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EFFECT OF USING TREATED RICE STRAW BY UREA, SULPHURIC ACID AND TAFLA CLAY ON PERFORMANCE OF SHEEP AND LACTATING BUFFALOS

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ABSTRACT: This work was included two trials. In the 1st trial, five digestibility trials were carried out using 15 mature crossbred (Suffolk x Ossimi) rams (3 animals each) to evaluate the following rations: Control ration (T1): 100% of requirements as starch equivalent (SE) and digestible crude protein (DCP) from concentrate feed mixture (CFM) plus untreated rice straw *ad libitum*. The 2nd ration (T2): 60% of requirements from CFM + treated rice straw with H_2SO_4 (2.5%) and urea (5%) *ad libitum*. The 3rd ration (T3): 60% of requirements from CFM + treated rice straw with H_2SO_4 (2.5%) and urea (5%) *ad libitum* plus tafla (1 g/ kg live body weight). The 4th ration (T4): 50% of requirements from CFM + treated rice straw with H_2SO_4 (2.5%) and urea (5%) *ad libitum*. The 5th ration (T5): 50% of requirements from CFM + rice straw treated with H_2SO_4 (2.5%) and urea (5%) *ad libitum* plus tafla (1 g/ kg live body weight). In the 2nd trial, six lactating buffaloes (Swing over method design) were used to evaluate the effect of the first three tested rations on production and constituents of milk.

Treatment of rice straw by sulphuric acid-urea led to increase its crude protein (CP) content from 3.25 % to 10.01, but the crude fiber content showed opposite trend.

Results of 1st trial showed that the highest ($P<0.05$) values of dry matter intake of total ration were recorded with control ration. The CF digestibility of the control group was significantly lower ($P<0.05$). Digestibility of the other nutrients of the tested rations were significantly improved with tafla addition. The highest values of total digestible nutrients (TDN%), starch equivalent (SE%) and DCP were recorded with the animals fed (T3). The TDN, SE and DCP intake were increased ($P<0.05$) with control ration (T1) than the other rations.

Results of 2nd trial showed that the treated rice straw intake values with or without tafla clay were significantly ($P<0.05$) increased than that of the control one. The DCP value was significantly increased when buffalos fed tafla containing ration (T3) than those fed control ration. The average daily fat corrected milk (FCM) yield of the control, T2 and T3 were 12.25, 13.31 and 14.57 kg, respectively.

The feed conversion as TDN and SE per kg FCM showed no significant differences between all groups. However, feed conversion as g DCP per kg FCM was more efficient in T1 followed by (T3) and the worst was recorded in T2. The economical study showed that the values of return were 1075.49, 1258.77 and 1471.02 P.T(h/d) for T1, T2 and T3, respectively.

The results concluded that treatment of rice straw with 2.5% H_2SO_4 and 5% urea improved its nutritive values. Addition of tafla clay to the treated rice straw improved urea utilization. The treated rice straw plus tafla can be used to replace about 40-50% of the concentrate feeds of sheep and lactating buffalos without any adverse effect on the performance, moreover its economical and environmental return.

This work dedicate to late of Prof. Dr. Soliman Mohamed Abd El-Baki, Proffesor of Animal Nutrition, Fac. of Agric. Zagazig Univ. which died in 6/2/2009.

Key words: Buffalos, sheep, urea, tafla, milk production.

INTRODUCTION

In Egypt, buffalos are the main productive farm animals (3.2 million animals), which gives the national economy around 40-60% from the total red meat and milk produced annually, respectively.

The annual feed resources in Egypt covered only 75.6% of the self-sufficiency as TDN. Using all crop residues annually produced could relize the self-sufficiency from feedstuffs (Abou-Akkada, 1984). Rice straw is one of the crop residues found in Egypt and surplus amounts are produced annually, which was 3.5 million tons (Abo-Selim and Bendary, 2005).

The most amount of rice straw was lost or burnt. It is very important to recycle the wastes and by-products in livestock feeding. This recycling may need some treatments. Acids and urea treatments of roughages are likely to be used in the regions of alkaline soils such as in Egypt (Abd El-Baki *et al*., 1984; 1992 and 1995; Hassona, 1986 and Hassona *et al*., 1995). Also, natural clays such as tafla were used to improve urea utilization, feed intake, nutritive values and animals performance (Abd El-Baki etal., 1992, 1995; Kirilove and Burikhnov, 1993; Lindermann *et al.,* 1993; Hassona *et al*., 1995 and Galal, 1997 and Salem *et al*., 2001).

This work was designed to evaluate the effect of feeding two levels of concentrate feed mixture (60 and 50%) with *ad libitum* treated rice straw by sulphuric acid (H_2SO_4) and urea with or without tafla addition on feed intake and nutritive values by sheep (1st trial) and feed intake, milk yield and composition and some economical traits by lactating buffalos (2nd trial).

MATERIALS AND METHODS

This study was carried out at El-Gemmiza Experimental Research Station, Animal Production Research Institute, Agriculture Research Center and the Animal Production Department, Faculty of Agriculture, Zagazig University during the period 2000-2003. This work was including two trials:

The First Trial

Five digestibility trials were carried out using 15 mature crossbred (S x O) rams (3 animals each averaged about 3.5 years old and 70 kg weight) to evaluate the effect of feeding different levels of concentrate feed mixture (CFM) with *ad libitum* sulphuric acid urea treated rice straw with (SAURT) or without tafla clay (SAUR) on digestion and nutritive values of the following experimental Rations:

1. Control ration 1 (T1): 100% of requirements as starch equivalent (SE) and digestible crude protein (DCP) as reported by Ghoneim (1967) requirements from CFM + untreated rice straw *ad libitum.*
2. Ration 2 (T2): 60% of SE and DCP requirements from CFM + rice straw treated with H_2SO_4 (2.5%) and urea (5%) *ad libitum.*
3. Ration 3 (T3): 60% of SE and DCP requirements from CFM + rice straw treated with H_2SO_4 (2.5%) and urea (5%) *ad libitum* + tafla (1g/ kg live body weight).
4. Ration 4 (T4): 50% of SE and DCP requirements from CFM + rice straw treated with H_2SO_4 (2.5%) and urea (5%) *ad libitum.*
5. Ration 5 (T5): 50% of SE and DCP requirements from CFM + rice straw treated with H_2SO_4 (2.5%) and urea (5%) *ad libitum* + tafla (1 g/ kg live body weight).

