EFFECT OF USING SUNFLOWER SEEDS INSTEAD OF SOME CONCENTRATE MIXTURE ON YIELD, COMPOSITION AND SOME PROPERTIES OF GOAT'S MILK

By
Elham H. Abou-Elenin
Animal Production Research Institute, Agricultural Research Center

ABSTRACT

A numbers of 15 local breed (Zaraibi) and 15 exotic breed (Damascus) goats were used in the present study. The daily feed intake per doe (control ration) composed of 1.250 kg concentrate mixture + 4 kg green berseem (*Trifloium alexanrium*) or 1.3 kg berseem hay for each doe. Goats in group 1 were fed control ration (G1) ; goats in groups 2 and 3 were fed as a control ration but replaced by 5% or 10% of concentrate mixture with sunflower seeds (G2) and (G3) in order.

The highest milk yield was recorded with goat's fed on 10% sunflower (1.86 kg/day for Damascus and 1.77 kg/day for Zaraibi goats) and the lowest in the control one (1.45 and 1.36 kg/day for Damascus and Zaraibi, respectively). The daily milk yield was the highest at the beginning of lactation, being 1.76, 2.18 and 2.21 kg/day for Damascus and 1.90, 2.02 and 1.95 kg/day for Zaraibi control ; G2 and G3, respectively, and decreased gradually up to the end of the 4th month of lactation (July) to be 1.46, 1.58 and 1.88 kg/day for Damascus and 1.40, 1.51 and 1.86 kg/day for Zaraibi control, G2 and G3, respectively.

The averages of milk fat and protein were significantly different ($P<0.05$) among the experimental treatment groups. The minimum fat values were 3.33 and 3.08% for Damascus and Zaraibi control group, respectively, while the maximum values (4.02 and 3.86%) were recorded in goat's fed on 10% sunflower (G3). Protein content was lower in Zaraibi goats fed on control diet and 5% sunflower (3.80% and 3.99%), respectively. Damascus control goats showed insignificant higher casein N/TN values (69.29%) than the others. The values of rennet clotting time and curd tension were insignificantly different between both goat breed groups or among treatments, while, the differences in curd syneresis (CS) values due to

breed and treatment groups were significant (P<0.05). The pH value of milk with zabady starter after inoculating for setting were 4.96, 5.05 and 5.08 for Damascus and for Zaraibi goats were 5.04, 5.11 and 5.12 in case of control ; G2 and G3 treatments, respectively.

INTRODUCTION

Goats are an important source of meat and milk and characterized by their ability to adapt in many tropical and subtropical regions and to use wastes, fibrous plant material not eaten by other species of animals (Devendra and Burns, 1983).

The milk of goats and sheep is of particular economic interest in developing countries, since the production of this type of milk has come to be a useful strategy to tackle the problem of under nutrition, especially among the infant population (Haenlein, 1996, 2001, 2004).

Although nutrient requirements are now relatively well-defined in sheep and cattle, there is still a lack of reliable information in the literature about the nutritional needs of lactating goats. Previous reports on protein and energy requirements of lactating goats have been derived mainly from feeding trials and only a limited number of studies have published results on nitrogen and energy balance trials (Aguilera *et al.*, 1990).

Sunflower is considered the third oil crop in the world, and it has high nutritive value, high content of protein and essential fatty acids, which contain non-saturated fatty acids, vitamin E, zinc, magnesium, iron, phosphorus, copper, and selenium more of there availability of cultivated in new saline land for three times a year. Total cultivated area in Egypt is around 40,000 faddan (ARC, 2005).

Sunflower would be a good choice from a consumer viewpoint, is rich in polyunsaturated fatty acids being a source of linoleic acid (66% of the total fatty acids). Sunflower seeds increase the proportion of unsaturated fatty acids in milk, compared to cows fed on supplemental fat (Schingoethe *et al.*, 1996).

Lipid composition is one of the most important components of the technological and nutritional quality of goat milk. Lipids are involved in cheese yield (per kilogram of milk) and firmness, as well as in the color, and in the falvor of caprine dairy products (Delacroix-Buchet and Lamberet, 2000). Furthermore, the peculiarities of goat milk lipolytic system (Chilliard, 1982) and medium-chain fatty acids (Ha and Lindsay, 1993) could greatly change the content in free fatty acids, playing a major role in the occurrence of the characteristics goat

flavor. Fat supplements are included in the diet of ruminants to increase energy density, improve nutrient utilization enhance milk and meat yields and manipulate fatty acid composition (Scott and Ashes, 1993 and Palmquist *et al.*, 1993). Such differences would be expected to affect rumen microbial fermentation, digestion, absorption and utilization of the constituent fatty acids (Scott and Ashes, 1993).

It is worthy noting that, linseed oil or sunflower oil supplementation (5-6% of the ration) reduces the "goaty" taste in milk or fresh cheese, linked to the lower secretion of lipase and reduced post-milking lipolysis (Chilliard *et al.*, 2003).

The objective of the present work was to measure the effect of supplementation with sunflower seeds on goat's milk yield, milk composition and determination of zabady starter activity.

