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COMPARISON OF ZARAIBI, DAMASCUS AND BALADI GOATS IN MILK COMPOSITION AND SOMATIC CELL COUNTS

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SUMMARY

Monthly milk samples from 287 Zaraibi does raised at El-Serw station (Damietta Governorate), 38 Damascus and 58 Baladi does at Sakha station (Kafr El-Shaiekh Governorate) were used to compare somatic cell counts (SCC), daily milk yield (DMY) and percentages of fat, protein, lactose and total solids between the breeds. Least squares means for log SCC, DMY (Kg), and percentages of fat, protein, lactose and total solids were 5.60, 0.399, 3.57, 2.84, 5.06 and 12.14, respectively, for the morning milkings, and 5.73, 0.314, 4.11, 2.89, 4.52 and 12.25, respectively, for the evening milkings for Baladi. The corresponding figures for Damascus were 5.69, 0.825, 3.56, 2.86, 4.98 and 12.06 for the morning milkings, and 5.77, 0.594, 4.07, 2.78, 4.52 and 12.24 for the evening milkings. The estimates of the same traits in Zaraibi goats were 5.72, 0.447, 3.83, 2.88, 4.65 and 12.18 for the morning milkings, and 5.74, 0.404, 3.99, 2.91, 4.86 and 12.36 for the evening milkings. There were no significant effects of breed on the studied traits except DMY. The effect of parity was non-significant for all traits of the three breeds except for SCC at evening milkings of the Sakha herd and of the Zaraibi herd in both milkings. Litter size had a significant effect on total solids at morning milkings of the Sakha herd and on fat in morning milkings of the Zaraibi herd. Order of lactation months had highly significant effects on all concerned traits for both milkings in the three breeds.

Keywords: *Somatic cell counts, milk composition, Egyptian goats*

INTRODUCTION

The Baladi goat is the dominant goat breed in the delta of the Nile River. Their milk beside that produced from Zaraibi and Damascus goat breeds is used for cheese production. Goat cheese is highly valued for export and important to cover the small demand of the domestic market.

Mastitis is one of the most expensive health problems for dairy animals that results in a marked reduction in milk yield and causes changes in levels of specific milk components (Poutrel and Lerondelle, 1983; Poutrel and Rainard, 1982). This problem affects the economics of dairy farms and the process of cheese production.

Somatic cell count (SCC) has been introduced in many milk-recording schemes for dairy animals as an indicator of mastitis and milk quality. It is accepted as a quantitative index for inflammation of the mammary gland, and is used to evaluate the quality of milk and predict udder infection. SCC is subject to several environmental factors, such as breed, parity, litter size and stage of lactation (Boscos, *et al.*, 1996; Sanchez *et al.*, 1999).

The aim of the present study was to compare daily milk yield, composition and SCC in three goat breeds (Zaraibi, Damascus and Baladi) and investigate the effect of breed, parity, litter size and stage of lactation on these traits.

MATERIALS AND METHODS

Data

Data in the present study were collected from two experimental stations belonging to the Sheep and Goats Research Department, Animal Production Research Institute (APRI), Egyptian Ministry of Agriculture and Land Reclamation, over a complete lactation (April-September, 2001) in the Sakha station, Kafr El-Shaiekh Governorate and from February to December of the same year in the El-Serw station, Damietta Governorate. Damascus and Baladi goats were raised on the Sakha station (Mid Delta), while Zaraibi goats were raised on the El-Serw station (North Delta). Total number of records was 1518, recorded for 383 does. Of the total records, 1167 were from 287 Zaraibi does, 184 were from 58 Baladi does, and 167 were from 38 Damascus does.

Management

Natural mating was practiced once a year for all does in September for Damascus and Baladi, while, 50% of Zaraibi goats were mated in October and the other 50% in June. Kids were weaned at three months of age. Does were milked twice daily. At Sakha, does were hand milked, while at El-Serw, they were machine milked using a pipeline milkings machine. Animals were fed on Egyptian clover (*Trifolium alexandrinum*) from December to May and on crop stubbles and green fodder if available, besides a concentrate mixture, clover hay and rice straw.

