ABATTOIR-BASED STUDY OF THE SUSCEPTIBILITY OF TWO NATURALLY INFECTED BREEDS OF GOAT TO *Haemonchus contortus* IN NSUKKA AREA OF ENUGU STATE, NIGERIA

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ABSTRACT

The study was carried out to assess the susceptibility of two indigenous breeds of goat – the Red Sokoto (RS) and the West African Dwarf (WAD) goats to Haemonchus contortus infection by using the abomasal worm burden and the worm's uterine egg count as the indices. One hundred (100) abomasa each from the RS and WAD slaughter goats were purchased from Nsukka Urban abattoir and Ibagwa rural abattoir for examination between October 2002 and Janaury 2003. The WAD goats had a significantly higher worm burden (7286) than the Red Sokoto goats (4675) (P<0.01). The female-male ratio of the worms showed the RS goats with a higher female population ratio of 1:0:90 as against the 1:1:03 for WAD goats. 240 adult female worms, which were randomly selected from each breed for the uterine egg count showed that the average uterine egg count was significantly higher in WAD goats (748.37) than in RS goats (620.50) (P<0.01). Both the worm and egg burdens exhibited a significant steady drop in both breeds from October 2002 to January 2003 (P<0.001). It is suggestive from this study that RS goats may be less susceptible to naturally acquired Haemonchus contortus infection than WAD goats.

Key words: *Haemonchus contortus,* Abattoir, Goats, Susceptibility, Egg-burden, Nsukka

INTRODUCTION

Meat, which is the primary source of animal protein in staple diets, has always been in short supply in Nigeria where individual consumption of about 3.24g per day falls far below the FAO recommended value of 34g per day (Shaib *et al*, 1997). Part of this requirement is met by the goat meat from its Nigeria population estimated at 35 million (RIM, 1992). Of the indigenous breeds of goats in Nigeria, the West African Dwarf (WAD) goats (chondroplastic breed) are found in the hot humid forest and derived savannah zones of southern Nigeria. The Red Sokoto (RS) goats (Maradi breed) constitute the dominant indigenous breed in the northern part. WAD goats are mostly managed by the tethering technique in the south (Ademosun, 1987 and Ayo *et al.*, 1998a). 2 to 7 animals in a herd are usually kept to meet domestic consumption demand and sundry cash needs in addition to producing manure for crop production (Adu *et al*, 1979; Chidebelu and Ngo Ndjon, 1998). Red Sokoto goats are usually extensively managed in northern Nigeria (Ayo and Minka, 2003). The pastoralists rear them as trade animals, which are mostly sold in southern Nigeria. Among the factors militating against the realization of the full potentials of small ruminant production in Nigeria is helminthoses especially the gastrointestinal nematodes of which *Haemonchus contortus* is the most prevalent (Fakae, 1990). A loss of $40 million is recorded annually in livestock industry from parasitic gastroenteritis (Akerejola *et al.*, 1979).

Efforts are now being made to selectively upgrade and rear *Haemonchus* resistant goat breeds (Shavulimo *et al.*, 1988; Fakae *et al.*, 2003). The frequency of drug administration, under dosing, prohibitive cost of chemotherapy and, presently, the influx of fake and adulterated drugs in Nigeria had given rise to the development of resistance to the currently used anthelminthics by the worm (Ikeme, 1997). An alternative approach is urgently needed, therefore, to check the rising frequency of resistant genes in the nematode population (Ikeme, 1997). The differences in susceptibility to *Haemonchus contortus* infection were found to be greater between breeds than within breeds from studies in East Africa (Preston and Allonby, 1978). This study therefore aims to find out the susceptibility of the two most common indigenous breeds of goats, the Red Sokoto and the West African Dwarf goats in Nigeria to *Haemonchus contortus* infection.

MATERIALS AND METHODS

Study Area: Nsukka urban town and Ibagwa-Aka, a suburban town, lie at longitude 7° 23[1] and 7° 25[1] East, and latitude 6° 51[1] and 7° 9[1] North, respectively. The two towns are about 10 km apart as the crow flies and about 20 km by road transport (Figure 1). They situate at an altitude of 400m above sea level. An annual rainfall range of 200-400 mm is recorded between March and December. Rainfall is very minimal in the dry season months of October to February.

