EFFECT FEEDING OF SUPPLEMENTED RATION WITH ALGAE ON MILK YIELD AND ITS COMPOSITION FOR DAMASCUS GOATS

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SUMMARY

The objective of the present investigation was to study the effect of two supplemented algae on nutritive value of lactating Damascus goats rations and its effect on performance of kids, milk production, milk composition, digestion coefficients, feed intake and feed conversion. Twenty seven Damascus lactating goats of 2-4 years old and average live body weight of 48.5±1.4kg were chosen divided and into three similar groups (9 animals each) R1 (control), R2 and R3. The groups were assigned at random to receive one of the three experimental rations. Animals of group R1 were fed 50% concentrate feed mixture (CFM) + 30% berseem hay + 20% wheat straw (control), R2 were fed 50% CFM + 30% berseem hay + 20% wheat straw with supplemented algae (*Spirulina*) and R3 were fed 50% CFM + 30%berseem hay + 20% wheat straw with supplemented algae (*Ulva rigida*) 0.2% of feed intake. At the end of the trial, three digestibility trials were conducted to determine digestibility coefficients and nutritive value of experimental rations. In addition, rumen liquor and blood samples were taken to determine some parameters. All supplemented in the present study decreased ($P<0.05$) CF, ash, ADL and hemicelluloses, but CP content had increased. The results revealed that the algae supplementation recorded highest digestibility coefficients ($P<0.05$) for all nutrients fiber fractions and nutritive value of R2 ($P<0.05$) compared with control. Nutrients digestibility coefficients, concentrations of ruminal ammonia nitrogen and total volatile were significantly ($P<0.05$) higher, which ruminal pH values were significantly ($P<0.05$) lower for rams fed algae supplemented diets than control at the sampling times 4 hrs. The highest body weight was recorded with R2. The algae supplemented recorded better feed conversion (DMI/daily milk yield) for R2 and R3, respectively compared with the control (R1). It could be concluded that supplemented goats ration with algae tended to increase digestibility coefficients and nutritive values, increased milk yield and improved feed conversion as kg DM intake per kg milk yield.

Keywords: *Algae, digestibility coefficients, feeding value, Damascus, kids, milk yield and milk composition.*

INTRODUCTION

Nowadays, consumers' demands for natural and healthy products are constantly increasing. Therefore, there is great interest in the research for novel functional foods. One strategy for producing such foods is the modification of the animal diets, using bioactive feed supplements, such as macroalgae (Madhusudan *et al.*, 2011) or microalgae (Christaki *et al.*, 2011a and Hoa *et al.*, 2011). Microalgae, these primitive aquatic organisms are reproduced by simple division once or twice per day and they are characterized as the most productive plants in the world (Marshall, 2007). Among the most known edible microalgae are *Spirulina* sp. (*Arthrospira*), belonging to the cyanobacteria, blue-green colored microalgae which are considered as intermediate species between plants and bacteria (Bold and Wynne, 1985 and Christaki *et al.*, 2011). *Spirulina* is an important source of nutritional compounds of high biological value, known centuries ago by many populations such as China, Greece, Mexico (Mirada *et al.*, 1998; Simpore *et al.*, 2005; Christaki *et al.*, 2010 and Nasseri *et al.*, 2011). Due to the fact that *Spirulina* has the above biologically active substances, it has been used in animal nutrition, for example rabbits (Colla *et al.*, 2008), pigs (Grinstead *et al.*, 2000), poultry (Carrillo *et al.*, 2008), acquacultures (Gouveia *et al.*, 2008) or ruminants (Kuplys *et al.*, 2009a).

Spirulina (Arthrospira sp.) is an edible filamentous, spiral shaped cyanobacterium (Becker, 2007 and Gouveia *et al.*, 2008). It is naturally found in the alkaline lakes of Mexico and Africa (Shimamatsu, 2004) where it has a long history as an ancient food source. *Spirulina* was rediscovered relatively recently by Leonard and Compare in the 1960s (Shimamatsu, 2004) and since then, has become commercially mass produced world-wide (Muhling *et al.*, 2005). Milk and dairy products can be used as functional foods (Bhat and Bhat, 2011), therefore, nowadays, much attention has been focused on the enrichment of cows milk fat with PUFA, since these are beneficial acids, especially the n-3 series, that cannot be synthesized by humans or animals and can protect against cardiovascular disease, atherosclerosis, skin diseases and arthritis (Simopoulos, 2002; Gouveia *et al.*, 2008; Lee and Hiramatsu, 2011). These fatty acids are absent or at a minimal level in traditional dairy cows rations (Singh and Sachan, 2011a), while they are present in very low proportions of less than 0.1% of total fatty acids in dairy products (Lock and Bauman, 2004).

