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EVALUATION OF THE EFFICACY OF SORGHUM CHAFF FOR THE CONTROL OF HELMINTHIASIS IN YANKASA RAMS.

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ABSTRACT

The objective of the study was to evaluate the anti-helminthic effect of sorghum chaff fed to small ruminants. Fifteen growing Yankasa rams with an average live weight of 17.5 kg were dewormed using Albendazole at 10mg/kg body weight and infected with nematodes larvae (2,100 L3 of strongyle per ram) and allotted to five (5) treatments of 0%, 20%, 40%, 60% and 80% inclusion levels of sorghum chaff in diets in a completely randomized design with three replications. Each ram was offered the experimental diet at 1.5% of its body weight as supplement daily for eight weeks. Faecal samples were collected from the rams before and at the end of the experiment to detect the presence of parasitic infections (fecal egg and oocyst counts). The control treatment (0% sorghum chaff) was dewormed using Albendazole at 10mg/kg body weight. The results showed mild infestations with strongyle and moniezia at four weeks after L_3 infestation but were statistically ($P>0.05$) similar. Similarly, there were no significant ($P>0.05$) differences observed in the number of eggs per gram of faeces across treatments at week six, but numerically, animals on treatment 4 (60% inclusion level of sorghum chaff) had better worm clearance relative to other treatments. It was concluded that inclusion of sorghum chaff in the diets of small ruminants up to 60% level could be used to control gastrointestinal nematodes infestation in sheep. Further studies to isolate the active ingredients having anti-helminthic effect in the sorghum chaff and standard inclusion levels are hereby recommended.

Key words: Anti-helminthic effect, Sorghum chaff, Yankasa rams

INTRODUCTION

Small ruminant production holds an important sector for the development of socioeconomic status in developing countries and supports a variety of socioeconomic functions throughout the world (Ibrahim *et. al.*, 2012). It plays crucial and multiple roles in the livelihoods of Nigerians (Ngozi, 2011). They have many advantages over large ruminants for most smallholder farmers, including among others: less feed costs, quicker turnover, easy management and appropriate size at slaughter (Pell *et al.*, 2010). The population of small ruminants in Nigeria is about 115,970,604 of which 42,091,043 are sheep and 73,879,561 are goats (FAO, 2016). They are raised with semi-intensive or extensive system of management. Nevertheless, small ruminant productivity is still low compared to their population due to poor nutrition, diseases and 'poor' genetic make-up of the indigenous stock. Parasitic diseases negatively impact not only direct losses related to acute illness and death, damage or condemnation of organs as well as cost of veterinary service, but also indirect losses, including decreases in productive potentials such as decreased growth rate, weight loss in young growing animals, and late maturity of slaughter stock (Blackburn *et al.*, 2011). Among diseases, helminthosis constitutes one of the most important constraints to small ruminant production in Nigeria. The great economic losses due to gastrointestinal nematodes (helminths) infection have more impact on sheep production than goat production. Gastrointestinal nematodes of ruminant animals refer to a group of complex multicellular eukaryotic parasites which are infective to animals (Karshima *et al.*, 2018). Intestinal parasites have become more difficult to manage in small ruminants because of the parasites' increasing resistance to several anti-helminthics (Eke *et al.*, 2019). The pervasive occurrence of parasitic infections in grazing animals, the associated loss of production, the cost of anti-helminthics, death of infected animals and increasing frequency of drug resistance are all major concerns. Prevalence of gastrointestinal nematodes has been reported in domestic animals from various parts of the world (Kahn *et al*., 2010; Tefera *et al*., 2011; Ibrahim *et al*., 2014; Zainalabidin *et al*., 2015). It thus, remains a global concern to halt gastrointestinal nematodes infection in small ruminants as they impose severe economic constraints particularly on sheep production worldwide. Production losses occur through mortalities, reduction in live weight gains, lower milk and meat production, organ condemnation as well as direct cost associated with control. Total eradication of gastrointestinal nematodes seems to be impracticable. It is however, important that, they should be controlled and the control options are limited in Nigeria. The existing control procedures in Nigeria rely virtually exclusively on the use of anti-helminthic drugs which are either unaffordable (by a small holder) or the worms, themselves, have become resistant to some commonly used drugs (Howell *et al*., 2008). Prevalence of gastrointestinal nematodes infestation in small ruminants is relatively high in Nigeria (Eke *et al.*, 2019). A pilot study we carried out suggested that local farmers in northern Nigeria claimed that sorghum chaff controls helminthiasis. Thus, exploiting this indigenous knowledge of using sorghum chaff could be an attractive option for gastrointestinal nematodes control in the country. It is affordable and available in the markets, particularly in the study area where sorghum is grown in large quantities. The present study was therefore designed to prove the claim by our local farmers.

