Comparison of Milk yield and its composition for Local mountain, Damascus and Maraz Does breed raised in Akre region

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Abstract

This study was done using 30 Local mountain does, 20 Maraz does and 19 Damascus does raised at three commercial flocks at Rasel Ain, Gali and Khalilka village in Akre region, during December, 2022 to July, 2023. Overall mean of milk traits which consist of average daily milk yield (ADMY), milk yield before weaning (MYBW), milk yield after weaning (MYAW) and total milk yield (TMY) were 0.928, 117.15, 77.81 and 194.97 kg, respectively. Breed and sex of kids had a high significant effect on all the above traits, while age of doe and month of kidding didn't affect the mentioned traits significantly. Overall mean of milk composition% (fat(F), protein(P), lactose(L), total solid(TS) and solid non-fat(SNF) before weaning were 2.86, 3.84, 4.81, 11.55 and 8.67 %, respectively and after weaning were 3.97, 3.41, 4.45, 12.48 and 8.57%, on the same order. Effect of breed was significant before weaning on all milk composition% except L%, while this effect was significant (P≤0.01) after weaning on all milk composition%. The effect of age of doe before weaning was significant (P≤0.01) on F%, P% and SNF% only, in addition, this effect was not significant on all milk composition after weaning. The effect of month of kidding was not significant of all milk composition before and after weaning except TS% was significant (P≤0.01). The effect of sex was significant (P≤0.01) on F%, P% and SNF%, before weaning and on F, TS and SNF% after weaning. The correlations between average daily milk yield (ADMY) and each of MYBY, MYAW and TMY were positive and highly significant. The correlations between ADMY with milk composition before and after weaning including P, L, TS and SNF% were all negative except that with F% and were significant.

Keywords: Damascus and Maraz goats, milk yield, milk composition, correlation.

Introduction

Goat population in Iraq estimated to be approximately 1.5 million heads, which depends on cereal by-products and extensive pastures for feeding which is linked closely to the grazing patterns of other ruminants (10). Goat considered an important livestock in Iraq and has a significant function for the meat and milk products, especially under the systems of agriculture surviving in the country (2).

Goat milk is an excellent source of nutrients, which contains more calcium, phosphate, and potassium than cow milk, while containing less cholesterol (28). Goats could produce much milk greater than which reported in the official statistic due to the large number of unreported home consumption in developing countries (11). Milk composition especially fat, protein and lactose are important in growth of kids beside the quantity of milk produced by goat (4). Goat milk yield and milk composition rely on genetic and non-genetic factors (33). Different goat breeds have different milking possibilities including milk productivity and composition (34).

Improvement of milk production in goats can arise through improvement in management, feeding regimes as well through genetic improvement by selecting animals with higher genetic merit than average to be parents of the next generation, such that the average genetic merit of their progeny will be higher than the average of the parental generation (12). Moreover, it was recommended that local goat genotypes are fitted to environmental conditions and produce sufficient milk and support growth of kid without additional feeding (25). The main goal of dairy goat production is to improve traits related with milk performance. It is possible to apply stronger selection in goats than in dairy cows due to higher fertility and shorter generation interval (8).

This study aimed to compare the milk yield and composition in several breeds of Goat namely Local Mountain, Damascus and Maraz breed raised in Akre Region.

Materials and Methods

The data used in this study obtained from Local mountain, Maraz and Damascus does raised at three commercial flocks at Rasel Ain, Gali and Khalilka village in Akre Region respectively, during December, 2022 to July, 2023. A total of 69 records of each of average daily milk yield (ADMY), Milk yield before weaning(MYBW), Milk yield after weaning (MYAW) and Total Milk yield (TMY) were analyzed. The animals were allowed to graze natural pasture and stubble, straw and barley were provided whenever required. Does were flushed 2 weeks prior to mating season and 2 week prior to the kidding season. While the bucks were isolated from flock and flushed 4 week prior to mating season. Kids were left with their does till weaning (3 month).

