MILK YIELD, COMPOSITION AND ODOR IN MILK OF LOCAL BARKI, EXOTIC DAMASCUS BREED OF GOATS AND THEIR CROSSES

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SUMMARY

*Desert Barki (B), Damascus (D) goats, F_1 (crosses D.B), F_2 {D X (D.B)} and backcrosses {B X (D.B) were studied under semi-arid condition of the coastal zone of the western desert of Egypt through the year 2001 and 2002. Damascus goat produced higher milk yield, Fat Corrected Milk (FCM) and protein% (1250.33 ±.18, 1304.23 ± .45 and 3.7 ± .40, respectively) than Barki goats. All crossbred were intermediate between them except in the case of the (¾D*¼B) genotype which produced higher milk yield, FCM and protein% (900.6 ±.30, 959.5 ± .33 and 3.5 ± .40, respectively) than either all crossbred or Barki goats. Milk yield in the third to the fourth year increased by 39% than the milk yield in the first to the second year. A significant effect ($P<0.05$) of Year of kidding was observed in all milk yield, FCM and milk constituents. The milk yield, FCM and fat% increased with increase in litter size by about 20%, 12% and 6.8%, respectively. Milk yield and FCM declined while the fat% increased gradually with stage of lactation reaching 726.8, 884.3 gm and 4.3%, respectively. Damascus goats had the lowest odor score while Barki goats had the highest odor score. Odor in crossbred goats had intermediate scores. Breed of dam and year of kidding had significant effect on odor. Age of dam and type of birth had insignificant effect on odor. No consistent trend was found for odor score of milk due to age of dam. Odor score of fresh milk increased progressively, though insignificantly, with advancing stage of lactation. Kidding weight and udder washing had insignificant effect on odor score. Damascus goats were slightly lower in its content of volatile fatty acids, whereas that of Barki goats had the higher content of volatile fatty acids. Otherwise the crossbred were intermediate between them. Caproic acid (C6), caprilic acid (C8) and capric acid (C10), it increased with increasing stage of lactation where the 3rd month had highest concentration.*

Keywords: *Goat, milk yield, milk composition, odor*

INTRODUCTION

Goats are considered as multi-purpose animals, they are used for meat, milk and fiber (mohair). Goat's milk is considered more digestible and less allergenic than cow's milk. The value of goat milk in human nutrition has so far received very little factual and academic attention (Haenlein, 1992; Park, 1991). However, if facts of the role and superiority in certain instances of goat milk in human nutrition can not be identified and promoted, it will be difficult justifying growth of the goat business as an industry next to the dairy cattle business. Powerful justification for goat's milk can come from medical needs (not just desires) of people, especially infants afflicted with various ailments, including cow milk protein sensitivities. The increased digestibility of protein is of importance to infant diets (both human and animal), as well as to invalid and convalescent diets. Furthermore, glycerol ethers are much higher in goat's than in cow's milk which appears to be important for the nutrition of the nursing newborn**.** Goat milk proteins have many significant differences in their amino acid compositions from the milk of other mammalian species, especially in relative proportions of the various milk proteins and in their genetic polymorphisms (Jenness, 1980; Baulanger *et al*., 1984; Addeo *et al*., 1988; Ambrosoli *et al*., 1988). Goat's milk that is hygienically produced tastes little different from cows milk Bakke *et al* (1977). Milk that tastes strong or "goaty' has not been produced correctly. Odor compounds in milk of four species are highest in water buffaloes for esters, aldehydes, ketones, alcohols, and Nitrogen compounds and overall, while sheep are highest for Sulfur and aromatic compounds and cows for lactones. Goat's milk is lowest among the four species for esters, aldehydes, ketones, and aromatic compounds and overall.C6 to C10 fatty acids in the triglycerides and especially caproic acid (C10) contributing to the goaty odor of rancid milk Jenness. (1980).

The present study was planned to estimate the effect of crossing of Barki goat with Damascus goat on milk yield, milk composition, milk odor and fatty acids concentration.

