EFFECT OF FEEDING VARYING LEVELS OF ACACIA LEAVES AND TWIGS ON PRODUCTIVE PERFORMANCE OF AWASSI EWES UNDER SEMI-ARID CONDITION OF NORTH SINAI.

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SUMMARY

This study was carried out to evaluate the effect of feeding different levels of acacia to Awassi ewes on digestibility coefficients and nutritive values of the rations, milk yield and composition, growth performance of their lambs and some blood serum constituents of the ewes and their lambs through two experiments. In the first experiment, three rations were nutritionally evaluated through three digestion trials with rams, the control ration basal ration consisted of CFM and rice straw to cover their nutritional requirements, while the second and third rations consisted of CFM to cover 65 or 45% of TDN requirements and acacia *ad lib*. The second was a feeding trial in which a total of 15 Awassi ewes were divided into three equal groups. The 1st group (control) was fed on concentrate feed mixture (CFM) and rice straw to cover 85% from their total digestible nutrients (TDN) requirements. While 2nd and 3rd groups and their lambs were fed the concentrates feed mixture to cover 65% and 45% of TDN requirements from basal ration and were offered acacia *ad lib.*, respectively.

The main results showed significant differences among rations in the digestibility coefficients for OM, CP and CF which decreased when acacia consumption increased. Diet 1 and 2 had the highest ($P<0.05$) TDN value, followed by diet 3. All animals were in positive N balance in the three experimental rations. There were no significant effects on birth weight, weaning weight and daily weight gain (DWG) of Awassi lambs due to feeding their mothers on acacia up to 55% of their nutrient requirements. Milk yield was not significantly affected by feeding acacia. Milk composition in terms of percentages of fat, protein, lactose, solids not fat and total solids were not significantly different among treatments. The differences among treatments in the concentrations of total protein, albumin, globulin, urea-N, cholesterol, total lipids, glucose, creatinine, GOT and GPT of blood serum of the ewes and their lambs were not significant.

It could be concluded that replacing of acacia up to 55% of the TDN requirements of Awassi ewes by acacia improved productive performance, economical efficiency and decreased feed cost under North Sinai conditions.

Keywords: *Acacia, Awasi ewes, digestibility, productive and growth performance, milk yield and composition, blood metabolites, economic efficiency, North Sinai.*

INTRODUCTION

In many parts of the world especially the arid and semi-arid regions with scarce animal feed resources , low quality non – conventional feeds are frequently fed to livestock (Mahgoaub *et al*, 2008) .Browse species play a major role as feeds for ruminants in arid and semi arid regions , particularly during the dry season when poor quality forage and crop residues are common (Kibon and Ørskov , 1993).During the dry periods; forage trees remain green and maintain a relatively high crude protein content (D'Mello , 1992 ; Mousa and Shetaewi , 2002 and Mousa and El-Shabrawy, 2003).

The contribution of trees and shrubs, particularly shrub legumes such as acacia, is an important aspect of livestock nutrition in semi-arid, arid and tropical regions. The foliage can potentially contribute significant levels of protein and generate energy supplement low quality roughages during prolonged dry periods when pasture availability is limited (Getachew *et al.* 2000).

Acacia saligna is a multipurpose shrub, which can be grown for wood and fodder production. Replacing 50% of the daily dry matter alfalfa intake for Barki sheep with acacia foliage increased total digestible nutrients (TDN) and reduced digestible protein (DP) (El-Lakany *et al.*; 1991).

The energy rich ingredients (mainly cereals) are not available of nomadic people in Sinai, especially middle Sinai, since they are transported to Sinai from the Nile valley at high costs compared with acacia plants which grow all year round in Sinai and are considered good feed source for livestock (goat, sheep and camels) especially during the dry season (Mousa and El-Shabrawy, 2003).

Utilization of non-conventional feed ingredients is becoming necessary to overcome the lack of feed resources in Sinai especially during the dry season (Mousa and El-Shabrawy, 2003).

Acacia contains some compounds that adversely influence palatability and consequently nutritive value which include tannins, phenolics, steroids, cyanogenic and alkaloids compounds (Russel and Michael, 1992).

Van *et al.* (2005) reported that the condensed tannins (CT) in Acacia cyanophylla foliage were reduced after 2 days of drying under shade or in the sun. The total tannins were reduced by 22.6% and 11.3% for the wilting and drying, respectively, compared to fresh, but these differences were not significant. Several attempts have been made to overcome this problem. While, air - drying failed to improve the nutritive value of acacia foliage (Ben Salem, *et al;* 1997).

Acacia contains about 12 to 18% crude protein on DM basis (Ben Salem *et al,* 2002; Mousa and El-Shabrawy, 2003; Moujahed *et al.*, 2005; Salem ,2005; El-Waziry, 2007; El-Meccawi *et al,* 2008; Yayneshet *et al* ,2008 and Ngambi *et al.*, 2009), depending on area and aridity.