Milk sample collection

Records of milk yield, milk composition and SCC were taken at monthly intervals following an a.m.-p.m. recording scheme. Milk composition traits (fat%, protein% and lactose%) were measured by the automated method of infrared absorption spectrophotometry (Milk-o-Scan; Foss Electric, Hillerd, Denmark), and SCC were determined using the Fossomatic method with a Fossomatic machine and both were carried out at the Dairy Services Unit of APRI (Sakha, Kafr El-Shaiekh).

Statistical analysis

Data from the Sakha herds (Damascus and Baladi) and from El-Serw (Zaraibi goats) were analyzed using two models for evening and morning milk samples. Least-squares means and analysis of variance for SCC, DMY and milk composition (percentage of fat, protein, lactose and total solids) were applied, using the MIXED procedure of the SAS Institute Inc. (1996). This procedure was used to analyze the repeated measures. The model contained the fixed effects of breed, parity, litter size and order of lactation month, and random effect of animal. SCC data were measured

as 100.000 cells per ml then transformed to their logarithmic form (log base 10) to meet the characteristics of hypothesis testing (Ali and Shook, 1980).

The following model was applied for morning and evening milkings separately to obtain estimates for the investigated traits in Sakha flocks:

$$y_{ijklmn} = \mu + b_i + p_j + s_k + a(b\ p\ s)_{ijkl} + o_m + e_{ijklmn}$$

where,

y_{ijklmn} = records of SCC, DMY, fat%, protein%, lactose% and total solids%, μ = the overall mean, b_i= the fixed effect of breed, i = 1,2 for Damascus and Baladi, respectively, p_j = the fixed effect of parity, j = 1,2,...,5, s_k= the fixed effect of litter size of the milking doe, k = 1,2,3, $a(bps)_{ijkl}$ = the random effect of animal l, nested within breed i, parity j and litter size k, o_m = the fixed effect of months order throughout the lactation period, m = 1,2,..,6 and e_{ijklmn} = random error.

The same model was used to analyze Zaraibi goat records (El-Serw herd) except for the fixed effect of breed.

RESULTS AND DISCUSSION

Least squares means and standard errors of the studied traits in different levels of fixed effects during a complete lactation from morning and evening milk samples for Sakha herds are given in Tables 1 and 2, respectively.

Estimated SCC of the two breeds were below the discriminating threshold values between healthy and infected udders given by PMO (1993) (1.0×10^6 SCC / ml milk) and Haenlein (2000) (8.0×10^5 SCC / ml milk).

Tables 1 & 2 show that no significant difference was observed for Log_{10} SCC between Damascus and Baladi goats in both morning and evening milkings. The results in the Tables 1 and 2 indicated that DMY for Damascus was much higher than that Baladi. The effect of breed was not significant on milk composition traits (percentage of fat, lactose and total solids) with the exception of protein at evening milkings (Table 2). Protein content of Damascus milk was higher than that for Baladi milk at morning milkings. Baladi milk had significantly higher protein % than Damascus milk at evening milkings.

All studied traits were not affected by parity at morning milkings (Table 1). Estimated SCC from evening milk samples was significantly influenced by parity, and tended to increase from the first to the fourth parity (Table 2).

Litter size of the does did not affect any of the considered traits at the evening milkings, while it had significant effect on total solids % at morning milkings (Table 1). The effect of litter size on DMY was in good agreement with the findings of Peris *et al.* (1996) who reported that prolificacy did not affect milk yield, although milk yield was always higher for goats that gave birth to twins than for goats that gave birth to single kids (339 vs 287 in 210 d of lactation, respectively).

Results in Tables 1 & 2 show that the influence of order of lactation month, as indicator of lactation stage, was highly significant on SCC, DMY and all milk constituents in both milkings. Milk SCC increased from the second to the fifth month of lactation at the morning milkings, while there was no particular trend of milk SCC means at the evening milkings. Wilson *et al.* (1995) indicated that increasing days in milk and month of the year were among the most important factors contributing to increased cell count in the absence of intramammary infection. The

Table 1. Morning milk samples, Least squares means, standard error (SE) and probability of type I error (P) for Log_{10}(SCC), DMY, percentages of fat, protein, lactose and total solids