MATERIALS AND METHODS

The present study was carried out at the Borg EL-Arab station belonging to the Animal Production Research Institute, Ministry of Agriculture, Egypt 119 does 30 Damascus (D), 17 Barki (B), 20 (½D*½B), 20 (¼D*¾B) and 32 (¾D*¼B) throughout the years of 2001 and 2002 were kept in confinement all the year round and were fed adlibtem Egyptian clover hay (*Trifolium alexandrinum*) and barley straw in addition to concentrate supplement according to their needs. Animals were allowed to drink twice daily. Mating season started in July and lasted for (90) days. Does and bucks were allowed to mate for the first time at the age of 1.5 years. Kidding took place during December and January. Kids were identified by ear tags and their birth weight, type of birth and sex were also recorded. Kids were kept with their dams up to weaning.

Daily milk yield was measured individually for each doe once weekly, using kid-suckling technique during the suckling period (0-16 weeks) and hand milking technique after weaning till the end of lactation period (17-32 weeks) as described by Haider (1982). The milk in all cases was converted to 4% fat corrected milk according to Gaines and Davidson (1923) (FCM = milk yield x (0.3925 + 0.1815% fat in milk). Milk components of fat % , protein % and total volatile fatty acids were determined according to A.O.A.C (1970).Samples of monthly pooled milk of all breeds were analyzed for concentration of separated fatty acids according to Radwan (1978). Energy values were calculated using equations developed by Economides (1986) for goats as follows: $Y = 1.64 + 0.42X$, where Y is the calorific value of milk in MJ/kg and X is the fat percent.

For judging and scoring milk odor, four well trained judges were assigned to assess the score of goat's milk odor. They spent about a month before starting the experimental study in a training program to determine accurately the intensity of odor in fresh goat's milk. The score of intensity of goat's milk odor was graded into four grades for subjective judgments as follows:

Grade one : no goaty odor,
Grade two : weak goaty odor,
Grade three : medium goaty odor,
Grade four : Strong goaty odor.

The udder of half does was washed before suckling or hand milking and the udder of others was unwashed to study the effect of washing on odor.

Data were analyzed using GLM procedure (SAS, 1999), constant was fitted for the effects of genotype, age of dam, stage of lactation (early, middle and late), year of kidding, and type of birth on milk yield and milk composition. The fixed effects of genotype, age and weight of dam, stage of lactation, year of kidding, type of birth and udder washing were studied on volatile fatty acids and milk odor.

RESULTS AND DISCUSSION

Least square means for milk yield, FCM, fat%, protein% and energy by breed, age of dam, year, and type of birth and stage of lactation are presented in Table (1). Damascus goat produced higher milk yield, FCM and protein% (1250.3 ± 0.18, 1204.2 ± 0.45 and 3.7 ± 0.40, respectively) than Barki goats. While all crossbred were intermediate between them. Among crossbreds does, the genotype (¾D * ¼B) goat produced the highest milk yield, FCM and protein% (900.5 ±.30, 959.5 ± .33 and 3.5 ± .40, respectively) than all other crossbred and Barki goats. The effect of breed in all traits studied was significant except the differences between the two genotype (½D*½B) and (¾D*¼B) which were not significant. No breed differences in the protein content of milk were observed. The genetic potential of goat breed had a direct influence on the milk yield and milk composition. The present results are in agreement with Prasad *et al*. (1994), Abdelaal (1999), Prasad and Sengar (2002) and Aboismail (2003).

Age of dam had no specific trend. While milk yield and FCM recorded was highest in the third to the fourth years, the fat%, protein% and energy had the highest values in first to second years. The first to the second years estimates of all these traits were, however, significantly different from the rest of the parities. Milk yield in the third to fourth years was increased by 39% than the milk yield in the first to the second years. The present results are in agreement with the findings of Prasad *et al*. (1994), Prasad and Sengar (2002) and Aboismail (2003). Peris *et al.* (1997), who reported that the effect of age of dam on milk production might have been due to the udder development with the progress of the age of doe till the maximum lactation, and also due to the development of digestive system with the progress in age of the doe, hence dry matter intake and as milk yield increased.

A significant effect ($P< 0.05$) of year of kidding was observed on milk yield, FCM and milk constituents (Table 1).The year differences can, however, be attributed to the availability of different types of fodders depending on different agro-climatic situation. The same results were reported by Prasad *et al*. (1994), Peris *et al*. (1997) and Prasad and Sengar (2002). It could be noticed that birth type and stage of lactation had insignificant effect on protein % and energy, while they had significant effect on milk yield, FCM and fat%.

