J. Anim. and Poultry Prod., Mansoura Univ., Vol.7 (12): 507- 513 , 2016

Response of Lactating Zaraibi Goats to Diets Containing *Sesbania sesban* Seeds as a New and High Source of Protein.

El-Kholany, M. E. ; G. A. Maged ; M. E. Ahmed ; A. M. Abdel-Gawad ; M. A. Aboul-Omran and A. A. Al-Mowafy.

Animal Production Research Institute, Agriculture Research Center, Dokki, Giza, Egypt.

ABSTRACT

This work was carried out on dairy goats to investigate the effect of partially replacing CFM protein by *Sesbania sesban* seeds on milk production, feed conversion efficiency and some blood constituents as well as economic efficiency. Twenty five dairy goats were divided into 5 groups (5 does each). The control group (G_1) was fed a ration consisting of concentrate feed mixture and corn silage (50:50) according to NRC (1981) recommendation. *Sesbania sesban* seeds (SS) were used to replace 10 and 20% of concentrate's protein for groups G_2 and G_3, respectively. Sesbania seeds were treated (TSS) by soaking and roasting and used at the same levels (10 and 20%) in G_4 and G_5, respectively. The feeding trails lasted for 14 weeks after weaning. The obtained results showed that the daily dry matter intake tended to decrease as a result to substitution of concentrate feed mixture with Sesbania seeds in rations of dairy goats. On the contrary, the daily water consumption as ml/g DM intake was noticeably higher (3.50, 3.64, 3.67 and 3.81) with Sesbania seeds rations (G_2, G_3, G_4 and G_5, respectively) compared with control (G_1, 3.14). The effect of the tested rations on ruminal pH values was not significant. Ruminal NH_3 concentration post-feeding tended to decrease as a result to using of Sesbania seeds especially G_4 and G_5. But, ruminal total VFA's concentrations post-feeding were significantly with G_4 compared with G_1 and G3. Moreover, ruminal microbial protein content at 2 and 4 hrs. post-feeding was significantly affected as a result of using of Sesbania seeds in goats rations and the bestIvalue was recordedIwith G_4.. The obtained results showed that there is significant effects on some blood parameters (hemoglobin, MCHC, lymphocyts, platelets count, globulin and enzymatic activites) due to using the tested rations. Concerning milk production, the obtained data indicated that the highest value of daily milk yield was recorded with G_4 (1.70 kg) followed by G_5 (1.67 kg) then G_2 (1.59 kg) and G_1 (1.56 kg) while the lowest value (1.499 kg) was recorded with G_3 and the differences were significant. The effects of experimental rations on milk constituents were not significant. The feed conversion efficiency, based on DM was better with G_5 (0.904) then G_4 (0.911) followed by G_2 and G_3 (0.971 and 1.009, respectively) and lastly G_1 (1.015). Therefore, the economic efficiency was improved by 9.25, 10.17, 16.31 and 22.81% with Sesbania seeds rations (G_2, G_3, G_4, and G_5, respectively) compared with control (G_1). It is concluded that partial replasment of up to 20% of CFM protein by Sesbania seeds has some positive effects on metabolic parameters, which reflected on the dairy goats performance and economic efficiency.

Keywords : Dairy Zaraibi goats- milk production- feed conversion – blood constituents – economic studies- rumen parameters.

INTRODUCTION

Seeds of the family leguminosae (e.g. pulses, feed legumes, dry beans) are important sources of protein, minerals, vitamins and energy in diets for farm animals (Van der Poel, 1990), *Sesbania sesban* is a legume shrub adapted to summer season and its plants can be successfully cultivated by seeds under irrigation (Abdl-Rahman *et al.* 1995). Many studies (Hossain and Becker, 2001,Hossain *et al*. 2002 and Pugalenthi *et al.* 2004 indicated that the Sesbania seeds contain high level of crude protein (29 to 33% of DM). Thus, legumes such as *Sesbania sesban* seeds constitute an important feed stuff and are an economic source of protein in the diets as reported by Kummar *et al.* (1991) and Pugalenthi *et al.* (2004). In a recent study, El-Kholany *et al.* (2013) studied the effect of feeding Sesbania seeds as a source of protein to partly replace the expensive CP of the concentrate feed mixture on growth performance of Zaraibi kids and they concluded that the Sesbania seeds could by safely, economically and successfully used as a source of feed protein for to replace up to 30% of CFM protein in kids rations since it did not have adverse effect on ruminal fermentation parameters, blood constituents and feeding values of rations compared with control. In another study, Hossain *et al*. (2002) studied the effect of different treatments such as soaking in water for 24h., soaking+ autoclaving at 121^0c for 30 min., autoclaving and dry heating 130^0c for 1 h on solubility and various anti nutrients levels such as total phenols, tannins, phytic acid, saponin and trypsin inhibitor activity in different species of Sesbania seeds (Sesbania aculeate, Sesbania rostorata, Sesbania sesban (accession 10865 D) and s. sesban (accession 15019 D) and the study indicated that the treatments such as soaking autoclaving was the most effective treatment for reducing the ant nutrient levels in different Sesbania seeds.

Therefore, the aim of this work was to evaluate the effect of using Sesbania sesban seeds (treated or untreated) to partially subistute CFM protein in rations of lactating Zaraibi goats on milk production, feed conversion and economic efficiency. Some rumen parameters and blood profile were also stated.

MATERIALS AND METHODS

This study was conducted at the Animal Production Research Station, El-Serw, belonging to Animal Production Research Institute, Agricultural Research Center, Egypt.

