Egyptian J. Anim. Prod. (2024) 61(1):39-46

GROWTH PERFORMANCE AND SOME BLOOD PARAMETERS OF MALE OSSIMI LAMBS FED RATIONS CONTAINED UNTREATED OR TREATED SOY-BEAN STRAW

S.T.M. Fahmy, A. S. Aied, M.A.A. El-Barody and E.M. Ibrahim

Department of Animal Production, Faculty of Agriculture, Minia University, Egypt

Submitted:19/12/2023; Accepted:13/3/2024; Published:12/5/2024

SUMMARY

Twenty lambs with 21 ± 2.47 kg body weight were assigned in four groups each of five lambs used in growth performance experiment, while eight lambs of 28.5 ± 2.47 kg body weight were used in digestibility and blood parameters experiment of four equal groups each of two lambs. Lambs were fed four rations nominated as T1, T2, T3 and T4. Rations contained the same concentrate feed mixture (CFM) that was offered in amounts to meet 70% of lambs metabolisable energy requirements, while soy-bean straw (SBS) treated or untreated were available ad. libitum. Ration T1 contained untreated SBS, ration T2 contained 5% urea and 10% molasses treated SBS, ration T3 contained (T2 +8% beaker yeast) treated SBS and ration T4 contained (T3+ 8% fat) treated SBS. CFM contained 18.89% crude protein (CP), 6.35% ether extract (EE), 9.77% crude fiber (CF) and 54.62% nitrogen free extract (NFE). The untreated SBS contained 4.6% CP, 2.02% EE, 33% CF and 43.96% NFE. All treatments increased the CP content to 8.18%, EE to 7.58%, NFE to 45.08%, while the CF was reduced to 27.98%. Digestibility coefficients were significantly (P<0.01) improved. The highest TDN value was 65.86% (T4 ration), while the TDN value for T1 was 61.17%. The average daily dry matter (DM) intake of the growing lambs were 1.21,1.34, 1.36 and 1.38 kg, while the average daily intake of SBS were 0.353, 0.416, 0.420 and 0.450 kg for the four rations respectively. The average daily weight gains were 180, 208, 211 and 225 g for lambs fed rations T1, T2, T3 and T4 successively. Blood urea and ammonia values were significantly (p>0.01) higher in T2, T3 and T4 than in T1. Lambs fed T4 Showed significantly (p>0.01) higher concentration of Triiodothyronine (T_3) 2.03 ng/ml than the other treatments. It could be concluded that the above mentioned biological positive effects may explain the increase in body weight gain and could suggest some good relative evidence for improving the nutritional value of the SBS treatments and supplementation.

Keywords: Straw, lambs, urea, yeast, fat

INTRODUCTION

The high prices of farm animal products are logical reflection of high production costs, shortage and limited production in comparable with the exponential increase in human consumption. Increasing dependence on inexpensive feed resources (farm crop wastes) is the goal of nutritional researchers. Ruminants can be fed on plant crop wastes that are high in cell wall constituents due to the activity of ruminal microbes. Soy-bean straw (SBS) is one of these crop wastes that is poor in its feeding value (37.19% as TDN and 1.94 as digestible crude protein; Aied ,2021). Increasing the feeding value of these crop wastes through nutritional treatments and supplements are ultimate and obligatory solution. Urea (5%), molasses (10%), yeast (8%) treatments and fat (8%) supplementation at the time of feeding were our tools to improve the feeding value of SBS.

The objective of this work was feeding growing Ossimi male lambs' rations that contained CFM to meet 70% of lambs metabolisable energy (ME) requirements, while lambs satisfied their ME needs from SBS treated or untreated that was available as an *ad. libitum*. Digestibility coefficients, feeding value, daily weight gain, feed conversion ratio, blood urea, ammonia, Triiodothyronine and thyroxin hormones concentrations were our projected criteria under studying.

MATERIALS AND METHODS

The study was conducted in two experiments: "A", Digestibility experiment and "B", growth performance experiment that were done at the Animal Production Department Farm belonging to the Faculty of Agriculture, Minia University.

Preparation of treated SBS:

The SBS treatments were executed 20 days before the beginning of the experiment and repeated continuously. 100 kg SBS were moistened with 50 liters' water, carefully mixed and kept in tightly tied nylon bags for 15 days (control treatment, T1). Urea (5%) plus molasses (10%) of SBS (w/w) were diluted with 50 liters' water and thoroughly mixed with 100 kg SBS and kept in tightly tied nylon bag for 15 days' treatment (T2). Urea (5%), molasses (10%) and baker's yeast (8%) were diluted with 50 liters' water and were thoroughly mixed with 100kg of (SBS w/w) and kept in tightly tied nylon bags for 15 days' treatments (T3). Treatment four (T4) was the same as (T3) plus supplementation of (8%w/w) fat (Soya bean oil) daily on SBS and mixed carefully just before feeding time.

After the incubation period (15 days) each treatment was aireated, air dried and subjected to laboratory nutritional analysis according to (A.O.A.C., 2006).

