IMPACT OF FEEDING *ATRIPLEX HALIMUS* AND *ACACIA SALIGNA* WITH DIFFERENT SOURCES OF ENERGY ON LAMBS PERFORMANCE

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ABSTRACT

This study was conducted to evaluate *Atriplex* (saltbush) and *Acacia* supplemented with crushed barley grains (CBG) alone or with crushed date seeds (CDS) for fattening growing Barki lambs. Forty lambs (initial weight of 30.6 ± 3.50 kg), 6-8 months age were divided by weight into four groups for 140 days. The first is control group (CG) was fed berseem hay *ad lib.* plus CBG to cover 100% of their maintenance energy requirement (MER). The other three groups were fed *ad lib.* on fresh leaves and succulent stems of both *Atriplex* and *Acacia* supplemented with either 100% of their MER from CBG for diet A, 50% CBG plus 50% CDS for diet B or 25% CBG plus 75% CDS for diet C, respectively. Lambs fed diets A, B, and C consumed slightly higher DMI (g/day/kg $w^{0.75}$) than the CG. The apparent digestibility of DM, OM and NFE for diets A, B, and C decreased ($P<0.05$) than CG which related mainly to changes in the type of roughage. Similarly, TDN values of the experimental diets were decreased ($P<0.01$) according to both type of roughage (diet A) and source of energy (diets B and C). Contrariwise, digestible crude protein (DCP %) increased ($P<0.01$) due to replacing *Atriplex* and *Acacia* for berseem hay. Average daily gain (g/day) decreased ($P<0.01$) as a result of changing type of roughage. The best feed conversion was recorded for control diet followed by A and B diets with no significant differences. Otherwise, lamb groups fed *Atriplex* and *Acacia* recorded the highest ($P<0.01$) insensible water loss (ml/kg$w^{0.82}$). Nitrogen retention (g/kg$w^{0.57}$) was decreased ($P<0.05$) by changing type of roughage. This study indicate that lambs could gain satisfy growth under harsh condition in arid and semi-arid areas of marginal lands, when fed *Atriplex* and *Acacia* shrubs supplemented with CBG and/or CDS at ratio 1:1 of MER as fodder sources.

***Keywords*:** lambs, *Atriplex*, *Acacia*, intake, growth, digestibility, nitrogen retention.

INTRODUCTION

Feed shortage will be increased in the next decades due to the expected global climate changes which will lead to increase desertification in many arid and semi-arid aeries of the world that leads to; accelerate soil erosion by wind and water; increasing salinity in water wells and soil with rain drop. These phenomena will lead to despair the natural range plant cover. Halophytes are widely distributed in high density in these aeries under harsh conditions . This refers to their high resistance to salinity in water and/ or soil especially during dry periods preventing soil erosion. So, feeding halophytes is a feasible solution to minimize the expected problems of feed shortage in such aeries. The suitable halophytic forage species that show better adaptability and chances of establishment are *Atriplex* and *Acacia* species **(Le Houerou, 1991; 1992 and Degan *et al.*, 1995 and 1997).** High salt content is the major negative component in *Atriplex* species **(Wilson, 1992).**

Acacia saligna is the most successful species of *Acacia* due to its tolerance to drought, ability to grow in salty soil, higher production of green biomass, higher crude protein content and good nutritive value **(Degan *et al.*, 1997).** But, it cannot serve as a sole feed for sheep due to its high content of condensed tannins (**Degan *et al*., 1997**)which form precipitates with proteins, resulting in the formation of indigestible tannin-protein complexes **(Makkar, 1993; Degen *et al*., 1995)** and also form complexes with soluble carbohydrates, cellulose, hemicelluloses and amino acids reducing their digestibilities **(Barry, 1985).**

Saltbushes, in general, are characterized by moderate digestible crude protein (DCP), low digestible ether extract, soluble carbohydrates and high mineral contents, particularly Na, K, Cl and Ca concentrations. Deficiency of available carbohydrates and the rapid fermentation of its crude protein (CP) together in the rumen may be responsible for the poor utilization of saltbush protein. Feeding on *Atriplex* solely adversely affects the general condition of sheep. Coordination between the concentration of dietary readily available carbohydrates and ruminal ammonia-nitrogen is recognized to maximize the utilization of dietary nitrogen by micro-organisms **(El-Shaer and Gihad, 1992)**. So, energy sources supplementation (i.e. barley grains, yellow corn grains or date seeds) was suggested to stimulate saltbush intake and to make better use of ruminal ammonia-nitrogen by rumen microorganisms. Also, high salt content of *Atriplex* species (saltbush) may be the major factor that limits intake and reduce digestibility as a result of increasing intake of drinking water which lead to shorten the rumen turnover times which reduce the feed ingredients transit time in the rumen **(Warren and Casson 1992)**.