Factor	No	Log_{10}(SCC)			DMY, kg			Fat %			Protein %			Lactose%			Total solid %		
		Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P
Breed				**.18**			**.00**			**.84**			**.69**			**.37**			**.55**
Damascus	167	5.69	.06		.825	.03		3.56	.07		2.86	.04		4.98	.09		12.06	.12	
Baladi	184	5.60	.06		.399	.03		3.57	.06		2.84	.04		5.06	.08		12.14	.11	
Parity				**.21**			**.41**			**.09**			**.22**			**.29**			**.16**
1	150	5.55	.06		.623	.02		3.54	.06		2.86	.04		5.11	.08		12.21	.11	
2	90	5.66	.06		.602	.03		3.52	.07		2.84	.04		4.97	.09		11.98	.12	
3	65	5.65	.07		.569	.03		3.60	.08		2.92	.05		5.12	.10		12.26	.13	
4	34	5.56	.09		.645	.04		3.39	.10		2.76	.06		5.02	.12		11.90	.18	
5	12	5.80	.13		.622	.06		3.78	.13		2.85	.08		4.88	.14		12.15	.23	
Litter size				**.18**			**.77**			**.06**			**.71**			**.36**			**.03**
1	204	5.70	.04		.598	.02		3.66	.05		2.83	.03		5.10	.06		12.30	.09	
2	122	5.72	.05		.608	.02		3.65	.06		2.84	.04		5.05	.07		12.21	.11	
3	25	5.51	.11		.630	.05		3.39	.11		2.88	.07		4.90	.15		11.79	.20	
Months				**.05**			**.00**			**.00**			**.00**			**.00**			**.00**
1	82	5.65	.11		.555	.04		3.66	.15		3.05	.09		4.66	.13		12.22	.34	
2	76	5.56	.07		.669	.03		3.61	.13		2.89	.09		4.39	.13		11.44	.22	
3	51	5.64	.09		.677	.04		3.70	.11		2.57	.07		4.32	.13		11.21	.18	
4	48	5.70	.08		.546	.03		3.34	.07		2.85	.05		5.10	.11		11.99	.12	
5	54	5.78	.06		.645	.04		3.74	.09		2.92	.05		5.62	.13		12.97	.14	
6	40	5.52	.08		.579	.03		3.34	.07		2.81	.04		6.01	.08		12.77	.11	

Table 2. Evening milk samples, Least squares means, standard error (SE) and probability of type I error (P) for Log_{10}(SCC), DMY, percentages of fat, protein, lactose and total solids

Factor	No	Log_{10}(SCC)			DMY, kg			Fat %			Protein %			Lactose%			Total solid %		
		Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P
Breed				**.47**			**.00**			**.72**			**.03**			**.93**			**.97**
Damascus	167	5.77	.06		.594	.02		4.07	.11		2.78	.04		4.52	.06		12.24	.16	
Baladi	184	5.73	.05		.314	.02		4.11	.12		2.89	.04		4.52	.07		12.25	.17	
Parity				**.00**			**.26**			**.75**			**.72**			**.17**			**.21**
1	150	5.58	.05		.467	.02		3.98	.11		2.78	.04		4.63	.06		12.14	.16	
2	90	5.70	.05		.437	.02		4.01	.12		2.83	.04		4.53	.07		12.13	.16	
3	65	5.73	.06		.426	.02		4.01	.13		2.84	.05		4.40	.08		11.90	.19	
4	34	5.94	.08		.474	.03		4.21	.17		2.84	.06		4.57	.10		12.20	.24	
5	12	5.81	.12		.466	.04		4.22	.27		2.89	.10		4.48	.14		12.86	.39	
Litter size				**.96**			**.78**			**.84**			**.57**			**.63**			**.96**
1	204	5.74	.04		.460	.01		4.10	.09		2.85	.03		4.53	.05		12.23	.13	
2	122	5.75	.05		.463	.02		4.04	.10		2.80	.04		4.57	.06		12.28	.15	
3	25	5.77	.10		.439	.03		4.13	.20		2.86	.07		4.46	.11		12.23	.29	
Months				**.01**			**.00**			**.00**			**.00**			**.00**			**.00**
1	82	5.80	.06		.350	.03		4.45	.17		3.09	.05		4.56	.10		12.87	.21	
2	76	5.55	.08		.402	.03		3.52	.13		2.95	.06		4.25	.10		11.51	.19	
3	51	5.77	.08		.453	.03		3.89	.12		2.84	06		4.87	.12		12.29	.21	
4	48	5.69	.09		.728	.04		3.97	.16		2.59	.07		4.47	.11		11.90	.31	
5	54	5.86	.06		.400	.03		3.60	.14		2.69	.06		4.42	.07		11.42	.19	
6	40	5.84	.09		.390	.02		5.11	.20		2.87	.07		4.57	.09		13.49	.25	

