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RESPONSE OF BARKI LAMBS TO DIETS CONTAINING *CASSAVA AND TREATED WHEAT STRAW WITH PROSOPIS* OR *ACACIA SALIGNE* (LEAVES & TWIGS) UNDER SEMI-ARID AREA IN EGYPT

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SUMMARY

This work carried out on growing Barki lambs to investigate the effect of using different combination from Cassava, Acacia Saligne and Prosopis (leaves & twigs) with treated wheat on growth performance, feeding values and feed utilization efficiency. Thirty lambs aged about 3 months and weighed in average 11.93 ± 0.40 kg were divided randomly into three groups, 10 lambs each. The supplementary values of two tree fodder with treated wheat straw were concluded that in complete rations as follow:

(G1) Control CFM+ berseem (Trifolum alexandrinum) hay.

(G2) CFM+ Cassava: Acacia Saligne: treated wheat straw at) 37.5: 37.5: 25, respectively).

(G3) CFM+ Cacaav: Prosopis: treated wheat straw at (37.5: 37.5: 25, respectively).

The roughage to concentrate ratio was maintained at 60:40 so as to meet the nutrient requirement (NRC, 1985) for growing sheep. The feeding trials lasted for 16 weeks.

The obtained data indicated that the methane production with first combination Cassava: Acacia Saligne: treated wheat straw 37.5: 37.5: 25 less than second combination Cassava: Prosopis: treated wheat straw 37.5: 37.5: 25 (8 vs.10ml/200 mg DM, respectively). Whereas, first combination was contained more condensed tannins (CT) compared with second combination (30 vs. 20 g/kg DM, respectively). The results indicated that most tested blood parameters were not significantly affected by tested rations. However, serum total protein (TP), albumin (A) and globulin (G) concentrations were tended to decrease with G2 and G3 compared with G1, but A/G ratio was increase with the combination of two fodder tree with wheat straw ammoniated (G2 and G3) without significant differences. While, glucose, serum urea, creatinine and cholesterol were significantly higher (P>0.05) with (G1) berseem hay (60.10, 46.26, 1.95 and 72.08, respectively) in Barki lambs rations. The highest values of final body weight (FBW) and total body gain (TBG) were recorded with G2 (34.44 and 22.20 kg, respectively) and the lowest values was detected with G_3 (31.33 and 19.80kg, respectively). Whereas, G_1 recorded medium values (33.52 and 21.24 kg, respectively). Thus, the daily body gain (DBG) was significantly increased (P<0.05) in Barki lambs fed G2 than the other groups G1 and G3. Feed conversion calculated as dry matter intake and CP intake/kg gain were better in G3 (4.01 and 0.618, respectively) compared with G2 (4.67 and 0.678, respectively) and G1 (4.84 and 0.707, respectively) but the differences were not significant. The economic efficiency (EE) was better with G3 then G2 compared with G1. These results indicated that under the semi-arid conditions, the combinations of Cassave and ammoniated wheat straw along with Prosopis Juliflora or Acacia Saligne could be included up to 60 % in the complete diet of growing Barki lambs.

Keywords: Cassava, prosopis, acacia,, economic efficiency, growing lambs, Barki

INTRODUCTION

The North Western Coast of Egypt stretches along 525 km on the Mediterranean Sea, west of Alexandria city latitudes 21°and 31° North and longitudes 25° and 35° East, the average temperature ranges from 13°C (56°F) in December and January to 26°C (79°F) in July and August. This promising region has little effective rainfall, Except for the areas along the Mediterranean coast, where winter rains are frequent, rainfall in Egypt's harsh desert climate is scarce to nonexistent, during the summer months and even the coast receives little or no rain. As a result, droughts and windstorms called (khamasin) occur often. The Western Desert accounts for almost three-fourths of the total land area of Egypt. In general the climate of this region is arid Mediterranean with a scarcity of rain and high radiation. The atmospheric relative humidity ranges from 50% to 75% and the average annual rainfall is about 100-150 mm, distributed over a period of 15-25 rainy days during the wet season. The suitable halophytic forage species that show better adaptability and chances of establishment are Cassava, *Acacia saligne* and *Prosopis juliflora* (Degan *et al.*, 1997; Shawket, 1999 and Khang *et al.*, 2005). In the desert rangelands, 1.4 million sheep and goats are kept in extensive systems. Sheep are mainly of the fat-tailed, coarse-wool, Barki breeds, Goats are mainly hairy and of medium size, and they vary greatly in type and

productivity, the lighter Barki breed in the north-west coastal area. Therefore, the main objective of the present study were to investigate the effect of using different combination from *Cassava*, *Acacia Saligne* and *Prosopis* (leaves & twigs) with treated wheat straw on growth performance and feed utilization efficiency of Barki lambs.