Accordingly, feeding leguminous trees with *Acacia* species seems to be a recommended practice to dilute the negative effects of possible anti-nutritional factors (tannins, oxalates, high salts, etc.) for best utilization of the nutritive value of the both halophytic forages **(Franclet and Le Houerou, 1971; Shawket, 1999; Ben Salem, *et***

***al*., 2002)**.

Date seeds are an agro-industrial by product of palm trees which grow successfully in arid and semi-arid areas. **El-Shear *et al*. (1986) and Khamis *et al*. (1989)** found that date seeds used successfully as unconventional supplementary feed for livestock grazing in the native range lands. It serve as source of energy and considerably reduce the feeding costs in comparison with the conventional supplement like barley grains.

The aim of this study was to evaluate the impact of feeding both *Atriplex halimus* (saltbush) and *Acacia saligna* supplemented with ground barley grains alone/or with ground date seeds on the performance of growing lambs.

MATERIAL & METHODS

Animals and Management

Forty growing male lambs of North African desert Barki breed, averaged 6-8 months old and 30.60 ± 3.50 kg body weight were randomly blocked by weight and assigned to four dietary treatments. Each group of 10 animals was housed separately in shaded pen. Animals were left two weeks for adaptation prior the start of experimentation. . During that period they were treated with anti-helmenthics. The growth experiment lasted for 120 days plus 22 days for the digestibility trials.

Experimental treatments

The first group (CG) was offered berseem hay *ad lib.* and daily supplement of crushed barley grains (CBG) to cover 100% of MER according to Kearl (1982) allowances. The other three groups, were fed indoors *ad libitum* on fresh cut leaves and succulent stems of *Atriplex halimus* plus *Acacia saligna*. Offered and refused amounts of feeds were recorded to estimate the actual voluntary feed intake for each group. These groups were also provided daily with supplement to cover 100% of MER. The supplement was CBG for group A, 50% CBG plus 50% crushed date seeds (CDS) for group B and 25% CBG plus 75% CDS for group C. All animals were weighed weekly. Fresh water was available all the day for each group.

Digestibility and nitrogen balance trials

Digestibility trial was conducted using three animals chosen randomly from each group. The digestibility trial lasted 22 days, the first 15 days were considered as a preliminary period, followed by a 7 days as collection period. The animals were weighed at the beginning and at the end of the metabolism trial. Animals were housed in individual metabolic cages. During the metabolism trials, animals were fed their normal allowances according to the experimental scheme. Faeces and urine were quantitatively collected from each animal. The daily faeces excreted of each animal were recorded and 10% was sub-sampled, pooled on animal basis and frozen pending chemical analysis. The urine was collected in plastic buckets containing a solution of 100 ml of 10% H_2SO_4 to prevent ammonia-N loss. The daily output from each animal was weighed and 10% sub- sampled, pooled on animal basis and stored at 4 ^{O}C until the analysis of nitrogen. Feed residues were removed daily at 7 a.m and weighed. Daily drinking water volume was recorded.

Analytical Methods

Chemical composition of feeds, residues, faeces and urine were determined according to the procedure of **A.O.A.C (1990).**

Statistical Analysis

The data were subjected to the statistical analysis according

to **SAS (1993).** Differences in mean values among groups were compared by Duncan's Multiple Range Test (**Duncan, 1955**).

RESULTS

Chemical composition of feed ingredients

Chemical composition of the experimental basal ingredients (berseem hay, fresh *Atriplex halimus* and *Acacia saligna*) and feed supplements (CBG and CDS) are presented in Table (1). Dry matter content of berseem hay was higher than that of *Atriplex* and *Acacia* by 3.2 and 2.4 times, respectively. *Atriplex* contain higher CP by about 1.4 and 1.3 times and ash by about 20.1 and 2.5 times than B. hay and *Acacia*, respectively. However, *Atriplex* contain less CF and NFE than B. hay and *Acacia* (18.22 *vs*. 32.3 and 25.5% and 39.28 *vs*. 41.43 and 49.2%, respectively).

