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Effects of Introducing Different Levels of Groundnut Hay Treated with Urea and Molasses on Performance of Desert Lambs (Hammari Ecotype)

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Abstract:

Non-traditional agricultural by-products are a potentially valuable alternative source of animal feed which may decrease dependence on traditional feed products and decrease overall feeding costs. This experiment was conducted to evaluate the effect of using groundnut hay in lambs fattening. Groundnut hay was used at three levels (0, 20 and 30%) in three iso-energetic and iso-nitrogenous diets (A, B and C). Twenty seven male lambs of Sudanese Desert sheep (Hamari ecotype) were selected according to their age (4-5months) and average live body weight (20.5Kg) and they were kept in Rural Development and Extension Center (R.D.E.C). The experimental feed includes three different levels of groundnut hay treated with urea and molasses (0, 20 and 30 %). Experimental animals were fed for 60 days included two weeks as adaptation periods. All the data was collected and statistically analyzed by using statistical package for Social Studies (SPSS version 17.0). an A Completely Randomized Design (CRD). One way analysis of variance (ANOVA) and Duncans multiple range were used to test for difference among the treatments means. The study showed a significant differences (P≥0.05) among different treatments for average values of final live body weight gain(FLBWG), total live body weight gain(TLBWG), daily live body weight gain(DLBWG), feed

conversion rate(FCR), feed conversion rate as % of live body weight gain, cost of one kg feed and cost of one kg live weight per (SG). While initial live body weight (ILBW) and daily feed intake (DFI) showed no significant differences (P>0.05) among different treatments. Treatment A (control) reported the highest and best values of final live body weight, daily weight gain, cost of one kg feed, and cost of one kg live weight followed by treatment B (%20) while treatment C (30%) reported the lowest values so, we recommend to use groundnut hay up to 20% for finishing desert lamb.

Keywords: *Groundnut hay, Desert sheep, Performance, fattening, Feeding cost.*

Introduction

Sudan is well endowed with livestock resources which estimated at 139 million heads, comprising 41, 51, 43 and 4 million heads of cattle, sheep, goats and camels, respectively (M.A.R, 2007). According to Hamed (2015) and Ministry of Animal Resources and Fisheries (2002). The current official estimations of the size of Sudan's livestock population are 51.56-52.08 million of sheep, 43.27- 43.44 million of goats, 41.56- 41.67 million of cattle and 4.52-4.62 million of camels. The average annual growth rate of the livestock sector was estimated at 3.1 %, Faki et al. (2009). This population figure puts the Sudan as a leading livestock producer in Africa and the Arab countries. Sheep of Sudan are kept mainly for meat production. The economic importance of sheep arises from the fact that sheep are a popular source of red meat for local consumption and an important source of foreign earnings, (Arab Organization for Agricultural Development, 1995). Sheep have many advantages over some other classes of livestock. They produce many different products in a year, wool and lambs, bringing in rather quick returns Singh (1969). Sheep also can improve fertility of many farms by adding 0.5-0.7 tons of manure to the soil every year Singh (1969). The author also reported that sheep have the ability to produce prime carcasses on roughage alone. Singh (1969) and Church (1991) reported that sheep are specially well adapted for many areas unable to produce grain refutably, and degraded environment owing to more selective grazing. Church (1991) reported that sheep do not require expensive buildings and equipment, and they are known to have higher fecundity and early puberty. Mohamed et al. (2015) reported that Sudanese desert sheep had good potential for mutton production due to its higher growth rates and feed conversion efficiency. The nutritional management of the animal can affect meat quality, carcass yield, and retail cuts, which are extremely important for measuring the animal fattening of meat production Lageet al. (2014).Non-traditional by-products of the agricultural crops are potentially valuable alternative source of animal feed which may decrease dependence on traditional feed products and decrease overall feeding costs Gomes et al. (2012).Evaluation and comparison of different feedstuffs and mutton quality as well as different feed supplements are now hot subjects for many researchers, Mohamed et al. (2015). A high cost of feeding cereal grains as the main source will increase the production cost. Utilization of locally available agricultural by-product will reduce costs of animal product and improve product quality. Thus, the shortage of quality and quantity of feeds, particularly in developing countries of Africa especially Sudan due to seasonal variation and non-availability of qualitative pasture, availability of agricultural by-products such as groundnut cake, hull, hay, wheat bran and sorghum can which are not in competition with human diet. Groundnut crop by-products are a common ruminant feed in peanut producing countries. They are generally considered as having the nutritional value of a good grass or alfalfa hay Hill (2002). In Nigeria, a survey of peanut crop residues and concluded that their protein content, higher than that of cereal crop residues, could effectively provide supplementary nitrogen to ruminants offered diets of low N cereal crop residues, especially during the dry season Larbi et.al. (1999).