Results in Table (1) show that milk yield, FCM and fat% were increased with an increase in litter size by about 20%, 12% and 6.8%, respectively. Hatfield *et al* (1995) suggested that there may be physiological mechanisms during pregnancy that prepare the udder to produce more milk when a doe is carrying multiple fetuses.Increased lactogenic activity after kidding (Hayden *et al*., 1979).

Table 1. Least-Square means (±SE) of milk yield, FCM at 4% fat, fat%, protein% and energy as affected by breed, parity, year, type of birth and stage of lactation

Item	No	Milk yield (gm)	FCM at 4% fat (gm)	Fat %	Protein %	Energy MJ/KG
Breed		**(*)**	**(*)**	**(*)**	**NS**	**(*)**
Barki(B)	17	665.3 ± 36^{a}	931.0 ± 33^{a}	4.8 ± .13^{a}	3.4 ± .30	3.7 ± .12^{a}
Damascus	30	1250.3 ± 18^{b}	1204.2 ± 45^{b}	3.7 ± .07^{b}	3.5 ± .40	3.2 ± .06^{b}
(D)	20	772.4 ± 17^{c}	932.7 ± 25^{c}	4.4 ± .11^{a}	3.3 ± .25	3.5 ± .22^{a}
¼B * ¾D	20	853.5 ± 36^{d}	947.7 ± 35^{c}	4.1 ± .10^{b}	3.4 ± .33	3.4 ± .12^{b}
½D * ½B	32	900.6 ± 30^{d}	959.5 ± 33^{dc}	4.1 ± .07^{b}	3.5 ±.40	3.4 ± .07^{b}
¾D * ¼B						
Age of dam		(*)	(*)	(*)	NS	(*)
1 to 2 years	35	791.4 ± 30 ^{a}	924.4 ± 30^{a}	4.4 ± .06^{a}	3.5 ± .31	3.5 ± .05^{a}
2 to 3 years	22	971.0 ± 34 ^{b}	1051.0 ± 38^{b}	4.1 ± .07^{b}	3.3 ± .22	3.4 ± .09^{a}
3 to 4 years	17	1100.7 ±22 ^{c}	1200.7 ± 45^{c}	4.2 ± .11^{b}	3.4 ± .28	3.4 ± .11^{a}
4 to 5 years	30	831.4 ± 26 ^{a}	931.5 ± 30^{a}	4.2 ± .10^{b}	3.5 ±.35	3.4 ± .14^{b}
> 5 years	15	747.6 ± 22 ^{a}	867.5 ± 25^{a}	4.3 ± .14^{ab}	3.4 ± .40	3.5 ± .13^{b}
Year of kidding		(*)	(*)	(*)	(*)	(*)
2001	70	960.3 ± .45^{a}	1095.6 ± 35^{a}	4.4 ± .12^{a}	3.64± 30^{a}	3.5 ± .22^{a}
2002	49	816.5 ±.32 ^{b}	895.0 ± 33^{b}	4.1 ± .06^{b}	3.20±.22^{b}	3.4 ± .18^{b}
Type of birth		(*)	(*)	(*)	NS	NS
1	69	808.7 ± 28 ^{a}	940.9 ± 33^{a}	4.1 ± .11^{a}	3.40± .40	3.4 ± .30
2	50	968.1 ± 35 ^{b}	1049.1 ± 35^{b}	4.4 ± .10^{b}	3.44± .24	3.5 ± .22
Stage of lactation		(*)	(*)	(*)	NS	NS
Early	46	1050 ± .30^{a}	1100.5 ± .22^{a}	4.1 ± .05^{a}	3.42± .30	3.4 ± .18
Middle	37	888.4 ± .22^{b}	1000.2 ± .30^{b}	4.3 ± .11^{a}	3.41± .25	3.4 ± .20
Late	36	726.8 ± .20^{c}	884.3 ± .25^{c}	4.3 ± .13^{b}	3.43± .30	3.5 ± .28

a,b,c in the same column means with different superscript are significantly different (P< 0.05).
* (P< 0.05), ** (P< 0.01), NS: not significant