It was noticed that CP and nitrogen free extract of barley grains were higher than that of date seeds by 1.8 and 1.2 times, respectively. On the other hand, date seeds contain higher ash and CF than barley grains by about 2 and 3 times, respectively. These data revealed that CDS were rich in energy content (as NFE) and slightly poor in CP content than CBG.

Digestion coefficient and nutritive value

Nutrient digestibilities and nutritive values of the experimental diets are presented in Table (2). Changing the type of roughage by adding *Atriplex* plus *Acacia* instead of berseem hay significantly ($P < 0.05$) decreased the DM, OM and NFF digestibility of A, B and C diets. There were no significant differences among CP, CF and EE digestibilities of dietary treatments. Also, changing type of the experimental diets either by adding *Atriplex* and *Acacia* instead of berseem hay or date seeds at rates of 50 and 75% instead of barley grains, were significantly ($P<0.01$) decreased their nutritive value as TDN%. Inclusion of *Atriplex* and *Acacia* instead of berseem hay promoted higher ($P<0.01$) DCP% (diet A), while inclusion of 50 or 75% date seeds instead of CBG (diets B and C) decreased DCP% comparing to diet A, but still higher than the control diet.

Voluntary feed intake, growth performance and feed conversion efficiency

Voluntary feed intake and daily nutrients intake g/day/Kgw$^{0.75}$ of growing lambs are shown in Table (3). The supplements offered were entirely consumed. Generally, irrespective of energy supplementation, it was noticeable that lambs fed diets A, B and C, consumed almost equal amounts (g DMI/day/kg$^{0.75}$) from fresh *Atriplex* and fresh *Acacia*. Total dry matter intake by lambs of CG and the experimental diets A, B and C were almost equal. Total digestible nutrients intake (TDNI, g/day/Kw$^{o.75}$) values revealed that the maximum intake was recorded by lambs of CG and A diets, respectively. Groups fed diets A, B and C which contained *Atriplex* and *Acacia* revealed higher digestible crude protein (DCP, g/ day/Kw$^{0.75}$) than CG group. It was noticed that when lambs had a free choice for feeding *Atriplex* or *Acacia* at the same time depending on their selectivity behavior, they consumed an equal amount from *Atriplex* and *Acacia* at ratio 1:1(diets A, B and C)(This is not valid because all amounts offered were consumed, accordingly there was no real selection choice).

Growth performance and feed conversion were presented in Table 2. Generally, changing the type of roughage by adding *Atriplex* and *Acacia* instead of berseem hay decreased average daily gain ($P<0.01$) of growing lambs (Fig.1). Feeding diets A and B for lambs accomplished significant better average daily gain than group C, but they were less than CG. Control diet revealed the best feed conversion as DM Kg/Kg gain followed by diets A (*Atriplex* and *Acacia* with 100% CBG), B (*Atriplex* and *Acacia* with 50% CBG plus 50% CDS) and lastly C, but with no significance in differences.

Water utilization

Responses of water intake, excretion and insensible loss to the experimental diets are shown in Table (4). Free drinking water (ml/kgw$^{0.82}$) was higher ($P<0.01$) for CG than the other experimental diet groups. Oppositely, feed water and total water intake (ml/kgw$^{0.82}$) for lambs fed diets A, B and C which contained *Atriplex* and *Acacia*, were higher ($P<0.01$) than for CG. Faecal water, urinary water and total water loss were higher ($P < 0.01$) for animals fed the experimental diets A, B and C (halophytic diets) than for CG. The same trend was observed for the insensible water loss. There was no significance in differences in the insensible water loss % of water intake and dietary treatments compared with value for CG.

Nitrogen balance:

As indicated in Table (5), using *Atriplex* plus *Acacia* (A, B and C) instead of berseem hay (CG) promoted higher (P<0.01) nitrogen and total nitrogen intake. Nitrogen loss in both faeces and urine were followed the same pattern of nitrogen intake. Nevertheless, all animal groups fed the experimental diets showed a positive nitrogen balance (P<0.05). When the nitrogen retention expressed as a percentage of total nitrogen intakes (NB/TNI) a significant differences (P<0.01) among treatments was noticed. The control diet showed the highest value, about double values, compared to those containing *Atriplex* and *Acacia.*

DISCUSSION

Lambs had free choice to consume *Atriplex* and *Acacia* beside being supplemented with CBG alone or plus CDS at rate of 50 or 75% instead of CBG to cover the maintenance energy requirements aiming to overcome the poor energy content of halophytic shrubs.

