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Effect of Feeding Cassava or Prosopis and Their Mixture Along with Ammoniated Wheat Straw on Methane Production (*In Vitro*) and Growth Performance of Growing Barki Lambs Under Semi-Arid Condition.

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ABSTRACT

The present study was conducted to investigate effect of feeding tree fodder Cassava or Prosopis and their mixture with ammoniated wheat straw on growth performance, blood metabolic and economic efficiency of growing Barki lambs. Twenty one growing male lambs of Barki, aged about 3 months and weighed in average 12.18±0.17 kg were divided randomly into three similar groups. Each group housed separately in shaded pen. Lambs received ration in groups. Lambs were fed tested rations according to NRC (1985) nutrient requirement for growing sheep as follow, concentrate feed mixture (CFM) 40% + Roughage 60% (*Cassava* (C): treated wheat straw (TWS) at 50:50), G1; CFM (40%) + Roughage 60% (C: *Prosopis* (P): TWS at 37.5:37.5:25, respectively), G2. CFM (40%) + Roughage 60% (P: TWS at 50:50), G3. The feeding trails lasted for 18 weeks. The calculated proximate chemical analysis of experimental roughages showed that the OM%, CF% and EE% values were nearly similar in all experimental roughages. The highest CP% was recorded with C:P:TWS (18.01) followed by C:TWS (16.40) while the lowest value was detected with P:TWS (14.19). Moreover, the NFE% and Ash% were the highest in P:TWS (38.97 and 14.19, respectively) followed by C:TWS (38.46 and 13.22, respectively) but the lowest values were recorded with C:P:TWS (36.79 and 13.21, respectively). Methane production showed negative correlation with phenolic compounds (TP, TT, and CT) and positive correlation with fiber components. Tannin showed depressing effect in fermentability of C:P:TWS and P:TWS. While, Cassava with treated wheat straw (C:TWS) was the most fermentable ration that could be associated to the low ADF and phenolic compounds. On the other hand, the combination of Cassava: Prosopis: treated wheat straw (C:P:TWS) was the least fermentable ration that could be due to the negative influence of high TT and phenolic compounds irrespective of ADL content. The highest value of final body weight (FBW) and total body gain (TBG) was recorded with G2 (34.69 and 22.39 kg, respectively) then G1 (34.17 and 21.97 kg, respectively) but, lowest values were detected with G3 (33.19 and 21.14 kg, respectively) and the differences were significant (P<0.05). However, there is no significant difference between G1 and G2 or G3 was observed for previous traits as well as in daily body gain (DBG). The best feed conversion (the lowest values) as kg DM intake/kg gain was recorded with G2 (3.58) followed by G1 (3.92) then G3 (10.40). The results indicated that most tested blood parameters (total protein (TP); albumin (A); cholesterol and triglycerides) were slightly highest with G2 followed by G1 then G3 without significant difference among dietary treatments. Moreover, the heights values of (A/G ratio, creatinine, AST, ALT, calcium and phosphorus) were recorded with G3 compared with other groups but without significant differences (P<0.05). The cost of consumed feed was slightly reduced with G2 (1.10 L.E/h) compared with G1 and G3 (1.15 and 1.13 L.E/h, respectively). But, the feed cost /kg gain was reduced with G2 (6.17 L.E.) while it was 6.61 and 6.73 for G1and G3, respectively. Thus, the economic efficiency was noticeably better with G2 (4.85%) followed by G1 (4.54 %) and lastly G3 (4.46 %). It could be concluded that feed Cacaav or/and Prosopis trees along with ammoniated wheat straw couldn't have an adverse effect on blood metabolites, feed and economic efficiency and growth performance of growing Barki lambs under semi-arid area.