The animals were kept in individual digestibility cages. Each digestibility trial lasted 28 days, which were 21 days as preliminary period, then followed by 7 days as collection period. The amounts of feed mixture, which offered for rams, were estimated according to Ghoneim (1967) as maintenance requirements. The nutritive values for concentrate feed mixture (CFM) which used in this trials was estimated previously by digestibility trial to determine both of TDN, SE and DCP which were 60.20, 52.97 and 11.96 respectively. Also, the digestibility coefficients were 64.73, 65.37, 72.41, 56.97, 71.34 and 64.57 for DM, OM, CP, CF, EE and NFE, respectively. The estimated amounts of CFM were offered into two equal parts at 8 a.m. and 4 p.m. the water was offered as desire for each animal. Tafla clay was mixed with the CFM as one g tafla / kg live body weight. The treated or untreated rice straw was offered *ad libitum*. The daily intake of CFM, rice straw and feces were daily estimated.

Preparation of Sulphuric Acid-Urea Treated Rice Straw

The rice straw was spread on cement flour and sprayed with 2.5% sulphuric acid solution (w/v). Sulphuric acid was dissolved in water at rate of 2.5 kg commercial sulphuric acid concentration in 100 liter of water then sprayed on 100 kg rice straw. Treated rice straw was mixed and covered by plastic sheet for reaction period (7 days). After 7 days the moisture in treated rice straw was estimated to calculate the water, which required for preparing urea solution (5% urea w/v) to adjustment the moisture percentage at 65%. The treated rice straw was sprayed by 5% urea solution and covered by plastic sheet for 7 days.

The Second Trial

The ‹Swing over‹ method design as described by Abou-Hussiein, (1958) and El-Serafi (1968) and Abd El-Baki (1970) with change in the duration of transition period to 21 days instead of 10 days was used. Six lactating buffalos in the second and third lactation season were used in this method to investigate the effect of feeding 60% of the nutritional requirements (Shehata, 1970) from CFM with *ad libitum* treated and untreated rice straw on lactating buffalos performance. The experimental rations were:

1. Control ration 1 (T1): 100% of SE and DCP requirements from CFM + untreated rice straw *ad libitum*.
2. Ration 2 (T2): 60% of SE and DCP requirements from CFM + rice straw treated with H_2SO_4 (2.5%) and urea (5%) *ad libitum*.
3. Ration 3 (T3): 60% of SE and DCP requirements from CFM + rice straw treated with H_2SO_4 (2.5%) and urea (5%) *ad libitum* + tafla (one g/ kg live body weight).

Milk sampling

Milk samples were individually collected for analysis from each buffalo during the experimental periods of both control and tested rations. The daily fat percentage was determined according to Gerber,s method as described by Ling (1963) during the experimental periods. In the middle day of each experimental period a daily representative sample was prepared for chemical analysis.

Proximate analysis

Milk was analyzed for total solids (T.S), solids non fat (S.N.F.), total protein and ash. Lactose content was estimated by difference. The chemical analysis of feedstuffs, feces and milk were carried out according to A.O.A.C. (1980).

Economical efficiency

The cost of feed (L.E.)/kg FCM yields was calculated by determining the net price of feed cost required for milk production after subtraction or adding the price of body weight change according to the following equation: NFC = TFC ± PBWC where NFC = Net feed cost for milk production ; TFC = total feed intake cost ; PBWC = price of body weight change. The cost of feed (L.E.) / 1 kg FCM according to the following equation: feed cost / kg FCM = net feed cost / amount of FCM by kg.

Statistical Analysis

Analysis of variance was carried out after transforming the percentage number into Arcsin values, using F test, according to Snedecor and Cochran (1982) tested and the differences among treatments means were testing using Duncan‘s multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Effect of Treatments on Chemical Composition

The obtained results Table 1 showed that the crude protein (CP) content of rice straw increased from 3.25 % in untreated rice straw (RS) to 10.01 in sulphuric acid-urea treated rice straw (SAUR). The increase of CP content may be due to high content of N in urea (46.50%), furthermore, the adding of H_2SO_4 before urea treatment was captured the excess of ammonia. Similar trend was reported by Enishi and Shijamaya (1994); Ahmed (1995); Deyab (1995); Hassona *et al.*, 1997 and El-Madany (1997); Abd El-Baki *et al.*, (2000).