Results revealed that date seeds are rich in energy (as NFE %) content but slightly poor in protein content and had higher ash, ether extract and crude fiber content **(Rashid and Alwash, 1976).** As an agro-industrial by product, it was 60% cheaper than barley grains **(El-Shear, *et al.*, 1986)**. It was noticeable that fresh *Atriplex* had higher CP than berseem hay and fresh *Acacia* **(Shawket *et al.*, 1998)**, higher ash content **(Wilson, 1966 a, b, and El-Shaer *et al.*, 1984)** and deficient in available carbohydrates as NFE content **(Hassan and Abd El-Aziz, 1979)**.

The apparent digestibility of DM %, OM % and NFE% of the experimental diets were significantly (P<0.05) decreased as a result of changing type of roughage by replacing *Atriplex* and *Acacia* instead of berseem hay (diets A, B and C). This may be due to the anti-nutritional factors content especially condensed tannins (CT) in *Acacia.* Condensed tannins link with protein and/or carbohydrates to form undegradable complexes **(Makkar, 1993; Waghorn *et al*., 1994 and Fall-Toure *et al.*, 1998)** which may have reduced rumen fermentation metabolism and nutrient digestibilities **(Ngwa *et al*., 2002)**. This may explain the depressive effect of CT on DM, OM and NFE digestibility. But **Ben Salem *et al*. (2002)** indicated that provision of *Atriplex* in combination with barley in the diet of sheep fed *Acacia* reduced its astringency and increased proteins degradation in the rumen by sparing microbial enzymes and improving nutrients digestibility. This improvement was reflected on a higher (P<0.01) nutritive value as TDN for diet A than B and C regardless of CG. Also, diet A recorded higher (P<0.01) DCP (%) than control and B and C diets, respectively. It is noticeable that provision of date seeds instead of barley grains either by 50% or 75% on the basis of maintenance requirement decreased (P<0.01) diet's nutritive value. This may be due to the higher CF of date seeds (19.55%), about 3.0 times, than that of barley grains (5.80%). Date seeds also may be responsible of the decrease in NFE digestibility of B and C diets ($P<0.05$) leading to deficiency in carbohydrates availability of the diet. Carbohydrates deficiency inhibit rumen microbial population of synthesizing enough nitrogen. This is also the reason of decreased DCP% in diets B and C in comparison with diet A ($P<0.01$). On the other hand, the poor palatability of date seeds reduced its intake by lambs so that they did not eat all the offered amounts calculated to cover 75% of their maintenance energy requirements preferring to consume barley This may be another reason for reduction in OM, DM and NFE digestibilities of diets which could be responsible of the decrease of the nutritive value as TDN% for B and C diets than that of A diet. The higher DCP% values of the experimental diets A, B and C based on *Atriplex* and *Acacia* as basal roughage than CG (berseem hay) () ($P<0.01$) lead to an interpretation may seems conflict with reports that supplementation with tanniferrous roughage-basal diets depressed microbial activity in the rumen **(Makkar, 1993 and Nsahlai *et al*., 1994).** The nutritional effects of tannins are associated with their ability to bind with proteins (dietary and enzymes), structural carbohydrates polymers found in plant cell walls and minerals with an overall effect of lowering the bioavailability of nutrients at specific sites in the gastro-intestinal tract **(Ndluvo, 2000).** Other workers (**Waghorn and Shelton, 1992; Wang et al., 1994**) had reported that low concentrations of tannins are beneficial to ruminants because they protect plant proteins from degradation in the rumen and increase quantity of dietary protein reaching the lower gastro-intestinal tract. Condensed tannins (at low concentrations) bind with plant protein at nearly neutral PH in the mouth and rumen to form tannin-protein complexes which are stable and insoluble at PH 3.6 -7.0, but dissociate and release protein at PH <3.5 in the abomasums with little effect on DM, OM and fiber apparent digestibility (**Wang et al., 1996, Ngwa et al., 2002**). Results of the present study confirm the previous observation. The average daily gain for the successive diets, control, A and B were 174.58, 141.25 and 136.25 g/day, respectively, which appeared more affected ($P<0.01$) by TDN intake than by increasing DCP intake values of the *Atriplex-Acacia* basal diets. This may be explained by the indicative report of **McNeill *et al*. (1999)** that dietary protein complexes with tannin was made available in the abomasums and digested in the intestine but tannin released from the protein-tannin complexes may react with non-dietary protein (including digestive enzymes) as it passes along the intestine thus counteracting the benefits of by-pass dietary protein. This may explain the significant ($P<0.05$) decrease in digestibility of dietary DM, OM and NFE components when *Atriplex* and *Acacia* were replaced berseem hay.