Digestibility experiment:

It was performed on eight male Ossimi lambs of 4 to 5 months as average age and (28.5± 2.47, kg) as an average body weight. Animals were distributed into four groups nominated as G1, G2, G3 and G4 (each of two lambs). The four groups fed the four experimental rations nominated as T1, T2, T3 and T4 in a 4 x4 Latin square design of four periods (P1, P2, P3 and P4) each of one month (Table 1). Acid-insoluble ash procedure (Van and Young,1977) was applied. The concentrate feed mixture (CFM) was composed of wheat bran 50%, yellow corn 27%, soya bean meal 20% lime stone 2%, sodium chloride 0.5%, minerals and vitamins mixture 0.5%. It provided 17% CP and 70% TDN as calculated figures from "Animal nutrition tables"; Animal Production Research Institute, (Ministry of Agriculture 1997, Tables). Minerals and vitamins mixture (contained for every 3kg): VIT.A 10.000.000 IU. VIT.D_3 2.000.000 IU, VIT.E 10.000mg, VIT.K_3 100 mg, VIT.B_1 1000 mg, VIT.B_2 5000mg, VIT B_6 1500mg, B_{12} 10mg VIT Biotin 50mg, Nicotinic acid 30 mg, Pantothenic acid 10mg, Folic acid 1000mg, Manganese 60mg, Zinc 50mg, Iron 30mg, Copper 4mg, Iodine 300mg, Selenium 100mg, Cobalt 100mg. Calcium carbonate up to 3 kg. (U.C. MIX Company). The cost of feed ingredients and feed additives as Egyptian livra (EL) per ton at time of experiment were 1350 for wheat bran ,7000 for yellow corn, 14500 for soya bean meal, 500 for lime stone, 500 for sodium chloride, mineral and vitamins mixture 5500.

Table 1. Distribution of male Ossimi lambs on the different dietary treatments and periods

Period	**Treatments**			
	T1	**T2**	**T3**	**T4**
P1	**G1**	**G2**	**G3**	**G4**
P2	**G2**	**G1**	**G4**	**G3**
P3	**G4**	**G3**	**G1**	**G2**
P4	**G3**	**G4**	**G2**	**G1**

T1= lambs fed concentrate feed mixture (CFM) and untreated soya bean straw (SBS control), T2= lambs fed CFM and SBS treated with urea and molasses, T3= lambs fed CFM and SBS treated with urea, molasses and yeast, T4= lambs fed CFM and SBS treated with urea, molasses, yeast and supplemented with fat at the time of feeding (soya bean oil). Lambs were distributed in four groups (G1, G2, G3, G4) each of five lambs.

Feeding system:

Feeds were offered in two meals at "7 am and 6 pm". Soya bean straw was available *ad. libitum,* while concentrate feed mixture (CFM) was offered in amounts calculated to cover 70% of metabolisable energy (ME) requirements for maintenance and growth (CSIRO., 2007). It was adjusted every 15 days as their weights were changed. Soya bean straw and concentrate feed mixture were introduced in separate pens. Feed residuals were collected daily for each group. Fresh water was available at all times.

Fecal samples collection:

Acid insoluble-ash procedure as internal marker for digestibility determination in ruminants (Van and Young ,1977) was followed. Accordingly, grasp fecal samples were collected from the rectum of each animal in each group at 9 am on days 23, 26 and 29 / period. The daily fecal samples for each animal were mixed and composed sample for each animal was kept in tightly tied plastic bag in the deep freezer until the end of the experiment to be analyzed according to (A.O.A.C., 2006).

Blood samples:

In the last week of each period blood samples from jugular vein for each lamb were withdrawn (10 ml in heparinized tube) at 9 am on days 27 and 30 of each period. Blood samples were stored in the deep freezer till the end of experiment to be analyzed for urea, ammonia, T_3 and T_4 hormones. Urea and ammonia–N concentrations in blood serum were measured calorimetrically by using specific kits according to Tietz (1990) methods. Serum hormones, Triiodothyronine (T_3) and thyroxin (T_4) concentrations were determined by a direct solid phase 125 I radioimmunology assay techniques using kits according to Schuurs and Van weeman (1977) and Walker (1977) for T_4 and T_3 (Bio-Check, Inc. foster city, CA 94404).

B- Growth performance experiment: It was performed on 20 weaned Ossimi male lambs, with average age 3 - 4 months and with 21 ± 2.47 kg average body weight. The weaned lambs were distributed in four groups (five lambs each). Each group was fed one of the four experimental rations outlined in the digestibility experiment.

Feeding system:

Lambs were weighed every 15 days before feeding and the amount of concentrate feed mixture was adjusted to cover 70% of their requirement for ME and digestible protein leaving stomach (metabolisable protein) according to (CSIRO, 2007) recommendations. Fresh and clean water was available for each group at all times. The SBS portion was available *ad. libitum*. The concentrate feed mixture was the same as that used in digestibility experiment. The feeding period lasted for 120 days. Lambs were subjected to the ordinary veterinary inspection. Minerals salt blocks were hanged and available for each animal in each yard.

Statistical Analysis:

Data were statistically analyzed by GLM procedure, Latin square design for digestibility experiment and one-way analysis for growth performance experiment, (SAS, 2006).The model used to analyze the digestibility coefficients and feeding value was: $Y_{ijr} = \mu + T_i + P_j + e_{ijr}$, while for growth performance experiment it was: $Y_{ij} = \mu + T_i + e_{ij}$ Where; Y_{ijr} is the observation of nutrients digestibility and feeding value, while Y_{ij} is the observation of weight gain, μ= is the overall mean , T_i = is the treatment effect where i = T1, T2, T3, and T4, P_j is the period effect where j =P1, P2 ,P3 and P4 and y_{ij} and e_{ijr} = random error. Factors under investigation were assumed to be fixed except the error term e_{ij} which was assumed to be random and normally distributed (0 and σ^2). Significant differences among means were tested using Duncan's multiples range test (Duncan's 1955) as given through SAS (2006).

RESULTS

The nutritional analysis as 100% dry matter basis of CFM and SBS untreated or treated that were used are listed in (Table 2). The DM content ranged from 87.54% for SBS treated with U+M+Y and supplemented with fat to 91.00% for untreated SBS. The OM content ranged from 84.05% for untreated SBS to 89.63% for the CFM. The CP content ranged from 4.6% for the untreated SBS to 18.89% for CFM. The EE content ranged from 2.02 % for untreated SBS to 7.85% in SBS treated with U+M+Y+F. The CF content ranged from 9.77% for the CFM to 33.45% for the untreated SBS. The corresponding values for NFE were 43.96% SBS without treatment and 54.62% for the CFM. The ash content ranged from 10.37% for the CFM feed to 14.95% in SBS without treatment.