The present results are in confinement with the results of Hayden *et al*. (1979), Prasad *et al.* (1994), Hatfield *et al*. (1995), Prasad and Sengar (2002) and Aboismail (2003). The milk yield and FCM were declined while the fat% increased gradually with stage of lactation reaching 726.8 gm, 884.33 and 4.34%, respectively, in the late stage of lactation. The same trend was observed by Hatfield *et al*. (1995), Prasad and Sengar (2002) and Aboismail (2003). Prasad *et al* (1994) reported that lactation stage differences in milk yield and milk composition may have been due to changes to physiological need of the does and their kids and also availability of different types of fodder, which is mainly dependant on the climatic condition of the area.

Milk odor score of different genotypes studied were illustrated in Figure (1) through the lactation period. In general, odor scores were of the medium score (2-4). Odor score of (¼D*¾B) milk reached high score of 3.7, 4.5 and 4 in the 7th, 10th and 16th weeks of lactation, respectively. But the (¾D*¼B) genotype reached high score of 3.4, 3.7 and 3.2 in the 2nd, 6th and 13th weeks of lactation, respectively. Score of odor in milk of imported Damascus goats and the (½D*½B) goats reached its high score in the 3rd, 6th and 10th weeks of lactation (3.7, 3.9 and 3.6 for Damascus and 4.2, 4.1 and 4.2 for (½D*½B), respectively). While odor score in milk of local breed (Barki) rose to peak of 4.2, 4.4 and 4 in the 3rd, 11th and 13th weeks of lactation, respectively. The lowest scores of all genotypes studied were in the 5th week of lactation (1.8, 1.2, 1.6, 1.3 and 1.6 for B, D, (¼D*¾B), (½D*½B) and (¾D*¼B) goats, respectively). The present results are in agreement with Abdelaal (1999) and Aboismail (2003) who reported that the highest odor score in milk of Damascus and Baladi goats was found in the 6th and 3rd week, while the lowest score was in 5th and 1st week, their results showed that the volatile fatty acids were high in these weeks.

Figure (1) Milk odor score of different genotypes studied

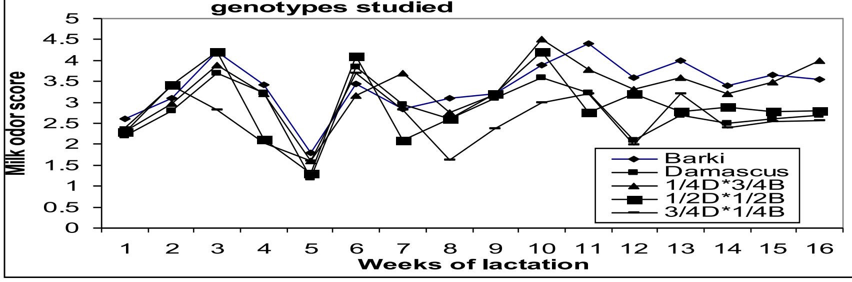

Table (2) shows the least square means ± S.E for odor for breed of dam, age of dam and type of birth of kids. It could be noticed that Damascus goats had the lowest odor score, whereas that of Barki goats had the highest score. Differences in odor score attributed to breed were significant ($P< 0.05$). The attained results are partially confirmed by the findings of Bakke *et al*. (1977), Anonymous (1976), Bakkene (1985) Ashmawi *et al*. (2000) and Aboismail (2003) who indicated that breed of goats had a marked influence on their milk flavour. Otherwise, the crossbred goats were intermediate between them. The present results are in agreement with Bakk *et al*. (1977) who reported that milk of native Norwegian goats had a higher flavour score average than that of imported Sannen goats (1.62 vs. 1.05), whereas their crossbreds had intermediate score (1.45). These findings were supported by Anonymous (1976) who crossed pure Norwegian goats with Saanen and found that the milk of the crossbred goats had weaker flavour than that of the pure Norwegians. Further studies on effect of the degree of crossbreeding on flavour intensity of goat's milk was carried out by Bakkene (1985) who analyzed the milk of 47 Norwegian goats and their crosses with Saanen at different stages of lactation. The author found a strong correlation between fatty acid content in milk and its flavour. Milk obtained from both Norwegian purebred and ¼ Saanen goats had the highest free fatty acid content and consequently had a harsh flavour, whereas milk from ¾ Saanen had a mild flavour and the lowest fatty acid content. Milk obtained from ½ Saanen goats had the highest quality score and a flavour typical to goat's milk.

