

FORAGE DIGESTIBILITY AND PERFORMANCE OF YANKASA RAMS SUPPLEMENTED WITH FUZZY COTTON SEEDS

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ABSTRACT

*The experiment was conducted at Federal University of Kashere, Gombe State, to evaluate the digestibility and performance of forages in sheep supplemented with fuzzy cotton seeds (FCS) called delinted cotton seed. Twelve (12) young Yankasa rams aged between 2 – 3 months were housed in the small ruminant section of Animal Science Departmental farm FUK under semi-intensive for nine (9) weeks in a three by four (3x4) factorial design in Complete Randomized Design. The animals were tagged based on the number of treatments and replicates. They were allowed to graze on the available forages within the University farm in the morning and supplemented in the evening with Fuzzy Cotton Seeds at (0g: T1, 200g: T2, 300g T3, and 400g: T4). Feed intake, live weight gain, and fecal output were recorded. Proximate analysis of the: experimental diets were carried out in the laboratory to determine the chemical composition. Statistical Analyses of (SAS) version 2022 was used to analyzed the data collected. The result indicated that there were significant differences ($P \leq 0.05$) in the average mean weight gain of the animals (6.2kg in T1 to 12.7kg in T3). Fuzzy Cotton Seeds showed a highest Dry Matter of 89.62% with lower free gossypol concentration of 0.6% at T3, while (*Poliostigma reticulatum*) had the lowest DryMatter of 85.22%, Crude Protein, Ether Extract, Crude Fibre, Acid Detergent Fibre, Neutral Detergent Fibre and Ash contents varied significantly ($P=0.005$) among the experimental treatments. The digestibility percentage showed that, T2 has the lowest digestibility of 66% while T4 has the highest digestibility of 80 %. It was concluded that Yankasa sheep supplemented with FCS at 400g (T3) responded positively in live weight gain consistently. The study therefore concluded and recommended the used of Fuzzy Cotton Seeds at 300g inclusion level for better performance in yankasa rams.*

Keywords: Forage, Digestibility, Performance, Yankasa, Supplement, Fuzzy Cotton Seed

INTRODUCTION

Forages are usually available in northern Nigeria during the wet season of every year, which lasts between 3 -8 months, there is adequate forage of good quality for ruminants during this period (Abdulahi *et al.*, 2019); however the availability of these forages diminishes with advancing dry season, the range does not meet the feed requirements of our ruminants animals both in terms of quantity and quality. During this period, the range grazing has to be supplemented after grazing by the utilization of legumes pastures, browse plants, such as maize offal, groundnut cake and of course Fuzzy Cotton Seeds (FCS) called delinted cotton seed (Adu and Ngere 2007). Small ruminants (sheep) are important sources of animal proteins through out the world including the developing countries (Hassan *et al.*, 2015). These animals and other non-ruminants adapt well to wide range of environment as well as utilize a variety of plant species for food (Abdulahi *et al.*, 2019; Nwachukwu and Ikpa, 2023; Hudu *et al.*, 2024). However, productivity from these animals in the tropics is low due to a combination of several factors which include poor feeding, scarcity and fluctuating quality and quantity of feed supply all year round which have been the major constraints to livestock production in the derived savanna zones (Makkar and Becker, 1999; Abdulahi *et al.*, 2019).

The use of highly productive good quality pasture grasses and legumes has given increased productivity in ruminants animals production particularly sheep and goats in Nigeria (Agishi, 2008; Wudil *et al.*, 2020). The estimated small ruminant production particularly sheep and goats is 12.8 million and 26 million respectively mostly in the northern Sahel/Sudan or Guinea savanna zones of the country (RIMS, 2020). These animals are principally under extensive system in their daily feeding principles (Adu and Ngere 2007; Olawoye and Kubkomawa 2018). Therefore, there is the need to provide alternative source to which sheep nutritional requirement can be met by feeding a variety of feed stuffs of which Fuzzy Cotton Seed were used to evaluate their digestibility and performance in Yankasa rams.

MATERIALS AND METHOD

Study area

The study was carried out at Federal University of Kashere Gombe state it is located at latitude 10.25°N and longitude 11.17°E of the Greenwich meridian in the North-Eastern region of Nigeria and occupies a total land area of about 20.265sq Km. The area has two distinct climates, the dry season (November - March) and the rainy season (April –October) with an average rain fall of 850mm. (RIMS 2020).

