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PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF SHEEP FED UREA TREATED CORN WITH COBS

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ABSTRACT

Two trials with 27 pregnant Ossimi ewes and 15 from their successive born lambs were carried out to evaluate the effect of feeding urea treated corn with cobs (UCC) as 50% (T_2) or total replacement (T_3) of pelleted concentrate feed mixture (CFM) compared to the conventional diets (CFM) on its production and reproduction performance. Rice straw was offered separately from the concentrate. Evaluation criteria included DM intake and utilization, ruminal fermentation characteristics, milk yield, birth, weaning and marketing weight and feed efficiency.

This study was conducted during the summer season (May through September 2003). In the first trial, 27 Ossimi, ewes beginning 45 days before expected day of lambing were assigned to the control, T_2 and T_3 diets. The milk was measured on day 14 post partum and once every week up to the 12^{th} week. The growth experimental periods were 137 day in duration using 15 weaned lambs. The selected lambs were allocated to the same three diets. In digestibility trial, 9 adult rams were allocated to the same three tested diets. In vivo digestibility, nutrients digestibility were different among diets. Feeding values (TDN) was greater for T_3 followed by control diet whereas the highest DCP was recorded for T_2. Feeding UCC had no effect on ruminal parameters in terms of pH, NH_3 and total FVA`s across the sampling time except for NH_3-N.

The replacement of CFM by UCC resulted in insignificant higher ($p \leq 0.05$) lambs birth weight T_3 (3.44 kg) but lower milk yield T_3 (436 g /day). The lower birth weight of lambs of the control group ($p \leq 0.05$) tended to grow faster and perform higher weaning as compared to the treated group.

In the growth trail, feeding UCC diets reduced ADG by approximately 10% compared to control. The results indicated that DM, TDN and DCP needed to produce 1 kg gain were almost 5 to 10% better than the corresponding items from T_2 and T_3.

Replacement of CFM in pregnant and growing lamb's rations with UCC would be cost effective as cost of UCC is 60% less than the cost of CFM.

Keywords: Sheep**,** feed**,** urea treated corn-cobs**,** digestibility, nutritive value, growth, milk yield, performance.

INTRODUCTION

Sheep population in Egypt is almost 5 million, (MOA, 2005). During the last two decades the importance of sheep production as a source of animal protein in Egypt has been increased. Meanwhile, the mutton price has also increased. In fact, the small ruminants are mainly associated with small farmers. Therefore there is need to search and develop stall-feeding systems for small ruminants based on crop by-products.

In Egypt, maize for grain is planted on approximately 1.68 million feddans producing 5.8 million metric tons (average 3.47 ton per feddan). Importation is 4.7 million tons. Almost 70% home production whole-crop maize is utilized by ruminants (MOA, 2005). Cobs (as residues) were estimated to be about 1.7 million tones (representing 25% of ear corn).

A major constraint facing livestock development is the lack of adequate supplies of feedstuffs at economic prices. Feeds represent the greatest proportional cost in livestock production and its availability is affected by seasonal variation in feed quantity and quality which causes fluctuations in animal nutrition and productivity throughout the year during the summer season in particular. Moreover, soybean meal and cottonseed meal are two important sources of protein used extensively in Egypt to feed ruminants and represent the most expensive ingredients in ruminant rations. There are large quantities of maize cobs which could be fed to ruminants instead of being wasted. Collection of maize cobs is easier than that of maize stalks which are left in the field where the maize is harvested while the cobs are gathered before de-husking and shelling.

In order to improve the low quality byproducts, the most pragmatic and acceptable is chemical treatment. This treatment disrupts the cell wall by solubilizing hemicellulose, lignin and silica, hydrolyzing uronic acid and acetic acid esters and swelling cellulose (Jackson 1977). The use of urea or ammonia to upgrade straws and other low quality by products has been world wide spread in the last three decades. Urea, the most commonly used an inexpensive NPN source is an attractive protein replacement compared with nowadays tremendously expensive natural proteins. Oji` *et al* (2007) stated that fertilizer grade urea can be used to improve the nutritional value of maize residues for small ruminants feeding during off season periods.

On the other hand, the relationship of birth weight to weaning and weans weight to slaughter weight is economically very important in lamb production and is affected by genetic, physiological and feeding of ewes and fetal growth affect by feeding her mother during pregnancy stage (Wu. 2006).

The experiments reported here were carried out to study the possibility of replacing concentrate feed mixture (CFM) in diets of pregnant ewes and growing lambs with urea treated corn with cobs.

MATERIALS AND METHODS

The present work was conducted at Seds Experimental Station and By-Products Utilization Department , Animal Production Research Institute (APRI) to study the effect of including urea treatedd corn with cobs in small ruminant diets on performance of Ossimi ewes (lactation and new born lambs performance) and considering a simple economical evaluation of urea treated corn with cobs supplemented rations . Nutrients in the CFM, UCC and RS were chemically measured before formulating the experimental rations.

Urea treatment of corn with cobs:

The coarse ground corn with cobs was sprayed with 30% urea solution to achieve 4% urea w/w. The stacks of the treated material measured 2 × 1.5 × 5 m, and weighed 2 tons. The treated corn with cobs was kept under polythene sheet for 21 days following urea treatment.

Diets:

Three experimental diets were formulated. The control (T1) contained CFM + rice straw according to NRC (1996), while in T2 and T3 urea treated corn with cobs (UCC) replaced 50 or 100 % of CFM, respectively.