The present study was under taken to study the feasibility of partially replacing the expensive concentrate feed mixture (CFM) by acacia in the diets of Awassi ewes on their productive performance under North Sinai condition.

MATERIAL AND METHODS

This study was carried out in the farm of Animal Production Department, Faculty of Environmental Agricultural Sciences, El-Arish, Suez Canal University. This area (Long. 33.75 E., Lat. 31.27 N.) is located in a semi-arid zone with an average annual rainfall of about 94mm (average 10 years from 2000 to 2009) (CLAC, 2008).

Acacia saligna (leaves and twigs) were daily harvested at morning from the farm Animal production Department. These plants were collected by hand then air- dried until DM content was around 450 g/kg.

The experimental work of this study was divided into two successive parts. During the first part, nine digestibility and nitrogen balance trails were conducted to evaluate the three experimental diets. Each diet was evaluated using three rams with an average live weight of 59±1.09 Kg. They were individually kept and fed in metabolic crates. The digestibility trial consisted of 14 days as a preliminary period followed by 7 days as a collection period. The control ration (T1) was a basal diet consisting of CFM and rice straw to cover their nutritional requirements according to NRC (1985). Rations 2 and 3 consisted of CFM to cover 65% and 45% of the TDN requirements, respectively and both were offered air-dried acacia *ad libitum*. The CFM consisted of 32% undecorticated cotton seed cake, 27% yellow corn, 31% wheat bran, 5% linseed meal, 3 % molasses, 2 % limestone and 1% sodium chloride. The daily quantities of CFM of rations were offered in almost two equal parts at 8.00 a.m. and 4.00 p.m. whereas acacia was offered *ad lib.* at 9.00 a.m. Refusals were collected just before offering the next day

feed. Daily intake from CFM and acacia were therefore recorded to calculate the composition of each ration. During the collection period, total daily faces output was collected and 10% sample was taken. Feces and acacia were first dried at 65° C for 48 hours. The final dry matter of feed and faces were determined after drying in a forced air oven at 105°C for 24hours. Dried samples were mixed and ground through in a wily mill with a 2 mm screen. Dry samples were kept in a plastic vials at room temperature for the chemical analysis. Total daily urinary excreted from each rams was collected in jar containing 100 ml of 10% H_2SO_4 to prevent ammonia loss. Daily samples of 10% were taken from each animal. The chemical composition of feed ingredients and the 3 experimental rations are shown in Table (1).

Table (1): Chemical composition of the ingredients and calculated chemical composition of the consumed rations (%)

Ingredients	On DM basis						
	DM	OM	CP	EE	CF	NFE	ASH
Concentrate feed mixture	89.30	90.19	17.19	2.90	11.60	58.50	9.81
Acacia (wilted)	46.95	91.93	13.87	1.70	22.50	53.86	8.07
Rice straw	91.30	80.60	3.50	1.15	39.20	36.75	19.40
Calculated chemical composition:							
Ration 1	89.77	87.92	13.96	2.49	18.11	53.37	12.07
Ration 2	68.85	91.03	15.59	2.32	16.86	56.26	8.97
Ration 3	60.56	91.37	14.93	2.12	18.99	55.32	8.63

- *Ration 1 , concentrate feed mixture (C F M) plus rice straw.*
- *Ration 2 , concentrate feed mixture (C F M) plus acacia ad lib. to cover the rest.*
- *Ration 3 , concentrate feed mixture (C F M) plus acacia ad lib. to cover the rest.*

During the second part, the effect of the control ration, 2nd and 3rd rations on productive performance, growth performance for their lambs and some blood metabolites and economical evaluation were studied.

A total of 15 Awassi ewes were divided into three similar groups one week prior to the expected data of parturition were used to study the effect of different levels of acacia on their productive performance. The three groups were randomly allotted to the following dietary treatments: Tr.1 (control) was given a basal ration consisting of concentrate feed mixture (CFM) and rice straw to cover their nutritional requirements according to NRC (1985). While, 2nd and 3rd groups were fed the CFM to cover 65% and 45%, respectively of the NRC recommended allowances from CFM and offered acacia *ad lib.* to cover the rest of their requirements. Feed allowances were adjusted every month according to body weight and milk yield.

Lambs born from the three groups were fed on barley after the first month of age till weaning (14 weeks). The feed ingredients were subjected to summative analysis by the AOAC (1990) methods.

The ewes were drenched against internal parasites before the start of the experiment. The animals were watered *ad lib.* natural saline well water containing 3400 ppm total dissolved solids. The analysis of drinking under ground water was carried out according to Page (1982). The animals of each group were group fed and housed in a 6x10 m^2 semi-open shaded pens. Concentrate feed mixture (CFM) was offered twice a day at 8 a.m. and 4 p.m., in almost two-equal parts where as acacia air dried was offered *ad lib.* at 9.00 a.m. The born lambs were individually weighed at birth and then weekly until they were weaned at 14 weeks of age. Number of born lambs were 7 (3male and 4 female), 6 (3male and 3 female) and 7 (3male and 4 female) for three groups of ewes, respectively.