Table 2. Nutritional analysis of concentrate feed mixture and treated or untreated Soya bean straw

Treatments	DM%	On100% DM basis					
		OM	CP	EE	CF	NFE	ASH
CFM	89.02	89.63	18.89	6.35	9.77	54.62	10.37
SBS	91.00	84.05	4.60	2.02	33.45	43.96	14.95
SBS +(U+M)	90.34	85.35	7.60	2.12	31.55	44.06	14.65
SBS+(U+M+Y)	89.69	85.81	8.11	2.22	30.54	44.92	14.19
SBS+(U+M+Y+F)	87.54	88.82	8.18	7.58	27.98	45.08	11.18

CFM =concentrate feed mixture, SBS= Soya bean straw, U=urea, M=molasses, Y=yeast, F=fat

The concentrate feed mixture offered was adjusted to cover 70% of their requirements for ME and digestible protein leaving stomach (metabolisable protein) according to (CSIRO, 2007) recommendation. The SBS portion was available *ad. libitum.*

The highest digestibility coefficients were recorded for feeding T4, the values were 63.68, 68.55, 78.61, 82.45, 58.51 and 67.35% for DM, OM, CP, EE, CF, and NFE respectively. While, the lowest digestibility coefficients of all feed nutrients were in the order 60.61, 64.09, 75.82, 78.67, 48.77 and 66.32 % for the respective feed nutrients when lambs fed T1. Accordingly, the feeding value expressed as total digestible nutrients (TDN) was significantly (P<0.01) higher for T4 (65.86%) than other treatments, while the TDN of the control ration (T1) was the lowest 61.17% as shown in Table 3. Treatment T3 showed significantly (P<0.01) higher digestibility coefficients for DM, OM, CF and NFE than T2. The values were in the order 63.12, 66.93, 51.74 and 69.07% for T3 compared with 61.85, 66.43, 49.76 and 67.49 % for the respective feed nutrients in T2, respectively. Therefore, the TDN of T3 (63.58%) was significantly (P<0.01) higher than that of T2 (62.30%). It is questionable to find that the NFE digestibility coefficient of T3 (69.07%) was significantly (p<0.01) higher than that of T4 (67.35%).

Table 3. Digestibility coefficients and feeding value of Ossimi lambs fed the tested treatments

	Treatments					
Items %	**T1**	**T2**	**T3**	**T4**	**± SE**	**Sig**
DM	60.61^d	61.85^C	63.12^b	63.68^a	0.145	**
OM	64.09^C	66.43^C	66.93^b	68.55^a	0.154	**
C P	75.82^C	77.33^b	77.00^b	78.61^a	0.199	**
EE	78.67^b	79.23^b	78.93^b	82.45^a	0.280	**
C F	48.77^c	49.76^c	51.74^b	58.51^a	0.374	**
NFE	66.32^c	67.49^b	69.07^a	67.35^b	0.417	**
TDN	61.17^d	62.30^c	63.58^b	65.86^a	0.277	**

*Significant different at (p<0.05). Means in the same row with different subscripts a, b, c and d are different significantly at (p<0.01 and p<0.05).DM= dry matter, OM=organic matter, CP=crude protein, EE=ether extract, CF=crude fiber, NFE= nitrogen free extract. T1 ration (CFM+SBS); T2 ration (CFM+SBS+U+M); T3 ration(CFM+SBS+U+M+Y); T4 ration(CFM+U+M+Y+F).

Results of the growth performance experiment are shown in Table (4). The averages of initial body weight of lambs were 22.06, 20.70, 22.80 and 23.60 kg /head for lambs fed T1, T2, T3 and T4, respectively. The corresponding values for final body weight were 43.72, 45.75, 48.20 and 50.70 kg /head for lambs fed T1, T2, T3 and T4, respectively. No significant difference was found among treatment in initial weight, while significant (P< 0.01) differences were found in final averages body weight. The average body weight gains of these lambs was 21.66, 25.05, 25.40 and 27.10 kg/ head for lambs fed T1, T2, T3 and T4, respectively. Lambs fed either T2, T3 or T4 gained significantly (P< 0.01) higher than those fed T1 (the control ration). No significant difference was observed among treatments T2, T3 and T4 in this respect, however lambs fed T4 achieved (8.18 and 6.69%) higher weight than both T2 and T3, respectively. The averages daily weight gain was 180, 208, 211 and 225 g/ head for lambs fed T1, T2, T 3 and T4, respectively. Lambs fed the control ration (T1) gained significantly (P<0.01) less weight than other treatments. The average daily intake of CFM was 0.858, 0.920, 0.940 and 0.925 kg feed /h for lambs fed T1, T2, T3 and T4, respectively while, the average daily intake of SBS untreated or treated were 0.353, 0.416, 0.420 and 0.450 kg feed /day for lambs fed T1, T2, T3 and T4, respectively.