Twenty five Zaraibi does in the 2nd, 3rd and 4th lactation seasons were selected from El-Serw Station herd, and weighing on average 35.88 kg. The animals were divided according to their body weight into 5 similar groups (5 each), to study effect of using Sesbania seeds as a source of protein at levels of 0.0 (G_1), 10% (G_2) and 20% (G_3) from CFM protein. Sesbania seeds were treated by soaking and roasting according to Yilkal *et al*., (2014) (soaking in water to 24 hrs. and roasting in oven at $145C^0$ 24 hrs.) and used at the same levels 10 and 20% in G_4 and G_5, respectively. Each group was housed in a semi-roofed yard (4 x3x5 meters). The animals were weighed at the beginning then biweekly. Zaraibi goats were fed for 2 weeks as a transitional period on the experimental rations before the start of the experimental work. Feeding the experimental rations lasted 14 weeks after weaning. The nutrients requirements were calculated according to NRC (1981) of dairy goats. The amount of concentrate feed mixture

and corn silage were offered at 50:50 ratio as reported by Ahmed and El-Kholany (2012) on dairy goats. Animals were fed the assigned ingredients as mixed rations. The used concentrate feed mixture (CFM) contained: undecorticated cotton seed meal (25%), yellow corn (43%), wheat bran (25%), molasses (3.5%), limestone (2%), common salt (1%) and minerals mixture (0,5%). The chemical composition of the tested ingredients was determined (Table 1), Water was available at all times and drinked water was measured for each group (ml/day). Diets were offered twice daily at 8.0 am and 3.0 and pm any refused amounts were daily recorded. Proximate chemical analysis of the feeds was carried out according to A.O.A.C (1995).

Rumen fluid samples were taken from 3 animals of each experimental group using stomach tube before feeding (0 time) and at 2, 4 and 6 hrs post –feeding at the end of feeding trails. The samples were filtered through 3 layers of gauze and pH was immediately determined by pH meter. Ammonia nitrogen (NH_3-N) concentration was measured according to the method of Conway (1957). Microbial protein was determined according to Schultz and Schultz (1970), whereas total volatile fatty acids (VFAs) were determined according to the technique described by Warner (1964).

Milk yield was collected daily for each doe by hand milking twice daily. Representative milk samples (about 0.5% of total milk produced) were taken biweekly for each doe, at both milking. Composite samples were analyzed for contents of total solid (TS) and protein according to Ling procedures (1963).Fat content was determined by using lacto scan made in Bulgaria. Lactose was determined according to Parnett and Abd El-Tawab (1957). Ash content was determined as reported in A.O.A.C. (1984).

Blood samples were collected from the jugular vein once before feeding (3 animals in each) at the end of experimental period. Blood samples were centrifuged at 4000 rpm for 20 min. Part of the separated serum was directed to enzyme activity determination, while the other part was stored frozen at -200C till the biochemical analysis. Commercial kits were used for colorimetric biochemical determination.

Data were statistically analyzed by one way analysis of variance using SAS (2003) programme. The significant differences among means were assigned according to Duncan (1955).

RESULTS AND DISCUSSION

Chemical composition of *Sesbania sesban* seeds:

The chemical composition of feed ingredients in Table1 indicated that Sesbania sesban seeds (SS) contained 92.9% DM, 30.65% CP, 7.50% CF, 5.41% EE, 52.79% NFE and 3.65% ash. Similar results were observed with treated Sesbania seeds (TSS) as shown in Table1. The chemical composition obtained in this study is nearly similar to that obtained by Pugalenthi *et al.*, (2004) and Hossain and Becker(2001) with different Sesbania seeds. In a recent study, El-Kholany *et al.* (2013) reported that *Sesbania sesban* seeds contained 31.19% CP, 5.30% EE, 52.63% NFE, 7.31% CF and 3.57% ash on DM basis. In the same year, Arekemase *et al* (2013) stated that Sesbania seeds were rich in all the essential nutrients such as protein, energy, minerals and vitamins. It is worth noting that Sesbania seeds contain almost double CP content than that of CFM and nearly 3 folds of CS. The reverse was true for CF contents.

Table 1. Chemical analysis of feed ingredients.

Items	DM	Composition, % DM basis					
		OM	CP	CF	EE	NFE	ASH
Concentrate feed mixture, CFM	91.05	93.95	15.00	15.93	3.35	59.67	6.05
Sesbania sesban seeds, SS	92.9	96.35	30.65	7.50	5.41	52.79	3.65
Treated Sesbania sesban seeds, TSS	93.15	96.71	31.17	7.25	5.29	53.0	3.29
Corn silage, CS	35.00	91.71	9.00	29.50	3.21	50.00	8.29
Experimental rations :							
50% CFM + 50% corn silage (G1)	63.27	92.84	12.03	21.63	3.28	55.90	7.16
46% CFM + 51% corn silage +3% SS (G2)	62.42	92.87	12.33	22.54	3.34	54.66	7.13
42% CFM + 52% corn silage + 6% SS (G3)	61.57	92.90	12.66	22.60	3.38	54.26	7.10
46% CFM + 51% corn silage + 3%SS (G4)	62.54	92.88	12.34	22.63	3.33	54.58	7.12
42% CFM + 52% corn silage + 6% SS (G5)	61.76	92.73	12.68	22.60	3.37	54.08	7.27

Feed intake:

The daily feed intake of lactating Zaraibi goats during mid-lactation are presented in Table 2. The total DM intake as g/kg $w^{0.75}$ tended to decrease (109.2, 105.5 and 104.6) with increasing level of *Sesbania sesban* seeds (0, 10 and 20%) in goats rations (G_1, G_2 G_3, respectively). The same trend was observed with treated Sesbania seeds (TSS) in G_4 and G_5 (104.6 and 102.2 g/kg $w^{0.75}$, respectively). The corresponding values of feed intake as % BW were 4.47, 4.30, 4.29, 4.26 and 4.17 for G_1, G_2, G_3, G_4 and G_5, respectively. The clear decrease in DM intake as g/h, g/kg$w^{0.75}$, and %BW with increasing level of *Sesbania sesban* even after being treated might indicate that some anti-nutritional factors remained in the seeds. The same trend was observed also by El-Kholany *et al.* (2013) with using of Sesbania sesban seeds in rations of growing Zaraibi kids. On the other hand, the obtained values of dry matter intake are within the normal range given by Ahmed and El-Kholany (2012) with lactating Zaraibi goats during the early-lactation period (ranged from 102 to 107 when related to metabolic body size or from 4.01 to 4.13% of BW).

Water consumption:

The average daily water consumption of lactating goats fed the tested experimental rations is summarized in Table 3. The daily water consumption was noticeably affected as a result to using of Sesbania seeds in both untreated (G_2 and G_3) and treated (G_4 and G_5). The highest value of water consumption as L/head, ml/kg $w^{0.82}$ and ml/g DM intake was recorded with G_5 (5.75,

303 and 3.81, respectively) then G_4 (5.69, 299 and 3.67, respectively) whereas the lowest value (4.99, 267 and 3.14, respectively) was detected with control group (G_1). Thus, the water consumption was higher with increasing level of Sesbania seeds in rations of lactating Zaraibi does especially in both two TSS groups (G_4 and G_5). This result indicates a direct relationship between voluntary water and milk yield in dairy goats as reported by Ahmed *et al.* (2001) and El-Kholany (2004) with using of (Kochia and Sesbania) in dairy goats rations. In this respect, El-Kholany *et al.* (2013) found that the values of water consumption as ml/ g DM intake was higher (3.11, 3.21, 3.34 and 3.36) with increasing level of Sesbania seeds in goats rations (0, 10, 20 and 30%, respectively).

Table 2. Average daily feed intake* by Zaraibi goats fed the experimental rations.

Items	Groups				
	G_1	G_2	G_3	G_4	G_5
Daily feed intake, g DM /h :					
Concentrate feed mixture	801	721	641	721	641
Sesbania Seeds	0.00	39	78	38.5	77
Corn Silage	787	791	793	789	792
Total DM intake	1588	1551	1512	1548.5	1510
DM intake, %BW	4.47	4.30	4.29	4.26	4.17
DM intake, g/kg $^{0.75}$	109.2	105.3	104.6	104.6	102.2
Roughage : concentrate (R/C) ratio	50:50	51:49	52:48	51:49	52:48

***Group feeding**

Table 3. Daily water consumption* by lactating Zaraibi does as affected by experimental treatments.

Items	Groups				
	G_1	G_2	G_3	G_4	G_5
Daily water consumption :					
L/head / day	4.99	5.43	5.51	5.69	5.75
ml/kg BW	141	150	156	157	159
ml/kg $W^{0.75}$	343	367	381	384	389
ml/kg $W^{0.82}$	267	287	297	299	303
ml/g DM intake	3.14	3.50	3.64	3.67	3.81

***Group feeding**

Generally, the values of daily water consumption in this study are nearly similar to those obtained by Ahmed and El-Kholany (2012) on lactating Zaraibi goats (ranged from 140 to 166 % BW, from 372 to 441 ml/kg$w^{0.75}$ and from 3.85 to 4.81 ml/ g DM intake).

Ruminal fluid parameters:

Rumen fluid parameters as affects by dietary treatments are presented in Table 4 and 5. The minimum pH values and the maximum NH3-N values were recorded 4hrs post-feeding as shown in Table (4). The same trend was obtained by Ahmed *et al*. (2001) and El-Emam *et al*. (2014), but, the effect of the tested experimental rations on both pH values and ammonia-N concentrations were not significant within each sampling time. However, ruminal NH3-N concentration post-feeding tended to decrease as result to using of Sesbania seeds especially G4 (21.13, 22. and 20.40 mg/100ml during 2, 4 and 6 hrs. , respectively). Moreover, the effect of using Sesbania seeds on ruminal total volatile fatty acids (VFA's) post-feeding were significant as shown in Table4. In the sametime, rumen total VFA's concentrations during the all hours post-feeding (2, 4 and 6hrs.) were the highest with G4 (11.23, 12.0 and 11.30 mEq/100ml, respectively) while the lowest values were detected with G3 (10.50, 11.03 and 10.50 mEq/100ml, respectively) and the differences were significant among intervals of sampling. Similarly, ruminal microbial protein was not significant different among five treatments at zero time and was significantly ($p < 0.05$) higher with G4 then G3 at 2 and 4 hrs. Post-feeding. The obtained data indicated also that the highest values of microbial protein (0.350, 0.587, 0.593 and 0.493 g/100ml) and lowest values of ruminal NH3-N (17.07, 21.13, 22.0 and 20.40 mg/100ml) were recorded with G4 at all hours (0, 2, 4 and 6 hrs. respectively). The present findings are in agreement with those reported by El-Kholany *et al*. (2013). Who observed also some noticeable and positive effects in ruminal protein, total VFA's concentrations and proportions of individual VFA's% as a result to using of Sesbania sesban seeds in rations of growing kids, whereas the differences in both ruminal pH value and NH3-N concentration were fewer values.

