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EFFECT OF FEEDING DIETS BASED ON MAIZE STOVER SILAGE TREATED WITH MOLASSES OR / AND UREA ON THE NUTRITIVE VALUES, RUMINAL FERMENTATION AND SOME BLOOD PARAMETARS BY SHEEP.

Maklad, Eman H.M.[1]; A. M. Abdel-Khabir[2]; H. M. El-Shabrawy[2]; K.M. Sharaf[2] and S.A. El-Ayouty[1] .

1- Animal Production Dept. Fac. of Agric. Mansoura University, Egypt.

2- Animal Production Res. Inst. Agric. Res.Center, Dokki, Giza, Egypt.

ABSTRACT

Five experimental rations were nutritionally evaluated in a 5x5 Latin square design with five Rahmani rams with an average live body weight (LBW) of 69.60±2.03kg. The five rations were formulated to contain at least 13% CP as a follow:

R1: 77.62% maize stover silage (**MSS**) not treated+10.07% com grains (C)+10.36% sugar beet pulp (SBP)+1.95% urea (U) as supplemented.

R2: 77.88% MSS treated with 2% molasses (**MSSM**) + 9.95% (C)+ 10.24% (SBP) + 1.93% (U) as supplemented.

R3: 79.67% MSS treated with 1% urea (**MSSU**)+ 10.02% (C)+ 10.31% (SBP).

R4: 79.52% % MSS treated with 2% molasses and 1% urea (**MSSMU**) + 10.1% (C) + 10.38% (SBP).

R5: 80.97%: maize silage (**MS**) not treated + 8.56% (C) + 8.81% (SBP)+ 1.66% (U) as supplemented.

The results obtained showed that the apparent digestibility of dry matter (DM), organic matter (OM) and neutral detergent fiber (NFE) were significantly (P<0.05) higher with R5 than other rations. The crude fiber (CF) digestibility was higher (P<0.05) when feeding R1 than R5 (62.37 vs. 46.29% respectively). The NDF digestibility was higher (P<0.05) when feeding R1 or R3 or R5 (55.68, 54.58 and 60.42% respectively) than with R2 or R4 (46.71 and 51.76% respectively). Cellulose (Cell.) digestibility was higher (P<0.05) when feeding R5 (70.89%) than with R2 (45.54%) or R4 (52.07%). The acid detergent lignin (ADL) digestibility was higher (P<0.05) 50.74% when feeding R5 than with R1 or R2 or R3 and R4 (33.07, 41.50, 40.30 and 26.73% respectively). The ADL digestibility decreased significantly (P<0.05) with R4 compared with other rations. The non fiberous carbohydrates (NFC) digestibility was higher (P<0.05) with R5 than with other tested rations. The total digestible nutrients (TDN%) was increased (P<0.05) when feeding R5 ration (75.43%) compared with R1, R2, R3 and R4 (61.66, 63.28, 62.68 and 59.99%, respectively). The digestible crude protein (DCP%) was higher (P<0.05) when feeding R3 or R4 (11.29 and 11.33% respectively) than with R1or R2 (9.7 and 10.03% respectively). The TDN/CP ratio and the metabolizable energy (ME Mcal/kg) of R5 were higher (P<0.05) than with other tested ones. The DCPI g/MEI Mcal/kg values were 56.66, 57.7, 65.08, 67.54 and 58.34 when for R1, R2, R3, R4 and R5 rations, respectively. The main pH values were higher (P<0.05) when feeding R1 or R2 or R3 and R4 than with R5 (6.85, 6.87, 6.89, 6.82 and 6.71, respectively). The mean effective neutral detergent fiber (eNDF%), total volatile fatty acids (TVFA's), ammonia nitrogen (NH_3-N) and blood parameters were in the normal range except for urea concentration which were higher than the recommended value with R3 and R4.

Keywords: Sheep, maize stover silage, molasses, urea.

INTRODUCTION

The total area planted with maize crop are about 2million Fadden. The main part utilized is the grains which are used in concentrate feeding of animals and interred in food industries. However, during resent years in Egypt the whole maize plant are utilized for making maize silage which is widely used in large specialized dairy farms as the main forage. Not only the large farms but also small holder farmers are actively engaged in maize silage making. Although this trend has positive effects on milk production and other animal productivities, it has a serious negative effect on the production of maize grains. The problem has been sharpened during 2007 as the prices of all grains had been jumped to very hay levels. In the recent varieties of maize, the grains retch to maturity while the plant is still green (maize stover). The maize stover is ensiled successfully although without any addition (Bendary et al., 2001). However, its silage is poorer than whole maize silage in protein and energy in addition to lower digestibility. The maize stover silage is suitable for feeding herd replacement animals.

To compensate for the removal of grains form the plant before ensilage, many economic additives have applied to the stover before ensilage. These additives include nitrogen sources to enrich the silage like urea or ammonia, energy rich materials like molasses acids or bacterial inoculants.

The main objective of this study was to evaluate the maize stover made the urea and /or molasses in a digestion and metabolism trials on sheep.

MATERIALS AND METHODS

The experimental work of present study was conducted at El-Serw Experimental Research Station (Damietta Governorate), belonging to the Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture. The chemical analysis was run at the laboratories of Animal Production Department, Faculty of Agricultural, Mansoura University and the Animal Production Research Institute, Dokki, Giza.

The maize hybrid was harvested at the dough stage. One part of the whole maize plant (about 800 kg) was used for making the whole maize plant silage (MS) where as the another part (about 3.2 tons) was utilized for making stover maize silage (MSS) after separation of the ears from the plant. The whole maize plant or the stover were mechanically chopped using Holland harvester machine to 2-3 cm. The whole maize plant was ensiled without any addition. One portion of maize stover was ensiled without any treated (**MSS**). Three other types of maize stover silages were made from maize stover, the first portion: was treated with 2% molasses of the fresh matter (**MSSM**). The second portion: was treated with 1% urea of the fresh matter (**MSSU**). The third portion: was treated with molasses (2%) and urea (1%) of the fresh matter (**MSSMU**).

All the silages were made in double layer plastic bags. Each bag contained 100 kg fresh materials pressed manually and sealed tightly to exclude air.

