

RELATIONSHIP BETWEEN UDDER CHARACTERISTICS AND EACH OF REPRODUCTIVE PERFORMANCE AND MILK PRODUCTION AND MILK COMPOSITION IN ZARAIBI AND DAMASCUS DAIRY GOATS

El-Gendy, M. E.; Hafsa F. H. Youssef; E.O.H. Saifelnasr; Heba A. El-Sanafawy and Fatma E. Saba

Animal Production Research Institute (APRI), Agricultural Research Center, Dokki, Giza.

ABSTRACT

Thirty-two Damascus goats and forty-one Zaraibi goats used to study the relationship between udder measurements and each of reproductive performance and milk yield and composition.

Udder circumference positively ($P < 0.05$) affected milk yield of both Damascus and Zaraibi does. The contents of fat, protein, lactose, solids not fat and total solids in milk decreased significantly ($P < 0.05$) with increasing udder circumference of Damascus does, while, they increased significantly ($P < 0.05$) with increasing udder circumference of Zaraibi does. Meanwhile, weaning weight and growth rate till weaning increased significantly ($P < 0.05$) with increasing udder circumference of both Damascus and Zaraibi does.

Udder length, both external and internal, positively ($P < 0.05$) affected milk yield of both Damascus and Zaraibi does. The contents of fat, protein, lactose, solids not fat and total solids in milk of Damascus does decreased significantly ($P < 0.05$) with increasing external and internal udder length. However, the contents of fat, protein, lactose, solids not fat and total solids in milk of Zaraibi does increased significantly ($P < 0.05$) with increasing external and internal udder length. On the other hand, the weaning weight and growth rate until weaning of Damascus and Zaraibi kids did not significantly affected by the internal and external udder lengths.

Udder condition score also positively ($P < 0.05$) affected milk yield of both Damascus and Zaraibi does. Moreover, the contents of fat, protein, solids not fat and total solids in milk of Damascus does decreased significantly ($P < 0.05$) with increasing udder condition score up to 4. However, the contents of fat, protein, lactose, solids not fat and total solids in milk of Zaraibi does decreased significantly ($P < 0.05$) with increasing udder condition score. Moreover, the weaning weight and growth rate of Zaraibi kids increased significantly ($P < 0.05$) with increasing udder condition score.

Teat length also positively ($P < 0.05$) affected milk yield of Damascus and Zaraibi does. Milk protein of Damascus does, increased significantly ($P < 0.05$), however, the contents of lactose, solids not fat and total solids decreased significantly ($P < 0.05$) with increasing teat length. In milk of Zaraibi does, the contents of protein, solids not fat and total solids increased significantly ($P < 0.05$) with increasing teat length. The weaning weight and growth rate till weaning of Zaraibi kids increased significantly ($P < 0.05$) with increasing teat length.

Keywords: Damascus, Zaraibi, goats, udder conformation, milk, yield, composition, kids, growth.

INTRODUCTION

The udder characteristics have strong effects on milk yield and its composition in sheep (Ugarte and Gabina, 2004). In dairy goat, investigation of the relationship between milk yield, somatic cell count (SCC) and udder traits enables breeders to obtain beneficial clues, not only for accomplishing the subject of selection of superior goats but also for

developing better selection strategies for goat milk yield. Mavrogenis *et al.* (1989) stated that Damascus goat has highly heritable traits of teat length (TL), diameter (TD), 90-d and total milk production, and positive moderately high correlations among udder traits. Meanwhile, Peris *et al.* (1999) reported significant correlations among udder traits, udder volume, body weight, milk yield, and milking traits in

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Murciano- Gradina dairy goat. **Amao et al., (2003)** also reported in Red Skoto goats significant correlations among udder traits { udder length (UL), udder width (UW), udder circumference (UC), teat length (TL), udder width (TW), teat circumference (TC) } and udder volume (UV). **Keskin et al. (2005)** reported the positive effects of udder circumference and udder bottom height (UBH) on Daily milk yield (DMY). They recognized that on the relationships between several udder traits { udder bottom height (UBH), udder depth (UD), UC, left teat length (LTL), right teat circumference (RTC), teat angle (TA) } and DMY of Akkeci goats by using Path analysis and the expectably significant positive relations of DMY with UD, UC, LTC, RTC and TA ($P < 0.01$). **Keskin et al. (2007)** investigated the relationship between daily milk yield and 10 udder traits (udder height (UH), udder bottom height (UBH), udder depth (UD), udder width (UW), udder circumference (UC), left teat length (LTL), right teat length (RTL), left teat circumference (LTC) and right teat circumference (RTC) and teat angle (TA) by using factor analysis scores in multiple linear regression model on Akkeci (Kilis x Saanen) crossbred goats.