Ewes feeding trails:

Twenty seven pregnant Ossimi ewes were selected 2-3 years old averaged 50.0 kg live body weight (LBW) in the last six weeks of gestation. The selected animals divided based on their live weight into three similar groups 9 ewes each and randomly allocated to diets of either control, T_2 & T_3.

Animals were group-housed and the diets were offered in two portions at 8 am and 16 pm and had free access to water. Animals were weighed at the beginning and at the end of the trial. The animals were healthy during the experimental period.

Survival rate:

Live lambs per born lambs and live lambs per ewe were determined after parturition and 30, 60 and 84 days after lambing.

Milk recording:

The 24-h milk production of each ewe was measured on d 14 (2weeks post partum) and once every week by hand milking throughout a 70-d of lactation period at 7-d intervals. On the day of parturition, ewes and lambs were weighed. Lambs were weaned at 84 d of age and both the ewe and lambs were weighed at this time. Milk production was measured using procedures described by Rusev and Lazarov,(1967) and Farage,(1979). According to this methods the ewes have been milked twice daily by milking one teat while the lamb suckle the other one. The morning and evening milked yield was multiplied by 2 to calculate the daily output. The weight of the collected milk was recorded and used to determine 24-h milk production. Total milk production for each ewe was calculated as the sum of milk produced on each day of milking.

Digestibility trials:

The metabolism trial included 9 rams, each ram was placed in a separate metabolism cage designed to collect with a 2 wk adjustment period and a 7 days collection period. Three rams were randomly assigned to each of the same ration as in feeding trial. Feeds offered and output of feces were daily recorded during the last 7 days of the collection period. Fecal trays were placed for total fecal collection during the 7 days collection period. Feed was offered twice daily and water was refreshed at 0700 and 01500. Fecal output was weighed, sub sampled (10% of wet weight), and composted across 7 days within lamb for each period. Samples were stored frozen (– 20°C) until dried in a forced-air oven for 48 h. The collections were made concurrently with the meals. Samples of feed were taken daily at 10% of the total offered and the residues were collected. A sub-sample (20%) of feces was composed, kept each day in plastic bags in the freezer (-20 °C) until the end of the experiment. Feed ingredients and dried feces were ground to pass a 1-mm screen in a hammer mill before analysis. The following chemical analyses were determined: dry matter (DM), Crude protein (CP), Crude fiber

(CF), Ether Extract (EE) and ash according **to** AOAC (1990). The feed offered to each ram during the preliminary and collection period was set to 90% of average feed intake during the second week of the adjustment period. There were no feed refusals during the 7-d collection period.

Weaning weight:

The born lambs from experimental ewes were weighed every two weeks up to the 84^{th} day of age.

Growth trial:

The growth of 15 weaned lambs at 84 days old was evaluated for 137 days. The lambs were divided into 3 equal groups (five in each group) with initial body weight of 19.06, 18.87 and 19.18 kg and were given access to the tested diets for control, T_2 and T_3, respectively similar to those used in ewes trial. Lambs were fed at 0700 and 01500 daily and the basal diet (CFM and UCC) and RS were offered separately at each feeding and were allowed free access to lick mineral blocks and water. Animal weights were recorded at the beginning and in 15 days interval throughout the 137 days growth period. To minimize variation due to drinking, feeding, and defecation, lambs were weighed on the morning of the first day of the experiment and every 15 days before morning replenishment of feed.

The amount of feed provided for the late-gestation and lactating ewes was based on the guidelines put forth (APRI) to be applied by the experimental stations and was determined for each group based on BW measured biweekly. The standard practice for the sheep flock at the Animal Production Research Institute to feed adult, non lactating, non pregnant ewes in confinement a maintenance ration of 2% of BW/d. During the ewes and growth trials the basal levels were adjusted so that diets were completely consumed each day; orts consisted solely of straw.

Rumen fluid:

Approximately 15 ml of ruminal fluid was collected using ruminal tube, and pH was measured immediately using a portable pH meter. Ruminal fluid samples were collected at 0, 3 and 6 h after feeding.

Fermentation parameters (pH, ammonia nitrogen and VFA's)

Fermentation parameters (pH, ammonia nitrogen and VFA's) were determined using liquor collected by rumen tube via esophagus three times before morning feeding (zero time) and after 3 and 6 hrs after feeding.

The ruminal fluid samples (15 ml) were acidified with 1.0 ml of 6 N H2SO4 and frozen (-10°C). The samples were later thawed at room temperature, centrifuged at 10,000 x g for 10 min, and a portion of the supernatant was analyzed for NH_3-N according to Broderick and Kang (1980). Total VFA's concentrations were determined as described by Abou-Akkada and El-Shazly (1964).

The data were statistically analyzed using GLM produces of SAS (1990). Duncan's test (1955) was applied in experiment whenever to test differences. The following model was used:

$Y_{ij} = \mu + Ti + e_{ij}$ Where :

Y_{ij} = observed trait, μ = overall mean,Ti = effect of treatment and e_{ij} = random error.

RESULTS AND DISCUSSION

Chemical Composition

The analyzed composition of dietary ingredients is reported in Table (1). The concentrate feed mixture (CFM) contained 87.11 OM, 14.04% CP, 18.95% CF, and 2.46.0% EE (DM basis). Treated Corn with cobs averaged 98.24%OM, 13.99% CP, 17.10% CF and 4.16% EE, and rice straw 81.5% OM, 3.92% CP, 35.24% CF and 0.46% EE on DM basis.

Table (1): Chemical composition of experimental concentrate feed mixture, rice straw and urea treated corn with cobs.