Research design and Management

Twelve Yankasa rams aged between 2 – 3 months were used in a three by four (3x4) factorial design in Complete Randomized Design. Tags were hanged on each ram based on the number of treatments and replicates. The animals were housed for 9 weeks. During the period animals were allowed to graze on the available forages within the University grazing area in the morning usually between 9:00am to 4:00pm, while in the evening usually by 5:00pm the animals were supplemented with Fuzzy Cotton Seeds at (0g: T1, 200g: T2, 300g: T3, and 400g: T4) respectively.

Weight measurement

The weights of the animals were weekly measured individually on a weighing scale and recorded. The actual weight of each sheep was calculated by subtracting the weight of the person holding the animal on the scale from the total weight.

Feed measurement

The test diet (FCS) was measured based on the experimental design. Weighing scale was used to measure the quantity of the feed supplemented in the evening usually by 5:00pm.

Fecal output

Two faecal samples per treatment were collected during the last two weeks of the experiment using metabolic trousers and evacuated every morning when they were going out for grazing. The samples collected per treatment were mixed together dried, grinded and taken to laboratory for analysis.

Digestibility Trial

The measure of the efficiency of digestion and absorption of various nutrients present in the feed was carried out and determined by using the following formula.

$$\% \text{Digestibility} = \frac{\text{Feed consumed} - \text{faecal output}}{\text{Feed consumed}} \times 100$$

Chemical Analysis and composition

Proximate analysis and fiber fractionation of both forages and faeces samples were determined in the laboratory involving of determination of Dry Matter, (DM) Ash, Crude Protein, (CP) Ether Extract, (EE) Crude Fiber, (CF) Acid Detergent Fiber (ADF), Neutral Detergent Fiber (NDF) and Lignin were performed according to Van Soest and Goering (2005) procedure

Statistical analysis

The data collected was analyzed using analysis of variance (ANOVA) SAS version 2021 and percentages were used to express proximate analysis and fiber compositions. Regarding the digestibility trial, digestibility performance levels of supplemented Fuzzy Cotton Seeds (FCS), were expressed in percentages, (RIMS, 2002).

RESULTS AND DISCUSSION

The Table below showed the chemical composition of the available forages within the grazing area in Federal University of Kashere (FUK) Gombe State.

Highest DM, 89.62% was observed in Fuzzy Cotton Seeds while the lowest was 85.22% in *Polio stigma reticulatum*. This result tally with (Agishi, 2008) that indicated increase in dry matter percentage affect the animal production and growth. Maximum ash percentage was found in *Digitaria debilis* with 14.95% and the lowest was found in *Cenchrus ciliaris* with 1.89%. High ash percentage may be as a result of low lime in the soil due to the high concentration of minerals as suggested by (RIMS, 2020). CP measures the nitrogen content of a feed stuff, its peak content was observed in *Alysicarpus vaginalis* with 29.86% and the low in *Cenchrus ciliaris* with 7.89%,

Table 1: Major plant forages available within Federal University of Kashere grazing area.

Common Names	Botanical	%DM	%ASH	%CP	%EE	%CF	%ADF	%NDF
	Names							
Gamba	<i>Andropogon gayanus</i>	88.65	2.73	10.52	1.23	34.67	44.64	55.25
Harkiya	<i>Digitaria debilis</i>	88.79	14.95	8.48	0.97	35.83	46.63	57.12
Kansuwa	<i>Pennisetum polystachyon</i>	88.56	1.91	8.19	0.72	35.26	45.44	56.51
Karangiya	<i>Cenchrus citiaris</i>	88.28	1.89	7.98	0.61	36.43	46.51	57.24
Gadagi	<i>Alysicarpus vaginalis</i>	88.84	14.09	29.86	6.25	20.89	36.72	46.83
Kargo	<i>Polio stigma reticulatum</i>	85.22	10.25	12.63	4.13	19.19	26.23	47.41

Rumfu	<i>Cassia singuena</i>	86.17	11.62	13.27	4.73	18.31	25.89	45.61
Sabara	<i>Guiera senegalensis</i>	85.53	12.51	14.73	4.21	19.66	34.25	45.44
Magarya	<i>Ziziphus spp</i>	87.26	8.25	11.43	7.22	10.59	19.14	42.98