Table 2. Least-Square means (±SE) of milk odor score as affected by breed, age of dam and type of birth

Item	No	Mean ± SE
Breed		(*)
Barki (B)	17	3.45 ± 0.32[a]
Damascus (D)	30	2.45± 0.21[b]
¼D * ¾B	20	3.15 ± 0.33[ac]
½DX½B	20	2.90 ± 0.28[c]
¾D * ¼B	32	2.70 ± 0.30[c]
Age of dam		NS
1 to 2 years	35	3.00 ± 0.22
2 to 3 years	22	3.20 ± 0.42
3 to 4 years	17	2.96± 0.30
4 to 5 years	30	2.84 ± 0.18
> 5 years	15	2.85 ± 0.13
Type of birth		NS
1	69	2.94 ± 0.44
2	50	3.00 ± 0.35
Year of kidding		(*)
2001	70	3.80 ± 0.33[a]
2002	49	2.14 ± 0.21[b]

a,b,c in the same column means with different superscript are significantly different (P< 0.05).
* (P< 0.05), NS: not significant

Age of dam and type of birth had insignificant effect in odor score of milk (Table 2). It is worthy to note that no consistent trend was found for odor score of milk due to age of dam, the does of 2 to 3 years had the highest intensity of odor in milk. It is evident from the previous results that flavour intensity in goat's milk was higher for young goats than for elder ones. Similar results were reported by Bakke *et al*. (1977) with two selected lines of Norwegian goats, one was selected for high milk flavour score, whereas the other selected for low score. They reported that does aged 2 and 3 years had higher flavour score than those elder than 3 years. The present results are in agreements with Ronningen (1965), Bakke *et al*. (1977), Abdelaal (1999) and Aboismail (2003). Also, Odor score in milk of does with one kid was lowest while those in milk of does with twins had the highest score. The same result was found by Aboismail, (2003).

Results in Table (2) show that the year of kidding had significant effect ($P < 0.05$) on milk odor. The differences from year to year may be attributed to the feeding system which is one of the most important factors affecting the milk odor which influenced by milk composition. Feeding system can be attributed to the availability of different types of fodders depending on different agro-climatic situation. Feeding system differs in nutrient intake and level especially the roughage from year to year, and all the year around. Goat breed had a direct influence on milk yield and concentration of milk constituent which might be due to differences in fat % and consequently volatile fatty acids for does fed concentrate and Egyptian clover hay (*Trifolium alexandrinum*). Jaubert (1996) found that the type of feeding was responsible of increasing compound of odor, which increased as concentrate increased. The present results are in agreement with Jaubert (1996) and Aboismail, (2003)

Table (3) shows that odor score of fresh milk increased progressively, though insignificantly, with advancing stage of lactation. This result may be attributed to increase in milk fat percentage with the advancement of lactation (Mba *et al*., 1975). Jenness and Patton (1969) showed that fat globules in goat's milk are responsible for odor of milk. Abdelaal (1999) who indicted that flavor intensity in Zaraibi, Damascus, Alpine and Baladi goat milk increased as lactation progressed. The obtained result disagrees with McGilliard and Freeman (1972) who indicted that flavor intensity in Norwegian goat milk decreased as lactation progressed.

Table 3. Least-Square means (±SE) of milk odor score as affected by stage of lactation, weight of dam and udder washing

Item	No	Mean ± SE
Stage of lactation	(NS)	
Early lactation	35	2.81 ± 0.11
Middle lactation	40	3.00± 0.42
Late lactation	44	3.10 ± 0.13
Weight of dam	(NS)	
20 to 30 kilogram	30	3.00 ± 0.22
31 to 40 kilogram	35	3.10 ± 0.12
41 to 50 kilogram	20	2.94± 0.37
> 50 kilogram	34	2.84 ± 0.28
Udder washing	(NS)	
Unwashed	59	3.20 ± 0.40
Washed	60	2.74 ± 0.25

The odor scores were higher in milk of does weigh 31-40 kg than in milk of lighter or heavier does. The differences were insignificant. The present result is in agreement with Aboismail (2003). Udder washing treatment decreased odor scores with insignificant differences between the two groups. Abdelaal (1999) and Aboismail (2003) reported that no hygienic milking condition caused higher odor score in milk than hygienic conditions.