MATERIAL AND METHODS

The present study was conducted at Borg El Arab Livestock Research Station, Animal Production Research Institute, Ministry of Agriculture.

Animals and Management:

Thirty growing male lambs of Barki, aged about 3 months and weighed in average 11.93 ± 0.40 kg were divided randomly into three groups, 10 lambs each housed separately in shaded pen. The animals were weighed at the beginning then biweekly. The feeding experiment lasted 16 weeks. Barki lambs were fed for 3 weeks as a transitional period on the experimental rations before the start of the experimental work. During that period they were treated with anti-helmenthics.

Experimental treatments:

Lambs received diets in groups. Barki lambs were fed tested rations accordingly as follow:
(G1) Control CFM+ berseem (*Trifolum alexandrinum*) hay.
(G2) CFM+ *Cassava*: *Acacia Saligne*: treated wheat straw at 37.5: 37.5: 25, respectively.
(G3) CFM+ Cacaav: *Prosopis*: treated wheat straw at 37.5: 37.5: 25, respectively.

The roughage to concentrate ratio was maintained at 60:40 level to meet the nutrient requirement (NRC, 1985) for growing sheep. The level of the ingredients in the concentrate portion was adjusted to maintain iso-protein and iso-caloric nature in the experimental rations. The chemical composition of the tested ingredients consumed by Barki lambs is shown in Table (1). Analysis of feed stuffs for micro-minerals, macro-minerals and phenols compound shown in Tables (2 and 3). The mineral content was determined by dry-Ashing the samples at 550°C in a furnace, and dissolving the ash in 10% HCI, and filtered (Oshodi, 1992). Sodium (Na) and potassium (K) were determined by flame photometer while Atomic Absorption Spectrometer (AAS) was used to determine Ca, Mg, Zn, Fe, P and Cu (A.O.A.C., 1990). Acid detergent fibre (ADF) and neutral detergent fiber (NDF) were analyzed by the Van Soest method (Van Soest 1965). Anti-nutrients determination: Tannin content was determined using the method described by Makkar (2003). Phytic was extracted and precipitated according to the method of Reed (1995). Quinones and glycosides content were determined using the procedure of Reed et al. (2000). Alkaloid was obtained by Harbone (1973) method while saponin was assayed by the test described by Wilson (1992). Water was available all times. The rations were offered twice daily at 8 am. and 3 pm.

Table 1. Chemical composition and cell wall constituents (% on DM basis) of feed ingredients

Item	DM	Chemical composition						Fiber Fraction		
		OM	CP	CF	EE	NFE	Ash	NDF	ADF	ADL
Berseem hay	95.12	89.59	10.64	38.54	1.03	39.38	10.41	55.89	43.27	37.16
Prosopis Juliflora	70.39	93.30	17.52	30.70	2.72	42.36	6.70	57.41	42.69	39.23
Acacia Saligne	52.45	91.66	15.66	31.59	1.47	42.94	8.34	60.86	54.57	48.96
Cassava	44.39	88.26	22.94	28.05	2.92	34.35	11.74	35.49	26.29	19.47
Treated Wheat Straw	98.00	89.00	9.86	48.23	3.90	27.07	11.00	35.42	30.22	27.33
CFM*	91.20	93.90	15.70	14.23	3.13	60.84	6.10	43.00	17.30	5.80

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

Table 2. Micro and Macro -mineral composition (mg/kg DM) of feed stuffs

Item	Berseem hay	*Prosopis Juliflora*	*Acacia Saligne*	*Cassava*	Treated wheat straw
Micro-mineral composition (mg/kg DM):					
Fe	471.2	384.1	165.87	184.05	31.57
Mn	31.94	13.11	36.36	180.25	1.89
Zn	30.38	44.11	38.66	108.95	47.17
Cu	3.4	4.1	2.5	4	3.96
Macro-mineral composition (mg/kg DM):					
Na	1921	210	953	181	1817
Ca	856	506	3484	2130	172
K	1089	781	201	1470	189
P	340	236	218	266	753