Table 4. Effect of experimental rations on rumen fermentation parameters of dairy Zaraibi goats

tems	Hours	Groups				
		G_1	G_2	G_3	G_4	G_5
pH values	0	7.13±0.03	7.15±0.03	7.10±0.07	7.07±0.00	7.08±0.11
	2	6.72±0.04	6.70±0.06	6.78±0.05	6.68±0.03	6.70±0.06
	4	6.57±0.06	6.55±0.07	6.60±0.05	6.50±0.07	6.53±0.04
	6	6.68±0.04	6.70±0.06	6.72±0.06	6.61±0.05	6.65±0.08
NH_3-N (mg / 100 ml)	0	18.33±0.36	19.03±0.34	17.93±0.28	17.07±0.29	18.40±0.31
	2	21.60±0.17	22.27±0.45	22.33±0.42	21.13±0.35	21.30±0.44
	4	22.47±0.47	23.00±0.40	23.40±0.41	22.00±0.20.	22. 33±0.53
	6	20.73±0.47	21.47±0.44	21.73±0.47	20.40±0.41	20.60±0.45
Total VFA's (m Eq /100ml)	0	9.10±0.28	9.07±0.25	8.90±0.27	9.13±0.29	9.10±0.28
	2	10.67±0.16^{b}	10.73±0.17^{b}	10.50±0.15^{b}	11.23±0.19^{a}	10.87±0.17^{ab}
	4	11.23±0.17^{c}	11.37±0.19^{c}	11.03±0.03^{c}	12.00±0.12^{ab}	11.63±0.10^{bc}
	6	11.00±0.01^{b}	11.03±0.02^{b}	10.50±0.09^{c}	11.30±0.14^{a}	11.10±0.12^{ab}
Microbial protein(g / 100 ml)	0	0.343±0.01	0.330±0.001	0.323±0.007	0.350±0.300	0.330±0.010
	2	0.560±0.009^{bc}	0.567±0.007^{bc}	0.540±0.010^{c}	0.587±0.007^{a}	0.570±0.007^{ab}
	4	0.567±0.10^{bc}	0.570±0.007^{bc}	0.533±0.007^{c}	0.593±0.009^{a}	0.577±0.009^{ab}
	6	0.453±0.007	0.460±0.008	0.440±0.010	0.493±0.009	0.473±0009

Means in the same row with different superscripts differ significantly at P<0.05.

Blood profile:

Data of hematological parameters of lactating Zaraibi does fed different experimental rations during mid-lactation period are presents in Table 5. The obtained data indicated that most hematological parameters were not markedly affect by the tested experimental rations. But, the effect of using Sesbania seeds on both hemoglobin (Hb) and mean cell hemoglobin concentration (MCHC) were significant. Moreover, the highest values of lymphocytes and platelets counts were recorded with G4 (54.85, 427, respectively) whereas the lowest values were detected with control group (49.9 and 385, respectively) and the differences were significant. In the sametime, the values of MCV and MCH were also higher with G4 (22.85 and 8.81, respectively) than other groups but without significance differences. Similar results were observed by El-Kholany *et al*. (2013) with using Sesbania sesban seeds (at levels 10, 20 and 30%) in kids rations.

Data of biochemical parameters of dairy Zaraibi goats fed tested experimental rations are presented in Table 6. Values of some serum blood parameters explained that there were no significant differences among the five rations for glucose, albumin, creatinine, urea, triglyceride, cholesterol, calcium, phosphorus and manganese, while serum total protein of control group was significantly decrease than G4 and G5. In the same line, the highest value of globulin was recorded with G4 (3.53) then G5 (3.45) followed by G2 and G3 (3.41 and 3.31, respectively) and the lowest value (3.12) was detected with G1 (control group) and the difference were significant. The obtained results indicated also that activities of serum AST and ALT decreased with using Sesbania sesban in goats rations and the significant effect was clear in G4 and G5 (TSS) only. The obtained values are within the normal range reported by Jain (1986) (for hematological parameters) and Kaneko (1989) (for biochemical parameters) for healthy goats and in line with the finding of El-Kholany *et al*. (2013) when they used Sesbania seeds in kids ration.

Table 5. Effect of experimental treatments on blood hematological parameters of lactating Zaraibi goats

Items	Groups				
	G_1	G_2	G_3	G_4	G_5
Hemoglobin (Hb), g/dl	10.80±0.19^{b}	11.50±0.21^{ab}	11.03±0.19^{b}	11.85±0.20^{a}	11.65±0.10^{ab}
Red blood cell (RBC's) x10^6/ ul	12.50±0.13	12.70±0.13	12.35±0.25	13.05±0.30	12.87±0.19
Hematocrit (Hct), %	34.20±0.63	33.51±0.55	35.05±0.49	33.10±0.71	34.07±0.63
Cell hemoglobin conc.(MCHC), %	31.60±0.51^{b}	34.27±0.47^{ab}	31.40±0.35^{b}	35.80±0.63^{a}	34.20±0.38^{ab}
Cell value (MCV), fl	21.15±0.22	22.0±0.40	21.30±0.75	22.85±0.80	22.43±0.51
Cell hemoglobin (MCH),pg	8.05±0.30	8.21±1.05	7.93±0.83	8.81±0.61	8.45±0.29
T. Leucocytic count, x10^3/ul	13.55±0.55	13.41±0.79	13.81±0.43	12.50±0.95	13.20±0.79
Neutrophils, %	45.5±1.31	41.89±1.15	43.65±0.95	41.30±0.79	42.03±1.11
Lymphocytes,%	49.9±0.89^{b}	53.70±1.23^{a}	51.89±0.93^{ab}	54.85± 1.21^{a}	54.15±0.73^{a}
Monocytes,%	2.85±0.43	2.73±0.23	2.51±0.29	2.29±0.33	2.52±0.21
Eosinophil's, %	1.75±0.33	1.68±0.33	1.95±0.33	1.56±0.33	1.30±0.33
Platelets count, x10^3/ul	385± 11.8^{b}	413±15.7^{ab}	397±19.3^{ab}	427±9.9^{a}	415±10.7^{ab}

Means in the same row with different superscripts differ significantly at P<0.05.