MATERIALS AND METHODS

The study was conducted at the Livestock Unit of Kano State University of Science and Technology Teaching and Research Farm, Gaya ($11^{0}51^{1}$ N; $9^{0}20^{1}$E; altitude 430m above sea level) in the Sudan savanna zone of Nigeria (Olofin *et al*., 2008). The study was conducted in January to April, 2022 (during the dry season). Fifteen (15) growing Yankasa rams with an average live weight of 17.5 kg were purchased from Wudil International Livestock Market, Kano state for the experiment. The animals were quarantined for one week, confined in individual pens (for adaptation) and tagged (for identification). Thereafter, faecal samples were collected from the animals and taken to the laboratory to confirm the presence of gastrointestinal nematodes prior to infestation. Simple faecal flotation and sedimentation methods were carried out in the laboratory to detect the presence of parasitic infections (fecal egg and oocyst counts) as outlined by Bawm *et al.* (2020). Having confirmed the presence of the parasites, the animals were then dewormed with Albendazole at dose rates of 10mg/kg body weight orally. Two weeks after deworming, faecal samples were collected to ensure absence of nematodes (strongyle) infestation. After confirming the absence of nematodes infestation, the animals were then infected with nematodes (2,100 L3 of strongyle per ram) prior to the commencement of the trial. Two weeks after L3 infestation, the animals were balanced by weight and allotted to five (5) treatments of 0%, 20%, 40%, 60% and 80% inclusion levels of sorghum chaff in diets (Table 1) in a completely randomized design with three replications. Each ram was offered groundnut haulm as basal diet and then supplemented with the experimental diet at 1.5% of its body weight daily (Ibrahim *et. al.*, 2018) for eight weeks. Water and mineral lick were offered *ad libitum*. The control treatment (0% sorghum chaff) was dewormed using Albendazole at 10mg/kg body weight two weeks post infestation. Faecal samples were collected at 4 and 6 weeks post infestation to detect the presence of nematodes (strongyle) or otherwise.

Data Analysis

The data obtained from the trial were subjected to analysis of variance (ANOVA) using the general linear model (GLM) of SAS (2009). Significant means were compared at 5% level of probability using Duncan’s Multiple Range Test (Shaffer, 1999).

RESULTS AND DISCUSSIONS

Table 1: Proximate composition of the experimental feeds (%)

Feeds	Composition (%)						
	DM	Ash	CP	EE	CF	NFE	ME (KCal/Kg)
Groundnut haulm (Basal diet)	93.25	5.22	12.45	2.08	19.84	53.66	1322.081
T1 (0% SC:100% WB)	89.45	3.75	16.98	2.76	9.29	56.67	1544.002
T2 (20% SC:80% WB)	92.72	11.80	8.77	2.21	29.49	40.48	1872.068
T3 (40% SC:60% WB)	92.14	9.65	10.13	2.56	27.70	42.10	2007.718
T4 (60% SC:40% WB)	91.97	6.76	11.95	3.18	23.47	46.61	2283.624
T5 (80% SC:20% WB)	90.05	6.27	13.85	3.50	20.21	46.22	2366.450

DM=dry matter; CP=crude protein; EE=ether extract; CF=crude fibre; NFE=nitrogen free extract; ME=metabolizable energy; T=treatment; SC=sorghum chaff; WB=wheat bran

The faecal egg counts of the experimental animals before deworming is presented in Table 2. Virtually all the animals were naturally infested with the parasites, even though it was during the dry season, which could probably be due to the well-known fact that most small holder farmers in Nigeria do not deworm their animals regularly. Furthermore, genetic and environmental factors, diet as well as physiological status of animals are all determinants of level of infestations in animals (Kahn *et al*., 2010). Age is also another factor that determines the level helminthes infestations in animals as reported by Getachew *et al*. (2007) and this could explain why our animals were naturally infested as they are young growing animals. In his report, Getachew *et al*. (2007) stated that lambs and kids are at the greatest risk of developing disease due to their immature immune response and high rate of infection from environmental contamination due to peri-parturient egg production by infected ewes and does. Even though our main concern was strongyly, the animals were more infested (naturally) with moniezia species relative to strongyle. Fitzpatrick (2013) reported that there are many species of gastrointestinal nematodes that parasitize small ruminants, such as sheep and the main gastrointestinal nematodes group of concern for producers and veterinarians is the trichostrongyles, common nematode parasites that cause major production losses and disease. Eke *et al*. (2019) noted that intestinal parasites have become more difficult to manage in small ruminants because of the parasites' increasing resistance to several anti-helminthics. Moreover, coinfection with other Trichostrongyle nematodes makes diagnoses for coccidiosis clinically difficult (Zainalabidin *et al*., 2015).