Animals :

Five mature Rahamani rams with an average body weight (BW) Of 69.6 ± 2,03 kg were utilized in a Latin square design to determine intake of five rations based on the previously made silages.

Diets:

The different types of silages : **MSS**, **MSSM**, **MSSU**, **MSSMU** and **MS** were entered as the basic feeds in formulation of 5 rations and were tested in intake and digestibility trials. The composition of the rations are given in Table (2). The five experimental rations were formulated as a follow:

R1: 77.62% maize stover silage (**MSS**) not treated+10.07% corn grains (C)+10.36% sugar beet pulp (SBP)+1.95% urea (U) as supplemented.

R2: 77.88% MSS treated with 2% molasses (**MSSM**) + 9.95% (C)+ 10.24% (SBP) + 1.93% (U) as supplemented.

R3: 79.67% MSS treated with 1% urea (**MSSU**)+ 10.02% (C)+ 10.31% (SBP).

R4: 79.52% % MSS treated with 2% molasses and 1% urea (**MSSMU**) + 10.1% (C) + 10.38% (SBP).

R5: 80.97%: maize silage (**MS**) not treated + 8.56% (C) + 8.81% (SBP)+ 1.66% (U) as supplemented.

The animals were kept in individual pens for 21 days, as primary period in which the rations were offered *ad libitum* to adjust the animals on feed and determination of feed intake during the last week of this period. After this period the animals were raised to the metabolic cages for 14 days: the first 7 days as adaptation to the metabolic cages and the last 7 days as collection period. The animals were given 90% of their *ad libitum* intake during their presence of them in metabolic cages.

Total fecal collection was carried during the collection period.

Sampling and methods of analysis:

Composite samples of the tested feedstuffs and feces were taken for proximate chemical analysis. All the samples were analyzed for dry matter, crude protein, crude fiber, ether extract and ash according to the methods outlined by A.O.A.C. (1995) The samples of feedstuffs and feces were analyzed for fiber fractions including neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) according to Goering and Van Soest procedures (1970). Cellulose and hemicellulose were calculated by difference (cellulose= ADF- ADL and hemicellulose=NDF – ADF).

Rumen fluid samples were taken from the animals during the last two days of digestion trial collection. The ruminal samples were collected just before offering the morning feeding (0 time) and at 2, 4, 6 and 8 hours post feeding. The ruminal samples were taken by rubber stomach tube using gentle mouth suction. The samples were filtered through 3 layers of cheese cloth and to determine pH immediately using Orion 680 pH meter, total volatile fatty acids (TVFA´s) by the method of Warner,1964 and ammonia nitrogen (NH3-N) according to Conway,1957.

Blood samples were collected from the jugular vein of all the animals in heparin zed tubes at 0 and 2 hours after morning feeding during the last day of the digestion trials. The blood parameters were determined by using commercial kits (Diamond Diagnostics). Hemoglobin was determined in the whole blood then the rest of the samples were centrifuged at 4000 rpm for 20 minutes. Part of the separated plasma were utilized in enzyme assays as soon as possible whereas the rest of the plasma samples were frozen at -20 C° till the analysis of glucose (Trinder 1969), total protein (Dumas et al,1981), albumin (Dumas et al,1971) and urea (Freidman et al,1980). Alanine amino transferase (ALT) and aspartate amino transferase (AST) were assayed as described by Reitman and Frankel (1957).

The statistical analysis was performed using the least squares method by likelihoodn program of SAS (2003). The differences among means were carried out according to Duncan's New Multiple Range Test (Duncan,1955).

RESULTS AND DISCUSSION

The result in Table (1) showed that the highest CP% content (17.24 and 16.78) were recorded in (MSSMU) and (MSSU) respectively, the lowest value (7.60%) was in (MSS), while those of (MSSM) and (MS) were fall intermediate. Concerning NDF% content, the highest NDF was found with (MSS), while the lowest value was in (MS) and the other NDF values for (MSSM), (MSSU) and (MSSMU) were immediate. The ADL% (9.19, 10.24, 7.68, 6.29 and 6.04) and NFC% (19.80, 33.45, 20.90, 21.60 and 35.26) of (MS), (MSSM), (MSSU), (MSSMU) and (MS) respectively as shown in Table (1).

Table (1): The chemical composition of the ingredients on DM basis.

Item	C	SBP	MSS	MSSM	MSSU	MSSMU	MS
DM%	85.89	88.31	24.95	24.47	24.86	25.49	27.94
			Composition of DM%:				
OM	98.30	96.25	90.68	91.37	91.39	91.13	93.91
CP	8.70	9.44	7.60	8.47	16.78	17.24	9.02
CF	2.66	22.42	35.26	32.52	24.02	27.81	20.79
EE	2.09	1.65	2.01	2.14	2.26	1.93	3.12
NFE	84.86	62.74	45.82	48.23	48.32	44.15	60.99
Ash	1.70	3.75	9.32	8.63	8.61	8.87	6.09
NDF	17.37	62.40	61.28	47.31	51.45	50.37	46.52
ADF	3.55	27.60	45.32	32.58	35.51	38.18	36.49
Hemi.*	13.82	34.80	15.96	14.73	15.94	.12.19	10.04
Cell.**	2.14	24.70	36.13	22.34	27.83	31.89	30.45
ADL	1.41	2.90	9.19	10.24	7.68	6.29	6.04
NFC***	70.15	22.76	19.80	33.45	20.90	21.60	35.26

C: yellow corn; SBP: Sugar Beet Pulp; MSS: maize stover silage; MSSM: maize stover silage treated with Molasses; MSSU: maize stover silage treated with Urea; MSSMU: maize stover silage treated with Molasses and Urea; MS: maize silage.
***Hemicellulose= NDF-ADF**
**** Cellulose=ADF-ADL**
*****Non fiberous carbohydrates (NFC%) =OM%- (CP%+NDF%+EE%), Calsmiglia *et al.*, 1995.**

As shown in Table (1), the tested ingredients and silages were chosen to represent the (MS) or (MSS) which vary in the fiber fractions and the supplements to represent high plant starch (C), high fiber fermentation (SBP), high N content (U) and high fermentable carbohydrates (mol). With the objective of increasing the use of silages, five tested rations were formulated to contain almost 78-81%, on DM basis (Table, 2).

