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EFFECT OF *ACACIA SALIGNA* LEVELS ON LACTATING BARKI EWES PERFORMANCE

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SUMMARY

This study was conducted to evaluate the effect of feeding graded levels of *Acacia saligna* leaves hay (ALH) on dry matter intake, milk yield, composition and lambs growth rate from birth to weaning. Forty Barki ewes at the start of lactation stage averaged 3-5 years old with an average live body weight 38.8±1.6 kg were randomly allocated to four treatments groups (ten ewes per group), were fed with 0, 20, 40 and 60% of ALH as berseem hay replacement. The experiment lasted 16 weeks and showed that there was no significant difference (P>0.05) in daily dry matter intake ewes body weight change, milk yield and compositions and lambs daily gain during lactation season due to the supplementation of lactating ewes with graded levels of ALH compared with control treatment. Milk yield values were 24.1, 23.9, 24.2 and 24.3 g/d and ADG values were 147.3, 145.5, 152.7 and 150.9 g/d for control, 20, 40 and 60% ALH, respectively. It may be concluded that *A. saligna* leaves hay can be used as alternative feed sources for lactating ewes.

Key words: *Lactating ewes, feed intake, milk yield, milk composition, lambs daily gain.*

INTRODUCTION

Acacia saligna (Labill.) H.L. Wendl. is an adapted evergreen species with appropriate characteristics for cultivation in the dry coastal area (Squella *et al*., 1985; Mora and Meneses, 2003 and Meneses, 2004). Normally farmers use this resource to feed sheep and goats, especially during summer and autumn. They harvest Acacia leaves and stems from young and mature trees during the dry season to provide a daily supplement to grazing.

However, Acacia contains 28.9 g kg-1 of total tannins, which have anti-nutritive activity in ruminal digestion. This component links dietary protein and makes nutrients less digestible in the rumen, limiting microbial growth, amino acid microbial synthesis and reduces the absorption of amino acids in the intestine (Pritchard *et al*., 1992; Ben Salem *et al*., 2008).

For lactating animals, it is considered that about 25 to 35% of protein intake will be converted to proteins in milk (Lapierre *et al*., 2002) while the rest will be excreted in urine (35–45%) or feces (30–40%), therefore it is reasonable to search ways to reduce these losses. Indeed, proper use of N from feeds reduced N discharges into the environment. In addition, environmental pressures are increasing on livestock production systems. Nitrogen excreted by ruminants, in particular, contributes to groundwater pollution. Protein supplementation for sheep fed protein deficient ration leads to an increase of protein quantity secreted in milk (Bocquier and Caja, 2001; Atti and Rouissi, 2003). However, pasture grass is characterized by its lushness of soluble N fermentable in the rumen resulting in a decrease in N retention. As a solution, the protection of proteins from microbial degradation in the rumen by chemical treatment was often used; however the use of formaldehyde is increasingly rejected because of the possible toxicity, indeed a positive correlation between oral administration of formaldehyde and its presence in the milk has been found on dairy cows and goats (Buckley *et al*., 1988; Barry and Tome, 1991). The protection of proteins by natural products like tannins present in local feed resources could increase the retention of N without negative repercussion (Terril *et al*., 1992).

The objective of this study was to evaluate the use of different levels of Acacia levels hay on ewes feed intake, body weight change, milk production and the offspring lambs weaning weight.

MATERIALS AND METHODS

The present study was conducted at Marryot Research Station, Desert Research Center, Ministry of Agriculture, 35 Km south of Alexandria, Egypt during 4014-2015. .

Acacia saligna hay preparation:

Enough amounts of the fresh Acacia leaves (AL) were collected from the farm of Marryot Station and Borg El-Arab Road and chopped to 3-5 cm length. After chopping, Acacia leaves were dried at shaded aria for 3–4 days by spreading on plastic sheets, (air-drying). Samples of hay were taken for subsequent proximate chemical analyses.

Animals and management:

Forty Barki ewes at the start of lactation stage averaged 3-5 years old with an average live body weight 38.8±1.6 kg were randomly allocated to four treatments groups (ten ewes per group); each group was housed separately in shaded 5x5 meter pens and fed their normal allowances according to the experimental assignment during the lactation period. Feeds were offered twice daily at 9:00 am. and 5:00 pm. Fresh tap water was made available for free-choice drinking once daily after the morning feeding. Refusals were collected the following morning, weighed and sampled, and daily intake was recorded. The experimental animals were kept under the same managerial and hygienic condition. Before beginning the experiment animals were treated against internal and external parasites and intro-toxemia.

Birth and individual kid body weight was considered and evaluated every 14 days until weaning. During lactation period, daily milk yield was measured biweekly starting from the second week of lambing till the 25th week of lactation using the standard hand-milking procedure after separation of lambs from their dams. Milk samples were collected biweekly for chemical analysis till the 25th week.

Experimental diets and feeding trial:

The requirements of digestible CP and metabolizable energy (ME) need during the lactation period of ewes were calculated according to the recommended feeding standards of Kearl (1982). The experimental diets were prepared to replace berseem hay by 0% (Control), 20% (20% ALH), 40% (40% ALH) and 60% (60% ALH) *Acacia saligna* leaves hay. The compositions and chemical analysis of diets are presented in Tables (1) and (2). Proximate analysis of feeds and milk samples were determined according to the procedure of A.O.A.C. (1995).

Table (1): Composition (%, on DM basis) of ewe's experimental diets.

Ingredient	Experimental Diets			
	Control	20% ALH	40% ALH	60% ALH
CFM*	36.0	36.0	36.0	36.0
Yellow corn	24.0	24.0	24.0	24.0
Berseem hay	40.0	32.0	24.0	16.0
Acacia saligna leaves	0.0	8.0	16.0	24.0

**CFM: Commercial concentrate feed mixture*

Table (2): Chemical analysis (%, on DM basis) of the experimental diets.