MATERIALS AND METHODS

A numbers of 15 local breed (Zaraibi) and 15 exotic breed (Damascus) goats were used in the present study (herd of Sakha Experimental Farm, Animal Production Research Institute (APRI), Ministry of Agriculture).

Animals have 4-5 years of age and mating in September mating season according the system of APRI and their average body weight at the beginning of study was 41.04±1.19 kg and 55.71±1.71 kg for Zaraibi and Damascus, respectively. All does were given the NRC feeding requirements (NRC, 1985) for production of 1-2 kg milk/head/day. The daily feed intake per doe composed of 1.250 kg concentrate mixture + 4 kg green berseem (*Trifloium alexanrium*) or 1.3 kg berseem hay for each doe. Goats in group 1 were a control group (G1) ; goats in group 2 were fed as a control ration but by replacing 5% of concentrate mixture with sunflower seeds (G2) and goats in group 3 were fed as a control ration but by replacing 10% of concentrate mixture with sunflower seeds (G3). Chemical composition of tested feedstuffs is presented in Table (1).

Milk samples (100 ml each) were taken every two weeks for chemical analysis. During suckling period, at the day of hand-milking, the morning milk from goats of each breed group was pooled, cooled at 5°C, added to the evening milk, well mixed and representative samples were taken. During machine milking period, morning cooled milk samples - taken biweekly by means of the milk meter- were added to the evening ones, pooled and the representative breed group

samples were taken. Milk samples were kept at -5°C till the chemical analysis.

Table (1): Chemical composition of tested feedstuffs

Item	DM	Chemical composition (on DM basis) %					
		OM	CP	CF	EE	NFE	Ash
CFM	89.91	87.73	14.42	12.11	3.51	57.69	12.27
Sunflower seeds	90.53	92.98	16.67	18.31	21.74	36.26	7.02
Fresh Berseem	17.53	84.99	14.22	26.25	1.19	43.13	15.01
Berseem hay	90.43	89.16	12.84	27.92	3.07	45.33	10.84

CFM = concentrate feed mixture, DM= Dry matter, OM=organic matter, CP, crude protein , CF= crude fiber, EE= either extract, NFE= nitrogen free extract.

During the suckling period, all does of each breed group (of each feeding treatment) were milked by hand every two weeks. Hand milking was carried out twice at the day of milking (6 a.m. and 5 p.m.), milk yield was individually measured, recorded and samples were taken for chemical analysis. The total milk yield for a doe at the day of milking was considered to represent her average daily milk yield during the previous two weeks. During the day of milking, kids were removed from their dams and allowed to suckle other goats. After the end of suckling period, machine milking was applied for all of the experimental does twice daily up to the end of lactation. Milk yield was individually detected at each milking time using Tru-Test milk meter fixed on the milk line. Milk samples were collected every two weeks by means of such milk meter for chemical analysis. Each doe was dried up when her daily milk yield declined to 100 g for three successive days. The daily milk yield and duration of lactation were individually recorded and lactation curve was established for goats of each group.

Following are the milk chemical constituents, which were analyzed in milk samples of each breed group of goats studied, and method used for the determination of each constituents and some rheological properties as follows: Fat and total solids (TS) were measured according to Ling (1963) whereas ash as described in A.O.A.C. (1984). Total Nitrogen (T.N) was determined using micro-Kjeldahl as recommended by Rowland (1938). Non-casein nitrogen (NCN) and non-protein nitrogen (NPN) were determined in the collected filtrate after precipitation of casein and protein, respectively.

Casein nitrogen (CN) and whey protein nitrogen (WPN) were quantified by the difference as given by Rowland (1938) as follows: CN = TN-NCN ; casein = CN x 6.38 and whey protein = (NCN-NPN) x 6.38. Rennet coagulation time (RCT) was determined according to Berridge (1952). Curd tension (CT) was measured at room temperature (25-30°C) as given by Chandrasekhara *et al.* (1957), whereas curd syneresis (CS) was followed according to Mehanna and Mehanna (1989). For the examination of starter activity, the pH of milk inoculated with zabady starter was periodically detected.

Determination of zabady starter activity was tested by adding 2 ml of zabady starter to a 100 ml of milk used for making zabady heated at 90°C for 15 min and cooled to 42°C. After mixing, it was inducated at 42°C. The pH values were determined at different intervals of incubation until the pH was reached to about 4.5-4.6.

Analysis of variance, standard error and Duncan's test as well as average and standard error were carried out using a SPSS computer program (SPSS, 1999).

RESULTS AND DISCUSSION

Table (2) shows significant differences in the average daily milk yield (ADMY) among the experimental treatment breed groups for the same feed treatments. The values were the highest in goat's fed on 10% sunflower (1.86 kg/day for Damascus and 1.77 kg/day for Zaraibi goats) in order, and the lowest in the control one (1.45 and 1.36 kg/day for the same order).

Monthly changes in the ADMY throughout the lactation period are presented in Fig. (1).