The crude fiber (CF) content of rice straw showed opposite trend which decreased from 34.56 % to 32.90 % in SAUR Table 1. These results may be due to liberation of cellulose from the ponds with lignin (delignification), which making cellulose more soluble

Table 1.Chemical composition (%) of ingredients and the experimental rations fed by rams

	DM	OM	CP	CF	EE	NFE	Ash
			Proximate analysis				
Concentrate feed mixture (CFM)	91.5	86.01	16.52	11.94	4.45	53.10	13.99
Rice straw (RS)	91.00	78.35	3.25	34.56	1.97	38.57	21.65
Treated rice straw(SAUR)	56.85	77.15	10.01	32.90	1.95	32.29	22.85
Tafla	91.70	7.14	-	7.14	-	-	92.86
Calculated chemical composition of consumed ratio							
100 % CFM + RS (T1)	91.33	83.41	12.02	19.60	3.61	48.18	16.59
60 % CFM + SAUR (T2)	71.37	81.90	13.51	21.65	3.29	43.45	18.10
60 % CFM + SAUR + tafla (T3)	71.60	78.17	12.75	21.26	3.10	41.06	21.83
50 % CFM + SAUR (T4)	70.90	81.78	13.41	21.95	3.25	43.17	18.22
50 % CFM + SAUR (T5)	70.77	77.48	12.50	21.75	3.01	40.22	22.52

(Abd El-Baki *et al.*, 1984). Similarly, Saenger *et al.*, (1982) and Mohamed (1988) showed that the decrease of CF content related to decrease of hemicellulose content of roughages might be due to its solubilization by sulphuric acid treatment. These results were in harmony with those obtained by Gupta *et al.*, (1985); Shoukry *et al.*, (1992); Abd El-Baki *et al.*, (2001 a & b).

First Trial: Digestibility Trials on Sheep

Feed intake

The results showed that the highest ($P<0.05$) values of dry matter intake (g/head/day) of total ration (CFM + RS) were recorded with control ration than those contained H_2SO_4-urea treated rice straw with or without tafla Table 2. These results agreed with those obtained by Abd El-Baki *et al.*, (1995) who showed that the use of clays as bentonite, kaolin or tafla in Rahmani rams and Zaraibi bucks rations had no significant effect on daily feed intake. The differences between rice straw of control ration and SAUR + tafla ration were not significant. Similar results were observed by Chopra *et al.*, (1993) with buffalo calves; Galal (1997) with crossbred Friesian cows and Saleh *et al.*, (1999) with buffalos. The results showed that roughage concentrate ratio was the lowest in control ration than other rations (Table 2).

Table 2. Feed intake of the experimental rations by rams

Items	*CFM 100% + RS (T1)	60 % CFM + RS		50 % CFM + RS	
		SAUR (T2)	SAUR + T (T3)	SAUR (T4)	SAUR + T (T5)
Total dry matter intake (g)	$1858.67^{a} \pm 48$	$1267^{bc} \pm 17$	$1372^{b} \pm 49$	$1086^{a} \pm 20$	$1221^{c} \pm 49$
Rice straw intake (g)	$629^{ab} \pm 11$	$587^{bc} \pm 5$	$692^{a} \pm 26$	$519^{c} \pm 29$	$587^{bc} \pm 25$
Roughage: concentrate ratio	34 : 66	46 : 54	50 : 50	48 : 52	48 : 52

a, b, c and d means the same row with different superscripts differ ($P<0.05$).
*CFM – Concentrate feed mixture.

Digestion coefficients

The CF digestibility of the control group was significantly lower (P<0.05) than those of the other experimental groups with or without tafla addition Table 3. However, the digestibility of the other nutrients of the tested rations were significantly improved with tafla addition than others. Digestibility of all nutrients increased (P<0.05) by tafla addition in comparison with that without addition and control group Table 3. The same trend was observed by Salem *et al.*, (2001) who reported that supplementing 4 or 8% bentonite to diets fed to growing lambs significantly increased the OM, CP, CF and EE digestibilities. The same results also reported by Madhu-Mohini *et al.*, (2001) using male cattle; Abd El-Baki *et al.*, (2001b) on cows and Nik-Khah *et al.*, (2002) using male lambs. The improvement in digestibility by tafla may be attributed to the role and benefit of clays by slowing feed passage time through out the digestive tract which reflected on better digestion, increasing the reactive surface areas of nutrients to the rumen microorganisms enzymes (Pulatov *et al.*, 1983); improvement of urea utilization as a result of its regulator mechanism of releasing ammonia in rumen (Abd El-Baki, 1977; Abd El-Baki *et al.*, 1992) and also as results of H_2SO_4 treatment which improved the crude fiber digestion and captured the excess of ammonia in treated straw. Similar results were obtained by Fahmy and Orskov (1984); Murphy (1986) and Abd El-Baki *et al.*, (1995).

Nutritive values

The highest values of total digestible nutrients (TDN%) and starch equivalent (SE%) were recorded with the animals which fed (T3) and there were no significant differences between the control group and the other experimental groups Table 3. Also, the highest value of DCP was recorded with T3 followed by T5 and T2, while the lowest value of DCP was observed with the control ration which was significantly lower (P<0.05) than rations contained treated rice straw with or without tafla clay. These results were in agreement with those reported by Aiad (1990); El-Hakim *et al.*, (1994) and Abd El-Baki *et al.*, (1995) who showed an improvement in all nutritive values as TDN, SE and DCP% by adding tafla to sheep rations. Also, Hassona (1997) who indicated that the addition of clay to urea ration

Table 3. Digestibility coefficients, nutritive values (%) and feed units intake of the experimental rations by rams