Item	Experimental Diets			
	Control	20% ALH	40% ALH	60% ALH
DM	90.3	89.8	91.2	91.1
OM	90.0	89.8	90.1	90.3
CP	12.0	11.8	11.6	11.9
CF	17.0	16.8	17.0	15.7
EE	3.5	3.4	3.5	3.6
NFE	57.5	57.8	58.0	59.1
Ash	10.0	10.2	9.9	9.7

DM: Dry matter; OM: organic matter; CP: crude protein; CF: crude fiber; EE: ether extract; NFE: nitrogen free extract.

Statistical analysis:

Data were statistically analyzed using the method of least squares analysis of variance using software SPSS 10.0 windows (SPSS, 1999). Differences in mean values between groups were compared by Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Feed intake and nutritive value:

Feed intake by Barki lactating ewes fed the experimental diets is presented in Table (3). Results indicated that DM (g/h/day) and digestible nutrient intake (TDNI, g/h/day) of lactating ewes did not influenced significantly (P>0.05) by the level of ALH replacement. However, the inclusion of graded levels of ALH in the diets of lactating ewes increased significantly (P<0.05) DCP intake (g/h/day) compared to control (135.8, 133.6 and 137.1 *vs*. 130.1 g/h/day, respectively) while differences between DCP intake values of lactating ewes fed 20% and 40% ALH diets were not significant.

Table (3): Effect of treatments on feed intake (g/h/day) and nutritive values of the experimental diets fed to the lactating Barki ewes (Means ± SE).

Item	Experimental Diets				P - value
	Control	20% ALH	40% ALH	60% ALH	
Con. mixture	599.8 ± 30.41	596.8 ± 25.86	593.7 ± 28.99	615.8 ± 25.98	----
Yellow corn	310.3 ± 29.83	298.4 ± 28.44	296.8 ± 24.87	307.9 ± 29.11	----
B. hay	590.7 ± 36.32	477.7 ± 31.66	356.4 ± 33.40	246.5 ± 32.33	----
ALH	-----	119.4 ± 12.89	237.6 ± 10.68	369.7 ± 10.91	----
TDMI	1500.8 ± 40.54	1492.3± 39.76	1484.6 ± 36.52	1540.0 ± 40.01	0.710
TDNI*	1032.6 ± 28.56	1017.8 ± 30.02	1021.4 ± 27.66	1058.0 ± 30.31	0.730
DCPI*	$130.1^{b} \pm 12.10$	$135.8^{ab} \pm 14.88$	$133.6^{ab} \pm 11.32$	$137.1^{a} \pm 12.10$	0.046

*Con. Mixture: Concentrate mixture, B. hay: Berseem hay, ALH: Acacia leaves hay, TDMI: Total dry matter intake. TDN: Total digestible nutrients and DCP: Digestible crude protein *(were calculated according to the nutritive values of the experimental diets, data under publication).*
*a, b, c, Means in the same raw with different superscripts are differ significantly *(P<0.05)*

In this respect, Maamouri *et al*. (2011) conducted study to evaluate the effects of natural protection of protein from microbial degradation in the rumen by Acacia tannins on DM intake and milk production in dairy ewes. The experimental sheep flock grazing rye grass pasture was divided into four groups. Indoor, animals were supplemented with 300 g of concentrate, 300 g of concentrate+100 g *Acacia cyanophylla* foliage (*Acacia*), 300 g of concentrate+200 g *Acacia* for C, C1A, C2A groups, respectively, and only 100 g of *Acacia* for group A. They indicated that total DM intake of ewes receiving concentrate and Acacia supplement was significantly higher (P<0.001) than the intake of ewes receiving only concentrate (300 g) which was higher than that of ewes receiving only Acacia (100 g).

At the same trend, Meneses *et al*., (2012) fed lactating ewes on 0, 25, 50, 75, and 100% of Acacia as alfalfa (*Medicago sativa* L.) hay replacement in a completely randomized design. They found that DM, CP, and ME intake were increased (P < 0.01) in the lactation stage over the control with a high percentage of Acacia in the diet, which differed from the results during pregnancy. In the latter period, the lower

Acacia intake can be attributed to the fetus, which reduced abdominal space, and to the low digestibility of this diet due to N fixation and ruminal ammonia by tannins, reducing rumen bacterial amino acid synthesis (Ben Salem *et al*., 2002; 2005; Krebs *et al*., 2007).

The lack of significantly in DM intake in the present study may be due to the low concentration of condensed tannins (TC) in the DM of the three levels of ALH consumption. Whereas, Frutos *et al*. (2009) reported that until fairly recently, most researchers believed that the consumption of tannins reduced voluntary feed intake. However, at present we have much more information, and are able to make more refined statements about tannins, their doses and their effects on the species that consume them, etc. It would appear that the consumption of plant species with high CT contents (generally > 50 g kg^{-1} of dry matter, DM) significantly reduces voluntary feed intake, while medium or low consumption (< 50 g kg^{-1}DM) seems not to affect it (Barry and Duncan, 1984; Barry and Manley, 1984; Waghorn *et al*., 1994a). It was previously reported that CT concentrate content in dried *Acacia saligna* leaves ranged from 31.5 (Maamouri *et al*., 2011) to 36 g/kg dry matter (DM) (Ben Salem *et al*., 2002). According to these determinations, the expected calculated CT content related to the three levels of ALH used in the present study will be equivalent to 3.78 – 4.32, 7.56 – 8.64 and 11.66 – 13.32 g CT for 20, 40 and 60% ALH replacement of berseem hay, respectively. These values are in accord with Min *et al*. (2003) and Frutos *et al*. (2004) recommendations.

Ewe's body weight change:

Results of the effect of feeding diets containing different levels of dried *Acacia saligna* leaves (20, 40 and 60%) instead of berseem hay on live body weight of Barki ewes during the lactation season are presented in Table (4) and Fig. (1). Initial body weight of lactating Barki ewes ranged from 38.4 to 39.5 Kg with no significant differences among treatments, which means a random distribution of the ewes on the different treatments. The results showed that the incorporation of ALH instead of berseem hay in the experimental diets at levels of 20%, 40 and 60% resulted in non-significant differences in live body weight at all the lactation season periods (2, 4, 6, 8, 10, 12,14 and 16 weeks). It was noticeable that all the four groups of lactating ewes fed control and treated experimental diets with different ALH levels showed a leaner decrease in the values of their body weight every two weeks during the lactation season period (16 weeks).