Recently many researchers had been interested and carry out for how to improve meat quality by improving meat animal finishing and requirements (Hassan, 2005; Bashir, 2009; Hassan 2010; Awad, et al, 2012; Ballal et al. 2014; Mohana, 2018; AbdElgadeem, 2018).

Accordingly, the general objective of this study was to evaluate the effect of using different levels of groundnut hay treated with urea and molasses on desert sheep lambs (Hammari ecotype) performance, while the specific objectives was:

1.To evaluate the potential of utilizing agricultural by-products (Groundnut hay) in sheep feeding and finishing.

2.To measure the growth rate of sheep lambs.

3. To measure feed intake, feed conversion rat and gain of sheep lambs

Material and methods

Site of the Study

This experiment was carried out at Rural Development and Extension Center, (.R.D.E.C), Faculty of Animal Production– Almanagil-University of Gezira, central Sudan,76 kilometers west to Wad madani city, Gezira state Sudan.

Housing and Management

The experimental animals were housed in semi-open pens house enclosed with corrugated steel, bamboo poles and steel bars of about three meters high, and covered with zinc sheet zinc set over half – meter brick wall. The roof was made of corrugated metal sheets, sloping from the middle (3 m high) to the sides (2.5m) and supported with metal pipes. Roof was covered with zinc sheets and the floor is concrete with reasonable inclination for drainage, partitioned internally to 27 pens (1.5 x 2.5 m^2). Each pen has separate door and adequately equipped with water and feed troughs.

Experimental Animals

Twenty-seven male lambs of Sudanese desert sheep ecotype Hamari were purchased from Um Rwoaba livestock market, north Kordofan State. The experimental animals were selected according to their age (4-5months) and their average live body weight (20.5Kg). They was transported to Almanagil city by truck and they were kept in the (R.D.E.C).

Experimental Feeds

The experiment was carried out to test and asses the nutritive value of three level of groundnut hay treated with urea and molasses for feeding and finishing lambs. The experimental feds includes three different levels of groundnut hay treated with urea and molasses (0, 20 and 30 %), in addition to the other ingredients: groundnut cake, groundnut hulls, wheat bran, sorghum grain, molasses, urea, limestone and common salt Table 2. These ingredients were manually mixed and then liquid molasses/ urea were added. The ration was then dried under shade and stored in labeled plastic sacks. The ration formulated to attain (14.10% CP DM) and 11.10 CP MJ/Kg) Table 2. The experimental diets were formulated as to be iso-energetic and iso-nitrogenous to meet the sheep requirement according to NRC (1994). Crude protein and metabolic energy values in the tables were calculated by the modified equation of Ellis (1981).

Table 1. Chemical Composition of Groundnut Hay

Item	Percentage
Moisture	9.75
Dry matter	97.5
Ash	12.85
Ether Extract	2.53
Crude fiber	13.3
Crude protein	7.95
Nitrogen free extract	31.65
ME(MJ/ Kg DM)	7.88

Table 2. Experimental Rations Formulation and Chemical Composition Percentage

Groundnut hay levels Ingredients	A 0%	B 20%	C 30%
Sorghum	34	25	18
Groundnut cake	10	4	5
Wheat bran	16	14	14
Groundnut Hay	0	20	30
Groundnut hulls	16	23	11
Molasses	20	8	17
Urea	0	1	1
Nacl	2	2	2
Limestone	2	3	2
Total	100kg	100kg	100kg
C P	14.06	14.04	14.06
ME(MJ/ Kg)	10.09	10.16	10.09
Chemical composition			
Moisture	10	12.83	9
Dry matter	90	87.5	91
Ash	10	8.5	8.5
Ether Extract	4.3	4.4	2.3
Crude fiber	8.0	9.0	11
Crude protein	16.2	15.8	15.00
Nitrogen free extract	51.6	35.1	61.7
ME(MJ/ Kg DM)	10.82	11.42	11.70