Ulva lactuca is a widespread macro algae occurring at all levels of the intertribal zone, in calm and protected harbors as deep as 10 meters and in northern climates. *Ulva lactuca* grows along rocky or sandy coasts of oceans and estuaries. *Ulva lactuca* growing in moderation has many uses. In some parts of Britain and Asia, seaweed is consumed by humans and livestock as it is considered valuable to human nutrition. Many of its nutrients include iron, protein (15 percent), iodine, vitamins (A, B1 and C) and trace elements. Because of antibacterial properties, it has been recommended by treating skin irritations typically, including burns.

Ewe's milk is used for making the cheese in Egypt. Although the milk composition is not considered a factor influencing the price for milk, it is an important factor determining its yield and quality of the final product. Data on ewe's milk yield includes also data on milk fat and protein content, make enabling to analyse ewe's populations with respect to milk composition traits. Nute *et al.* (2007) found that lambs supplemented with linseed oil had the highest 18:3ω3 content in muscle tissue, rating for lamb flavour, and overall liking compared to those supplemented with fish oil or marine algae. These latter supplements were noted as producing 'putty' and 'fishy' odours. Ponnampalam *et al.* (2002) showed that long chain n-3 PUFA content in lamb muscle tissue were highest with fish meal supplementation, whereas n-6 PUFA were highest with lupine supplements.

MATERIALS AND METHODS

The experimental work of this study was carried out at Sakha Experimental Station (Kafer El-Sheikh Governorate), belonging to Animal Production Research Institute, Agricultural Research Center, Egypt. Twenty seven Damascus lactating goats of 2-4 years old and average live body weight of 48.5±1.4kg were used. At the last 45 days of pregnancy animals were randomly distributed into three groups (9 animals each). The groups were assigned at random to receive one of the three experimental rations. The first (R1) was the control group which fed 50% concentrate feed mixture (CFM) + 30% berseem hay + 20% wheat straw, the 2nd group (R2) was fed ration of control (R1) with supplemented algae (*Spirulina Platensis*) 0.2% of feed intake and the 3rd group (R3) was fed ration of control (R1) plus R3 supplemented algae (*Ulva rigida*) 0.2% of feed intake.

Alage treatment:

Cyanobacteria strain (*Spirulina platensis*) was obtained from Agricultural Microbiology Research Department, Soils, Water and Environment Research Institute (SWERI), Agriculture Research Center. *Spirulina platensis* and *Ulva rigida* were grown on Zarrouk medium (Zarrouk, 1966), the cultures were incubated in growth chamber under continuous illumination (2000 lux) and a temperature of 35˚C± 2˚C. After 30 days of incubation, the cultures were homogenized and filtered to take cells for air drying to be used in the experiment as powder. At the end of the trial three animals from each group were slaughtered to dermine dressing percentage and carcass quality.

Ulva rigida Samples collected during spring .The collected *ulva* were examined and identified by Papenfuss (1968), Gribb (1983).Specimens were collected at El Temsah lake beach, which is located in Suez canal, Latitude 30°32' and 30°36' North Latitude Longitude 32°16' and 32°21' East Longitude were collected manually from the intertidal zone at depths between 60cm and 1.20 m. and was spread on a cement surface and sun-dried for two days. Then the alga (Ulva) was ground in a hammer mill (JERZA, model L) and afterwards in a knife mill using a 1mm mesh. A sample was taking by quartering, to grind it finely and carry out chemical analysis by triplicate.