Table 4. Weight gain, feed intake, feed conversion ratio, feeds cost and feed return of growing male Ossimi lambs fed the tested rations

Items	T1	T2	T3	T4	± SE	Sig
No. of animals	5	5	5	5	-	-
Feeding period, day	120	120	120	120	-	-
Average initial Weight (kg/h)	22.06	20.70	22.80	23.60	2.47	N S
Average final Weight (kg/h)	43.72^{d}	45.75^{c}	48.20^{b}	50.70^{a}	3.06	**
Average body weight gain (kg/ h)	21.66^{b}	25.05^{a}	25.40^{a}	27.10^{a}	0.84	*
Average daily weight gain (gm./ h)	180^{c}	208^{b}	211^{b}	225^{a}	4.00	**
Average daily intake of CFM, (kg/h)	0.858	0.920	0.940	0.925	-	-
Average daily intake of SBS, (kg/h)	0.353	0.416	0.420	0.450	-	-
Average total dry matter intake (kg/d/h)	1.211	1.336	1.360	1.375	-	-
Average feed conversion ratio (kg feed/ kg gain).	6.72	6.42	6.43	6.11	-	-
Cost of average daily intake of CFM, (kg/h)	4.719	5.06	5.17	5.088		
Cost of average daily intake of SBS, (kg/h)	0.424	0.711	1.121	2.102		
Cost of total daily feed intake (EL /h)	5.143	5.771	6.291	7.190		
Price of average daily weight gain (EL/h)	14.4	16.64	16.88	18.00		
Daily return (EL/h)	9.257	10.869	10.539	10.810		

Means in the same row with different superscripts a, b, c and d are Significant different at (p<0.05), Sig = significantly different at p<0.01 and p<0.05, CFM (kg/h) concentrate feed mixture kg/head /day, SBS (kg/h) soy bean straw kg/head /day, (EL/h) Egyptian livre/head, the price of one kg live body weight was 80 Egyptian livre at the time of experiment

The statistical analysis of feed intake was not applicable as lambs were fed as group, whereas it could be stated that the different treatments increased intake of both the CFM and the SBS. The highest value was 1.375 kg feed /h /d for lambs fed T4, while the lowest value was 1.211 kg feed/h/d for lambs fed T1. The increased achieved value was 13.54 % for T4 above T1. The feed conversion ratio (kg feed/ kg gain) was 6.72, 6.42, 6.43 and 6.11 for lambs fed T1, T2, T3 and T4, respectively. The lowest figure is the best as little amount of feed is recorded to gain the same unit of body weight. The improvement attained in this respect is 9.91% for T4 above T1 (the control ration). The cost of total feed intake was increased from 5.143 to 7.190 (EL) due to the price of substrates used in the different treatments, supplementation and the increase in feed intake (Table 4). The increment is 39.80%. Even though the daily return was increased 16.77%, from 9.257 to 10.810 (EL). The return of feeding T4 is slightly less than feeding T2, which can be explained as the intake of SBS in T4 was greater than T2. However, the feed conversion ratio was better when T4 was fed than T2, it was 4.98% improvement.

Results of urea, ammonia-n, triiodothyronine (T_3) and thyroxin (T_4) in blood of male Ossimi lambs fed the tested rations are recorded in Table (5).

Table 5. Blood urea, ammonia, Triiodothyronine (T_3) and thyroxin (T_4) concentrations

Items	T1	T2	T3	T4	± SE	Sig
Urea (mg/dl)	20.75^{d}	35.35^{a}	33.22^{b}	31.58^{c}	0.089	**
Ammonia (mg/dl)	0.557^{d}	0.725^{a}	0.717^{b}	0.69^{c}	0.0005	**
T_3(ng / ml)	1.78^{d}	1.88^{c}	1.96^{b}	2.03^{a}	0.009	**
T_4(µg/dl)	10.16^{a}	9.88^{b}	9.71^{c}	8.91^{d}	0.013	**

** Significant at (P<0. 01). Means in the same raw having different superscripts are significantly different (P<0. 01).

It is obvious that lambs fed the control ration (T1) showed significantly (P <0. 01) lowest concentrations of urea, ammonia and Triiodothyronine (T_3) hormone than other treatments, While, it shown significantly, (P <0.01) the highest concentration of T_4 than other treatments in this aspect. The concentrations were in the order; urea (20.75 mg/dl), ammonia (0.557 mg/dl), Triiodothyronine (T_3) 1.78 ng/ml and thyroxin 10.16 mg/dl for lambs fed T1. The significantly (P<0. 01) highest concentrations for urea and ammonia in blood were shown for lambs fed T2, the values were 35.35 (mg/dl) for urea and 0.725 (mg/dl) for ammonia. Lambs fed T4 showed the significantly (P<0. 01) highest concentration of Triiodothyronine (T3) 2.03 ng/ml and the significantly (P<0. 01) lowest concentration of thyroxin (t4) 8.91 µg/dl than other treatments. Lambs fed T3 showed moderate concentration for all the determined metabolites, however they showed significantly (P<0 .01) higher concentration of Triiodothyronine than lambs fed T2 (1.96 VS 1.88 ng/ml) respectively. Whereas the opposite was the fact considering thyroxin T4 concentrations. The values were 9.88 with T2 VS. 9.71 µg/dl with T3, the difference was significant (P <0. 01).

DISCUSSION

Alterations brought-about in nutrients content of SBS could be elucidated in view of urea, molasses and yeast treatments. Urea is a nitrogen source (46.6 N %). It is readily dissolved in water and hydrolyzed to ammonia (ammonium hydroxide). It has the advantage of being N source to raise the nitrogen content of the treated roughage accompanied by the alkaline effect of ammonium hydroxide. This alkaline agent has a break down effect on lignin, cellulose and hemicellulose linkages, hence easily attached and attacked by ruminal microbes (Sheikh *et al*., 2017). They have stated that the CP content of rice straw was raised from 3.5 to 6.4%, while the NDF and ADF contents were decreased from 84.90 and 61.30 to 73.9 and 53.90%, respectively due to urea 2% and 5% molasses treatment. Moreover, as water was added through treatment process the treated material tissues got swollen with a greater surface area that enable rumen microbes to attaché, attack and the fermentation processes were enhanced. Zhang *et al*. (2019) reported that rice straw treated with urea 34 g/kg DM, nitrate 4.7 g/kg DM and corn oil 30 g / kg DM improved fiber digestibility and lowered enteric methane emission. They mentioned that ammonia removed the polymerized silica –waxy compounds from the leaf fraction and destroy the covalent association between ligno-celluloses and expose the inner tissues to bacterial colonization. Molasses is a source of soluble sugars (NFE 77.49 - 80.77%, NRC. 2001). It exerts its effect on treated roughages as NFE content were clearly get up. It provides energy and carbon chain required for microbial protein synthesis. Abera *et al.* (2018) reported that among techniques available to improve the nutritive value of low-quality crop residues is ammonia treatment and supplementation with industrial by- product (molasses). Mashayekhi *et al*. (2007) reported that addition of molasses from 5-10% did not affect gas yield, but when it was increased to 15% a significant reduction (P< 0.05) of gas production was observed, in other words reduce CH_4 emission and saved dietary energy.