The flock was placed on a regular health program including vaccination, drenching and dipping. Does were milked by hand at biweekly intervals starting from the first week post kidding till the does are dried off (less than 100 g), kids were separated from their dams overnight (at 8:00 pm – 8:00 am) prior to milking. A total of 138 milk sample were taken separately before and after weaning analyzed by EKO TOTAL MILK in order to determine the chemical composition of milk.

The statistical analysis of data was carried out by using General Linear Model (GLM) procedure within the statistical program SAS (26), the following model was used to analyze the studied

traits including (ADMY), (MYBW), (MYAW) and (TMY):

$Yijklm = \mu + B_i + A_j + S_k + K_l + eijklm$

Where

Yijklm: measurements on nth observation;

μ : overall mean;

B_i: Effect of i^{th} breed (where, i= Local Mountain, Damascus or Maraz Goats)

A_j: effect of j^{th} age of doe (where, j = 3.5, 4.5 year);

S_k: effect of $_k{}^{th}$ sex (where, k = female, male, twin male, twin female, male and female);

K_l : effect of l^{th} month of kidding (where, l = January or February);

eijklm : random error NID (0 , Iσ2e).

Results and Discussion

Milk traits

The overall means ± S.E. of Milk traits which consist of average daily milk yield (ADMY), Milk yield before weaning(MYBW), Milk yield after weaning (MYAW) and Total Milk yield (TMY) were 0.928±0.05, 117.15±5.08, 77.81±5.60 and 194.97±10.58 kg, respectively (Table 1). (16) recorded the highest ADMY (3.1 kg) in White Short-Haired, while the lowest (0.159 L) recorded in Black Bengal goat (7). The maximum (1187 kg) and minimum (7.21 kg) TMY was noticed in Saanen (20) and Black Bengal goat (9) respectively. (1) demonstrated that MYBY (43.92 kg) in Black Mountain and (118.77 kg) in Damascus. It appeared that MYAW ranged between 20.69 kg in Saanen crosses local goat (14) and 93.05 kg in Shami (13).

Factors affecting Milk traits

Breed

Breed had a significant (P≤ 0.01) effect on ADMY, MYBW, MYAW and TMY. Damascus does produce the highest all milk yield traits as compared with the Local Mountain and Maraz does (Table 1.). This result is in accordance with findings of previous results (3, 9, 1 and 18). But the result was conflicting to the earlier finding reported by (14) in Local does with their crosses. Results enumerated in the first table showed that the age of doe didn't affect ADMY, MYBW, MYAW and TMY significantly. Also (14) didn't reveal to the significant effects for age of doe on their milk production. This effect could be due to maturity and development of digestive system and increase feed consumption (23). On the other hand several studies reported that age of dam is one of the important factors that affecting the milk production (12, 1, 5, and 15), they indicated that dams at 3 to 4 years of age produce higher milk than other ages, while other studies indicated that dams aged 5 years produce much milk comparing to other ages (3 and 16). This because of the size of udder is larger of surrounding, teat distance, the length and the width (3). Such results resemble to earlier investigators who reported significant effect of doe's age on some milk traits (3, 1, 5 and 4).

Month of kidding

The effect of month of kidding on all milk yield traits was not significant. Similarly, (24) found that month of kidding had a non-significant effect. Various breeds of goat were affected significantly by season or month of birth (19 and 32). In Iraq, (13) reported that season of kidding affect TMY and MYAW significantly while its effect on ADMY was not significant. Also *(*14) reported that season of kidding had a significant effect on TMY, while the effect on ADMY was not significant.

Sex of Kids

The effects of sex of kids were significant (P≤0.01) on all milk traits as given in Table 1. It can be noticed that does with female twins produce significantly more all milk yield traits compared with other groups. Such results resemble earlier reports who found a significant effect on all milk yield traits (5). The results

revealed in this study were similar to earlier reports who found significant effects on TMY (28). In Iraq, (13) stated that does with triple births produce higher TMY and ADMY than those born single or twin kids. On the other hand, (14) claimed that this effect on ADMY, MYAW and TMY was not significant.