Items	CFM 100% + RS (T1)	60 %* CFM + RS		50 % CFM + RS	
		SAUR (T2)	SAUR + T (T3)	SAUR (T4)	SAUR + T (T5)
Digestion coefficients (%)					
DM	62.47^{c} ± 1.34	62.14^{c} ± 0.21	68.90^{a} ± 0.40	61.98^{a} ± 0.79	66.10^{b} ± 0.19
OM	63.66^{c} ± 1.09	65.67^{b} ± 0.61	71.61^{a} ± 0.08	65.32^{bc} ± 0.33	70.67^{a} ± 0.26
CP	62.23^{b} ± 0.66	64.00^{b} ± 0.72	70.41^{a} ± 0.22	63.74^{b} ± 1.41	69.38^{a} ± 0.22
CF	54.42^{c} ± 0.38	60.68^{b} ± 0.68	65.45^{a} ± 0.17	59.13^{b} ± 1.07	64.57^{a} ± 0.67
EE	67.14^{b} ± 1.30	69.40^{b} ± 0.59	73.69^{a} ± 0.55	68.99^{b} ± 1.42	72.57^{a} ± 0.54
NFE	67.57^{b} ± 2.09	68.39^{b} ± 0.87	75.02^{a} ± 0.17	68.68^{b} ± 0.47	74.24^{a} ± 0.20
Nutritive values (%)					
TDN	55.91^{b} ± 0.99	56.64^{b} ± 0.50	58.84^{a} ± 0.10	56.24^{b} ± 0.39	57.55^{ab} ± 0.2
SE	43.50^{ab} ± 1.0	42.78^{b} ± 0.55	45.31^{a} ± 0.22	42.36^{b} ± 0.64	43.65^{ab} ± 0.2
DCP	7.48^{c} ± 0.11	8.65^{ab} ± 0.09	8.98^{a} ± 0.01	8.55^{b} ± 0.22	8.72^{ab} ± 0.05
Feed units intake (g /h /day)					
TDN	1039.2^{a} ± 45	717.76^{c} ± 14	807.48^{b} ± 27	610.58^{d} ± 9.24	702.50^{c} ± 27
SE	808.52a ± 38	542.91c ± 13	621.80b ± 15	459.89d ± 4	532.82cd ± 20
DCP	139.03^{a} ± 4	109.60^{c} ± 2	123.24^{b} ± 5	92.83^{d} ± 2	106.44^{c} ± 4

a, b and c means the same row with different superscripts differ (P<0.05).

increased the DCP value. Salem *et al.*, (2001) found that TDN, SE and DCP were improved by adding bentonite.

Feed units intake

The TDN, SE and DCP intake (g/h/d) were increased ($P<0.05$) with control ration (T1) than other rations Table 3. These results may be related to the lower palatability of treated rice straw than the untreated one. These results were in harmony with those reported by Azzam (1992); Deyab (1995) and El-Madany (1997). The results showed also that, the lowest feed units intake were recorded with the animals which fed 50% CFM without tafla.

Generally, the obtained results showed improvements in digestibilities and the nutritive values of the tested rations which may attributed to the reaction between the digestive system and the dietary ingredients in terms of changes in rumen liquor parameters, digesta flow, count and activity of the microorganisms and hence microbial digestion in addition to enzyme activity and secretion (Roy, 1983).

Second Trial: Lactating Buffalos Performance

Dry matter intake

The treated rice straw intake with or without tafla clay as kg /h/d were significantly ($P<0.05$) increased than the control one. But, there were no significant effects on daily rice straw intake between (SAUR) with or without tafla clay Table 4. The same trend was observed with the other feed intake measurements. These results agreed with Abd El-Baki *et al.*, (1995); Madhu-Mohini *et al.*, (1999) and Ahmed (1999) who observed that the DMI as g/h/d by sheep or goats fed rations supplemented with or without tafla had no significant effect on daily dry matter intake. Also, Nik-Khah *et al.*, (2002) found that supplementing clinoptlolite or zeolite in male lambs ration had no effect on average DMI.

Body weight change

The highest values of body weight change Table 4 was recorded with ration (T3) (SAUR + T) followed by the control ration (T1) and the lowest value was observed with ration T2 (H_2SO_4-urea treatment, SAUR).

Feed units intake

The difference of TDN and SE as kg /h/d among their rations were not significant, while, the DCP was significantly increased when buffalos fed ration (T3) than those fed control ration (T1). But, the

Table 4. Feed and feed units intake of the experimental rations by buffaloes

Items	100 % CFM +RS	60 % CFM + RS	
	Control (T1)	SAUR (T2)	SAUR + T (T3)
No of buffaloes	6	6	6
Average body weight (kg)	603.83 ± 3.16	606.00 ±12.12	610.00 ±11.66
Average metabolic body size $W^{0.75}$	121.80 ± 1.99	122.10 ±1.82	122.70 ±1.77
Daily body change (g)	83.00 ± 35.58	60.00± 28.07	111.00 ±22.26
DM intake (kg/h/d):			
Concentrate feed mixture (CFM)	9.52^{a} ± 0.72	5.90^{b} ± 0.19	6.24^{b} ± 0.14
Rice straw (RS)	8.89^{b} ± 0.46	13.24^{a} ± 0.30	12.68^{a} ± 0.34
Tafla	--	--	0.58
Total	18.41 ± 1.09	19.14 ± 0.47	19.50 ± 0.46
R/C ratio	48 : 52	69 : 31	67 : 33
Feed units intake (g/h/d):			
TDN	10.29 ± 0.63	10.84 ± 0.27	11.47 ± 0.27
SE	8.01 ± 0.48	8.19 ± 0.20	8.84 ± 0.21
DCP	1.38^{b} ± 0.08	1.66^{a} ± 0.03	1.75^{a} ± 0.04

a, b and c means the same row with different superscripts differ ($P<0.05$).

difference between T2 and T3 were not significant. These results agreed with · those obtained by Soliman (1990) who indicated that the DCP intake was increased with addition of clay to urea ration. Also, Yousef, (2001) found that the addition of tafla clay to rations significantly increased daily feed units intake as TDN, SE and DCP than control.