Akporhwarho (2015) found that there was a significant high positive phenotypic correlation ($P < 0.05$) between udder and teat traits. Regression analysis revealed that udder circumference was the most important single measurement accounted for over 22 % of variation of partial Daily Milk yield (PDM) in West African Dwarf goat. The multiple regression analysis revealed that yield and udder width had significant linear, quadratic and cubic functions while udder length was significant at quadratic and cubic functions only.

The udder is a very important gland in reproducing of animals as for milk production. Several studies have confirmed that udder and teat characteristics are important determinants of milk yield and ease of milking or milking ability of dairy animals (**Akpa et al., 2002; De la Fuente et al., 1999; Rogers and Spencer, 1991**). Udder and teat characteristics influenced

by several factors such as genotype, breeding and management system (**Milerski et al., 2006**).

The objective of this study was to investigate the relationship among udder circumference, external and internal udder length, udder condition score and teat length on milk yield and composition and kids' growth until weaning of Damascus and Zaraibi goats.

METERIALS AND METHODS

The current work was carried out at Sakha Animal Production Research Station, belonging to Animal Production Research Institute (APRI), Agricultural Research Center (ARC), Ministry of Agriculture, Egypt.

Thirty two Damascus goats aging 2.53-7.47 years and weighing 33-59 kg and forty one Zaraibi goats aging 2.16-8.48 years and weighing 21-46 kg were used in this study.

All udder measurements were recorded after morning milking each measuring period. The studies of udder measurements such as, external and internal udder length and teat length were measured with tape in centimeter. Udder condition score and udder palpation were performed with goats in the normal standing position. The right hand was used with palm uppermost. This was placed on the udder by reaching the hind legs and the cupped hand was applied to the entire udder to quantify categories 1 to 5.

Birth weight (BW), weaning weight (WW) (45 days in Damascus kids and 90 days in Zaraibi kids) and average daily gain (ADG) during suckling period.

Average daily milk yield was recorded biweekly from kidding till the end of lactation season and milk samples were taken monthly for chemical analysis to determine fat, protein, lactose, solids not fat (SNF) and total solids (TS) by Milko-Scan apparatus.

Data were subjected to statistical analysis as one-way ANOVA, using general linear models procedure adapted by **IBM SPSS Statistics (2013)**. Differences among means were tested according to **Duncan (1955)** whenever the differences were significant.

RESULTS AND DISCUSSION

Udder conformation of Damascus and Zaraibi does are shown in Table (1). The udder conformation of Damascus does revealed that; udder circumference ranged from 16 to 57 cm with average 30.95 ± 0.46 cm, external udder length ranged from 11 to 38 cm with average 23.22 ± 0.36 cm, internal udder length ranged from 5 to 24 cm with average 12.35 ± 0.23 cm, udder condition score ranged from 1 to 5 with average 3.46 ± 0.07 and teat length ranged from 1.50 to 4.75 cm with average 3.10 ± 0.04 cm. The coefficient of variances of udder circumference, external udder length, internal udder length, udder condition score and teat length were 23.55, 24.76, 29.36, 34.22 and 21.39%, respectively.

In the same time, the udder conformation of Zaraibi does revealed that; udder circumference ranged from 12 to 38 cm with average 24.47 ± 0.37 cm, external udder length ranged from 11 to 29 cm with average 18.51 ± 0.29 cm, internal udder length ranged from 4 to 16 cm with average 8.91 ± 0.16 cm, udder condition score ranged from 1 to 5 with average 2.91 ± 0.07 and teat length ranged from 1.75 to 4.25 cm with average 2.77 ± 0.04 cm. The coefficient of variances of udder circumference, external udder length, internal udder length, udder condition score and teat length were 23.33, 23.72, 27.43, 38.11 and 19.82%, respectively. Udder size has a strong and significant effect on milk yield (Mavrogenis *et al.*, 1989), which makes it an important factor in the machine milk ability of dairy breeds. The udder circumference, width and height have been identified as traits which could replace the udder volume measurement because they are easy to measure and have high repeat abilities (Martinez *et al.*, 2011).