Item	Moisture %	DM composition (%)					
		OM	CP	CF	EE	NFE	Ash
Concentrate feed mixture CFM	8.45	87.11	14.04	18.95	2.46	51.66	12.89
Rice straw RS	7.85	81.50	3.92	35.24	0.46	41.88	18.50
Urea treated corn cobs UCC	14.85	98.24	13.99	7.71	4.16	72.38	1.76
Corn cobs CC	9.75	97.73	7.59	7.70	5.60	76.84	2.27

CFM : 26%, undecortecated cotton seed meal , 44% wheat bran, 19% yellow corn, 5% rice bran, 1% salt mixture, 2% lime stone and 3% molasses.

Urea treatment was effective in upgrading the nutritional value of corn with cobs. Treated corn with cobs had higher (N x 6.25) 13.99% as compared to7.59 to for untreated, representing 85% increment. Meantime, ether extract and ash content decreased from 5.60 and 2.27 to 4.16 and 1.76%, respectively (Table 1). The moisture contents of the treated corn with cobs upon opening the stack was approximately 27% which was reduced to 14.85% after exposing to air for 24 hrs.

The formulated tested diets were isonitrogenous (almost 10% CP) containing 0.00, 16.86 and 32.4 gram nitrogen (NPN) originated from urea treated corn with cobs for control, T2 and T3, respectively. These values represent 19.2 and 38.5% for the total nitrogen for T_2 and T_3, respectively.

Digestibility trial

Data presented in (Table 2) revealed that the intake from the concentrate (CFM and / or UCC) for T_2 and T_3 during the digestibility trial was 3 and 7% lower as compared to the control ration. Also, there was tendency for straw intake to decrease (20 and 27%) by feeding 50% and 100% urea treated corn with cobs, respectively. These together resulted in 10 and 15% decrease in the total dry matter intake for T_2 and T_3, respectively. There was slight difference (3 and 6% lower for T_2 and T_3, respectively as compared to control) regarding the DMI of straw among the three groups. The fecal nitrogen excretion was 6.2, 6.8 and 5.3 g/d/h representing 38, 44 and 39% from the N intake for control, T_2 and T_3, respectively. The almost similar percentage of digested N retained (as percentage of intake) for control and 100% UCC group revealed that NPN urea source has no effect N efficiency.

The apparent digestibility coefficients are presented in (Table 2). Highest DM and OM digestibility (69.67 and 71.96%) were recorded for the control ration being 9% and 6% and 7 and 3% higher than T_2 and T_3, respectively. Crude protein exhibited almost similar digestibility for control and 100%UCC diet (61.42 and 60.60%, respectively) being 8% lower than 50% UCC group. The digestibility for crude fiber ranged between 69.94% (control) and 53.05 for T_3. The CF in control diet was highly digestible (16 and 32%) than T_2 and T_3, respectively. The EE digestibility for T_3 was 9 and 5% higher than the values recorded for T_1 and T_2, respectively. The values for NFE showed similar coefficients for control and T_3 diets being 7% higher than T_2.

Table (2): Dry matter intake, nutrient digestibility and nutritive values of different experimental diets.

Item	Experimental Diets			
	T_1 CFM	T_2 50%UCC	T_3 100%UCC	±SE
Animal weight , kg	40.50	39.51	38.18	±4.90
CFM (DM intake,kg/d)	0.916	0.458	----	…..
UCC (DM intake,kg/d)	------	0.426	0.852	……
RS (DM intake,kg/d)	0. 627	0. 507	0.461	±2.42
otal DMI, kg /head /day	1.543	1.391	1.313	±1.26
Nutrient Digestibility %				
DM	69.76 ^{a}	63.72 ^{b}	65.92 ^{b}	±0.61
OM	71.96	67.23	69.88	±0.68
CP	61.41 ^{b}	66.09 ^{a}	60.60 ^{b}	±0.39
CF	69.94 ^{a}	60.28 ^{b}	53.05 ^{c}	±1.42
EE	77.46 ^{b}	79..90 ^{b}	85.10 ^{a}	±1.26
NFE	75.06	69.93	76.37	±1.21
Nutritive Values				
TDN %	62.78	60.81	64.92	± 0.25
DCP %	6.12	6.46	5.80	±0.22
TDN intake g/h/day	968	846	852	±2.44
DCP intake g/h/day	94 ^{a}	90 ^{a}	76 ^{b}	±0.03

$^{a, b, c}$ Means in the some row having different superscripts are significantly different at, ($p < 0.05$).

Rumen fluid parameters:

Rumen pH values at zero time ranged between 7.42 and 7.43 (Table 3)and tended to slightly increase 3h after feeding to7.5, 7.7 and rose by 6 h to 7.9, 8.0 and 8.0 for T_1, T_2 and T_3, respectively. This result revealed that the rumen pH values were not affected by the source of nitrogen.

Table (3): Rumen fluid parameter of lambs fed the experimental diets.

Item	Experimental diets			±SE
	T_1 CFM	T_2 50 % UCC	T_3 100% UCC	
pH				
hrs 0	7.42	7.43	7.42	±0.06
3	7.54	7.68	7.70	±0.07
6	7.92	8.04	7.99	±0.05
NH_3-N(mg/dl)				
hrs 0	16.36 ^{a}	13.58 ^{b}	14.95 ^{a}	±1.10
3	22.87	23.53	23.64	±0.20
6	13.27^{a}	9.53^{b}	11.50^{a}	±0.49
VFA`s (meq/dl)				
hrs , 0	6.07	7.26	7.34	±0.75
3	10.25	8.91	9.70	±0.65
6	11.30	10.70	10.80	±0.12

$^{a, b, c}$ Means in the same row having different superscripts are significantly different at ($P < 0.05$).

