J.Animal and Poultry Prod., Mansoura Univ., Vol. 6 (7): 483 - 492, 2015

NUTRITIONAL EVALUATION OF ALGAE SUPPLEMENTATION AND IMPACT OF THEIR FEEDING ON MILK PRODUCTION AND COMPOSITION OF EWES

Yacout,M.H.M.[1];H.M.El-Gandy[2];A. M. El - Hais[2]; A. F. Abo-roash[2]; A. A. Hassan[1]and Shyma M. El-Komy[2].

[1] **By-Products Utilization Dept. Animal Production Research Institute, Agricultural Research center, Dokki, Giza, Egypt.**

[2] **Animal production Dept., Faculty of Agriculture, Tanta University.**

ABSTRACT

The present study was carried out to estimate digestion, rumen fermentation, milk yield and composition of lactating Barki ewes fed diets with or without different types of algae (*Ulva lactuca* and *Pteroclandia capillacea*) at levels of 0, 5 and 10 g/kg di*et al*one or a combination of both algae, at levels of 2.5 and 5 g/kg diet. Results showed that supplementation of both types of algae at a level of 5 g/kg for each improved (P≤0.05) the digestion of the experimental diets in term of increasing digestibility coefficients of nutrients, especially CP, CF and fiber fractions. On the other hand, digestibility coefficients of the cell wall constitutes were higher (P≤0.05) for diet supplemented with both types of algae at level of 2.5 or 5 g of each. Higher feeding values were obtained for diet supplemented with both algae, followed by those supplemented with each type of algae alone. The highest (P≤0.05) milk yield, milk fat and milk protein were detected by the same diets. Algae supplementation had no effect on milk lactose and ash percentages.

It could be recommended to supplement ewe diets with both algae strains (*Ulva Lactuca* and *Pteroclandia Capillacea*) at a level of 5 g from each in order to economically improve the performance of lactating ewes.

Keywords*:* Algae, digestibility, rumen parameters, sheep, milk.

INTRODUCTION

There is an increasing interest in the use of unconventional resources to guarantee of good quality forages all over the year. The use of seaweed or algae can play a role in these new resources. The identification of new feed resources is therefore crucial for sustainable animal production and future viability. Ideally, the new feed resource should have high nutritive value and conversion efficiency, be able to optimize animal product quality and use land and water efficiently (Poppi and McLennan, 2010).

Algae are good valuable sources of food, micronutrients (essential nutrients, especially trace elements), and raw materials for the pharmaceutical industry and considered in the 21st century as the food supplement or source of proteins, lipids, polysaccharides, minerals, vitamins, and enzymes (Rimber 2007).A wide variety of seaweeds grow along the Egyptian Mediterranean coast, especially at Alexandria. The green algae (*Ulva lactuca*) and the red algae (*Jania rubens and Pteroclandia capillacea*) are among the most abundant the Alexandria coast, particularly, from spring to autumn (Aleem, 1993). Algae are considering one of the marine feedstuffs where it can be found in the sea, rivers and lakes. It's heterogeneous group

of plants with a long fossil history, the two major types of algae can be identified as the macro-algae (seaweeds) occupy the littoral zone, which included green algae, brown algae and red algae, and the micro-algae are found in both benthic and littoral habitats and also throughout the ocean waters as phytoplankton (Garson, 1989).Harvested algal biomass is a high-grade protein source, which could be used to replace a portion of the protein content of animal feed which is mostly imported and expensive. It providing feed usually amounts to 50% or more of the cost of producing milk (Johnson *et al*., 1991).

In addition, milk from dairy cows fed a diet supplemented with the marine algae (*Schizochytrium sp*.) showed an increase in omega-3-fatty acid content, a characteristic that has potential for improving consumer health (Franklin *et al*., 1999). The purpose of this study was to determine the effect of inclusion marine algae *(Ulva lactuca* and *Pteroclandia capillacea*) in diets of lactating ewes on digestion, feeding value and milk production.

MATERIALS AND METHODS

This study was carried out at Noubaria Experimental station, Animal Production Research Institute, Ministry of Agriculture and laboratory experiments were conducted in Animal Production Department, Faculty of Agriculture, Tanta University.