Satter and Slyter (1974) concluded that microbial protein yield increased linearly until dietary CP reached about 13% of DM. at that point, microbial protein outflow from the fermenters stopped increasing while ammonia begin to climb rapidly. However, Gressley (2005) recently reported that increasing dietary CP from 13.5 to 16.1% by adding urea to a diet based on corn and corn silage had no effect on yield of milk and milk components in lactating dairy cows. Also it should be noted that in situ digestion of soy hull NDF was increased and there was a trend for elevated urinary excretion of purine derivatives (an indicator of microbial growth in the rumen) with urea supplementation (Gressley, 2005).

Molasses and number of other by product feeds can serve as economical sugar sources. Corn starch was replaced with sucrose (Broderick *et al.,* 2000), or dried molasses or liquid molasses (Broderick and Radloff, 2004), in which the basal diet contained 2.6% total sugars. The positive production effects of sugar feeding in these trails were at least partly driven by increased feed intake.

The formulation and chemical composition of tested rations are presented in Table (2). The CP content was ranged from 13.31% (R1) to 15.51% (R4). The lowest CF content 18.99% was in R5 while the highest value was in R1 (29.88%), the reveres trend was true in case of NFE content being the highest in R5 and the lowest in R1.

Table (2): Formulation and the chemical composition of total mixed rations.

Item	R1	R2	R3	R4	R5
Yellow Corn%	10.07	9.95	10.02	10.1	8.56
SBP%	10.36	10.24	10.31	10.38	8.81
Silage%	77.62	77.88	79.67	79.52	80.97
Urea%	1.95	1.93	0	0	1.66
Total	100	100	100	100	100
The chemical composition of rations					
DM	29.82	29.19	29.18	30.01	32.25
Composition of DM%:					
OM	90.24	90.80	92.61	92.43	92.90
CP	13.31	13.89	15.19	15.51	13.63
CF	29.88	27.84	21.68	24.61	18.99
EE	1.94	2.04	2.18	1.92	2.84
NFE	45.12	47.02	53.56	50.39	57.43
Ash	9.76	9.20	7.39	7.57	7.10
NDF	55.69	44.94	49.12	48.21	44.61
ADF	38.29	28.51	31.43	33.43	32.18
Hemi.	17.40	16.43	17.70	14.78	12.43
Cell.	30.74	20.12	24.89	28.02	26.93
ADL	7.55	8.39	6.54	5.42	5.25
NFC	24.86	35.39	26.12	26.79	36.58
NFC/CP	1.87	2.55	1.72	1.73	2.68

R1 maize stover silage supplemented with urea.

R2; maize stover silage treated with molasses and supplemented with urea.

R3; maize stover silage treated with urea.

R4; maize stover silage treated with molasses and urea.

R5; maize silage supplemented with urea.

Wheeler (2003) reported that the NFC levels in the total ration dry matter should not fall bellow 20 to 25%, nor go above 40-45%, also rations formulated for 35 to 37% NFC (DM basis) should avoid metabolic disturbances related to feeding high levels of starches in grains and concentrate mixtures.

The chemical composition and the nutritive values of MS and MSS are influenced by several factors including maturity of the plant at harvest, verity of the plant. The additives also affect chemical composition and nutritive value. Our results agree with others (Ahmed et al., 2003), (Mader and Brittan, 1986) and (Maklad and Mohamed, 2000) that the whole MS had more CP, NFE and NFC content lower contents of CF, NDF, ADF and ADL then MSS. The contents of NDF and ADF of MSS were similar to the values formed by Colenbrander et al., (1971) but lower than flues of Mader and Brittan (1986) and Lopez-Guisa et al., (1991).

The MSS made with urea or urea plus molasses had more than double CP than untreated MSS. Crude protein content of the silage was found to increase as the urea amount added before ensilage was increased (Shirley et al., 1972) and (Heinrichs and Conasd 1984).Britt and Huber (1975) found increases in CP of silage as quantities added nitrogen as urea, aqua NH4 or NH4 solution increased. Colenbrander et al., (1971) found that the addition of 0.5% urea increased CP of the MSS from 5.7% to 8% in experiment 1 and from 6.4% to 9.7% in experiment 2.

Although the results of chemical analysis were not analyzed statistically, it was obvious that addition of molasses, urea or both decreased CF content and fiber fractions (NDF, ADF and cellulose). The results are in agreement with Hargreaves et al., (1984) who found that treatment of corn stover before ensilage with 2% NH3 or 2% NH3 plus 2% molasses (as DM basis) decreased NDF, ADF, cellulose, hemicellulose and lignin. Also Berger et al., (1979) found that corn stalkage treated before ensilage with 4% of an additive composed of NaOH and Ca (OH)2 (3:1) had resulted in decreased content of NDF and ADF. Others had not noticed such effect of nitrogen or molasses additives on maize or maize stover silage (Carr et al., 1984, Lopez-Guisa et al., 1991 and Colenbrander et al., 1971).

The apparent digestibility of the rations in addition to intakes and nutritive values are given in Table 3. the MS ration (R5) had higher DM and OM digestibility as compares to stover silages diets (P<0.05). on the other hand there were no significant differences among stover silages diets in DM or OM digestibility. The CF digestibility was higher in MSS than MS diets (62.37 vs. 46.29%, P<0.05); without significant differences among stover diets. Molasses and urea addition to silages treated to lower digestibility of CP and this trend was more obvious when both molasses and urea were added before ensilage. Concerning EE digestibility the MS ration was the highest (85.40%) with significant differences from all the stover diets except that of MSSU diet (R3)76.84%.

Nitrogen free extract (NFE) digestibility was the highest in MS ration (81.65%) with significant differences from all the stover diets. Although the NFE digestibility of the stover diets did not differ significantly. The additions tended to hastier NFE digestibility. The MS diet (R5) had significantly higher digestibility of NDF and ADF than MSSU and MSSMU rations. The NDF digestibility of MSS rations was higher than MSSM (55.68 against 46.71%, P<0.05). The addition of molasses before ensiling (R2 and R4) had negative effects on ADF digestibility in the stover silage diets, although this trend did not reach significant MS diets had digestibility higher digestibility of cellulose than MSSM or MSSUM digest (70.89 against 45.54 or 52.07%, P<0.05). Cellulose digestibility tended to be higher in MSS or MSSU atietls then MSSM o MSSUM diets (59.97 and 62,88 vs, 45.54 and 52.07%)

Table (3): Effect of experimental rations on digestion coefficients, dry matter intake (DMI) and feeding value of the rations.

