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Replacement Values Of Complete Shade Dried Senna Obtusifolia Hay For Groundnut Hay As Roughage Source In The Diets Of Growing Huda Sheep (Ovis Aries).

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Abstract:
Maintaining stable hay for sheep is crucial for sustainable sheep production in Nigeria. This study investigated the replacement values of complete shade dried Senna obtusifolia hay for groundnut hay on the body weight gain, feed intake, feed efficiency, cost of feed and one linear body measurement of twelve growing Uda sheep. The dried groundnut hay was purchased from Badume market, while the complete Senna obtisifolia hay (leaves, stems and roots) were obtained from the premises of department of agricultural education research farm, Federal College of Education (Technical) Bichi. Twelve (6 rams and 6 ewes) Uda sheep aged between 16 and 19 months, with mean initial weight of 21.33 to 21.38kg were fed with three different diets (T1, T2 and T3) containing shade dried Senna obtusifolia hay to replace groundnut hay at 0, 20 and 40% replacements levels. The animals (2 rams + 2 ewes = four Uda sheep per experimental diet) were randomly allocated to the three experimental diets in a complete randomized design for a period of 60 days (September to November 2025). The data obtained were subjected to Analysis of Variance (ANOVA) using GENSTAT package, while separation of significant means was done using Least Significance (LSD) at 5% probability level. Results show that, average final body weight gain, daily weight gain, feed efficiency and horn length of the animals did not differ significantly ($p>0.05$) between the mean treatments, while the cost of feed differ significantly ($p<0.05$), which shows that the complete shade dried Senna obtusifolia is a good hay for feeding the growing Uda sheep. It is concluded that complete shade dried senna obtusifolia hay (leaves, stems and roots) could partially or totally replace groundnut hay in growing Uda sheep diets with good performance in daily body weight gain, horn length and feed cost.

Keywords*: growing Uda sheep, Complete Senna obtusifolia hay, groundnut hay, weight gain, treatment-diets, linear body measurement, replacement value, feed cost*

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I. Introduction

Growing Uda sheep require a balanced diet particularly roughage, throughout their growth cycle. Soaring sheep feed prices have triggered increase in cost of sheep management in Nigeria. This phenomenon is manifested in the poor health of Nigerians due of low daily protein intake. Sheep entrepreneurship is a reliable profit-making business with high job opportunities for millions of unemployed Nigerians. Income generation in sheep farming business is generally reasonable within a short period. Nevertheless, feeding the sheep remains the most limiting factor that determines profit level of the sheep entrepreneur. This is much connected with the fact that sheep feed ingredient (ground nut hay - roughage) is being competed for with other livestock, such as rabbits, horse, goats, donkey, cattle and camel.

Senna obtusifolia

Senna obtusifolia (known as Tafasa in Northern Nigeria) is a world notorious weed. Weeds are plants that grow where they are not wanted. The plant Senna obtusifolia belongs to the kingdom plantae, family fabaceae. A common annual plant grows wild in Northern Nigeria. The plant is considered a serious weed to agriculturists and farmers in nineteen Northern states and Abuja in Nigeria. Senna obtusifolia is found throughout tropical Africa and it was introduced into Africa from America (Ismaila, et al, 2011). The young tender leaves of Senna obtusifolia occasionally used as vegetable throughout Africa and the plant is cultivated in home for this purpose in several countries including Senegal, Ghana, Cameroon and Ethiopia. Ismaila et al (2011) reported that dry senna obtusifolia leaves indigenous to Mubi, Gongola state Nigeria contained 5.2 percent crude protein, 2.6 percent crude fibre-roughage, mineral elements such as calcium, copper, sodium and manganese and some anti nutritional factors like tannis, alkaloids, saponins and steroids. Olakunle (2016) observed that samples of dry