The ADMY had the maximum values at the beginning of lactation period (April) being 1.76, 2.18 and 2.21 kg/day for Damascus and 1.90, 2.02 and 1.95 kg/d for Zaraibi control ; 5% sunflower and 10% sunflower, respectively, and decreased gradually up to the end of the 4th month of lactation (July) reaching 1.46, 1.58 and 1.88 kg/d for Damascus and 1.40, 1.51 and 1.86 kg/d for Zaraibi control ; 5% sunflower and 10% sunflower, respectively.

In general, milk yield was slightly higher in both 5% and 10% sunflower groups than in control group for both breed groups. The

declined continued between month 2 and 4 then gradually decreased up to the end of lactation (August).

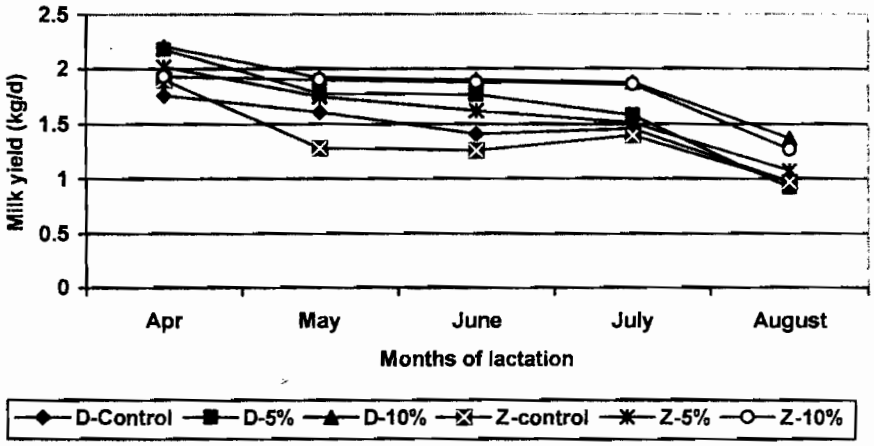

Fig. (1): Milk yield (kg) of different breed groups of goat's during lactation period as affected by experimental rations.

The resultant lactation curves agree, in general, with those reported by many authors, for different breeds of goats (Hadjipanayiotou and Koumas, 1991 and Sahlu *et al.*, 1993). It could also be observed that the present results are in agreement with those obtained by Milerski and Mareš (2001) and Ciappesoni *et al.* (2002), who observed higher average milk yield of 2.58 and 2.93 kg/day during the 1st months of lactation for the white and the brown Czech breeds, respectively. **Aguilera *et al.* (1990)** found that the mean daily milk production of goats ranged widely from 0.649 to 1.742 kg/d in the first lactation and from 0.222 to 1.989 kg/d in the second lactation. Within the lactation period, milk yield declined progressively.

Monthly changes in milk composition throughout the lactation period in goats of the different studied treatment breed groups are presented in Table (2) Fig. 2 (a-d). Average of milk fat (%) was significantly different among the experimental treatment groups (Table 2). The minimum values were 3.33 and 3.08% for Damascus and Zaraibi control group, respectively, while the maximum value was recorded in goats fed on 10% sunflower (4.02 and 3.86% for Damascus and Zaraibi, respectively).

Table (2): Yield and composition of goat's milk as affected by experimental rations

Property	Damascus goats			Zaraibi goats		
	Control	5% sunflower	10% sunflower	Control	5% sunflower	10% sunflower
Milk yield (kg/d)	1.45±0.08^{c}	1.65±0.08^{b}	1.86±0.09^{a}	1.36±0.10^{c}	1.59±0.11^{b}	1.77±0.09^{ab}
Milk composition:						
Fat %	3.33±0.32^{c}	3.65±0.39^{b}	4.02±0.50^{a}	3.08±0.20^{c}	3.61±0.45^{b}	3.86±0.40^{b}
Fat yield (kg)	49.65±0.80	61.80±0.81	76.83±1.70	43.02±0.90	59.79±0.80	68.01±0.11
Protein %	4.54±0.28^{a}	4.25±0.31^{b}	4.41±0.50^{a}	3.99±0.11^{c}	3.80±0.14^{c}	4.13±0.40^{b}
Protein yield (kg)	67.25±0.92	71.99±0.87	84.11±0.64	54.86±0.79	61.36±0.81	75.07±0.15
Casein%	3.04±0.21	2.95±0.211	3.03±0.34	2.76±0.08	2.63±0.09	2.86±0.33
Casein N/TN%	66.92±0.9^{b}	69.29±0.3^{a}	68.86±0.5^{a}	69.18±0.8^{a}	69.04±0.2^{a}	69.31±0.2^{a}
Whey protein %	1.28±0.04^{a}	0.92±0.12^{b}	1.11±0.12^{a}	0.97±0.05^{b}	0.95±0.03^{b}	0.96±0.12^{b}
TS%	10.95±0.48	11.39±0.59	11.59±0.71	10.84±0.54	10.99±0.54	11.69±0.59
Ash%	0.71±0.03^{b}	0.77±0.02^{ab}	0.81±0.02^{a}	0.72±0.01^{b}	0.80±0.02^{a}	0.76±0.02^{ab}

Means a, b and c...etc in the same row with different superscripts differ significantly ($P<0.05$).