Item	R1	R2	R3	R4	R5
BW Kg	71.20 ± 2.44	71.60 ± 2.47	70.90 ±2.32	70.80±2.38	70.10±2.36
Digestion Coefficients%					
DM	59.18^{b}±1.48	60.56^{b}±1.27	63.25^{b}±3.28	61.02^{b}±0.99	71.18^{a}±2.02
OM	60.30^{b}±1.71	61.57^{b}±1.47	65.42^{b}±3.15	63.11^{b}±0.99	72.83^{a}±1.87
CP	72.81±0.93	72.23±0.61	74.3±1.95	73.03±0.32	76.42±2.45
CF	62.37^{a}±4.10	58.51^{ab}±3.63	54.94^{ab}±6.58	50.51^{ab}±3.86	46.29^{b}±5.18
EE	69.69^{b}±3.56	74.90^{b}±2.37	76.84^{ab}±4.00	69.05^{b}±2.73	85.04^{a}±0.97
NFE	59.87^{b}±2.34	63.80^{b}±1.71	66.63^{b}±3.67	65.85^{b}±2.67	81.65^{a}±0.93
NDF	55.68^{ab}±2.45	46.71^{c}±1.25	54.58^{abc}±4.18	51.76^{bc}±1.76	60.42^{a}±2.68
ADF	54.66^{bc}±3.41	44.29^{c}±3.67	58.19^{ab}±3.47	47.96^{bc}±4.05	67.60^{a}±2.76
Hemi.	57.55±8.97	50.69±6.39	48.12±5.92	60.34±10.19	41.61±5.41
Cell.	59.97^{abc}±3.80	45.54^{c}±7.29	62.88^{ab}±3.39	52.07^{bc}±4.63	70.89^{a}±3.24
ADL	33.07^{b}±5.15	41.50^{ab}±8.64	40.30^{ab}±6.28	26.73^{c}±3.98	50.74^{a}±4.63
NFC	72.16^{c}±3.85	81.44^{ab}±2.71	77.71^{bc}±2.19	77.40^{bc}±3.29	89.18^{a}±1.25
DMI g/h/d	1279.23±74.59	1294.38±63.05	1285.37±77.97	1275.64±103.96	1504.66±111.29
CPI g/h/d	169.13±5.67	179.09±5.34	195.59±13.09	198.54±17.92	203.58±10.04
TDN%	61.66^{b}±1.83	63.28^{b}±1.36	62.68^{b}±2.99	59.99^{b}±1.02	75.43^{a}±1.81
DCP%	9.70^{b}±0.35	10.03^{b}±0.17	11.29^{a}±0.33	11.33^{a}±0.17	10.43^{ab}±0.49
TDNI g/h/d	788.77^{b}±37.95	819.08^{b}±42.72	805.97^{b}±66.99	765.26^{b}±53.40	1134.97^{a}±82.37
DCPI g/h/d	124.09^{b}±3.69	129.83^{ab}±4.49	145.12^{ab}±11.60	144.53^{ab}±13.59	156.94^{a}±8.20
DCPI g/Kg BW	1.74^{c}±0.04	1.81^{bc}±0.04	2.05^{ab}±0.12	2.04^{ab}±0.15	2.24^{a}±0.08
NFCI g/h/d	318.03^{c}±14.76	458.06^{b}±21.09	335.77^{c}±16.31	341.71^{c}±22.45	550.41^{a}±39.22
DMI g/Kg $w^{0.75}$	52.19^{b}±2.23	52.60^{b}±1.89	52.61^{b}±2.31	52.26^{b}±3.32	62.10^{a}±3.35
TDNI g/Kg $w^{0.75}$	32.18^{b}±1.22	33.28^{b}±1.41	32.99^{b}±2.26	31.35^{b}±1.64	46.84^{a}±2.54
DCPI g/Kg $w^{0.75}$	5.06^{b}±0.10	5.28^{b}±0.11	5.94^{ab}±0.37	5.92^{ab}±0.46	6.48^{a}±0.25
TDN/CP	4.64^{b}±0.11	4.56^{b}±0.13	4.13^{c}±0.20	3.87^{c}±0.11	5.54^{a}±0.16
NFCI/DCPI	2.56^{b}±0.06	3.53^{a}±0.05	2.31^{b}±0.08	2.36^{b}±0.08	3.51^{a}±0.15
ME (Mcal/Kg DM)	2.19^{b}±0.07	2.25^{b}±0.05	2.23^{b}±0.11	2.14^{b}±0.04	2.69^{a}±0.06
ME (Mj/Kg DM)	9.18^{b}±0.27	9.42^{b}±0.20	9.33^{b}±0.45	8.93^{b}±0.15	11.23^{a}±0.27
DCPI g/ME Mcal	56.66±3.04	57.7±2.49	65.08±4.87	67.54±7.13	58.34±2.88
NE (Mcal/Kg)	1.39^{b}±0.04	1.43^{b}±0.03	1.42^{b}±0.07	1.35^{b}±0.02	1.73^{a}±0.04

a, b and c: Means within the same raw with different superscripts or significantly different (P<0.05).

NE (Mcal/Kg) = (TDN% x 0.0245) – 0.12 (NRC, 1985).

The TDN of MS ration was 75.43 which was significantly(P< 0.05) higher than any of the stover rations (61.66, 63.28, 62.68 and 59.99 for R1,R2,R3,and R4,respectively). The DCP % was higher (P<0.05) with urea treated stover silage diets (R3 and R4) than R1 and R2 (11.29 and 11.33 vs.

9.70 and 10.03). the TDN/CP ratio of MS ration as well as metabolizable energy (ME Mcal/kg)compared with the other tested rations.

The DM intakes as g/d and g/kg W0.75 were higher for MS ration as compared to all the stover silage diets ($P<0.05$). The DMI of all stover silge diets were similar. The MS ration resulted also in the highest TDNI (g/d and g/Kg W0.75)with ($P<0.05$) among all the diets, without differences among the stover rations. The DCPI (g/d and g/Kg W0.75)of the MS was higher than MSS ration($P<0.05$).