The basal diet for all the experimental groups included concentrate feed mixture (CFM) and rice straw (RS). Ingredients of CFM and chemical analysis of CFM and RS are presented in Tables (1 and 2), respectively.

Ewes in seven experimental groups were fed the basal diet with or without different levels and types of algae as the following:

D1: Basal un-supplemented diet (Control).
D2: Control diet supplemented with 5 g *Ulva lactuca*.
D3: Control diet supplemented with 10 g *Ulva lactuca*.
D4: Control diet supplemented with 5 g *Pteroclandia capillacea*.
D5: Control diet supplemented with 10 g *Pteroclandia capillacea*.
D6: Control diet supplemented with 2.5 g *Ulva lactuca* and 2.5 g *Pteroclandia capillacea*.
D7: Control diet supplemented with 5 g *Ulva lactuca* and *Pteroclandia cpillacea*.

Proximate chemical analysis of the two types of algae (*Ulva lactuca and Pteroclandia capillacea*) is shown in Table (3)..

Table (1): Ingredients of concentrate feed mixture (CFM) fed to all experimental groups.

Ingredient	(%)
Yellow corn	38
Wheat bran	33
Soybean meal	18
Molasses	7
Lime stone	2
Salt	1.5
Mineral premix	0.5

Table (2): Proximate chemical analysis of concentrate feed mixture (CFM) and rice straw (RS) (on DM basis, %).

Item	Chemical analysis (%)						Cellular constituents (%)				
	OM	CP	CF	EE	NFE	Ash	NDF	ADF	ADL	Hemi-c	cellulose
CFM	93.45	13.49	8.22	2.62	69.12	6.55	36.76	21.37	9.67	15.39	11.70
RS	87.89	3.82	38.57	0.95	44.55	12.11	66.54	47.88	22.65	18.66	25.23

Hemi-c: Hemi-cellulose.

Table (3): Proximate chemical analysis of the two types of algae (*Ulva lactuca and Pteroclandia capillacea*).

Item	*Ulva lactuca*	*Petrocladia capillacea*
Chemical composition (%):		
DM	81.77	78.95
CP	20.23	18.85
CF	9.91	11.94
EE	3.22	2.84
NFE	48.41	45.32
ASH	18.23	21.05
Calories, kcal	309.34	285.14
Mineral composition (PPM) (?(N):		
Sodium	197.8	206.3
Potassium	97.8	95.6
Calcium	70.1	69.2
Magnesium	217.0	186.5
Major elements (PPM):		
Phosphorus	312.3	299.5
Iodine	185.7	166.8
Minor elements (PPM):		
Lead	0.07	0.09
Cadmium	0.035	0.039
Iron	2.137	2.879
Cupper	0.118	0.143
Manganese	0.083	0.088
Selenium	1.15	1.06
Zinc	0.783	0.688

Animals:

Nine adult Barki sheep (48±1.5 kg) were used to conduct the digestibility trails, while, three rams fitted with rumen permanent fistula were used to evaluate the rumen fermentation activity. In addition, forty two Barki ewes at the same lactation stage weighing (50±2 kg) were used to estimate milk yield and milk composition.

Digestibility trails:

The digestibility trails lasted 28 days, 21 days as preliminary period, followed by 7 days as a collection period. Animals were kept in individual metabolic cages and fed the experimental diets. Water was available all the time. During the collection period, the daily feed residues if any were

collected and weighed to estimate the actual feed intake. Fresh feaces were collected, weighed and 10% of a total amount was dried at 65 °C for 24 h then grounded in a mill to uniform particle size of 1 mm and stored in plastic bags at room temperature for the laboratory analysis. The daily urine secreted was collected in a plastic jar contained 5 ml of sulphuric acid (H_2So_4) for preventing ammonia losses. Ten percentage of urine was taken as samples and stored in glass bottle at 20 °C until the chemical analysis. Feed, feed refused, urine and feaces were analyzed according to AOAC (2000). The cell wall constituents (NDF, ADF and ADL) in feed samples were estimated according to Goering and Van Soest (1970).

Lactation experiment:

Feeding the experimental diets began after 5 weeks of the beginning of lactation and lasted about 4 weeks. Rice straw was offered *ad libitum*, while CFM was offered according to NRC (1988).