It could be observed (Fig. 2a) that there was significant decrease ($P<0.05$) in milk fat (g/kg) during lactation of the two treatments breed groups compared with the control. This might be due to milk yield production. Generally, both of Damascus and Zaraibi goats fed 10% sunflower had higher fat content than those fed on 5% sunflower group. The present results are in agreement with those reported by Boros (1986) and Pal *et al.* (1996). Lower values of 1.8-3.7% were recorded by Mashaly *et al.* (1984) in the Egyptian Baladi goats, and higher contents of 5-5.5% were reported by Hadjipanayiotou and Photiou (1995) in Damascus breed in Cyprus. Moreover, less fat of 2.8% was reported for Alpine goats in Southern Italy compared with 3.9-5.4% for the native breeds (Pizzillo *et al.*, 1994). The change in fat during lactation are in agreement with those given by (Boros, 1986).

Content of protein (Table 2) was significantly ($P<0.05$) different among the experimental groups, being lower in Zaraibi goats fed on control diet and 5% sunflower (3.80% and 3.99%), respectively, and in Damascus goats fed 5% sunflower seed (4.25%). On the other hand, protein content was the highest in Damascus goats fed on control diet and 10% sunflower (4.54% and 4.41%), respectively, and in Zaraibi goats fed on 10% sunflower (4.13%).

Protein content (g/kg milk) of goat's milk (Fig. 2b) as affected by treatment breed groups and lactation stage decreased gradually with advancing lactation period. It could also be noticed that there were significant differences ($P<0.05$) between treatment breed groups and control one during the lactation stages. The general trend of the obtained results are in agreement with those reported by Hadjipanayiotou and Koumas (1991) and Giaccone *et al.* (1995).

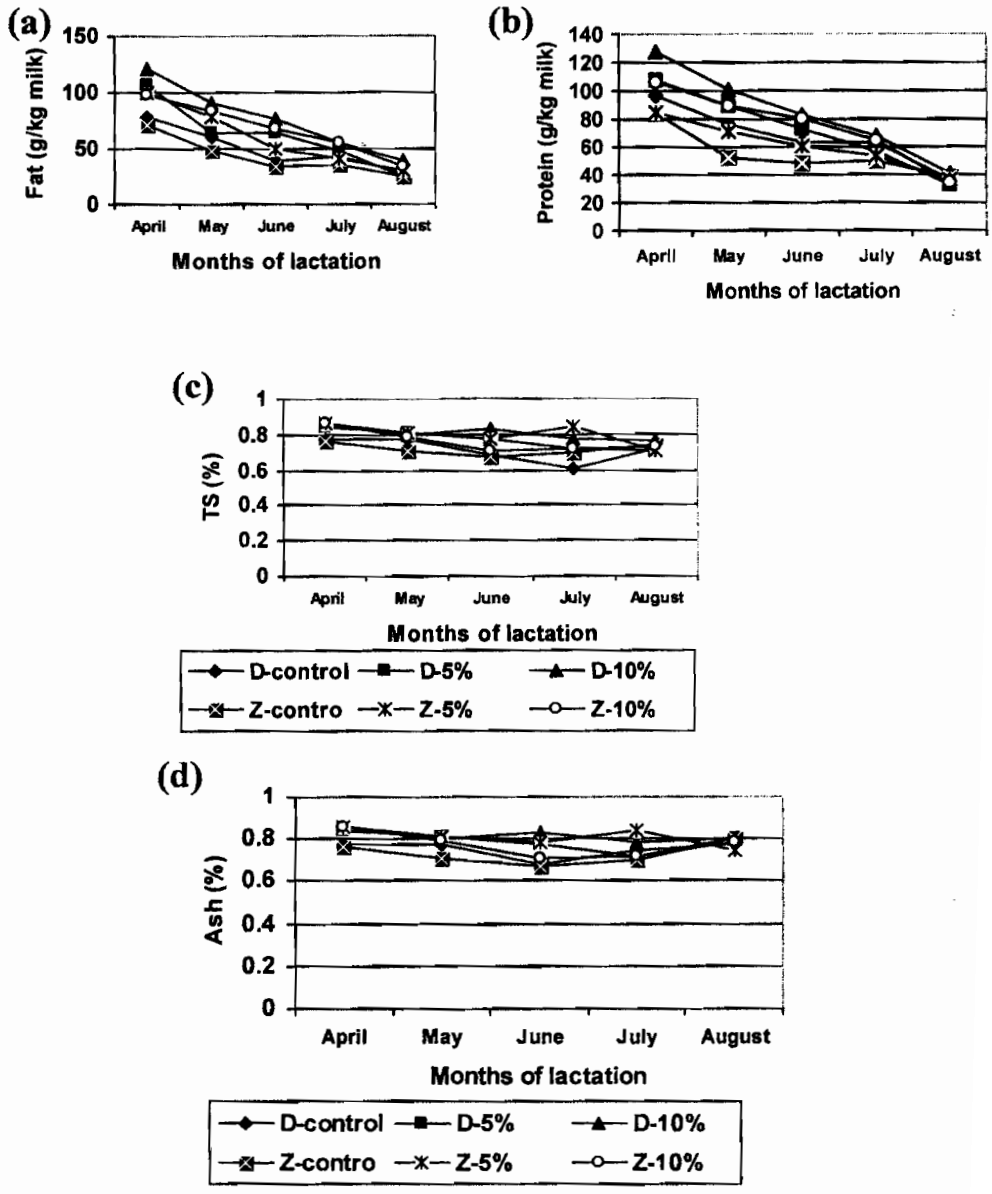

Fig. (2) :Milk composition during the lactation period (April to August) as affected by the feeding treatment breed groups.