dilution effect with milk volume may partially explain the increase of SCC with the advance of the stage of lactation. The increase in SCC as lactation continued could also depend on the worsening of subclinical mastitis. These results are in agreement with those found by Rota *et al.* (1993). Significant differences in DMY were attributed to breed and stage of lactation, with DMY being higher in the second and third month of lactation at the morning milkings and in the fourth month of lactation at the evening milkings . Concerning milk constituents from a.m. and p.m. samples, the effect of lactation stages was significant on the percentage of fat, protein, lactose and total solids in both milkings.

Least squares means and standard errors of the studied traits for different fixed effects during a complete lactation at morning and evening milking time for Zaraibi goats are given in Tables 3 and 4, respectively.

The effect of parity was highly significant on SCC measured in morning and evening milk samples, showing a pattern of values increasing with the order of parity and with a drop at the fifth and eighth parity. Parity did not affect DMY at morning milkings. The means of DMY did not exhibit specific trend in subsequent parities. Milk composition traits (fat, protein, lactose and total solids) were not significantly affected by parity in both milkings.

Number of kids born did not affect DMY and SCC for Zaraibi does in both morning and evening milkings (Tables 3 and 4). In contrast to these results, other studies (Zygoyiannis and Katsaounis, 1986; Zygoyiannis, 1994) showed that goats with twins tended to yield significantly higher amounts of milk than do goats with a single kid. In both milking times, month of lactation had a highly significant effect on SCC, DMY and all milk components ($P<0.01$) (Tables 3& 4). Although there were significant differences among means of months of lactation, these means show no particular trend.

CONCLUSION

The effect of stage of lactation on the studied traits has to be taken into consideration in modeling test day records for milk yield traits including SCC although the means of the studied traits through months of lactation didn't show particular trend. The analyzed data set did not find significant effects of breed and litter size on most of the studied traits. Damascus and Baladi goats seem to behave similarly in milk composition traits under the dominant management practices in the study.

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Table 3. Morning milk samples in Zaraibi herd, Least squares means, standard error (SE) and probability of type I error (P) for Log_{10}(SCC), DMY, percentage of fat, protein, lactose and total solids

Factor	No	Log_{10}(SCC)			DMY, kg			Fat %			Protein %			Lactose%			Total solid %		
		Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P
Parity				**.00**			**.08**			**.52**			**.84**						**.30**
1	282	5.54	.05		.457	.02		3.95	.06		2.92	.03		-	-		12.47	.08	
2	388	5.58	.04		.474	.02		3.99	.06		2.91	.02		-	-		12.43	.07	
3	84	5.76	.08		.480	.04		3.81	.11		2.91	.05		-	-		12.16	.14	
4	113	6.02	.06		.405	.03		4.06	.09		2.95	.04		-	-		12.35	.11	
5	136	5.93	.06		.502	.03		4.03	.08		2.88	.04		-	-		12.31	.10	
6	51	5.98	.09		.495	.05		3.88	.12		2.97	.05		-	-		12.38	.16	
7	62	6.08	.08		.525	.04		3.94	.11		2.92	.05		-	-		12.23	.14	
8	30	5.94	.12		.572	.06		4.12	.15		2.90	.07		-	-		12.63	.21	
9	21	6.11	.15		.309	.08		3.75	.19		2.97	.08		-	-		12.16	.24	
Litter size				**.10**			**.50**			**.05**			**.19**						**.33**
1	185	5.89	.05		.448	.03		4.12	.08		2.92	.03		-	-		12.46	.09	
2	650	5.88	.03		.483	.02		3.94	.05		2.96	.02		-	-		12.41	.06	
3	273	5.89	.05		.494	.02		3.96	.06		2.95	.03		-	-		12.33	.08	
4	59	5.88	.09		.450	.05		3.77	.12		2.87	.05		-	-		12.18	.15	
Months				**.00**			**.00**			**.00**			**.00**						**.00**
1	287	5.95	.04		.549	.02		4.14	.05		2.90	.02		-	-		12.29	.07	
2	286	5.97	.04		.539	.02		4.33	.07		2.97	.02		-	-		12.81	.08	
3	278	5.98	.04		.474	.02		4.43	.10		2.92	.02		-	-		12.17	.10	
4	213	5.85	.05		.447	.02		3.31	.06		2.91	.02		-	-		12.10	.10	
5	103	5.66	.06		.335	.02		3.53	.06		-	-		-	-		-	-	

