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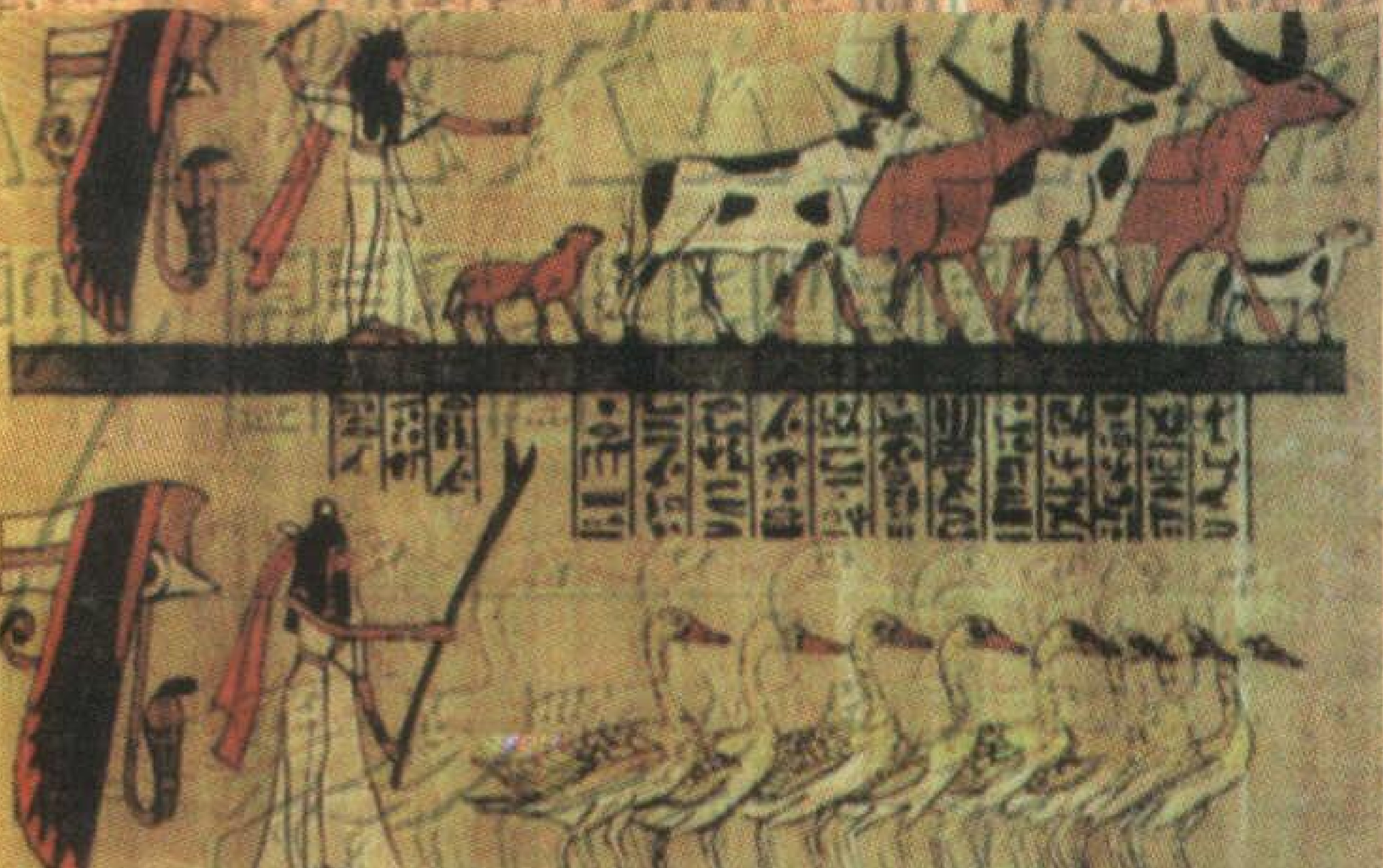

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EFECT OF FORMALDEHYDE TREATMENT OF CONCENTRATE FEED MIXTURE AND SOURCE OF ROUGHAGE ON FERMENTATION AND SOME BACTERIAL ACTIVITIES IN THE RUMEN OF SHEEP.

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SUMMARY

A2 x 2 factorial experiment was designed to investigate the effect of two sources of roughage (berseem hay "BH" and whole corn silage "WCS") and concentrate feed mixture (CFM) either treated with formaldehyde to protect its protein against microbial degradation (undegradable intake protein "UDIP") or without treatment; to be degraded intake protein (DIP) on some fermentation characteristics as well as some bacterial activities in the rumen of sheep.. Three mature Rahmani rams with an average live body weight of 50 Kg were assigned for each of the four experimental rations. The animals received 85% of their *ad lib.* intake at the level of 60% concentrate + 40% roughage.