The effect of udder circumference (cm) of Damascus and Zaraibi does on milk yield and kids' growth until weaning presented in Table (2). Milk yield of both Damascus and Zaraibi does increased significantly ($P < 0.05$) with increasing udder circumference ($r = 0.660^{**}$ and 0.425^{**} , respectively). While, the contents of fat, protein, lactose, solids not fat and total solids in milk of Damascus does decreased significantly ($P < 0.05$) with increasing udder

circumference ($r = -0.164^{**}$, -0.186^{**} , -0.211^{**} , -0.233^{**} and 0.183^{**} , respectively), the contents of fat, protein, lactose, solids not fat and total solids in milk of Zaraibi does increased significantly ($P < 0.05$) with increasing udder circumference ($r = 0.386^{**}$, 0.499^{**} , 0.393^{**} , 0.646^{**} and 0.561^{**} , respectively).

Meanwhile, weaning weight and growth rate till weaning increased significantly ($P < 0.05$) with increasing udder circumference of both Damascus and Zaraibi does ($r = 0.145^*$, 0.141^* , 0.158^* and 0.156^* , respectively). These results might be due to udder role on increasing milk yield. The correlations between milk yield of Damascus and Zaraibi does and weaning weight and growth rate till weaning of their kids were 0.214^{**} , 0.189^{**} , 0.196^{**} and 0.172^{**} , respectively. These results agree with those obtained by Ugarte and Gabina (2004) who reported that udder characteristics have strong effect on milk yield and composition of sheep. Akporhwarho (2012) found a significant and high positive phenotypic correlation ($P < 0.05$) between udder and teat traits. Regression analysis revealed that udder circumference (UC) was the most important single measurement accounted for over 22 % of variation of partial daily milk yield (PDM) in West African Dwarf goat.

Results in Table (3) revealed that milk yield of both Damascus and Zaraibi does increased significantly ($P < 0.05$) with increasing external udder length ($r = 0.579^{**}$ and 0.446^{**} , respectively). The contents of fat, protein, lactose, solids not fat and total solids in milk of Damascus does decreased significantly ($P < 0.05$) with increasing external udder length. The high significant negative correlations exist between external udder length and the contents of fat, protein, lactose, solids not fat and total solids in Damascus were -0.240^{**} , -0.322^{**} , -0.197^{**} , -0.324^{**} and -0.337^{**} , respectively. However, the contents of fat, protein, lactose, solids not fat and total solids in milk of Zaraibi does increased significantly ($P < 0.05$) with increasing external udder length. The high significant positive correlations exist between external udder length and the contents of fat, protein, lactose, solids not fat and total solids were 0.252^{**} , 0.411^{**} , 0.317^{**} , 0.531^{**} and

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0.424**, respectively. Moreover, the weaning weight and growth rate till weaning of Damascus and Zaraibi kids did not significantly affected by the external udder length. This result agree with those obtained by **Amao *et al.* (2003)** on Red Skoto Goat, who reported

significant correlations between udder traits UL, UW, UC, TL, TW, TC, and UV. The udder characteristics have strong effects on milk yield and composition of sheep (**Ugarte and Gabina, 2004**).

Table 1: Udder measurements and conformation of Damascus and Zaraibi does.

Item	Udder measurements and conformation				
	Minimum	Maximum	Mean	SE	CV%
Damascus					
Udder circumference (cm)	16.00	57.00	30.95	0.46	23.55
External udder length (cm)	11.00	38.00	23.22	0.36	24.76
Internal udder length (cm)	5.00	24.00	12.35	0.23	29.36
Udder condition score	1.00	5.00	3.46	0.07	34.22
Teat length (cm)	1.50	4.75	3.10	0.04	21.39
Zaraibi					
Udder circumference (cm)	12.00	38.00	24.47	0.37	23.33
External udder length (cm)	11.00	29.00	18.51	0.29	23.72
Internal udder length (cm)	4.00	16.00	8.91	0.16	27.43
Udder condition score	1.00	5.00	2.91	0.07	38.11
Teat length (cm)	1.75	4.25	2.77	0.04	19.82

Table 2: Effect of udder circumference (cm) on reproductive performance and milk yield and composition of Damascus and Zaraibi goats.