DM=Dry Matter, CP=Crude Protein, EE=Ether Extract, CF=Crude Fibre, ADF=Acid Detergent Fibre, NDF=Neutral Detergent Fibre

Fuzzy Cotton Seeds has the highest ether extract with 12:13% while *Cenchrus ciliaris* has the lowest ether extract with 0.61%. Ether extract is crude fat content of a feed stuff with energy source of 2-25times the energy density of carbohydrates (Agishi, 2008). However, *Cenchrus ciliaris* had the highest CF content of 36.43% and the lowest CF content was in *Ziziphus spinachristi* of 10.59%. Crude fiber is a traditional measure of fibre content in feeds. This agreed with the findings of Akinol, (2007) that plants species can have high CF percentage when they are allowed to mature fully. *Digitaria debilis* has the highest ADF of 46.63% while *Ziziphus spinachristi* has the lowest ADF of 19.14%. ADF percentages or values are inversely related to digestibility, so forages with low ADF concentration are usually higher in energy (Hudu *et al.*, 2024). *Cenchrus ciliaris* had the highest NDF of 57.24% followed by *Digitaria debilis* with 57.12% while *Ziziphus spinachristi* had 42.98%.

Table 2 below shows that there was progressive weight increase from T2 to T4 which were supplemented with FCS at 200g, 300g and 400g/day respectively. The Table shows that FCS was well digestible with the lowest digestibility of 66% in T2 and the highest digestibility of 80% in T4. This indicated that increase in the supplement feed (FCS) leads to higher digestibility. Despite the significance differences ($p < 0.05$) highest total weight gain was obtained at T3 300g/day (12.7kg) this may be attributed to the low level of free gossypol concentration of 0.60% compared to others (Van Soest 2005).

Table 2: Performances indices of Yankasa Rams fed forages supplemented with Fuzzy Cotton Seeds diet (FCS)

Parameter	T1	T2	T3	T4	SEM	LOS
Feed offered (g)	0.00	200.00	300.00	400.00	57.74	ns
Feed Left (g)	-	20.00	25.00	32.00	3.48	ns
Faecal output (g)	58.00 ^d	60.00 ^c	66.00 ^b	73.00 ^a	3.76	*
Digestibility (%)	-	66.00 ^c	77.00 ^b	80.00 ^a	4.26	*
Final Weight (kg)	27.50 ^c	28.80 ^b	33.00 ^a	31.5 ^a	1.25	*
Initial Weight (kg)	19.00	18.50	19.30	19.00	0.57	ns
Weight Gain (kg)	8.50 ^d	10.30 ^c	13.70 ^a	12.50 ^b	1.20	*
% Acid Detergent Fibre	54.21 ^a	50.33 ^b	45.32 ^c	42.14 ^c	2.67	*
% Neural Detergent Fibre (NDF)	63.63 ^a	60.42 ^b	55.11 ^c	53.21 ^c	2.39	*
% Lignin (LIG)	9.42 ^b	10.09 ^a	9.39 ^b	11.07 ^a	0.35	*
% Free Gossypol Concentration	0.00	0.61	0.60	0.64	0.15	ns

Mean within a row with different superscript are significantly different at $P < (0.05)$, SEM= Standard Error of Mean, LOS=Level of Significance

Table 2 shows ADF in T1 has the highest value of 54.21% while T4 has the lowest ADF value of 42.14%. This indicates that as you increased the level of supplement test diet, ADF reduces as suggested by (Wudil *et al.*, 2020), therefore, ADF is inversely related to digestibility (Markar and Becker 1999). T1 has the highest NDF of 63.63% while T4 has the lowest NDF of 53.21% but T4 has the highest feed intake. Despite their significances differences, T4 has the highest lignin value of 11.07% while T1 has the lowest 9.42%. This suggested that T4 has the highest indigestible compound which reduces the digestibility of cellulose and hemicellulose substances in the total animal diet despite having the highest supplemental ration as elucidated by (Agishi, 2008).

CONCLUSION AND RECOMENDATION

The finding revealed that Fuzzy Cotton Seed supplementation at 300g/head/day responded more positively to body weight gain and conversion ratio. The study recommends the use of Fuzzy Cotton Seed at 300kg supplementation for increase live weight gain consistently for optimum growth and performance in ruminants.

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