Results obtained showed significant ($P<0.05$) increase in digestibility coefficients of OM and NFE of WCS compared to BH. The same effect was also found in the nutritive value in terms of DE and ME of WCS. Formaldehyde treatment of CFM significantly ($P<0.05$) increased both of CP digestibility coefficient and DCP%. No significant differences were found in other nutrients digestibility coefficients and / or the feeding values of the tested rations. Data of N-balance indicated positive N-balance with values ranging between 6.50 and 9.94 g/day, but without significant differences among the tested rations and / or the two sources of roughage. A significant positive effect was recorded for NB value of animals when they received F-CFM compared to those received U-CFM ration.

Results of rumen liquor parameters indicated a significant ($P<0.05$) effect of roughage source on pH values, NH_3-N and VFA concentrations, since BH recorded higher values except for VFA which was significantly ($P<0.05$) higher with WCS rations. Feeding F-CFM led to a slight non-significant increase in pH values and VFA concentrations, while it significantly ($P<0.05$) decreased NH_3-N concentrations.

Regarding microbiological measurements, results obtained showed that gas length (GL), total bacterial counts (TBC), amylolytic and cellulolytic activities were significantly ($P<0.05$) decreased when F-CFM was fed. Meanwhile, the optical density (OD) and proteolytic activity were not affected. The rations contained BH recorded the highest significant values ($P<0.01$) of GL, OD, amylolytic and proteolytic activities. The WCS rations were superior in TBC and cellulolytic activity.

According to the fore-mentioned results it could be concluded that, although TBC and cellulolytic activity were significantly higher in WCS rations than those recorded with BH rations, the inclusion of F-CFM in the diets of sheep tended to decrease the activities of amylolytic, proteolytic and cellulolytic bacteria as well as their growth indicators compared to untreated-CFM in general. On the other hand, diets contained BH were higher in GL and OD values as well as amylolytic and proteolytic activities, with higher pH values and NH_3-N concentrations. So, the study recommended that dietary protein of

rations with high available carbohydrates content needs to be protected against degradation in the rumen for better fermentation and maximal utilization of such diets.

Keywords: *sheep, formaldehyde treatment, rumen, fermentation, bacteria and enzyme activities.*

INTRODUCTION

Better understanding of rumen environment, i.e. digestibility, fermentation parameters, rumen microorganisms and their activities are a must for better utilization of feedstuffs and hence animal performance "milk or growth" (Ørskov, 1992). In this concern, the results obtained by El-Deeb (2001) emphasized that the importance of rations formulation was not only in terms of nutritive value, but also to satisfy of the rumen microorganisms nutrient requirements and hence optimal fermentation conditions to ensure maximal utilization of forage or roughages which should be the main feed components. Demeyer and Van Nevel (1986) showed that microbial-N yields in the rumen may vary between two extremes which were associated with feeding of long roughage or concentrate starch. However, Hoover and Stokes (1991) found that total bacterial population achieved their highest growth on mixture of peptides, amino acids and ammonia (fractions of protein digestion). They added also that carbohydrates are digested by exoenzymes to oligosaccharides that were available for cross feeding by the mixed microbial population, since the rate of carbohydrates digestion is the major factor controlling the energy available for microbial growth.

Moreover, Archimede *et al.* (1997) mentioned that the ruminal digestion of cell wall materials was maximal when the concentrate incorporated in the diet at 30%. The efficiency of microbial synthesis was optimal when the concentrate incorporation level reached 40%. Meanwhile, the mean depression of cellulolysis in the rumen was higher (-13 points) with rapidly degraded starch than that (-7 points) with slowly degradable starch.

Russell *et al.* (1992) stated that microbial yield was decreased when forage NDF was <20%. In case of structural carbohydrate (SC), bacteria can utilize only NH_3 as N source, but in case of non-structural carbohydrate (NSC) bacteria can utilize either NH_3 or peptides. The yield of NSC bacteria is enhanced by as much as 18.7% when proteins or peptides are available and produce less NH_3 when carbohydrate fermentation rate is rapid. Ammonia production rates are moderated by the rate of peptide and amino acids uptake, although 34% of its production is insensitive to the rate of carbohydrate fermentation.

The digestibility of dietary protein influences both the availability of N for rumen microbes and the amount of dietary protein subsequently made available for potential digestion in the small intestine. Peptides and amino acids can pass out of the rumen if the rate of proteolysis is faster than the rate of peptide utilization (Russell *et al.*, 1992). Thus the need to increase the supply of rumen undegradable protein to duodenum of animals is well recognized. Moreover, because microorganisms degrade much of the dietary protein to NH_3 and VFA (Annison, 1956), so that efforts have been made to make high quality protein directly available without microbial modification, e.g. formaldehyde treatment as discussed and reviewed by El-Shabrawy (1996 and 2000).

This study aimed to examine the effect of supplementing BH and / or WCS with CFM either untreated or treated with formaldehyde on digestibility, fermentation parameters and some rumen bacterial growth and their activities in the rumen liquor of sheep.