Yeast is an aerobic microorganism that help reducing oxygen in the ensiled materials and the environment being more un-aerobic that suites microbial fermentation. Moreover, yeast is a source of protein (749±4.24 g/kg DM) of high biological value (71.99 %) that is well balanced and contains large amount of lysine and Lucien (6.46 ±0.13and 6.35 g / 16 g N respectively) and vitamins. Maamouri *et al*. (2014) in their study on yeast supplementation and its effect on growth performance of lambs reported that yeast supplementation 1.5 g / lamb / day increased Oat hay voluntary intake from 347.6 to 439.9 g DM / lamb / day and the daily gain changed from 145 to 223 g / day. Michalik *et al*. (2014) stated that yeast promote the fibrolytic activity, accelerate intestinal transit and subsequently increase the amount of feed intake. Tripathi and karim (2011) studied the effect of yeast culture supplementation ($1.5\text{-}2.0 \times 10^9$ cell per ml) which was fed at 1 ml / kg live weight of growing lambs. They concluded that yeast supplementation improved feed intake 8% and daily gain by 26.6%. It facilitated microbial growth and improved activity of short chain polysaccharides degrading microorganisms. Comert *et al*. (2015) in their in-situ degradability study on wheat straw treated with anhydrous ammonia 3% and supplementation of 4 g yeast/day on yearling lambs found increased effective degradability, average daily gain and voluntary metabolisable energy and protein intake. The high ash content of SBS (Table 1) is hardly to be explainable unless they were stored on the farm ground.

The concentrate feed mixture (CFM) used consisted of Wheat bran 50%, Yellow corn 27%, Soya bean meal 20%, Lime stone 2%, Sodium chloride 0.5%, Mineral and vitamins 0.5 %. These ingredients are rich in cell soluble constituents; therefore, the nutritional analysis came up to display that CFM contain 18.89 % CP, 6.35 % EE, 54.62 % NFE and 9.77 % CF, on the contrary, SBS as a waste by- product of soya bean plant is poor in cell solubles (energy and protein nutrients) but high in cell wall make up (33.45 % CF Table 2). Even though SBS as a roughage stuff is essential to slow down the passage rate of digesta along the alimentary tract giving chance for digestion, absorption sweeping off the micro feed particles, activate secretion of gastric juices, making the digest more fragile, lush and full of froth being easily penetrated with microbial and digestive system enzymes. Moreover, it is bulky material that helps satiety feeling and it is cheap.

Treating SBS with urea, molasses, yeast and supplemented with fat raised up its content of CP, EE and NFE, while reduce its content of CF. These results are in agreement with Maamouri *et al*. (2014), Comert *et al*. (2015), Sheikh *et al*. (2017), and Abera *et al*. (2018) findings.

The improvements observed in digestibility coefficients were the net result of SBS treatments and fat supplementation leading to changes in nutrients content of SBS (Table 3). It should be mentioned that the consumed *ad-lib* fed SBS, was calculated from Table 4 (Average daily intake of SBS, (kg/d/h) / Average total dry matter intake kg/d/h), represents 29.15, 31.14, 30.88 and 32.73 % of the whole diet consumed. It is of interest to find this result compatible with Kellems and Church 2010, recommended that Forages is advisable to represent one third of the feed bulk. While, the concentrate feed mixture represents the rest portion (70.85 to 67.27%) even though the different treatments of SBS exert clearly its effect on digestibility coefficient of the whole ration in all nutrients. Accordingly, the feeding value expressed as TDN of the whole ration was improved by 7.66 % with feeding T4 was compared with T1 (61.17 vs. 65.86 %). It is very satisfactory to find that the biggest jump was in CF digestibility coefficient, it is 19.97 % improvement as T4 was compared with T1 (58.51 vs. 48.77%). This improvement could be referred to the alkali effect of urea (ammonium hydroxide) that help dissociation of linkages of cell wall constituents (Kraidees , 2005 and Sheikh *et al* ., 2017), also urea is a source of degradable N that is essential growth factor for ruminal cellulolytic bacteria (Wanapat *et al* .,2013) moreover, changes in the physical property of SBS through ensiling as it is hydrated then air derided , which make it more fragile and easily to be attached and attacked by rumen microflora (Macdonald *et al* . , 2010).

In addition, yeast (*saccharomyces Cerevisiae*) increased O_2 disappearance rate between (46 and 89 %) from the ruminal ecology (Newbold et *al*., 1996). Moreover, yeast supplementation increased total viable counts of ruminal bacteria in general and cellulolytic bacteria in particular (Marden *et al*., 2008; Chaucheyras Durand, 2010 and Comert *et al*., 2015). According to the improvement attained in digestibility coefficients, the indigestible portion of digesta became less therefore the animals eat more to feel satiety (Owens 1987).