The DCPI g/MEI Mcal/kg values were 56.66, 57.7, 65.08, 67.54 and 58.34 when feeding R1, R2, R3, R4 and R5, respectively.

Corn silage is commonly fed as a high energy "forage" low in CP and, thus can be fed with highly degradable protein (Dhiman and Satter, 1997). Soluble starch remained in the rumen two to three times as long as did glucose, the greatest utilization of protein in the rumen occurred when carbohydrate was present that could be fermented at a comparable rate to the protein. Supplementing silage with a source of readily available energy has been found to reduce ruminal ammonia concentration (Charmly *et al.*, 1991) and increase the flow of ruminal protein to the small intestine (Rooke *et al.*, 1987).

Whole maize silage diet (R5) had higher digestion coefficients than MSS diets (R1, R2, R3 and R4) for DM, OM and NFE. These results are inagreement with Ahmed et al., (2003). Addition of molasses, urea or both (MSSM, MSSU and MSSMU) did not affect most of the digestion coefficients or nutritive values. Lopez-Guisa et al., (1991) observed that inclusion of 3.4% NH3 in corn stover before ensilage did not affect digestion coefficients of DM, OM, NDF and ADF in diets containing about 50% corn stover silage. Also Carr et al., (1984) did not found differences in the digestibility of DM, NDF and ADF of corn silage treated with 0.28% NH3 , but digestibility of nitrogen was improved from 39.7% to 54.4%. on the other hand Chauhan (1995) found that 1% urea treated maize silage had higher digestibility of DM, CP, CF , NFE and ADF than the maize silage without additives. Also, he found that treatment of MSS with 1% urea and 1.5% molasses improved the previously mentioned digestibility in addition to TDN and DCP.

Galber, (2002) observed linear effect in feed efficiency and some structural growth measurements demonstrate positive results when feeding CP g/ME Mcal ratio above 48.3 to Holstein heifers gaining 0.80 kg/d. Dry matter (DM) utilization also improved quadratically with the 63.3 CP:ME ratio (3.05 NFC:RDP ratio) having the highest total tract apparent DM digestibility. He, reported that feeding a CP:ME ratio of 63.3 at 2%BW and DM intake to Holstein heifers produced less calculated MCP than higher CP:ME ratio (69.4 and 77.3), but achieved a better synergistic relationship of dietary protein to energy (CP:ME) and (NSC:RDP). So, it could be concluded from the present results that feeding R2 or R5 gave the best value for DCPIg/ME Mcal were 57.7 and 58.34, and NFCI:DCPI ratio were 3.53 and 3.51 for R2 and R5 respectively.

The results of rumen parameters including pH, VFA's and NH_3-N concentration in addition to eNDF are given in Table (4). The pH values ranged from 6.52 to 7.10 with different treatments at all measuring times.

Ruminal pH is high before the morning feeding because extensive rumination and limited feed intake occur at night. After feeding, the pH drops and the extent of this decline depends upon the size and fermentability of the meal (Russell and Wilson, 1996).

The pH values decreased ($P<0.05$) with advancing time after feeding (0, 2 and 4 hrs) then increased once again at (6 and 8 hrs) when feeding R1, R2 and R5, but the pH values of rumen liquor were not significantly differed between R3 and R4 rations at 0, 2, 4, 6 and 8hrs post feeding.

The main effects of treatment and time on the rumen parameters are shown in Table (5).The pH value in the rumen of rams fed R5 are significantly lower than these fed MSS diets (R1 or R2 or R3 and R4).

The eNDF% was found to be adequate (about 30%) which was indicative to normal rumen pH (Pitt *et al.*, 1996). They showed that rumen pH below 6.2 results in linear reductions in microbial protein production, fiber digestion and eNDF (below 20%).

As shown in Table (4) the eNDF% values were 33.71, 34.16, 34.62, 33.03 and 30.47 when feeding R1, R2, R3, R4 and R5, respectively.

Øroskov (1987) reported that the type of supplemental feed to poor quality roughages are very important, since rumen bacteria which ferment or digest cellulosic feeds are very sensitive to low rumen pH caused by supplementation. The pH values as shown in the present study were always with a normal range of 6-7. Such range is suitable for the growth and activity of cellulytic bacteria.

Data presented in Table (4) showed that ruminal VFA's concentrations at 0, 2, 4, 6 and 8 hrs post feeding was ranged from 6.71 to 10.60 ml eq./100 ml rumen liquor with different rations. The pattern of VFA concentration followed the reserve trend of pH values. As shown in Table (4), the TVFA's concentration was increased ($P<0.05$) up to 2hrs for all rations, then decreased significantly ($P<0.05$) at 4 and 6hrs when feeding R2 or R5 rations. All values of TVFA's concentration were decreased at 8hrs post feeding to be nearly similar to the concentrations at 0hrs.

Data presented in Table (4) showed that ruminal VFA's concentrations at 0, 2, 4, 6 and 8 hrs post feeding ranged from 6.71 to 10.60 ml eq./100 ml rumen liquor with different rations. The pattern of VFA concentration followed the reverse trend of pH values. As shown in Table (4), the TVFA's concentration was increased ($P<0.05$) up to 2 hrs for all rations, then decreased significantly ($P<0.05$) at 4 and 6 hrs when feeding R2 or R5 rations. All values of TVFA's concentration decreased at 8 hrs post feeding to be nearly similar to the concentrations at 0 hrs.

As shown in Table (5), the main values of the TVFA's concentration were 7.79, 8.37, 8.20, 8.50 and 8.20 for R1, R2, R3, R4 and R5, respectively. There were no significant differences among the treated rations.

The ammonia-N concentrations are presented in Table (4). The ruminal NH_3-N concentration at 0, 2, 4, 6 and 8 hrs post-feeding ranged from 10.53 to 40.66 mg/100ml rumen liquor. These concentrations were suitable for optimal microbial growth in the rumen (Mehrez, 1992).

The ruminal NH_3- N concentration was lower at 0 hr pre-feeding, but it increased ($P<0.05$) by advancing time post-feeding to record the highest values at 2 hrs post-feeding in all tested rations, then decreased (P<0.05) gradually from 4 up to 8 hrs.