MATERIALS AND METHODS

The current investigation was carried out at El-Serw Experimental Station, Animal Production Research Institute, Agricultural Research Center. Ministry of Agriculture, Egypt. A 2 x 2 factorial experiment was designed to investigate the effect of two sources of roughage (berseem hay "BH" and whole corn silage "WCS") and concentrate feed mixture (CFM) either treated with formaldehyde (to protect its protein against microbial degradation; undegradable intake protein "UDIP") or without treatment (degraded intake protein, "DIP") on some fermentation characteristics as well as some bacterial activities in the rumen of sheep. Three mature Rahmani rams with an average live body weight of 50 Kg were assigned for each of four experimental rations which were formulated at the level of 60% concentrate + 40% roughage, as follows:

1. Untreated concentrate feed mixture + berseem hay (U-CFM + BH).
2. Formaldehyde treated CFM + BH (F-CFM + BH).
3. Untreated concentrate feed mixture + whole corn silage (U-CFM+WCS).
4. Formaldehyde treated CFM + whole corn silage (F-CFM+WCS).

For protection treatment, ground CFM (12 mm, particle size) was sprayed with commercial formaline solution (40%) at the rate of 1 gm HCHO/100 gm CP (w/w) according to Ferguson *et al.* (1967).

The *ad lib* intake of the experimental diets was determined by the animals; one month before the commencement of the trials. The animals were offered 85% of their ad lib intake during the experimental period (30 days) to avoid any refusals and to ensure constant roughage : concentrate ratio. The first 21 days were cosidered as an adaptaion preliminary period followed by 7 days for quantitative collection of feces and urine using metabolic cages. Feeds were introduced to the experimental animals at 800 a.m. and 1600 p.m. Animals had free access for fresh water.

Representative samples of WCS after drying at 60 C° for 48 hours in forced air oven, berseem hay and CFM as well as feces samples were ground through a 1-mm screen hummer mill and analyzed for DM, CP, CF, EE and ash according to the AOAC (1990).

During the last two days, rumen liquor samples (RL) were taken after each collection period of the digestibility trials at 0, 2, 4, 6 and 8 hrs post-feeding. The collected RL (50 ml) was taken via stomach tube from each animal, used immediately for pH measurements using a digital pH-meter. Each filtered RL sample was divided into two sub-samples. One sub-sample was kept at 4°C till it was used for measuring NH_3-N concentrations according to Conway and O'Malley (1942), and VFA concentrations according to Abou Akkada and El-Shazly (1964).

The rest part of filtered RL was used for determination of Gas length measured by a ruler after incubating the samples at 39°C according to the Vaspar broth method (West and Wilkins, 1980). Bacterial cell density at 600 nm in 1 cm cell using Spekol spectrophotometer was measured. Direct bacterial count using breed slide techniques as described by Collins and Lyne (1985) carried out. Cellulase activity using 3 x 1 cm diameter pieces (25 mg) of filter paper No. 1 according to the method outlined by Gadgil *et al.* (1995); Amylase activity using 1% soluble starch solution according to Kochhar and Dua (1990) and Proteolytic activity by quantitative assay of proteinase activity was carried out according to the modified casein digestion method described by Lupin *et al.* (1982).

Results were statistically analysed according to a 2 X 2 factorial design (Gomez and Gomez, 1984). Means were compared according to Duncan's Multiple Range Test at 0.05 level (Duncan, 1955). Computations were made using SAS computer program package (SAS, 1994).

RESULTS AND DISCUSSION

The chemical composition of ingredients and the calculated composition of the tested rations are shown in Table (1).
The results revealed that the values were within the normal ranges previously published in Egypt for both BH and CFM. (El-Ayouty, 1991; El-Ayek, 1996, El-Shabrawy, 2000 and El-Deeb, 2001). Mixing CFM either with BH or WCS produced iso-nitrogenous and iso-caloric rations despite the differences in DM, CP, CF and NFE% of WCS compared to the other ingredients. This is mainly due to the relatively low contribution of the roughage and to the inclusion of CFM either treated or untreated had improved the level of these constituents in the four tested rations.

Data in Table (2) showed that there were no significant differences in the digestibility coefficients of all nutrients among the four experimental rations (the interaction of roughage's source and protection method). These results came on line with those obtained by Christensen *et al.* (1994); Krastanova *et al.* (1995); El-Shabrawy (1996); Mabjeesh *et al.* (1997) and El-Shabrawy (2000). They reported that protection of dietary protein led to non-significant effect on nutrients digestibility with different sources of feedstuffs and protection methods. However, the source of roughage significantly ($P<0.05$) affected the digestibility coefficients of both OM and NFE, since it was higher in WCS than in BH diets. Moreover, the CP digestibility was significantly ($P<0.05$) increased with using the F-CFM diets. On the same line, Klusmeyer *et al.* (1990) and Atwal *et al.* (1995) found that digestibility of CP were decreased from 7.0 to 8.2 and 6.0 to 9.8 percentage unit when they chemically (casein protection) treated SBM.