It was noticeable that the higher total water intake of lambs fed on the basal diets of *Atriplex* and *Acacia* (diets A, B and C) might be attributed to the higher ($P<0.01$) feed water intake (ml/kg$^{0.82}$) while not for free water intake which decreased ($P<0.01$) than those drank when fed control diet. This due to the higher humidity of *Atriplex* and *Acacia* than berseem hay (about 72% and 62% *vs*.11%, respectively). This result was conflict with the other findings of previous studies that the higher ash content of *Atriplex* forced animals to consume relatively more water intake in order to excrete the ingested salt with consequential influences on rumen physiology and metabolism (**Konig, 1993, Ben Salem *et al.*, 2002 and Abu-Zanat and Tabbaa, 2005**). This result confirmed that feeding animals with a mixture of shrub species seems to be a recommended practice to dilute the negative effects of possible anti-nutritional factors (tannins, oxalates, higher salt content etc.) as indicated previously by **Shawket *et al.* (1998) and Ben Salem *et al*., (2002)**. Insensible water losses ($P<0.01$) were in favor of the growing lambs fed diets containing *Atriplex* and *Acacia*, which might have vital significant regulation under the intensive heat load of arid and semi-arid areas (**El-Shaer and Kandil, 1990**).

Total nitrogen intake of the experimental basal diets were different among diets($P<0.01$). Whereas, changing type of roughage by using *Atriplex* with *Acacia* (diets A, B and C) instead of berseem hay (control diet) increased nitrogen intake and total nitrogen intake due to the higher CP content of *Atriplex* than berseem hay and *Acacia* (18.17% *vs.* 13.15% and 13.67%, respectively). Also, nitrogen excretion in urine and faeces was higher ($P<0.01$) for lambs fed halophytic basal diets by about 2.4 and 1.9 times that for lambs fed berseem hay. This may be due to the anti-nutritional factors in the halophytic basal diets which form insoluble complexes with diet proteins rendering them indigestible (**Degan et al., 1995, 1997 and Ben Salem, 1998**) and excreted in faeces. The greater ($P<0.01$) nitrogen excretion in urine of lambs fed diets of basal roughages of *Atriplex* and *Acacia* could be attributed to the high solubility of nitrogen levels content of *Atriplex* foliage (45% of total N, **Kaitho *et al*., 1998a,b**). This also explain the reduction ($P<0.05$) in nitrogen retention values for these diets. The present study indicated that the N digestibility did not affected significantly by feeding growing lambs this halophytic basal diet (*Atriplex* and *Acacia*) instead of berseem hay. This may be due to the higher NI from halophytic basal diets which can cover the undesirable impact of their anti-nutritional factors that bind feed proteins to be indigestible. Also the inclusion of *Atriplex* with *Acacia* in the experimental basal diets diluted the impair effects of *Acacia* tannins on nutrients digestibility.

CONCLUSION

Under arid and semi-arid conditions, it is desirable to allow sheep grazing more than one kind of halophytic forages i.e. *Atriplex halimus* (saltbush) and *Acacia saligna* (leguminous tree shrubs). These combinations encourage the selection behavior to better obtain the animal needs and help to dilute the possible concentration of anti-nutritional factors in halophytic forages (i.e. tannins, oxalates, salts etc.). Supplement with a suitable source of energy like barley grains either alone or with date seeds (1:1) could improve rumen fermentation and overcome halophytic nutrients deficiency which help to obtain satisfied body weight gain.

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Table 1: Chemical composition (% on DM basis) of the experimental diets.