Goat's milk protein content varied from 2.7% in Alpine (Sahlu *et al.*, 1993) to 4-4.3% in Damascus goats (Hadjipanayiotou and Photiou, 1995). Protein in Zaraibi ranged from 2.3-3.2% (El-Gallad *et al.*, 1988) to 3.84% (Hassan *et al.*, 1986) in Egypt and Damascus goats ranged in their milk content of protein from 3.7% (Hadjipanayiotou *et al.*, 1988) to 4-4.3% (Hadjipanayiotou and Photiou, 1995) in Cyprus. Pizzillo *et al.* **(1994)** found that the protein and casein were less in Alpine goat's milk in Southern Italy (2.7 and 2.1%, respectively) compared with those of native breeds (3.2-3.7 and 2.4-2.8%, respectively).

Results presented in Table (2), revealed that the casein content was not significantly affected by the applied feeding treatments. Insignificant differences among casein N/TN values were detected for all treatment breed groups except for Damascus control goats. Whey protein contents among ranged between 0.92 and 1.28% (Table 2).

Total solids (TS) did not differ significantly among the experimental treatment groups (Table 2), with higher content for both treatment groups fed on 10% sunflower seed. Results indicated that total solids content of milk were almost similar during the first stage of lactation (Fig. 2c). 10% sunflower treatment goat's milk showed the highest total solids content. This general trend of total solids during lactation period is in a full agreement with those reported by Pal *et al.* (1996).

Wide variations between in TS and ash content of goats were given in the literature (Lu, 1993, Chesworth and Horton, 1996 and Eissa, 1996). Ash content was not significantly affected by the applied treatments and the values ranged between 0.71 and 0.81% (Table 2). Results presented in Fig. (2d) showed that the mean ash content decreased gradually with lactation advance. Treatment groups were of similar values and did not differ significantly. These results are in agreement with those reported by Abbas (1983) and Hadjipanayiotou and Koumas (1991) and Hayam Abbas *et al.* (1995).

Ash in milk of Norwegian goats increased with lactation advance (Brendehaug and Abrahamsen, 1986). In Capra Prisca goat's milk, it fell during the first month of lactation and thenafter showed a gradual rise (Zygoyiannis and Katsaounis, 1986).

Generally, it is well known that the gross composition of goat's milk is affected by many factors such as diet, breed, parity, stage of lactation and environmental conditions. In general, stage of lactation seems to have the same impact given in the literature on the

gross chemical composition of goat's milk (Guo *et al.*, 2001 and Soryal *et al.*, 2004).

Table (3) reveals that the values of rennet clotting time (RCT) were insignificantly different between both goat breed groups or among treatments. This trend of results was true with curd tension (CT). Thus, the CT value, differed insignificantly among treatment breed groups.. However, the differences in curd syneresis (CS) values due to breed and treatment groups were significant.

Table (3): Rennet clotting time (min), curd tension (g) and curd syneresis (g/15 g) of goat's milk as affected by experimental treatment breed groups.

Breed	Treat.	Clotting time	Curd tension	Curd syneresis after*			
				10 min	30 min	60 min	120 min
Damascus	Control	11.96 ±0.36	22.33 ±1.76	5.57^{b} ±0.27	6.13^{b} ±0.20	6.57^{a} ±0.19	6.97^{a} ±0.24
	5% sunflower	12.07 ±0.26	21.66 ±1.60	6.47^{ab} ±0.17	6.47^{ab} ±0.17	6.77^{a} ±0.17	7.10^{a} ±0.11
	10% sunflower	11.94 ±0.28	23.0 ±0.0	6.77^{a} ±0.17	6.77^{a} ±0.06	7.07^{a} ±0.08	7.33^{a} ±0.08
Zaraibi	Control	12.24 ±0.50	23.67 ±2.1	6.80^{a} ±0.01	6.80^{a} ±0.01	7.13^{a} ±0.17	7.47^{a} ±0.03
	5% sunflower	12.62 ±0.49	23.0 ±0.0	6.63^{a} ±0.03	6.63^{ab} ±0.03	7.03^{a} ±0.06	7.33^{a} ±0.06
	10% sunflower	12.05 ±0.43	21.67 ±2.30	6.43^{ab} ±0.29	6.43^{ab} ±0.29	6.87^{a} ±0.29	7.17^{a} ±0.23

Means a, b and c... etc in the same column with different superscripts differ significantly ($P<0.05$).

Activity of yoghurt culture is quite important for the production of yoghurt, Table (4) reveals such activity as affected by fed treatment and goats breed.