Table 4. Evening milk samples in Zaraibi herd, Least squares means, standard error (SE) and probability of type I error (P) for Log_{10}(SCC), DMY, percentages of fat, protein, lactose and total solids

Factor	No	Log_{10}(SCC)			DMY, kg			Fat %			Protein %			Lactose%			Total solid %		
		Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P
Parity				**.00**			**.04**			**.19**			**.98**			**.42**			**.09**
1	282	5.58	.04		.411	.02		3.97	.07		2.89	.04		4.87	.03		12.37	.10	
2	388	5.60	.04		.446	.02		3.88	.06		2.92	.03		4.90	.02		12.40	.08	
3	84	5.75	.08		.457	.04		3.71	.12		2.87	.06		4.90	.04		12.24	.16	
4	113	5.96	.06		.384	.03		4.09	.10		2.92	.05		4.86	.04		12.74	.13	
5	136	5.84	.06		.477	.03		4.08	.09		2.91	.05		4.83	.03		12.51	.12	
6	51	5.85	.09		.465	.05		3.97	.14		2.92	.07		4.82	.05		12.46	.18	
7	62	6.05	.08		.526	.04		4.04	.13		2.96	.06		4.87	.04		12.65	.17	
8	30	5.82	.12		.521	.06		4.05	.18		2.88	.09		4.86	.06		12.62	.22	
9	21	5.94	.14		.281	.08		4.02	.22		2.95	.11		4.77	.08		11.91	.30	
Litter size				**.66**			**.33**			**.55**			**.33**			**.93**			**.33**
1	185	5.85	.05		.417	.03		4.02	.08		2.97	.04		4.85	.03		12.49	.12	
2	650	5.79	.03		.459	.02		4.03	.05		2.94	.03		4.86	.02		12.55	.07	
3	273	5.84	.04		.471	.02		4.03	.07		2.93	.04		4.86	.02		12.47	.09	
4	59	5.81	.09		.416	.05		3.82	.14		2.82	.07		4.84	.05		12.23	.18	
Months				**.00**			**.00**			**.00**			**.00**			**.00**			**.00**
1	287	5.97	.04		.533	.02		4.59	.09		2.95	.05		4.72	.04		12.77	.13	
2	286	5.96	.04		.468	.02		4.23	.08		2.84	.04		4.82	.03		12.44	.12	
3	278	5.83	.04		.458	.02		3.89	.07		2.86	.03		4.68	.03		12.06	.12	
4	213	5.87	.04		.430	.02		3.59	.06		3.00	.03		5.19	.06		12.47	.09	
5	103	5.47	.06		.315	.02		3.59	.06		-	-		-	-		-	-	

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مقارنة الماعز الزرايبى والدمشقى والبلدى فى مكونات اللبن وتعداد الخلايا الجسدية