Table 3. Phenols compound on dry and wet basis (mg/g) as tannic acid of Certain tree & shrubs Species

Item	Phenolic compound on dry basis	Phenolic compound on wet basis
Prosopis Juliflora	111.89	90.36
Acacia Saligne	108.60	91.09
Cassava	99.729	80.22

Feed samples and gas production:

Three fresh different species leaves & twigs samples of (*Acacia Saligne*, *Prosopes Juliflora*, and *Cassava*). The collected samples were pooled and then dried in shadow. The samples were then sieved to pass through 1mm sieve and stored in airtight polythene bags for further analysis. Similarly, samples of wheat straw were treated by injecting ammonia in the Borg El Arab Livestock Research Station. Samples of feeds were analyzed according to A.O.A.C (1995).

According to previous chemical analysis of three fodders leaves & twigs viz (*Prosopes Juliflora, Acacia Saligne* and *Cacava*) and treated wheat straw were then mixed in different combinations in different proportions and subjected to *in vitro* dry matter degradability as described by A.O.A.C (1995). This analysis was done to list the optimum tree fodder- crop residue combinations that gave the highest degradability. At the end of this analysis, based on the statistical analysis, a total of two promising combinations to determine methane concentration. The gas was analyzed with a portable GASMET DX4030 gear using the CO_2 Technique, which measure the CO_2 content and then calculate the ration CH_4/CO_2 (Patra *et al*., 2006).

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 BH = 1600 L.E.; CFM = 2800 L.E.; *Cassava* = 500 L.E.; *Prosopis Juliflora* = 500 L.E.; *Acacia Saligne* = 500 L.E.; Treated wheat straw = 710 L.E.; Kg live body weight of lambs = 50 L.E.

Statistical analysis:

Data were statistically analyzed using One-Way Layout with Means Comparisons Procedure SAS (2003).

RESULTS AND DISCUSSION

Chemical composition and cell wall constituents:

The chemical composition and cell wall constituents of experimental rations are presented in Table (4). It was noticed that berssem hay contained more OM (88.53 *vs*, 87.91 and 87.23, respectively) compared with the combination of two fodder tree with wheat straw ammoniated. Similarly, NFE (51.97 *vs.* 45.79 and 39.79, respectively). Contrary, it was less in EE (3.21 *vs.* 3.75 and 4.22, respectively) and Ash (11.47 *vs.* 12.09 and 12.77, respectively). The differences in CP and CF were of fewer values. Moreover, the NDF and hemicellulose contents were increased while cellulose and ADL was decreased in the combination of two fodder tree with treated wheat straw than berseem hay. The chemical composition obtained by this study were nearly similar to that obtained by Ben Salem *et al.* (2005), Fulkerson *et al.* (2008) and Afaf *et al.* (2010) on berssem hay. Shaker *et al.* (2014) on some salt tolerant fodder shrubs mixture. The non fiber carbohydrates (NFC) were ranged from 28.81 to 47.61% in the presented experimental rations. Wheeler, (2003) reported that, the NFC levels in the total ration dry matter should not fall bellow 20 to 25% nor go above 40 to 45%. Rations formulated for 35 to 37% NFC (DM basis) should avoid metabolic disturbances.

The levels of ANF's (anti-nutritional factors) are varied from plant to plant and from season to season (El-Shaer *et al.*, 2005). The CT concentration for above optimum combinations was ranged on average from 20 to 30 g/kg DM. The ideal CT concentration for ruminant nutrition has been suggested to be in the range 20 to 40 g/kg DM, increase 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 food conversion, Kumar (2003).

Methane production:

Methane production indicates an energy loss to ruminant and many tropical feedstuffs have been implicated to increase methanogenesis as an integrated part of carbohydrate metabolism (Babayemi and Bamikole, 2006). Data of

methane production are presented in Figure (1). The results indicated that the methane production with first combination *Cassava*: *Acacia Saligne*: treated wheat straw 37.5: 37.5: 25 less than second combination *Cassava*: *Prosopis*: treated wheat straw 37.5: 37.5: 25 (8 *vs.*10ml/200 mg DM, respectively). Whereas, first combination was contained more condensed tannins (CT) compared with second combination (30 *vs.* 20 g/kg DM, respectively). In recent study, Eissa *et al.* (2015) they found that the rations consisted of Cassava or Prosopis with ammoniated wheat straw. The methane production was more with Cassava than Prosopis (12 *vs.* 10 ml/200mg DM, respectively). It means, that the mixing between different types of shrubs to contain condensed tannins have been shown to decrease methane production both *in vivo* and *in vitro*. So, it is beneficial for sparing of energy loss as methane (Waghorn *et al.*, 2002).