Table (4): Effect of treatments on ewe's body weight changes.

Items	Experimental Diets				P-value
	Control	20% ALH	40% ALH	60% ALH	
At start	38.6 ± 1.68	38.4 ± 1.68	38.6 ± 1.22	39.5 ± 1.45	0.208
2nd week	38.6 ± 1.88	38.4 ± 1.60	38.6 ± 1.55	39.5 ± 1.22	0.263
4th week	38.4 ± 1.52	38.2 ± 1.81	38.4 ± 1.26	39.3 ± 1.84	0.298
6th week	38.1 ± 1.76	38.0 ± 2.05	37.9 ± 1.38	39.0 ± 1.53	0.387
8th week	38.0 ± 2.08	38.4 ± 1.81	37.6 ± 2.07	38.9 ± 1.39	0.340
10th week	38.3 ± 1.46	37.8 ± 1.67	37.4 ± 1.80	39.2 ± 1.32	0.488
12th week	37.8 ± 1.53	37.8 ± 1.55	37.1 ± 1.65	39.6 ± 1.65	0.389
14th week	37.6 ± 2.17	37.4 ± 2.12	37.0 ± 1.22	39.0 ± 1.82	0.413
16th week	37.0 ± 1.55	36.6 ± 1.85	37.0 ± 1.49	38.0 ± 1.33	0.512
Body weight change, Kg	-1.6 ± 0.58	- 1.8 ± 0.52	- 1.6 ± 0.61	- 1.5 ± 0.73	0.311

Also the body weight changes of lactating Barki ewes at the end of lactation season and weaning of the offspring show the same trend as cleared previously. The lost values of body weight of lactating ewes fed control, 20, 40 and 60% ALH diets (- 1.6, -1.8, -1.6 and -1.5 Kg, respectively) from the start to the end of lactation season and weaning of offspring may be due to that the nursing lambs beyond the age of

6 – 8 weeks consume increasing amounts of concentrates (and possibly hay) as indicated by Farid *et al*. (2005 a and b) and represent serious competition to their dams.

Milk yield:

Results of Table (5) showed that the incorporation of 20 or 40 or 60% ALH instead of berseem hay in lactating ewes diets did not affect significantly the daily milk yield (215.5, 210.7, 215.6 and 216.6 ml/day for control, 20, 40 and 60% ALH ewe groups, respectively) or total milk production (24.1, 23.9, 24.2 and 24.3 Littre/16 weeks for control, 20, 40 and 60% ALH ewe groups, respectively).

Table (5): Effect of feeding treatments on milk production.

Item	Experimental Diets				P-value
	Control	20% ALH	40% ALH	60% ALH	
Length of lactation, days	112	112	112	112	----
0-2 weeks	180.0 ± 0.43	177.0 ± 0.45	197.4 ± 0.64	181.7 ± 0.48	0.367
2-4 weeks	310.5 ± 0.37	300.0 ± 0.62	286.7 ± 0.77	282.0 ± 0.60	0.287
4-6 weeks	295.2 ± 0.56	270.0 ± 0.52	278.2 ± 0.68	265.1 ± 0.53	0.467
6-8 weeks	252.2 ± 0.51	248.4 ± 0.80	219.3 ± 0.48	244.4 ± 0.72	0.775
8-10 weeks	225.5 ± 0.66	207.3 ± 0.51	198.7 ± 0.64	217.9 ± 0.54	0.393
10-12 weeks	180.0 ± 0.58	180.0 ± 0.55	184.0 ± 0.55	207.0 ± 0.68	0.720
12-14 weeks	151.2 ± 0.44	162.6 ± 0.33	177.0 ± 0.73	188.6 ± 0.55	0.654
14-16 weeks	138.6 ± 0.52	140.4 ± 0.47	151.1 ± 048	143.3 ± 0.70	0.771
Average daily milk yield, ml	215.5 ± 0.65	210.7 ± 0.48	215.6 ± 0.71	216.6 ± 0.54	0.686
Total 16 weeks, L.	24.1 ± 2.13	23.9 ± 2.56	24.2 ± 2.84	24.3 ± 2.77	0.711

Although, there are no significant differences between the total milk production (L/16 weeks) values of the experimental ewe groups due to increasing the incorporation of ALH instead of berseem hay, but it is noticeable that, ewes in 60% group produced the higher value of total milk production during the lactation season period followed by 40% ALH, control and then 20% ALH ewe groups, as indicated in Table (5). Lactation curves of the four groups are illustrated in Figure (2). In all, peak lactation was observed during the second week of lambing. The 60% ALH ewes group showed better persistency throughout as compared to other experimental groups.

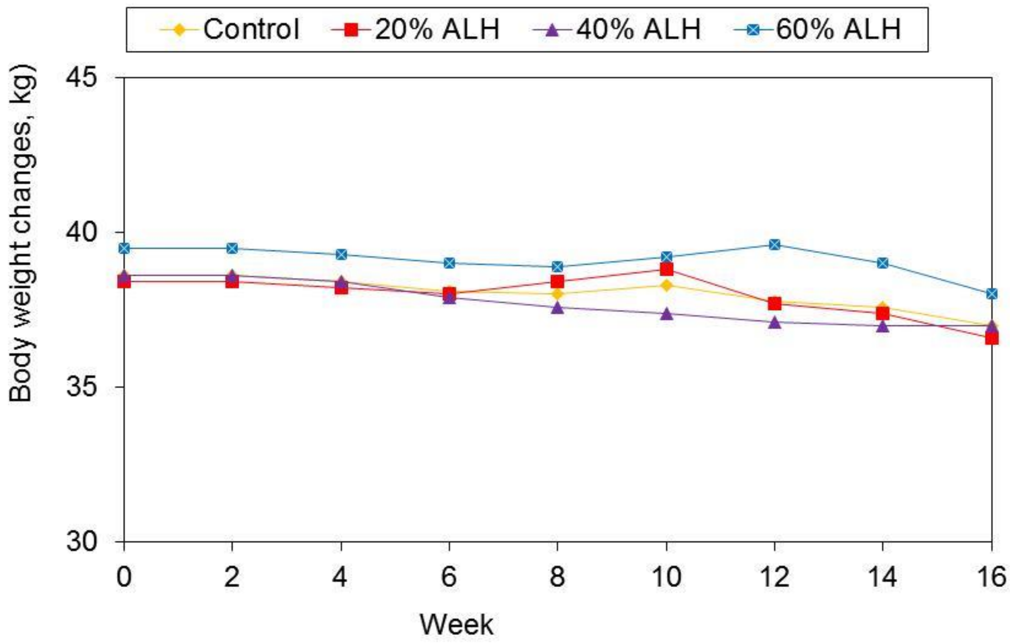

Figure (1): Body weight change of ewes fed with different levels of *Acacia saligna* leaf hay in the diet during lactation period.