Keywords: *Cacaav- Prosopis*- Blood parameters- Growth performance- Barki

INTRODUCTION

Enteric methane is a greenhouse gas that causes significant loses of energy in ruminants and estimated to represent globally 2,079 and 2,344 Mt CO_2-eq/year for 2010 and 2020, respectively (Hristov *et al.,* 2013). So, in targeting methane reduction it is crucial to develop a strategy that decrease methane producing micro-biota activities and proliferation without limiting rumen function. Recently there are numerous reports that have shown the reduction of enteric methane due to inclusion of tannin rich browses because the tannins have anti-methanogenic activity, either by direct inhibition of methanogens or indirectly through inhibition of protozoa (Animut *et al.,* 2008 and Hristov *et al.,* 2013). Tannins are polyphenolic compounds which bind to protein and can be used as chemical additives for protecting and decreasing ruminal fermentation of proteins in ruminant feeds (Makkar, 2003_a). They are complex polymers with various linkages and bonds that vary among browse species and within parts of plants (Makkar, 2003_a and Patra and Saxena, 2011). This contributes to differences in degree of polymerization and chemical structures that further contributes to the differing biological properties (Patra and Saxena, 2011).

Tannins from different plants exhibit variation in their effects at the same concentration as evidenced by difference in magnitudes of gas production (GP) and digestibility (Makkar, 2003_a and Guglielmelli *et al,* 2011). This indicates that tannin from different plants might show different response in digestibility and methane production (Gemeda and Hassen, 2015). However, the net improvement in digestibility is much influenced by the type and the level of phenolic compounds under semi-arid area condition where supplementation of nitrogen is critical. Moreover, their strategic inclusion to poor quality feed to optimize their utilization in ruminants feeding can be regarded as a way forward (Beauchemin *et al.,* 2008). Consequently, the present study aimed to evaluate the possible effects of feeding of Cassava or *Prosopis juliflora* and their mixture with ammoniated wheat straw on growing performance of Barki lambs under semi-arid areas in Egypt.

MATERIALS AND METHODS

This study was conducted at Animal Production Research Station, Borg El Arab, belonging to Animal Production Research Institute, Agricultural Research Center, Egypt.

Animals and Management

Twenty one growing male lambs of Barki, aged about 3 months and weighed in average 12.18±0.17 kg were divided randomly into three similarly groups, each group housed separately in shaded pen. The animals were weighed at the beginning then biweekly. The feeding experiment lasted 18 weeks. Barki lambs were fed for 2 weeks as a transitional period on the experimental rations before the start of the experimental work. Water was available all times. The lambs were received ration in groups twice daily at 8 am and 3 pm.

Experimental treatments

Lambs received diets in groups. Barki lambs were fed tested rations using the allowances of NRC (1985) for growing sheep as follows:

(G1): CFM (40%) + Roughage 60% (*Cassava* (C): treated wheat straw (TWS) at 50:50).

(G2): CFM (40%) + Roughage 60% (C: *Prosopis* (P): TWS at 37.5:37.5:25, respectively).

(G3): CFM (40%) + Roughage 60% (P: TWS at 50:50).

Sample collection, preparation and chemical analysis:

The tree fodder *Cassava* and *Prosopis* (leaves & twigs) were harvested along the sub-roads from the North Western Coast of Egypt on the Mediterranean Sea, west of Alexandria city latitudes 21°and 31° North and longitudes 25° and 35° East.

Samples were taken from each roughage (up to 200 g) dried at 55°C for 48 h and ground to pass a 1-mm screen for subsequent chemical analyses and in vitro methane production. The gas was analyzed with a portable GASMET DX4030 gear using the CO2 Technique, which measure the CO2 content and then calculate the ration CH4/CO2 (Patra et al. 2006). Bales of wheat straw were treated by injecting ammonia (3%) the Borg El Arab Livestock Research Station. The proximate analysis of tested ingredients and rations were determined according to A.O.A.C (1995). Acid detergent fiber (ADF), neutral detergent fiber (NDF) and ADL were analyzed by the Van Soest method (Van Soest 1965). Therefore, hemi-cellulose and cellulose were determined by difference. The chemical analysis and cell wall contents of tested ingredients are shown in Table (1). Determinations of total phenols (TP), total tannins (TT) and condensed tannins (CT) were done following procedure described by Makkar (2003b). Condensed tannins were determined by the butanol-HCl-iron method (Porter et al., 1985). Total phenols and tannins were expressed as tannic acid equivalent and CTs as leucocyanidin equivalent.

Table (1): Chemical composition and cell wall constituents of feed ingredients.