Item	Udder circumference (cm)					SEM
	11-20	21-30	31-40	41-50	51-60	
Damascus						
Milk yield (kg/day)	0.76 ^c	1.40 ^c	2.46 ^b	2.76 ^b	3.43 ^a	0.06
Fat %	4.95 ^a	4.60 ^{ab}	4.34 ^{ab}	4.30 ^{ab}	4.20 ^b	0.05
Protein %	3.24 ^a	2.77 ^{ab}	2.70 ^{ab}	2.68 ^{ab}	2.32 ^b	0.05
Lactose %	4.55 ^a	4.31 ^{ab}	4.19 ^b	4.09 ^b	4.04 ^b	0.03
SNF %	8.44 ^a	7.75 ^{ab}	7.56 ^{ab}	7.41 ^{ab}	7.03 ^b	0.06
TS %	13.39 ^a	12.35 ^{ab}	11.90 ^{ab}	11.71 ^{ab}	11.23 ^b	0.10
Ash %	0.65 ^a	0.67 ^a	0.67 ^a	0.64 ^a	0.67 ^a	0.01
Birth weight (kg)	4.00 ^a	4.00 ^a	4.02 ^a	4.19 ^a	4.28 ^a	0.04
Weaning weight (kg)	15.14 ^b	15.50 ^{ab}	15.56 ^{ab}	15.65 ^{ab}	16.67 ^a	0.09
Growth rate till weaning (g/day)	247.57 ^b	251.35 ^b	250.61 ^b	258.33 ^b	281.48 ^a	1.66
Zaraibi						
Milk yield (kg/day)	1.46 ^b	1.97 ^a	2.07 ^a			0.05
Fat %	4.07 ^b	4.43 ^b	4.91 ^a			0.08
Protein %	2.14 ^c	2.64 ^b	3.28 ^a			0.07
Lactose %	4.02 ^c	4.23 ^b	4.52 ^a			0.04
SNF %	6.86 ^c	7.54 ^b	8.42 ^a			0.08
TS %	10.93 ^c	11.96 ^b	13.33 ^a			0.14
Ash %	0.70 ^a	0.67 ^b	0.62 ^c			0.01
Birth weight (kg)	3.38 ^a	3.58 ^a	3.81 ^a			0.08
Weaning weight (kg)	17.33 ^b	18.55 ^{ab}	19.60 ^a			0.38
Growth rate till weaning (g/day)	155.00 ^b	166.26 ^{ab}	175.40 ^a			3.43

a, b, c: Means in the same row with different superscripts differ significantly at 5% level.

Table 3: Effect of external udder length (cm) on reproductive performance and milk yield and composition of Damascus and Zaraibi goats.

Item	External udder length (cm)			SEM
	11-20	21-30	31-40	
Damascus				
Milk yield (kg/day)	1.20 ^b	2.24 ^a	2.51 ^a	0.06
Fat %	4.66 ^a	4.22 ^b	4.21 ^b	0.05
Protein %	3.01 ^a	2.34 ^b	2.46 ^b	0.05
Lactose %	4.27 ^a	4.10 ^b	4.13a ^b	0.03
SNF %	7.92 ^a	7.11 ^b	7.27 ^b	0.06
TS %	12.57 ^a	11.34 ^b	11.48 ^b	0.10
Ash %	0.64 ^a	0.67 ^a	0.68 ^a	0.01
Birth weight (kg)	4.02 ^a	4.12 ^a	4.24 ^a	0.04
Weaning weight (kg)	15.48 ^a	15.28 ^a	15.24 ^a	0.09
Growth rate till weaning (g/day)	254.71 ^a	248.06 ^a	244.44 ^a	1.66
Zaraibi				
Milk yield (kg/day)	1.72 ^b	2.03 ^a		0.05
Fat %	4.28 ^b	4.60 ^a		0.08
Protein %	2.43 ^b	2.89 ^a		0.07
Lactose %	4.13 ^b	4.34 ^a		0.04
SNF %	7.25 ^b	7.87 ^a		0.08
TS %	11.52 ^b	12.47 ^a		0.14
Ash %	0.69 ^a	0.64 ^b		0.01
Birth weight (kg)	3.50 ^a	3.66 ^a		0.08
Weaning weight (kg)	18.18 ^a	18.80 ^a		0.38
Growth rate till weaning (g/day)	163.05 ^a	168.24 ^a		3.43

Values in percentages or means. Values with different letters (a, b) in the same row differ significantly ($P < 0.05$)