Daily milk yield for each ewe was measured individually twice/day (every 12h) by suckling lambs, once every two weeks until 1.5 months of suckling. The lambs were separated from their dams at 16.00 p.m. prior to the day of measurement. Lambs were weighed immediately before and after suckling and hand milking of the residual milk in the udder. The differences between the lambs weights recorded

before and after each suckling were added together with the residual milk denoting (Louca, 1972 and Mousa, 1996). After 1.5 months (6 weeks) from lactation, the lambs were weaned and separated from their dams and the daily milk yield for each ewe was collected by hand milking twice daily until 14 weeks from parturition. Average daily milk, total milk yield during the suckling period (14 weeks) and lambs weaning weights were recorded.

Milk samples from consecutive morning and evening milking were taken monthly during the experimental period in the end of the 2nd and 3rd month of lactation period and stored at – 20Co for analysis.

Milk samples were analyzed for percentage of fat, protein, lactose, and total solids (TS) by milk SCAN 133 BNF OSS electric, Denmark. Solids not fat (SNF) was calculated (TS – fat).

Blood samples were collected before morning feeding by jugular vein puncture from 3 lambs at weaning and from 3 ewes at the end of the 1^{st}, 2^{nd} and 3^{rd} month of the experimental period from each group. Within 1h of collection, the samples were centrifuged at 1.509 X g for 20 min. The serum was separated and stored at – 20° C until analysis.

Serum total protein, albumin, glucose, cholesterol, urea, creatinine, ALT or GPT, AST or GOT levels were determined calorimetrically using commercial kits, Bio Merius Laboratory Reagent and Products, France. The globulin values were obtained by subtracting albumin values from total protein values.

Data were subjected to statistical analysis by the computer program of SAS (1996) using the general linear models (GLM) using the following model:

$$Y_{ij} = \mu + T_{ri} + E_{ij}$$

Where: Y_{ij} = observation in treatment *I*, μ = overall mean, T_{ri} = effect of treatment (i= 1-3), E_{ij} = the experimental error.

Differences among treatment means were tested for significance ($P<0.05$) using Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Digestibility coefficients and nutritive values:

Digestion coefficients of the experimental rations are presented in Table (2). Significant differences were observed in the digestion coefficients of OM, CP, EE and CF among rations 1, 2 and 3. The digestibility of OM, CP and CF were significantly ($P<0.05$) higher in ration 2 (CFM to cover 65% of the TDN requirements and acacia *ad lib*itum to cover the rest) than ration 3 (CFM to cover 45% of the TDN requirements and acacia *ad libitum* to cover the rest). There was no difference among DM, EE and NFE digestibility of rations 1, 2 and 3. These results agree with the data of Mousa and El-Shabrawy (2003) who found that the digestibility coefficients of DM, OM, CP EE, CF and NFE of diet consisted of concentrate feed mixture (CFM) to cover 70% of the TDN requirements of kids and green acacia *ad lib* were lower than those of the control diet. On the other hand, Mugwenietal (2001) reported that the dry matter digestibility of acacia /maize mixture was similar to maize alone (62.2 vs. 63.8%), both higher than the Leucaena /maize mixture (57.6%).

Generally, the digestibility coefficients of DM, OM, CP, CF and NFE decreased with increasing acacia inclusion in the diet. The best CP digestibility (73.59) was that of ration 1 (control) followed by rations 2 and 3 (67.55 and 63.15, respectively).

The adverse effect of acacia on the digestibility of the ration should be ascribed to the inhibitory effect of its high tannin content on microbial activity (Malechek and Provenza (1981). The type of

tannin, the level and activities of tannin in browse are variable leading to varied effects on the reduction of digestibility (Ebong, 1995).

Table (2): Digestion coefficients and nutritive values of the experimental rations.

Items	Experimental rations		
	1	2	3
DM%	$64.89^{A} \pm 0.53$	$62.42^{B} \pm 2.11$	$60.71^{B} \pm 0.78$
OM%	$67.98^{A} \pm 0.20$	$66.49^{AB} \pm 1.06$	$64.11^{B} \pm 0.64$
CP%	$73.59^{A} \pm 0.84$	$67.55^{B} \pm 0.38$	$63.15^{C} \pm 0.42$
EE%	68.42 ± 0.25	68.53 ± 0.27	68.18 ± 0.15
CF%	$60.97^{A} \pm 0.14$	$57.99^{B} \pm 0.44$	$54.41^{B} \pm 0.58$
NFE%	70.09 ± 1.45	69.21 ± 1.18	66.02 ± 0.22
Nutritive value (%)			
TDN	$62.57^{A} \pm 0.85$	$62.82^{A} \pm 0.76$	$59.52^{B} \pm 0.25$
DCP	$10.27^{A} \pm 0.12$	$10.53^{A} \pm 0.08$	$9.43^{B} \pm 0.07$

- A, B, C, means bearing different superscripts within the same row are significantly different at P<0.05.