Regarding the nutritive value of the experimental rations (Table 2), the results of the interaction effect of roughage source and protection method (the four tested rations), indicated that there were no significant differences among them in TDN, DCP, DE and ME. Moreover, it is clear that BH diets were superior ($P<0.05$) in DCP%, while WCS diets were significantly ($P<0.05$) higher in DE and ME. The treatment with formaldehyde of CFM significantly ($P<0.05$) increased the DCP% of the diets contained F-CFM compared to those contained the U-CFM (10.43 vs. 9.92%). The higher nutritive value of WCS than BH rations could be a reflection for its high content of digestible OM and NFE. On the other hand, the reverse was true for DCP%, since it was higher in BH rations and with F-CFM. This could be explained by the increase in the favourable N source for rumen microbes beside the reduced dietary energy escaping ruminal degradation. These results are in harmony with the findings of El-Shabrawy (2000).

Data in Table (3) reveals the NB of the experimental animals. Although there were significant differences in digested, fecal and urinary N of animals received, either BH or WCS, the NB values of the four tested rations were positive without significant differences in terms of NB, NB/NI %, NB/ND %, NB/100 gm TDN intake and NB/100 gm DOM. These results came on line with those obtained by Ead (1999); El-Ayek (1996); Maklad and Mohamed (2000) and El-Deeb (2001). They reported higher values of NB with sheep fed BH when its proportion in the diet increased. On the other side, formaldehyde treatment of CFM increased ($P<0.05$) the values of NB parameters in animals received F-CFM than those received U-CFM rations.

The fermentation characteristics in terms of pH, NH_3-N concentrations as well as total volatile fatty acids concentrations as affected by dietary treatments are presented in Table (4). Values obtained of these parameters showed that there were no significant differences among the tested rations. Likewise, the same effect was noticed for formaldehyde treatment of CFM. Similar trend was also observed by Chunningham *et al.* (1993) who found that ruminal pH values was unaffected in dairy cows fed basal alfalfa silage plus RUP supplement (6.16) as compared to those fed without rumen undegraded protein "RUP" (6.21). These results are also in harmony with the findings of Kim *et al.* (1992); Tice *et al.* (1993); Cunningham *et al.* (1996); Baker *et al.* (1996) and El-Shabrawy (2000). They did not detect any effect for protein protection on ruminal pH values and VFA concentrations. The pH values reported in the current trial are within the normal range (6-7) for maximal proteolytic activity (Abou Akkada and Blackburn, 1963) and celluololytic activity (Hungate, 1966).

As for NH_3-N concentrations, it was significantly ($P<0.05$) decreased when CFM was treated with formaldehyde. This reduction of about 20.3% in NH_3-N concentrations obtained with rations contained F-CFM agreed with the results of Keery and Amos (1993); Krastanova *et al.* (1995); Stanford *et al.* (1995); Wu *et al.* (1997) and El-Shabrawy (2000). The protection of dietary protein in diets for dairy cows led to a reduction of 25 to 45% (Rodriguez *et al.*, 1997) and 32% (Cunningham *et al.*, 1996) in ruminal NH_3-N concentrations, in similar studies with dairy cows fed diets high in RUP. Regarding the source of roughage effect on fermentation process results, it was clear that BH recorded the highest ($P<0.05$) values either for pH or NH_3-N concentrations, while it gave the lowest ($P<0.05$) values of total volatile fatty acids compared to that obtained when WCS rations were fed. The pH values and VFA concentrations were not significantly different among 2, 4 and 6 hrs of sampling, while such difference was significant ($P<0.05$) before feeding compared to that obtained after feeding. The reduction in pH values with advancing sampling time post feeding was mainly due to increased fermentation after feeding. These results agree with those recorded by Vagnoni and Broderick (1997); El-Shabrawy. (2000) and El-Deeb (2001). The NH_3-N concentrations did not show any significant differences due to sampling times. But the obtained values in this study were, generally, higher than those recorded by Mehrez *et al.* (1977), being 23.5 mg/100 ml RL for maximum rate of fermentation of whole concentrate diets; 15 mg/100 ml RL, Alvarez *et al.* (1983) necessary for maximal rate of fermentation of whole roughage diets; and El-Shabrawy (2000), being 17.54 mg/100 ml RL for better fermentation rate. However, Mehrez (1992) reported that the optimal NH_3-N concentration for maximal rates of fermentation of feeds in the rumen varies with R:C ratios, being lower with increasing roughage proportion in the diet.