Fat corrected milk yield

The average daily FCM yield of the control ration was 12.25 kg, however, the average daily calculated FCM yield of the groups T2 and T3 were increased to 13.31 kg and 14.57 kg, respectively compared with the control one Table 5. Similar results were obtained by Abd El-Baki *et al*., (2001 b) who reported that the fat corrected milk yield was significantly higher for cows fed rations contained H_2SO_4-urea treated rice straw with tafla *ad libitum* with 75 or 65% of their nutritional allowances from CFM than those fed the same rations without tafla or control ration with untreated rice straw. Increased FCM yield by tafla clay addition may be due to improve of feed conversion Table 6. Its important role as a regulator factor for NH3-N concentration in rumen fluid (donor or receptor), which led to improving urea utilization by microorganisms. Also, clay improved energy metabolism (Hassona, 1997).

Milk constituents

The milk constituents showed that the ration (T3) was significantly ($P<0.05$) increased milk composition as total solid (TS), solid nonfat (SNF), fat, lactose and ash contents compared to the other tested groups (T1 and T2). The same trend was reported by Horing *et al*., (1999) and Yousef (2001) who indicated that the fat, protein and ash-free DM yield as well as the lactose contents were significantly increased by clinoptlolite addition to dairy cows ration.

Feed conversion

The feed conversion as TDN and SE per kg FCM Table 7 showed no significant differences between the control and the other tested groups. However, feed conversion as g DCP per kg FCM was more efficient in T1 followed group (T3) and the worst value was recorded in T2. These results are similar with the findings of May and Barker (1988) and Kirilov *et al*., (1994).

Economical study

The price of actual milk produced, feed consumed by buffalos and the price of body gain (as kg LBW) was estimated according to market prices Table 8. The values of return were 1075.49, 1258.77 and 1471.02 P.T (h/d) for T1, T2 and T3, respectively. It could be concluded that, adding tafla clay to rations contained H_2SO_4-urea treated rice straw was more effective in decreasing the feed cost to produce 1 kg FCM by 21.17% when compared with those fed the control and 11.53% compared with those fed (T2) without tafla. These results were in harmony with those obtained by Galal (1997); Saleh *et al.*, (1999) and Abd El-Baki *et al.*, (2001b).

The results concluded that treatment of rice straw with H_2SO_4 (2.5%) and urea (5%) improved its nutritive values. Moreover, addition of tafla clay to the treated rice straw improved urea utilization. The treated rice straw plus tafla can be used to replace 40-50% of the concentrate feed of ruminants (sheep and lactating buffalos) without any adverse effect on the performance, moreover its economical and environmental return.

Table 5. Fat corrected milk (kg) yield of lactating buffaloes fed the experimental rations

Animal No.	Experimental rations		
	Control (T1)	First tested ration (T2)	Second tested ration (T3)
1	12.51	13.62	15.41
2	11.81	12.50	13.96
3	12.27	13.09	14.62
4	11.50	12.43	13.53
5	13.27	13.96	15.89
6	12.12	14.26	13.90
Average	$12.25^c \pm 0.25$	$13.31^b \pm 0.31$	$14.57^a \pm 0.38$

a, b and c means the same row with different superscripts differ ($P<0.05$).

Table 6. The milk constituents of lactating buffaloes fed the experimental rations

Items	100 % CFM	60 % CFM	
	T1	T2	T3
Total solids (TS)	16.68	17.10	17.50
Solid non fat (SNF)	9.79	10.01	10.27
Fat	6.89	7.09	7.23
Protein	4.31	4.43	4.39
Lactose	4.89	4.97	5.19
Ash	0.59	0.61	0.69

Table 7. Feed conversion of lactating buffaloes fed the experimental rations

Items	Experimental rations		
	100 % CFM (T1)	60 % CFM (T2)	60 % CFM + T (T3)
Feed units intake / kg FCM			
TDN kg / kg	0.46 ± 0.049	0.46 ± 0.018	0.45 ± 0.018
SE kg / kg	0.36 ± 0.038	0.36 ± 0.014	0.35 ± 0.014
DCP g / kg	79.54^{a} ± 6.75	95.28^{c} ± 2.48	90.80^{b} ± 2.45

a, b and c means the same row with different superscripts differ ($P<0.05$).

Table 8. Economical efficiency of lactating buffaloes fed the experimental rations

Items	*Experimental rations*		
	100 % CFM (T1)	60 % CFM (T2)	60 % CFM + T (T3)
Average daily feed consumption (kg)			
Concentrate Feed mixture	10.40	6.44	6.80
Rice straw	9.76	23.02	22.07
Average daily production (kg)			
FCM	12.25	13.13	14.57
Gain	0.083	0.060	0.111
Costs of feed intake (pt/h/d)			
FCM	769.6	476.56	503.20
Rice straw	54.66	306.17	293.53
Tafla	--	--	1.00
Total feed costs (input)	824.26	782.73	797.73
Price of milk	1837.50	1996.50	2185.50
Price of weight change	62.25	45.00	83.25
Total (output)	1899.75	2041.50	2268.75
Total feed cost of milk production	762.01	737.73	714.48
Feed cost / kg FCM	67.29	58.81	54.75
Net feed cost / 1 kg FCM production	62.21	55.43	49.04
Return / h / d	1057.49	1258.77	1471.02
Economical efficiency	2.31	2.61	2.84

Price in piaster (0.01 L.E.) free market according to price 2002 / kg of concentrate feed mixture, rice straw, treated rice straw (SAUR), tafla, milk (FCM 4%) and body gain buffalos were 74, 5.6, 13.3, 1, 150 and 750 respectively.

REFERENCES

Abd El-Baki, S.M.S. 1970. Some nutritional studies on using roughage with berseem in dairy rations. M.Sc. Thesis, Fac. of Agric., Cairo Univ.

