

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 (G₁) 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 G₂ and G₃, respectively. Sesbania seeds were treated (TSS) by soaking and roasting and used at the same levels (10 and 20%) in G₄ and G₅, 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 (G₂, G₃, G₄ and G₅, respectively) compared with control (G₁, 3.14). The effect of the tested rations on ruminal pH values was not significant. Ruminal NH₃ concentration post-feeding tended to decrease as a result to using of Sesbania seeds especially G₄ and G₅. But, ruminal total VFA's concentrations post-feeding were significantly with G₄ compared with G₁ 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 best I value was recorded with G₄. The obtained results showed that there is significant effects on some blood parameters (hemoglobin, MCHC, lymphocytes, platelets count, globulin and enzymatic activities) due to using the tested rations. Concerning milk production, the obtained data indicated that the highest value of daily milk yield was recorded with G₄ (1.70 kg) followed by G₅ (1.67 kg) then G₂ (1.59 kg) and G₁ (1.56 kg) while the lowest value (1.499 kg) was recorded with G₃ 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 G₅ (0.904) then G₄ (0.911) followed by G₂ and G₃ (0.971 and 1.009, respectively) and lastly G₁ (1.015). Therefore, the economic efficiency was improved by 9.25, 10.17, 16.31 and 22.81% with Sesbania seeds rations (G₂, G₃, G₄, and G₅, respectively) compared with control (G₁). 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 be 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^oc for 30 min., autoclaving and dry heating 130^oc 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 rostrata*, *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 substitute 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 (G₁), 10% (G₂) and 20% (G₃) 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 145^oC 24 hrs.) and used at the same levels 10 and 20% in G₄ and G₅, 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 drunk water was measured for each group (ml/day). Diets were offered twice daily at 8.0 am and 3.0 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 (NH₃-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 Table 1 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 Table 1. The chemical composition obtained in this study is nearly similar to that obtained by Pugalenti *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	Composition, % DM basis						
	DM	OM	CP	CF	EE	NFE	ASH
Concentrate feed mixture, CFM	91.05	93.95	15.00	15.93	3.35	59.67	6.05
<i>Sesbania sesban</i> seeds, SS	92.9	96.35	30.65	7.50	5.41	52.79	3.65
Treated <i>Sesbania sesban</i> 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 (G₁, G₂ G₃, respectively). The same trend was observed with treated *Sesbania* seeds (TSS) in G₄ and G₅ (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 G₁, G₂, G₃, G₄ and G₅, respectively. The clear decrease in DM intake as g/h, g/kgw^{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 (G₂ and G₃) and treated (G₄ and G₅). The highest value of water consumption as L/head, ml/kg w^{0.82} and ml/g DM intake was recorded with G₅ (5.75,

303 and 3.81, respectively) then G₄ (5.69, 299 and 3.67, respectively) whereas the lowest value (4.99, 267 and 3.14, respectively) was detected with control group (G₁). Thus, the water consumption was higher with increasing level of Sesbania seeds in rations of lactating Zaraibi does especially in both two TSS groups (G₄ and G₅). 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/kgw^{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
Total VFA's (m Eq /100ml)	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
	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}
Microbial protein(g/ 100 ml)	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}
	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
Totalsolids, %	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 ^c	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 G₅ (0.904) then G₄ (0.911) followed by G₂ and G₃ (0.971 and 1.009, respectively) and lastly G₁ (1.015). Similarly, the values of feed conversion based on crude protein were better with two TSS groups (G₄ and G₅) 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 (G₁, G₂, G₃, and G₄, 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 G₂, G₃ and G₄, respectively) compared with control (G₁, 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 G₁ (3.314) compared with other groups (3.099, 2.882, 3.096 and 2.880 for G₂, G₃, G₄ and G₅, respectively). The corresponding values of price of milk yield were 4.692, 4.794, 4.497, 5.100 and 5.010 LE /h for G₁, G₂, G₃, G₄ and G₅, respectively). Therefore, the highest total feed cost/ kg milk (LE) was observed for

G₁ (2.119) while the intermediate values were recorded for G₂ and G₃ (1.939 and 1.923, respectively) and the lowest values were for G₄ and G₅ (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 (G₄ and G₅). Economic efficiency values revealed that G₅ had the highest economic feed efficiency, followed by G₄ then G₃ and G₂ and lastly G₁. Thus, the economic return was clearly increased (9.25, 10.17,

16.31 and 22.81%) with Sesbania seeds rations (G₂, G₃, G₄ and G₅, respectively) compared with control (G₁). 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.

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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 وتركيبه وكفاءة التحويل الغذائي وصورة الدم واقتصاديات انتاج اللبن في اناث الماعز الزرايبي. حيث وزعت ٢٥ عنزة حلاية عشوائيا في ٥ مجموعات متساوية في العدد (٥ حيوانات في كل مجموعة)، غذيت المجموعة الاولى (مج ١) وهي مجموعة المقارنة علي العلف المصنع وسيلاج الانزعة بالكيوزان (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 (مج ٢، مج ٣ 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 (مج ٤، ومج ٥ 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 (مج ٤، مج ٥)، في نفس الوقت حدث ارتفاع معنوي للأحماض الدهنية الطيارة بعد الأكل مع مج ٤ مقارنة مع مج ١، مج ٣، أيضا حدث تأثير معنوي للعلائق المختبرة علي البروتين الميكروبي عند الساعة ٢، ٤ بعد الأكل وكانت القيمة الأفضل مع مج ٤ أيضا وقد أظهرت النتائج أيضا أن بعض قياسات صورة الدم (مثل الهيموجلوبين- متوسط تركيز هيموجلوبين الخلية- ليمفوسيت- الصفائح الدموية- والجلوبولين- نشاط الإنزيمات قد تأثرت معنويا كنتيجة لاستخدام العلائق المختبرة - أما فيما يتعلق بإنتاج اللبن اليومي فقد سجلت النتائج أن أعلى إنتاج كان مع مج ٤ (١.٧٠٠ كجم) ثم مج ٥ (١.٦٧٠ كجم)؛ مج ٢ (١.٥٩٨ كجم)، مج ١ (١.٥٦٤ كجم) في حين سجلت أقل قيمة مع مج ٣ (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 مج ٥ (٠.٩٠٤) هي الأفضل ثم تلتها مج ٤ (٠.٩١١) ثم مج ٢، ومج ٣ (١.٠٠٩، ٠.٩٧١ علي التوالي) وأخيرا كانت القيمة الأقل (١.٠١٥) مع مجموعة المقارنة (مج ١)، وكانت الكفاءة الاقتصادية نفس الاتجاه حيث أظهرت تحسنا ملحوظا بنسبة ٩.٢٥، ١٠.١٧، ١٦.٣١، ٢٢.٨١% مع علائق السيسبان الأربعة (مج ٢، مج ٣، مج ٤، مج ٥ علي التوالي) مقارنة بمجموعة المقارنة (مج ١). وعليه يتضح من هذه الدراسة أن استخدام بذور السيسبان بالنسبة المذكورة لتحل محل ١٠، ٢٠% من البروتين في علائق الماعز الحلاب كان لها بعض التأثيرات الإيجابية علي ميتابوليزم الحيوان وصورة الدم والجلوبولين 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.