In general, the fermentation process's parameters characteristics indicated quite clearly that the pattern of NH_3-N and total VFA concentrations followed the reverse trend to that with obtained pH values at all sampling times and reflect the pattern of fermentation in the rumen as revealed by Shafie and Ashour (1997).

Data in Table (5) shows that there were no significant differences among the four tested rations in the bacterial growth and activities in terms of gas length, optical density, total bacterial counts, amylolytic, proteolytic and cellulolytic enzymes. On the other hand, the source of roughage showed significant ($P<0.05$) effects on all the above mentioned parameters. The BH based rations showed higher values in gas length, optical density, amylolytic and proteolytic activities, while WCS based rations were superior in total bacterial counts and cellulolytic activity values. In this concern, Harrison *et al.* (1988) used cows fed 40% corn silage and 60% concentrate (DM basis) had found that, the concentrations of anaerobic as well as cellulolytic bacteria tended to be high. Total viable bacterial concentrations tended to decrease with decreasing diets degradable protein intake from 70 to 50%, inducing a decline in total VFA production (Mansfield *et al.*, 1994).

Data in Table (5) indicated that formaldehyde treatment for CFM did not show considerable effects either in optical density or proteolytic activity. Meanwhile, the untreated CFM recorded higher ($P<0.05$) values in gas length, total bacterial count, amylolytic and cellulolytic activities compared to formaldehyde treated CFM.

In addition, the higher NH_3-N values were associated with feeding U-CFM than that of treated CFM (31.41 vs. 25.04, Table 4) but without significant difference in VFA concentrations (Table 4) and proteolytic activity (Table 5). In this concern, Russell *et al.* (1992) mentioned that some rumen bacteria can utilize only NH_3 as a N source in case of structural carbohydrate, but in case of non structural carbohydrate (NSC) bacteria can utilize either ammonia or peptides. The yield of NSC bacteria is enhanced by as much as 18.7% when proteins or peptides are available. The ammonia produced by NSC bacteria is less when carbohydrate fermentation rate (bacterial growth) is rapid, but 34% of the produced NH_3 is insensitive to the rate of carbohydrate fermentation.

All investigated parameters of the tested bacterial growth and enzymatic activities (Table 5) were significantly ($P<0.05$) affected by sampling time after feeding. The data showed that amylolytic and cellulolytic activities reached its peak after 6 hrs of feeding, while the highest values for other tested criteria were achieved after 8 hrs post feeding. Similar trends were obtained by El-Fadaly *et al.* (2001) who found that the highest ($P<0.05$) enzymatic activities were found to be proteolytic followed by those of cellulolytic and amylolytic activities, respectively.

According to the fore-mentioned results it could be concluded that, although TBC and cellulolytic activity were significantly higher in WCS rations than those recorded with BH rations, the inclusion of F-CFM in the diets of sheep tended to decrease the amylolytic, proteolytic and cellulolytic bacteria activities as well as their growth indicators compared to U-CFM, in general. On the other hand, diets contained BH were higher in GL and OD values as well as amylolytic and proteolytic activities with higher pH values and NH_3-N concentrations. So, the study recommended that formulating rations with high available carbohydrate content needs to protect its dietary protein against degradation in the rumen for better fermentation and maximal utilization.

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Table (1): The chemical composition of the tested feed ingredients and their formulated tested rations.

Items	DM (%)	Chemical composition (on DM basis, %)						
		OM	CP	EE	CF	NFE	Ash	GE**
Ingredients								
U-CFM*	90.56	91.88	16.82	2.78	10.65	61.63	8.12	17.88
F-CFM*	88.07	91.92	16.90	2.82	10.43	61.77	8.08	17.90
Berseem hay, BH	88.87	87.83	13.89	2.48	26.52	44.94	12.17	17.19
Whole corn silage, WCS	26.66	91.83	7.31	2.16	26.56	55.80	8.17	17.51
Calculated chemical composition of the formulated experimental rations								
60% U-CFM + 40% BH	89.89	90.27	15.65	2.66	17.00	54.96	9.74	17.61
60% F-CFM + 40% BH	88.39	90.29	15.70	2.68	16.87	55.04	9.72	17.62
60% U-CFM + 40% WCS	65.00	91.85	13.01	2.53	17.01	59.30	8.14	17.73
60% F-CFM + 40% WCS	63.50	91.87	13.06	2.55	16.88	59.38	8.12	17.74

* U-CFM, untreated concentrate feed mixture (22% yellow corn, 26% wheat bran, 32% undecorticated cotton seed meal, 5% linseed meal, 9% rice bran, 3% molasses, 2% limestone and 1% sodium chloride); F-CFM formaldehyde treated concentrate feed mixture.

** GE = Gross energy, calculated according to MAFF (1975) using the following equation:
GE (MJ/Kg DM) = 0.0226 CP + 0.0407 EE + 0.0192 CF + 0.0177 NFE.

Table (2): Effect of roughage type and formaldehyde treatment on nutrient digestibility coefficients and nutritive values of the experimental rations fed to sheep.