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استخدم فى هذه الدراسة عينات لبن من ٣٨ عنزة دمشقى ، ٥٨ عنزة بلدية فى محطة سخا ، ٢٨٧ عنزة زرايبى فى محطة السرو لمقارنة عدد الخلايا الجسدية ومحصول اللبن اليومى والنسب المئوية للدهن والبروتين واللاكتوز والمواد الصلبة. جمعت العينات شهريا صباحا/مساء خلال موسم الحليب. تضمن النموذج الاحصائى لقطعان سخا السلالة وترتيب موسم الولادة وحجم الخلفة للاناث الحلابة وترتيب شهر الحليب والأثر العشوائى للحيوان. وقد طبق نموذج مشابه لكن بدون السلالة على قطيع السرو. حللت القياسات المتكررة للصفات المدروسة باستخدام النموذج االمختلط لبرنامج SAS. كانت متوسطات مجموع المربعات الصغرى للوغاريتم تعداد الخلايا الجسدية ومحصول اللبن اليومى والنسب المئوية للدهن والبروتين واللاكتوز والمادة الصلبة ٥,٦٩ ، ٠,٣٦٢ ، ٣,٥٨ ، ٢,٩٥ ، ٥,٠٠ ، ١٢,٢٧ على الترتيب فى حلبة الصباح للماعز البلدية وكانت فى المساء ٥,٧٧، ٠,٢٨٦ ، ٤,١٨ ، ٢,٨٨ ، ٤,٤٩ ، ١٢,٣٢ وكانت التقديرات المقابلة فى الماعز الدمشقى فى حلبة الصباح ٥,٨١ ، ٠,٧٨٢ ، ٣,٥٩ ، ٣,٠٣ ، ٤,٨٩، ١٢,١٧ على الترتيب بينما فى حلبة المساء كانت التقديرات ٥,٧٩ ، ٠,٥٦٨ ، ٤,١١ ، ٢,٧٧ ، ٤,٤٦ ، ١٢,٢٨ على الترتيب. كانت التقديرات لنفس الصفات فى الماعز الزرايبى صباحاً كالتالى ٥,٧٢ ، ٠,٤٤٧ ، ٣,٨٣ ، ٢,٨٨ ، ٤,٦٥ ، ١٢,١٨ وكانت ٥,٧٤ ، ٠,٤٠٤ ، ٣,٩٩ ، ٢,٩١ ، ٤,٨٦ ، ١٢,٣٦ فى المساء على الترتيب. لم تظهر السلالة اى تأثير معنوى على الصفات تحت الدراسة فيما عدا محصول اللبن اليومى. كان تأثير ترتيب موسم الولادة غير معنوي على الصفات تحت الدراسة فيما عدا تعداد الخلايا الجسدية من عينات حلبة المساء فى قطعان سخا. و كان معنويا على عدد الخلايا الجسدية فى قطيع الزرايبى. عدد المواليد كان له تأثير معنوى على المادة الصلبة فى حلبة الصباح فى قطعان سخا وعلى الدهن فى حلبة الصباح فى قطيع الزرايبى. كان لترتيب شهر الحليب تأثيرا معنويا على كل الصفات موضع الاهتمام فى الدراسة فى كلتا الحلبتين فى محطتى سخا والسرو.

as 100.000 cells per ml then transformed to their logarithmic form (log base 10) to meet the characteristics of hypothesis testing (Ali and Shook, 1980).

The following model was applied for morning and evening milkings separately to obtain estimates for the investigated traits in Sakha flocks:

$$y_{ijklmn} = \mu + b_i + p_j + s_k + a(b\ p\ s)_{ijkl} + o_m + e_{ijklmn}$$

where,

y_{ijklmn} = records of SCC, DMY, fat%, protein%, lactose% and total solids%, μ = the overall mean, b_i= the fixed effect of breed, i = 1,2 for Damascus and Baladi, respectively, p_j = the fixed effect of parity, j = 1,2,...,5, s_k= the fixed effect of litter size of the milking doe, k = 1,2,3, $a(bps)_{ijkl}$ = the random effect of animal l, nested within breed i, parity j and litter size k, o_m = the fixed effect of months order throughout the lactation period, m = 1,2,..,6 and e_{ijklmn} = random error.

The same model was used to analyze Zaraibi goat records (El-Serw herd) except for the fixed effect of breed.

RESULTS AND DISCUSSION

Least squares means and standard errors of the studied traits in different levels of fixed effects during a complete lactation from morning and evening milk samples for Sakha herds are given in Tables 1 and 2, respectively.

Estimated SCC of the two breeds were below the discriminating threshold values between healthy and infected udders given by PMO (1993) (1.0×10^6 SCC / ml milk) and Haenlein (2000) (8.0×10^5 SCC / ml milk).