Digestibility trial:

Nine crossbred rams (3 of each treatment group) weighing on average 55±1.2 kg and 3 – 5 years old. Animals were used to determine nutrients digestion coefficient and nutritive values of the experimental rations. The animals were kept in separate metabolic cages. Each trial consisted of 21 days as a preliminary period followed by 7 days as collection period and fed with the same regime of the previous trial. Rumen liquor samples were obtained via rubber stomach tube at 4 hours after feeding to determine rumen pH values by pH meter (Orin-Res-Earh), Ammonia-N (NH3-N) concentration was immediately determined by the micro-diffusion method (Conway, 1963) and total volatile fatty acids (TVFAs) by steam distillation (Abou-Akkada and Osman, 1967). Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined by the methods of Van Soest (1982). Chemical composition of rations was analyzed according to A.O.A.C. (1990). Samples of dried minced meat were defatted by Soxhlet and protein was determined by the micro-kjeldhyle method and ash was determined by muffle furnace at 600°C for three hrs. Chemical composition of ingredients used to formulate the tested rations is presented in Table (1).

Table (1): Chemical composition of ingredients used to formulate the tested rations (% on DM basis).

Item	Wheat straw	Berseem hay	Concentrate feed mixture (CFM)*
DM	90.50	89.28	90.30
OM	83.89	87.75	92.60
CP	4.15	13.85	14.20
CF	35.75	30.64	14.35
EE	1.42	1.35	2.75
NFE	42.57	41.91	61.30
Ash	16.11	12.25	7.40
NDF	80.40	80.85	39.00
ADF	48.52	60.51	23.00
ADL	10.30	9.52	6.30
Cellulose	38.22	50.99	16.70
Hemicellulose	31.88	20.34	16.00

**Concentrate feed mixture (CFM) was consisted of: 35% ground yellow corn, 25% undecorticated cotton seed meal, 5% soybean meal, 15% wheat bran, 12% rice bran, 5% cane molasses, 2% lime stone and 1% common salt.*

Blood parameters:

Blood samples were drawn from the jugular vein of three lambs of each group at 4 hours after morning feeding and centrifuged for 20 min at 4000 r.p.m. The supernatant was frozen and stored at -20°C for subsequent analysis. Plasma total protein was determined according to (Armstrong and Carr 1964); albumin according to (Doumas *et al.*, 1971); AST and ALT according to (Reitman and Frankel, 1957); creatinine according to (Folin, 1994) and urea nitrogen according to (Siest *et al.,* 1981), cholesterol according to Fassati and Prencipile (1982) and triglycerides according to (Richmond, 1973).

Milk production:

Individual milk production was recorded and samples were collected weekly for composition analyses. Protein, fat and lactose contents were determined by the automated infrared method, using a Milko-Scan 255 (Foss Electric). Fatty acid methyl esters (FAME) (International Dairy Federation (1984) were analyzed on a Varian chromatograph (model Star 3400 CX). Separations were performed using a CP-88 capillary column (100 m x 0.25mm i.d. x 0.25.μm). Operating conditions were: a helium flow rate of 0.7 ml/min, a FID detector at 250°C, a split-splitless injector at 230°C with an injection rate of 120 ml/min, an injection volume of 1 μl. The temperature program of the column was: 3 min at 40°C and an increase of 10°C/min to 150°C for 3 min and a subsequent increase of 4°C/min to 150°C for 25 min. Retention time and area of each peak were computed using the Varian Star 3.4.1. software. Individual fatty acids were identified by retention time with reference to fatty acid standard mixtures (FAME, Sigma). Results were expressed as relative percentages.

Statistical analysis:

Collected data were subjected to statistical analysis using one-way-analysis of variance according to Snedecor and Cochran (1980) uses the following mathematical model:

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

Where: Y_{ij} is the parameter under analysis, μ is the overall mean, T_i is the effect due to treatment and e_{ij} is the experimental error. The general linear model of SAS (2009) program was used in processing measured parameters. The difference between means was statistically measured for significance at ($P<0.05$) according to Duncan’s test (1955).

RESULTS AND DISCUSSION

Digestibility coefficients:

As shown in Table (2), R2 recorded ($P<0.05$) the highest digestibility coefficients for all nutrients and nutritive value compared with the others. In the meantime R3 was ($P<0.05$) better in all nutrients digestibility coefficients and nutritive value than R1. These remarkably improve in all nutrients digestibility in rations contained supplemented algae compared with the control (R1). It could be noticed that supplemented algae tended to positive impact in improving of digestibility coefficients of DM, OM, CP, CF, EE, NFE and the nutritive value. Higher fiber digestibility in ration containing the algae may have been due to higher rumen cellulolytic activity, but how exactly algae might improve the cellulolytic activity in the rumen is yet to be understood. (El-Ashry *et al.*, 2003) reported that biological treatments with different fungal strain decreased cell wall constituents of different crop residue.
This is probably due to the enhanced cellulolytic activities in algae fed animals. Thus, in a subsequent trial, the effects of supplementing algal suspension or oilcake to a straw diet on the rumen cellulolytic activity. In general, R2 recorded ($P<0.05$) the higher digestibility coefficients, fiber fractions digestibility and nutritive value and appeared to better results compared to R3. This improve in previous parameters may be due to that fungi increased number of cellulalytic bacteria as indicated previously by Wiedmeier *et al.* (1987) or the increase in cells in fermentation capacity of the rumen or that presence of fungi cells in the rumen might initiate a dynamic action that out come faster passage rate of feed particles in the gastro intestinal tract (El-Badawi *et al.*, 2007).

In the contrary, Peiretti and Meineri (2008) mentioned decrease in digestibility coefficients with ration containing *Spirulina*. Also, Heidarpour *et al.* (2011) showed decrease in digestibility coefficients of all nutrients with Holsten calves and rabbits.

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

Item	Experimental rations		
	R1	R2	R3
Digestibility coefficients,%			
DM	$68.20^{c}\pm0.02$	$78.11^{a}\pm0.24$	$72.22^{b}\pm0.30$
OM	$63.01^{c}\pm0.50$	$75.02^{a}\pm0.57$	$71.13^{b}\pm 0.20$
CP	$65.40^{c}\pm0.03$	$74.21^{a}\pm0.30$	$70.44^{b}\pm0.20$
CF	$67.45^{c}\pm0.43$	$76.33^{a}\pm0.12$	$72.4^{b}\pm0.22$
EE	$68.25^{c}\pm1.20$	$73.22^{a}\pm0.20$	$70.21^{b}\pm0.24$
NFE	$66.50^{c}\pm0.02$	$74.45^{a}\pm0.55$	$70.52^{b}\pm0.23$
NDF	$61.40^{c}\pm0.45$	$69.50^{a}\pm0.61$	$65.00^{b}\pm0.02$
ADF	$60.94^{c}\pm0.23$	$70.47^{a}\pm0.48$	$64.52^{b}\pm0.41$
ADL	$18.40^{c}\pm0.32$	$23.14^{a}\pm0.29$	$20.14^{b}\pm0.62$
Cellulose	$58.72^{c}\pm1.18$	$63.12^{a}\pm0.30$	$60.15^{b}\pm0.02$
Hemicellulose	$59.44^{c}\pm1.17$	$66.68^{a}\pm0.60$	$62.45^{b}\pm0.41$
Nutritive value,%			
TDN	$53.00^{c}\pm0.21$	$61.75^{a}\pm0.17$	$59.20^{b}\pm0.55$
DCP	$6.11^{c}\pm0.09$	$8.45^{a}\pm0.22$	$7.40^{b}\pm0.22$

a, b and c: Means within the same row with different superscripts differ (P<0.05)
R1: 50% CFM + 30% BH + 20% WH (control)., R2: 50% CFM + 30% BH + 20% WH with (Spirulina platensis).
R3: 50% CFM + 30% BH + 20% WH with (Ulva rigida).

Rumen parameters:

Data of rumen fermentation parameters 4 hours after feeding are given in Table (3). Ruminal pH values were significantly (P<0.05) lower for rams fed algae supplemented diets than control ration. Ruminal pH values were significantly (P<0.05) lower for rams fed *Spirulina platensis* supplemented diets followed by *Ulva rigida* than control at the sampling time (6.10, 6.25 and 6.43), respectively. Ruminal ammonia-N concentration statistically influenced by algae supplementation, however the values were slightly higher with diets contained *Spirulina platensis* (R2) after 4 hours of feeding than other groups (R3 and R1) being (22.4, 20.3 and 18.5mg/100ml), respectively. TVFA's concentration was significantly (P<0.05) influenced by algae supplementation since the highest values were recorded with *Spirulina platensis* (R2) supplementation (13.40 meq./ 100ml).