Experimental Animal Management

A day after arrived, the experimental animals were ear tagged, deeped with cypermetherine for external parasite, drenched with Ivermectin and Levamizazol 3% against the internal parasites. The experimental animals given prophylactic dose of Oxytetracycline. The animals were vaccinated against anthrax, small ruminants' pox and Hemorrhagic septicemia. A total of twenty seven male lambs were divided into three groups each group was divided into three sub groups (replicates). The experimental animal were fed with three rations contained different levels of groundnut hay (0%, 20% and 30%) with CRD design and then were randomly assigned to the pens A control, B and C treatments. This will allow a fair comparison among treatment groups. During the adaptation period, which extended for ten days experimental animals were fed with feeding system which involved 70% concentrate ration and 30 % roughage. The control group A was fed with control ration and group B and C were fed with ration B and C (tested). After end of adaptation period, experimental animals were weighted and distributed into three groups A,B and C. The feed were offered to the experimental animals as 5% of live body weight daily every morning at 7:00 am and the refusals feed were collected every next morning and weighed recorded. Clean water and salt lick were provided throughout the experimental period which extended for 60 days. Immediately after the adaptation period the experimental animals were individually weighed by using small ruminants balance (0 -50Kg capacity),as initial weight with similar average body weight (20.50Kg).The experimental animal feed requirement was introduce daily at8:00 am. The live body weight and feed conversion ratio of experimental animals were calculated weekly. Some of the feed additives of *(cdVet* NaturpruduKetGmbH, 2017) were added to the ration during experimental period for multiple purposes according to their commercial recommendations of manufactory. PhytoStart was used (5g/head/ day) to supports the gut especially in the binding force of liquids and to support essential oils and herbal nutritional cause the performance of the respiratory organs, optimize metabolism and digestion condition. Turbo Bronchial drinking water was used (2 ml/ head /day) for nutritional support of the respiratory condition and stimulation of feed intake.

Data Collection

Feed Intake

The concentrate rations and roughage (groundnut hay) were given to the lambs daily every morning at 8:00 am adlib and the refusal part was collected in the next morning at7:00 am, weighed and subtracted from the daily offered amount to calculate the actually feed intake.

Body Weight

The experimental animals were weighed initially before experimental feed offered by using small ruminant's balance (50 Kg capacity) at 7:00 am before feeding every week after following an overnight fasting to asses body weight gain (kg/day or week). Feed intake calculated to asses' growth rate and feed conversion ratio (F.C.R).

Chemical Analysis

Roughage and concentrate rations were proximately analyzed on dry- matter basis, for moisture, ash, crude protein, ether extract (fat) and nitrogen free - extract by the procedure described by the Association of Official Agricultural Chemists (AOAC, 1984). Results were expressed as percentage composition.

Statistical Analysis

The data of the experiments was statistically analyzed by using statistical package for Social Studies (SPSS version 17.0). A Completely Randomized Design (CRD) (Steel and Torrie, 1980). One way analysis of variance (ANOVA) and Duncan Multiple Range Tests (DMRT) were used to test difference among means (Snedecor and Cochran, 1980).

Results and Discussion

Average values of experimental lambs performance are showed in Table 3. The study showed no significant differences ($P \geq 0.05$) among different treatments for average values of initial live body weight and daily feed intake, that is maybe attributes to the distribution of lambs according to the weight at the beginning of the experiment. These results was agree with Ahmed (1993), Hassan (2005), Bashir (2009), Hassan (2010), Awad, et al. (2012), Ballal, et al. (2014), Mohana (2018) and AbdElgadeem (2018) who reported no significant differences ($P \geq 0.05$) among different treatments for average values of initial live body weight and daily feed intake. On the other hand live body weight a good indicate of evaluating animal growth and growth rate hence, increasing of live body weight reflect the degree of utilization of feed and efficiency of the animals. In this study the results showed a significant difference ($P<0.05$) among different treatments for average values of final live body weight gain, total live body weight gain and daily live body weight gain. Treatment A (control) tended to have the highest values (32.73, 11.83 and 0.24 kg) for final live body weight gain, total live body weight gain and daily live body weight gain) followed by treatment B (30.83, 9.83 and 0.20kg) while treatment C reported the lowest values (30.24, 9.14 and 0.19 kg) respectively. Live body weight increases gradually by decreasing of groundnut hay levels in experimental feed that is may be due to increasing of crude fiber and decreasing of crude protein for treatment B and C respectively. On the other hand the study showed a significant difference ($P<0.05$) among different treatments for relative growth treatment A recorded the highest value (56.62%) followed by treatment B (46.755) while treatment C scored the lowest value (43.67%) of relative growth. That is justifies increasing of live body weight gain because relative growth increase by increasing of live body weight gain and that is what was reported in this study. These results agree with Bashir (2009), Hassan (2005), Hassan (2010), Awad, et al. (2012), Ballal, et al. (2014), Mohana (2018) and AbdElgadeem (2018) who reported a significant difference ($P<0.05$) among different treatments for average values of live body weight gain and relative growth. With regard to daily feed intake the study showed no significant differences ($P>0.05$) among the different treatments for average values (1.26, 1.28 and 1.23 kg for treatment A, B and C respectively. Although treatment B and C tended to have the highest values of crude fiber and lowest values of crude protein howsoever, feed intake showed no significant differences ($P>0.05$) that is maybe due to similarity of animal age and weight in addition to effect of the adaptation period beside similarity of experimental conditions. The similarity in daily feed intake maybe due to feed introduced to lambs where requirements reached up to 5%of lamb live weight. Concerning the feed conversion rate and daily feed intake as % of live body weight the study showed a significant difference ($P<0.05$) among the different treatments. Treatment C showed the highest value numerically (6.54) followed by treatment B (6.44) while treatment A scored the lowest value (5.26) of feed conversion rate. With respect to feed intake as % of live body weight treatment B tended to have the highest values (4.16) followed by treatment C (4.06) and treatment A (3.8). Both of feed conversion rate and daily feed intake as % of live body weight explained the efficiency of feed and ability of animals to consume and convert the feed to