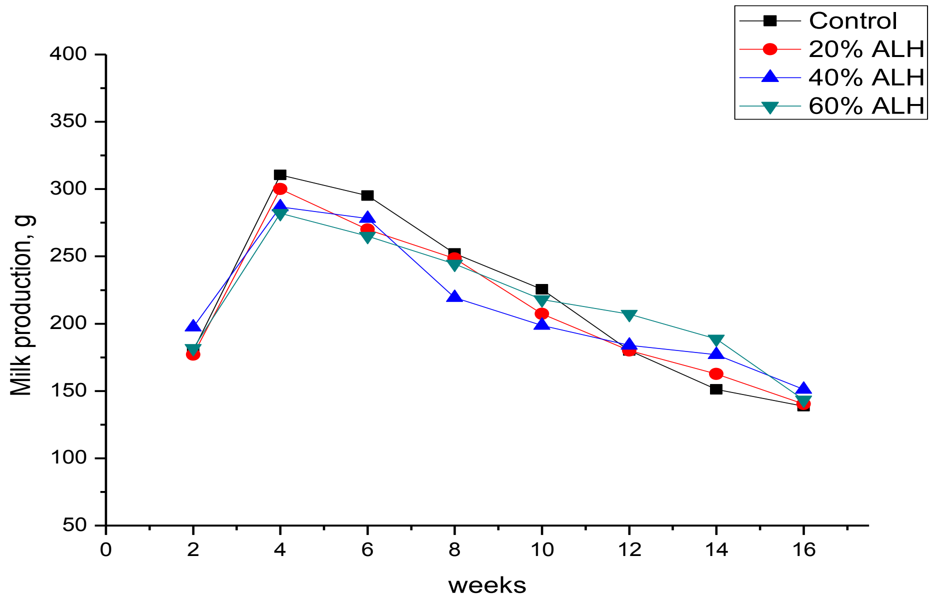

Figure (2): Length of lactation and daily milk production of ewes feeding graded levels of *Acacia saligna* leaf hay (ALH).

Vasta *et al*. (2008) reported that condensed tannins in high concentrations generally have adverse effects on animal performance. However, moderate concentrations might have positive effects. Indeed, Wang *et al*. (1996) studied the effect of CT on sheep milk yield, comparing ewes grazing *Lotus corniculatus*, which contained moderate amounts of CT (44.5 g/kg DM), supplemented or not with PEG. Treatments did not affect milk yield until the 5th week of lactation, while from the 6th to the 11th week milk yield was significantly higher in the ewes receiving the diet without PEG. When lactating Sarda ewes grazed either on annual ryegrass (*Lolium rigidum* Gaudin) or sulla (CT: 20–40 g/kg DM), no differences in milk yield and composition were observed in early spring, while the milk yield of the sulla-fed ewes was significantly higher than that of ryegrass-fed ones (1122 g/d *versus* 615 g/d, respectively) in mid spring (Molle *et al*., 2003). Milk yield was the highest for C1A group (555 ml/day) and the lowest for A group (500 ml/day). This is in agreement with other studies (D'Urso *et al*., 1993; Purroy and Jaime, 1995; Rouissi *et al*., 2005), in which supplementation with concentrate for grazing ewes increased milk production. Acacia supply did not improve (p>0.05) milk production. The protection of protein from microbial degradation in the rumen by tannins of the Acacia did not result in milk increase; there was only a slight superiority for milk production in the C1A group compared to the C one. These results of *Acacia* supplementation effect on milk production are in agreement with our present results of milk production. Similarly, Zegeye *et al.* (2016) indicated that feeding *A. saligna* leaves increased milk yield which implied that the tree can be used as alternative sources of feed for dairy animals. The findings were in line with Steinshamn (2010) who reported that legumes increased milk yield than grass based feeding.

On the contrary, Meneses *et al*. (2012) used *goats on* 0, 25, 50, 75, and 100% of Acacia as alfalfa (*Medicago sativa* L.) hay replacement. The milk production for 0 and 25% treatments were the same but different from those for the other treatments, which were 160.24, 163.35, 128.18, 125.92, and 66.48 L, respectively for the 0, 25, 50, 75 and 100% treatments. These results indicate that the progressive increasing percentage level of *Acacia saligna* instead of alfalfa hay decreased significantly (P<0.01) milk production.

Milk composition:

Milk composition of lactating Barki ewes is presented in Table (6). Results indicated that increasing of the percentage level of ALH replacement instead of B. hay did not significantly affect the milk chemical composition.

Table (6): Milk chemical composition of lactating ewes fed diets contain different levels of ALH.

Item	Experimental Diets				P - value
	Control	20% ALH	40% ALH	60% ALH	
TS%	16.7±0.50	16.5±0.50	16.5±0.50	16.7±0.70	0.552
SNF%	12.6±0.60	12.6±0.50	12.4±0.90	12.6±0.70	0.496
Fat%	4.1±0.30	3.9±0.20	4.1±0.20	4.1±0.30	0.407
Ash%	1.0±0.06	1.1±0.05	1.1±0.05	1.1±0.07	0.513
Protein%	6.4±0.30	6.1±0.30	6.2±0.30	6.2±0.40	0.458
Lactose%	5.2±0.60	5.2±0.60	5.6±0.60	4.9±0.80	0.522

The effect of tanniniferous feeds (like, *Acacia spp*.) on milk fat and protein composition varies markedly depending on the concentration of tannins present in the feeds. Condensed tannins in high concentrations generally have adverse effects on animal performance (Vasta *et al.* 2008). However, moderate concentrations might have positive effects. Indeed, Wang *et al*. (1996) studied the effect of CT on sheep milk composition, comparing ewes grazing *Lotus corniculatus*, which contained moderate amounts of CT (44.5 g/kg DM), supplemented or not with PEG. Treatments indicated that milk fat concentration was higher for the PEG supplemented group, which had the lowest milk yield. However, no differences were observed in milk protein concentration, despite the differences in milk yield.