Abd El-Baki, S.M.S. 1977. Study on effects of zeolite and carbomide contents of rations on some physiological functions of sheep. Ph.D Thesis, Sofia (in Bulgarian).

Abd El-Baki, S.M.S., A.S. El-Shobokshy, F.Z. Swidan, S.Y. Sherif and E.M. Hassona. 1984. Chemical treatments of some poor quality roughages. 1- Chemical composition. Animal Prod. Dept., Fac. of Agric., Zagazig Univ., Egypt.

Abd El-Baki, S.M.S., E.M. Hassona, A.M. Abd El-Khabir, E.S. Soliman and M.G. Ahmed. 1995. Clays in animal nutrition. 1- Bentonite, kaolin and tafla to improve digestibility and nutritive value of rations contained sulphuric acid-urea treated rice straw by Rahmany sheep and Zaraibi goats. Proc. 5th Sci. Conf. Animal Nutr., 1 : 191-205, Ismailia, Egypt.

Abd El-Baki, S.M.S., E.M. Hassona, S.M. Bassuny and A.M. Aiad. 1992. Effect of adding tafla clay to ration containing high level of urea on some ruminal parameters and growth performance of lambs. Int. Conf. on manipulation of rumen microorganisms, Alexandria, Egypt.

Abd El-Baki, S.M.S., E.M. Hassona, E.L. Abou-Fandoud and A.M. Aiad. 2000. Clays in animal nutrition. 6- Effect of feeding pelleted complete feeds contained urea and tafla on digestibility, growth and wool of local sheep. Proc. Conf. Anim. Prod. In the 2nd Century, Sakha, Egypt, 18-20 April.

Abd El-Baki, S.M.S., E.M. Hassona, H.M. Ghanem, H.M. Yousef, A.A. Zaki, R.I. Moawd and S.A. Ebrahem. 2001a. Clays in animal nutrition. 7- Effect of feeding ensiled sulphuric acid-urea-tafla treated rice straw by crossbred Friesian bull calves on digestibility, growth performance, and some physiological parameters. Egyptian J. Nutr. And Feeds, 4 (1): 1-9.

Abd El-Baki, S.M.S., E.S. Soliman and N.A. Youssef. 2001b. Clays in animal nutrition. 8- Effect of tafla clay on performance of lactating cows fed different levels of concentrate feed mixture with sulphuric acid-urea treated rice straw. Egyptian J. Nutr. And Feeds, (2001), 4 (Special Issue): 337-347. Proc. 8th Conf. Animal Nutr., 23-26 October 2001, Sharm El-Sheikh, Egypt.

Abo-Akkada, A.R. 1984. Evaluation of present status and potential development of animal feed resources in Arab countries. 10- Arab Republic of Egypt, ACSAD/ ASP. 24, 1982 (in Arabic).

Abou-Hussien, E.R.M. 1958. Economical feeding of dairy cows and buffalos for milk production in Egypt. Ph.D Thesis, Fac. Of Agric., Cairo Univ.

Abou-Selim, I.A. and M.M. Bendary. 2005. Feed resources in Arab Repobulik of Egypt. Sources maximize of utilization. Proc. 2nd Anim. Prod. Res. Inst., Sakha, 27-29 Sep. 2005. 57-67.

Ahmed, M.E. 1995. Improvement of the utilization of chemical treated poor quality roughages by ruminants. M. Sc. Thesis, Fac. of Agric., Zagazig Univ.

Ahmed, M.E. 1999. Improving feed conversion efficiency during reproduction stress-phases. Ph.D. Thesis Fac. of Agric., Mansoura Univ.

Aiad, A.M.A. 1997. Using clay in animal nutrition. Ph.D. Thesis, Fac. of Agric. Zagazig Univ.

A.O.A.C. 1980. Association of Official Agricultural of Chemists Official Methods of Analysis (13th ed.), Washington, S.D.C.

Azzam, M.H. 1992. Nutritional studies on some chemically treated poor quality roughages in ruminant feeding. M.Sc. Thesis, Fac. of Agric., Zagazig Univ.

Chopra, R.C., S.S. Kundu, P. Atreja, H. Kaur and S.K. Sharma. 1993. Nutrient utilization in buffalo calves fed urea treated wheat straw with and without bentonite, maize or sorghum forage. Indian J Anim. Nutr., 10 (4): 237-239.

Duncan,s, D.B. 1955. Multiple range and Multiple F. test. Biometrics, 11: 1-42.

Deyab, H.E.S.A. 1995. Sulphuric acid and urea treated poor quality roughage in ruminant feeding. M.Sc. Thesis, Fac. of Agric., Zagazig Univ.

El-Hakim, A., E.M. Abdel-Raouf, M.I. Bassiuni, M.S. Saleh, H.M. El-Gendy and M.K. Mohsen. 1994. Effect of adding bentonite clay to concentrate diets containing urea on the performance of sheep. 1- Ration digestibility and nitrogen metabolism by rams. J. of Agric. Sci., Mansoura Univ., 19 (11): 3619-3627.

El-Madany, H.A. 1997. Nutritional studies on using treated rice straw in goat rations. M.Sc. Thesis, Fac. of Agric., Zagazig Univ.

El-Serafy, A.M. 1968. Nutritional studies on the suitable combination of molasses with certain feeding stuff. M.Sc., Fac. of Agric., Cairo Univ.

Enishi, O. and K. Shijmaya. 1994. Effects of rice straw treatment using urea on digestibility, nitrogen balance and energy balance in feeding goat. Nut. Abst. & Rev. (Series B). 64 (8): 3401.