The effect of internal udder length (cm) of Damascus and Zaraibi does on milk yield and kids' growth until weaning revealed similar trend to external udder length as presented in Table (4). Milk yield of both Damascus and Zaraibi does increased significantly ($P < 0.05$) with increasing internal udder length ($r = 0.580^{**}$ and 0.423^{**} , respectively). The contents of fat, protein, lactose, solids not fat and total solids in milk of Damascus does decreased significantly ($P < 0.05$) with increasing internal udder length and showed high significant negative correlations in between (-0.130^* , -0.168^* , -0.142^* , -0.184^{**} and -0.188^{**} , respectively). Oppositely, these contents had significantly increased ($P < 0.05$) with increasing internal udder length of Zaraibi does, thus estimates of comparable correlations were 0.229^{**} , 0.314^{**} , 0.295^{**} , 0.419^{**} and 0.351^{**} , respectively. Moreover, the weaning weight and growth rate until weaning of Damascus and Zaraibi kids did not significantly affected by the internal udder length. These

results agree with those obtained by **Amao et al. (2003)** who reported significant correlations between udder traits UL, UW, UC, TL, TW, TC, and UVc. in Red Skoto Goat. The udder characteristics have strong effect on milk yield and composition of sheep (**Ugarte and Gabina, 2004**).

As shown in Table (5) milk yield of Damascus and Zaraibi does increased significantly ($P < 0.05$) with increasing udder condition score ($r = 0.610^{**}$ and 0.412^{**} , respectively). Moreover, the percentage of fat, protein, solids not fat and total solids in milk decreased significantly ($P < 0.05$) with increasing udder condition of Damascus does with score up to 4 ($r = -0.170^*$, -0.178^* , -0.145^* and -0.166^* , respectively), while lactose was nearly similar ($r = 0.058$). Zaraibi does oppositely showed that percentages of fat, protein, lactose, solids not fat and total solids in milk had decreased significantly ($P < 0.05$) with increasing udder condition score ($R = 0.448^{**}$, 0.380^{**} , 0.480^{**} , 0.537^{**} and 0.538^{**} , respectively).

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Weaning weight and growth rate of Damascus kids did not significantly affected by udder condition score, while, they increased significantly ($P < 0.05$) with increasing udder condition score with Zaraibi kids ($r = 0.173^{**}$ and 0.165^* , respectively) especially comparable to the poorest score (1). This result might be attributed to that Damascus does able to maintain milk production level with various udder scores while Zaraibi does showed 15% increase in milk yield with scores 3-5 than 1-2. Moreover, there is high positive correlation between milk yield of Zaraibi does and weaning weight and growth rate until weaning of their kids ($r = 0.196^{**}$ and 0.172^{**} , respectively). These results agree with **Amao *et al.* (2003)** who reported, in Red Skoto Goat, significant correlations between udder traits UL, UW, UC, TL, TW, TC, UV, etc. and milk yield. **Keskin *et al.* (2005)** reported positive effects of UC and UBH on DMY in their study on the

relationships between several udder traits (UBH, UD, UC, LTC, RTC, AND TA) and DMY of Akkeci Goat, by using Path Analysis and expectably significant positive correlations of DMY with UD, UC, LTC, RTC, and TA ($P < 0.01$).

Effect of Teat length of Damascus and Zaraibi does on milk yield and kids' growth until weaning shown in Table (6). Milk yield of Damascus and Zaraibi does increased significantly ($P < 0.05$) with increasing teat length ($r = 0.364^{**}$ and 0.174^* , respectively). In Damascus does, milk contents of protein increased significantly ($P < 0.05$), however, the percentage of lactose, solids not fat and total solids decreased significantly ($P < 0.05$) with increasing teat length. While, in milk of Zaraibi does, the contents of protein, solids not fat and total solids increased significantly ($P < 0.05$) with increasing teat length.

Table 4: Effect of internal udder length (cm) on milk yield and reproductive performance of Damascus and Zaraibi goats.