It is clear that intake of SBS in T4 was 27.48% greater than T1, as calculated from Table 4 (0.450 / 0.353). This finding could be explained as this treatment is supplemented with 8% (w/w) soya bean oil. This may accelerate the passage rate along the alimentary tract and reduce the residence time of feed bulk in the rumen reticular vat giving room for more feed and in the meantime reduce the methane emission, beside that it is the lowest treatment in CF content (Table 3), the main source of methane production (Macdonald *et al*., 2010), Accordingly, more metabolisable energy is available for the productive processes.

The feeding value for T4 was significantly (P<0.01) the highest among other treatments (Table 4). Therefore, it is logically to find that lambs fed T4 achieved the highest average body weight gain, accordingly as rules of thumb the highest daily weight gain was achieved. As a result of these consequences the feed conversion ratio was the best (6.11 kg feed / kg weight gain) among other treatments. It saves 9.07% of the feed /kg gain. Zinn and Plascencia (2007) reported that fat can improve palatability, feed efficiency, reproductive efficiency and can help alleviate heat stress. They mentioned that limited evidence suggests that fat with high proportions of free fatty acids may inhibit ruminal bio hydrogenation, thereby increasing intestinal fat digestion. In the study reported herein, soya bean oil was used, generally oils of vegetable origin are considered polyunsaturated source. Unsaturated, long – chain free fatty acids undergo extensive bio hydrogenation that reduce their toxicity towards ruminal microorganisms (Zinn and Plascencia, 2007). Ultimately, the feeding coast became less especially when more animals would be fed the same amount of feed. Therefore, more animal products could be available for human consumption with reasonable price.

The significant (P<0.01) increment in urea and ammonia concentrations in blood serum of lambs fed the treated SBS than those fed the control treatment (Table 5) could be easily explained as a result of urea treatment leading to increased CP concentration of SBS (Table 3). Moreover, the amounts consumed from the treated SBS and CFM were increased in all treatments compared with the control treatment, SBS, (Table 5). In addition, the CP digestibility of lambs fed treated SBS were significantly (P<0.01) greater than those fed the control treatment (Table 4). These results are in agreement with Gunun *et al*. (2013), and Aziz (2019). Fahmy (1975) stated that the normal range of urea in sheep blood was in the range of 33.38 -78.52 mg / dl, while the normal range of ammonia -N in sheep blood was in the range of 0.180- 0.899 mg / dl. The obtained results are in the reference range. It is logically that blood ammonia and urea concentrations are affected by several factors, nitrogen metabolism status is one of the most affecting factors in this respect.

Looking to the significant increase in thyroidal hormone (T3) concentration in blood of lambs fed the treated SBS than the control treatment (Table 5). This means greater or at least more metabolic activity in general for these lambs, the matter that coincide with better digestibility coefficients, greater weight gain leading to better feed conversion ratio. It is well knowing that thyroidal hormone overrides and control general metabolism of the body (Skripkin *et al.*, 2019).

It is well documented that thyroxin hormone (T_4) is the storage form of thyroid gland secretions, while Triiodothyronine (T3) is the active form (Mohamed and Abou –Zeina, 2008). The normal levels of thyroxin hormone (T_4) and Triiodothyronine (T3) in sheep blood were in the range from 1.018 to 1.157 (ng/ml) for T_3 and from12.92 to14.27 (mg/dl) for T4 (khaliel,2009). The concentrations obtained in the study are slightly higher for T_3 and slightly lower for t4 than (khaliel, 2009) findings. Thyroidal hormones concentration in blood is an index of different items such as type of feeds and its iodine content, amount of feed consumed, type and breed of animal and their age beside the physiological aspects.

Zinn and Plascencia (2007) concluded that to optimize the feeding value of supplemented feed total lipid intake in finishing diet should not exceed 1 gm. /kg body weight or 7% of the dietary dry matter. In the present experiment, the EE content in T4 was not too far (7.58%) from the previous recommendation.

Improvements brought about by digestibility experiment ascertained the positive effects of urea, molasses, yeast treatments and fat supplementation on nutritional analysis, digestibility coefficients that led to significantly (P<0.01) greater feeding value (TDN). It is broadly known that the relatively low nutritive value of roughages in terms of low CP content (2-5%), high cell walls contents (NDF > 50%) and low digestibility let feeding roughage does not provide enough nutrients for optimum production requirements. In addition, poor fermentation and low disappearance rate and passage through the rumen, feed intake was reduced (Wanapat *et al.*, 2013). On the contrary as a result of urea treatment and its alkali effect on the out-flow rate of digesta into the abomasum was increased (Males, 1987). Fat (soya bean oil 8%) supplementation is a high-density energy source (35 MJ metabolisable energy CSIRO, 2007) and it`s accelerating effect on rate of digesta passage along the alimentary tract may lead to reduced ruminal residence time and limit methane production (Zhang *et al.*, 2019). In conclusion these positive effects may explain the significant increase in body weight gain and could provide reasonable reliable evidence of improvement in the nutritional value of urea, molasses and yeast treatments and fat supplemented straw.

The application of these treatments on other types of straws and on a wider scale is our global interest.

REFERENCES

Abera, F.M. Urge and G. Animut, 2018. Feeding Value of Maize Stover Treated with Urea or Urea Molasses for Hararghe Highland Sheep. The Open Agriculture Journal., V.12 - 85.

Aied, S.M., 2021. Effect of Improving the Feeding Value of Some Roughages on Productive Efficiency of Sheep. Master of Agri. Sci., Animal Production Dept., Faculty of Agriculture. Minia University.

A.O.A.C., 2006. Official Methods of Analysis of AOAC International, (18th ed). AOAC International, Arlington, VA, USA.

Aziz, A. Hend, 2019. improvement of nutritional value for date palm leaves using urea treatment and its effect on small ruminants feeding. Egyptian j. Nutrition and feeds, 22(3): 439-451.