senna obtusifolia plants collected from premises of Federal College of Education (Tech) Bichi, kano state contained 9.2 percent crude protein, 4.21 percent fat, 8.1 percent moisture, 22 percent crude fibre-roughage, 7.1 percent ash, 0.69 percent phosphorous, 0.73 percent calcium, niacin 0.11mg/100g, alkaloid 220mg/100g, tannins 85mg/100g and 2700 kca/kg metabolizable energy. Senna obtusifolia grows in sub–Saharan African. People in Northern Nigeria, Ethiopia, Sudan and Ghana eat the dry leaves of Senna obtusifolia, but animals in these places do not, possibly because of presence of some anti nutritional factors in the plant (Becker, 1986). Therefore, there is need for research in this area to cure and reduce the anti-nutritional factors in the Senna obtusifolia leaves and subsequently making the weed-plant acceptable to livestock and cheaper source of roughage-fibre in sheep diets. Abdulazeez et al (2016) recorded neither ill health nor mortality figure in all the twelve Chinchilla rabbits fed dry Senna obtusifolia. The green leaves of the senna obtusifolia are fermented to produce a high-protein food called "kawai" which is eaten by many people in Sudan as a meat substitute (Becker 1986). Villagers in Northern Nigeria prepared a delicious soup "tafasa soup" with dry senna obtusifolia leaves. These reports have portrayed the notorious weed, senna obtusifolia leaves somewhat, as a plant source of protein and roughage with a fair potential for use in sheep diet, even if it is to replace a portion of groundnut hay which is used conventionally in the diet of sheep. This observation would make economic sense, since groundnut hay, the conventional energy source has become scarce and expensive due to high demand caused by competition for its use as ruminants feed. Sheep has potential for rapid growth. This growth process requires energy and roughage-fibre for its support and such energy and roughage come from plants.

Uda or Ouda breed of sheep

Uda are indigenous tropical breed of sheep, they are found in the extreme northern parts of West Africa e.g. Mali, Chad, Niger and Northern Nigeria. They are characterized by the possession of long legs which is an adaptation to nomadic system of rearing commonly practiced in these areas; they are tall reaching height of 75-85cm and weighing 60-70kg at maturity. The skin colour is dark brown or black forequarter and white hindquarter. They are excellent animal for meat production (Onazi 2014)

Animal body measurements

Growth rate is an important economic trait for sheep producers, because live weight at slaughter or carcass weight determines a producer's income from sheep sales. Therefore, a potential sheep producers should select sheep for increased body weight (BW)) and horn length (HL). Measurements of various body conformations are of value in judging the quantitative characteristics of meat and also helpful in developing suitable selection criteria (Islam et al 1991). Linear measurements of the body are kind of growth indicators in animal life (Goe et al, 2001, Abbasi et al, 2011) and are helpful in predicting body weight and carcass trait (Atta and El-Khidir, 2004).

Justification Of The Study

Protein is incredibly important. If we don't get enough from the diet, our health and body suffer (Abdulazeez, et al 2014). The essence of sheep domestication is mainly for protein and income generation. Sheep is a ruminant animal therefore, plant, grass, or roughage is the most important and expensive ingredient in sheep feeding. Feeding constitutes a major capital expense in sheep farming business, especially in the Northern Nigeria. This problem is more critical during the dry period (7-8 months) when there is inadequate or absence of hay, grass, roughage and forage or fibre for sheep in Northern Nigeria and the available groundnut hay is very expensive. In this case, the search for alternative roughage-fibre feed ingredient which is cheap and easier to obtain is of paramount importance. Senna obstufolia plant grows very fast and wild in Northern Nigeria (Fig 1). There has not been sufficient information on the use of complete shade dried Senna obtusifolia leaves, stems and roots in growing Uda sheep diets. Hence the present study was to investigate the replacement values of complete shade dried Senna obtusifolia hay (leaves, stems and roots) for groundnut hay as roughage source in the diets of growing Huda sheep (ovis aries).

Fig 1. Senna obtusifolia

Aim

The aim of this trial is to assess the replacement value of complete shade dried Senna obtusifolia hay (leaves, stems and roots) for groundnut hay in growing Uda sheep diets.