Table (4) shows that the least square means ± S.E for volatile fatty acids for breed of dam, age of dam and type of birth of kids. It could be noticed that Damascus goats was slightly lower in its content of volatile fatty acids, whereas that of Barki goats had the higher content of volatile fatty acids. Otherwise the crossbred were intermediate between them. Differences in content of volatile fatty acids attributed to breed were significant (P< 0.05). This trend was also found in fat content trend thought lactation period. The present results are disagreement with Aboismail (2003) who reported that the breed had insignificant effect in content of volatile fatty acids. Age of dam and type of birth had insignificant effect in content of volatile fatty acids (Table 4). It is worthy to note that no consistent trend was found for content of volatile fatty acids due to age of dam; the does of 2 to 3 years had the highest intensity of in content of volatile fatty acids. It is evident from the previous results that content of volatile fatty acids was higher for young goats than for older. Results in Table (4) show that the year of kidding had significant effect (P< 0.05) in content of volatile fatty acids. The differences from year to year may be attributed to the feeding system which is one of the most important factors affecting the content of volatile fatty acids which influenced by milk composition. Feeding system differ in nutrient intake and level especially the roughage from year to year, and all the year around of goat breed had a direct influence on milk yield and concentration of milk constituent this may be due to differences in fat % and consequently volatile fatty acids for does fed concentrate and Egyptian clover hay (*Trifolium alexandrinum*). The present results are disagreement with Aboismail, (2003).

Table 4. Least-Square means (±SE) of volatile fatty acids (ml NaOH 0.1 N/100 g milk) as affected by breed, age of dam and type of birth

Item	No	Mean ± SE
Breed		(*)
Barki (B)	17	3.15 ± 0.12^{a}
Damascus (D)	30	2.15± 0.11^{b}
¼D * ¾B	20	2.85 ± 0.12^{ac}
½DX½B	20	2.60 ± 0.10^{c}
¾D * ¼B	32	2.40 ± 0.01^{c}
Age of dam	NS	
1 to 2 years	35	2.90 ± 0.10
2 to 3 years	22	2.50 ± 0.12
3 to 4 years	17	2.76± 0.20
4 to 5 years	30	2.64 ± 0.10
> 5 years	15	2.55 ± 0.03
Type of birth	NS	
1	69	2.74 ± 0.24
2	50	2.60 ± 0.12
Year of kidding	(*)	
2001	70	3.30 ± 0.12^{a}
2002	49	2.04 ± 0.51^{b}

a,b,c in the same column means with different superscript are significantly different (P< 0.05).
* (P< 0.05), NS: not significant

Table (5) shows that content of volatile fatty acids increased progressively, though insignificantly, with advancing stage of lactation . This trend was also found in fat content trend thought lactation period. This result may be attributed to increase in milk fat percentage with the advancement of lactation (Mba *et al*., 1975). Jenness and Patton (1969) showed that fat globules in goat's milk are responsible for content of volatile fatty acids. The present result is in agreement with Aboismail (2003).

The content of volatile fatty acids was higher in milk of does weigh 31-40 kg than in milk of lighter or heavier does. The differences were insignificant. There were no significant differences in total volatile fatty acids as results of washing udder of does. The present result is in agreement with Aboismail (2003) who reported that Udder washing treatment decreased content of volatile fatty acids with insignificant differences between the two groups.

Table 5. Least-Square means (±SE) of volatile fatty acids (ml NaOH 0.1 N/100 g milk) as affected by stage of lactation, weight of dam and udder washing

Item	No	Mean ± SE
Stage of lactation	(NS)	
Early lactation	35	2.51 ± 0.01
Middle lactation	40	2.70± 0.12
Late lactation	44	2.80 ± 0.10
Weight of dam	(NS)	
20 to 30 kilogram	30	2.60 ± 0.12
31 to 40 kilogram	35	2.80 ± 0.10
41 to 50 kilogram	20	2.54± 0.21
> 50 kilogram	34	2.74 ± 0.02
Udder washing	(NS)	
Unwashed	59	2.40 ± 0.10
Washed	60	2.94 ± 0.11

Fatty acids concentrations in polled of different genotype studied are tabulated in table (6). It could be noticed that caprilic acid (C8) ranged 1.88-5.26 %. The third month had the highest concentration and the first month was the lowest.