Wang *et al*. (1996) stated that the use of feeds with low CT concentration reduced rumen protein degradation and increased both protein abomasal flow and essential AA absorption in the small intestine. This explanation is also supported by Barry and McNabb (1999). Moreover, Woodward *et al*. (2002) suggested a modification of rumen microbial population. When lactating Sarda ewes grazed either on annual ryegrass (*Lolium rigidum* Gaudin) or sulla (CT: 20–40 g/kg DM), no differences in milk composition were observed in early spring, while the milk yield of the sulla-fed ewes was significantly higher than that of ryegrass-fed ones (1122 g/d *versus* 615 g/d, respectively) in mid spring (Molle *et al*., 2003). Despite this large difference in milk yield, which should have induced an evident dilution effect, milk fat and protein concentration did not differ between groups. This suggests that the CT of sulla did not depress milk production and probably helped to maintain high milk fat and protein concentration.

The utilization of forages with low CT concentration increases milk yield and has positive effects on milk protein concentration and yield, due to a higher availability of essential amino acids. On the other hand, high concentrations of CT in alternative feed resources (AFR) markedly reduce rumen microbial activity and bacterial and feed amino acid digestion in the intestine because effects of tannins on ruminant productivity depend on the quality and quantity of dietary protein (Patra and Saxena, 2011). The present results are also in agreement with those of Zegeye *et al.* (2016) who reported that there was no significant difference in milk fat, lactose, solids not fat, density, protein and mineral content of dairy cows fed diets containing graded level of *Acacia saligna* leaves. Feeding *A. saligna* leaves did not affect milk composition but increased milk yield which implied that the tree can be used as alternative sources of feed for dairy animals. These findings also were in line with Steinshamn (2010) who reported that legumes increased milk yield than grass based feeding. Similarly, milk yield was higher for ewes fed higher level of AS leaves (Maamouri *et al*., 2011).

Lambs body weight changes from birth to weaning:

Results of the effect of feeding dried *Acacia saligna* leaf hay (A LH) at levels 20, 40 and 60% instead of berseem hay on birth weight and biweekly body weight are presented in Table (7) and Figure (3). Neglecting the lambs sex, results showed that the inclusion of ALH instead of berseem hay at levels of 20, 40 and 60% resulted in non-significant differences (P>0.05) in birth weight and body weight change from birth to weaning at all periods of the experiment (2, 4, 6, 8, 10, 12, 14 and 16 weeks).

The present birth weight values are lower than the average values (males and females) 3.7 and 3.9 Kg of lambs born for Barki ewe dams fed *ad lib* berseem hay (according to NRC, 1985) and one- third hay plus *ad lib* rice straw respectively, and higher than the average birth weight 3.2 Kg of lambs born for Barki ewe dams fed *ad lib* rice straw with added a commercial molasses-urea mixture (Farid *et al*., 2005c). Weaning weights of lambs (neglecting lamb's sex) are19.8, 19.6, 20.5 and 20.4Kg of lambs from dams fed control, 20, 40 and 60% ALH diets, respectively. These values are almost nearly to the value of 21.8 Kg for lams born from ewe dams fed according to NRC (1985) recommended allowances as recorded by Farid *et al*. (2005c).

Table (7): Effect of feeding treatments on lamb's body weight change from birth to weaning.

Items	Experimental diets				P - value
	Control	20% ALH	40% ALH	60% ALH	
Birth weight	3.5 ± 0.21	3.4 ± 0.19	3.4 ± 0.25	3.5 ± 0.27	0.269
2 weeks	4.9 ± 0.42	4.9 ± 0.35	5.3 ±0.42	5.6 ± 0.33	0.564
4 weeks	7.0 ± 0.68	7.5 ± 0.73	7.9 ± 0.91	8.3 ± 0.79	0.415
6 weeks	9.6 ± 0.55	10.1± 0.88	10.5 ± 1.02	10.9 ± 0.50	0.411
8 weeks	11.9 ± 0.80	12.4 ± 0.70	13.1 ±1.13	13.2 ± 0.74	0.312
10 weeks	14.1 ± 0.74	14.4 ± 0.81	15.3 ± 0.20	15.1 ± 0.59	0.377
12 weeks	16.2 ± 0.88	16.2± 0.73	17.1 ± 0.76	16.8 ± 0.43	0.409
14 weeks	18.1± 0.69	18.0 ± 0.66	19.1 ± 0.53	18.8 ± 0.76	0.534
16 weeks	19.8 ± 1.11	19.6 ± 1.02	20.5 ± 1.01	20.4 ±1.08	0.520

The growth curve shown in Figure (3) indicate a relatively stable increase in live body weight throughout the 16-week period supporting contention (Farid *et al*., 2005b) that as milk production decreased and weights increased the lambs shared the diets offered to the dams especially the concentrates (and possibly hay) and in particular beyond the age of eight weeks.

Growth rates calculated during two-weeks between birth and weaning, least-square means are summarized in Table (8) and Figure (4). In general, growth was particularly fast between 4 and 8weeks in the control lambs group. But, the fast growth for 20, 40 and 60% ALH lamb groups started early between 2 and 8 weeks.

Table (8): Pre-weaning growth rates of lambs (g/day).