Ruminal ammonia concentrations were 16.4, 13.6 and 15 (mg/100 ml) for control, T_2 and T_3 at zero time tended to increase up to 22.9, 23.5 and 23.6 at 3 hrs after feeding (Table 3). At 6 hrs after feeding the concentrations showed remarkable decrease up to 13.3, 9.5 and 11.5 for control, T_2 and T_3, respectively. The control group presented higher ammonia concentration compared to the treated group. Statistically, the differences were significant ($P < 0.05$) at 6 h.

Total VFA concentration in ruminal fluid (Table 3) was lower in the control ration at zero time being 6.07 as compared to T_2 and T_3 (7.26 and 7.34 respectively). Meanwhile, it tended to be greater up to 11.3 at 6h after feeding as compared to 10.7 and 10.80 for T_2 and T_3, respectively.

Statistically, neither pH nor total VFA concentration significantly differed among diets while ammonia concentration only displayed a weak tendency towards reduction with the 50% UCC (T^2) diet.

Ewes feeding trial and milk yield:

Data presented in (Table 4) showed that intake from control ration and T_2 were almost similar being 720 and 702 concentrate and 480 and 470g rice straw, respectively. The T_3 ration presented much lower intake 677 and 451g concentrate and rice straw, respectively.

The calculated feeding values in terms of TDN and DCP results from the digestibility trial (Table 2) showed that feeding 100% UCC plus RS increased TDN content (64.90) by 3 and 7% compared with the control (62.78) and T_2 (60.81), respectively. On the other hand, DCP for the same diet (5.80) was 5 and 10% lower than T_1 and T_2, respectively. However, feed intakes for the selected late pregnant ewes were in the range of 3 and 3.2% of body weight indicating that the diets were palatable.

Table (4): Ewes feeding and milk yield.

Item	Experimental groups			
	T_1 CFM	**T_2 50 %UCC**	**T_3 100 %UCC**	**±SE**
Ewes feeding g / h / d :				
Concentrate	720	702	677	14.69
Rice straw (RS)	480	470	451	16.36
Total dry matter intake (DMI)	1200	1172	1128	14.17
Average milk yield g/h /d	527	497	436	3.20

[a, b,c] Means in the same row having different superscripts are significantly different at ($p< 0.05$).

According to the feeding values (in terms of TDN and DCP) of the tested diets extracted from the digestibility trial (Table2), the TDN intake for control group (968 g/h/d) was approximately 15% higher than the T_2 and T_3 groups, respectively. Corresponding values for DCP intake (94.4 g/h/d) was 5 and 24% higher for control group than T_2 (89.9 g/h/d) and T_3 76.2 g/h/d).

Milk yield:

Over the 70 - d lactation (begin from the third week post partum) , estimated average (7 days interval) milk production for the nine selected ewes rearing single lambs (Table 4) was 527, 497 and 436 g/h/d, for the control, T_2 and T_3, respectively.

The differences between control group and 50% UCC group were reduced by mid and late lactation. In fact, average estimated milk production in the first month of lactation for control group was slightly (almost 5%) higher than the other two tested groups. The level of milk production was declining and continued to decline after d 49.

Survival rates

Lambs survival rates were derived from the number of lambs/ewe present at 4 stages: born alive, 30 days after birth, from 30 up to 60 and end weaning (84 day). According to the results obtained in this study (Table 5) lambs mortality rates for T_1, T_2 and T_3 were 18.2, 0.0 and 11.1 % for the first stage, respectively, being nil for the other stages for the three groups.

Table (5): Effect of feeding the experimental diets on lambs survival rate (%).

Item	Experimental groups		
	T_1 CFM	**T_2 50 %UCC**	**T_3 100 %UCC**
At first day	81-82	100.00	88-89
Form day 1 up to 30	81-82	100.00	88-89
Form day 30 up to 60	81--82	100.00	88-89
Form day 60 up to 90	81-82	100.00	88-89
Lambs survived at weaning per 100.00 ewes	100.00	111.1	88--89

Growth trial - Lambs performance

Weaning period

Although lambs born from ewes fed on the control ration were significantly lighter in weight (2.48 kg/h) than those on tested rations (3.17 and 3.44 kg /h for T_2 and T_3, respectively) , it tended to grow faster than those suckled from ewes fed on T^2 and T^3 rations and had higher daily gain and weaning body weight of 18.13kg compared to 18.08 and 17.63kg for T_2 and T_3 (Table 6). Mean daily live weight gain (from birth up to weaning, 84 days) for the control and treatment groups T_2 and T_3 were found to be 172, 164 and 156 g, respectively. However, the differences were not significant.

Table (6): Average total weight gain for male and female lambs and some reproductive performance of ewes

Item	Experimental groups					
	(T_1) CFM		(T_2) 50 %UCC		(T_3) 100 %UCC	
	♂	♀	♂	♀	♂	♀
Birth weight BW kg	2.48	2.48	3.77	2.58	3.80	3.08
Average (M and F)	2.44		3.18		3.44	
Weaning weight WW kg	18.25	18.00	20.25	15.92	18.00	17.25
Average (M and F)	18.3		18.1		17.6	
Total gain TG kg	15.78	15.52	16.48	13.33	14.20	14.18
Average (M and F)	15.65		14.91		14.19	
Average daily gain ADG gm	173.41	170.55	181.10	46.48	156.04	155.82
Average (M and F)	171.98		163.79		155.93	
No .of ewes / treat .	9		9		9	
No. of lambs born / teat.	11.00		10.00		9.00	
Average litter size / ewe	1.22		1.11		1.00	
Average of lambs birth weight, kg	2.24		3.12		3.16	
Average litter weight, kg	2.73		3.46		3.16	

weaning period = 84 days BW = birth weight WW = weaning weight TG = total gain

Respective to the effect of sex on birth weight and daily gain up to weaning, regardless from the different treatments, born male lambs showed higher average birth weight for the three groups (3.80 kg) and lower average daily gain 156.04g/h as compared to female born lambs 3.08 kg and 155.8g/h, respectively).