The pH values at the end of incubation time were 4.96, 5.05 and 5.08 for Damascus and for Zaraibi goats were 5.04, 5.11 and 5.12. The foregoing results suggest that replacement sunflower seed for concentrate mixture had no retarding effect on activity of yoghurt culture

Table (4): Effect of replacement sunflower seeds of concentrate mixture on the activity of yoghurt culture (pH value) in goat's milk during the fermentation period

Breed	Treat.	Time (minute)							
		0	30	60	90	120	150	180	210
Damascus	Control	6.62±0.02	6.43±0.01	6.21±0.05	6.21±0.05	6.09±0.01	5.83±0.06	5.33±0.01	4.96±0.03
	5%	6.63±0.03	6.43±0.06	6.25±0.04	6.18±0.01	6.04±0.05	5.86±0.01	5.45±0.03	5.05±0.05
	10%	6.65±0.01	6.42±0.08	6.31±0.10	6.24±0.06	6.08±0.19	5.88±0.19	5.65±0.16	5.08±0.08
Zaraibi	Control	6.65±0.03	6.46±0.02	6.33±0.05	6.24±0.04	6.09±0.11	5.88±0.02	5.54±0.22	5.04±0.05
	5%	6.61±0.05	6.44±0.05	6.31±0.07	6.24±0.03	6.14±0.03	5.99±0.05	5.54±0.22	5.11±0.01
	10%	6.60±0.04	6.41±0.08	6.28±0.05	6.81±0.01	6.09±0.01	5.99±0.01	5.55±0.24	5.12±0.05

Means a, b and c... etc in the same column with different superscripts differ significantly ($P<0.05$).

REFERENCES

Abbas,F.M. (1983). Studies on the compositional quality of goat milk in Suez Canal area and Sinai Peninsula. M. Sc. Thesis. Fac. gric., Suez Canal Univ.

Aguilera, J. F. ; C. Prieto and J. Fonolla (1990). Protein and energy metabolism of lactating Granadina goats. British Journal of Nutrition., 63: 165-175.

AOAC (1984). Official Methods of Analysis, 14th ed. Association of Official Analytical Chemists. Washington DC.

ARC (2005). Agricultural Research Council. The Nutrient Requirements of Ruminant Livestock, Commonwealth Agricultural Bureaux, Farnham Royal, Slough.

Berridge, N. J. (1952). Some observation of activity of rennet. Analyst, 17:57.

Boros,V. (1986). Influence of the lactation period on variations in the levels of certain components of bulked goat's milk. IDF Bull. (202): 81-83, A.B.A. (55): 3655.

Brendehaug, J. and R. K. Abrahamsen (1986). Chemical composition of milk from a herd of Norwegian goats. J. Dairy Res., 53(2): 211.

Chandrasekhara, M. R. ; R. K. Bhagawan ; M. Swaminathan and C. Subrahmanyan (1957). The use of mammalian milk and processed milk foods in the feeding of infants. India J. Child Health, 6: 701.

Chesworth, J. M. and G. M. J. Horton (1996). Lactation in indigenous Omani goats. International J. Anim. Sci., 11(1): 7-12.

Chilliard Y. ; A. Ferlay ; J. Rouel and G. A. Lamberet (2003.). Review of nutritional and physiological factorsaffecting goat milk lipid synthesis and lipolysis. J. Dairy Sci., 86: 1751.

Chilliard, Y. (1982).Variations physiologiques des activites lipasique et de la lipolyse spontanee dans les laits de vache, de chevre et de femme: revue bibliographique. Lait, 62: 154.

Ciappesoni C. G. ; M. Milerski and J. Pribyl (2002). Parámetros productivos de cabras de la raza checa marrón de pelo corto. In: XXVII Jornadas ientíficas y VI Jornadas Internacionales SEOC, 19–21 de septiembre Valencia (Espana), 819.

Delacroix-Buchet, A. and G. Lamberet (2000). Sensorial properties and typicity of goat dairy products. 7th Int. Conf. on Goats, Tours, France. 15–21 May 2000, Tome, 2:559.

Devendra, C. and M. Burns (1983). Goat production in the tropics. 2nd ed., CAB., Edinburgh.

Eissa, M. M.(1996). Improving productivity of desert Barki goats by crossing with Damascus goats with special reference to milk production. Ph.D. Thesis, Fac. Agric., Alex. Univ.

El-Gallad, T. T.; E. A. Gihad ; S. M. Allam and T. M. El-Badawy (1988). Effect of energy intake and roughage ratio on the lactation of Egyptian Nubian (Zaraibi) goats. J. Small Ruminant Res., 1:327-341.

Giaccone, P. ; B. Portolano ; Bonanno, A. ; Alicata, M.L. and Todaro, M. (1995). Quantitative and qualitative aspects of milk production and quality in the Derivata di Siria goat population. Zootecnica e Nutrizione Animale, 21(2): 97.

Guo, M. R. ; P. H. Dixon ; Y. W. Park ; J. A. Gilmore and P. S. Kindstedt (2001). Seasonal changes in the chemical composition of commingled goat milk. J. Dairy Sci., 84: (Suppl. E), E79.