Table (4): Effect of experimental rations on some rumen parameters at different times of sampling.

Item	Period	R1	R2	R3	R4	R5
pH						
	0	7.04^{a}±0.02	7.10^{a}±0.04	7.03±0.08	7.01±0.04	6.97^{a}±0.08
	2	6.75^{c}±0.02	6.77^{b}±0.05	6.85±0.06	6.77±0.08	6.57^{bc}±0.10
	4	6.75^{c}±0.06	6.74^{b}±0.03	6.85±0.08	6.79±0.12	6.52^{c}±0.10
	6	6.81^{bc}±0.04	6.80^{b}±0.04	6.83±0.06	6.74±0.07	6.72^{bc}±0.07
	8	6.91^{b}±0.05	6.93^{ab}±0.12	6.89±0.09	6.8±0.06	6.80^{ab}±0.04
FVA's (Ml eq./100 ml RL)						
	0	6.71^{b}±0.33	6.99^{c}±0.40	7.18^{b}±0.40	7.40^{b}±0.80	7.03^{c}±0.35
	2	9.27^{a}±0.22	10.34^{a}±0.33	10.60^{a}±0.84	10.39^{a}±1.00	10.01^{a}±0.58
	4	8.68^{a}±0.30	9.10^{b}±0.33	8,68^{ab}±0.74	9.06^{ab}±0.67	8.71^{b}±0.20
	6	7.27^{b}±0.24	8.15^{bc}±0.45	7.70^{b}±0.66	8.39^{ab}±0.42	8.24^{b}±0.30
	8	7.01^{b}±0.21	7.27^{c}±0.40	6.86^{b}±0.76	7.24^{b}±0.61	6.98^{c}±0.21
NH_3-N (mg /100 ml RL)						
	0	10.53^{c}±1.90	10.75^{c}±1.15	13.16^{bc}±0.89	12.54^{b}±2.35	10.53^{c}±2.03
	2	33.77^{a}±2.55	32.42^{a}±2.20	39.00^{a}±4.66	40.66^{a}±4.11	40.49^{a}±2.49
	4	22.29^{b}±2.74	22.01^{b}±3.04	22.40^{b}±3.67	22.46^{b}±4.07	22.23^{b}±2.63
	6	14.17^{c}±2.56	15.90^{bc}±2.70	14.62^{bc}±2.55	15.79^{b}±3.12	13.66^{c}±2.18
	8	10.53^{c}±1.98	11.54^{c}±2.02	11.37^{c}±1.45	12.32^{b}±1.87	11.98^{c}±1.12
%eNDF		33.71±0.58	34.16±1.00	34.62±1.50	33.03±1.64	30.47±1.49

a, b and c: Means within the same column with different superscripts or significantly different (P<0.05).
% eNDF= (pH – 5.425)/0.04229 (Fox *et al.*, 2000).

As shown in Table (5), the mean values of NH_3-N concentration were not significantly affected by the treatments. The values were 18.26, 18.52, 20.11, 20.75, and 19.79 mg/100ml RL, for R1, R2, R3, R4 and R5 rations, respectively.

Table (5): Effect of experimental rations on some rumen parameters at different times of sampling.

Item	Mean					Period				
	R1	R2	R3	R4	R5	0	2	4	6	8
pH	6.85^{a}± 0.06	6.87^{a}± 0.07	6.89^{a}± 0.04	6.82^{a}± 0.05	6.71^{b}± 0.08	7.03^{a}± 0.02	6.74^{c}± 0.05	6.73^{c}± 0.06	6.78^{c}± 0.02	6.87^{b}± 0.03
VFA's	7.79± 0.50	8.37± 0.61	8.20± 0.67	8.50± 0.58	8.20± 0.57	7.06d± 0.11	10.12a± 0.23	8.85b± 0.10	7.95c± 0.21	7.07d± 0.08
NH3-N	18.26± 4.43	18.52± 4.01	20.11± 5.08	20.75± 5.30	19.78± 5.56	11.50^{c}± 0.56	37.27^{a}± 1.74	22.28^{b}± 0.08	14.83^{c}± 0.44	11.55^{c}± 0.30

a, b and c: Means within the same raw with different superscripts are significantly different (P<0.05).

Data in Table (6) showed the effect of feeding the experimental rations on some blood parameters.

There were no significant effects of the tested rations on all tested parameters. The glucose concentration ranged from 60.54 to 64.09 mg/100ml. The highest value of glucose concentration was observed when feeding R5. Total protein (g/100ml) ranged from 7.42 to 7.74 being the highest with R1, while urea (mg/100ml) ranged from 34.22 to 46.83, but the highest values were with feeding R3 and R4 rations (46.32 and 46.83 mg/100ml, respectively).

The AST (u/l) ranged from 31.3 to 41.5 and the highest value was when feeding R5. The ALT (u/l) ranged from 10.60 to 13.70 and the highest value was observed when feeding R4 ration. These results were in the normal ranges as recommended by Mohamed and Selim (1999) except for urea concentration which was higher than the recommended value (8-20 mg/100ml).

Table (6): Effect of experimental rations on some blood parameters.