On the other hand, Sanon *et al* (2008) reported that the *Acacia senegal* leaves with high CP content had good intake characteristics and showed high nutrient digestibility. It seems that the protein in acacia is poorly digested by sheep and goats owing to the presence of tannins (4-11%) DM basis (Degen *et al.*, 1995 and Abou El-Nasr *et al.*, 1996).

Anti–nutritional factors such as condensed tannins protect plants from degradation in the rumen. They are reported to form combination with proteins in the rumen rendering them unavailable for digestion and consequently increase their out put in Feces (Robins and Brooker, 2005).

Feeding values:

The feeding values of, ration 1 (control) and 2 had the highest (P<0.05) TDN value followed by ration 3 (55% Acacia) which had the lowest TDN value. On the other hand, ration 3 contained high levels of acacia which reflected lower TDN value. Regarding the DCP% of the three experimental rations (Table 2), it was clear that the differences among the four rations were significant (P<0.05). The highest value was that of ration 2 followed by rations 1 and 3. The low DCP% value of ration 3 may be due to its high level of acacia which contains a high value of tannins, therefore it showed the lowest value of CP digestibility, as reported by Mousa and El-Shabrawy (2003). The present findings are in agreement with those reported by Abou El-Nasr ***et al*** (1996) and Mohamed (1996). It is worth to mention that DCP does not reflect true intestinal digestibility of feed protein. The lower DCP values with acacia containing diets was most probably shift of fiber fermentation from the rumen towards the hind gut resulting in an increased fecal output of microbial protein resulting in lowered apparent Cp digestion.

The absence of negative effects of tannin on intake could be attributed to the relatively low quantity of tannin ingested and/or to the effect of drying the acacia before feeding. Barry *et al* (1986) reported that less than 40% of tannin in the ration was beneficial to ruminants. Igwebuike *et al* (2008) reported that the growing rabbits can tolerate 40% *Acacia alibido* pods in their diets without adverse effect on nutrient digestibility and blood parameters.

Nitrogen balance:

The date of N-balance recorded for the three experimental rations are reported in Table (3). In general, all animals on the three experimental rations were in positive N. balance. The average initial live body weight at the beginning of the collection period was 59.9±1.09 Kg while their average live body weight at the end of the collection period was 61.4±2.1 Kg. The highest N intake was recorded for ration 3 followed by group 2 and 1. The amounts excreted in the feces are reflected on the CP

digestibility coefficients. Fecal – N was highest with ration 3 including high levels from acacia compared with rations 1 and 2.

The negative effect of acacia tannins on N-balance was demonstrated in numerous studies on sheep and goats (Reed *et al*, 1990, Degan *et al*, 1995, Ben Salem *et al*, 1999 a, b ,2000,2002a and 2005). In addition, acacia leaves contains in average 20% of its total N bound to fiber (N-ADF) as reported by Ben Salem *et al* (1995). The present findings are in agreement with those reported by Woodward and Reed (1997) and Mousa and El-Shabrawy (2003). The amount excreted in the urine was highest with ration 3 which received the highest N-intake. Ben Salem *et al.* (2005) reported that lambs fed on acacia diet retained less nitrogen than those on the oat hay diet ($P<0.001$). While Sotohy *et al.* (1997) reported that absorbed and retained nitrogen (g/d) were decreased with increasing levels of *Acacia nilotic* (tannin-rich plants) by Baladi goats in Assuit.

Table (3). Nitrogen balance of rams fed the experimental rations.

Items	Experimental rations		
	1	2	3
No. of animals	3	3	3
N-intake (g/h/d)	26.01^{C}±0.04	28.08^{B} ± 0.59	29.49^{A} ± 0.58
Fecal-N (g/h/d)	7.22^{C} ± 0.53	9.57^{B} ± 0.24	11.34^{A}± 0.58
N-digested (g/h/d)	18.80±0.51	18.51 ± 0.63	18.6± 0.42
Urinary-N (g/h/d)	8.75^{B}±0.32	8.59^{B} ± 0.29	9.87^{A} ± 0.24
N-balance (g/h/d)	10.05±0.22	9.92 ± 0.78	8.73± 0.25
NB/NI x 100	36.81±2.66	35.25 ± 2.35	29.16± 0.5
NB/ND x 100	53.24±0.5	53.42 ± 2.66	47.14± 0.95

A, B, C, means with different superscripts within the same row are significantly different at $P<0.05$

Milk yield and composition:

The daily milk yield of Awassi ewes reached the peak at the 2nd and 4th week of lactation with ration 2 and 3 and at the 4th week of lactation in ration 1 (Tables 4 and 5), then decreased gradually till the end of lactation . In this respect Mousa (1999) cited that daily milk yield of Awassi ewes reached the peak at 2nd week of lactation in control and treatment 3 and the 4th week of lactation in treatment 2. Also, Kassab *et al*, (2009) found that lactation reached the peak at the second week of lactation for Sohagi ewes. Similar results were obtained by Hayder (2004), Hamdan (2005) and El-Medany (2005). On the other hand , Mousa (1996) reported that daily milk yield of Egyptian – Nubian goats , high lactation does reached the peak at 4th and 6th week of lactation with high feeding level , while does given low feeding level reached the peak at 2nd and 4th week of lactation. The average milk yield of ewes was not significantly affected by dietary treatments indicating that the ewes were able to cover the rest of their requirements from acacia. These results are in agreement with those reported by Shetaewi *et al.* (2001) and Mousa and Shetaewi (2002). Mousa and Shetaewi (2002) reported that the Awassi ewes fed acacia produced 16.5% more milk than those fed a basal ration during the suckling period.

However, the average daily milk yield in the present study is similar to that of Awassi ewes in Iraq (Guirgis *et al.*, 1980) and Awassi ewes in North Sinai (Mousa and Shetaewi, 2002), but higher than those reported for Awassi sheep by Mousa (1999).

Milk composition of the produced milk as affected by dietary treatments is presented in Table (6). The percentages of fat, protein, lactose, solids not fat and total solids, in morning and evening milk, were not significantly different among all dietary treatments during the 2nd and 3rd month of lactation period. These results are in agreement with those of Kholif *et al.* (2001) who reported that insignificant differences for lactose, total solid and solids not fat (SNF) percentage of lactating goats and sheep fed rations containing olive cake compared to the control animals. Also, Moustafa *et al* (2008) reported that insignificant differences among treatments for milk protein content, milk total solids (TS) and solids not

fat (SNF) percentage of Egyptian lactating Buffalos fed rations containing olive pulp compared to the control animals. The milk composition in the evening had increased of percentage of fat, lactose and total solids than in the morning. Similar results were obtained by Mousa (1999) who reported that the percentage of milk fat in the evening for Awassi ewes was higher than in the morning. This is inversely related to the quantity of milk produced. The slight increase of milk fat % in the evening of ewes fed rations containing 35 and 55% acacia than ewes fed the basal ration (control) by 6.8 and 9.8%, respectively, may be due to the increased roughage / concentrate ratio which is producing more acetic acid, which is the main precursor for milk fat synthesis. Overton *et al* (1996) reported that microorganisms might benefit form the increase of ruminal acetate fermentation stimulating synthesis of lipids.

Table (4): Average daily milk yield (kg) at bi-weekly intervals for ewes as affected by feeding acacia (X+SE).

Week	Experimental rations		
	1	2	3
2	1.06 ± 0.14	1.30 ± 0.16	1.32 ± 0.15
4	1.19 ± 0.14	1.30 ± 0.15	1.29 ± 0.15
6	1.13 ± 0.16	1.15 ± 0.14	1. 12 ± 0.16
8	0.80 ± 0.11	1.06 ± 0.14	1.03 ± 0.14
10	0.60 ± 0.07	0.75 ± 0.11	0.73 ± 0.13
12	0.60 ± 0.08	0.64 ± 0.08	0.68 ± 1.11
14	0.49 ± 0.10	0.62 ± 0.08	0.61 ± 1.07
Average milk yield(g)	838 ± 11.54	974 ±11.38	968 ± 11.21

All differences among the three rations were not significant (P< 0.05).

Table (5): Milk yield means (Kg) of the ewes as influenced by feeding acacia during bi-weekly intervals of the lactation period.

week	Experimental rations		
	1	2	3
2	14.90 ± 1.17	18.27 ± 2.01	18.51 ± 3.03
4	16.61 ± 2.01	18.27 ± 2.18	18.02 ± 2.22
6	15.78 ± 2.24	16.14 ± 2.22	15.73 ± 2.23
8	11.13 ± 1.58	14.86 ± 2.01	14.44 ± 1.95
10	8.43 ± 1.05	10.48 ± 1.90	10.24 ± 2.58
12	8.43 ± 1.23	8.92 ± 1.58	9.49 ± 1.67
14	6.84 ± 1.77	8.66 ± 1.20	8.55 ± 1.07
Total milk yield (ITG)	81.95 ± 9.83	95.84 ± 8.84	94.46 ± 13.40
Lactation period day	98	98	98
Average milk yield (g)	838 ± 11.54	974 ± 11.38	968 ± 11.21

All differences among the three rations were not significant (P< 0.05).

Feed intake and economical efficiency:

Feed allowances were adjusted every month according to body weight (Table 7) and milk yield Tables 4 and 5). The changes in body weight (Kg) of the ewes of each treatment did not significantly differ among the control and the treated groups either before or after lambing.