Items	Rations				Roughage source		Protection method	
	U-FM+BH	F-CFM +BH	U-CFM +WCS	F-CFM +WCS	BH	WCS	U-CFM	F-CFM
Digestibility coefficients (% DM basis)								
DM	57.23	60.88	61.19	63.54	59.05	62.37	59.21.	62.21
OM	59.10	63.18	63.79	65.94	61.14[b]	64.86[a]	61.44	64.56
CP	63.50	67.09	62.60	64.82	65.29	63.71	63.05[b]	65.96[a]
EE	67.39	81.49	89.04	73.90	74.44	81.47	78.21	77.69
CF	43.31	46.80	46.88	50.11	45.05	48.49	45.09	48.45
NFE	62.30	66.26	67.83	70.34	64.28[b]	69.09[a]	65.07	68.30
Nutritive values (% DM basis)								
TDN, %	57.34	61.70	61.41	62.94	59.52	62.17	59.37	62.32
DCP, %	11.70	12.39	8.14	8.47	12.04[a]	8.30[b]	9.92[b]	10.43[a]
DE, MJ/Kg DM	10.13	10.83	11.13	11.51	10.48[b]	11.32[a]	10.63	11.17
ME, MJ/Kg DM	8.31	8.88	9.13	9.44	8.59[b]	9.28[a]	8.72	9.16

Values have no superscripts are not significantly differ at P<0.05.
a,b: Values in the same row of roughage source or protection method having different superscripts significantly differ at P<0.05.

Table (3): Effect of roughage type and formaldehyde treatment of CFM on nitrogen balance in sheep fed the experimental rations.

Items	Rations				Roughage source		Protection method	
	U-CFM +BH	F-CFM +BH	U-CFM +WCS	F-CFM +WCS	BH	WCS	U-CFM	F-CFM
N-Intake, NI (g)	40.06	40.18	33.32	33.44	-	-	-	-
Fecal N (g)	15.08	13.63	12.54	11.76	14.35[a]	12.15[b]	13.81	12.69
Urinary N (g)	17.07	16.61	14.28	12.04	16.84[a]	13.16[b]	15.67	14.33
N Balance, NB	7.92	9.94	6.50	9.64	8.93	8.07	7.21[b]	9.79[a]
N-Digested, ND	25.44	26.96	20.86	21.68	26.20[a]	21.27[b]	23.15[b]	24.32[a]
NB/NI %	19.76	24.75	19.52	28.82	22.25	24.17	19.64[b]	26.78[a]
NB/ND %	31.03	36.72	31.20	44.38	33.88	37.79	31.12[b]	40.55[a]
NB/100 gm TDNI	0.14	0.16	0.11	0.15	0.15	0.13	0.12[b]	0.16[a]
NB/100 gm DOM	0.13	0.16	0.10	0.15	0.14	0.12	0.12[b]	0.15[a]

Values have no superscripts are not significantly differ at P<0.05.
a,b: Values in the same row of roughage source or protection method having different superscripts significantly differ at P<0.05.

Table (4): Effect of roughage type and formaldehyde treatment of concentrate feed mixture on some rumen liquor parameters of the experimental rations.

Items		pH values	NH_3-N conc. (mg/100 ml RL)	VFA conc. (meq./100 ml RL)
Treatment effect:				
U-CFM + BH		6.53	33.73	8.22
F-CFM + BH		6.52	28.24	8.48
U-CFM + WCS		6.24	29.09	10.02
F-CFM + WCS		6.29	21.84	9.96
Roughage source:				
BH		6.52^a	30.98^a	8.35^b
WCS		6.26^b	25.46^b	9.99^a
Protection treatment:				
U-CFM		6.38	31.41^a	9.12
F-CFM		6.40	25.04^b	9.22
Sampling times (hrs):				
Before feeding,	0	6.74^a	27.81	8.45^c
After feeding:				
	2	6.24^c	29.58	9.51^a
	4	6.27^c	28.54	9.67^a
	6	6.28^c	27.95	9.38^a
	8	6.42^b	27.25	8.84^c

Values have no superscripts are not significantly differ at $P<0.05$.
a,b: Values in the same column of each category having different superscripts significantly differ at $P<0.05$.

Table (5): Effect of roughage type and formaldehyde treatment of concentrate feed mixture on some bacterial growth and activities in the rumen of sheep.