Growth period

All weaned lambs used in the growth trial were fed almost at 3.0% of BW throughout the trial and the quantity of feed refusals (data not shown) was very minimal and did not differ among treatments.

For the period from weaning up to the end of growth period (137 d), the lambs fed the control ration consumed more concentrates and rice straw than those fed on treated groups. The data presented in (Table 7) showed that the rice straw and the basal diet (CFM and/or UCC) was for control group almost 3 and 8% higher than T_2 (50%UCC) and T_3 (100% UCC). Organic matter intake did not differ among the groups and ranged between 772.5 and 776 g/h/d, whereas CP intake between 84.0 and 87.8 g/h/d across treatments (Table 6) The CP intake ranged between 90g/h/d (control) and 84g/h/d for T_3. Because of their numerically higher DMI of CFM as well as RS for control group, lambs consumed a greater quantity of crude fiber 231.8 compared to 194.5 and 158.0g/h/d for T_2 and T_3, respectively. These figures represent 15 and 33% higher for control than T_2 and T_3, respectively. Ether extract intake for all urea treated corn with cobs group (T_3) was 60 and 24% higher than control and T_2, respectively.

Table (7): Effect of dietary treatments on lambs performance and economic efficiency.

Item	Experimental groups			
	T_1 CFM	T_2 50 %UCC	T_3 100%UCC	±SE
Duration period / days	137	137	137	……
Number of growing lambs	5	5	5	…….
Initial body weight (kg)	19.06	18.88	19.18	±2.11
Final body weight (kg)	40.50	38.30	38.18	±3.20
Total weight gain (kg)	21.44 ^{a}	19.40^{b}	19.00 ^{b}	±0.29
Av. Daily gain (g)	156.00^{a}	142.00 ^{b}	139.00^{b}	±0.15
Dry matter intake g/h/d:				
CFM	546	264	-----	
UCC	----	264	507	
RS	364	352	337	
TDMI	910.00	880.00	844.00	±0.83
TDNI g/h/d	571	535	545	±0.32
DCPI g/h/d	56	57	49	±0.13
Feed Conversion :				
Kg DMI/kg gain	5.8	6.2	6.1	±1.11
Kg TDN/kg gain	3.65	3.77	3.95	±1.11
Kg DCP/kg gain	0.356	0.401	0.353	±0.01
Feeding cost*:				
LE/d/h	0.473	0.391	0.313	±0.01
LE/kg gain	3.02	2.76	2.26	±0.23
Relative decreased in feed cost/kg gain (%)	100	109.4	133.6	±0.21

$^{a, b,c}$ Means in the some row having different superscripts are significantly different at ($p< 0.05$).

Feeding cost based on: **per ton**

CFM	**900 LE**
CC	**500 LE**
RS	**100 LE**
Urea treatment	**50 LE**

It could be observed from the recorded DMI figures that there was a tendency for straw DM intake to decrease as UCC in the diet increased. However, the concentrates in the three tested diets represented almost 60% of the total dry matter intake.

Feeding the tested weaned lambs on the experimental rations for 137 days resulted in slight differences in ADG between the control (9 and 12%) higher than T_2 and T_3, respectively. Based on initial and final BW of the tested animals (Table 7) during the 137 days growth period, the average daily gain was 156., 142 and 139 g/d/h. for control and 50% and 100% UCC groups, respectively.

The weaned lambs light in weight in particular those fed on control and 100% UCC diet exhibited higher growth rate than the heavier lambs. The lambs over 20kg weaning weight in the three tested groups showed the lowest ADG across the growth period as compared to those less than 20 kg fed the same diets. It seems that the low weaning weight lambs have the capacity to grow at rates at least approaching, if not equivalent to, the high weaned weight during the growth period.

Feed efficiency ratio in terms of (Kg of DM intake) need to produce 1 kg gain was comparable for T_2 and T_3 consuming 5% DM higher than the control (5.82, 6.20 and 6.1 Kg DMI/ 1Kg gain, respectively). The TDN conversion rate comparable for control and T_2 groups being slightly better than T_3 representing 3.7, 3.8 and 4.0 Kg TDN per kg gain weight. The conversion rate for DCP was similar for control and T_3 being 11% lower than T_2 in terms of kg gain /kg DCP intake. The DCP amount needed for 1kg gain was 356, 401 and 353 g/ kg gain for control, T_2 and T_3, respectively. However, the different were insignificant among rations (Table 7).

Providing that the production cost are similar except the feed cost changed according to variation in the price of its components, therefore the economical efficiency were calculated from the input (feeding cost) and output (gain per unit feed). The calculated feeding cost based on the price of CFM, UCC and Rice straw (year 2003) were in average of 0.473, 0.391 and 0.313 per head daily for control, T_2 and T_3, respectively. Accordingly, the cost (of feed) for producing 1 Kg gain was in average of 3.02, 2.76 and 2.26 LE/h/d for control, T_2 and T_3, respectively. The calculated decrease in feed cost / kg gain relative to the control was 9 (50% AAC) and 33% (100% UCC).