Item	Internal udder length (cm)			SEM
	1-10	11-20	21-30	
Damascus				
Milk yield (kg/day)	1.26 ^c	2.21 ^b	3.23 ^a	0.06
Fat %	4.47 ^a	4.33 ^{a^b}	4.14 ^b	0.05
Protein %	2.83 ^a	2.45 ^b	3.01 ^a	0.05
Lactose %	4.20 ^a	4.13 ^a	4.30 ^a	0.03
SNF %	7.67 ^{a^b}	7.25 ^b	7.99 ^a	0.06
TS %	12.14 ^a	11.58 ^b	12.13 ^a	0.10
Ash %	0.63 ^b	0.68 ^a	0.68 ^a	0.01
Birth weight (kg)	3.96 ^a	4.17 ^a	4.00 ^a	0.04
Weaning weight (kg)	15.33 ^a	15.38 ^a	14.60 ^a	0.09
Growth rate till weaning (g/day)	252.74 ^a	249.22 ^a	235.56 ^a	1.66
Zaraibi				
Milk yield (kg/day)	1.69 ^b	2.20 ^a		0.05
Fat %	4.25 ^b	4.75 ^a		0.08
Protein %	2.47 ^b	2.95 ^a		0.07
Lactose %	4.16 ^b	4.33 ^a		0.04
SNF %	7.31 ^b	7.92 ^a		0.08
TS %	11.57 ^b	12.67 ^a		0.14
Ash %	0.69 ^a	0.64 ^b		0.01
Birth weight (kg)	3.59 ^a	3.46 ^a		0.08
Weaning weight (kg)	18.58 ^a	17.84 ^a		0.38
Growth rate till weaning (g/day)	166.54 ^a	159.87 ^a		3.43

Values in percentages or means. Values with different letters (a, b, c) in the same row differ significantly ($P < 0.05$)

The weaning weight and growth rate until weaning of Damascus kids did not significantly affected by the teat length, while, they increased significantly for Zaraibi kids ($P < 0.05$) with increasing teat length ($r = 0.219^{**}$ and 0.212^{**} , respectively). The relatively higher milk yield of Damascus could explain its ability to maintain kids' growth rates. These results agree with what stated by **Mavrogenis *et al.* (1989)**, in a study on Damascus goat, about the high heritable of teat length (TL), diameter (TD) on 90-d and total milk production and the positive moderately high correlations among udder traits.

Prediction of milk yield from body conformation

The linear prediction equations of milk yield for Damascus does from udder confirmation were:

1- Udder circumference (UC): Milk yield = $- 0.777 + 0.086UC$

- 2- External udder length (EUL): Milk yield = $- 0.428 + 0.100EUL$
- 3- Internal udder length (IUL): Milk yield = $- 0.061 + 0.160IUL$
- 4- Udder condition score (UCS): Milk yield = $1.834 + 0.018UCS$
- 5- Teat length (TL): Milk yield = $0.291 + 0.523TL$

The linear prediction equations of milk yield for Zaraibi does from udder conformation were:

- 1- Udder circumference (UC): Milk yield = $0.757 + 0.045UC$
- 2- External udder length (EUL): Milk yield = $0.722 + 0.060EUL$
- 3- Internal udder length (IUL): Milk yield = $0.919 + 0.099IUL$
- 4- Udder condition score (UCS): Milk yield = $1.754 + 0.028UCS$
- 5- Teat length (TL): Milk yield = $2.031 - 0.063TL$

Table 5: Effect of udder condition score on milk yield and reproductive performance of Damascus and Zaraibi goats.