Item	Berseem Hay	*Atriplex halimus*	*Acacia saligna*	Barley grains	Date seeds
Dry matter (DM)	89.42	27.98	37.93	87.13	91.71
Organic matter (OM)	89.44	78.13	91.17	96.49	92.89
Crude protein (CP)	13.15	18.17	13.76	10.37	5.92
Crude fiber (CF)	32.20	18.22	25.50	5.80	17.55
Ether extract (EE)	2.66	2.46	2.71	3.89	3.65
Nitrogen free extract	41.43	39.28	49.20	76.43	65.77
Ash	10.56	21.87	8.83	3.51	7.11

Table 2: Voluntary feed intake, growth performance, feed conversion of lambs fed *Atriplex* and *Acacia* with different sources of energy supplementation.

Items	Control	Experimental diets[1] A	B	C	F test
No. of animals	10	10	10	10	
Experimental periods, day			120		
Initial BW, Kg	30.55±1.5	30.55±0.83	30.5±1.33	30.8±0.78	NS
Final BW, Kg	51.5±1.73	47.5±1.05	46.85±1.31	46.35±1.87	*
BW changes, Kg	21.13±2.47	17.09±1.29	16.49±1.29	15.68±0.96	*
Average daily gain, g/day	174.6±18.5^{a}	141.3±11.9^{b}	136.3±9.5^{b}	129.6±8.3^{c}	**
DM intake, g/day/Kg$^{0.75}$					
Barley grains	33.95	33.44	16.92	9.02	
Date seeds	-	-	-	-	
Berseem hay	74.23	-	-	-	
Atriplex halimus	-	38.52	38.78	35.57	
Acacia saligna	-	40.56	37.41	38.78	
Daily nutrient intake,					
DM	108.18	112.52	111.38	110.77	NS
TDN	79.6^{a}	76.46^{a}	71.79^{b}	70.75^{b}	**
DCP	8.8^{c}	11.02^{a}	9.77^{b}	9.90b	*
Feed conversion					
DM Kg/Kg gain	10.49	12.44	12.5	12.97	NS
DCP g/kg gain	7.68	8.45	7.89	8.46	NS

a, b, c values in the same row with different superscripts are significant different. *P<0.05; **P< 0.01; NS not significant.

[1]Control diet: *ad lib.* B.hay plus 100% ground barley grains (GBG) of maintenance energy requirements (MER). Diet A: *ad lib. Atriplex – Acacia* plus 100% GBG of MER. Diet B: *ad lib. Atriplex – Acacia* plus 50% GBG + 50% ground date seeds (GDS) of MER. Diet C: *ad lib. Atriplex – Acacia* plus 25% GBG + 75% GDS of MER.

Table 3: Apparent nutrients digestibility and nutritive value of the experimental diets fed to growing lambs.

Item	Control	A	B	C	Sig.
Dry matter (DM)	73.95± 0.73^{a}	71.06± 0.82^{b}	69.18± 0.71^{b}	69.39± 0.68^{b}	*
Organic matter (OM)	74.55± 0.65^{a}	70.81± 0.84^{b}	71.03± 0.41^{b}	71.35± 0.80^{b}	*
Crude protein (CP)	70.85± 2.06	69.64± 0.65	69.84± 0.44	70.44± 0.68	NS
Crude fiber (CF)	17± 0.51	9.61± 1.25	69.31± 0.28	69.32± 0.40	NS
Ether extract (EE)	69.62± 0.54	69.64± 0.58	67.99± 1.21	68.45± 0.23	NS
Nitrogen free extract (NFE)	73.91± 0.78^{a}	71.87± 0.62^{ab}	66.65± 1.77^{b}	67.12± 1.15^{b}	*
Nutritive value (%)					
TDN	73.19± 1.70^{a}	67.95± 0.38^{b}	64.45± 1.31^{c}	63.87± 1.46^{c}	**
DCP	8.14± 0.36^{b}	9.79± 0.32^{a}	8.77± 0.09^{ab}	8.97± 0.27^{ab}	*

a, b, c values in the same row with different superscripts are significant different,*P<0.05; **P< 0.01; NS not significant.