Item	Period	R1	R2	R3	R4	R5	Means
Glucose mg/100ml							
	0	59.77±4.34	62.76±2.60	59.83±2.31	60.71±1.71	63.47±3.99	61.31
	2	61.31±4.18	63.64±3.29	64.94±3.19	63.44±4.35	64.72±3.86	63.61
	Means	60.54±3.64	63.20±2.39	62.39±1.61	62.07±2.75	64.09±3.26	
Haemoglobin g/100ml							
	0	15.49±1.86	14.32±2.16	15.90±2.74	16.36±3.10	15.61±3.11	15.54
	2	14.94±2.00	14.96±2.66	14.69±2.45	15.31±2.66	16.23±3.33	15.22
	Means	15.22±1.78	14.64±2.40	15.29±2.58	15.84±2.87	15.92±3.21	
Total protein g/100ml							
	0	8.13±0.48	7.59±0.39	7.69±0.55	7.67±0.51	7.52±0.30	7.72
	2	7.35±0.39	7.26±0.43	7.38±0.58	7.28±0.45	7.37±0.31	7.32
	Means	7.74±0.36	7.42±0.40	7.54±0.56	7.48±0.48	7.44±0.30	
Albumen g/100ml							
	0	3.48±0.18	3.42±0.12	3.58±0.16	3.67±0.16	3.32±0.07	3.49
	2	3.23±0.08	3.30±0.11	3.47±0.13	3.45±0.08	3.29±0.20	3.35
	Means	3.35±0.12	3.36±0.09	3.52±0.12	3.56±0.08	3.30±0.12	
Globulin g/100ml							
	0	4.66±0.60	4.17±0.39	4.11±0.60	4.01±0.42	4.20±0.34	4.23
	2	4.11±0.34	3.95±0.47	3.91±0.51	3.8351±0.	4.08±0.24	3.98
	Means	4.39±0.42	4.06±0.41	4.01±0.55	3.92±0.46	4.14±0.28	
AL/GL							
	0	0.81±0.12	0.86±0.10	0.99±0.20	0.96±0.11	0.81±0.08	0.88
	2	0.81±0.07	0.91±0.17	0.96±0.13	0.99±0.17	0.81±0.07	0.90
	Means	0.81±0.10	0.88±0.13	0.97±0.17	0.98±0.14	0.81±0.06	
Urea mg/100ml							
	0	32.79±3.26	32.89±3.87	48.09±6.29	45.38±4.39	30.43±4.51	37.92
	2	42.07±6.51	44.22±7.49	44.55±7.37	48.27±4.24	38.01±5.77	43.42
	Means	37.43±4.82	38.55±5.56	46.32±6.54	46.83±4.22	34.22±5.05	
AST (u/l)							
	0	32.60±2.38	35.60±4.61	40.80±2.29	44.40±5.37	42.80±4.76	39.24
	2	30.00±3.33	39.20±5.54	35.40±5.63	36.20±3.83	40.20±3.75	36.20
	Means	31.30±2.40	37.40±2.59	38.10±3.94	40.30±4.52	41.50±4.13	
ALT (u/l)							
	0	10.00±2.88	11.60±2.69	14.20±2.67	14.60±2.27	12.20±3.12	12.52
	2	11.20±2.97	12.80±3.10	11.60±3.01	12.80±2.33	12.80±2.85	12.24
	Means	10.60±2.90	12.20±2.84	12.90±2.81	13.70±2.19	12.50±2.92	
AST/ALT							
	0	4.04±0.80	3.78±0.96	3.20±0.47	3.38±0.58	4.23±0.76	3.73
	2	3.18±0.64	3.43±0.46	3.60±0.60	3.17±0.56	3.70±0.72	3.42
	Means	3.61±0.62	3.60±0.66	3.40±0.53	3.28±0.51	3.97±0.66	

*GL= Total protein - AL

The AST (u/l) ranged from 31.3 to 41.5 and the highest value was when feeding R5. The ALT (u/l) ranged from 10.60 to 13.70 and the highest value was observed when feeding R4 ration. These results were in the normal ranges as recommended by Mohamed and Selim (1999) except for urea concentration which was higher than the recommended value (8-20 mg/100ml).

The concentration of urea in blood is affected not only by dietary intake of digestible crude protein in the rumen, but also by balance between energy and protein in the diet(Hoffman and Steinhofel, 1990). Increasing the intake of CP/ME, increases the urea content in blood, but feeding a balanced diet was found to reduce the concentration of urea in blood (Grings et al., 1991).

CONCLUSION

It is concluded that maize silage had better chemical composition and nutritive value than maize stover silages. Maize stover silage made from green stover alone can be ensiled successfully with acceptable quality and nutritive values. Addition of molasses or/ and urea at the time of ensilage had no added effect on the nutritive values of maize stover silage.

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تأثير استخدام سيلاج عيدان الذرة المعامل بالمولاس أو اليوريا أو كلاهما معا على القيمة الغذائية وبعض قياسات الدم وتخمرات الكرش بالأغنام الرحماني.

إيمان حنفى محمود مقلد* ، عبد الخبير محمد عبد الخبير ** ، حامد محمد الشبراوى**، خالد محمود شرف** و السيد احمد العيوطى*.
* قسم إنتاج الحيوان ، كلية الزراعة ، جامعة المنصورة.
** معهد بحوث الإنتاج الحيواني ، مركز البحوث الزراعية.

تمت هذه الدراسة بمحطة بحوث الإنتاج الحيواني بالسرو التابعة لمعهد بحوث الانتاج الحيوانى بالاشتراك مع قسم إنتاج الحيوان بكلية الزراعة – جامعة المنصورة .

تم تقطيع حوالى ٤ طن من محصول الذرة (هجين ثلاثى) بأطوال (٢- ٣سم) لعمل السيلاج وتم تقسيمها الى خمسة مجاميع (كل مجموعة ٨٠٠ كجم) :-

المجموعة الأولى : سيلاج من عيدان الذرة (بدون كيزان) بدون معاملة.
المجموعة الثانية : سيلاج من عيدان الذرة معامل بنسبة (٢% مولاس) على أساس المادة الطازجة.
المجموعة الثالثة : سيلاج من عيدان الذرة معامل بنسبة (١% يوريا) على أساس المادة الطازجة.
المجموعة الرابعة: سيلاج من عيدان الذرة معامل بنسبة (٢% مولاس + ١% يوريا) على أساس المادة الطازجة.
المجموعة الخامسة: سيلاج الذرة الكامل (بالكيزان) بدون معاملة.