Daily milk yield was recorded once a week on an individual basis. Milk was sampled from the morning milking and immediately cooled. Milk content of total solids (TS) was determined after drying the milk at 110 °C for 3 to 4 h till fixed weight. Milk fat was determined according to Gerber's methods described by Ling (1963), while solid not fat (SNF) was calculated by the difference. Fat corrected milk (FCM, 4 %) was calculated according to Gaines (1923) using the following equation: $FCM = 0.4\ M + 15.0\ F$ Where, M = milk yield and F = fat yield.

Statistical analysis:

Data were statistically analyzed using procedure of SAS (2000). Duncan's Multiple Range Test (Duncan, 1955) was used to compare among means.

RESULTS AND DISCUSSION

Digestibility coefficients:

Results shown in Table (4) revealed that algae supplementation had a significant ($P \leq 0.05$) effect on digestion of the experimental diets. Diets supplemented with algae combination at a level of 5 g (D7) recorded the highest digestibility coefficients of all nutrients, while the control diet had the lowest values. The increase of digestibility coefficients of nutrients following the supplementation of algae combination could be due to that they may alter the bacterial population in the rumen of sheep, which many affect the digestibility of diet, and in turn alter the end products of fermentation (Lowery and Kennedy,1996).

Table (4): Effect of algae supplementation on digestibility coefficients of the experimental diets.

Item	Control (D1)	*Ulva lactuca*		*Pteroclandia capillacea*		*Ulva lactuca + Pteroclandia capillacea*	
		5 g (D2)	10 g (D3)	5 g (D4)	10 g (D5)	2.5+2.5 g (D6)	5 +5 g (D7)
DM	62.25 ±0.33^{d}	63.94 ±0.18^{C}	65.94 ±0.10^{b}	62.75 ±0.21^{d}	63.49 ±0.14^{C}	65.68 ±0.41^{b}	67.42 ±0.08^{a}
OM	63.56 ±0.39^{d}	65.68 ±0.16^{c}	67.32 ±0.23^{b}	64.89 ±0.20^{cd}	65.53 ±0.10^{c}	67.36 ±0.38^{b}	69.03 ±0.20^{a}
CP	58.88 ±0.75^{d}	63.23 ±0.04^{b}	63.46 ±0.80^{b}	61.99 ±0.17^{c}	62.77 ±0.23^{c}	63.73 ±0.24^{b}	66.09 ±0.64^{a}
CF	51.52 ±1.72^{c}	57.48 ±0.71^{b}	59.18 ±1.41^{ab}	56.04 ±1.13^{b}	56.22 ±0.39^{b}	60.00 ±0.30^{a}	60.46 ±0.26^{a}
EE	68.81 ±1.27^{b}	69.40 ±0.02^{b}	72.37 ±0.90^{a}	69.29 ±0.74^{b}	68.67 ±0.39^{b}	69.87 ±0.33^{b}	71.93 ±0.99^{a}
NFE	66.87 ±0.84^{d}	68.20 ±0.08^{c}	69.94 ±0.59^{b}	67.66 ±0.62^{c}	68.53 ±0.30^{c}	70.01 ±0.53^{b}	71.77 ±0.51^{a}

$^{a, b,...d}$: Means within the same row with different superscript are significantly differ (P≤0.05) .

Concerning the digestibility of wall cell constituents, digestibility coefficients of NDF, ADF and ADL were significantly (P<0.05) increased by algae supplementation with both levels of *Ulva Lactuca* and *Pteroclandia capillacea* at levels of 2.5 or 5 g (D6 and D7), being significantly (P<0.05) higher for D6 than D7.

Table (5): Effect of algae supplementation *on* digestibility of wall cell constituents of the experimental diets.