DISCUSSION

Using urea as an agent to improve the nutritional value of low quality by products still considered as the most favorable up till now. Oji *et al*, (2007) stated that feed grade urea or the equivalent weight of fertilizer grade urea can be used to improve the nutritional value of chopped cobs (approximately 1 cm length) in terms of N, DM, NDF, ADF and OM for small ruminant feeding during off season periods. Moreover, Koster *et al*, (2002) concluded that, urea could replace between 20 and 40% of the degradable intake protein (drawn from values presented by NRC 1996).Also, Sahoo *et al,* (2002) reported that treatment with urea (storage time 21 days) improve the nutritive values as compared to urea supplementation just prior to feeding. Concerning the treatment period and moisture level, it was found that at least two weeks and 25-45% moisture level is sufficient for maximum response during summer months (Hadjipanayiotou and Economides1997 and Lines *et al*,(1996). The authors added that covered urea treated straw (UTS) is superior to non-covered, and UTS is also superior to urea-spraying prior to feeding. Lines and Weiss (1996) added that most of the changes caused by ammoniation were completed by 21 d after ammoniation. In this study, the stack opened was open after 28 days after treatment.

Increasing the nitrogen content in urea treated corn and cobs in this study was almost 185%. Wanapat *et al*., (1985) reported significantly increased up to 7-fold by urine and urea treatments. It could be due to the lower nitrogen content in the treated material.

The tendency, in this study, for rice straw and concentrate) to decrease by feeding 100% UCC and hence total DM, OM, and N intake decreased was similar to the results observed by Matejovsky and Sanson (1995) using ear corn as basic diets. The decrease of DMI and CP digestibility for T_3 could be due to increasing energy (T_3) without adequate protein availability which was associated with depressed intake and digestibility (Del Curto *et al*, 1990).

Ration formulation

Forage to concentrate ratio

The diets used in this study generally have about 60% concentrates during 137 d growth period. It should be mentioned that the forage concentrate ratio does not take into consideration the quality of the forage, particle size of the forage, the type and processing of the cereal grains, and the concentration of non forage fiber sources in the diet to affect dietary starch concentration as the case in using corn and cobs in the study.

Ludden and Cecava (1995) formulate diets contained 12.5% CP using cracked corn (70%), ground corn cobs (15%), and different sources of protein supplement (included urea). The results suggest that corn-based diets may be limiting in ruminally degradable N, especially when high ruminal escape protein sources are fed as supplemental CP.

The digestibility data concerning the fibrous portion tended to decrease as the proportions of CF content decreased as described by Woodford *et al* (1986).

The lower DM and CF digestibility observed in this study for 50% and 100% UCC is confirmed by Sanson *et al*. (1990). The authors reported a decrease in DM and hemicelluloses digestibility as dietary level of corn increased from 0.26 to 0.52% of BW in steers consuming low-quality meadow hay.

Feeding urea as protein supplement to starch-based energy diet (corn) has been shown to cause depressions in forage intake as well as negative associative effects on dry matter and fiber digestibility (Chase and Hibberd, 1987; Pordomingo *et al*, 1991 and Matejovsky and Sanson (1995).Similar DMD for T_2 and T_3 (Table 2) was found by Nelson *et al* (1984) . The authors used maize cobs containing 40% moisture reported 61.30, 61.69 and 65.94% DMD for 2, 3 and 4% ammonia treatment, respectively.

Contrary to the negative effect of urea treatment on nutrients digestibility mentioned previously, Cottyn and De Boever (1988) reported upgrading of straw by ammoniation. Treatment of straw with 3% NH_3 improved digestibility and energy value, the contents of crude protein (CP) and digestible crude proteins (DCP) by wethers. Also, Zinn *et al*, (2000) found that total tract OM digestion was slightly greater for diets containing 20% of N as NPN (partial replacement of fish meal). Moreover, the tendency for CP digestibility for urea treated corn and cobs (as source of NPN) to be greater for T2 has been reported by Bohnert *et al*, (2002a)

The lower DMD of the T_2 and T_3 could be due, as explained by Tuah [1] and Ørskov (1989), to that with the cobs, most of the material was cell wall while the cell content was about 6.04 and the hemicellulose was very high (46.4%). They stated that the cellulose and the hemicellulose of the maize cobs may therefore not be made readily available for microbial degradation, thus decreasing its DMD and DCF values.

The lower DMI for T_2 and T_3 (in particular during digestibility trial) should be taken in account when comparing the tested diets since intake has great effect on digestibility (Tyrrel and Moe 1975).

According to Hoover WH, (1986) and Galina *et al*., (2007) who stated that major possible factors responsible for the decrease in fiber digestion are the rumen pH. Moderate depression in pH, to approximately 6.0, results in a small decrease in fiber digestion and in considered as the lowest limit to adequate activity of the celullolitic bacteria.

The lack of an effect of NPN source on fecal N excretion agrees with other research using urea as CP supplements to low-quality forages (Coleman and Wyatt, 1982; Bohnert *et al*., 2002b). Joy *et al*., (1992) and Hammadi (2007) observed that increasing urea up to 8 % DM basis and different levels of moisture content (up to 40%) increased total N content as well as a significant effect on the DOM of low quality roughages and improved ADG and gain/feed (Brown *et al*., (1995)

The higher CP digestibility for T_2 (50% UCC) compared with the other two groups could be due to the associated effective the two sources of nitrogen (soybean in the CFM and urea in the treated corn and cobs. Ammerman et al. (1972), observed an increase in N balance and digested N retained (expressed as a percentage of N intake) in wethers consuming low-quality forage (2.6% CP) and supplemented with urea and soybean meal (50:50 N basis), or biuret and soybean meal (50:50 N basis) compared with withers receiving just forage.