Fahmy, S.T. and Orskov. 1984. Digestion and utilization of straw. 1- Effect of different chemical treatments on degradability and digestibility of barley straw by sheep. Anim. Prod., 38 : 69-74.

Galal, H.M. 1997. Utilization of poor quality roughages in complete feeds for ruminants. Ph.D. Thesis, Fac. of Agric., Cairo Univ.

Gupta, R., A.P. Sinha, B.S. Gupta, P.K. Maheshwari and J.P. Srivaste. 1985. Effect of ammonia (generated for urea) on approximate constituents of paddy straw. Indian J. Anim. Health, 14: 101-104.

Ghoneim, A. 1967. Animal nutrition 1st Ed. Anglo-Egyptian Book-store, Cairo, Egypt.

Hassona, E.M. 1986. The utilization of treated feeding stuffs in feeding ruminant animals. Ph.D. Thesis, Fac. of Agric. Sci., Zagazig Univ.

Hassona, E.M. 1997. Clays in animal nutrition. 3- Study on energy digestibility and mineral metabolism of rations content $H2SO4$-urea treated rice straw and clays fed to Rahmani sheep and Zaraibi goats. J. of Agric. Sci., Mansoura Univ., 22: 1455-1471.

Hassona, E.M., S.M.S. Abd El-Baki, A.M. Abd El-Kabir, E.S. Soliman and M.G. Ahmed.

1995. Clays in animal nutrition. 2- Rations contained sulphuric acid-urea treated rice straw and clays for growing Rahmany lambs and Zaraibi kids. Conf. Anim. Nutr., Ismailia, 12 Dec.

Horing, G., E. Scherping, L. Hasselmann, H. Falter, R. Schubert, G. Flachowsky, R. Bitsch and G. Jahereis. 1999. The effect of the mineral clinoptilolite as feed additive for dairy cows. Vitamine und Zusatzstoffe in der Ernahrung von Mench und Tier: 7-Symposium Jena-Thuringen, Germany, 22-23 September, 1999: 527-530.

Kirilov, M.P. and A. Burikhonov. 1993. Bentonite in the feeding of replacement heifer. Zootekhniya, 8: 20-23.

Kirilove, M.P., U.M. Fantin, S.V. Kumarin, N.I. Kiriova and S.M. Sadykov. 1994. Zeolite in feed mixture for cows. Zootekniya, 10: 12-14.

Lindermann, M.D., D.J., Blodgett, E.T. Kornegay and G.G. Sehuryg. 1993. Potential ameliorators of aflatoxicosis in weanling/ growing swine. J. Anim. Sci., 71: 171-178.

Ling, E.R. 1963. Text Book of Dairy Chemistry, Vol 11, Practical Chapman Hall. LTD, London, 4th ed. Pp. 140.

Madhu-Mohini, G.P. Singh, Neelam-Kewalarmani, M. Mohini and N.J. Kewalramani. 2001. Effect of supplementation of bentonite on nutrient utilization and rumen parameters in cattle. J. of Dairy and Bio-Sci., 12: 26-31.

Madhu-Mohini, G.P. Singh, Neelam-Kewalarmani M. Mohini and N.J. Kewalramani 1999. Effect of bentonite on growth in crossbred calves fed diet containing urea. Indian J. of Anim. Sci., 69, 10: 823-826.

May, P.J. and D.J. Barker. 1988. Sodium bentonite in high grain diets for young cattle. Proc. Of the Australian Society of Anim. Production, 17: 439. (C.F. Nutr. Abst. & Rev., 1989).

Mohamed, A.E.H. 1988. Feeding ruminants with treated agricultural by product to raise their nutritive value. M.Sc. Thesis, Fac. of Agric., Cairo Univ.

Murphy, J.J. 1986. A comparative evaluation of the feeding value for dairy cows of silages treated with formic and sulphuric acids. Irish J. of Agric. Res., 25 (1): 1-9. (C.F. Nutr. Abst. & Rev., 1986).

Nik-Khah, A., B. Bapapour, M. Moradishahrbabak and R.A. Moghaddam. 2002. The use of clinoptilolite rich tuff in ration of finishing Varamin male lambs and its effects on their performance. Indian J. of Agric. Sci., 33, 3: 543-551.

Patterson, J.A., C.H. Noller and L.J. Wheeler. 1985. Efficient of zeolite as a ruminant buffer. J. Anim. Sci. (Abst.), 16: 465.

Pulatov, G.S., A.D. Ignotov and A. Nelyubin. 1983. Biological properties of zeolite. Trudy Uzbckskogo Nauchnoissled Ovatel Skogoi Veterinarnogo Institute, 35: 30-33. (C.F. Nutr. Abst. & Rev., 1986, 56 (9): 578.

Roy, J.H.P. 1983. Funktion und Dysfuntion des Dunndarms bie Tieren: Diatetissche Einflusse. Ubers. Tierenahrung, 11: 1-46.

Salch, M.S., E.M. Abd-Raouf, M.K. Mohsen and A.Y. Salem. 1999. Bentonite supplementation to concentrate ration for lactating buffaloes. Egyptian J. Nutrition and Feeds (Special Issue), 2 : 67 Proc. 7th Sci. Con. Anim. Nutr. Part 1, October, El-Arish, Egypt.

Salem, F.A.F., E. Hanaa and S.H. Hassanin. 2001. Effect of bentonite supplementation on nutrients digestibility, rumen fermentation, some blood physiological parameters and performance of growing lambs. The 8th Conf. On Anim. Nutr., October 2001, Sharm El-Sheikh (Special Issue): 179-191.

Saenger, P.F., R.P. Lemenager and K.S. Hendrix. 1982. Anhydrous ammonia treatment of corn stover and its effects on digestibility, intake and performance of beef cattle. J. Anim. Sci., 54: 419-424.