Objectives Of The Study

i. To determine the level to which complete Senna obtusifolia hay (leaves, stems and roots) could replace groundnut hay in growing Uda sheep diets.
ii. To increase animal and animal products for improved health of Nigerians.
iii. To protect the ecosystem against the use of herbicides in controlling Senna obtusifolia - plants/weeds in farms, gardens and surroundings.
iv. To support the Renewed Hope Initiatives of President of Federal Republic of Nigeria, Mr. Ahmed Bola Tinubu in a new employment and income generation in Senna obtusifolia sheep diet and sheep farming for the unemployed Nigerians, small, medium and large-scale investors/entrepreneurs.
v. To create local and international awareness on an indigenous and cheaper sheep/livestock feed – Senna obtusifolia diet as a sustainable solution to nutritional problems of the current sheep (livestock) production and the incessant Fulani herdsmen and farmers clashes in Nigeria.
vi. To support Tertiary Education Trust Fund (Tetfund) Institutional Based group research and joint journal publications

II. Materials And Method

Study site

The trial was carried out at the livestock research farm of the Department of Agricultural Education, School of Secondary Education (Vocational), Federal College of Education (Technical) Bichi, old site, Kano State in the North-West geo-political zone, latitude: N $12^{0}12'30"$, longitude: E $8^{0}13'3"$, altitude: 551.9m situated in the Sudan savanna region of Nigeria.

Materials

Twelve (6 rams and 6 ewes) growing Uda sheep, aged between 16 to 19 months, whole Senna obtusifolia hay (leaves, stems and roots), groundnut hay, Izal, feeders, drinkers, dewormers, multivitamins, animal pen, drinking water, salt, bone meal, wheat offal, maize bran, stalk crushing machine, flexible measuring tape and digital weighing scale.

Method

Experimental sheep and their management

Twelve (6 rams and 6 ewes) growing Uda sheep were purchased from Bichi emirate market, kano state. The sheep were quarantined for ten days and treated against both ecto and endo parasites and also given antibiotics. Prior to the trial, the sheep were managed intensively and group-fed with the common groundnut hay and wheat bran.

Experimental Feed formulation

Three complete diets were formulated using concentrates and varying levels of complete Senna obtusifolia hay to replace groundnut hay (Table 1). The diets were designated as diets T1, T2 and T3, representing zero (0), 20% and 40% levels of inclusion of shade dried and crushed complete Senna obtusifolia leaves, stems and roots.

Experimental procedure

Each sheep was housed in a pen measuring 2m x 1m x 3m (Fig 2) which was previously disinfected with Izal before the arrival of the sheep. Each animal was assigned to an experimental diet, water and fed ad libitum in the morning and evening for 60 days (September to November 2025).

Fig 2. A growing Uda ram in a pen, feeding on Senna obtusifolia formulated diets

Animal and animal feeding management

The feeding trial was conducted using twelve intact growing Uda sheep (average weight between 21.33 – 21.38kg) which were sourced from Bichi Emirate market. The animals were put in ten days quarantine and adaptive environment where they were sprayed, dewormed and vaccinated against external parasites, internal parasites and common diseases, respectively. Complete Senna obtusifolia was obtained from the research farm of the department of agricultural education while concentrate feeds were sourced from both Kano and Bichi Emirate markets. Experimental diets and clean drinking water were offered in free choice for all the experimental twelve growing Uda sheep twice a day in two equal portions (09:00 am and 02:00 pm). The Uda sheep were confined and studied in an individual pen for 60 days.

Experimental design and dietary treatments

The experiment was conducted using a randomized complete block design with 3 dietary treatments (T1, T2 and T3, table 1) in 3 replicates. The Uda sheep were blocked based on their initial body weight which was determined as a mean of two consecutive weightings after overnight fasting. They were grouped into three blocks of four (2 rams and 2 ewes) animals each and treatment diets were randomly assigned to each animal. Each animal in a block had an equal chance of receiving one of the following treatment diets: Senna obtusifolia hay with concentrate fed ad libitum (T1), combined groundnut hay, Senna obtusifolia hay and concentrate fed ad libitum (T2) and groundnut hay with concentrate fed ad libitum (T3). The diet composition was set to meet the requirements for growing sheep following the recommendation of NRC (2007, table 1).