Item	Feed ingredients			
	Cassava	***Prosopis Juliflora***	**Treated Wheat Straw**	**CFM+**
DM	71.39	70.40	91.70	91.20
Chemical composition:				
OM	88.26	86.32	85.30	93.90
CP	22.94	18.52	9.86	15.70
CF	28.05	29.70	31.23	14.23
EE	2.92	2.72	1.65	3.13
NFE	34.35	35.38	42.56	60.84
Ash	11.74	13.68	14.70	6.10
Fiber fraction % of DM:				
NDF	35.49	38.41	35.42	43.00
ADF	31.29	32.29	32.12	13.30
ADL	26.47	28.23	27.33	5.80
Hemi-cellulose*	4.20	6.12	3.30	29.70
Cellulose **	4.82	4.06	4.79	7.50
NFC***	26.91	26.67	38.37	32.07
NFC/NDF	0.758	0.694	1.083	0.746

+ Concentrate feed mixture (CFM) consists of 25% undecortecated cotton meal, 43% yellow corn, 25% wheat bran, 3.5% molasses, 2% limestone, 1% common salt and 0.5% minerals mixtures..

*** Hemi-cellulose = NDF-ADF**

****Cellulose = ADF-ADL**

*****Non fiberous carbohydrates%= OM% - (CP%+NDF%+EE%), Calsamiglia *et al.*, 1995.**

Blood samples:

Blood samples were collected from the jugular vein once before feeding (3 animals in each) at the end of growing period. Blood samples were centrifuged at 4000 rpm for 20 min. Part of the separated serum was directed to enzymes activity determination, while the other part was stored frozen at-20c° till the biochemical analysis. Commercial kits were used for all colorimetric biochemical determination.

Economic efficiency:

Economic efficiency was calculated, as total output/ total input according to the local prices (where one ton CFM = 2800 L.E.; *Cassava* = 500 L.E.; *Prosopis Juliflora* = 500 L.E.; Treated wheat straw = 710 L.E.; Kg live body weight of lambs = 30 L.E.

Statistical analysis:

Data were statistically analyzed using One-Way Layout with Means Comparisons Procedure SAS (2003). Significant differences among means were evaluated using Duncan's Multiple Range Test of SAS (2003). The model used for the analysis of all parameters was:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where: μ is the overall mean Ti is the treatment type eij is the random error term

RESULTS AND DISCUSSION

Chemical composition:

The calculated proximate chemical analysis and determined cell wall constituents and phenols compounds of experimental roughages are presented in Table 2. It was noticed that the highest DM% was recorded with C:TWS (81.55%) and C:P:TWS (81.05%) with P:TWS (76.10 %). The highest OM% was recorded with C:P:TWS (86.79) and C:TWS (86.78) while the lowest value was detected with P:TWS (85.81). The highest CP% was recorded with C:P:TWS (18.01) followed by C:TWS (16.40) while the lowest value was detected with P:TWS (14.19). The CF% and EE% values were nearly similar in all experimental roughages. Moreover, the NFE% and Ash% were the highest in P:TWS (38.97 and 14.19, respectively) followed by C:TWS (38.46 and 13.22, respectively) but the lowest values were recorded with C:P:TWS (36.79 and 13.21, respectively).

Table (2): Calculated proximate chemical analysis and determined cell wall constituents of phenols compounds and experimental roughages.

Item	Experimental roughages		
	C:TWS	C:P:TWS	P:TWS
DM	81.55	76.10	81.05
Chemical composition:			
OM	86.78	86.79	85.81
CP	16.40	18.01	14.19
CF	29.64	29.46	30.47
EE	2.29	2.53	2.19
NFE	38.46	36.79	38.97
Ash	13.22	13.21	14.19
Fiber fractions, % of DM:			
NDF	36.10	36.80	36.70
ADF	30.42	31.87	31.24
ADL	26.90	27.78	27.35
Hemi-cellulose*	5.68	4.93	5.46
Cellulose **	3.52	4.09	3.89
NFC***	31.99	29.45	32.74
NFC/NDF	0.886	0.800	0.892
Phenols compounds g/kg DM:			
TP	39.90	42.28	40.27
TT	16.40	19.2	15.60
CT	20.00	20.00	23.00