Item	Control (D1)	Ulva lactuca		Pteroclandia capillacea		Ulva lactuca + Pteroclandia capillacea	
		5 g (D2)	10 g (D3)	5 g (D4)	10 g (D5)	2.5+2.5 g (D6)	5+5 g (D7)
NDF	51.56 ±0.15^{c}	54.11 ±0.45b	55.24 ±0.21^{ab}	52.94 ±0.22^{d}	53.17 ±0.12^{b}	56.32 ±0.37^{a}	57.03 ±0.25^{d}
ADF	48.75 ±0.28^{c}	50.32 ±0.19b	53.39 ±0.11^{a}	50.78 ±0.21^{b}	51.32 ±0.31^{b}	53.78 ±0.16^{a}	54.02 ±0.21^{d}
ADL	38.67 ±0.34^{c}	41.65 ±0.21b	42.44 ±0.10^{b}	40.38 ±0.15^{b}	41.47 ±0.26^{b}	44.26 ±0.43^{a}	44.86 ±0.14
Hemi-c	59.76 ±0.45^{c}	62.65 ±0.38b	63.44 ±0.27^{ab}	61.88 ±0.25^{b}	62.47 ±0.42^{b}	63.98 ±0.65^{a}	65.47 ±0.21^{d}
Cellulose	57.87 ±0.32^{c}	60.16 ±0.54b	61.87 ±0.11^{b}	59.05 ±0.42^{b}	60.43 ±0.65^{b}	63.64 ±0.22^{a}	64.67 ±0.32^{d}

$^{a, b,...d}$: Means within the same row with different superscript are significantly differ (P≤0.05) .

Feed consumption:

Data presented in Table (6) illustrated that diets supplemented with both algae types (at a rate of 5 g from each algae) showed significantly (P<0.05) the lowest feed intake as DM with the highest feeding values as

DTN and DCP, and insignificantly moderate feed intake as DTN or DCP. This could be due to the more digestion coefficient of most of nutrients and NDF, ADF and ADL digestion coefficients as well.

Table (6): Effect of algae supplementation on dry matter intake and nutritive values of the experimental diets fed to sheep.

Item	Control (D1)	*Ulva lactuca*		*Pteroclandia capillacea*		*Ulva lactuca + Pteroclandia capillacea*	
		5 g (D2)	10 g (D3)	5 g (D4)	10 g (D5)	2.5 g+2.5 g (D6)	5 g+5 g (D7)
DMI (g/h/d)	1199.8 ±37.66^{c}	1270.4 ±11.66^{b}	1232.8 ±22.03^{b}	1277.1 ±8.30^{b}	1287.1 ±10.35^{b}	1316.2 ±6.38^{a}	1275.8 ±12.7^{c}
TDN	60.5 ±0.26^{d}	62.2 ±0.12^{c}	63.9 ±0.24^{b}	61.5 ±0.20^{c}	62.0 ±0.06^{c}	63.6 ±0.34^{b}	65.33 ±0.21^{a}
TDNI (g/h/d)	725.3 ±9.76	790.1 ±12.86	787.9 ±9.43	784.8 ±16.33	797.9 ±13.06	837.4 ±11.65	833.53 ±0.14
DCP	6.54 ±0.07^{b}	6.79 ±0.04^{ab}	6.95 ±0.14^{ab}	6.63 ±0.04^{b}	6.68 ±0.05^{b}	6.69 ±0.06^{b}	7.08 ±0.21^{a}
DCPI (g/h/d)	78.48 ±2.98	86.25 ±3.05	85.68 ±2.99	84.68 ±1.77	85.98 ±0.99	88.05 ±2.32	90.33 ±0.32

^{abcd}: **Means within rows with different superscript are significantly differ (P≤0.05).**

Nitrogen balance:

Regarding the N utilization of the experimental diets, results in Table (7) revealed significant (P<0.05) differences in N intake (NI) and N absorbed (NA), being the highest for D6, but nitrogen balance (NB) was significantly (P<0.05) the highest for D3 and D7 as recorded for TDN and DCP intakes. These were reflected in the highest N utilization expressed as either NB/NI in D7 or NB/NA in D3. However, the lowest (P<0.05) NB and N utilization was recorded for the control diet (D1). These results agreed with Khalel (2013), who noticed that the supplementation of ulva lactuca at level of 4% had higher values of total digestible nutrients (TDN), digestible crude protein (DCP), N-balance and nitrogen utilization compared to other experimental diets, but there were no significant differences (P<0.05) were appeared among experimental diets for N-intake.