Data measurements

All measurements were taken when the animals were in standing position with head raised and on all four feet without body movement. Physical restraint was sometimes applied to limit movement. Following measurements were taken on the animals:

Body weight gain (BWG): by carefully having the sheep stand completely on the measuring digital scale. Each sheep was weighed at the beginning of the experimental period and every eight days interval throughout the experiment after overnight fasting at 6:00 a.m, before daily feed offering to avoid feed effect. The weight taken every 8 days was used to show the growth pattern of the experimental sheep. Average daily gain (gram/day) was calculated as the difference between the final live weight and initial live weight of the animal divided by the number of feeding days.

Horn length (HL): distance from base of horn where it meets head to tip of the horn using flexible measuring tape.

Feed intake: giving the animal a known feed quantity daily and subtract the leftover feed from it

Feed efficiency: the unit of feed consumed per weight gain = feed intake/weight gain

Cost of feed/kg: divide its cost by its unit weight.

Statistical analyses

The data on the feed intake, live body weight gain, feed cost, horn length (Fig 3) and feed conversion efficiency were subjected to analyses of variance (ANOVA) using GENSTAT package, while separation of significant means was done using Least Significant Difference (LSD) at 5% between the mean differences ($p>0.05$).

Fig 3. Weekly taking of experimental Uda ram horn length (cm)

III. Results

Table, 1. Dietary treatments/ingredients composition of experimental diets

Ingredients	T1	T2	T3
Wheat offal	25	25	25
Senna obtusifolia hay	40	20	0

Ground nut hay	0	20	40
Groundnut cake	20	20	20
Soyabean cake	12	12	12
Bone meal	1.5	1.5	1.5
Salt	0.9	0.9	0.9
Vit + premix	0.6	0.6	0.6
Total	100	100	100

T1 = Senna obtusifolia hay and concentrate, T2 = combined Senna obtusifolia hay, groundnut hay and concentrate, T3 = groundnut hay and concentrate.

Table 2. chemical composition of experimental diets

Experimental diets	Ash (%)	Moisture (%)	Dry Matter (DM) (%)	Crude Fiber (%)	Fat (%)	Crude Protein (%)	NFE (%)
T1	7.80	0.15	99.85	12.20	8.80	9.84	61.21
T2	8.35	0.85	99.15	15.96	7.80	9.84	57.20
T3	8.00	0.50	99.50	15.09	8.20	10.94	57.27

T1 = Senna obtusifolia hay and concentrate, T2 = combined Senna obtusifolia hay, groundnut hay and concentrate, T3 = groundnut hay and concentrate.

Table 3. Growth performance and feed efficiency of Uda sheep fed under different Senna obtusifolia feeding regimes

Parameters	T1	T2	T3	SEM	LSD
Initial body weight (kg)	21.33[a]	21.26[a]	21.38[a]	5.08	ns
Final body weight (kg)	29.45[a]	29.97[a]	29.95[a]	3.76	ns
Body weight gain (kg)	8.12[a]	8.71[a]	8.57[a]	4.04	ns
Average daily body gain (g)	115.25[a]	160.37[a]	138.62[a]	2.806	ns
Initial horn length (cm)	4.03[a]	4.23[a]	4.93[a]	2.08	ns
Final horn length (cm)	10.52[a]	10.71[a]	10.95[a]	3.68	ns
Horn length gain (cm)	6.49[a]	6.48[a]	6.02[a]	1.08	ns
Average daily feed intake (g/d)	54.17[a]	54.24[a]	54. 47[a]	3.30	ns
Feed efficiency kg/kg gain	13.10[a]	14.28[a]	13.98[a]	2.08	ns
Cost of feed/kg of diet (#)	80[a]	130[b]	210[c]	21.13	s

[a-c] means within a row not bearing common superscript are significantly different; s = significant at $p<0.05$; ns = not significant at $p>0.05$. SEM = Standard Error of Means, LSD = Least Significant Difference