Baraghit *et al.* (2009) reported that pH values were higher before feeding and decline after feeding to reach the least value at 4 hours and then it started to rise up at 6 hours. It could be observed that NH_3-N concentration and TVFA'S concentration were significantly different with all supplemented algae (R2 and R3) compared with the control (R1). On the other hand, R2 recorded (P<0.05) higher NH_3-N and TVFA's concentration compared with all other rations (R1 and R3). Yadav and Yadav (1988) and Ibrahim (2014) noticed that increased ruminal NH_3-N concentration might be due to the higher intake of nitrogen and higher CP digestibility. This increasing in TVFA's concentration in R4 may be attributed to alteration in chemical composition of rations with supplemented algae. Kumar *et al.* (1997) found high concentration of TVFA's in the rumen fluid when used biologically treated roughages, they attributed such increase to the high fiber breakdown.

Khorshed (2000) recorded that the highest ammonia-N concentration were found at after 4 hrs of feeding. These differences in NH_3-N concentration are referred to difference in treatments. However, it is well recognized that the NH_3-N concentration found in the rumen at any given time presented the net concentration value of its production, utilization by rumen microbs and absorption across the rumen wall, the dilution by other factors and passage to the lower gut. Similar results are also reported by Khorshed (2000) who that NH_3-N concentration increased in rumen of sheep and goats fed on ration treated with white rot fungi or yeast culture. NH_3-N and VFA values were significant (P<0.05) only at 4 and 6 hrs post feeding. The NH_3-N and VFA increased (P<0.05) in the biological treatment SCB compared with untreated SCB (control) (Baraghit *et al.,* 2009).

Table (3): Rumen parameters of animals fed different experimental rations.

Item	Experimental rations		
	R1	R2	R3
pH	$6.43^{a} \pm 0.02$	$6.10^{c} \pm 0.22$	$6.25^{b} \pm 0.54$
NH_3-N (mg/100ml)	$18.5^{c} \pm 0.15$	$22.4^{a} \pm 0.32$	$20.3^{b} \pm 0.70$
TVFA's (meq./100ml)	$9.00^{c} \pm 0.29$	$13.40^{a} \pm 0.42$	$11.0^{b} \pm 0.54$

a, b and c: Means within the same row with different superscripts differ (P<0.05).
R1: 50% CFM + 30% BH + 20% WH (control).
R2: 50% CFM + 30% BH + 20% WH with (Spirulina platensis).
R3: 50% CFM + 30% BH + 20% WH with (Ulva rigida).

Blood parameters:

Results of blood constituents for R1, R2 and R3 are illustrated in Table (4). Data showed insignificant differences (P<0.05) among the three tested groups in all blood parameters. All parameters were found to be within the normal range as reported by El-Sayed (1994) and Ibrahim (2014) found no marked effect in blood total protein, albumin, globulin, urea-N, and creatinine as well as AST and ALT as a result of feeding goats. Also, it could be noticed that supplemented rations with *Spirulina* (R2) tended to higher of total protein, albumin, urea-N, AST, cholesterol and triglyceride with no significant differences.

Table (4): Blood parameters of animals fed different experimental rations.

Item	Experimental rations		
	R1	R2	R3
Total protein (g/dl)	7.74±0.33	8.00±0.31	7.93±0.29
Albumin (g/dl)	4.00±0.23	4.38±0.26	3.99±0.24
Globulin (g/dl)	3.74±0.2	3.62±0.3	3.94±0.25
Creatinine (mg/dl)	1.08±0.05	1.00±0.06	1.14±0.014
Urea-N (mg/dl)	17.79±1.16	19.23±1.18	19.09±2.23
ALT (U/ml)	18.00±1.82	16.38±2.10	16.88±1.95
AST (U/ml)	25.25±1.93	27.38±3.93	28.00±3.36
Cholesterol (mg/dl)	105.16±19.44	105.98±17.18	102.85±16.59
Triglyceride (mg/dl)	73.53±12.25	75.17±46.57	73.86±14.82

R1: 50% CFM + 30% BH + 20% WH (control).
R2: 50% CFM + 30% BH + 20% WH with (Spirulina platensis).
R3: 50% CFM + 30% BH + 20% WH with (Ulva rigida).