Table 3: Voluntary feed intake, growth performance, feed conversion of lambs fed *Atriplex* and *Acacia* with different sources of energy supplementation

Items	Control	A	B	C	Sig.
Water intake, ml/kg $w^{0.82}$					
Free drinking water	86.86± 3.43α	64.67± 1.02 β	64.51± 2.15β	70.59± 2.55β	**
Feed water	9.63±0.04β	112.27± 2.38α	109.33±2.66α	119.61± 3.74α	**
Total water intake (TWI)	94.70± 2.51χ	176.94±1.68 β	173.84±1.63αβ	190.20± 1.28α	**
Water excretion, ml/kg $w^{0.82}$					
Feacal water (FW)	19.98± 1.83β	27.73±1.00α	25.82± 1.05α	25.10± 0.99α	**
Urinary water (UW)	31.77± 1.09χ	67.89±0.86 β	67.39± 1.82β	77.17± 1.66α	**
Total water excretion (TWE)	51.75± 2.34β	95.62±3.52 α	93.21± 1.88α	102.27± 4.09α	**
Insensible water loss ml / kg $w^{0.82}$	42.95± 3.56β	81.32±5.68α	80.63± 6.27α	87.93± 6.34α	**
% of Water intake	45.35±1.22	45.93±3.81	46.38± 3.62	46.23± 1.52	NS

a, b, c values in the same row with different superscripts are significant different. *P<0.05; **P< 0.01; NS not significant.

[1]Control diet: *ad lib.* B.hay plus 100% crushed barley grains (CBG) of maintenance energy requirements (MER). Diet A: *ad lib. Atriplex – Acacia* plus 100% CBG of MER. Diet B: *ad lib. Atriplex – Acacia* plus 50% CBG + 50% crushed date seeds (CDS) of MER. Diet C: *ad lib. Atriplex – Acacia* plus 25% CBG + 75% CDS of MER.

Table 4: Water utilization of growing lambs fed *Atriplex* and *acacia* with different sources of energy.

Items	Control	A	B	C	Sig.
Water intake, ml/kg $w^{0.82}$					
Free drinking water	86.86± 3.43α	64.67± 1.02β	64.51± 2.15β	70.59± 2.55β	**
Feed water	9.63± 0.04β	112.27± 2.38α	109.33± 2.66α	119.61± 3.74α	**
Total water intake (TWI)	94.70± 2.51χ	176.94±1.68β	173.84± 1.63αβ	190.20± 1.28α	**
Water excretion, ml/kg $w^{0.82}$					
Feacal water (FW)	19.98± 1.83β	27.73± 1.00α	25.82± 1.05α	25.10± 0.99α	**
Urinary water (UW)	31.77± 1.09χ	67.89± 0.86β	67.39± 1.82β	77.17± 1.66α	**
Total water excretion (TWE)	51.75± 2.34β	95.62± 3.52α	93.21± 1.88α	102.27± 4.09α	**
Insensible water loss ml / kg $w^{0.82}$	42.95± 3.56β	81.32± 5.68α	80.63± 6.27α	87.93± 6.34α	**
% of Water intake	45.35± 1.22	45.93± 3.81	46.38± 3.62	46.23± 1.52	NS

a,b,c values in the same raw with different superscripts are significant different.** p <0.01; NS not significant.

Table 5: Nitrogen utilization (g/kgw$^{0.75}$) for growing lambs fed *Atriplex* and *Acacia* with of the tested energy supplements.

	Control	A	B	C	Sig.
NI of basal diets	0.66± 0.13b	2.08± 0.92a	2.19± 1.19a	2.21± 0.64a	**
NI of supplement	0.83± 3.5a	0.63± 3.09b	0.57± 2.7b	0.60± 3.04b	**
Total NI (TNI)	1.49± 3.5b	2.71± 1.18a	2.76± 1.24a	2.81± 0.9a	**
Feacal nitrogen (FN)	0.43± 0.64b	0.82± 0.62a	0.83± 0.26a	0.83± 0.34a	**
Digest nitrogen (DN)	1.06± 0.45b	1.89± 0.85a	1.93± 0.81a	1.98± 0.93a	**
Urinary nitrogen (UN)	0.66± 0.17b	1.52± 1.0a	1.58± 0.76a	1.60± 0.75a	**
Nitrogen balance (NB)	0.40± 0.21a	0.37± 0.15b	0.36± 0.60b	0.38± 0.21b	*
NB/TNI	26.85±3 .42a	13.65± 0.76b	13.04± 0.37b	13.52± 0.49b	**

a, b values in the same row with different superscripts are significantly different, ** P < 0.01, NS not significant.