Table 4. Chemical composition, cell wall constituents and phenols compounds of experimental ratios

Item	Groups		
	G1	G2	G3
DM	91.58	75.30	73.50
Chemical composition:			
OM	88.53	87.91	87.23
CP	14.61	14.52	15.40
CF	42.21	43.20	41.23
EE	3.21	3.75	4.22
NFE	28.50	26.44	26.38
Ash	11.47	12.09	12.77
Fiber fraction % of DM:			
NDF	32.10	32.40	38.80
ADF	26.00	20.00	28.00
Hemi-cellulose	6.10	12.40	10.80
Cellulose	16.00	12.50	11.20
ADL	10.00	7.50	6.80
NFC*	38.61	37.24	28.81
NFC/NDF	1.20	1.15	0.74
Phenols compounds g/kg DM:			
TP	16.7	38.5	42.28
TT	2.8	15.5	19.2
CT	0.2	30	20

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

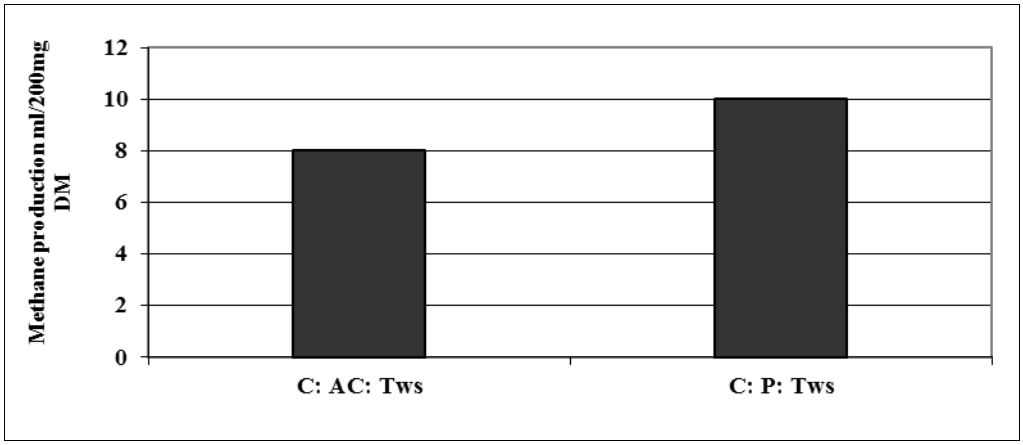

Fig. 1. Methane production from the experimental combination

Blood parameters:

Data of blood serum parameters are presented in Table (5). The results indicated that most tested blood parameters were not significantly affected by tested rations. However, serum total protein (TP), albumin (A) and globulin (G) concentrations were tended to decrease with G2 and G3 compared with G1, but A/G ratio was increase with the combination of two fodder tree with wheat straw ammoniated

(G2 and G3) without significant differences. While, glucose, serum urea, cearatinine and cholesterol were significantly higher (P>0.05) with (G1) berseem hay (60.10, 46.26, 1.95 and 72.08, respectively) in Barki lambs rations. These findings were in accordance with reported by Asker (1998) and Abdel- Halim (2003). Moreover, 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. This reduction of TP in animals fed salt shrubs might be owing to the high content of tannins in these plants. In agreement, Muller *et al.* (1989) and Reed *et al.* (1990) reported that high content of tannins in acacia probably decreases the digestibility of crude protein. Coles (1986) found that poor absorption of dietary constituents from the intestinal tract leads to hypoproteinemia. Tannins can reduce digestibility of protein and carbohydrate by inhibiting digestive enzymes and by altering permeability of the gut wall (Streeter *et al.*, 1993). Moreover, Ortiz *et al.* (1993) reported that tannins could adversely influence digestibility and absorption of nutrients such as proteins and amino acids, carbohydrates and lipids and also the activity of digestive enzymes. The results were in harmony with those reported by Ismail *et al.* (2003) and Shaker *et al.* (2008).