Table 6. Effect of experimental treatments on serum biochemical parameters of lactating Zaraibi goats.

Items	Groups				
	G_1	G_2	G_3	G_4	G_5
Glucose, mg/dl	59.40±1.0	61.26±1.25	60.03±1.18	62.71±1.31	63.09±0.95
Total protein, g/dl	6.70±0.31^{b}	6.90±0.25^{ab}	6.89±0.31^{ab}	7.33±0.19^{a}	7.15±0.45^{a}
Albumin, g/dl	3.58±0.25	3.50±0.13	3.56±0.21	3.80±0.13	3.71±0.10
Globulin, g/dl	3.12±0.09^{b}	3.41±0.08^{a}	3.31±0.05^{ab}	3.53±0.11^{a}	3.45±0.09^{a}
Creatinine, mg/dl	0.99±0.07	0.95±0.09	0.97±0.08	0.87±0.05	0.91±0.03
Urea, mg/dl	55.30±1.25	53.90±1.22	54.70±1.50	52.35±1.15	53.05±2.15
Triglyceride, ml/dl	62.25±2.08	59.85±1.15	63.05±1.63	59.03±1.20	61.05±1.17
Cholesterol, mg/dl	53.96±1.91	52.13±1.17	55.21±1.51	51.59±1.35	52.01±1.22
AST, ul	94.61±2.11^{b}	89.15±1.61^{ab}	90.07±1.85^{ab}	87.21±2.07^{a}	86.90±1.75^{a}
ALT, ul	22.95±1.05^{a}	21.15±0.71.^{ab}	22.03±0.87^{ab}	20.25±0.65^{b}	20.50±1.0^{b}
Calcium, mg/dl	10.58±0.47	10.81±0.51	10.60±0.49	10.75±0.61	10.67±0.55
Phosphorus (inorganic) mg/dl	5.40±0.20	5.55±0.13	5.29±0.21	5.45±0.17	5.35±0.09
Manganese, mg/dl	2.81±0.17	2.85±0.11	2.70±0.13	2.91±0.07	2.75±0.08

Means in the same row with different superscripts differ significantly at P<0.05.

Milk yield and its composition:

Data presented in Table7 show average daily milk yield and its composition for the five treatments. The differences in daily milk yield were significant ($p < 0.05$) among the tested experimental rations. The average milk yield had the highest values with G4 (1.70 kg/h /d) followed by G5 (1.670kg/h/d) then G2 (1.598 kg/h/d) and the lowest value (1.499 kg/h/d) was recorded with G3. This positive effect of treatment by Sesbania seeds especially in G4 and G5 (TSS) on milk yield by Zaraibi goats was observed also in yields of fat and protein as shown in Table 7. These results were related to the metabolic parameters (rumen and blood) as reported earlier.

As regard to milk composition (Table 7), the obtained results indicated that the effect of tested experimental rations on milk composition as fat, protein, total solids, solids non fat (SNF), lactose and ash fluctuated. However, the differences of milk content among the five groups were not significant (P< 0.05) and the obtained values of milk constituents were within the normal range given by Ahmed (1999), El-Kholany (2004), Shehata *et al*. (2006) and Ahmed *et al*. (2013) for goats milk

Table 7. Effect of experimental rations on average milk yield, its composition and yield of fat and protein of lactating Zaraibi goats.

Items	Groups				
	G1	G2	G3	G4	G5
Average milk yield, kg/h/d	1.564±0.03^{ab}	1.598±0.05^{ab}	1.499±0.07^{b}	1.700±0.02^{a}	1.670±0.02^{ab}
Milk composition :					
Fat, %	3.78±0.09	3.66±0.04	3.80±0.08	3.60±0.07	3.62±0.07
Protein, %	2.88±0.03	2.90±0.03	2.91±0.03	2.87±0.04	2.86±0.04
Lactose, %	4.66±0.04	4.67±0.04	4.70±0.03	4.64±0.03	4.62±0.03
Total solids, %	12.04±0.09	11.94±0.07	12.14±0.09	11.81±0.05	11.81±0.05
Solids non fat, (SNF), %	8.26±0.06	8.28±0.08	8.34±0.07	8.21±0.04	8.20±0.04
Ash, %	0.72±0.005	0.71±0.003	0.73±0.005	0.70±0.003	0.71±0.003
Average fat yield, g/h/d	591±24.20	584±25.16	565±21.12	612±12.21	604±15.30
Average protein yield, g/h/d	450±13.82^{b}	463±12.20^{bc}	433±11.30^{b}	487±28.06^{ac}	477±27.35^{bc}

Means in the same row with different superscripts differ significantly at P<0.05.