Item	Experimental Diets				P-value
	Control	20% ALH	40% ALH	60% ALH	
Birth weight, Kg	3.4 ± 0.21	3.3 ± 0.19	3.4 ± 0.25	3.5 ± 0.27	0.095
Bir. - 2 weeks	100.0 ± 0.11	114.3 ± 0.14	135.7 ± 0.13	150.0 ± 0.14	0.344
2 - 4 weeks	150.0 ± 0.15	185.7 ± 0.16	185.7 ± 0.10	192.9 ± 0.20	0.502
4 - 6 weeks	185.7 ± 0.10	185.7 ± 0.12	185.7 ± 0.13	185.7 ± 0.15	0.464
6 - 8 weeks	164.3 ± 0.14	164.3 ± 0.14	185.7 ± 0.15	164.3 ± 0.19	0.481
8 - 10 weeks	157.1 ± 0.18	142.9 ± 0.16	157.1 ± 0.10	135.7 ± 0.14	0.543
10 - 12 weeks	150.0 ± 0.15	128.6 ± 0.13	128.6 ± 0.12	121.4 ± 0.17	0.483
12 - 14 weeks	135.7 ± 0.11	128.6 ± 0.17	142.9 ± 0.14	142.9 ± 0.11	0.511
14 -16 weeks	121.4 ± 0.14	114.3 ± 0.13	100.0 ± 0.14	114.3 ± 0.18	0.376
Average daily gain	147.3 ± 0.19	145.5 ± 0.18	152.7 ± 0.20	150.9 ± 0.17	0.436

The present results of daily growth gain indicate that the graded levels of ALH (dried *Acacia saligna* leaves) inclusion instead of berseem hay did not significantly (P>0.05) affect daily gain. The average total daily gain for the experimental lamb groups are 147.3, 145.5, 152.7 and 150.9 g/day for control, 20, 40 and 60% ALH lamb groups, respectively. These values of lamb's daily gain are almost equal to the recorded daily gain value 150 gm/day for lambs born for Barki ewes fed 30% berseem hay plus *ad lib* rice straw and below the value 160 g/day for lamb groups born for Barki ewes fed according to the recommended allowances of NRC (1985), (Farid *et.al*.,2005c).

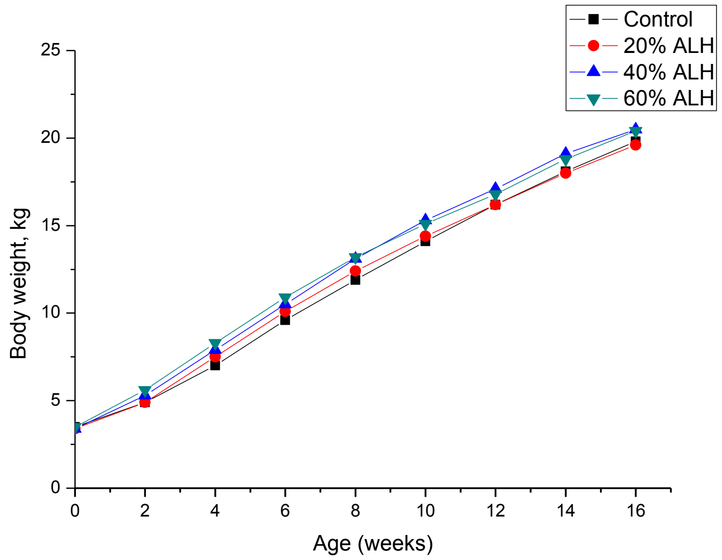

Figure (3): Lambs weight gain from birth to weaning (16 weeks, Kg).

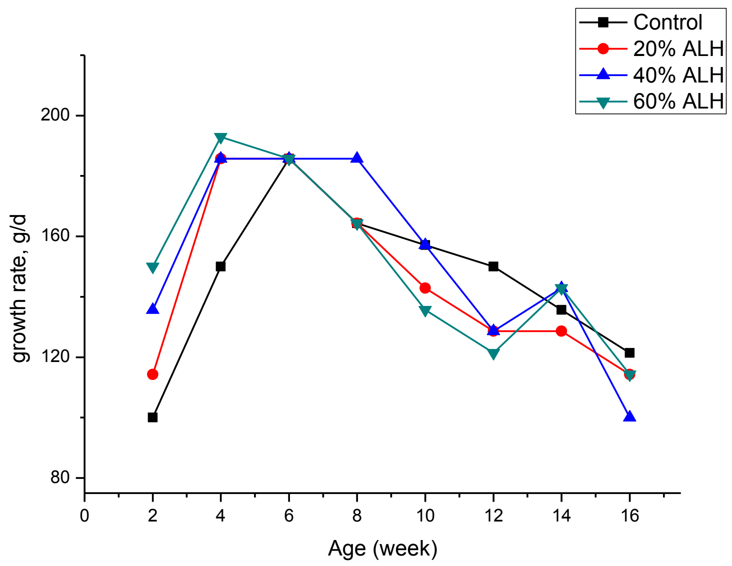

Figure (4): Pre-weaning growth rates of suckling lambs (g/day).

It is little known about the effect of feeding *Acacia saligna* component on pregnant ruminant animals and offspring birth weight and daily weight gain from birth to weaning. Menenses *et al*. (2012) conducted a study to evaluate production response of goats during pregnancy and lactation when fed *Acacia saligna* (Labill.) H.L. Wendl. forage as an alternative feed supply during dry periods. Pregnant goats were received 0, 25, 50, 75, and 100% Acacia component: leaf, and small (< 4 mm) and large steam (> 4 mm) as an alfalfa (*Medicago sativa* L.) hay replacement with no concentrates. They reported that birth weight varied with Acacia as the only forage ($P < 0.05$). The birth weights obtained were 2.89 and 3.29 kg for goat's females and males, respectively, with an average of 3.14 Kg. This average birth weight is lower than the lambs birth weights recorded in the present experiment. These differences may be due to animal species and feeding regimen. Also, they indicated that, the type of kidding also did not vary ($P > 0.05$). The values were 3.4, 3.18, and 2.7 kg for single, twin, and triplet births, respectively. They also, concluded that, although the partial inclusion of acacia produced only a tendency toward lower birth weights, it is necessary to consider nutrient intake reduction; the ME deficit, and the effect on body condition, particularly at birth, which may affect birth weight; and because the type of kidding and sex did not show conclusive results.