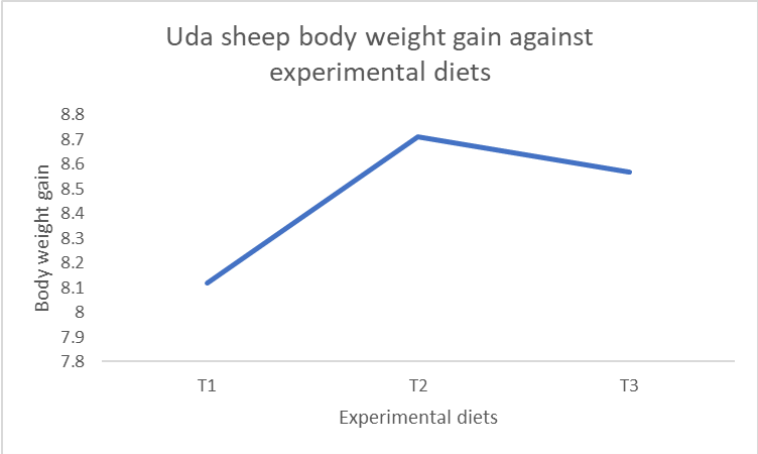

Fig. 4. Uda sheep final live body weight gain against experimental diets over a period of 60 days.

IV. Discussion

The replacement value of complete Senna obtusifolia hay for groundnut hay on body weight gain, feed intake, a linear body measurement, feed efficiency and cost of feed were studied. The replacement value was non-significant ($P>0.05$) on all the body measurements. The results have shown that body weight gain, horn length, daily feed intake and feed efficiency increased with daily consumption of the complete Senna obtusifolia diets throughout the trial period. This might be due to the Senna obtusifolia being a legume plant, which has same roughage value with that of groundnut hay. Generally, the weight gain, linear measurement and feed consumption increased with increased percentages of complete Senna obtusifolia hay in the diets (table 3, fig 4).

Chemical composition of experimental diets

The ingredients of dietary treatments are shown in table 1. The chemical composition of experimental diets is presented in Table 2. The dry matter content was more comparable (T2 = 99.15%, T3 = 99.50% and T1 = 99.85%) across the experimental diets. The combined Senna obtusifolia hay, groundnut hay and concentrate (T2) and Senna obtusifolia diet (T1) had same lower crude protein (9.84%) when compared to groundnut hay-diets (T3 = 10.94%). T2 contained the highest crude fiber content (15.96%) followed by that of the T3 (15.09%) and T1 (12.20%). Growth performance, final body weight gain (fig 4), daily body weight gain, feed conversion efficiency and feed cost of Northen Nigeria Uda sheep under different Senna obtusifolia feeding options are presented in table 3, fig 4. There was an increasing trend for all treatment groups throughout the 60 days of study; however, a sharp increase in the cost of feed was observed for T3 (#210.0/kg) when compared with T1 (#80.0/kg). This may due to the series of agronomic practices involved in groundnut hay production, such as purchase of groundnut seeds, cost of land preparation, planting, fertilizer application, weed control, harvesting and processing, while Senna obtusifolia diet (T1) requires harvesting and processing only. T2 had the highest live body weight gain (8.71kg) followed by that of the T3 (8.57kg) and T1 (8.12kg) (fig 4). The non-significant difference in growth performance, horn length and feed efficiency in all the experimental diets, is attributed to the comparable feed consumption. The results corroborate the findings of Umar et al (2017), who reported that sundried or ensiled Senna obtusifolia leaf meal could partially or completely replace Moringa oleifera leaf meal in diets with good performance in terms of nutrient intake, digestibility and weight gain.

V. Conclusion

The complete shade dried Senna obtusifolia hay (leaves, stems and roots) at 20% and 40% produced good growth results (table 3, fig 4) with wide acceptability among the twelve growing Northern Nigeria Uda sheep, no any health challenges observed among the twelve growing Uda sheep fed with the complete Senna obtusifolia diets and also recorded the least feed cost (#80/kg), thus could be introduced to small, medium and large ruminant farmers, local and international investors/entrepreneurs, TetFund for international and institutional collaborative research, Renewed Hope Initiatives and youth employment programs of the Federal Government of Nigeria and Fulani herdsmen in the Northern Nigeria.

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