*** Hemi-cellulose = NDF-ADF** ****Cellulose = ADF-ADL**

*****Non fiberous carbohydrates%= OM% - (CP%+NDF%+EE%), Calsamiglia *et al.*, 1995.**

As for fiber fractions, the C:P:TWS is recorded the highest values followed by P:TWS compared with C:TWS. Similar trend have been reported by, Ben Salem et al. (2005), Afaf et al. (2010) and Shaker et al. (2008) when using some salt tolerant fodder shrubs mixture in sheep's feed. The variation among data in the literature could be due to the age of the leaves at harvest, the soil type and fertility as well as the agro-ecological system under which the trees were grown. Maasdorp et al. (1999) showed that the plant species or variety, soil, climate, grazing, plant fraction and stage of maturity at sampling affect the nutritive value of forages.

The non fiber carbohydrates (NFC) values were ranged from 29.45 to 32.74% in the tested roughages. In this respect, Wheeler (2003) reported that the NFC levels in the total ration dry matter should not fall below 20 to 25% nor go above 40 to 45%. Roughages formulated for 29 to 32% NFC should avoid metabolic disturbances. The levels of anti-nutritional factors (ANF's) are varied from plant to plant and from season to season (El-Shaer et al., 2005). The condensed tannins (CTs) concentration ranged from 20 to 23 g/kg DM as shown in Table 2. The ideal CTs concentration for ruminant nutrition has been suggested to be in the range of 20 to 40 g/kg DM, under such range the absorption of essential amino acids from small intestine and increased wool growth, milk secretion and reproductive rate without affecting voluntary feed intake, thus improving the efficiency of feed utilization (Kumar, 2003).

Correlation among chemical composition, phenolic compounds of tested rations and methane production:

Data of methane production are presented in Fig (1). Total methane production had shown similar pattern of correlation with chemical and phenolic composition of tested rations (Table 2). In the present study tannin showed depressing effect in fermentability of C:P:TWS and P:TWS. While, Cassava with treated wheat straw (C:TWS) was the most fermentable ration that could be associated to the low ADF and phenolic compounds. On the other hand, the combination of Cassava: Prosopis: treated wheat straw (C:P:TWS) was the least fermentable ration that could be due to the negative influence of high TT and phenolic compounds irrespective of ADL composition as shown in Table (2).

In agreement with current finding, studies done on different tropical browses had showed negative effects of plant phenolic compounds on their fermentation and digestion (Guglielmelli et al., 2011; Jayanegara et al., 2011 and Sebata et al., 2011). The negative effect of tannins on fermentation could be related to the formation of tannin-carbohydrate and tannin-protein complexes that are less degradable or to toxicity to rumen microbes (Bhatta et al., 2009).

Methane production showed negative correlation with phenolic compounds (TP, TT, and CT) and positive correlation with fiber components (Table 2& Fig1). In this respect, Gemeda and Hassen (2015) showed that the high gas production (GP) indicates greater fermentation to support rapid rumen microbial growth.

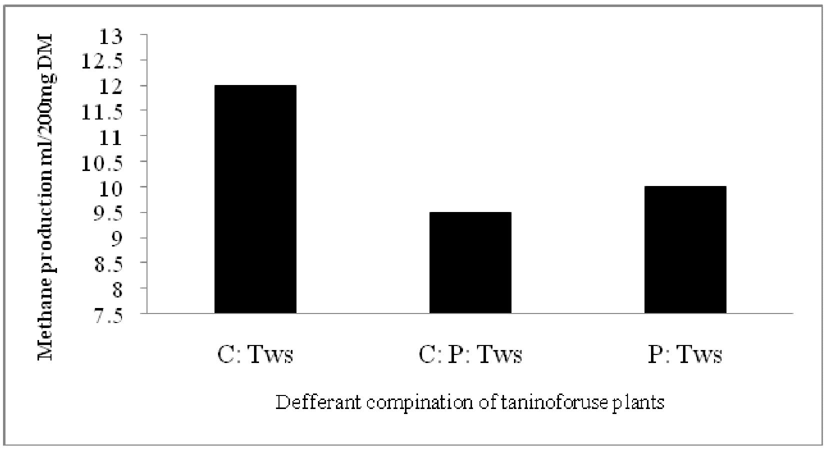

Fig (1): Methane production from the experimental forages.