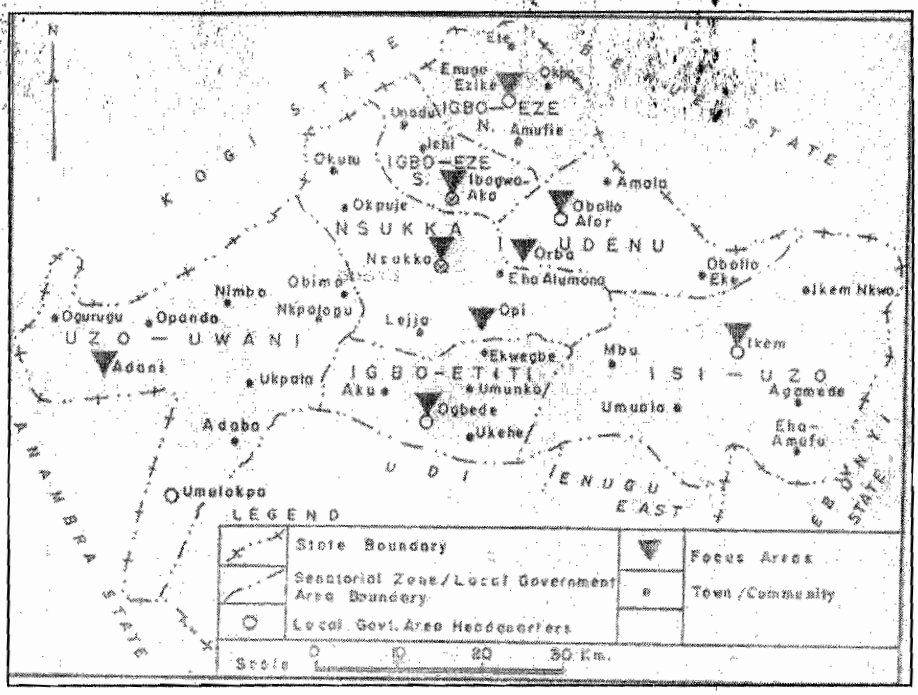

Figure 1: Map of Nsukka cutural zone in Enugu State (The study area)

Sample Collection and Analysis: Between 5 - 7 infected abomasa of Red Sokoto (RS) goats were purchased weekly from Nsukka abattoir on alternate daily visits while 2-4 infected West African Dwarf (WAD) goat abomasa were purchased from Ibagwa slaughter house on each (Nkwo) market day. A monthly total of 25 abomasa were purchased for each breed. A total of 100 abomasa for each breed were collected during the 4-month study period. Before flaying and dressing the animal, each abomasum was ligated at about 2 cm beyond the fundic and the pyloric ends of the gastrointestinal tract and excised. This was to prevent the influx or reflux of the worms (if any) from the abomasum into the adjacent chambers during handling. The abomasum was longitudinally slit open. Only infected abomasa with adult worms were paid for. In the laboratory, 100-mesh sized sieves were used to repeatedly wash and recover the worms until only the faecal debris were left. The adult male and female worms were separated and counted using their distinctive morphological characteristics with a stereo-microscope (MAFF, 1977). Fifteen (15) gravid female worms were randomly selected from each weekly collection for the uterine egg count for each breed of goat. A total of 60 was processed each month for each breed. Egg recovery was done by using a metal spatula to crush the gravid females on a glass Petri-dish with about 5 ml of water. 5 gravid females were processed at a time. A piece of fine muslin was used to sieve off the tissue debris in a water jet. The solution containing the eggs were transferred into centrifuge tubes, which were filled up with normal saline solution. The contents were centrifuged at 2000 rpm for 5 minutes. The upper third of the solution, which contains the floating eggs, was decanted into test tubes. The egg count was done using the modified McMaster technique with a compound microscope at x 100 magnification. The average egg load of the individual worm was calculated by simple average. The Chi-square, student t-test and One Way ANOVA statistical analyses were used in result analysis.

RESULTS

The results as presented in Tables 1 and 2 show a significant steady decrease in worm burden and egg load respectively from October 2002 to January 2003 ($P<0.01$). However, the cumulative worm burden of 7286 from the WAD goats was significantly higher than the 4675 obtained from the RS goats ($P<0.01$). There was a slightly higher female/male worm ratio among the RS goats as shown in Table 1. The average uterine egg load of the individual female worm was significantly higher in the WAD goats than in the RS from October to December as shown in Table 2 ($P<0.01$).

DISCUSSION

The steady decrease in the worm burden from the early months of the dry season onwards observed in both breeds was consistent with the findings of other workers (Okon and Enyenihi, 1975).