On the other hand, the phenolic and tannin composition content of *Acacia* (Degen *et al*., 1995) may reduce nutrient absorption due to fixing, especially of proteins. This led us to conclude that the use of *Acacia* in goat diets during the last third of pregnancy has limitations and that as a consequence of the body condition response; *Acacia* should not be included in percentages higher than 26% of total DM intake to avoid negative effects on production. This result seems to be comparable to our present results that inclusion 60% Acacia instead berseem hay showed a positive effect on production, whereas this level represent about 24% of total DM intake.

CONCLUSION

Supplementation of dried *A. saligna* leaves to lactating ewes did not affect the daily dry mater intake and milk yield and composition. A. saligna can easily grow in the tropical and sub-tropical areas where feed deficiency is a critical problem. Hence, dried *A. saligna* leaves can be used as alternative feed sources for lactating sheep especially during dried and semi-dried seasons.

REFERENCES

AOAC (1995). Official Methods of Analysis (15th ed.). Association Official Analytical Chemists. Washington, Virginal 1, USA.

Atti, N. and H. Rouissi (2003). Effets de la complémentation sur la production laitière des brebis Sicilo-Sarde en pâturage de l'orge en vert et de la vesce. Ann.

Barry, T.N. and S.J. Duncan (1984). The role of condensed tannins in the nutritional value of Lotus pedunculatus for sheep. 1. Voluntary intake. *Br. J. Nutr*. 51, 484–491.

Barry, T.N. and T.R. Manley (1984). The role of condensed tannins in the nutritional value of Lotus pedunculatus for sheep. 2. Quantitative digestion of carbohydrates and proteins. *Brit. J. Nutr*. 51, 493-504.

Barry, J.N., and W.C. McNabb (1999). The implication of condensed tannins on the nutritive value of temperate forages fed to ruminants. *The British Journal of Nutrition*. 81, 263-272.

Barry, J.L. and D. Tome (1991). Formaldehyde content of milk in goats fed formaldehyde treated soybean oil-meal. Food Addit. Contam. 8 (5), 633–640.

Ben Salem, H., H.P.S. Makkar, A. Nefzaoui, L.Hassayoun and S. Abidi (2005). Benefit from the association of small amounts of tannin-rich shrub foliage (Acacia cyanophylla Lindl.) with soya bean meal given as supplements to Barbarine sheep fed on oaten hay. Anim. Feed Sci.Tech. 122, 173–186.

Ben Salem, H., A. Nefzaoui and L. Ben Salem (2002). Supplementation of *Acacia cyanophylla* Lindl. Foliage-based diets with barely or shrubs from arid areas (*Opuntia ficus-indica F. inermis* and *Atriple nurnmularia* L.) on growth and digestibility in lambs. Anim. Feed Sci. Technol., 96: 15-30.

Ben Salem, H., A. Priolo, and P. Morand-Fehr. (2008). Beneficial and detrimental effects of dietary condensed tannins for sustainablesheep and goat production- Progress and challenges. Animal Feed Science and Technology 147:116-139.

Bocquier, F. and G. Caja (2001). Production et composition du lait de brebis: effets de l'alimentation. INRA Prod. Anim. 14 (2), 129–140.

Buckley, K.E., L.J. Fisher and V.G. Mackay (1988). Levels of aldehyde in milk, blood and tissues of dairy cows and calves consuming formalin-treated whey. J. Agri. Food Chem. 36, 1146–1150.

Degen, A., K. Becker, H. Makkar and N. Borowy (1995). Acacia saligna as a fodder tree for desert livestock and the interaction of its tannins with fibre fractions. Journal of the Science of Food and Agriculture 68:65-71.

Duncan, D.B. (1955). Multiple ranges and multiple F- test. Biometrics. 11: 1 – 42.

D'Urso, G., M. Avondo and L. Biondi, (1993). Effect of supplementary feeding on grazing behavior of Comisana ewes in a Mediterranean semi-extensive production system. Anim. Feed Sci. Technol. 42, 259–272

Farid, M.F.A., H.S. Khamis, E.Y.A. Eid and A. Helal (2005a). Feeding management and the performance of sheep in southern Sinai. 1. Diet selection and voluntary food intake of ewes. Journal of Agricultural Sciences, Mansoura University, 30 (12): 7437-7456.

Farid, M.F.A., H.S. Khamis, E.Y.A. Eid and A. Helal. (2005b). Feeding management and the performance of sheep in southern Sinai. 2. Reproduction and production performance of the ewe. Journal of Agricultural Sciences, Mansoura University, 30 (12): 7457 – 7476.

Farid, M.F.A. H.S. Khamis, E.Y.A. Eid, R.A. Ahlam and A. Helal. (2005c). Feeding Management and the Performance of Sheep in Southern Sinai: 3. The Lambs Pre-And Post-Weaning. J. Agric. Sci., Mansoura Univ., 30 (12): 7477 – 7494.

Frutos, P., G. Hervás, F.J. Giráldez and A.R. Mantecón (2004).Tannins and ruminant nutrition. Review. Span. J. Agric. Res., 2, 191-202.

Kearl, L.C. (1982). Nutrient Requirements of Ruminants in Developing Countries. International Feedstuffs Institute (IFI), Utah State University, Logan.

Krebs, G.L., D.M. Howard and K. Dods (2007). Feeding Acacia saligna to sheep and goats with or without the addition of urea or polyethylene glycol. Asian Australasian Journal of Animal Sciences 20:1551-1556.

Lapierre, H., R. Berthiaume and P. Dubreuil (2002). Equilibrer les rations pour lesacides aminés : rêve ou réalité. 26ème Symposium sur les bovins laitiers. CRAAQ. Université de Sherbrooke, pp. 12–29.

Maamouri, O., N. Atti, K. Kraiem and M. Mahouachi (2011). Effect of concentrate and *Acacia cyanophylla* foliage supplementation on nitrogen balance and milk production of grazing ewes. Journal of Livestock science. Vol: 139 (3): Pp. 264-270.

Meneses R. R. (2004). Comportamiento de procedencias de *Acacia saligna* (Labill.) H.L. Wendl. en la Región de Coquimbo, Chile. Ciencia Forestal Santa María 9:103-109.