The relative lower CP digestibility for T_3 (100% UCC) have been explained by Oltjen *et al*, (1969); Ammerman *et al*, (1972) and Bohnert *et al*, (2002b). The authors stated that NPN source did not affect N balance or digested N retained and suggest that urea or biuret can be effectively used as a source of supplemental N by ruminants consuming low-quality forage (7% CP).

Weaning and growth period

The effect of urea treatment on lamb birth weight and on ADG during weaning and growth periods observed in this study of feeds match the results of Koster *et al*, (2002). The authors concluded that feeding urea treatment diets prepartuss did not affect pregnancy rate, calf birth weight, or ADG. Concerning the rapid growth of the lower birth weight born lambs for control group in this work (Table 6), Greenwood et al., (2002) concluded that low-birth-weight lambs are less mature than their high-birth-weight counterparts in some aspects of endocrine and metabolic development at birth which may enhance their capacity to utilize amino acids for energy production and to support gluconeogenesis during the immediate postpartum period. The authors added that under appropriate environmental and nutritional conditions, vital life support systems can mature sufficiently to allow extremely low birth weight lambs to survive and achieve growth.

Meanwhile, Sidwell *et al*, (1964) reported positive correlation between birth and weaning weights which contradicts the results of this study. Also, Greenwood et al., (1998) stated that average daily gain tended to be greater in the high- than in the low birth-weight lambs given *ad libitum* access to feed. However, differences in weaning weight due to breed, sex, month of birth and litter size were reported by Bodisco *et al* (1973) and Gonzalez (1972). On other hand, Bodisco *et al* (1973) reported differences due to year and litter size but not to sex. The results presented in Table (6); sex of born lambs gave insignificant differences for both birth and weaning weight.

The higher ADG of male born lambs compared to the female is in accordance with the finding of Yilmaz (2007) who reported that at birth, 90 and 180 days of age, ram lambs were heavier than ewe lambs. Zinn *et al*., (2000) reported that overall, ADG was 17% greater for cattle consuming diets containing 20 vs 40% NPN. Overall, gain efficiency was 6% greater for diets containing 20% NPN.

Rumen parameters

pH value

Ruminal fluid pH was not affected by dietary treatment and averaged 7.6 across treatments. It has been reported (Ørskov 1992) that feeding grain (corn) and forage decreased ruminal pH below 6.0 and reduced the activity of cellulolytic bacteria which could reduce forage fiber digestibility. In this study, although the T_3 (100% UCC) diet has been formulated from corn and cobs and rice straw, the ruminal pH was comparable to the other tested diets averaged 7.7compared to 7.6and 7.7 for the control and T_2. Therefore, the lack of effect of feeding corn on ruminal pH could be due to urea treatment.

Ammonia- N

The concentration of ruminal NH_3-N seems to be adequate to maintain fermentation of diets in this experiment, as long as VFA concentrations were within the optimal range of 2.0 to 5.0 mg/dL ruminal NH_3- N as suggested by Satter and Slyter (1974) to maintain microbial growth.

The statement of Ludden and Cecava (1995) could explain the low CF digestibility by the treated groups. The author considered a 3.6 mg/dL for urea as supplemental protein sources for steers fed corn-based diets as evidence for possible shortage of ruminally degradable N, In the present work the ruminal ammonia was far below this concentration.

The lack of effect feeding urea treated corn and cobs on ruminal ammonia nitrogen as compared to the control has been documented by Lines and Weiss (1996) who stated that cows fed the urea diet had higher concentrations of ruminal NH_3 than did cows fed ammoniated hay.

TFVA´S

The higher total VFA concentration for control ration at 3 and 6 hrs after feeding could be a result of a greater supply of fermentable material that have been made available than the other tested rations.

Breeding and lambing season:

According to the breeding plan in Sids experimental station, the ewes averaged three lambings over two years. It was originally decided to synchronize breeding to take place in January, May and September so lambing would occur in June, October and February , respectively and hence births group between October and February when there is green forage (berseem) to provide sufficient nourishment for the ewes to have enough milk for their lambs to develop normally. Births group between June and July when feed availability is low, reduces the chances of lamb survival (mortality rates are as high as 25%). Weaning percentages are low (under 70%). On the other hand, it should be taken in account that the conception rate for ewes bred in January are higher than in May and September. Lambing in October could be early that the lambs may be born before the berseem could provide sufficient nourishment for the ewes to have enough milk and for their lambs to develop normally. However, considering lambing percentages and lamb survival and growth, breeding in March-April and August-September is preferable.

Breeding takes place throughout the year, most breeding is linked with the highly seasonal availability of berseem.

Survival rate

According to Dwyer and Morgan (2006), the worldwide rate of mortality in newborn lambs is in excess of 15% of lambs born and represents a challenge to sheep production and welfare. Dwyer and Morgan (2006) added that especially in prolific ewes the mortality rates are high in lambs with low birth weights and that after birth the absolute growth rates are lower in the surviving light lambs than in the heavier lambs. However, in this study low birth weight lambs exhibited faster growth than the heavier born lambs.