Ha, J. K, and R. C. Lindsay (1993). Release of volatile branched-chain and other fatty acids from ruminant milk fats by various lipases. J. Dairy Sci., 76:677.

Hadjipanayiotou, M. and Koumas, A. (1991). Effect of protein source on performance of lactating Damascus goats. Small Ruminant Res., 5:319.

Hadjipanayiotou, M. and Photiou, A. (1995). Effects of protein source and level on performance of lactating Damascus goats in negative energy balance. Small Ruminant Res.,15:257.

Hadjipanayiotou,M.; E. Georghiades and A. Koumas (1988). The effect of protein source on the performance of suckling Chios ewes and Damascus goats. Anim. Prod., 46:249.

Haenlein, G. F. W. (1996). Nutritional value of dairy products of ewe and goat milk. In: Proceedings of the IDF/CIRVAL Seminar Production and Utilization of Ewe and Goat Milk, vol. 9603, IDF. Publ., Brussels, Belgium.

Haenlein, G. F. W. (2001). Past, present and future perspectives of small In: Lokeshwar, R.R. (Ed.), Proceedings of the V. International Haenlein, G.F.W., 1996. Nutritional value of dairy products of ewe and goat milk. In: Proceedings of the, IDF/CIRVAL, Seminar Production, Utilization of Ewe, Goat, Milk, vol. 9603, Internat. Dairy Fed. Publ., Brussels, Belgium.

Haenlein, G. F. W. (2004). Goat milk in human nutrition. Small Rumin. Res. 51, 155.

Hassan,G. A.; F. D. El-Nouty ; M. A. Samak and M. H. Salem (1986). Relationship between milk production and some blood constituents in Egyptian Baladi goats. Beitrage zur Tropischen Landwirtschaft und Veterinarmedizin., 24(2): 213-219.

Hayam M.Abbas ; Nawal S.Ahmed; M. Metwally and A.K. Enab (1995). Goats milk coagulation behaviour in relation to physical and chemical properties of the resultant curd. Egyptian J. Food Sci., 23(1-2): 57.

Ling, E. R. (1963). A Text Book of Dairy Chemistry. 3rd ed., Vol.2. Chapman and Hall, London, UK.

Lu, C. D. (1993). Implication of feeding isoenergetic diets containing animals fat on milk composition of Alpine does during early lactation. J. Dairy Sci., 76:1137.

Mashaly, R. I. ; S.A. El-Deeb ; F.D. El-Nouty ; G. A. Hassan and M.H. Salem (1984). Changes in milk yield and in milk chemical and physical properties during lactation period in Egyptian Baladi goats. Egyptian J. Dairy Sci., 12(2):123.

Mehanna, N. M. and A. S. Mehanna (1989). On the use of stabilizer for improving some properties of cow's milk yoghurt. Egyptian J. Dairy Sci., 17: 289.

Milerski, M. and V. Mares (2001). Analysis of systematic factors affecting milk production in dairy goat. Acta Univ. Agric. et Silvic. Mendel. Brun (Brno), 1: 43.

NRC (1996). Nutrient Requirements of sheep and goats. Natl. Acad. Press, Washington, DC.

Pal, U. K. ; V. K. Saxena; M. K. Agnihotri and R.Roy (1996). Effect of season, parity and stage of lactation on the composition of Jamnapari goat's milk. International J. Anim. Sci., 11(1): 245.

Palmquist, D. L. ; A. D. Beaulieu and D. M. Barbano (1993). Feed and animal factors influencing milk fat composition. J. Dairy Sci., 76: 1753.

Pizzillo, M. ; E. Cogliandrio ; R. Rubino and V. Fedele (1994). Productivity and qualitative characteristics of milk from the principal goat breeds reared in Southern Italy. "Progressi scientifici e tecnologici in tema di patologia e di allevamento degli ovini e dei cvaprini". Societa Italiana di Potologia e di Allevamento degli Ovini e dei Caprini. Atti XI Congresso Nazionale, Perugia, Italy, 1-4 June 1994. Perugia, Italy ; Facolta di Agraria, Universita degli Studi di Perugia (1994) 431-434 (ABAs, 64:3724).

Rowland, S. J. (1938). The determination of nitrogen distribution. J. Dairy Res., 9:30.

Sahlu,T.; Fernandez, J.M.; Jia, Z.H.; Akinsoyinu, A.O.; Hart, S.P. and The, T. H. (1993). Effect of source and amount of protein on milk production in dairy goats. J. Dairy Sci., 76:2701.

Schingoethe, D. J. ; M. J. Brouk ; K. D. Lightfield and R. J. Baer (1996). Lactational responses of dairy cows fed unsaturated fat from extruded soybeans or sunflower seeds. J. Dairy Sci., 79:1244.

Scott, T.W. and J.R. Ashes (1993). Dietary lipids for ruminants: protection, utilization and effects on remodeling of skeletal muscle phospholipids. Aust. J. Agric. Res., 44: 495.

Soryal, K. A. ; S. S. Zeng ; B. R. Min; Hart, S. P. and Beyene, F. A. (2004). Effect of feeding systems on composition of goat milk and yield of Domiati cheese. Small Rum. Res. 54: 121.