Milk yield and composition:

Milk yield and its composition of the experimental animal group are given in Table (5). Milk yield (kg/day) was significantly higher (P<0.05) in R2 and R3 being 2.80 and 2.10kg, respectively. This result is agreement with Kulpys *et al.* (2009) who found that cows fed *Spirulina* had 21% increase in their milk production

Data presented in Table (5) showed that the composition of milk for animals fed ration supplemented with algae had higher (P<0.05) significant there that of control. The results of the present study are in agreement with the findings of Kovnerev and Smironov (1988). Milk composition was differed significantly (P<0.05) among the two animal groups in percentage of protein and lactose during suckling and lactation periods. Increasing protein% in R2 than R3 during suckling and lactation periods may be attributed to supplement with microbial inoculate that enhanced amino acid and stimulate rumen that caused alteration in microbial protein synthesis and increased protein passage, yet protein milk content. On the other hands, Rius *et al.* (2010) observed increase in milk protein yield for cows fed protein deficient but high energy diets. Lactose content in milk had increased (P<0.05) in R2 and R3 than R1. These results, disagreements with Franklin *et al.* (1999) who found no significant influence of marine algae on milk yield although this kind of supplementation produced a decrease in milk fat. However, Simkus *et al.* (2007 and 2008) showed increases in milk fat (between 17.6 and 25.0%), milk protein (9.7%), and lactose (11.7%) in cows fed *Spirulina* compared to controls.

Table (5): Milk yield its composition of animals fed different experimental rations.

Item	Experimental rations		
	R1	R2	R3
Milk yield, kg/h/d	1.78^{c}±0.50	2.80^{a}±0.48	2.10^{b}±0.25
Milk composition:			
Fat %	2.63^{c}±0.05	3.10^{a}±0.25	2.90^{b}±0.23
Protein %	2.57^{c}±0.12	3.21^{a}±0.58	2.92^{b}±0.51
Lactose %	2.21^{c}±0.05	3.25^{a}±0.50	2.60^{b}±0.20
Total solid %	11.02^{c}±0.52	12.68^{a}±0.02	11.40^{b}±0.85
SNF%	8.39^{c}±0.02	9.58^{a}±0.05	8.50^{b}±0.30

$^{a, b,}$ and ^{c}: Means within the same row with different superscripts differ (P<0.05).
R1: 50% CFM + 30% BH + 20% WH (control).
R2: 50% CFM + 30% BH + 20% WH with (Spirulina platensis).
R3: 50% CFM + 30% BH + 20% WH with (Ulva rigida).

Growth performance:

Data in Table (6) showed that higher (P<0.05) birth weight, weaning weight, total gain and average daily gain values of kids born from does fed supplemented algae rations compared with control group. These results are agree with those of (Holman *et al.*, 2012) evident that lambs receiving 10% *Spirulina* levels recorded the highest mean live body weight of 41.9 kg (P<0.018), compared to the control group. Quigley and Poppi (2009) and Panjaitan *et al.*(2010) suggest that increasing level used as a supplement in ruminants is expected to result in proportional improvements in lamb final body weight and average daily gain due to its association with increased rumen microbial crude protein production. Ead *et al.* (2011) found that average daily gain was higher (P<0.05) from 17-18 months when animals were fed rations containing algae.

Table (6): Growth performance of kids.

Item	Experimental rations		
	R1	R2	R3
Birth wt, kg	3.10^{c} ±0.30	3.90^{a}±0.44	3.50^{b}±0.45
Weaning wt, kg	15.14^{c}±0.25	19.21^{a}±0.02	17.85^{b}±0.40
Total gain, kg	12.21^{c}±0.42	15.71^{a}±0.78	14.36^{b}±0.02
Daily gain (g/day)	135^{c}±0.20	175^{a}±0.42	160^{b}±0.05

a,b and c: Means within the same row with different superscripts are significantly differ (P<0.05).
R1: 50% CFM + 30% BH + 20% WH (control).
R2: 50% CFM + 30% BH + 20% WH with (Spirulina platensis).
R3: 50% CFM + 30% BH + 20% WH with (Ulva rigida).

Feed intake and feed conversion:

Data presented in Table (7) showed that total dry matter intake (DMI) increased with group supplemented algae compared with the control group. Concentrate feed mixture intake were equaled in the three experimental groups, however, both BH and WS appeared two higher intake groups supplemented algae. On the other hand, feed utilization efficiency showed that animal fed (R2) and (R3) had the best in feed conversion as kg DM/kg milk yield being 0.856 and 0.915, respectively (Table 7). It could be observed that feed conversion as kg TDN or DCP/kg milk yield recorded higher values with groups fed R2 and R3 than that fed R1. Feed conversion as kg TDN or DCP/kg milk yield were better for animals fed R1 (control) than those fed R2 and R3 owing to higher feeding values and DMI with the animals fed R2 and R3. Generally, supplemented rations with algae tended to improve feed conversion as kg DMI/kg milk yield

Table (7): Effect of experimental rations on growth performance of goats.

