae as warm weather becomes more conducive.

Although donkeys are able to survive in dry areas on a poor plane of nutrition, supplementation should be given in times of drought, which periodically ravages this region[11]. In many parts of the world, there is very little legislation that caters for the welfare of donkeys[11]. Previous studies have shown that the efficiency of the donkey is compromised by poor management practices, inhumane treatment and inadequate protection against diseases[10,15].

Efforts should therefore be made to enable small-scale farmers to purchase donkeys for traction power in rural areas that are short of labour due to migration to urban areas. It is therefore important that basic veterinary services should be provided, and that owners should be educated about the correct treatment of their donkeys.

In conclusion, the donkeys examined during this study seemed to tolerate both endo- ecto- and haemoparasites burdens relatively well. However, it is possible that stress caused by malnutrition and overwork could make them succumb. It is therefore recommended that donkey owners should seek veterinary assistance to improve the plane of nutrition of their donkeys and for advice on disease control strategies. Veterinarians, on the other hand, should design herd health programmes to assist donkey owners in this regard.

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