SPSS (1999). SPSS for windows. Release 10.0. Standard Version. Copyright SPSS Inc., 1989-1999.

Zygoyiannis, D. and N. Katsaounis (1986). Milk yield and milk composition of indigenous goats (*Capra Prisca*) in Greece. Anim. Prod., 42: 365.

الملخص العربي

تأثير أحلال بذور عباد الشمس لجزء من العلف المركز على انتاج وتركيب وخواص لبن الماعز

الهام حسن أبو العنين
معهد بحوث الإنتاج الحيوانى ، مركز البحوث الزراعية

استخدم فى الدراسة عدد ١٥ معزة محلية (زرايبى) ، ١٥ معزة مستوردة (دمشقى) من قطيع مزرعة سخا التابع لمعهد بحوث الإنتاج الحيوانى . غذيت الماعز يوميا على ١,٢٥ كجم علف مركز + ٤ كجم برسيم اخضر أو ١,٣ كجم دريس برسيم لكل معزة / يوم. قسمت الحيوانات إلى ٤ مجاميع متماثلة. ماعز المجموعة الأولى مجموعة ضابطة (ج١) ، ماعز المجموعة الثانية غذيت بنفس تغذية المجموعة الأولى مع استبدال ٥% من العلف المركز ببذور عباد الشمس (ج٢) ، ماعز المجموعة الثالثة غذيت بنفس تغذية المجموعة الأولى مع استبدال ١٠% من العلف المركز ببذور عباد الشمس (ج٣) .

أوضحت النتائج أن اعلى إنتاج للبن الماعز كان لتلك الماعز التى غذيت على ١٠% بذور عباد الشمس (١,٨٦ كجم/يوم للماعز الدمشقى و ١,٧٧ كجم/يوم للماعز الزرايبى) واقل انتاج للبن كان لماعز المجموعة الضابطة (١,٤٥ و ١,٣٦ كجم للماعز الدمشقى والزرايبى على التوالى). انتاج اللبن اليومى اخذ نفس المسار لماعز المجاميع الثلاثة حيث كان اقصى ما يمكن مع بداية انتاج اللبن (شهر ابريل) ١,٧٦ ، ٢,١٨ ، ٢,٢١ كجم/يوم للماعز الدمشقى ، ١,٩٠ ، ٢,٠٢ ، ١,٩٥ كجم/يوم للماعز الزرايبى لكل من المجموعة الضابطة ، ج٢ ، ج٣ على الترتيب وتناقص الإنتاج تدريجيا حتى نهاية الشهر الرابع من الحليب (يوليو) ١,٤٦ ، ١,٥٨ ، ١,٨٨ كجم/يوم للماعز الدمشقى و ١,٤٠ ، ١,٥١ ، ١,٨٦ كجم/يوم للماعز الزرايبى لكل من المجموعة الضابطة ، ج٢ ، ج٣ على الترتيب.

أظهرت النتائج وجود فروق معنوية (٠,٠٥%) فى متوسط نسبة الدهن فى اللبن كان بين المعاملات بالتجربة. اقل قيمة لنسبة الدهن كانت ٣,٣٣ ، ٣,٠٨% للماعز الدمشقى والزرايبى للمجموعة الضابطة على الترتيب ، بينما كانت اعلى قيمة فى الماعز المغذاة على ١٠% بذور عباد شمس (ج٣) ٤,٠٢ و ٣,٨٦% للماعز الدمشقى والزرايبى على التوالى.

أيضا أوضحت النتائج وجود فروق معنوية (0.05%) فى نسبة البروتين بين المعاملات حيث كانت نسبة البروتين منخفضة فى لبن الماعز الزرايبى الضابطة وكذا المغذاة على ٥% بذور عباد شمس (٣,٨٠ و٣,٩٩%) على الترتيب. أوضحت النتائج عدم وجود فروق معنوية بين لبن المعاملات الثلاث فى نسبة نتروجين الكازين / النتروجين الكلى ما عدا الماعز الدمشقى فى المجموعة الضابطة التى أظهرت زيادة فى نسبة الكازين / النتروجين الكلى (٦٩,٢٩%) عن لبن الماعز الأخرى. أيضا أظهرت النتائج عدم وجود اختلافات معنوية فى الوقت اللازم للتجبن لكل من السلالات وكذا المعاملات. وكذلك كانت نفس النتائج منطبقة على صلابة الخثرة. بينما كانت الاختلافات فى فقد الخثرة للشرش للاختلافات فى السلالة وكذا المعاملات معنوية (٠,٠٥%) بعد ١٠ ، ٣٠ ، ٦٠ ، ١٢٠ دقيقة. لم يكن هناك تأثير على نشاط البادىء بعد التحضين مع بادىء الزبادى بقياس قيمة pH حيث كان ٤,٩٦ ، ٥,٠٥ ، ٥,٠٨ للبن الماعز الدمشقى وكان ٥,٠٤ ، ٥,١١ ، ٥,١٢ للبن الماعز الزرايبى للمجموعة الضابطة وج٢ ، ج٣ على الترتيب.