Feed conversion:

The feed conversion efficiency based on dry matter and crude protein intake by lactating Zaraibi goats are summarized in Table 8. The obtained results indicated that feed conversion calculated as dry matter intake/ milk yield was better with G_5 (0.904) then G_4 (0.911) followed by G_2 and G_3 (0.971 and 1.009, respectively) and lastly G_1 (1.015). Similarly, the values of feed conversion based on crude protein were better with two TSS groups (G_4 and G_5) compared with other groups as shown in Table 8. In this respect, El-Kholany *et al*. (2013) stated the effect of using Sesbania seeds at levels 0, 10, 20 and 30% in goats rations (G_1, G_2, G_3, and G_4, respectively) during growing period and found that the values of feed conversion expressed as TDN intake/ kg gain was better in kids received SS diets (5.81, 5.77 and 5.82 for G_2, G_3 and G_4, respectively) compared with control (G_1, 5.97). The same trend was noticed also when efficiency of conversion was based on DM and DCP. However, the obtained values of feed conversion are within the normal range given by Shehata *et al.* (2006), Ahmed *et al.* 2013 and Ayyad *et al.* 2014 for dairy Zaraibi goats. In a recent study, El-Emam *et al.* (2014) found that the values of feed conversion (based on DM) ranged from 0.901 to 1.01 vs. from 0.123 to 0.145 when efficiency of conversion was based on CP.

Table 8. Feed utilization efficiency by lactating Zaraibi does as affected by the experimental rations.

Items	Groups				
	G_1	G_2	G_3	G_4	G_5
No. of does	5	5	5	5	5
Average body weight, kg:	35.50	36.10	35.21	36.35	36.23
Metabolic body size, $w^{0.75}$	14.54	14.73	14.45	14.80	14.77
Daily DM intake *during the experimental periods, g/h :					
Concentrate feed mixture	801	721	641	721	641
Sesbania sesban	0.00-	39	78	38.5	77
Silage	787	791	793	789	792
Total DM intake, g/h/d	1588	1551	1512	1548.5	1510
CP intake, g/hd	191.0	191.3	191.4	191.2	191.4
Daily milk yield, g/h	1564	1598	1499	1700	1670
Feed utilization efficiency :					
Kg DM / Kg milk	1.015	0.971	1.009	0.911	0.904
Kg CP / Kg milk	0.122	0.120	0.128	0.112	0.115

***Group feeding**

Economic efficiency:

Data in Table 9 indicated that the highest total feed cost (LE/h) along the feeding period was observed for G_1 (3.314) compared with other groups (3.099, 2.882, 3.096 and 2.880 for G_2, G_3, G_4 and G_5, respectively). The corresponding values of price of milk yield were 4.692, 4.794, 4.497, 5.100 and 5.010 LE /h for G_1, G_2, G_3, G_4 and G_5, respectively). Therefore, the highest total feed cost/ kg milk (LE) was observed for G_1 (2.119) while the intermediate values were recorded for G_2 and G_3 (1.939 and 1.923, respectively) and the lowest values were for G_4 and G_5 (1.821 and 1.725, respectively), due to the highest daily milk yield as well as the lowest price of feed consumption in the two groups ($G_4$and G_5). Economic efficiency values revealed that G_5 had the highest economic feed efficiency, followed by G_4 then G_3 and G_2 and lastly G_1. Thus, the economic return was clearly increased (9.25, 10.17,

16.31 and 22.81%) with Sesbania seeds rations (G_2, G_3, G_4 and G_5, respectively) compared with control (G_1). This positive effect of Sesbania seeds (SS) on economic efficiency was observed by El-Kholany *et al.* (2013). They found that the economic efficiency was improved by about 9.0, 12.0 and 17.0 % as a result to using of SS at level 10, 20 and 30%, respectively in diets of growing male Zaraibi goats (kids).

Table 9. The effect of using Sesbania sesban seeds in dairy goats rations on economic efficiency.

Items	Groups				
	G1	G2	G3	G4	G5
Daily feed intake (g/h) as fed :					
Concentrate feed mixture	880	792	704	792	704
Sesbania sesban seeds	---	42.0	84.0	41.3	82.7
Corn silage	2249	2260	2266	2254	2263
Cost of consumed feed, LE/h	3.314	3.099	2.882	3.096	2.880
Price of milk yield, LE/h	4.692	4.794	4.497	5.100	5.010
Feed cost/kg milk, LE	2.119	1.939	1.923	1.821	1.725
Economic efficiency, %	1.42	1.55	1.55	1.65	1.74

CONCLUSION

It is concluded that the using Sesbania seeds to partially substitute CFM protein in rations of lactating goats had positive effects on metabolism, blood picture and globulin with clear decrease in enzymatic activities (AST, ALT), that was reflected on the dairy goats performance and health which lead to improving the milk production and feed conversion rate to milk. So, the use of Sesbania seeds to replace up to 20% of CFM has a great effect on the economics of milk production of dairy goats.

REFERENCES

A.O.A.C. (1984). Association of official analytical chemists METHODS OF Analysis 14th Ed., Washington, DC.

A. O. A. C. (1995). Official Methods of Analysis. (16th) Edt. Association Analytical Chemists, Washington, D.C., USA. Abdl-Rahman, K. M., A. A. Kandil, S. El-Kasshab and S. Al-Deeb (1995). Chemical and nutritional studies on some forage shrubs adapted in arid region. J. Agric. Mansoura Univ., 20 (8) : 3669-3645.

Ahmed, M.E. (1999). Improving feed conversion efficiency during reproductive-stress. Ph. D. Thesis, Fac. Agric. Mansoura Univ.