Chaucheyras, Durand. F., and H. Durand, 2010. Probiotics in animal nutrition and health, Lallemand Animal Nutrition, Blagnac, France. Beneficial Microbes. 1,1 3-9.

Comert, M., Y. Şayan, H. Özelçam and G. Yeğenoğlu. Baykal, 2015. Effects of Saccharomyces Cerevisiae Supplementation and Anhydrous Ammonia Treatment of Wheat Straw on In-situ Degradability and, Rumen Fermentation and Growth Performance of Yearling Lambs. Asian Australas. J. Anim. Sci. Vol. 28, No. 5: 639-646.

C.S.I.R.O., 2007. Nutrient Requirements of Domesticated Ruminants. Collingwood, vic., Australia, CSIRO Publishing. Commonwealth Scientific and Industrial Research organization (CSIRO).

Duncan, D.B., 1955. Multiple ranges and multiple F-test. Biometric. 11: 1042.

Fahmy, S.T.M., 1975. some metabolic studies on goats.Ph.D. Thesis, Alexandria university, Faculty of Agriculture.

Gunun. P., M. Wanapat and N. Anantasook, 2013. Effects of Physical Form and Urea Treatment of Rice Straw on Rumen Fermentation, Microbial Protein Synthesis and Nutrient Digestibility in Dairy Steers. Asian Australas. J. Anim. Sci. Vol. 26, No. 12: 1689-1697.

Kellems, R.O., and D.C. Church, 2010. Livestock Feeds and Feeding Sixth Edition, Prentice Hall, Pearson New York, U.S. Boock, pp:1-711.ISBN 0131594753, 9780131594753.

Khaliel, A.A.B., 2009. Nutritional studies on diets contain different levels of sugar beet pulp and / or cassava. Master of Agri. Sci., Animal prod.Dept.., Fac. of Agriculture. Minia University.

Kraidees, M.S., 2005. Influence of urea treatment and soya bean meal (Urease) Addition on the Utilization of Wheat Straw by Sheep. Asian-Australasian Journal of Animal Sciences, 18(7): 957-965.

Maamouri, O., B. Jemmali, I. Badri, H. Selmi and H. Roussi, 2014. Effects of yeast (Saccharomyces Cerevisiae) feed supplement on growth performances in "Queue Fine de l'Ouest" lamb . Journal of New Sciences., 8. (1):1-6.

McDonald, R. E., J.F.D. Greenhalgh, C.A. Morgan, L.A. Sinclair and R.G. Wilkinson, 2010. Animal Nutrition. (7th ed.) Pearson Education Limited. Uk.

Males, J.R., 1987. Optimizing the utilization of cereal crop residues for beef cattle. J. Anim. Sci., 65:1124-1130.

Marden, J.P., C. Julien, V. Monteils, E. Auclair, R.

Moncoulon and C. Bayourthe, 2008. How does live yeast differ from sodium bicarbonate to stabilize ruminal pH in high-yielding dairy cows? Journal of Dairy Science, 91:3528-3535.

Michalik, B., W. Biel1, R. Lubowicki and E. Jacyno, 2014. Chemical composition and biological value of proteins of the yeast Yarrow lipolytica growing on industrial glycerol Can. J. Anim. Sci. 94: 99-104 doi:10.4141/CJAS2013-052.

Mohamed, M.I., and H.A.A. Abou –Zeina, 2008. Effect of dietary supplementation with biologically treated SBP on performance and organs function in goat kids. American –Eurasian. j. Agr. Environ since, (4): 410-416.

Newbold, C,J., R.J. Wallace and F.M. McIntosh, 1996. Mode of action of the yeast Saccharomyces Cerevisiae as a feed additive for ruminants. Br. J. Nutr. 76:249-261.

N.R.C., 2001. National Research Council. Nutrient requirement in dairy cattle .7th Ed., Nat. A cad. Press, Washington, D. C. USA.

Owens, F., 1987. Symposium proceedings: feed intake by beef cattle, November 20-22, 1986.

S.A.S., 2006. Statistical analysis system, Users Guide. Statistical Analysis Institute, Inc., Raleigh, North Carolina, USA.

Schuurs, A.H.W.M., and B.K. Van weeman, 1977. Review. Enzyme-immunoassay. Clin. Chem. Acta, 81:1-40.

Sheikh, Ganai. A.M., F.A. Sheikh, S.A. Bhat and Mudasir, 2017. Effect of feeding urea molasses treated rice straw along with fibrolytic enzymes on the performance of corriedale sheep. Journal of Entomology and Zoology Studies.5(6):2626-2630.

Skripkin, V., A. kvochko, T. Derezina, A. Kuzminova, I. Cymbal, N. Belugin and N. Pisarenko, 2019. Dynamics of thyroid hormones in Stavropol breed sheep in postnatal ontogenesis. IOP Conf. Series: Earth and Environmental Science, 403:1-8 doi:10.1088/1755-1315/403/1/012064.

Tietz, N.W., 1990. Ed. clinical Guide to laboratory tests. 2-nd ed. Philadelphia: WB saunders:26-29.

Tripathi, M.K., and S.A. Karim, 2011. Effect of yeast cultures supplementation on live weight change, rumen fermentation, ciliate protozoa population, microbial hydrolytic enzymes status and slaughtering performance of growing lamb. Livestock science, 135:17-25.

Van, J. k., and B.A. Young, 1977 Evaluation of acid – in-soluble-ash as internal marker in ruminant digestibility studies. J. Anim. sic., 44 (2):2582-2587.

Zhang, X., F.M. Rodolfo, W. Min, A.B. Karen, W. Rong, M. Zhiyuan, A.B. Lukuyu and T. Zhiliang, 2019. Effects of urea plus nitrate pretreated rice straw and corn oil supplementation on fiber digestibility, nitrogen balance, rumen fermentation, and microbiota and methane emissions in goats. Journal of Animal Science and Biotechnology. v.10 (6).1186.