Rumen parameters:

Rumen parameters of ewes fed the experimental diets are presented in Table (8). Ruminal pH value was insignificant (P<0.05) among diets. While NH_3-N concentrations were significantly higher (P<0.05) for D7 than for other experimental diets, which did not differ significantly. These could be due to the highest NH_3-N rate of production for D7. On the other hand, TVFA´s concentration significantly (P<0.05) decreased for all supplemented diets, especially D7. However, D2 did not differ significantly from that in D1 (control). This finding could be resulted from more DM intake, NB and N utilization of these dietsor due to the effect of such supplementation on alteration of the bacterial population in the rumen of ewes fed diets supplemented with algae. In this respect, Obara *et al*. (1991) explained that increasing the rumen fermentation is often related with lower ruminal concentration of NH_3-N which may be used for microbial protein synthesis.

Table (7): Effect of algae supplementation on nitrogen utilization of the experimental diets fed to sheep.

Item	Control (D1)	*Ulva lactuca*		*Pteroclandia capillacea*		*Ulva lactuca+ Pteroclandia capillacea*	
		5 g (D2)	10 g (D3)	5 g (D4)	10 g (D5)	2.5 g+2.5 g (D6)	5 g+5 g (D7)
NI(gm/day)	21.39 ±0.23^{c}	21.82 ±0o.07^{b}	21.59 ±0.14^{c}	21.86 ±0.05^{b}	21.93 ±0.06^{a}	22.10 ±0.04^{a}	21.85 ±0.08^{b}
NA(gm/day)	12.56 ±0.27^{c}	13.80 ±0.04^{b}	13.70 ±0.16^{b}	13.55 ±0.04^{b}	13.76 ±0.05^{b}	14.09 ±0.08^{a}	14.44 ±0.01^{a}
NB(gm/day)	6.09 ±0.20^{d}	8.40 ±0.06^{b}	9.41 ±0.29^{a}	7.48 ±0.13^{b}	8.19 ±0.31^{b}	8.61 ±0.09^{b}	9.59 ±0.03^{a}
NB/NI	28.45 ±0.70^{d}	38.51 ±0.37^{b}	43.58 ±1.18^{a}	34.21 ±0.66^{c}	37.37 ±1.45^{b}	38.94 ±0.40^{b}	43.87 ±0.09^{a}
NB/NA	48.48 ±0.97^{d}	60.91 ±0.58^{b}	68.67 ±1.51^{a}	55.18 ±1.03^{c}	59.53 ±2.10^{b}	61.11 ±0.75^{b}	66.40 ±0.76^{a}

^{abcd} **: Means within the same row with different superscript are significantly differ (P≤0.05).**

Table (8): Effect of algae supplementation on rumen parameters of the experimental fed to sheep (means ± SE).

Parameter	Control (D1)	Ulva lactuca		Pteroclandia capillacea		Ulva lactuca+pteroclandia capillacea	
		5 g (D2)	10 g (D3)	5 g (D4)	10 g (D5)	2.5 +2.5 g (D6)	5+5 g (D7)
Rumen pH	6.42 ±0.12	6.47 ±0.10	6.52 ±0.11	6.53 ±0.10	6.45 ±0.10	6.48 ±0.09	6.57 ±0.10
NH3-N (ml eq/100 ml R L)	13.84 ±0.41^{b}	13.98 ±0.38^{b}	14.30 ±0.50^{b}	14.40 ±0.51^{b}	14.00 ±0.39^{b}	14.60 ±0.4^{b}	15.73 ±0.67^{a}
Rate (%) of NH3-N production	2.72 ±0.06^{c}	2.79 ±0.07^{bc}	2.93 ±0.06^{ab}	2.96 ±0.09^{ab}	2.84 ±0.08^{b}	2.90 ±0.8^{b}	3.10 ±0.13^{a}
VFAs ((ml eq/100 ml R L))	12.28 ±0.23^{a}	12.04 ±0.19^{a}	11.28 ±0.17^{b}	11.28 ±0.17^{b}	11.59 ±0.11^{b}	11.38 ±0.21^{b}	10.61 ±0.17^{c}
VFAs rate production **(%)**	3.73± 0.22^{a}	3.55± 0.30^{a}	3.01± 0.24^{b}	2.86± 0.23^{b}	3.45±0. 30^{a}	3.14± 0.24^{a}	2.66 ±0.19^{b}
Rate of outflow (%/h)	6.43 ±0.17^{a}	5.65 ±0.12^{b}	5.47 ±0.10^{c}	5.78 ±0.08^{ab}	5.68 ±0.12^{b}	5.28 ±0.10^{d}	5.20 ±0.09^{d}
Microbial protein(g)	46.30 ±1.73^{c}	55.79 ±2.92^{b}	60.33 ±3.49^{a}	50.37± 1.65^{b}	53.25± 2.02^{b}	62.04 ±3.41^{a}	65.81 ±4.43^{a}