Item	Udder condition score					SEM
	1	2	3	4	5	
Damascus						
Milk yield (kg/day)	1.64 ^b	1.81 ^{ab}	1.84 ^{ab}	1.92 ^{ab}	2.06 ^a	0.06
Fat %	4.65 ^a	4.30 ^b	4.51 ^{ab}	4.24 ^b	4.32 ^b	0.05
Protein %	3.37 ^a	2.58 ^b	2.55 ^b	2.41 ^b	2.64 ^b	0.05
Lactose %	4.06 ^a	4.24 ^a	4.13 ^a	4.11 ^a	4.21 ^a	0.03
SNF %	7.99 ^a	7.47 ^{ab}	7.35 ^b	7.19 ^b	7.52 ^{ab}	0.06
TS %	12.63 ^a	11.77 ^b	11.86 ^{ab}	11.44 ^b	11.84 ^{ab}	0.10
Ash %	0.55 ^b	0.64 ^a	0.67 ^a	0.67 ^a	0.67 ^a	0.01
Birth weight (kg)	4.12 ^a	3.87 ^a	4.14 ^a	4.07 ^a	4.21 ^a	0.04
Weaning weight (kg)	15.75 ^a	15.02 ^a	15.25 ^a	15.45 ^a	15.62 ^a	0.09
Growth rate till weaning (g/day)	258.33 ^a	247.80 ^a	246.90 ^a	252.72 ^a	253.52 ^a	1.66
Zaraibi						
Milk yield (kg/day)	1.58 ^b	1.89 ^{ab}	2.00 ^a	2.02 ^a	2.02 ^a	0.05
Fat %	5.53 ^a	4.77 ^b	4.22 ^c	4.08 ^c	4.04 ^c	0.08
Protein %	3.34 ^a	2.91 ^{ab}	2.52 ^{bc}	2.36 ^c	2.24 ^c	0.07
Lactose %	4.44 ^{ab}	4.50 ^a	4.12 ^c	4.25 ^{bc}	3.90 ^d	0.04
SNF %	8.41 ^a	8.05 ^a	7.31 ^b	7.30 ^b	6.84 ^c	0.08
TS %	13.94 ^a	12.81 ^b	11.53 ^c	11.38 ^c	10.89 ^c	0.14
Ash %	0.63 ^b	0.64 ^b	0.67 ^a	0.70 ^a	0.70 ^a	0.01
Birth weight (kg)	3.00 ^b	3.43 ^{ab}	3.56 ^{ab}	3.69 ^a	4.00 ^a	0.08
Weaning weight (kg)	15.25 ^b	17.58 ^{ab}	19.06 ^a	18.81 ^a	19.58 ^a	0.38
Growth rate till weaning (g/day)	136.11 ^b	157.25 ^{ab}	172.22 ^a	168.09 ^a	173.15 ^a	3.43

Values in percentages or means. Values with different letters (a, b, c) in the same row differ significantly ($P < 0.05$)

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Table 6: Effect of Teat length (cm) on milk yield and reproductive performance of Damascus and Zaraibi goats.

Item	Teat length (cm)				SEM
	1-<2	2-<3	3-<4	4-5	
Damascus					
Milk yield (kg/day)	1.35 ^c	1.72 ^c	2.31 ^b	2.82 ^a	0.06
Fat %	4.42 ^a	4.40 ^a	4.31 ^a	4.38 ^a	0.05
Protein %	2.45 ^b	2.60 ^a	2.76 ^a	2.81 ^a	0.05
Lactose %	4.26 ^a	4.21 ^a	4.09 ^a	3.80 ^b	0.03
SNF %	7.36 ^a	7.47 ^a	7.52 ^a	7.27 ^b	0.06
TS %	11.78 ^a	11.87 ^a	11.82 ^a	11.65 ^b	0.10
Ash %	0.65 ^a	0.66 ^a	0.67 ^a	0.66 ^a	0.01
Birth weight (kg)	3.80 ^b	4.02 ^{ab}	4.32 ^a	4.18 ^a	0.04
Weaning weight (kg)	15.06 ^a	15.44 ^a	15.37 ^a	15.09 ^a	0.09
Growth rate till weaning (g/day)	250.35 ^a	253.70 ^a	245.62 ^a	242.42 ^a	1.66
Zaraibi					
Milk yield (kg/day)	1.80 ^b	1.83 ^b	2.06 ^a		0.05
Fat %	4.32 ^a	4.39 ^a	4.60 ^a		0.08
Protein %	2.37 ^b	2.63 ^{ab}	2.82 ^a		0.07
Lactose %	4.27 ^a	4.19 ^a	4.31 ^a		0.04
SNF %	7.32 ^b	7.50 ^{ab}	7.75 ^a		0.08
TS %	11.64 ^b	11.89 ^{ab}	12.36 ^a		0.14
Ash %	0.69 ^a	0.68 ^a	0.63 ^b		0.01
Birth weight (kg)	3.11 ^b	3.57 ^{ab}	3.92 ^a		0.08
Weaning weight (kg)	16.74 ^b	18.21 ^b	20.50 ^a		0.38
Growth rate till weaning (g/day)	151.45 ^b	162.59 ^b	184.21 ^a		3.43

Values in percentages or means. Values with different letters (a, b,c) in the same row differ significantly (P < 0.05)

From these results it could be concluded that udder circumference, external and internal udder length, udder condition score and teat length showed significant effect on milk yield and composition of Damascus and Zaraibi does. Udder circumference revealed significant effect on weaning weight and growth rate of Damascus and Zaraibi kids, while udder condition score and teat length had significant effect on weaning weight and growth rate of Zaraibi kids. The results allow possibility to predict milk yield of Damascus and Zaraibi does from the linear regression of udder confirmation.