تم تكوين العلائق التجريبية بحيث لا تقل النسبة المئوية للبروتين الخام بالعلائق عن ١٣% مع ملاحظة أن اليوريا استخدمت على النحو التالى:
معاملة (عند عمل السيلاج فى العليقة الثالثة والرابعة)
إضافة (لرفع نسبة المئوية للبروتين الخام بالعلائق الأولى والثانية والخامسة لمستوى أعلى من ١٣%).
وتتكون العلائق التجريبية الخمسة في هذه الدراسة على النحو التالي:-

العليقة الأولى : ٧٧,٦٢% سيلاج عيدان الذرة (بدون كيزان) بدون معاملة + ١٠,٠٧ % حبوب أذرة + ١٠,٣٦ % تفل بنجر سكر + ١,٩٥% يوريا (**إضافة**).
العليقة الثانية : ٧٧,٨٨% سيلاج عيدان الذرة معامل بنسبة (٢% مولاس) + ٩,٩٥ % حبوب أذرة + ١٠,٢٤ % تفل بنجر سكر+ ١,٩٣% يوريا (**إضافة**).
العليقة الثالثة : ٧٩,٦٧% سيلاج عيدان الذرة **معامل** بنسبة (١% يوريا)+ ١٠,٢ % حبوب أذرة + ١٠,٣١% تفل بنجر سكر.
العليقة الرابعة : ٧٩,٥٢ % سيلاج عيدان الذرة **معامل** بنسبة (٢% مولاس + ١% يوريا)+ ١٠,١ % حبوب أذرة + ١٠,٣٨ % تفل بنجر سكر .
العليقة الخامسة : ٨٠,٩٧% سيلاج الذرة الكامل (بالكيزان) بدون معاملة + ٨,٥٦ % حبوب أذرة + ٨,٨١ % تفل بنجر سكر + ١,٦٦% يوريا (**إضافة**).

وقد تم استخدام خمسة كباش رحماني تامة النمو وزنها حوالى ٦٩,٦٠ كجم لتقيم العلائق التجريبية بطريقة ٥x٥ (مربع لاتيني) وذلك من خلال تجارب الهضم.
وقد كانت أهم النتائج المتحصل عليها على النحو التالى :

١. تحسنت معنويا معاملات هضم المادة الجافة (DM)والمادة العضوية (OM) والمستخلص الخالي من الآزوت (NFE) معنويا على مستوى ٥% عند التغذية على العليقة الخامسة مقارنة بالعلائق الأخرى.
٢. تحسنت معنويا معاملات هضم الألياف (CF) معنوياً على مستوى ٥% عند التغذية على العليقة الاولى (٦٢,٣٧) مقارنة بالتغذية على العليقة الخامسة (٤٦,٢٩) ولكن لم تظهر فروق معنوية بين العليقة الثانية أوالثالثة أوالرابعة أو الخامسة .
٣. زاد معامل هضم مستخلص الألياف المتعادل (NDF) معنوياً على مستوى ٥% عند التغذية على العليقة الأولى أو الثالثة أو الخامسة مقارنة بالعليقة الثانية أو الرابعة.
٤. زاد معامل هضم السليلوز(.Cell) معنويا على مستوى ٥% عند التغذية على العليقة الخامسة (٧٠,٨٩%) مقارنة بالعليقة الثانية (٤٥,٥%) أو العليقة الرابعة (٥٢,٠٧%).

٥. زاد معامل هضم مستخلص اللجنين (ADL) معنوياً على مستوى ٥% عند التغذية على العليقة الخامسة مقارنة بالعلائق الأخرى وكانت القيم ٣٣,٠٧ , ٤١,٥ , ٤٠,٣ , ٢٦,٧٣ , ٥٠,٧٤ % لكل من العلائق الأولى والثانية والثالثة والرابعة والخامسة على التوالى.
٦. زاد معامل هضم المركبات الكربوهيدراتية غير الليفية (NFC) معنوياً على مستوى ٥% عند التغذية على العليقة الخامسة (٨٩,٨١) مقارنة بالعلائق الأخرى وكانت القيم (٧٢,١٦ , ٥١,٤٤ , ٧٧,٧١ , ٧٧,٤ %) لكل من العلائق الأولى والثانية والثالثة والرابعة على التوالى.
٧. زاد قيمة المركبات المهضومة الكلية (TDN) معنويا على مستوى ٥% عند التغذية على العليقة الخامسة مقارنة بالعلائق الأخرى وكانت القيم (٦١,٦٦ , ٦٣,٢٨ , ٦٢,٦٨ , ٥٩,٩٩ , ٧٥,٤٣) لكل من العلائق الأولى والثانية والثالثة والرابعة والخامسة على التوالى.
٨. تحسنت قيم البروتين الخام المهضوم (DCP) معنويا على مستوى ٥% مع العليقة الثالثه أو الرابعة (١١,٢٩ , ١١,٣٣ %) على التوالي بالمقارنة بالعليقة الأولى أو الثانية (٩,٧ , ١٠,٠٣ %) على التوالي ولكن لم تظهر فروق معنوية مع العليقة الخامسة (١٠,٤٣%).
٩. كانت النسبة بين مجموع المركبات المهضومة الكلية (TDN) والبروتين الخام (CP) والطاقة القابلة للتمثيل (ME) بالعلائق مرتفعة معنوياً (على مستوى ٥%) بالتغذية على العليقة الخامسة مقارنة بالعلائق الأولى أو الثانية أو الثالثة أو الرابعة.
١٠. كانت متوسطات قيم تركيز أيون الأيدروجين (pH) فى سائل الكرش فى الحدود الطبيعية لنشاط البكتريا وتأثرت معنويا على مستوى ٥% عند التغذية العلائق الأولى والثانية والثالثة والرابعة مقارنة بالعليقة الخامسة وكانت القيم (٦,٨٥ , ٦,٨٧ , ٦,٨٩ , ٦,٨٢ , ٦,٧١ على الترتيب).
١١. لم تظهر فروق معنوية على قيمة الألياف القابلة للتخمر (eNDF%) وتركيز الأحماض الدهنية الطيارة (TVFA`s) وتركيز الأمونيا(NH_3-N) وقياسات الدم بين العلائق المختلفة. ما عدا زيادة اليوريا بالدم عن الحد المسموح به بالعليقة الثالثة و الرابعة.

مما سبق يتضح أن التركيب الكيماوي والقيمة الغذائية لسيلاج الذرة الكامل أفضل من سيلاج عيدان الذرة وأظهرت الدراسة انه يمكن الاستفادة من عيدان الذرة بعمل سيلاج جيد من حيث القيمة الغذائية دون الحاجة إلى اى إضافات أثناء السيلجه (مولاس أو يوريا أو مولاس ويوريا). وان التغذية على العليقة الخامسة كانت الأفضل تليها العليقة الثانية مقارنة بالعلائق الأولى والثالثة والرابعة ويرجع ذلك للاتزان بين الطاقة والبروتين المهضوم بهما.