$^{a, b.....d}$ **: Means within the same row with different superscript are significantly differ (P≤0.05).**

Milk production:

Data in Table (9) revealed that ewes fed D7 showed the highest milk yield and 4% FCM, but did not differ significantly from those fed D1. Also, ewes fed D7 showed significantly (P<0.05) the highest percentages and yields of fat and protein in milk. However, percentage of total solids (TS) in treatment groups as compared to control one. While, percentages of solids not fat, lactose and ash were not affected significantly by treatments. Increasing milk, fat and protein yields in D7 could be due to the more

digestion coefficients, feed intake and diet utilization. These results are in disagreement with Bichi *et al*. (2013), who evaluated the animal performance and milk fatty acids composition in response to marine algae (MA) in the diet of Assaf ewes. They found that diet response to marine algae (MA) did not affect milk yield, but did decreased milk fat content.

Table (9): Effect of algae supplementation on milk yield (gm/h/d)of lactating ewes fed the experimental diets (means ± SE).

Item	Control (D1)	Ulva lactuca		Pteroclandia capillacea		Ulva lactuca+ Pteroclandia capillacea	
		5g (D2)	10 g (D3)	5 g (D4)	10 g (D5)	2.5 +2.5 g (D6)	5 +5 g (D7)
Milk yield (g)	530.31 ±12.90^{ab}	561.69 ±16.90 ^{a}	579.19 ±15.86^{a}	544.25 ±19.10^{b}	554.06 ±10.81^{ab}	594.06 ±13.38^{a}	605.44 ±25.62^{a}
4% FCM yield (g)	4.44	4.88	4.97	4.58	4.80	5.12	5.42
Fat (%)	2.98 ±0.11^{b}	3.13 ±0.09^{ab}	3.18 ±0.11^{a}	3.00 ±0.09^{b}	3.15 ±0.10^{a}	3.23 ±0.11^{a}	3.35 ±0.12^{a}
Fat yield (g/d)	15.52 ±0.6^{c}	17.56 ±0.47^{b}	17.70 ±0.64^{b}	16.10 ±0.44^{bc}	17.24 ±0.45	18.33 ±0.38^{b}	20.01 ±0.68^{a}
Protein **(%)**	3.20 ±0.10^{b}	3.30 ±0.11^{a}	3.35 ±0.10^{a}	3.23 ±0.08^{b}	3.28 ±0.09^{ab}	3.28 ±0.11^{a}	3.45 ±0.06^{a}
Protein yield (g/d)	16.71 ±0.56^{c}	18.24 ±0.36^{b}	19.13 ±0.39^{a}	17.30 ±0.41^{bc}	17.94 ±0.56^{b}	19.84 ±0.53^{a}	20.63 ±0.41^{a}
TS **(%)**	11.48 ±0.16^{b}	11.76 ±0.09^{a}	11.85 ±0.09^{a}	11.72 ±0.11^{a}	11.75 ±0.10^{a}	11.90 ±0.08^{a}	11.93 ±0.10^{a}
SNF **(%)**	8.71 ±0.56	8.24 ±0.36	8.13 ±0.39	8.30 ±0.41	8.94 ±0.56	8.84 ±0.53	8.63 ±0.41
Lactose (%)	4.47 ±0.06	4.53 ±0.09	4.49 ±0.07	4.66 ±0.06	4.48 ±0.03	4.44 ±0.05	4.29 ±0.06
Ash (%)	0.84 ±0.02	0.82 ±0.03	0.84 ±0.02	0.83 ±0.03	0.84 ±0.03	0.85 ±0.02	0.83 ±0.03

$^{a, b....d}$: Means within the same row with different superscript are significantly differ (P≤0.05).