Table 2: Detection of Faecal Egg Counts of the Experimental Animals before Deworming

Animals	Faecal Egg Counts	
	Strongyle	Moniezia
001	+	+
002	0	++
003	+	0
004	+	0
005	0	0
006	0	0
007	0	0
008	0	0
009	+	0
010	0	+++
011	0	+
012	+	0
013	+	0
014	0	0
015	0	0

NB: 0 = No infestation; + = Mild infestation; ++ = Low infestation; +++ = High infestation

Table 3 shows the faecal egg counts of the experimental animals at two weeks after deworming the animals using Albendazole at 10mg/kg body weight. No infestation was recorded at two weeks post deworming. This suggests that using Albendazole, at the right dosage, is an effective remedy for gastrointestinal nematodes control. Reports by Kaplan and Vidyashankar (2012) showed that until recently, gastrointestinal nematodes were controlled almost exclusively with anti-helminthic drugs. Unfortunately, the wide and frequent use of these drugs has created selection pressure that favours individual worms resistant to these anti-helminthics (Gilleard, 2013). The nematode parasites possess a direct lifecycle where the adults in the host produce eggs that are shed in the faeces.

Table 3: Detection of Faecal Egg Counts of the Experimental Animals at Two Weeks after Deworming

Animals	**Faecal Egg Counts**	
	Strongyle	**Moniezia**
001	0	0
002	0	0
003	0	0
004	0	0
005	0	0
006	0	0
007	0	0
008	0	0
009	0	0
010	0	0
011	0	0
012	0	0
013	0	0
014	0	0
015	0	0

NB: 0 = No infestation

The faecal egg counts of the experimental animals at four weeks after L3 infestation is shown in Table 4. There were no significant (P>0.05) differences across treatments. Mild infestations with strongyle and moniezia were detected but were statistically similar (P>0.05). This could probably be due to the fact that feeding had been beefed up in the experimental confinement leading to better physiological status of the animals, thus preventing high infestation. It could also be attributed to the anti-helminthic effect of the sorghum chaff in the diet and thus lowering the infestation, or due to the fact that the trial was conducted during the dry season period which does not favour the growth and development of nematodes. Parasitic diseases negatively impact not only direct losses related to acute illness and death, damage or condemnation of organs as well as cost of veterinary service but also indirect losses, including decreases in productive potentials, such as decreased growth rate, weight loss in young growing animals, and late maturity of slaughter stock (Blackburn *et al*., 2011). Scott and Sutherland (2009) reported that the eggs usually develop to third stage larvae (L3) in the faeces and then circulate into the ambient environment. This infective L3 stage is ingested by the host and develops into an egg-laying adult in the gastrointestinal tract of the animal.

Table 4: Detection of Faecal Egg Counts of the Experimental Animals at Four Weeks after L3 Infestation

Level of Sorghum Chaff (%)	Faecal Egg Counts	
	Strongyle	Moniezia
0	0.00	0.00
20	0.67	0.67
40	0.67	0.33
60	0.00	0.33
80	0.33	0.33
SEM	0.258	0.298

NB: 0.00 = No infestation; 0.10 – 0.99 = Mild infestation; SEM = Standard Error of Means

Table 5 presents the faecal egg counts of the experimental animals at six weeks after L3 infestation**.** There were no significant (P>0.05) differences observed in the number of eggs per gram of faeces across treatments. Numerically however, animals on treatment 4 (60% inclusion level of sorghum chaff) had better worms clearance relative to other treatments. This could suggest that the optimum quantity for efficacious anti-helminthic effect is within this range. On the other hand, animals on treatment 5 (80% inclusion level of sorghum chaff) showed some level of infestation. Eke *et al*. (2019) reported that gastrointestinal parasite infection in ruminant animals usually affects feed intake.

Table 5: Detection of Faecal Egg Counts of the Experimental Animals at Six Weeks after L3 Infestation

Level of Sorghum Chaff (%)	Faecal Egg Counts Number of Eggs Per Gram
0	0.00
20	26.67
40	20.00
60	0.00
80	20.00
SEM	17.385

NB: 0.00 = No infestation; 1. 00 – 30.00 = Mild infestation; SEM = Standard Error of Means

CONCLUSION

Based on the findings of the present study, it was concluded that inclusion of sorghum chaff in the diets of small ruminants up to 60% level could be used to control gastrointestinal nematodes infestation in sheep. Further studies to isolate the active ingredients having the anti-helminthic effect and the optimum inclusion level around the 60% inclusion rate to achieve maximum anti-helminthic effect are hereby recommended.

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