Items	Gas length	Optical density	Total bacterial count	Amylolytic	Proteolytic	Cellulolytic
Treatment effect:						
U-CFM + BH	6.17±0.71	0.54±0.05	52.33±4.16	49.01	112.81	59.68
F-CFM + BH	5.80±0.55	0.59±0.06	33.00±4.19	34.73	105.85	55.79
U-CFM + WCS	3.46±0.34	0.43±0.03	53.33±3.30	41.71	53.33	67.08
F-CFM + WCS	3.25±0.38	0.40±0.04	54.00±3.01	36.41	48.05	63.22
Roughage source:						
BH	$5.98±0.44^a$	$0.56±0.04^a$	$42.67±3.41^b$	$41.87±2.44^a$	$109.33±9.93^a$	$57.74±2.21^b$
WCS	$3.55±0.25^b$	$0.41±0.02^b$	$53.17±2.20^a$	$39.06±1.68^b$	$50.69±2.00^b$	$65.15±2.64^a$
Protection treatment:						
U-CFM	$4.81±0.46^a$	0.48±0.03	$53.33±2.61^a$	45.36^a	83.07	63.38^a
F-CFM	$4.52±0.41^b$	0.49±0.04	$43.50±3.20^b$	35.57^b	76.95	59.51^b
Sampling times (hrs):						
Before feeding, 0	$2.12±0.22^E$	$0.23±0.02^c$	$32.92±3.61^c$	25.98^E	36.17^E	43.95^E
After feeding:						
2	$3.35±0.29^D$	$0.39±0.02^b$	$35.83±3.73^c$	34.79^D	57.08^D	52.39^D
4	$4.59±0.41^c$	$0.57±0.05^a$	$47.08±3.28^b$	43.04^C	84.93^C	63.93^C
6	$6.11±0.54^b$	$0.62±0.04^a$	$60.00±3.37^a$	52.24^a	100.15^b	77.16^a
8	$7.17±0.64^a$	$0.62±0.02^a$	$63.75±1.52^a$	46.27^b	121.72^a	69.78^b

Values have no superscripts are not significantly differ at $P<0.05$.
a,b: Values in the same column within each categeory having different superscripts significantly differ at $P<0.05$.

تأثير معاملة العلف المركز بالفورمالهيد ومصدر العلف الخشن على قياسات التخمر وبعض الأنشطة البكتيرية فى كرش الأغنام

حسين عبد الله الفضالى[1] – حامد محمد الشبراوى[2] – محمد محمد الديب[2] – احمد زكي محرز[3]

1- قسم الميكروبيولوجى – كلية الزراعة جامعة المنصورة
2- قسم تغذية الحيوان- معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية-الجيزة- مصر
3- قسم إنتاج الحيوان- كلية الزراعة – جامعة المنصورة

أجريت هذه الدراسة فى محطة بحوث الإنتاج الحيواني بالسرو – معهد بحوث الإنتاج الحيواني- وزارة الزراعة – مصر وقسم الميكروبيولوجى- كلية الزراعة- جامعة المنصورة0 تهدف هذه الدراسة الى معرفة تأثير معاملة بروتين العلف المركز بالفورمالدهيد (بغرض حمايته من التكسير فى الكرش) وكذلك مصدر العلف الخشن على خصائص التخمر وبعض أنشطة البكتريا فى كرش الأغنام 0 أجريت أربع تجارب تمثيل غذائي على ثلاثة كباش رحماني (متوسط الوزن الحي 50 كيلو جرام) فى تصميم عاملي 2×2 اشتمل على بروتين مخلوط علف مركز معامل بالفورمالدهيد وغير المعامل ، ومصدرين من العلف الخشن وهما دريس البرسيم المصري، وسيلاج الاذرة الكامل ، وقد تم تغذية الكباش على مستوى 85% من مستوى الشبع وكان مخلوط العلائق المختبرة على النحو التالى:-

1- 60% مخلوط علف مركز غير معامل + 40% دريس البرسيم
2- 60% مخلوط علف مركز معامل بالفورمالدهيد + 40% دريس البرسيم
3- 60% مخلوط علف مركز غير معامل + 40% سيلاج الاذرة
4- 60% مخلوط علف مركز معامل بالفورمالدهيد + 40% سيلاج الاذرة

وخلصت النتائج المتحصل عليها إلى:

1- زيادة معاملات هضم المادة العضوية، المستخلص خالى الأزوت وكذلك القيمة الغذائية ممثلة فى الطاقة المهضومة، والطاقة الممثلة للعلائق المحتوية على سيلاج الاذرة بالمقارنة بالعلائق المحتوية على دريس البرسيم

2- زيادة معاملات هضم البروتين ، وكذلك قيم البروتين الخام المهضوم، وميزان الأزوت فى العليقة المحتوية على علف مركز معامل بالفورمالدهيد بالمقارنة بالعليقة المحتوية على علف مركز غير معامل

3- زيادة قيم اللوغارتم السالب لتركيز ايون الهيدروجين وكذلك نيتروجين الامونيا في سائل الكرش (بمستوى5%) على العلائق المحتوية على دريس البرسيم بالمقارنة بالعلائق المحتوية على سيلاج الاذرة

4- انخفاض معنوى (بمستوى 5%) فى قيم تركيز نيتروجين امونيا الكرش على العلائق المحتوية على علف مركز معامل بالفورمالدهيد بالمقارنة بالعلائق غير المعاملة.