تأثير التغذية على القطف والأكاسيا مع مصادر مختلفه من الطاقه على إنتاجية حملان الأغنام البرقى

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إستخدم فى هذه الدراسة ٤٠ ذكر نامى برقى – متوسط وزن ٣٠.٦±٣.٥٠ كجم. قسمت الحيوانات إلى أربع مجموعات متماثلة لدراسة تأثير إضافة الشعيرالمجروش بمفرده أو مع نوى البلح المجروش كمصدر للطاقة لعلائق طازجة من القطف و الأكاسيا على معدلات نمو الحملان. وكانت العلائق المختبرة كما يلى:

١ – عليقة الكنترول: دريس البرسيم حتى االشبع + ١٠٠ % شعير مجروش

٢ – عليقة (أ) : قطف + أكاسيا حتى الشبع + ١٠٠ % شعير مجروش

٣ – عليقة (ب) : قطف + أكاسيا حتى االشبع + ٥٠ % شعير مجروش + ٥٠ % نوى البلح المجروش

٤ – عليقة (ث) : قطف + أكاسيا حتى االشبع + ٢٥ % شعير مجروش + ٧٥ % نوى بلح مجروش

أوضحت النتائج أن الحوالى المغذاة لمدة ١٢٠ يوما على العلائق أ ، ب ، ث سجلت نسبيا أعلا مادة جافة مأكولة (جم/اليوم/كجم ٠.٧٥) ولاتوجد إختلافات معنوية نتيجة المعاملات الغذائية. إحلال القطف والأكاسيا بدل دريس البرسيم أدى إلى إنخفاض معنوى($P<0.05$) فى معاملات هضم المادة الجافة والمادة العضوية والكربوهيدرات الذائبة. إنخفض معنويا ($P<0.01$) المأكول من المواد الغذائية المهضومة بإحلال دريس البرسيم بالقطف + الأكاسيا فى عليقة (أ) ونتيجة إحلال الشعير بنوى البلح بنسبة ٥٠% و ٧٥% من الطاقة الحافظة فى العليقة (ب) و (ث). لوحظ أن المأكول من البروتين المهضوم قد زاد ($P<0.05$) فى المجاميع التجريبية المغذاة على القطف + الأكاسيا أ ، ب ، ث بالمقارنه بمجموعة الكنترول. معدل الزيادة اليومية فى الوزن (جم/اليوم) إنخفض معنويا ($P<0.01$) بإحلال القطف + الأكاسيا بدلا من دريس البرسيم وسجلت المعدلات التالية ١٧٤.٥٨ ، ١٤١.٢٦ لعلائق الكنترول ، أ على الترتيب وإحلال الشعيرمحل نوى البلح بنسبة ٥٠%، ٧٥% من الطاقة الحافظة فى العليقة ب ، ث أدى لإستمرار إنخفاض معدل الزيادة اليومية إلى ١٣٦.٢٥ ،١٢٩.٥٨، على التوالى. معدل التحويل الغذائى معبرا عنه بوحدات كجم ماده جافة أو عناصر غذائية كلية مهضومة/كجم زياده فى وزن الجسم لم يتغير معنويا سواء بإحلال القطف والأكاسيا محل الدريس أو إحلال نوى البلح بنسبة ٥٠% أو ٧٥%. سجلت الحوالى النامية المغذاة على القطف + الأكاسيا أعلا مستوى معنوى ($P<0.01$) من المياه المحتجزه بالجسم (مل/كجم ٠.٨٢) وكانت ٢٥٦.٦٠ ، ٢٥٤.٦٣ ، ٢٦٨.١٦ للحوالى المغذاه على العلائق أ ، ب ، ث على الترتيب بالمقارنه بمجموعة الكنترول (١٧٢.٨٠). إحلال القطف والأكاسيا بدل دريس البرسيم أدى إلى خفض ($P<0.05$) النيتروجين المحتجز بالجسم للحوالى المغذاه على العلائق التجريبية أ ، ب ، ث بالمقارنة بتلك المغذاه على عليقة الكنترول.

من هذه النتاج يمكن أن نوصى بإستخدام القطف الطازج + الأكاسيا الطازجه مع الشعير (١٠٠ % من الإحتياجات الحافظة) أو مع مخلوط من الشعير ونوى البلح بنسبة ١:١ فى تغذية الحملان النامية تحت الظروف الجافه والشبه جافه حيث يمكن أن يحقق ذلك معدلات نمو جيده.