The differences between the 3rd month and both of 1st and 2nd months were significant ($p<0.05$). The same trend was also found in capric acid (C10), it increased with increasing stage of lactation where the 3rd month had highest 15.01% concentration compared with the 1st (4.55 %) and 2nd month (6.89 %), while the 4th month had intermediate value (10.20 %) .The differences between the 3rd month and both 1st and 2nd are significant ($p<0.01$) but there is no differences between concentration of the 4th month and those in others months.

Caproic acid (C6) concentration increased till the 3rd month and then decreased afterwards. The differences were not significant.

The above results for the concentration of caproic (C6), caprillic (C8) and capric acid (C10) trend may be due to the obtained trend of fat present. These results are in agreement with Gelais *et al*. (2000) on Sannen, Toggenburg, Alpine, lamancha and Nubian goats, reported that the bulk goats milk was rich in palmatic, oleic, butyric, myristic, stearic and capric acids and they added that the concentration of butyric acids (C4), capric acid (C10), palmetic acid (C16) and oleic acid (C18 : 1) are related to fat content, the higher the fat content of goats milk the greater the fatty acid content.

Table 6. Least-Square means (±SE) of monthly volatile fatty acids percent (FA%)

Month / FA%	1	2	3	4	5
C6	1.78 ± 1.20	2.85± 0.60	2.92± 0.80	1.85± 0.52	1.82 ± 0.12
C8	1.88± 1.35[a]	2.96± 0.70[a]	5.26± 0.80[b]	3.00± 0.10[a]	2.34 ± 0.01[a]
C10	4.55 ± 3.01[a]	6.89±1.42[a]	15.01± 1.6[b]	10.20± 0.79[ab]	7.82 ± 0.15[ab]
C12	1.85±0.86	2.60 ± 0.10	4.02± 0.94	3.56± 0.45	2.88 ± 0.41
C14	4.20± 2.1	6.88± 1.51	9.20± 1.11	8.01± 1.07	7.12 ± 0.02
C16	30.0± 6.24	25.20± 2.46	27.14± 3.02	29.25± 1.23	24.52 ± 1.51
C16:1	1.20±0.52	1.62 ± 0.16	1.31 ± 0.15	1.21 ± 0.06	1.21 ± 0.03
C18	18.15± 4.10	13.00± 1.25	10.22± 3.00	10.68± 0.10	10.97 ± 0.10
C18:1	48.22± 9.55	37.32± 4.11	26.11± 5.00	34.23± 2.16	31.80 ± 1.82
C18:2	4.21± 0.63	10.00± 1.21	6.60± 1.81	4.80 ± 0.89	4.10 ± 0.62
S-FA	59.45±9.00	59.62± 5.00	69.56± 5.57	63.25± 3.10	62.01 ± 3.06
Uns-FA	50.12±9.23	48.62± 5.00	34.11 ± 5.75	40.21± 3.76	40.00 ± 3.26

caproic (C6), caprlic (C8) and capric (C10), Louric (C12)
Mristic (C14), Palmetic (C16), Palmeto-Oliec acid (16:1)
Stearic (C18), Olic (18:1)
Linoleic (C18:2)
S-AF: Saturated fatty acids
Uns-FA: Unsaturated fatty acids
a,b,c,d in the same row means with different superscript are significantly different ($P < 0.05$).

The concentration of loric acid (C12:0) meristic acid (C14:0), plametic (C16:0) palmetic-oliec (C16:1); Stearic (C18); oleic (C18:1) and linoleic (C18:2) had insignificant differences between month. The concentration ranged 1.85-4.02 %, 4.20-9.20 %, 24.52-30.0 %, 1.20-1.62 %, 8.67-18.15 %, 48.22-26.11 % and 10.0-4.10 %, respectively.