Tables 1 & 2 show that no significant difference was observed for Log_{10} SCC between Damascus and Baladi goats in both morning and evening milkings. The results in the Tables 1 and 2 indicated that DMY for Damascus was much higher than that Baladi. The effect of breed was not significant on milk composition traits (percentage of fat, lactose and total solids) with the exception of protein at evening milkings (Table 2). Protein content of Damascus milk was higher than that for Baladi milk at morning milkings. Baladi milk had significantly higher protein % than Damascus milk at evening milkings.

All studied traits were not affected by parity at morning milkings (Table 1). Estimated SCC from evening milk samples was significantly influenced by parity, and tended to increase from the first to the fourth parity (Table 2).

Litter size of the does did not affect any of the considered traits at the evening milkings, while it had significant effect on total solids % at morning milkings (Table 1). The effect of litter size on DMY was in good agreement with the findings of Peris *et al.* (1996) who reported that prolificacy did not affect milk yield, although milk yield was always higher for goats that gave birth to twins than for goats that gave birth to single kids (339 vs 287 in 210 d of lactation, respectively).

Results in Tables 1 & 2 show that the influence of order of lactation month, as indicator of lactation stage, was highly significant on SCC, DMY and all milk constituents in both milkings. Milk SCC increased from the second to the fifth month of lactation at the morning milkings, while there was no particular trend of milk SCC means at the evening milkings. Wilson *et al.* (1995) indicated that increasing days in milk and month of the year were among the most important factors contributing to increased cell count in the absence of intramammary infection. The

Table 1. Morning milk samples, Least squares means, standard error (SE) and probability of type I error (P) for Log_{10}(SCC), DMY, percentages of fat, protein, lactose and total solids

Factor	No	Log_{10}(SCC)			DMY, kg			Fat %			Protein %			Lactose%			Total solid %		
		Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P
Breed				**.18**			**.00**			**.84**			**.69**			**.37**			**.55**
Damascus	167	5.69	.06		.825	.03		3.56	.07		2.86	.04		4.98	.09		12.06	.12	
Baladi	184	5.60	.06		.399	.03		3.57	.06		2.84	.04		5.06	.08		12.14	.11	
Parity				**.21**			**.41**			**.09**			**.22**			**.29**			**.16**
1	150	5.55	.06		.623	.02		3.54	.06		2.86	.04		5.11	.08		12.21	.11	
2	90	5.66	.06		.602	.03		3.52	.07		2.84	.04		4.97	.09		11.98	.12	
3	65	5.65	.07		.569	.03		3.60	.08		2.92	.05		5.12	.10		12.26	.13	
4	34	5.56	.09		.645	.04		3.39	.10		2.76	.06		5.02	.12		11.90	.18	
5	12	5.80	.13		.622	.06		3.78	.13		2.85	.08		4.88	.14		12.15	.23	
Litter size				**.18**			**.77**			**.06**			**.71**			**.36**			**.03**
1	204	5.70	.04		.598	.02		3.66	.05		2.83	.03		5.10	.06		12.30	.09	
2	122	5.72	.05		.608	.02		3.65	.06		2.84	.04		5.05	.07		12.21	.11	
3	25	5.51	.11		.630	.05		3.39	.11		2.88	.07		4.90	.15		11.79	.20	
Months				**.05**			**.00**			**.00**			**.00**			**.00**			**.00**
1	82	5.65	.11		.555	.04		3.66	.15		3.05	.09		4.66	.13		12.22	.34	
2	76	5.56	.07		.669	.03		3.61	.13		2.89	.09		4.39	.13		11.44	.22	
3	51	5.64	.09		.677	.04		3.70	.11		2.57	.07		4.32	.13		11.21	.18	
4	48	5.70	.08		.546	.03		3.34	.07		2.85	.05		5.10	.11		11.99	.12	
5	54	5.78	.06		.645	.04		3.74	.09		2.92	.05		5.62	.13		12.97	.14	
6	40	5.52	.08		.579	.03		3.34	.07		2.81	.04		6.01	.08		12.77	.11	

Table 2. Evening milk samples, Least squares means, standard error (SE) and probability of type I error (P) for Log_{10}(SCC), DMY, percentages of fat, protein, lactose and total solids