Ahmed, M. E.; A.M. Abdelhamid, F.F. AbouAmou, E.S. Soliman, N.M. El-Kholy and E.I. Shehata (2001).Response of milk production of Zaraibi goats to feeding silage containing different levels of teosinte and kochia.Egyptian J. Nutrition and Feeds, 4 (Special Issue):141.

Ahmed, M. E. and M.E. El-Kholany (2012). Productive performance, some rumen parameters and blood profile of Zaraibi goats fed rations supplemented with chufa tubers during late pregnancy and suckling periods. J. Animal and Poultry Prod., Mansoura Univ., 3 (12): 537 - 555 .

Ahmed M.E., E.I. Shehata, M. E. El-Kholany, G.I. El-Emam, E.I. Khalifa and H. Bahery (2013).Productive performance of Zaraibi goats fed berseem and/or triticale silage. The 4thScientific Conference of Animal Production Research Institute, 184:192.

Abdl-Rahman, K.M., Kandil, S. El-Kashab and S. Al-Deeb (1995). Chemical and nutritional studies on some forage shrubs adapted in arid region. J. Agric. Mansoura Univ., 20 (8): 3669-3675.

Arekemase S. O., I. Abdulwaliyu, M. A. Dakare, S. Bala, A. S. Ibraheem and O. L. Nkeonye. (2013). Quantitative evaluation of the nutritional constituents of Sesbania sesban seeds and pods. International Journal of Modern Plant & Animal Sciences, 1(1): 16-27

Ayyad, K. M., W.M.A. Sadek, G.A. Maged, E.I. Shehata and M.E. Ahmed (2014). Impact of feeding microbial additives on production and hygienic quality in milk of Zaraibi does. 12th Conf. Agric. Dev. Res., Fac. Agric. Ain Shams Univ. Cairo, Egypt.

Conway, E.F.(1957). Micro diffusion Analysis and Volumetric Error. Rev. Ed. Lock Wood, London.

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

El-Emam G. I., Y.H. Hafez, H. Bahery, E.I. Khalifa, E. I. Shehata and M. E. Ahmed (2014). Growth performance and some rumen and blood parameters of growing Rahmani lambs fed diets containing Triticale and berseem silages and their mixture. Egyptian J. Sheep and Goat Sci., 9(1) :67-76.

El-Kholany, M. M (2004).Evaluation of some new green fodder for Farm animals.Ph.D. Thesis Fac. of Agric, Mansoura Univ.

El-Kholany, M. E., E. S. Soliman, F. A. El-Sayed, and M. E. Ahmed (2013) Growth performance, some rumen parameters and blood profile of male Zaraibi goats fed diets containing Sesbania sesban seeds as a new source of protein. . Animal and Poultry Prod., Mansoura Univ., 4 (12):747-759.

Hossain M. A. and Becker K. (2001).Nutritive value and nutritive factors in different verities of Sesbania seeds and their morphological factors. Food Chem., 73: 421-431.

Hossain MA, Focken U, Becker K (2002) Nutritional evaluation of dhaincha (Sesbania aculeata) seeds as dietary protein source for tilapia Oreochromisniloticus. Aquacult Res 33(9):653-662

Jain, N. C.(1986). Veterinary Hematology 4 th Ed., Lea. and Febiger. Philadelphia.

Kaneko, J. J. (1989). Clinical Biochemistry of Animals.4thEd., Academic Press, Inc. USA

Kummar, s. Singh, G. K., Kummar, R. Bahatia. N. K. and Awasthi, C.P. (1991) Variation in quality triets of pigon pea cajanuscagan L. M., (SP) varieties. J. of Feed Sci. Techn., 28: 173-174.

Ling, E.R. (1963). A Text Book of Dairy Chemistry.3rd Ed. Chapman and Hall Ltd., London.

NRC (1981).Nutrient Requirements of Domestic Animals. Nutrient Requirements of Goats.National Research Council, Washington, D.C. USA, of Official Analytical Chemists, Washington, D.C., USA.

Parnett, A.J.G. and G. Abd El-Tawab.(1957). Determination of lactose in milk and cheese.J.Sci Food Agric., 8: 437 – 441.

Pugalenthi, M. V. Vadivel, P. Gurumoorthi and K. Janardhanan (2004).Comparative nutritional evaluation of little known legumes, Tamarindusindica, Erythrimaindica and Sesbania bispinosa.Tropical and Sub Tropical Agroecosytems. (4) : 107-123.

SAS (2003).SAS. ISTATR User Guid: Statistics. Ver. 9.1; Fourt "Edition SAS Institute Inc; Cary; Nc. USA.

Schultz, T.A. and E. Schultz (1970).Estimation of rumen microbial nitrogen by three analytical methods. J. Dairy Sci., 53: 781.

Shehata, E.I., M.E. Ahmed, Faten. F. AbouAmmou, A.A. M. Soliman, K.M. Aiad and A.M. Abdel-Gawad (2006).Comparison of feeding reed as hay or silage with feeding berseem hay or Maize silage to dairy Zaraibi goats. Egyptian Sheep Goats and Desert Animals Sci., 1(1): 233-247.

Van der Poel, A. F. B., (1990). Effect of processing on anti nutritional factors and protein nutritional value of dry beans (*Phaseolusvulgares* L.). A review Anim. Feed Sci. Techn.29, 179- 208.

Warner, A.C.I. (1964). Production of volatile fatty acids in the rumen, methods of measurements. Nutr.Abst.& Rev., 34: 339.

Yilkal T., M. Yuseph and T. Firew (2014) Suplemintation with different forms of processed lupin (Lupinusalbus) grain in hay based feeding of washera sheep: Effect on feed intake, dogestabilty body weight and carcass parameters. Journal of Biology, Agric. and Healthcare. 4, 27 .