SNF: Solid not fat. Total solids: TS

Economic efficiency:

From the economic point of view, Table (10) showed that feeding ewes with diet supplemented with both of algae can achieved more cash return compared to the un-supplemented one, being with the highest economic efficiency for ewes fed D7 supplemented with Ulva Lactuca + Pteroclandia capillacea at level of 5 g from each.

Table (10): Economic efficiency of feeding the tested diets to lactating ewes.

Item	Control (D1)	Ulva lactuca		Pteroclandia capillacea		Ulva Lactuca + Pteroclandia capillacea	
		5 g (D2)	10 g (D3)	5 g (D4)	10 g (D5)	2.5 +2.5 g (D6)	5+5 g (D7)
DM intake (g)	1333.1	1411.1	1369.8	1418.9	1430.2	1462.4	1417.6
Cost (LE)	207.87	217.44	222.41	217.75	225.10	219.49	224.54
Milk yield (g)	530.3^{b}	561.7^{a}	579.2^{a}	544.3^{b}	554.6^{ab}	594.1^{a}	605.4^{a}
Milk income (LE)	371.22	393.18	405.43	380.97	387.84	415.84	423.81
Return (LE)	163.35^{d}	175.74^{c}	183.02^{b}	163.22^{d}	162.74^{d}	196.35^{a}	199.27^{a}
Relative economic efficiency	100^{d}	108^{c}	112^{b}	100^{d}	100^{d}	120^{a}	122^{a}

CONCLUSION

In the current study, the results appeared that, algae supplementation enhanced the digestion especially, crude protein and crude fiber of the experimental diets fed to sheep. Also, supplementation with *Ulva lactuca or/and Pteroclandia capillacea* improved milk production and milk composition as milk fat and protein. So, it could be recommended that, diets fed to sheep and lactating ewes can be supplemented with both algae strains (*Ulva Lactuca or/and Pteroclandia Capillacea*) especially, at 5 g, to achieve good economic results.

REFERENCES

Aleem, A.A. (1993). *The marine algae of Alexandria, Egypt*, Ed. University of Alexandria Egypt.139 p.

AOAC (2000). *Association of Official Analytical Chemists*, *Official Methods of Analysis*. 16th Edn., AOAC, Arlington, Virginia, USA.

Bichi, E., Hervás, G., Toral, P.G., Loor, J.J., Frutos, P. (2013). Milk fat depression induced by dietary marine algae in dairy ewes: persistency of milk fatty acid composition and animal performance responses. J. Dairy Sci., 96: 524–532.

Duncan, M. B. (1955). Multiple ranges and multiple F-tests. Biometrics, 11:1-42.

Franklin S.T., K.R. Martin, R.J. Baer, D.J. Schingoethe and A.R. Hippen (1999). Dietary marine algae (Schizochytrium sp.) increases concentrations of conjugated linoleic, docosahexaenoic and transvaccenic acids in milk of dairy cows. In: J. Nutr., 129 (11), 2048–2054.

Gaines, W. L. (1923). Relation between percentage of fat content and yield of milk.1.Correction of milk yield for fat content. Agri. Exo. Sta. 245 (C.F. Gaines, 1928).

Garson, J. (1989). Marine natural products. Nat. Prod. Rep. 6, 143– 170.

Goering, H. K. and P. J. Van Soest (1970). Forage fiber analysis (Apparatus, reagent, procedures and some applications). Agric. Handbook, No. 379, ARS-USDA, Washington, DC.

Johnson, Jr., J.C., G.L. Newton and J.L. Butler (1991). Recycling liquid dairy cattle waste to sustain annual triple crop production of forages. In: Proceedings of the 28th Annual Florida Dairy Production Conference. Dairy Science Department, University of Florida, Gainesville, FL, pp. 41–50.

Khalel, M. S. M. (2013). The kelp (ulva lactuca) as a nutritional supplement for feeding Barki sheep. Egyptian J. Nutrition and Feds, 16(1):27-36.

Ling, E. R. (1963). A text book of dairy chemistry. 3th Ed. Vol. II. Chapman and Hall Ltd. London.

Lowery, J. B., and P. M. Kennedy. (1996). Fermentation of flavonols by rumen organisms. Proc. Aust. Soc. Anim. Prod., 21:366–268.