Factor	No	Log_{10}(SCC)			DMY, kg			Fat %			Protein %			Lactose%			Total solid %		
		Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P	Mean	SE	P
Breed				**.47**			**.00**			**.72**			**.03**			**.93**			**.97**
Damascus	167	5.77	.06		.594	.02		4.07	.11		2.78	.04		4.52	.06		12.24	.16	
Baladi	184	5.73	.05		.314	.02		4.11	.12		2.89	.04		4.52	.07		12.25	.17	
Parity				**.00**			**.26**			**.75**			**.72**			**.17**			**.21**
1	150	5.58	.05		.467	.02		3.98	.11		2.78	.04		4.63	.06		12.14	.16	
2	90	5.70	.05		.437	.02		4.01	.12		2.83	.04		4.53	.07		12.13	.16	
3	65	5.73	.06		.426	.02		4.01	.13		2.84	.05		4.40	.08		11.90	.19	
4	34	5.94	.08		.474	.03		4.21	.17		2.84	.06		4.57	.10		12.20	.24	
5	12	5.81	.12		.466	.04		4.22	.27		2.89	.10		4.48	.14		12.86	.39	
Litter size				**.96**			**.78**			**.84**			**.57**			**.63**			**.96**
1	204	5.74	.04		.460	.01		4.10	.09		2.85	.03		4.53	.05		12.23	.13	
2	122	5.75	.05		.463	.02		4.04	.10		2.80	.04		4.57	.06		12.28	.15	
3	25	5.77	.10		.439	.03		4.13	.20		2.86	.07		4.46	.11		12.23	.29	
Months				**.01**			**.00**			**.00**			**.00**			**.00**			**.00**
1	82	5.80	.06		.350	.03		4.45	.17		3.09	.05		4.56	.10		12.87	.21	
2	76	5.55	.08		.402	.03		3.52	.13		2.95	.06		4.25	.10		11.51	.19	
3	51	5.77	.08		.453	.03		3.89	.12		2.84	06		4.87	.12		12.29	.21	
4	48	5.69	.09		.728	.04		3.97	.16		2.59	.07		4.47	.11		11.90	.31	
5	54	5.86	.06		.400	.03		3.60	.14		2.69	.06		4.42	.07		11.42	.19	
6	40	5.84	.09		.390	.02		5.11	.20		2.87	.07		4.57	.09		13.49	.25	

dilution effect with milk volume may partially explain the increase of SCC with the advance of the stage of lactation. The increase in SCC as lactation continued could also depend on the worsening of subclinical mastitis. These results are in agreement with those found by Rota *et al.* (1993). Significant differences in DMY were attributed to breed and stage of lactation, with DMY being higher in the second and third month of lactation at the morning milkings and in the fourth month of lactation at the evening milkings . Concerning milk constituents from a.m. and p.m. samples, the effect of lactation stages was significant on the percentage of fat, protein, lactose and total solids in both milkings.

Least squares means and standard errors of the studied traits for different fixed effects during a complete lactation at morning and evening milking time for Zaraibi goats are given in Tables 3 and 4, respectively.

The effect of parity was highly significant on SCC measured in morning and evening milk samples, showing a pattern of values increasing with the order of parity and with a drop at the fifth and eighth parity. Parity did not affect DMY at morning milkings. The means of DMY did not exhibit specific trend in subsequent parities. Milk composition traits (fat, protein, lactose and total solids) were not significantly affected by parity in both milkings.

Number of kids born did not affect DMY and SCC for Zaraibi does in both morning and evening milkings (Tables 3 and 4). In contrast to these results, other studies (Zygoyiannis and Katsaounis, 1986; Zygoyiannis, 1994) showed that goats with twins tended to yield significantly higher amounts of milk than do goats with a single kid. In both milking times, month of lactation had a highly significant effect on SCC, DMY and all milk components ($P<0.01$) (Tables 3& 4). Although there were significant differences among means of months of lactation, these means show no particular trend.

CONCLUSION

The effect of stage of lactation on the studied traits has to be taken into consideration in modeling test day records for milk yield traits including SCC although the means of the studied traits through months of lactation didn't show particular trend. The analyzed data set did not find significant effects of breed and litter size on most of the studied traits. Damascus and Baladi goats seem to behave similarly in milk composition traits under the dominant management practices in the study.

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