Meneses R. R., Y.V. Olivares, M.S. Martinoli and H. P. Flores (2012). Effect of feeding *Acacia saligna* (LABILL.) H.L. Wendl. on goats stabled during late pregnancy and lactation. Chilean Journal of Agriculture Research, 72 (4): 550-555.

Min, B.R., T.N. Barry, G.T. Attwood and W.C. McNabb (2003). The effect of condensed tannins on the nutrition and health of ruminants fed fresh temperate forages. A review. Anim. Feed Sci. Technol. 106, 3–19.

Molle, G., M. Decandia, N. Fois, S. Ligios, A. Cabiddu and M. Sitzia (2003). The performance of Mediterranean dairy sheep given access to sulla (*Hedysarum coronarium* L.) and annual ryegrass (*Lolium rigidum Gaudin*) pastures in different time proportions. Small Rum. Res. 49, 319–328.

Mora, F.and R. Meneses (2003). Efecto del riego sobre el crecimientoy producción forrajera de *Acacia saligna* (Labill.) H.L. Wendl. en la zona árida de Chile. CERNE 9: 257-260.

NRC (1985). Nutrient Requirements of Sheep. 6th Ed., National Academy Press, Washington D.C.

Patra, A.K. and J. Saxena (2011). Exploitation of dietary tannins to improve rumen metabolism and ruminant nutrition. J.Sci. Food Agric. 91, 24–37.

Pritchard, D.A., P.R. Martin and P.K. O'Rourke (1992). The role of condensed tannins in the nutritive value of Mulga (*Acacia aneura*) for sheep. Australian Journal of Agricultural Research 49:1739-1746.

Purroy, A. and C. Jaime (1995). The response of lactating and dry ewes to energy intake and protein source in the diet. Small Rum. Res. 17, 17–24.

Rouissi, H., N. Atti and M.H. Othmane (2005). Effets de l'espèce fourragère, du mode d'exploitation et de la complémentation sur les performance laitières la brebis sicilo-sarde. Ann. INRAT 78, 147–161.

SPSS (1999). "Statistical Package for Social Science "Release 11, SPSS INC, Chicago. USA.

Squella, F., R. Meneses and Y.T. Gutiérrez (1985). Evaluación de especies forrajeras arbustivas bajo condiciones de clima mediterráneo árido. Agricultura Técnica (Chile) 45:303-313.

Steinshamn, H. (2010). Effect of forage legumes on feed intake, milk production and milk quality: A review. Animal Science Papers and Reports. Vol. 28 (3), 195-206.

Terril, T.H., G.B. Douglas, A.G. Foote, R.W. Purchas, G.F. Wilson and T.N. Barry (1992). Effect of condensed tannins upon body growth, wool growth and rumen metabolism in sheep grazing sulla (*Hedysarum coronarium*) andperennial pasture. J. Agric. Sci. Camb. 119 (2), 265–273.

Waghorn, G.C., I.D. Shelton, W.C. McNabb and S.N. McCutcheon (1994). Effects of condensed tannins in *Lotus pedunculatus* on its nutritive value for sheep.2. Nitrogenous aspects. J. Agric. Sci. 123, 109.

Wang, Y., G.B. Douglas, G.C. Waghorn, T.N. Barry and A.G. Foote (1996). Effect of condensed tannins in *Lotus corniculatus* upon lactation performance in ewes. J. Agric. Sci. Camb. 126, 353–362.

Woodward, S.L., G.C. Waghorn, K.R. Lassey and P. Laboyre (2002). Does feeding sulla (*Hedysarum coronarium*) reduce methane emissions from dairy cows? Proc. New Zeal. Soc. Anim. Prod. 62, 227–230.

Zegeye, T., S. Gebreyohaness and M. Kebede (2016). Effect of feeding graded level of dried *Acacia Saligna* leaves on milk yield and milk composition of crossbred dairy cows fed grass hay as basal diet. Journal of Biology, Agriculture and Healthcare, Vol.6, No.1, 1-20.

Vasta, V., A. Nudda, A. Cannas, M. Lanza and A. Priolo (2008). Alternative feed resources and their effects on the quality of meat and milk from small ruminants. Anim Feed Sci Technol. 147: 223–246.

تأثير مستويات الاكاسيا ساليجنا على اداء النعاج البرقي

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أجريت هذه الدراسة لتقييم تأثير تغذية مستويات متدرجة من اوراق اشجار الأكاسيا ساليجنا الجافة على المأكول اليومي من المادة الجافة، وانتاج اللبن وتركيبه، ومعدلات نمو الحملان من الولادة إلى الفطام. إستخدم في هذا البحث عدد اربعون من النعاج البرقي في بداية مرحلة الادرار متوسط عمرها 3-5 سنوات ومتوسط وزن الجسم الحي 38.8 ± 1.6 كجم تم توزيعها عشوائيا على أربع مجموعات تجريبية (عشرة نعاج لكل مجموعة) وتم تغذيتها على مستويات 0 و 20 و 40 و 60٪ دريس اوراق الاكاسيا إستبدالا من دريس البرسيم. استمرت التجربة 16 أسبوعا وأظهرت عدم وجود فرق معنوي (P> 0.05) في المأكول اليومي من المادة الجافة ووزن الجسم و انتاج اللبن وتركيبه ومعدل نمو الحملان يوميا خلال موسم الرضاعة كنتيجة لتغذية النعاج على مستويات متدرجة من دريس اوراق الاكاسيا مقارنة مع المجموعة الضابطة. وكانت قيم انتاج اللبن 24.1 و 23.9 و 24.2 و 24.3 جم/يوم، وكانت قيم متوسط الزيادة اليومية في اوزان الحملان هي: 147.3 و 145.5 و 152.7 و 150.9 جم/يوم ، للمجموعات الضابطة و 20 و 40 و 60٪ دريس اوراق الاكاسيا على التوالي. ويمكن ان نخلص الى ان دريس اوراق الاكاسيا سالجينا يمكن أن يستخدم كمصدر غذائي بديلا عن دريس البرسيم للنعاج المرضعات.