مدي استجابة الماعز الزرايبي الحلاب للعلائق التي تحتوي بذور السيسبان كمصدر جديد ومرتفع في نسبة البروتين.

محمد التابعي الخولاني ، جمال عبد المعطي ماجد ، محمد إبراهيم احمد ، عبد الجواد مجاهد عبد الجواد ، ماجد احمد ابو العمران و ايمن عبده الموافي.

معهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية- دقي – جيزة.

اجري هذا البحث علي الماعز الزرايبي الحلاب لاختبار تأثير استخدام بذور السيسبان لتحل جزئيا محل بروتين العلف المركز علي انتاج اللبن وتركيبة وكفاءة التحويل الغذائي وصورة الدم واقتصاديات انتاج اللبن في اناث الماعز الزرايبي. حيث وزعت ٢٥ عنزة حلابة عشوائيا في ٥ مجموعات متساوية في العدد (٥ حيوانات في كل مجموعة)، غذيت المجموعة الاولي (مج١) وهي مجموعة المقارنة علي العلف المصنع وسيلاج الاذرة بالكيزان (بنسبة ٥٠:٥٠ للمادة الخشنة الي المركزة) طبقا لمقررات NRC لسنة ١٩٨١، وتم استخدام بذور السيسبان لتحل محل ١٠، ٢٠% من بروتين العلف المصنع للمجموعتين الثانية والثالثة (مج٢، مج٣ علي التوالي)، وقد استخدمت أيضا بذور السيسبان مرة اخري بعد معاملتها بالنقع والتحميص لتحل محل ١٠، ٢٠% أيضا من بروتين العلف المصنع في المجموعتين الرابعة والخامسة (مج٤، ومج٥ علي التوالي) ، واستمرت فترة التجربة لمدة ١٤ اسبوع بعد الفطام، وكانت أهم النتائج المتحصل عليها كالتالي : - حدث انخفاض تدريجي للمأكول من المادة الجافة نتيجة لاستبدال بذور السيسبان محل العلف المصنع، وفي المقابل حدث ارتفاع ملحوظ في استهلاك الماء (٣.٥٠، ٣.٦٤، ٣.٦٧ ، ٣.٨١ مل/ جم مادة جافة) مع علائق السيسبان علي التوالي بالمقارنة بمجموعة المقارنة (٣.١٤ مل / جم مادة جافة). - بالنسبة لقياسات سائل الكرش، فلم يحدث تأثيرات ملحوظة علي حموضة سائل الكرش وكذلك الأمونيا أثناء ساعات أخذ العينة وإن كان هناك انخفاض لأمونيا سائل الكرش بعد الأكل كنتيجة لاستخدام بذور السيسبان خاصة المعاملة (مج٤، مج٥)، في نفس الوقت حدث ارتفاع معنوي للأحماض الدهنية الطيارة بعد الأكل مع مج٤ مقارنة مع مج١، مج٣، أيضا حدث تأثير معنوي للعلائق المختبرة علي البروتين الميكروبي عند الساعة ٢، ٤ بعد الأكل وكانت القيمة الأفضل مع مج٤ أيضا وقد أظهرت النتائج أيضا أن بعض قياسات صورة الدم (مثل الهيموجلوبين- متوسط تركيز هيموجلوبين الخلية- ليمفوسيت- الصفائح الدموية- والجلوبيولين- نشاط الإنزيمات قد تأثرت معنويا كنتيجة لاستخدام العلائق المختبرة.- أما فيما يتعلق بإنتاج اللبن اليومي فقد سجلت النتائج أن أعلي إنتاج كان مع مج٤ (١.٧٠٠كجم) ثم مج٥ (١.٦٧٠ كجم) ؛ مج٢ (١.٥٩٨ كجم)، مج١ (١.٥٦٤ كجم) في حين سجلت أقل قيمة مع مج٣ (١.٤٩٩ كجم) والاختلافات كانت معنوية بين العلائق في حين لم تتأثر مكونات اللبن بالعلائق المختبرة. - وقد أظهرت النتائج أيضا بالنسبة لكفاءة التحويل الغذائي محسوبة علي أساس المادة الجافة أن مج٥ (٠.٩٠٤) هي الأفضل ثم تلتها مج٤ (٠.٩١١) ثم مج٢، ومج٣ (٠.٩٧١، ١.٠٠٩ علي التوالي) وأخيرا كانت القيمة الأقل (١.٠١٥) مع مجموعة المقارنة (مج١)، و كانت الكفاءة الاقتصادية نفس الاتجاه حيث أظهرت تحسنا ملحوظا بنسبة ٩.٢٥، ١٠.١٧، ١٦.٣١، ٢٢.٨١% مع علائق السيسبان الأربعة (مج٢، مج٣ ، مج٤، مج٥ علي التوالي) مقارنة بمجموعة المقارنة (مج١). وعلية يتضح من هذه الدراسة أن استخدام بذور السيسبان بالنسبة المذكورة لتحل محل ١٠, ٢٠ % من البروتين في علائق الماعز الحلاب كان لها بعض التأثيرات الايجابية علي ميتابوليزم الحيوان وصورة الدم والجلوبيولين مع انخفاض ملحوظ في نشاط الإنزيمات وقد انعكس ذلك علي أداء وصحة الماعز الحلاب فحدث تحسن في إنتاج اللبن وكفاءة تحويل الغذاء إلي لبن، وكان ذلك له مردود جيد علي اقتصاديات إنتاج اللبن من الماعز.