Milk Composition

The overall mean ± S.E. of milk composition: fat%, protein%, lactose% , total solid% and solid non-fat % before weaning were 2.86±0.14, 3.84±0.09, 4.81±0.04, 11.55±0.09 and 8.67±0.15 %, respectively and after weaning were 3.97±0.09, 3.41±0.03, 4.45±0.05, 12.48±0.11 and 8.57±0.06%, on the same order. The lowest percentage of fat was recorded for Alpine (2.46%) in USA (36), while the highest value was noticed for Abergelle (8.71%) in Ethiopia (6). Protein percentage ranged from 2.53 to 5.13 % obtained for Alpine (30) and Black mountain and Shami (1), respectively. As well as, lactose varied between 3.23% for Shami goats (31) and 5.8% for Beetal X Black Bengal (22). The lowest value of total solids percentage was showed for Alpine (9.95%) in USA (36), whereas the highest value was found for Albergelle (18.59%) in Ethiopia (6). The percentage of solid non-fat ranged between (7.5%) and (10.7%) as reported for Alpine and Jamunapari (36), respectively.

Factors affecting Milk composition

Breed

Effect of breed was significant (P≤ 0.01) on all milk composition % before weaning except Lactose %, while this effect was significant (P≤ 0.01) on all milk composition % after weaning. Similarly, the significant effect of breed on milk composition% is in accordance with those found by (18, 19 and 27); and 29) in different breeds of goat.

Age of doe

The effect of age of doe was significant (P≤ 0.01) on fat %, protein% and solid non-fat % before weaning, while its effect on lactose % and total solid % was not significant in addition, this effect on all milk composition after weaning found to be not significant. Earlier researchers using different breeds of goat claimed that milk components percentages did not influenced significantly by age of doe (21 and 4). In addition, (35) claimed that the effect of parity on the percentage of total solid was not significant. Also (19) reported that parity did not affect fat and lactose percentages significantly. (15) demonstrated that age of doe was not significant on protein% and lactose % while significant on fat % and solid non-fat %.

Month of kidding

The effect of month of kidding was not significant on all milk composition traits before and after weaning except total solid % before weaning which was significant (P≤ 0.01). Similar results for all milk components were reported in an earlier study in milk of Jamunapari, Beetal and Black Bengal goat (21). Also, (19) demonstrated a non-significant effect of season of kidding on protein and lactose %.

Sex of Kids

The effect of sex was significant (P≤ 0.01) on fat %, protein % and solid non-fat % and non-significant on lactose % and total solid before weaning, while the effect of sex was significant (P≤ 0.01) on fat %, total solid and solid non-fat % after weaning and it was found to be not significant on protein % and lactose %. Several studies conducted earlier noticed the non-significant effect of this factor on most of milk composition traits (28).

Correlations between ADMY and each of MYBY, MYAW, TMY

The correlations between ADMY and each of MYBY, MYAW, and TMY were positive

and highly significant (table 4). This result is in accordance with findings of previous results (14 and 4).

Correlations between ADMY and milk composition before and after weaning

The correlations between ADMY with milk composition before and after weaning including fat, protein, lactose, total solid and solid non-fat percentages were all negative except that with fat % and were significant (tables 5 and 6). Negative correlations indicate that any increase of milk will cause a decrease in percentages of its composition. The estimates of correlation coefficients among milk composition traits were positive and highly significant between protein % and total solid %, the rest one was all negative or non-significant. The lower (-0.77) and higher (0.55) ($P \leq 0.01$) estimates were between fat % and solid non-fat %, protein % and total solid % respectively (table 5) and the lower (-0.43) and higher (0.23) ($P \leq 0.01$) estimates were between fat % and protein %, protein and solid nonfat% respectively (table 6). Most of the earlier studies revealed to the same trend of the correlations among studied traits (36, 35 and 19 and 4).