The results indicated also small fluctuations among groups fed different rations in concentrations of ALT, calcium and phosphorus without significant, but the differences were significant with AST (Table 5). The highest values of triglyceride were recorded with G2 and G3 compared with G1 (39.83, 38.30 *vs.* 29.50 u/l, respectively) as shown in Table (5). Generally, the obtained results indicated that blood components measured were showed slightly differences among treatments tested, yet all values were within the normal ranges as reported by Kaneko (1989) for healthy goats and in line with findings of Shaker *et al.* (2014) when used salt tolerant fodder shrubs Mixture on physiological performance in small ruminant rations.

Table 5. Effect of feeding experimental rations for Barki lambs on some blood serum parameters

Items	Groups		
	G_1	G_2	G_3
Glucose , mg/dl	60.10±1.65^a	48.22±0.32^b	46.35±2.14^b
Total protein, g/dl	7.11±0.43	6.28±0.07	6.31±0.43
Albumin(A), g/dl	3.15±0.11	2.97±0.38	3.06±0.07
Globulin(G), g/dl	3.96±0.45	3.32±0.44	3.33±0.44
A/G ratio	0.82±0.11	0.95±0.21	0.95±0.13
Urea, g/dl	46.26±1.15^a	29.55±0.64^c	36.19±0.97^b
Creatinine mg/dl	1.95±0.09^a	1.11±0.07^b	1.28±0.08^b
Cholesterol, mg/dl	72.08±0.24^a	45.78±0.86^c	58.68±1.23^b
Triglycerides mg/dl	71.32±0.40^b	78.68±1.08^a	78.50±1.38^a
AST, u/l	29.50±0.90^b	39.83±0.27^a	38.30±1.05^a
ALT, u/l	17.33±0.43	18.99±0.61	18.82±0.78
Calcium, mg /dl	11.58±0.30	12.16±0.46	11.84±0.46
Phosphorus, mg/dl	5.30±0.20	4.50±0.50	4.90±0.42

Means in the same raw with different superscripts differ significantly at P<0.05.

Table 6. Growth performance of Barki lambs fed the experimental rations

Items	Groups		
	G_1	G_2	G_3
No. of lambs	10	10	10
Feeding period, weeks	16	16	16
Initial weight, (kg)	12.28±0.25	12.24±0.13	11.53±0.35
Final weight, (kg)	33.52±0.55^a	34.44±0.31^a	31.33±0.18^b
Total gain, (kg)	21.24±0.38^b	22.20±0.21^a	19.80±0.27^c
Daily body gain, (g)	177±3.18^b	185±1.72^a	165±2.22^c

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

Growth performance:

Performances of the growing Barki lambs in relation to different experimental groups are presented in Table (6) and Figure (2). The effect of the experimental rations on both final body weight (FBW) and total body gain (TBG) were significant. Meanwhile, the highest values of FBW and TBG were recorded with G2 (34.44 and 22.20, respectively) and the lowest values was detected with G_3 (31.33 and 19.80kg, respectively). Whereas, G_1 recorded medium values (33.52 and 21.24 kg, respectively). Thus,

the daily body gain (DBG) was significantly increased (P<0.05) in Barki lambs fed G2 than the other groups G1 and G3. Similarly, the mean final body weight and mean daily live body weight gain obtained in the present study were higher for *Prosopis Juliflora*. Similar trend have been reported by Ahmed *et al.* (2012). Moreover, Mahgoub *et al.* (2005) observed increased body weight when the basal diet of elephant grass for Omani sheep was supplemented with *Prosopis Juliflora*. The possible explanation for significant increase of growth rate in G2 refers to increase of DMI and CP intake and may be also to tannins which increase fiber and protein digestibility (Patra, 2012).