Growth performance:

As for growth performance, the obtained data in Table 3 indicated that the highest value of final body weight (FBW) and total body gain (TBG) was recorded with G2 (34.69 and 22.39 kg, respectively) then G1 (34.17 and 21.97 kg, respectively) but, lowest values were detected with G3 (33.19 and 21.14 kg, respectively) and the differences were significant (P<0.05). However, there is no significant difference between G1 and G2 or G3 was observed for previous traits as well as in daily body gain (DBG). This improvement in G1 compared G3 could be attributed to either increase fermentation of carbohydrates to support rapid rumen microbial growth especially in the presence of ammoniated wheat straw or due to increased of CT in third tested ration (P: TWS) compared with other rations according to (Animut *et al.,* 2008; Hristov *et al.,* 2013 and Gemeda and Hassen, 2015) or both.

Table (3): Growth performance and feed efficiency of Barki lambs fed experimental rations.

Item	Groups		
	G1	**G2**	**G3**
No. of lambs	7	7	7
Feeding period, weeks	18	18	18
Initial weight, (kg)	12.20±0.17	12.29±0.33	12.05±0.37
Final weight, (kg)	34.17±0.35^{ab}	34.69±0.40^{a}	33.19±0.45^{b}
Total gain, (kg)	21.97±0.21^{ab}	22.39±0.32^{a}	21.14±0.33^{b}
Daily body gain, (g)	174±1.79^{ab}	178±2.63^{a}	168±2.78^{b}
Daily feed intake:			
Cassava	210	155	-
Prosopis Juliflora	-	155	210
Treated wheat straw	210	100	205
CFM	280	270	275
Total DMI (g/h/d)	700	670	690
Feed efficiency:			
Average body weight, kg	23.19	23.49	22.62
Metabolic body size, $w^{0.75}$	10.57	10.67	10.37
DMI as %BW	3.02	2.85	3.05
DMI g/kg $BW^{0.75}$	66.23	62.79	66.54
kg DM/kg gain	3.83	3.58	3.92

a-b Means in the same row with different superscripts differ significantly at P<0.05.u

Feed utilization:

Feed efficiency of the experimental rations is showed in Table 3. The best feed efficiency (the lowest values) as kg DM intake/kg gain was recorded with G2 (3.58) followed by G1 (3.92) then G3 (3.92). Such improvement in feed utilization efficiency when using Cassava, Prosopis and ammoniated wheat Straw may be related to low CTs content which lead to increased levels of post-ruminally available proteins (Gemeda and Hassen, 2015). Similar trend have been reported by Barry and McNabb (1999), Barry et al., (2001) and Ben Salem et al., (2003). Moreover, several plant species, e.g. Acacia albida pods (Nsahlai et al., 1999), Lotus pedunculatus (Barry et al., 1986) and Acacia cyanophylla Lindl. (syn. Acacia saligna) low in CT levels increased daily gain in sheep given protein-rich diets.

Blood parameters:

Data of blood serum parameters are presented in Table (4). The results indicated that most tested blood parameters (total protein (TP); albumin (A); cholesterol and triglycerides) were slightly highest with G2 followed by G1 then G3 without significant difference among dietary treatments. Moreover, the heights values of A/G ratio, creatinine, AST, ALT, calcium and phosphorus were recorded with G3, compared with other groups but without significant differences (P<0.05).

Blood urea concentration was significantly higher with G3 than those of G1 and G2 (35.37, 33.60 and 32.18 g/dl, respectively), but the differences between G1 and G2 were not significant as shown in Table (4). There were no significant differences (P<0.05) for glucose value among tested groups.

Shaker et al. (2014) reported that the goats fed salt tolerant shrubs mixture (Prosopis juliflora, Acacia saligna and Leucaena Leucocephala) had slightly insignificant lower concentrations of total proteins (TP), albumin (AL), globulin (GL) and albumin/ globulin ration (A/g ratio) than their received berseem hay (control). Morover, Shaker et al. (2008) working on growing Barki lambs and Badawy et al. (2002) on growing Barki lambs and Baladi kids reported that feeding fresh Acacia lowered TP, A and G values. The reduction of TP in animals fed salt shrubs might be owing to the high content of tannins in these plants.