Conclusion

It can be concluded that the all studied milk traits recorded for Damascus goat were significantly higher than Local Mountain and Maraz goats breed, however it could be recommended more care to breeding and improve Damascus goat for milk production. Also milk composition % especially fat % was higher significant for Damascus goat compared than Local Mountain and Maraz goats breed before and after weaning.

Conflict of interest

The author declares no conflict of interest.

Table 1. Least square means ± standard errors for the effects on milk traits (Kg) in Mountain, Damascus and Maraz does.

Factor	No.	ADMY Means± S.E.	MYBW Means± S.E.	MYAW Means± S.E.	TMY Means± S.E.
Overall mean	69	0.928±0.05	117.15±5.08	77.81±5.60	194.97±10.58
Breed					
Damascus	19	1.571±0.02a	179.12±3.28a	150.78±1.99a	329.91±4.58a
Maraz	20	0.741±0.02b	102.14±3.38b	53.50±2.04b	155.64±4.70b
Local Mountain	30	0.759±0.02b	103.07±3.33b	56.35±2.01b	159.43±4.64b
Age of doe (years):					
3.5	43	1.023±0.01a	128.0±2.42a	86.86±1.46a	214.87±3.38a
4.5	26	1.024±0.01a	128.21±2.90a	86.90±1.75a	215.12±4.04a
Month of kidding:					
January	44	1.01±0.15a	128.71±2.27a	85.45±1.37a	214.17±3.16a
February	25	1.02±0.18a	127.51±2.84a	88.30±1.72a	215.82±3.96a
Sex of Kids					
Single Female	22	0.93±0.02c	115.38±3.07c	79.92±1.86d	195.30±4.28c
Twin Female	5	1.17±0.03a	150.60±5.89a	96.20±3.56a	246.80±8.21a
Single Male	27	0.94±0.01c	116.66±2.62c	81.44±1.58cd	198.10±3.65c
Male and Female	8	1.03±0.03b	128.80±4.71b	89.46±2.85b	218.26±6.56b
Twin Male	7	1.03±0.03b	129.10±4.94b	87.38±2.98c	216.491±6.87b

Different letters within same column for each factor means there were significant differences at P≤ 0.01.

Table 2. Least square means ± standard errors for the effects on Fat, Protein, Lactose, Total solid and Solid non-fat (%) in Mountain, Damascus and Maraz does before weaning.

Factor	No.	Means ± S.E.				
		Fat %	Protein %	Lactose %	Total solid %	Solid non fat %
Overall mean	69	2.86±0.14	3.84±0.09	4.81±0.04	11.55±0.09	8.67±0.15
Breed						
Damascus	19	4.41±021a	3.29±0.12b	4.67±0.09a	11.23±0.18b	6.78±0.15c
Maraz	20	2.26±0.21b	4.74±012a	4.79±0.10a	12.16±0.19a	9.82±0.16a
Local Mountain	30	2.08±0.21b	3.33±0.12b	4.96±0.09a	11.27±0.19b	9.15±0.15b
Age of doe (years):						
3.5	43	2.82±0.15a	3.84±0.09a	4.89±0.07a	11.57±0.14a	8.67±0.11a
4.5	26	3.01±018b	3.73±0.10b	4.72±0.08a	11.53±0.16a	8.49±0.13b
Month of kidding:						
January	44	2.77±0.14a	3.81±0.08a	4.77±0.06a	11.39±0.13b	8.61±0.10a
February	25	3.06±0.18a	3.75±0.01a	4.83±0.08a	11.71±0.16a	8.56±0.13a
Sex of Kids						
Single Female	22	3.35±0.19ab	3.77±0.11ab	4.65±0.09a	11.78±0.17a	8.41±0.14a
Twin Female	5	2.63±0.37c	3.42±0.22c	4.93±0.17a	11.33±0.34a	8.52±0.27c
Single Male	27	3.09±0.16a	4.09±0.09a	4.82±0.07a	11.63±0.15a	8.50±0.12a
Male and Female	8	2.59±0.30c	3.63±0.17bc	4.79±0.14a	11.48±0.27a	8.86±0.22b
Twin Male	7	2.92±0.31ab	4.02±0.18ab	4.83±0.14a	11.54±0.28a	8.63±0.23cb

Different letters within same column for each factor means there were significant differences at P≤ 0.01.