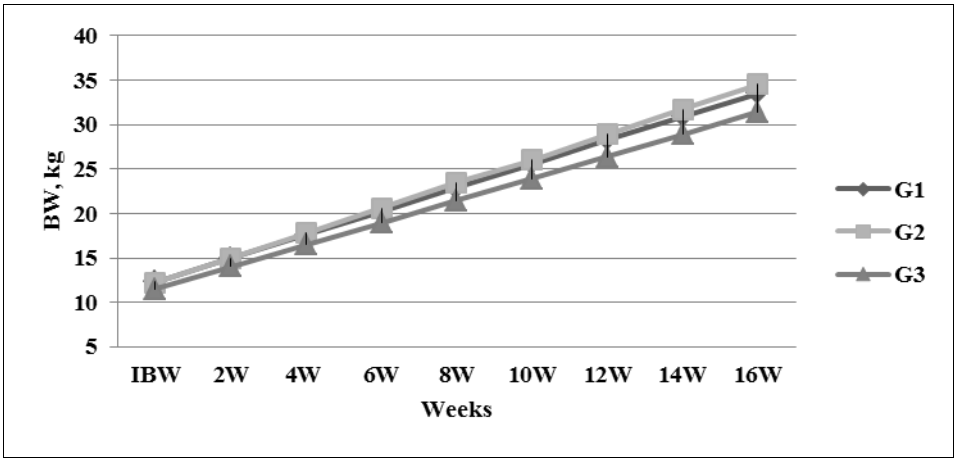

Fig. 2. Effect of experimental treatments on change in weight of Barki lambs.

Feed intake and feed conversion:

The low feeding level 662 g/h/d as DM with (G3) during experimental period had negative effects on total body gain (19.80 kg) and daily body gain (165 g) of lambs compared with the other groups Table (7). However, the highest level (G2) followed by (G1) 864 and 856, respectively. This result was in line with the results of other studies (Mahgoub *et al.,* 2005; Abdullah *et al.,* 2011). Abdullah *et al.* (2011) observed an increase in the total DM intake with an increase in supplementation with *Prosopis Juliflora* and sesame hulls. Data of feed conversion efficiency of the experimental lambs are summarized in Table7. The obtained results indicated that feed conversion calculated as dry matter intake and CP intake/kg gain were better in G3 (4.01 and 0.618, respectively) compared with G2 (4.67 and 0.678, respectively) and G1 (4.84 and 0.707, respectively). The positive effect (based on DM and CP) obtained values of feed conversion are within the normal range given by Gabr *et al.* (1999) and El-Zalaky (2001).

Economic efficiency:

Economic efficiency (EE) estimated as price of gained weight divided by cost of feed consumed for that gain, are presented in Table (7). The results indicated that the highest economic efficiency was recorded with G2 (6.49%) followed by G3 (4.72%) and then for G1 (4.65%). Similarly, Eissa *et al.* (2015) indicated that the economic efficiency was much better with supplementary values of tree fodder (Cassava or Prosopis) than berseem hay in growing Barki lambs rations. Norton (1994) stated that they had been incorporated into concentrate rations as substitutes for more expensive processed protein sources.

CONCLUSION

Under the semi-arid conditions, the combinations of Cassave and ammoniated wheat straw along with *Prosopis Juliflora* or *Acacia Saligne* (37.5: 37.5: 25; G2 and G3, respectively) could be included up to 60 percent in the complete diet of growing Barki lambs which increases the economic return without negative effect on growth performance and blood metabolites**.**

Table 7. Feed intake, feed conversion and economic efficiency of Barki lambs fed the experimental rations

Item	Groups		
	G1	G2	G3
Daily feed intake, g/h/d			
From berssem hay	514	0	0
From *Cassava*	0	194	149
From *Prosopis Juliflora*	0	194	0
From *Acacia Saligne*	0	0	149
From treated wheat straw	0	130	99
From CFM	342	346	265
Total DMI (g/h/d)	856	864	662
DMI as % BW	3.74	3.70	3.09
DMI g/kg $BW^{0.75}$	81.76	81.36	66.47
CP intake (g/h/d)	125.06	125.45	101.95
Roughage: Concentrate (R/C) ratio	1.55	1.49	1.49
Total body gain, (kg)	21.24±0.38b	22.20±0.21a	19.80±0.27c
	Feed efficiency:		
kg DM /kg gain	4.84	4.67	4.01
kg CP/kg gain	0.707	0.678	0.618
Economic efficiency:			
Cost of consumed feed, L.E/h	1.904	1.425	1.749
Price of weight gain, L.E	8.85	9.25	8.25
Feed cost/ kg gain, L.E	10.76	7.70	10.60
Economic efficiency, %	4.65	6.49	4.72

Market price (LE)/Ton fresh of ingredients:
BH = 1600 LE; CFM = 2800 LE; *Cassava* = 500 LE; *Prosopis Juliflora* = 500LE; *Acacia Saligne* = 500LE; Treated wheat straw = 710 LE; Kg live body weight of lambs = 50 LE.