The daily DM intake by ewes fed the control ration was 1091 g from the CFM + 456 g rice straw (Table 8). The intake from CFM was reduced to 970 g and 634 g/head/day in treatments 2 and 3, respectively according to the design. The ewes of these two treatments consumed 550g and 902g from acacia, respectively, which was offered *ad lib.*, in order to compensate the reduced CFM allowed. The total DM intakes (g/head/day) were very similar, being 1547, 1520 and 1556 for ewes fed rations 1, 2 and 3, respectively. The corresponding TDN and DCP intakes were also very similar, being 968, 955

and 926g TDN and 158.9, 160.1 and 146.7g DCP. These intakes were sufficient to meet the requirements of the animals according to the NRC (1985) recommendations. This indicated quite clearly that acacia was good foliage for lactating ewes to compensate CFM restriction.

Table (6): Effect of feeding acacia to ewes on milk yield and its composition.

Item	Experimental rations		
	1	2	3
Average daily milk yield at morning (g)	490	575	571
Lactation period (day)	98	98	98
Morning milk			
Milk protein %	4.08 ± 0.32	4.10 ± 0.4	4.00 ± 0.60
Milk fat %	3.99 ± 0.10	4.00 ± 0.12	3.89 ± 0.13
Milk lactose %	5.12 ± 0.10	5.08 ± 0.10	5.05 ± 0.11
Solid not fat %	9.92 ± 0.13	9.86 ± 0.18	9.72 ± 0.22
Total solids %	13.91 ± 0.30	13.86 ± 0.50	13.58 ± 0.66
Average daily milk yield at evening (g)	348	399	397
Milk protein %	4.04 ± 0.14	4.04 ± 0.12	3.83 ± 0.06
Milk fat %	4.58 ± 0.34	4.89 ± 0.45	5.03 ± 0.53
Milk lactose %	5.27 ± 0.12	5. 48 ± 0.08	5.53 ± 0.06
Solid not fat %	9.97 ± 0.08	10.16 ± 0.06	9.98 ± 0.06
Total solids %	14.56 ± 0.26	15.05 ± 0.42	14.61 ± 0.57

All differences among the three rations were not significant (P< 0.05).

Table (7): Changes in body weight of the ewes during the experimental period.

Days from parturition	Control	Treatment 1	Treatment 2
7 before (start)	50.3±1.84	50.5±1.56	50.6±1.86
At parturition	44.0±1.67	44.3±1.21	43.8±1.06
30 after	42.1±0.52	42.3±1.08	41.6±0.88
60 after	43.4±0.99	44.0±0.89	42.6±0.98
90 after	45.1±0.98	45.4±1.04	43.3±0.96

The highest total feed cost along the feeding period was observed for ration 1 (1.65 L.E), while the intermediate total feed cost was recorded for ration 2 (1.41 L.E), and the lowest was 0.95 L.E for the ration 3, due to the low price of acacia, which reduced the total cost of the ration by increasing the acacia in rations . Feed cost per head was improved with increased level of acacia in tested in comparison with control ration.

Economical efficiency (price of kg milk / cost kg of consumed feed) illustrated in Table (8) revealed that ration 3 (55% acacia) had the highest economical feed efficiency (3.05) followed by ration 2(2.07) compared to the control ration (1.52). The same trend was noticed for the improvement % since the values were 100, 136.2 and 200.7, respectively. The results are in agreement with those reported by Mousa, 1999 , 2001 and Mousa and Abdel-Samee , 2002 ; Fayed *et al* (2001); Abd El-Rahman (2003); Mostafa *et al* (2003) and Moustafa *et al.* (2008), they found the feed cost per kg gain was relatively lower than the control when lambs and lactating Buffalos were fed rations containing 15-40% olive pulp. On the other hand, Mousa and Shetaewi (2002) and Mousa and El-Shabrawy (2003) reported that the feed cost was relatively lower than the control when goat and sheep were fed rations contained 30-40% acacia.

Table (8): Effects of feeding the experimental rations on DM intake and economical efficiency of ewes

Item	Experimental rations		
	1	2	3
DM intake (g / h / day)			
Rice straw	456	-	-
Accacia	-	550	902
Concentrate	1091	970	654
Total DM intake	1547	1520	1556
Roughage cost (L.E)	0.07	---	---
Concentrate cost (L.E)	1.58	1.41	0.95
Total feed cost / day (L.E)	1.65	1.41	0.95
Daily TDN intake (g)	968	955	926
Daily DCP intake (g)	158.9	160.1	146.7
Feed efficiency			
DMI : milk yield	1.85	1.56	1.61
TDN : milk yield	1.15	0.98	0.96
DCP : milk yield	0.19	0.164	0.152
Daily milk yield (g)	838	974	968
Economical efficiency	1.52	2.07	3.05
Improvement %	100	136.18	200.66

The price of concentrate feed mixture, rice straw and milk = 1450,150 and 3000 L.E / ton, respectively.