Table (4): Effect of feeding experimental rations for Barki lambs on some blood serum parameters.

Items	Groups		
	G_1	G_2	G_3
Glucose , mg/dl	44.60±0.56	45.84±0.60	44.22±0.43
Total protein, g/dl	6.57±0.78^{ab}	7.57±0.35^{a}	5.17±0.44^{b}
Albumin(A), g/dl	2.96±0.17	3.06±0.07	2.70±0.35
Globulin(G), g/dl	3.61±0.84	3.33±0.44	2.47±0.78
A/G	0.91±0.20	0.95±0.13	1.38±0.45
Urea, g/dl	32.18±0.45^{b}	33.60±0.64^{b}	35.37±0.41^{a}
Creatinine mg/dl	1.17±0.09	1.27±0.09	1.47±0.12
Cholesterol, mg/dl	56.43±1.13	57.53±1.96	55.33±1.20
Triglycerides mg/dl	74.00±1.53	74.33±1.45	73.00±1.22
AST, u/l	32.63±1.23	33.67±1.20	34.07±1.16
ALT, u/l	18.33±1.76	18.33±1.67	18.88±1.69
Calcium, mg /dl	17.90±1.45	17.67±1.67	18.00±1.53
Phosphorus, mg/dl	4.47±0.52	4.50±0.31	4.57±0.61

a-b Means in the same row with different superscripts differ significantly at P<0.05.

Economic efficiency:

Economic efficiency (EE), estimated as price of weight gain divided by cost of feed consumed for that gain, is presented in Table 5. The obtained results indicated that the cost of consumed feed was slightly reduced with G2 (1.10 L.E/h) compared G1 and G3 (1.15 and 1.13 L.E/h, respectively). But, the feed cost /kg gain was reduced with G2 (6.17 L.E.) while it was 6.61 and 6.73 L.E. for G1and G3, respectively. Thus, the economic efficiency was noticeably better with G2 (4.85%) followed by G1 (4.54 %) and lastly G3 (4.46 %). Generally, the economic efficiency of G2 was higher by about 7 and 8% compared with G1 and G3 respectively. Similar results were observed by Ahmed *et al.* (2001) with substitution of Teosinte by Kochia silage in dairy goat's rations.

Table (5): Economic evaluation of the experimental rations.

Item	Groups		
	G1	G2	G3
Daily body gain, (g)	174	178	168
Total feed intake (g/h/d) as fed:			
From *Cassava*	270	199	--
From *Prosopis Juliflora*	--	201	272
From wheat Straw	227	108	222
From CFM	305	294	299
Cost of consumed feed, L.E/h	1.150	1.100	1.131
Price of weight gain, L.E/h	5.22	5.34	5.04
Feed cost/ kg gain, L.E	6.61	6.17	6.73
Economic efficiency, %	4.54	4.85	4.46

Market price (LE)/Ton fresh of ingredients: BH = 1600 LE; CFM = 2800 LE; *Cassava* = 500 LE; *Prosopis Juliflora* = 500LE; Treated wheat straw = 710 LE; Kg live body weight of lambs = 30 LE.

CONCLUSION

It could be concluded that feed Cassava or/and Prosopis trees along with ammoniated wheat straw couldn't have an adverse effect on blood metabolites, feed and economic efficiency and growth performance of growing Barki lambs. Under semi-arid area depends on rangeland trees could be solving fodder shortage in green protein feeds specially in summer, which berseem hay or silage has become scarce and expensive.

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تأثير التغذية على الكسافا او البروسوبس او مخلوطهما مع قش الارز المعامل بالامونيا على انتاج الميثان (فى المعمل) والاداء الانتاجى فى علائق الحملان البرقى النامية تحت ظروف المناطق الشبه قاحلة.