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RELATIONSHIP BETWEEN UDDER CHARACTERISTICS AND EACH OF REPRODUCTIVE PERFORMANCE AND MILK PRODUCTION AND MILK COMPOSITION IN ZARAIBI AND DAMASCUS DAIRY GOATS

الملخص العربي

العلاقة بين صفات الضرع الظاهرية والأداء التناسلي ونتاج اللبن وتركيبه في الماعز الدمشقي والزرايبي الحلابة

محمود السيد الجندي، حافصة فهمي حسين يوسف، عصام سيف النصر، هبة عبدالرحيم الصنفاوي، فاطمة السيد سبع
معهد بحوث الانتاج الحيواني، مركز البحوث الزراعية، الدقي، الجيزة 0

معنويا في لبن الماعز الدمشقي معنويا مع درجة تقييم الضرع حتى 4، بينما يقل محتوى الدهن والبروتين واللاكتوز والجوامد الصلبة اللادهنية والجوامد الصلبة الكلية في لبن الماعز الزرايبي مع زيادة درجة تقييم الضرع 0 زيادة وزن الفطام ومعدل النمو حتى الفطام في الماعز الزرايبي مع زيادة درجة تقييم الضرع 0

• زيادة انتاج اللبن معنويا في الماعز الدمشقي والزرايبي مع زيادة طول الحلمة 0 زيادة محتوى البروتين معنويا في لبن الماعز الدمشقي، بينما يقل معنويا محتوى اللاكتوز والجوامد الصلبة اللادهنية والجوامد الصلبة الكلية مع زيادة طول الحلمة 0 لم يتغير محتوى البروتين والجوامد الصلبة اللادهنية والجوامد الصلبة الكلية في لبن الماعز الزرايبي مع زيادة طول الحلمة 0 زيادة وزن الفطام ومعدل النمو حتى الفطام في الماعز الزرايبي مع زيادة طول الحلمة 0 نستخلص من هذه الدراسة أن محيط الضرع، طول الضرع الخارجي و الداخلي، درجة تقييم الضرع و طول الحلمة ذو تأثير معنوي على انتاج اللبن وتركيبه في الماعز الدمشقي والزرايبي 0 كما أظهر محيط الضرع تأثير معنوي على وزن الفطام ومعدل النمو حتى الفطام في الماعز الدمشقي والزرايبي، بينما طول الحلمة له تأثير معنوي على وزن الفطام ومعدل النمو حتى الفطام في الماعز الزرايبي 0 كما يمكن التنبؤ بإنتاج اللبن في الماعز الدمشقي والزرايبي من معادلات الانحدار الخطى لمقاييس الضرع 0

استخدم في هذه الدراسة عدد 32 عنزة دمشقي وعدد 41 عنزة زرايبي لدراسة تأثير قياسات الضرع على التناسل ونتاج اللبن وتركيبه 0

وكانت نتائج الدراسة ما يلي:

• زيادة انتاج اللبن معنويا في الماعز الدمشقي والزرايبي مع زيادة محيط الضرع 0 نقص محتوى الدهن والبروتين واللاكتوز والجوامد الصلبة اللادهنية والجوامد الصلبة الكلية معنويا في لبن الماعز الدمشقي مع زيادة محيط الضرع، بينما تزداد معنويا في لبن الماعز الزرايبي مع زيادة محيط الضرع 0 زيادة وزن الفطام ومعدل النمو حتى الفطام معنويا مع زيادة محيط الضرع في الماعز الدمشقي والزرايبي 0

• زيادة انتاج اللبن معنويا في الماعز الدمشقي والزرايبي مع زيادة طول الضرع الخارجي والداخلي 0 نقص محتوى الدهن والبروتين واللاكتوز والجوامد الصلبة اللادهنية والجوامد الصلبة الكلية معنويا في لبن الماعز الدمشقي مع زيادة طول الضرع الخارجي والداخلي، بينما تزداد معنويا في لبن الماعز الزرايبي مع زيادة طول الضرع الخارجي والداخلي 0 وزن الفطام ومعدل النمو حتى الفطام في الماعز الدمشقي والزرايبي لم يتأثرا معنويا بطول الضرع الخارجي والداخلي 0

• زيادة انتاج اللبن معنويا في الماعز الدمشقي والزرايبي مع زيادة درجة تقييم الضرع 0 نقص محتوى الدهن والبروتين والجوامد الصلبة اللادهنية والجوامد الصلبة الكلية