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

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إستجابة الحملان البرقى المغذاة على علائق تحتوى على الكسافا و تبن القمح المعامل مع (عيدان و أوراق) البروسوبس أو الاكاسيا تحت ظروف المناطق الشبه قاحلة فى مصر.

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أجري هذا البحث علي الحملان البرقى لدراسة اثر استخدام خلطات مختلفة من (أوراق وعيدان) الكسافا، الأكاسيا والبروسوبس مع تبن القمح المعامل بالأمونيا علي معدلات النمو ومعدلات التغذية وكفاءة التحويل الغذائى والكفاءة الاقتصادية ، ولتحقيق هذا الهدف البحثي تم استخدام ٣٠ حولي عمر ٣ شهور وبمتوسط وزن ١١.٩٣±٠.٤٠ كجم وزعت عشوائيا على ثلاث مجموعات متساوية (١٠ بكل مجموعة) ، وقد تضمنت العيقة الواحدة اضافة شجرتين علفيتين مع تبن القمح المعامل باليوريا وغذيت الحيوانات فى مجموعات على العلائق التجريبية كما يلى: المجموعة الاولى (مج١) مجموعة المقارنة علف مركز + دريس البرسيم، المجموعة الثانية (مج٢) علف مركز + الكاسافا: الأكاسيا: تبن القمح المعامل باليوريا بنسبة (٣٧.٥: ٣٧.٥: ٢٥، على التوالى) والمجموعة الثالثة (مج٣) علف مركز + الكاسافا : البروسوبس: تبن القمح المعامل باليوريا بنسبة (٣٧.٥: ٣٧.٥: ٢٥، على التوالى) . وكانت النسبة بين العلف الخشن: المركز ٦٠ : ٤٠ لتغطي ١٤٠الاحتياجات الغذائية للأغنام طبقا لمقررات الـ NRC (١٩٨٥) .واستمرت التجربة لمدة ١٦ أسبوع ، وقد اوضحت النتائج انخفض إنتاج الميثان مع عليقة مج٢ مقارنة بعليقة مج٣ (٨ مقابل ١٠ مل/٢٠٠ مجم مادة جافة، على التوالى). بينما عليقة مج٢ كانت اعلى فى محتواها من التانين مقارنة بعليقة مج٣ (٣٠ مقابل ٢٠ جم/ كجم مادة جافة ، على التوالى). كما لم تتأثر بشكل معنوى اغلب قياسات الدم بالعلائق التجريبية المستخدمة. الا ان تركيز البروتين الكلى فى الدم ، الالبيومين و الجلوبيولين انخفض فى مج٢ ومج٣ مقارنة مع مج١، لكن النسبة بين الالبيومين/ الجلوبيولين زادت زيادة غير معنوية مع مج٢ و مج٣. بينما تركيز الجلوكوز ، اليوريا، الكرياتنين والكولستيرول فى الدم ارتفعت بشكل معنوى مع (مج١) مجموعة دريس البرسيم (٦٠.١٠ ، ٤٦.٢٦، ١.٩٥ و ٧٢.٠٨ على التوالى). زاد الوزن النهائى و معدل النمو الكلى فى مج٢ (٣٤.٤٤ و ٢٢.٢٠ كجم، على التوالى) ثم مج١ (٣٣.٥٢ و ٢١.٢٤ كجم، على التوالى) بينما مج٣ كانت الاقل (٣١.٣٣، ١٩.٨٠ كجم، على التوالى). وعليه زاد معدل النمو اليومى بشكل معنوى . تم حساب معدل التحويل الغذائى كمادة جافة مأكولة وكبروتين خام مأكول لكل كجم نمو وكانت افضل النتائج مع مج٣ ثم مج٢ مقارنة بمجموعة دريس البرسيم (مج١). وكانت الكفاءة الاقتصادية أفضل مع مج٣ ثم مج٢ مقارنة بعليقة الكنترول.

ومن تلك النتائج يتضح انه تحت ظروف المناطق الشبه قاحلة فإن خلط الكاسافا و تبن القمح المعامل باليوريا مع البروسوبس أو الأكاسيا يمكن أن يدخل فى علائق الحملان الرحمانى النامية حتى ٦٠% .