5- أدت المعاملة بالفومالدهيد الى انخفاض معنوي (بمستوى 5%) فى حجم الغاز الناتج عن التخمر، التعداد البكتيري الكلى، النشاط الانزيمى للسليوليز والأميليز ، بينما لم يحدث تأثير فى الكثافة الميكروبية والنشاط الانزيمى للبروتينيز سواء فى العلف المركز المعامل او غير المعامل.

6- سجلت العلائق المحتوية على دريس البرسيم ارتفاع معنوى (بمستوى 5%) فى قيم حجم الغاز الناتج عن التخمر ، الكثافة الميكروبية ، النشاط الانزيمى للبروتينيز والاميليز بينما العلائق المحتوية على سيلاج الاذرة سجلت تفوق فى التعداد البكتيرى و النشاط الانزيمى للسليوليز.

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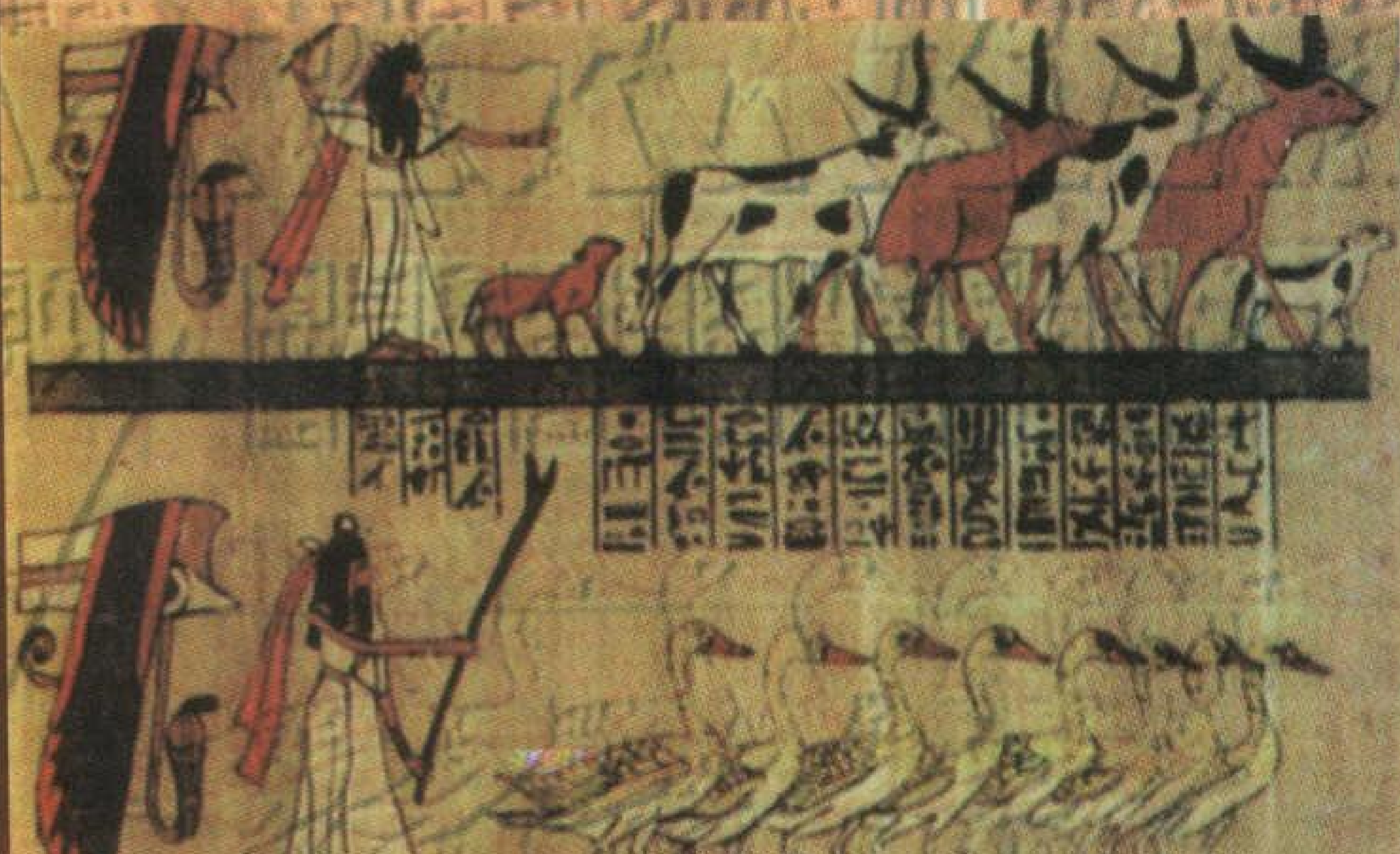

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