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اجريت هذه الدراسة بمحطة بحوث الانتاج الحيوانى ببرج العرب – معهد بحوث الانتاج الحيوانى – مركز البحوث الزراعية – مصر. تم اختيار ٢١ ذكر برقى عمر ٣ شهور بمتوسط وزن ١٢.١٨ ± ٠.١٧ كجم. قسمت الى ثلاث مجاميع (٧حيوانات فى كل مجموعة) بشكل عشوائى فى حظائر مظلله لدراسة تأثير استخدام شجيرات الكسافا او البروسوبس او مخلوطهما مع القش المعامل بالامونيا على معدل النمو، قياسات الدم والكفاءة الاقتصادية فى حملان البرقى النامية. تم تغذية الحيوانات فى مجاميع وفقا للاحتياجات الغذائية للاغنام النامية (NRC, 1985) وكانت كالتالى: مج١: ٤٠% مخلوط علف مركز + ٦٠% علف خشن (كسافا: قش معامل بالامونيا بنسبة ٥٠:٥٠%). مج٢: ٤٠% مخلوط علف مركز + ٦٠% علف خشن (كسافا: بروسوبس: قش معامل بالامونيا بنسبة ٣٧.٥:٣٧.٥: ٢٥%). مج٣: ٤٠% مخلوط علف مركز + ٦٠% علف خشن (بروسوبس: قش معامل بالامونيا بنسبة ٥٠%:٥٠%). استمرت التجربة مدة ١٨ اسبوع. وكانت اهم النتائج: - اظهرت نتائج التحليل الكيماوى المحسوبة لمواد العلف الخشنة تقارب قيم المادة العضوية والالياف الخام والدهن والمستخلص الخالى من الازوت والرماد فى الاعلاف الخشنة تحت الدراسة فيما عدا البروتين الخام حيث كانت اعلى القيم فى مج٢ يليها مج١ واخيرا مج٣.- اظهر انتاج الميثان نتائج عكسية مع محتوى مادة العلف الخشنة المختبرة من المركبات الفينولية.- ادى محتوى مادة العلف الخشنة المختبرة فى مج٢ و مج٣ من التانينات الى انخفاض التخمر لمادة العلف، بينما مادة العلف الخشنة المختبرة فى مج١كانت الاعلى فى التخمر وهذا قد يرجع الى انخفاض محتواها من ADF والمركبات الفينولية.- ادى الخلط بين الكسافا والبروسوبس مع القش المعامل بالامونيا فى مج٢الى انخفاض تخمرها فى المعمل وهذا قد يرجع الى محتواها المرتفع من TT والمركبات الفينولية بغض النظر عن من ADL.
- ادى استخدام عليقة مج٢ الى زيادة معنوية فى الوزن النهائى واجمالى الزيادة الوزنية ثم تلتها مج١ وكانت اقلها مج٣. وكذلك لم تظهر مج١ اختلافات معنوية مع مج٢و مج٣ فى معدل الزيادة اليومية .- سجلت مج٢ افضل القيم فى معدل تحويل الغذاء على اساس المأكول كجم مادة جافة/ كجم زيادة وزنية.- لم تتأثر اغلب قياسات الدم بالعلائق التجريبية المختلفة وارتفع البروتين الكلى فى الدم والالبيومين والكليسترول والدهون الثلاثية بشكل طفيف بدون فروق معنوية.- انخفض تكلفة التغذية/ رأس بقيمة طفيفة وكانت اقل تكلفة مج٢ (١.١٠ج.م) مقارنة بتكلفتها مع مج١و مج٣ (١.١٥، ١.١٣ ج.م ،على الترتيب). وكذلك انخفضت تكلفة كجم زيادة وزنية مع مج٢ (٦.١٧ ج.م) بينما كانت (٦.٦١ ج.م) مج ١ ، (٦.٧٣ ج.م) مج٣.- كانت مج٢ افضل من حيث الكفاءة الاقتصادية ثم مج١ واخيرا مج٣ (٤.٨٥، ٤.٥٤ و ٤.٤٦%، على الترتيب).
الخلاصة: يمكن استخدام الشجيرات العلفية (الكسافا أوالبروسوبس) او مخلوطهما مع قش الارز المعامل بالامونيا فى تكوين علائق اقتصادية للحملان البرقى تحت ظروف المناطق الشبه قاحلة دون تأثير سلبى على الاداء الانتاجى وقياسات الدم . وبالتالى يمكن الاستفادة من تلك الاعلاف البروتينية الخضراء لسد الفجوة الغذائية خاصة فى فصل الصيف مع ندرة السيلاج و دريس البرسيم وارتفاع ثمنه .