Zinn, R.A., and A.J. Plascencia, 2007. Feed value of supplemental fats used in feedlot cattle diets. Vet Clin food Anim 23:247-268.

Walker, W.H.O., 1977. Introduction. An Approach to immunoassay. Clin. Chem., 23 (2):384.

Wanapat, M., S. Kang, N. Hankla and K. Phesatcha, 2013. Effect of rice straw treatment on feed intake, rumen fermentation and milk production in lactating dairy cows. African Journal of Agricultural Research Vol., 8(17):1677-1687.

النمو وبعض مكونات الدم لحملان الأوسيمي النامية المغذاة على علائق احتوت تبن فول صويا غير معامل أو معامل

سمير توفيق محمد فهمي، علي سليم عايد، محمد عبد الفتاح البارودي، عماد الدين إبراهيم

قسم الانتاج الحيواني، كلية الزراعة، جامعة المنيا

اجريت الدراسة على ٢٨ من ذكور الحملان الأوسيمي النامية في تجربتين. تجربة نمو استخدم فيها ٢٠ حمل بمتوسط عمر ٣-٤ شهور ومتوسط وزن ٢١,٠ ±٢,٤٧كجم. وزعت في ٤ مجموعات متساوية (٥حيوانات /مجموعة) وغذيت على ٤ علائق لمدة ١٢٠ يوما. أما التجربة الثانية فكانت تجربة هضم أجريت على ٨ حملان بمتوسط عمر ٤ -٥ شهور ومتوسط وزن ٢٨,٥±٢,٤٧كجم وزعت في ٤ مجموعات متساوية (حيوانين /مجموعة) واتبع تصميم مربع لاتيني (٤×٤) أربع معاملات ×أربع مجموعات من الحملان× أربع فترات كل منها مدتة شهر. وكان مخلوط العلف المركز واحد فى التجربتين واحتوى ١٨,٨٩٪ بروتين خام، ٦,٣٥٪ مستخلص اثيري،٩,٧٧ %ألياف خام،٥٤,٦٢ % كربوهيدرات ذائبة. قدم بكمية تمثل ٧٠٪ من إحتياجات الطاقة الممثلة بينما كان تبن فول الصويا المعامل أو الغير معامل متاح تبعا لشهية الحيوانات لتستوفي منة باقي الأحتياجات. وكانت المعاملات الاربع كالتالي: الأولى تبن فول الصويا غير معامل (المقارنة)، الثانية تبن فول الصويا معامل ٥٪ يوريا +١٠٪ مولاس، الثالثة (الثانية+٨٪ خميرة الخباز)، الرابعة (الثالثة + ٨٪ زيت فول صويا يضاف قبل تقديم الغذاء مباشرة) وكان تبن فول الصويا الغير معامل يحوي ٤,٦٪ بروتين خام ،٢,٠٢٪ مستخلص اثيري ،٣٣ % الياف خام، ٤٣,٩٦٪ كربوهيدرات ذائبة وكان تبن فول الصويا المعامل (المعاملة الرابعة) يحوي ٨,١٨٪ بروتين خام ،٧,٥٨٪ مستخلص اثيري،٢٧,٩٨٪ الياف خام، ٤٥,٠٨٪ كربوهيدرات ذائبة. وأوضحت النتائج أن معاملات الهضم لمختلف العناصر الغذائية تحسنت معنويا باحتمال ٠,٠١ % وكانت أكبر القيم للمعاملة الرابعة. وكانت قيمة مجموع المركبات الغذائية المهضومة ٦٥,٨٦٪ للمعاملة الرابعة، ٦١,١٧٪ للمعاملة المقارنة. وكان متوسط المادة الجافة المأكولة من العلف المركز وتبن فول الصويا ١,٢١ ،١,٣٤ ،١,٣٦ ،١,٣٨كجم/حيوان/يوم للمعاملات الأربع على الترتيب بينما كان متوسط المأكول من تبن فول الصويا ٠,٣٥٣ ،٠,٤١٦ ،٠,٤٢٠ ،٠,٤٥٠ كجم/حيوان/يوم للمعاملات الأربع على الترتيب. وكان متوسط الزيادة اليومية في الوزن ١٨٠ ،٢٠٨ ،٢١١، ٢٢٥ جم/حيوان للمعاملات الأربع على الترتيب وكانت الاختلافات بين المعاملات معنوية باحتمال ٠,٠١ %. وكان تركيز اليوريا والأمونيا بالدم أعلى معنويا باحتمال ٠,٠١٪ في المعاملات الثانية والثالثة والرابعة عن المعاملة الأولي (المقارنة). الحملان التي غذيت المعاملة الرابعة كان تركيز هرمون الغدة الدرقية ثلاثي ايودوثيرونين (T_3) أعلي معنويا باحتمال ٠,٠١٪ عن باقي المعاملات.

ومن هذة النتائج يستخلص أن هذة التأثيرات الأيجابية تفسر الزيادة فى وزن الجسم كنتيجة للتحسن في القيمة الغذائية للمعاملات المختلفة لتبن فول الصويا. وكانت تكلفة المادة المأكولة يوميا /حيوان ٥,١٤٣، ٥,٧٧١، ٦,٢٩١، ٧,١٩٠ جنية للمعاملات الأربع على الترتيب وكانت قيمة الزيادة اليومية فى الوزن/حيوان ١٤,٤، ١٦,٦٤، ١٦,٨٨، ١٨,٠٠ جنية للمعاملات الأربع على الترتيب وكان العائد اليومي/حيوان ٩,٢٥٧، ١٠,٨٦٩، ١٠,٥٣٩، ١٠,٨١٠ جنية للمعاملات الأربع على الترتيب.