Prevalence And Loads Of Gastrointestinal Parasites In Nguni And Non-Descript Cattle On Semi-Arid Rangelands

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Introduction

Infections with gastrointestinal nematodes (GI) are among the important factors limiting cattle productivity on the semi arid communal rangelands of South Africa (Ndlovu et al., 2008) due to poor animal health management, limited access to preventive and therapeutic veterinary medicines and use of inappropriate cattle breeds (Dold and Cock, 2001). Subclinical nematode parasitic infections cause the greatest economic losses and these go unnoticed in cattle on rangelands. When selecting cattle for breeding, GI nematode resistance is an important trait to consider as this provides a relatively simple and cheap method of reducing the economic effects of these parasites in cattle. To select and breed GI nematode-resistant cattle on semi arid communal rangelands, there is a need to determine their prevalence in the cattle breeds reared on these rangelands.

Indigenous Nguni cattle have been shown to be more resilient to GI nematodes than exotic cattle breeds on semi arid rangelands in the Eastern Cape (Ndlovu et al., 2008). Nguni cattle are part of the Sanga group in Southern Africa, descendants of Bos taurus animals that were domesticated in north-eastern Africa 7000–8000 years ago and later crossed with zebu cattle from the Arabian Peninsula that arrived in South Africa around 300–700 AD. Non-descript cattle which predominate on communal rangelands arose from the indiscriminate crossing of exotic (Bos taurus) cattle with the Nguni. Information on the prevalence and egg counts of GI nematodes in the two genotypes on the communal rangelands is unknown. With current efforts to repopulate communal areas of South Africa with Nguni cattle and improve their productivity, there is a need to determine their resistance to GI nematodes amongst other traits. The determination of GI nematodes prevalence enables the characterisation of indigenous breeds as internal parasite-resistant and their adoption for use in sustainable and profitable production by resource-poor farmers. The objective of the current study was therefore to determine the prevalence and egg counts of GI nematodes in Nguni and non-descript cattle in semi arid communal rangelands of the Eastern Cape, South Africa.

Material and methods

Description of study sites. Faecal sample collection was carried out in Magwiji (sweet rangeland) and Cala (sour rangeland) in the Eastern Cape Province, South Africa. Magwiji is located on 30°37′ S and 27°22′ E and lies at an altitude of 1507 m above sea level in a sweet rangeland. The annual rainfall is 200 – 500 mm and temperatures vary from 9°C to 22°C .

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Cala is located on 31°33′ S and 27°36′ E with an altitude of 1441 m above sea level in a sour rangeland. The area receives moderate annual rainfall of 600 – 800 mm mainly in the hot-wet season with temperatures between 11°C and 20°C.

Study animals. A total of 144 clinically healthy cattle of two breeds (72 Nguni and 72 local crossbreds), different ages and both sexes (72 male and 72 female) were sampled during the period of study. The cattle were selected and ear-tagged, for easy identification, at the beginning of the study and grazed on communal rangelands.

Sample collection, processing and identification. Faecal samples were collected per rectum for each animal between 08h00 and 10h00 once in the cold-dry (August 2007), hot-dry (October 2007), hot-wet (January 2008) and post-rainy (April 2008) season. The modified McMaster's technique (Hansen and Perry, 1994) was used to prepare the faeces for identification and quantification of worm eggs. All nematode eggs were identified using a combination of keys given by Foreyt (2001). The prevalence of each species of GI nematodes was computed as:

$$P = \frac{d}{n} \times 100$$

Where: P is the prevalence of the GI nematode, d is the number of animals having the GI nematode at a particular point in time; and n the number of animals in the population at risk at that point in time.

Statistical analysis. Egg count data were transformed using log10 (x + 1) to confer normality. The mean and standard error of the eggs per gram (EPG) of faeces for each GI nematode species were computed using PROC MEANS of SAS (2003). The chi-square test was used to determine the association between parasite prevalence and breed. The effects of rangeland type, season, breed, age, sex and their first order interactions on the transformed mean egg counts (MEC) of the GI parasites were determined using PROC GLM for repeated measures of SAS (2003). An odds ratio analysis was performed on the prevalence of GI nematode egg output using PROC LOGISTIC (SAS, 2003).

Results and discussion

Three GI nematode egg types (strongyles, *Strongyloides* and *Trichuris*) were identified in the study. The three GI nematode egg types observed in this study are in agreement with those reported in other studies on prevalence of internal parasites of cattle in South Africa (Dreyer et al., 1999; Ndlovu et al., 2008).

Breed significantly affected the MEC of *Strongyloides* species with the Nguni breed having lower ($P < 0.05$) MEC than the non-descript breed (Table 1). Breed did not significantly affect the MEC of other GI parasite species identified. The observation that Nguni cattle had lower mean egg counts for *S. papillosus* than local crossbreds confirms earlier assertions by Ndlovu et al. (2008) that Nguni cattle are resistant to GI nematodes. Nguni cattle were also observed to have lower odds of risk of GI nematode infection than the non-descript breed (Table 2) and this suggests a higher innate and/or acquired resistance to these parasites. This observation agrees with that of Ndlovu et al. (2008) and Xhomfulana et al. (2009). Nguni cattle are adapted to the local environment (Scholtz et al., 2000) and, thus, may have developed an increased resistance to GI parasites. The mechanism for resistance is, however, not known. Determination of the Nguni breed's mechanism for resistance is therefore imperative as this is an adaptive trait of the indigenous breed that may be used to improve the welfare of livestock-keepers. It is also important to identify QTL(s) or gene(s) of resistance to GI nematodes allowing selection for resistance in the Nguni breed without expensive and wasteful animal testing for nematode infestation.

Faecal egg counts (200 EPG) were generally lower than 500 EPG, the recommended minimum level for treatment of GI nematodes in cattle (Hansen and Perry, 1994). Farmers however need to be wary of clinical cases of nematodoses during the hot-dry season. Development of strategic antihelminthic control to abate such cases in the communal areas is important. Indigenous Nguni cattle are recommended for use in the integrated control of GI nematodes in the communal areas of South Africa as they are better able to cope with nematode infections than non-descript breeds.

Table 1: Log10 (x+1) transformed mean egg counts and standard error of gastrointestinal nematodes in the Nguni and Non-descript breeds

Parasite species	Nguni	Non-descript
Strongyles	1.08 ± 0.101^{a}	1.11 ± 0.077^{a}
Strongyloides	0.09 ± 0.054^{b}	0.21 ± 0.041^{a}
Trichuris	0.06 ± 0.033^{a}	0.08 ± 0.003^{a}
Coccidia	0.18 ± 0.064^{a}	0.28 ± 0.049^{a}

a,b Values with different superscripts within a row are significantly different (P < 0.05)

Table 2: Relative risk (odds ratio) for total worm egg output in relation to rangeland type, breed and sex of cattle

Variable	Relative risk of infection by GI parasites
Rangeland type	
Sweet vs Sour	1.7 (0.90 - 3.52) *
Breed	
Nguni vs Non descript	1.2 (0.65 - 2.40)

* The figures in parentheses indicate 95% confidence level of the odds ratio point estimate.

Conclusion

Gastrointestinal nematodes were moderately prevalent in communal areas of the sweet and sour rangelands of the Eastern Cape. Nguni cattle had low MEC for *Strongyloides* species and carried lower odds of infection with GI nematodes compared to non-descript cattle. The use of the Nguni breed in the integrated control of GI nematodes of cattle in communal areas of the Eastern Cape is recommended. Further studies are required to determine the Nguni breed's mechanism for resistance of GI nematodes.

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