Shehata, O. 1970. Lectures in Anim. Production. Fac. of Agric., Ain-Shams Univ., Egypt.

Shoukry, M.M., H.M. Ali, M.A. El-Ashry and F.M. Salman. 1992. Effect of urea treatment level and ensiling period on the chemical composition, nitrogen fixation and nutritive value of some poor quality roughages. Zagazig J. Agric. Res., 19 (4B): 1795-1814.

Snedecor, G.W. and W.G. Cochran. 1982. Statistical Methods. 7th Ed. Iowa State Univ. Press, Ames, Iowa.

Soliman, A.M. 1990. Evaluation and utilization of cassava as a new animal feed in Egypt. Ph.D. Thesis, Fac. of Agric., Zagazig Univ.

Yousef, N.A. 2001. The use of clays in ruminant nutrition. Ph.D Thesis, Fac. of Agric., Zagazig Univ.

تأثير استخدام قش الأرز المعامل باليوريا و حامض الكبريتيك والطفلة على أداء الأغنام و الجاموس الحلاب

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تضمن هذا البحث تجربتين، فى التجربة الاولى: خمس تجارب هضم تم إجرائها على ١٥ كبش بالغ خليط (سفولك x أوسيمى) (٣ حيوان / تجربة) لتقييم العلائق الآتية: عليقة الكنترول (T1): وفيها تم تغطية ١٠٠% من الاحتياجات كمعادل نشا (SE) و بروتين خام مهضوم (DCP) من مخلوط العلف المركز بالإضافة إلى قش الأرز الغير معامل للشبع. العليقة الثانية (T2): تم تغطية ٦٠% من الاحتياجات من مخلوط العلف المركز + قش أرز معامل بحامض الكبريتيك (٢,٥%) واليوريا (٥%) للشبع، العليقة الثالثة: تم تغطية٦٠% من الاحتياجات من مخلوط العلف المركز + قش أرز معامل بحامض الكبريتيك (٢,٥%) واليوريا (٥%) للشبع بالإضافة إلى الطفلة (١ جم / كجم وزن حى). العليقة الرابعة: تم تغطية ٥٠% من الاحتياجات من مخلوط العلف المركز + قش أرز معامل بحامض الكبريتيك (٢,٥%) واليوريا (٥%) للشبع. العليقة الخامسة: تم تغطية ٥٠% من الاحتياجات من مخلوط العلف المركز + قش أرز معامل بحامض الكبريتيك (٢,٥%) واليوريا (٥%) للشبع بالإضافة إلى الطفلة (١ جم / كجم وزن حى). فى التجربة الثانية: استخدم ٦ جاموسات حلابة (طريقة Swing over) لتقييم تأثير العلائق الثلاثة الأولى على إنتاج وتركيب اللبن. وكانت أهم النتائج كالتالى:

معاملة قش الأرز بحامض الكبرتيك واليوريا أدت إلى زيادة محتواه من البروتين الخام من ٣,٢٥ الى ١٠,٠١% ولكن محتواه من الألياف الخام اخذ أنجاه عكسى.

أوضحت نتائج التجربة الأولى أن أعلى قيمة (معنوية ٥%) للمادة الجافة المأكولة كان لعليقة الكنترول. انخفض هضم الألياف معنويا لمجموعة الكنترول. حدث تحسن فى هضم المركبات الغذائية الأخرى للعلائق المختبرة بإضافة الطفلة. سجلت الحيوانات المغذاة على المعاملة الثالثة أعلى القيم للمركبات الغذائية (TDN%) و(SE%) و البروتين الخام

المهضوم (DCP). زاد المأكول معنويا (مستوى ٥%) من TDN وSE وDCP لمجموعة الكنترول بالمقارنة بباقى العلائق.

أوضحت نتائج التجربة الثانية أن المأكول من قش الأرز المعامل مع أو بدون الطفلة زاد معنويا بالمقارنة بالكنترول. زادت قيمة البروتين الخام المهضوم معنويا فى الجاموس المغذى عليقة تحتوى على الطفلة (المعاملة الثالثة) بالمقارنة بالمغذاة على عليقة الكنترول. متوسط محصول اللبن المعدل لنسبة دهن ٤% (FCM) لمجموعة الكنترول، المعاملة الثانية والثالثة كان ١٢,٢٥ ، ١٣,٣١ و ١٤,٥٧ كجم على التوالى. لم توجد اختلافات معنوية بين المعاملات فى معامل التحويل الغذائى (TDN وSE لكل كجم لبن معدل). على أية حال فإن معامل التحويل الغذائى فى صورة بروتين خام (جم) لكل كجم لبن معدل كان أكثر كفاءة فى المعاملة الأولى ثم مجموعة الطفلة (المعاملة الثالثة) وكان أسوأها المعاملة الثانية.

أوضحت الدراسة الاقتصادية أن قيم العائد كانت ١٠٧٥,٤٩ ، ١٢٥٨,٧٧ و ٤٧١,٠٢ قرش / رأس/ يوم للمعاملات الأولى والثانية والثالثة على التوالى.

يستنتج من هذه الدراسة أن معاملة قش الأرز بـ ٢,٥% حامض كبرتيك و ٥% يوريا حسنت القيم الغذائية. إضافة الطفلة إلى القش المعامل حسنت الاستفادة من اليوريا. يمكن استبدال حوالى ٤٠-٥٠% من العلف المركز للأغنام والجاموس الحلاب بقش الأرز المعامل والطفلة بدون أى تأثيرات عكسية على الأداء، كما أنه أفضل من الناحية الاقتصادية والبيئية.