Astrup *et al* (1985) said that the concentration of C10.0 (7.9 to 8.8 %), C14:0 (8.9-9.6 %), C18-1(22.4-25 %).While Aboismail (2003) reported that caprilic acid (C8), capric acid (C10) and Caproic acid (C6) ranged 1.68-4.88 %, 4.07-13.75% and 1.37-2.27% and the concentration of loric acid (C12:0) meristic acid (C14:0), plametic (C16:0) palmetic-oliec (C16:1); Stearic (C18); oleic(C18:1) and linoleic (C18:2) had insignificant differences between month. The concentration ranged 1.18-

3.87 %, 3.90-8.63 %, 23.20-27.36 %, 0.78-1.24 %, 9.57-16.07 %, 41.36-24.08 % and 13.5-9.0 %, respectively.

The concentration of C12:0 and C14:0 at the 3rd month are more than at the 2nd and 1st month, while the concentration of C18:0 and C18:1 decreased with increasing stage of lactation till the 3rd month of lactation and then slightly increased at 4th month of lactation. The saturated fatty acid increased with increasing stage of lactation, while unsaturated fatty acids decreased with increasing stage of lactation. Haenlein (2002) reported that the goat's milk fat normally had 35percent of medium chain fatty acids (C6-C14).The caproic (C6), caprlic (C8) and capric (C10) represented about 15 % in goats milk fat.

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الرائحة فى لبن الماعز البرقى المحلية والماعزالدمشقى المستوردة وخلطانها

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أجريت هذه الدراسة على ١١٩ عنزات (٣٠ دمشقى ،١٧برقى ، ٢٠ (٣/٤برقى*١/٤دمشقى) ، ٢٠ (١/٢دمشقى*١/٢برقى) ، ٣٢ (٣/٤ دمشقى*١/٤برقى) خلال الفترة من عام٢٠٠١ إلى عام ٢٠٠٢ والمرباة بمزرعة بحوث الإنتاج الحيوانى ببرج العرب التابعة لمعهد بحوث الأنتاج الحيوانى الإسكندرية بغرض دراسة أثر بعض العوامل الوراثية والبيئية على إنتاج اللبن و مكوناتة والرائحة. وقد أوضحت النتائج أن الماعز الدمشقى كانت أعلى التراكيب الوراثية فى أنتاج اللبن و كذا فى أنتاج اللبن المعدل عند ٤% دهن وفى نسبة البروتين بينما كانت التراكيب الوراثية الخليطة وسط فى معدلات أنتاجها ما بين الماعز الدمشقية المستوردة و الماعز البرقية المحلية. وكانت الماعز التى فى عمر ٣ سنوات إلى ٤ سنوات أعلى أنتاجية من اللبن بنسبة ٣٩% عن الماعز التى فى عمر سنة إلى سنتين. وجد تأثير معنوى للتركيب الوراثى وعمر الأم ونوع الولادة وسنة الولادة ومرحلة الحليب على إنتاج اللبن وإنتاج اللبن المعدل عند ٤% دهن وكذا على التركيب الكيماوى والطاقة. أوضحت النتائج أن الماعز الدمشقى كانت أقل التراكيب الوراثية قيمة من درجات الرائحة فى اللبن بينما كانت الماعز البرقى أعلى قيمة فى درجات الرائحة. التركيب الوراثى وسنة الولادة كانت لها تأثير معنويا على الرائحة فى اللبن بينما أثر عمر الأم ونوع الولادة ومرحلة الحليب وعملية غسيل الضرع على الرائحة فى اللبن تأثيرا غير معنويا. النتائج أن الماعز الدمشقى كانت أقل التراكيب الوراثية التى تحت الدراسة قيمة من الاحماض الدهنية والتى تسبب الرائحة عن الماعز البرقى. والاحماض الدهنية التى تسبب الرائحة و هى الكابرليك و الكابريك و الكابرويك تتروا ح نسبتها خلال مرحلة الحليب من ١.٨٨ الى ٥.٢٦ و ٤.٥٥ الى ١٥.٠١ و ١.٧٨ الى ٢.٩٩ على التوالى و كانت اعلى قيمة لهما جميعا عند الشهر الثالث.