Table 3. Least square means ± standard errors for the effects on Fat, Protein, Lactose, Total solid and Solid non-fat (%) in Mountain, Damascus and Maraz does after weaning.

Factor	No.	Means ± S.E.				
		Fat %	Protein %	Lactose %	Total solid %	Solid non fat %
Overall mean	69	3.97±0.09	3.41±0.03	4.45±0.05	12.48±0.11	8.57±0.06
Breed						
Damascus	19	4.57±0.15a	3.22±0.07b	4.36±0.10ab	12.61±0.23ab	8.32±0.12b
Maraz	20	4.28±0.16b	3.57±0.07a	4.41±0.11b	12.95±0.23a	8.65±0.13a
Local Mountain	30	3.33±0.15c	3.45±0.07a	4.71±0.10a	12.11±0.23b	8.74±0.12a
Age of doe (years):						
3.5	43	4.15±0.11a	3.41±0.05a	4.50±0.07a	12.64±0.17a	8.55±0.09a
4.5	26	3.96±0.13a	3.42±0.06a	4.49±0.09a	12.47±0.20a	8.59±0.11a

Month of kidding:						
January	44	4.09±0.10a	3.45±0.05a	4.42±0.07a	12.47±0.15a	8.50±0.08a
February	25	4.03±0.13a	3.38±0.06a	4.56±0.09a	12.65±0.19a	8.64±0.11a
Sex of Kids						
Single Female	22	4.12±0.14ab	3.38±0.06a	4.32±0.10a	12.64±0.21ab	8.65±0.11a
Twin Female	5	4.15±0.28ab	3.52±0.12a	4.67±0.19a	12.92±0.41a	8.85±0.22a
Single Male	27	4.01±0.12b	3.38±0.05a	4.45±0.08a	12.51±0.18ab	8.57±0.10a
Male and Female	8	3.73±0.22c	3.46±0.10a	4.48±0.15a	12.08±0.33b	8.28±0.18b
Twin Male	7	4.26±0.23a	3.33±0.10a	4.54±0.16a	12.63±0.34ab	8.49±0.19ab

Different letters within same column for each factor means there were significant differences at P≤ 0.01.

Table 4. Correlations between ADMY and MYBW, MYAW and TMY in Mountain, Damascus and Maraz does.

Traits	MYBW	MYAW	TMY
ADMY	0.98**	0.99**	1.00 **
MYBW		0.96**	0.98**
MYAW			0.99**

** Different letters within same column means there were significant differences at P≤ 0.01.

Table 5. Correlations between ADMY and milk composition in Mountain, Damascus and Maraz does (%) before weaning.

Traits	F %	P %	L %	TS %	SNF%
ADMY	0.71**	-0.40	-0.12	-0.84	-0.27
F %		-0.09	0.04	0.22	-0.77
P %			0.005	0.55**	0.44
L %				0.12	0.04
TS %					0.42

** Different letters within same column means there were significant differences at P≤0.01.

Table 6. Correlations between ADMY and milk composition in Mountain, Damascus and Maraz does (%) after weaning.

Traits	F %	P %	L %	TS %	SNF%
ADMY	0.50**	-0.38	-0.10	0.10	-0.36

F %	-0.43	-0.17	-0.29	0.15
P %		-0.12	0.09	0.23
L %			-0.10	0.004
TS %				-0.06

** Different letters within same column means there were significant differences at P≤0.01.

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