NRC (1988). National Research Council. Nutrient requirement of sheep (6th Ed.). National academy press, Washington, D.C.

Obara, Y., D. W. Dellow and J. V. Nolan (1991). The influence of energy rich-supplements on nitrogen kinetics in ruminants. Physiological Aspects of Digestion and Metabolism in Ruminants Proceedings of the Seventh International Symposium on Ruminant Physiology. Pages 515–539.

Poppi, D. P. and S. R. McLennan (2010). Nutritional research to meet future challenges. Animal Production Science, 50: 329–338.

Rimber Ir. Indy (2007). Why is seaweed so important? M. Sc. Thesis, Faculty of Fisheries and Marine Sciences, Sam Ratulangi University, Jln. Kampus Bahu, Manado 95115, Indonesia

SAS. (2000). Users Guide: Statistics. Statistics analysis System Institute Inc., Gary. NC.

التقييم الغذائى لاضافة الطحالب وتاثير التغذية على انتاج وتركيب اللبن للنعاج

محمد حلمى محمد ياقوت١ , حسن محمود الجندى٢ , عبد العزيز محمد الحايس٢, عادل فريد ابورواش٢ , ايمن عبد المحسن حسن١ و شيماء محمد الكومى٢

١- قسم المخلفات الزراعية- معهد بحوث الانتاج الحيوانى- الدقى – الجيزة – مصر.

٢- قسم الانتاج الحيوانى- كلية الزراعة- جامعة طنطا- مصر

تم عمل هذه التجربة لتقدير معاملات الهضم وقياسات التخمر بالكرش وانتاج اللبن ومكوناته للنعاج البرقي المغذاه على علائق بدون اضافة (كنترول) أومضاف اليها الطحالب *Ulva lactuca* و*Pterocladia capillacea* بمعدل صفر و ٥ و ١٠ جم/كجم عليقة او مضاف اليها كلا من الطحالب بمعدل ٢.٥ او ٥ جم/ كجم عليقة. وقد اوضحت النتائج ان اضافة الطحالب ادى الى تحسين الهضم معنويا فى الحيوانات التى تم تغذيتها على العلائق التجريبية. حيث كانت معاملات الهضم للبروتين الخام والالياف الخام ومكونات الالياف أعلى معنويا فى العليقة المضاف اليها كلا من الطحلبين بمعدل ٥ جم/ كجم عليقة. كما اظهرت تلك العلائق قيمة غذائية عالية (DCP&TDN) اضافة الى تحسن كبير فى الاستفادة من نيتروجين العليقة و الاستفادة منه مقارنة بالعليقة المقارنة من ناحية و باقى العلائق من ناحية اخرى . ايضا كان اعلى انتاج للبن وكذلك نسبة الدهن والبروتين فى اللبن تم تحقيقها مع نفس العليقة. كانت النسبة المئوية للمكونات الصلبة الكلية للبن تم الحصول عليها بواسطة اضافة كلا من الطحلبين بمعدل ٥ جم/ كجم عليقة بينما اعلى نسبة لمكونات اللبن الدهنية الغير صلبة تم تحقيقها مع اضافة طحلب*Pterocladia capillacea* بمعدل ١٠ جم/ كجم عليقة . اضافة الطحالب لم يكن له تاثير معنوى لنسبة اللاكتوز والمادة المعدنية للبن. النتائج السابقة اوضحت ان اضافة الطحالب *Ulva Lactuca & Pteroclandia* ***Capillacea*** ادى الى تحسين الهضم وانتاج البن ومكوناته كنسبة الدهن والبروتين وخاصة مع اضافة كلا من الطحلبين بمعدل ٥ جم/ كجم عليقة.كما ان الدراسة الاقتصادية اظهرت ارتفاع العائد النقدي للعلائق التى تحتوى على نوعى الطحالب بمعدل اضافة ٢.٥, ٢.٥ او ٥, ٥ جم مقارنة بالمقارنة و باقى العلائق الاخرى لذلك يمكن التوصية باضافة كلا من سلالات الطحلبين بمعدل ٥ جم/كجم عليقة لامكانية تحسين اداء الاغنام والنعاج الحلابة وتحقيق نتائج اقتصادية افضل.