Productive performance of born lambs:

Table (9) shows that lambs birth weights were 4.10, 4.08 and 3.90 kg for the three rations containing 35 and 55% acacia, respectively. The differences among the three rations were not significant. Such finding is in agreement with those reported by Mousa and Shetaewi (2002) who reported that birth weight of lambs born for ewes that received acacia were not significantly different. Similar birth weight was recorded for Awassi lambs in Iraq (Al-Jalili , *et.al,* 2006)

Birth weight of males tended to be heavier than females for the three groups. Similar results were reported by many investigators (Shaat, 1995; Mousa, 1996, 000 and Al- Jalili, *et. al* ,2006).

Weaning weights of lambs are also presented in Table (9). Weaning weight for lambs of rations 2 and 3 tended to be heavier than lambs of ration 1 (control), but the differences were not significant up to 14 weeks of age.

Weaning weight for lambs in Present study Similar Weaning Weight Were recorded Awassi lambs in Iraq (Al- Jalili *et al.* 2006).

Similar trend was noticed for the average daily gain, the values were 175.5 , 181.2 and 188.16 g/d for groups 1,2and 3, respectively. It could be concluded that feeding acacia to ewes did not adversely affect growth performance of their lambs from birth to weaning. The slight improvement in growth performance of the lambs may be associated with the slight increase in milk production of their dams (Table 4).

Table (10) shows some blood serum parameters of lambs in terms of total protein, albumin, globulin, urea, cholesterol, lipids, glucose, creatinine, GOT and GPT concentrations of lambs at pre-weaning stage. No significant ($P< 0.05$) changes concerning these metabolites were found.

The effects of dietary treatments (acacia) on the concentrations of total proteins, albumin, globulin, urea, cholesterol, total lipid, glucose, creatinine, GOT and GPT in blood serum of ewes fed the three rations post lambing, are presented in Table (11).

The differences between concentrations of all blood serum constituents of experimental rations, were non significant. Similar results were reported by Mousa and Shetaewi (2002) who found that the differences were not significant between the concentrations of total protein, albumin, globulin, urea-N,

cholesterol, total lipids , glucose, creatinine, GOT and GPT in blood serum of ewes fed rations containing acacia and olive pulp during the second half of lactation period .

Table (9): Growth rates of lambs as affected by feeding acacia (x-±se) from 2 to 14 weeks of age.

Item	Experimental ration (X±SE)		
	1	2	3
No. of born lambs	7	6	7
Average male birth weight(kg)	4.35 ± 0.42	4.33 ± 0.18	4.22 ± 0.36
Average female birth weight (kg)	3.89 ± 0.51	3.87 ± 0.12	3.66 ± 0.30
Body weight at:			
Birth	4.08 ± 0.29	4.10 ± 0.14	3.90 ± 0.21
2 weeks	7.31 ± 0.46	7.35 ± 0.40	6.97 ± 0.43
4 weeks	10.33 ± 0.61	10.42 ± 0.84	9.99 ± 0.81
6 weeks (weaning)	12.66 ± 0.70	13.10 ± 0.98	13.37 ± 0.77
8 weeks	14.16 ± 0.74	15.96 ± 1.02	16.10 ± 1.07
10 weeks	16.95 ± 0.97	18.15 ± 1.30	18.28 ± 1.25
12 weeks	18.81 ± 0.95	19.90 ± 1.20	20.38 ± 1.30
14 weeks	21.28 ± 0.98	21.86 ± 1.22	22.34 ± 1.28
Average daily gain (g)	175.51 ± 6.86	181.22 ± 9.80	188.16 ±11.90

All differences among the three rations were not significant (P< 0.05).

Table (10): Some blood constituents of lambs at pre-weaning as affected by feeding acacia under North Sinai condition .

Item	Experimental rations		
	1	2	3
Total protein (g/dl)	5.72 ± 0.22	6.06 ± 0.20	6.17 ± 0.27
Albumin (g/dl)	2.95 ± 0.22	3.52 ± 0.15	3.72 ± 0.13
Globulin (g/dl)	2.77 ± 0.19	2.54 ± 0.12	2.45 ± 0.37
Albumin /Globulin ratio	1.06	1.43	1.52
Urea-N (mg/dl)	30.45 ± 1.69	33.20 ± 2.12	32.01 ± 2.22
Cholesterol (mg/dl)	81.61 ± 0.89	85.40 ± 0.41	84.07 ± 0.36
Total lipids (G/1)	2.17 ± 0.41	2.58 ± 0.36	2.55 ± 0.30
Glucose (mg/dl)	56.90 ± 9.76	52.80 ± 8.81	47.75 ± 1.19
Creatinine (mg/dl)	1.43 ± 0.13	1.12 ± 0.10	1.03 ± 0.08
SGOT (u/ml)	20.20 ± 1.35	22.30 ± 2.52	23.33 ± 2.79
SGOT (u/ml)	28.60 ± 1.12	30.40 ± 1.45	26.00 ± 1.57

All differences among the three rations were not significant (P< 0.05).