Table 1: The Mean Abomasal Worm Burden and male-female ratio of *Haemonchus contortus* in Red Sokoto (RS) and West African Dwarf (WAD) goats

Month	Breed				
	Red Sokoto (RS) Goats		West African Dwarf (Wad) Goats		Total
	Mean worm burden per goat	Female/Male Ratio	Mean worm burden per goat	Female/male ratio	
October	50.98 ± 8.99	677/596(0.88)	92.53 ± 26.69	1056/1206(1.14)	3535
November	48.61 ± 10.46	612/562(0.92)	88.60 ± 16.39	1153/995(0.86)	3,322
December	48.21± 9.18	616/540(0.88)	69.69 ± 11.60	810/904(1.12)	2870
January	43.77± 6.79	560/512(0.91)	47.51 ± 7.60	568/594(1.05)	2234
Total		2465/2210 (0.90)		3587/3699(1.03)	
		4675		7286	11961

Table 2: Monthly mean uterine egg load in female *Haemonchus contortus* recovered from Red (RS) or West African Dwarf (WAD) goats

Month	Breed	
	Red Sokoto (RS) goats	West African Dwarf (WAD)
October	671.00 ± 4542	969.90 ± 52.65
November	662.83 ± 44.92	870.33 ± 99.51
December	600.57 ± 9.53	688.88 ± 101.68
January	548.17 ± 54.57	464.37 ± 103.94

This may be due to the onset of adverse climatic condition for preparasitic stages and their transmission. The higher worm burden in the WAD goats may probably be attributed to the micro-climate of the hot humid rainforest zone of the south. This is their adapted natural eco-habitat, which favour the development of the pre-parasitic stages of the worm. In contrast, the less humid zone of the Savannah where the RS goats are reared has a delimiting effect on the pre-parasitic stage development. But the watering or drinking points found in the savannah grasslands are known to be foci of herd infections. Therefore this position alone may not fully explain the significant differences observed in the individual worm's uterine egg load between the two breeds. It may also seem that the tethering technique could compromise the health status of the WAD goats. This is because the technique is known to subject goats to physical discomfort, behavioural deprivation, emotional instability, etc (Danilevsky, 1991). These factors, which are very minimal in the RS goats reared on the free-grazing or extensive management system, predispose the goats to infections (Ademosun, 1987; Ayo and Minka, 2003). But it can equally be contended that the extensive trekking and fodder-feeding to which the RS goats are subjected could elicit such stress factors with similar consequences. It was advanced that animals on a higher plane of nutrition are normally more resistant to *Haemonchus* infection (Shavulimo *et al.*, 1988; Preston and Allonby, 1978). In this case, both breeds had their nutritional benefits compromised through their different management systems, especially in the dry season when this study was carried out. It may further be argued that the traditional method of feeding the WAD goats with grasses which are cut closer to the roots may expose them to the pre-parasitic stages of the nematode. This is because goats are naturally high browsers and so are less exposed to the infective stages of the parasites found closer to the foliage bases. But the RS goats equally resort to low grazing especially during the dry months in savanna when shorter foliage abound. Hence they likewise become exposed to the pre-parasitic or infective stages of the worm. So, this too may have less influence on the significant disparity observed in the uterine egg load of the individual worm between the two breeds. A stronger contention may therefore lie in the breed-dependent host resistance against the *Haemonchus* infection. The higher uterine egg load of the WAD goat may be associated with its rearing system. The tethering technique gives the goat little exposure to contaminated environment where trickle infections of *Haemonchus* would have boosted the development of natural resistance against it by the goat over a period (Chiejina *et al.*, 1988). The RS goats reared on the extensive management system are constantly being exposed to such trickle infection. This most probably explains why the WAD goats were more susceptible to the infection as evident in both the higher worm burden and egg load. This pattern had also been observed against other gastrointestinal nematodes (Chiejina *et al.*., 1988). However, the higher residual female/male worm ratio of the RS goats may be responsible for the usual fast transmission rate and quicker population of the environment usually observed at the on-set of the rainy season in the savanna (Fakae, 1990).

Conclusion: The wide variations observed in the uterine egg counts among the WAD goats may indicate a small population of *Haemonchus*-resistant goats within the breed. A controlled further study at the genetic level may confirm this. However, with accommodation for individual variability within both breeds, the Red Sokoto (RS) goats most probably may offer a more promising degree of resistance against naturally acquired (*Haemonchus contortus*

infection than the West African Dwarf (WAD) goats. This is of significant advantage to a farmer in a less selective goat breeding programme.

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