meat tissues. In this study although treatment A tended to report the lowest values of feed conversion rate and daily feed intake as % of live body weight it considered to have the best values of performance. That is reflects the efficiency of feed and efficiency of animals. These results disagree with AbdElgadeem (2018) who reported no significant differences (P>0.05) among different treatments but agree with Hassan (2005), Hassan (2010), Awad, et al. (2012), Ballal, et al. (2014), and Mohana (2018) who reported a significant difference (P<0.05) among the different treatments. All results may be attributed to the amount of the high level the fiber in the Groundnut hay which affected the experimental animals growth which in agreement with (Hammond, 1960) who reported that growth rate of lambs is considerably affected by the amount of fiber in the diet.

Table 3. Performance of Sudanese Desert lambs (Hammari Ecotype) Fed with Groundnut Hay Levels treated with Urea and Molasses

Items	Groundnut Hay Levels (Treatment Groups)			*L.S*
	A 0%	B20%	C30%	
Ave. initial live body weight, (kg).	20.90±0.10	21.04±0.07	20.96±0.20	N.S
Ave. final live body weight, (kg).	32.73±0.67^{a}	30.83±0.53^{b}	30.24±0.26^{b}	*
Ave. total live body weight, (kg).	11.83±0.58^{a}	9.83±0.50^{b}	9.14±0.57^{b}	*
Ave. daily weight gain, (kg).	0.24±0.01^{a}	0.20±0.01^{ab}	0.19±0.01^{b}	*
Ave. daily feed intake, (kg).	1.26±0.00	1.28±0.03	1.23±0.03	N.S
Ave. feed conversion rate, (rate).	5.26±0.26^{b}	6.44±0.37^{ab}	6.54±0.40^{a}	*
Ave. daily feed intake as% of live body weight, (%).	3.84±0.08^{b}	4.16±0.09^{a}	4.06±0.07^{ab}	*
Ave. Relative growth, (%).	56.62±2.53^{a}	49.75±2.25^{ab}	43.67±3.10^{b}	*

Note: S.E=Standard error of the treatment means,N.S.=Not significantly different, L.S = Level of Significant, *=Significantly different at 0.05 and Means in one row followed by different letters differ significantly at level *

Table 4 shows the economic study as average cost of one kg feed and one kg live weight per (SG). The study showed a significant differences (P<0.05) among the different treatments for average values of feed and live weight cost per (SG),where the highest value (7.50) recorded by the control treatment A (0%) and the lowest value (6.33) recorded by treatment B(20%) for feed cost also the results showed significant differences(P<0.05) among the treatments for average cost of one kg live weight, where the highest value (51.64) recorded by treatment A(0**%**) and the lowest value (40.40) recorded by treatment (B 20%**)**. The results showed that incorporating of groundnut hay up to 20% in the rations of fattening decreased the cost of one kg ration and one kg live weight.

Table 4. Economic Effects of Feeding Sudanese Desert lambs (Hammari Ecotype) with Groundnut Hay Levels Treated with Urea and Molasses

Items	Groundnut ay Levels (Treatment Groups)			*L.S*
	A 0%	B20%	C30%	
Ave. cost of one kg feed, (SG)	7.50±0.29^{a}	6.33±0.00^{b}	7.00±0.10^{ab}	*
Ave. cost of one kg live weight, (SG)	51.64±0.26^{a}	40.40±1.13^{b}	49.08±1.36^{b}	*

Note: S.E= Standard error of the treatment means,N.S.= Not significantly different, L.S = Level of Significant, * = Significantly different at 0.05 and Means in one row followed by different letters differ significantly at level *; *The cost of rations and meat calculated according prices of 2017

Conclusion and Recommendations

The inclusion or the use of agricultural by products (groundnut hay) for finishing meat animals showed a positive effect on the performance as some authors reported. Due to this study treatment A (received no groundnut hay) reported the highest values of final live body weight gain, total live body weight gain, daily live body weight gain, feed conversion rate and feed conversion rate as % of live body weight gain followed by treatment B (20% groundnut hay) while treatment C (30%) groundnut hay tended to have the lowest values so, we recommended to use groundnut hay up to 20% for finishing desert lambs (Hamari) without any deleterious effects and gain positive results with very low prices of cost of one kg ration and meat.

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