Generally, the values obtained of blood constituents indicated normal physiological and healthy status of both lambs and ewes fed the experimental rations. The values of concentration of blood serum constituents are within the normal ranges reported by Mousa and Shetaewi (2002) on ewes fed acacia.

It could be concluded that replacing of acacia up to 55% of the TDN requirements of Awassi ewes by acacia improved productive performance traits, economical efficiency and decreased feed cost under North Sinai conditions.

Table (11): Effect of feeding acacia on Some blood plasma constituents of ewes .

Item	Experimental ration		
	1	2	3
Total protein (g/dl)	6.43 ± 0.19	6.98 ± 0.22	7.12 ± 0.37
Albumin (g/dl)	3.43 ± 0.18	3.78 ± 0.16	3.75 ± 0.13
Globulin (g/dl)	3.01 ± 0.14	3.29 ± 0.14	3.43 ± 0.24
Albumin /Globulin ratio	1.14	1.18	1.09
Urea (mg/dl)	46.87 ± 4.38	47.30 ± 3.31	44.53 ± 3.74
Cholesterol (mg/dl)	90.44 ± 0.77	87.52 ± 4.48	88.89 ± 8.01
Total lipids (g/l)	2.77 ± 0.35	2.67 ± 0.35	2.16 ± 0.33
Glucose (mg/dl)	45.76 ± 0.41	44.46 ± 1.98	37.15 ±2.23
Creatinine (mg/dl)	1.25 ± 0.05	1.24 ± 0.04	1.26 ± 0.06
SGOT (u/ml)	20.30 ± 1.06	22.12 ± 1.08	22.18 ± 1.11
SGOT (u/ml)	29.20 ± 0.27	28.56 ± 1.12	27.91 ± 1.39

All differences among the three rations were not significant (P< 0.05).

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تأثير التغذية على مستويات مختلفة من الاكاسيا على الأداء الإنتاجي للنعاج العواسى تحت ظروف شمال سيناء

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استخدم في هذه الدراسة 15 نعجة عواسى قبل موعد الولاده المنتظر بأسبوع حيث كان متوسط وزنها 50كجم. قسمت الى ثلاث مجموعات تجريبية متماثله (5 نعجة لكل مجموعة) وذلك لدراسة تاثير التغذية لمستويات مختلفة من الاكاسيا على معاملات الهضم وانتاج اللبن وتركيبه الكيماوى ووزن النتاج عند الميلاد والفطام وبعض قياسات الدم ووزعت المجموعات عشوائيا على المعاملات الغذائية التالية.

المعاملة الاولى : كنترول وكانت النعاج تتغذى على علف مصنع وقش ارز لتغطية احتياجاتها الغذائية من المركبات الغذائيه الكليه المهضومة. المعاملة الثانية : 65 % من احتياجات النعاج من المركبات الغذائيه الكليه المهضومة من العلف المصنع من مجموعة الكنترول + أكاسيا للشبع لعد باقي الاحتياجات. المعاملة الثالثة : 45 % مركبات من احتياجات النعاج من المركبات الغذائيه الكليه المهضومة من العلف المصنع من مجموعة الكنترول + أكاسيا للشبع لعد باقي الاحتياجات. وتم تغذية النعاج تبعا لمقررات، NRC لسنة 1985. واستمرت التجربة من الولاده وطوال فترة رضاعة الحملان التي استمرت حتى 16 أسبوعا من الولاده وكانت أهم النتائج المتحصل عليها هي:

انخفضت معاملات هضم كل من المادة العضوية والبروتين الخام والألياف الخام بزيادة نسبة الاكاسيا فى العلائق . كما تفوقت العليقة الاولى والثانية على العليقة الثالثة فى المركبات الكلية المهضومة . و كان ميزان الازوت موجبا فى كل العلائق . و لم توجد اختلافات معنوية فى وزن النتاج عند الميلاد ووزن الفطام ومعدل النمو اليومى للحملان المولوده من النعاج المغذاة على الاكاسيا ومجموعة الكنترول. و لم يتأثر انتاج اللبن للنعاج المغذاة على الاكاسيا اثناء فترة الرضاعة. كما لم توجد اختلافات معنوية بين المجاميع فى قياسات الدم.

من النتائج السابقة يوصى باستخدام الاكاسيا بدلا من العلف المركز الغالى السعر فى علائق النعاج العواسى حتى نسبة 55 % من الاحتياجات الغذائيه من مجموعة الكنترول فى صورة مركبات غذائيه كليه مهضومه مما يؤدى الى زيادة الكفاءة الاقتصادية ويؤدى الى خفض تكاليف التغذية للحيوانات تحت ظروف شمال سيناء.