Item	Experimental rations		
	R1	R2	R3
Av. daily DM intake (kg/h/d):			
CFM	1.125	1.125	1.125
BH	0.400	0.420	0.430
WS	0.260	0.280	0.285
Total DMI, kg	1.785	1.825	1.840
Feed conversion (DMI/daily milk yield)	0.988	0..855	0.914
Av. daily feed unit intake (kg/h/d):			
TDN	0.946	1.127	1.089
DCP	0.109	0.154	0.136
Daily milk yield, kg	1.845^{c}±0.50	2.131^{a}±0.48	2.010^{b}±0.25
Feed utilization efficiency:			
Kg DM/kg milk yield	0.967	0.856	0.915
Kg TDN/kg milk yield	0.513	0.529	0.542
Kg DCP/kg milk yield	0.059	0.072	0.068

a ,b and c: Means within the same row with different superscripts are significantly differ (P<0.05).
R1: 50% CFM + 30% BH + 20% WH (control).
R2: 50% CFM + 30% BH + 20% WH with (Spirulina platensis).
R3: 50% CFM + 30% BH + 20% WH with (Ulva rigida).

CONCLUSION

In general, it could be concluded that supplemented rations with algae *Spirulina platensis* and *Ulva rigida* had a great effect on digestibility coefficients, fiber fractions, milk yield and composition of Damascus lactating goats, weaning weight, total gain and daily gain of Damascus kids. In addition, feed conversion as kg DM/kg milk yield had improved with supplemental groups.

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تأثير تغذية الطحالب المضافة في العلائق على محصول اللبن وتركيبه فى الماعز الدمشقى

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يهدف هذا البحث الى دراسه استخدام نوعين من الطحالب على القيمه الغذائيه لعلائق الماعز الدمشقي الحلابه وتأثيره على اداء النعاج وانتاج اللبن والتركيب الكيماى للبن ومعاملات الهضم والمأكول من الغذاء . استخدم فى هذه الدراسه 27 ماعز دمشقى (تسع حيوانات لكل مجموعه) بمتوسط وزن 48.5±1.4 كيلوجرام وزعت عشوائيا على ثلاث مجاميع المجموعه الاولى كنترول غذيت على 50% علف مركز + 30% دريس برسيم + 20% تبن القمح . المجموعه الثانيه عباره عن مجموعه الكنترول بالاضافه الى طحلب الاسبيرولينا والمجموعه الثالثه مجموعه الكنترول بالاضافه الى طحلب اليولفا . وكلا الطحلبين تم إضافتيهما بنسبه 0.2% من الغذاء المأكول و قد اوضحت النتائج ما يلى :

- تحسن التركيب الكيماوى بالنسبه للعلائق باضافه كلا الطحلبين
- ارتفاع معاملات الهضم والقيمه الغذائيه الثانيه والثالثة عن مجموعه المقارنه
- توجد فروق معنويه عند مستوى 0.05بين المجاميع الثلاثه فى قياس pH ومع وجود اختلاف معنوى يتجه الى المجموعتين الثانيه والثالثه الامونيا – نيتروجين و الاحماض الدهنيه الطياره.
- لا توجد فروق معنويه عند مستوى 0.05 بالنسبه لقياسات الدم فى كل المجاميع.
- ارتفاع معدل الكفاءه الاقتصادية ومعدل التحويل الغذائى بالنسبه للمجموعه الثانيه تليها المجموعه الثالثه ثم الكنترول.
- ارتفاع محصول اللبن وكذلك التركيب الكيماوى للبن بالنسبه للمجموعه الثانيه تليها المجموعه الثالثه ثم الكنترول.

ونستنتج من هذه الدراسه التالية انه يمكن إضافه الطحالب الى علائق الماعز الدمشقي مما يؤدى إلى تحسين القيمه الغذائيه لهذه العلائق بالإضافه إلى تحسين معاملات الهضم والقيمة الغذائية وإنتاج وتركيب اللبن للماعز الدمشقي مع تحسين معدل النمو اليومي , الزيادة الوزنية و وزن الفطام للجداء.