Milk production

Regarding the effect of ammoniation on milk production, it was found that lactating cows tended to gain more weight and produce more milk when fed dehydrated alfalfa meal than did cows fed supplemented ammonia treated corn cobs or soybean (Rock. *et al.*,1991). However, Hadjipanayiotou *et al*, (1993) found that feeding Awassi ewes on ammoniated straw (AS) diet produced significantly less milk than those on the control diet (AS, 432 *vs* 462 g milk/ewe/day).

Meanwhile, Lines and Weiss (1996) stated that the use of diverse sources of dietary N (ammoniation, urea, soybean meal, or a commercial blend of animal protein meals) did not greatly influence N utilization by dairy cows.

Conclusion

Urea treatment improved the nutritive value of corn with cobs and made it at least equivalent to CFM respective to CP content (14%) and when offered alone achieved better efficiency compared to the control and the 50% UCC. The increased milk production of the ewes given CFM, before and during lactation was limited but type of feeding had an effect on the birth weight and weaning weight of lambs born and raised by these ewes.

Further work is required to investigate other sources that could enhance the nutritive value of the residues in order to stimulate intake and production. Feeding Ossimi ewes on UCC around parturition during the summer season did not seem to enhance ewe or lamb production traits but the feed costs for lactating ewes and growing lambs can be minimized. Strategic timing of feeding ammoniated by products for Ossimi sheep ewes may provide a method for increasing the weight of lambs weaned during periods of limited green forage availability.

Whether ammoniation of the by products is economical depends on relative costs of anhydrous NH_3 , Urea and alternative feedstuffs, such as cereal grains. However, this system is only acceptable if the value of the response is higher than associated costs of processing and treatment. However, the use of urea is up till today is feasible.

There was little difference in average daily gain or feed efficiency between lambs fed the rations based on CFM and those included UCC but reduced feed cost per kg of weight gain by 15% (50% UCC) or 35% (100% UCC), suggesting that a crude protein level near 14% based on UCC would be optimal for 25 - 40kg growing Ossimi lambs.Replacement of CFM in pregnant and growing lams rations with UCC would be cost effective as cost UCC is only at 60% less than cost of CFM.

Moreover from feeding management such ruminant exposed once to ammoniated any feed stuff performed better when exposed later on to treated feed stuffs. Therefore,. managers should consider previous exposure to treated material (in particular the low quality) when considering applying this technology to reduce food costs.

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الأداء الإنتاجي والتناسلي للأغنام المغذاة على كيزان الذرة بالقوالح المعاملة باليوريا .

مصطفى ربيع حماد ، صفاء عبد العظيم ، أحمد عياد ، صبحي عفيفي محمد و ناصر سليمان.

معهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية – الجيزة – مصر.

الهدف من هذه الدراسة هو تقييم تأثير إحلال كيزان الذرة بالقوالح المعاملة باليوريا محل العلف المركز من حيث الهضم الغذائي و القيمة الغذائية للأعلاف المختبرة وعلى كفاءة الحيوان بهدف الوصول إلى أعلاف جيدة رخيصة الثمن لنمو الحيوانات المجترة.

أجريت هذه الدراسة في محطة بحوث سدس التابعة لمعهد بحوث الإنتاج الحيواني. و قد أستخدم في هذه الدراسة ٢٧ نعجة لدراسة تأثير العلائق المختبرة على تلك الأغنام من حيث عدد المواليد ووزن الميلاد ووزن الفطام وذلك خلال موسم ٢٠٠٣.

تم استخدام ٩ كباش تامة النمو حيث قسمت عشوائيا إلى ثلاثة مجاميع غذائية لإجراء تجارب الهضم والتقييم الغذائي واخذ عينات من سائل الكرش لدراسة تخمرات الكرش .

وقد أجريت تجارب النمو على الحملان بوزن يتراوح بين ١٨ إلى ١٩ كجم ودراسة معدل نمو الحملان والغذاء المأكول والكفاءة الاقتصادية للعلائق المختبرة .

تم إعداد مجاميع التغذية بحيث تكون إحداهما ضابطة تستخدم للمقارنة (قش أرز + علف مصنع) والمجموعة الثانية يتم استبدال ٥٠% من العلف المصنع بكيزان الذرة بالقوالح المعاملة باليوريا والمجموعة الثالثة يتم استبدال ١٠٠% من العلف المصنع بكيزان الذرة بالقوالح المعاملة باليوريا .

ويمكن تلخيص أهم النتائج فيما يلي:

١- أظهرت المعاملة الثالثة (١٠٠% كيزان الذرة بالقوالح) ارتفاعا معنويا في قيم مجموع المركبات الغذائية(TDN) بينما أظهرت العليقة الثانية (٥٠% كيزان الذرة بالقوالح) أعلى قيم في البروتين الخام المهضوم (DCP).

٢- لم يكن هناك فروق معنوية بالنسبة للاس الهيدروجيني وتركيز الامونيا في الدم و الأحماض الدهنية بالكرش.

٣- أظهرت العليقة الثالثة أعلى وزن ميلاد واقل معدل لإنتاج اللبن بدون فروق معنوية بينما أعطت العليقة الثانية اقل وزن ميلاد وأعلى وزن فطام.

٤- أظهرت النتائج انخفاض في معدل الزيادة اليومية بمقدار ١٠% بالنسبة للعليقة الثانية والثالثة على التوالي مقارنة بالعليقة الضابطة.

٥- أظهرت العليقة الثالثة أعلى كفاءة اقتصادية تلتها العليقة الثانية .

وقد استخلص من هذه الدراسة انه يمكن إحلال كيزان الذرة المعاملة باليوريا محل العلف المركز عند تغذية الحملان و بكفاءة اقتصادية عالية.