

## GENETIC AND PHENOTYPIC PARAMETERS OF NURSING BEHAVIOUR IN DAMASCUS GOATS

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**ABSTRACT:** *Twelve Damascus does and seventeen kids were observed and video recorded for six days/doe (8640 minutes) using digital video time-lapse recorder (Panasonic WJ-HD100) in the Animal Behaviour Unit, Animal Production Department, Faculty of Agriculture, Menufiya, University, Shebin El-Kom, Egypt.*

*The overall mean time interval from kid successful standing until the first attempt to suckling (FAS), from standing to suckling (SS) and from kidding to suckling (KS) were  $11.7 \pm 2.7$ ,  $21.0 \pm 3.6$  and  $56.2 \pm 6.1$  minutes, respectively. The effect of parity, age and birth weight of kids on FAS, SS and KS were significant. However litter size affected KS, Kidding season affected FAS and SS as well as sex of kids affected FAS and KS significantly.*

*The overall mean of nursing frequency in the present study was  $36.4 \pm 1.5$  bouts throughout the whole day. On the other hand, the time spent nursing were  $44.1 \pm 2.3$  minutes per day. Factors affecting nursing frequency and duration such as the effect of does body weight (kg), Parity age of does, Litter size, kidding season were also studied. The overall means for frequency and duration of joint nursing in Damascus does were  $5.3 \pm 0.5$  bouts and  $6.5 \pm 0.7$  minutes per day, respectively. The effect of parity, age of does and kidding season on joint nursing frequency and duration were significant and/or highly significant.*

*Heritability estimates of nursing frequency and nursing duration were 0.24 and 0.54 respectively, while repeatability estimates for nursing frequency and nursing duration were 0.81 and 0.90 respectively. Nursing frequency correlated highly significant with eating frequency ( $r_p = 0.39$ ) and ruminating frequency ( $r_p = 0.39$ ).*

*On the other hand, nursing duration correlated negative and highly significant with lying duration ( $r_p = -0.48$ ), and positive with eating frequency ( $r_p = 0.48$ ), ruminating frequency ( $r_p = 0.31$ ) and nursing frequency ( $r_p = 0.50$ ).*

**Key words:** *Damascus Goats, heritability, repeatability, nursing behavior, suckling behavior, daily activities.*

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### INTRODUCTION

Damascus goats are considered to be the most important goat breed in the Arab countries due to their high milk and meat yield. The average litter size and kidding rates have been recorded to be 1.87 and 86–94%,

respectively, while the daily body weight gains from birth to weaning for male and female kids are 174 and 157g, respectively. Mean milk productions during lactation periods of 281–336 days have been recorded to be 2.5kg per day (Al Khouri, 1996).

Recently a number of researchers have concluded that using behavioral activities are good indicators in evaluating animal welfare and performances (El-kaschab, *et al*, 2009).

Maternal behaviors are often of very great importance to the welfare of the kid and the economics of the farming enterprise; as inadequate maternal behavior results in high prenatal mortalities and great economical losses. Especially in extensive production systems, it is essential that the dam is able to successfully rear her offspring without human intervention. Also in more intensive production systems, there is a trend towards larger production units with less staff and, consequently, the stockperson will have less time to spend supervising each individual animal (Grandinson, 2005). After birth, kids must nurse their mothers as soon as possible in order to receive the vitally important colostrums which is only available for about 24 hours after Kidding.

Although nursing behavior in goats is an important objective in selection criteria, the potential for genetic improvement is largely dependent on the genetic and phenotypic parameters of this trait upon which selection may be applied. Moreover, environmental influences can be controlled and corrected to permit more accurate identification of genetic differences between individual goats. This experiment aimed to study the effects of some genetic and non-genetic factors on behavior of affecting does nurturing behavior and kids suckling.

## **MATERIALS AND METHODS**

Thirteen Damascus does and seventeen kids were observed during 264 days in the Animal Behavior Unit, Animal Production Department, Faculty of Agriculture, Menufiya, University, Shebin El-Kom, Egypt. The study was started from August 2007 to July 2008. does age ranged from 4-6 years (2<sup>nd</sup> to 4<sup>th</sup> parity) with average body weight of 44.85 kg. Natural mating was used during the period from applied throughout september and november month.

Concentrate mixture (14% crude protein was offered to does once daily at 08:30. All does were fed concentrate mixture according to their maintenance and reproductive requirements. Green fodder according to year seasons and roughage were offered *ad lib*, two times daily during the period from 09:00 and 16: 30. at the feed manger (Table1).

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**Table (1): Green fodder and Roughage available throughout the year.**

Season	Green fodder and roughage	Concentrate mixture g/day head
August and September	Green maize	500
October and November	Straw and hay	500
December to May	Egyptian clover ( <i>Trifolium Alexandrinum</i> ,; berseem) and straw	800
June and July	Berseem hay and straw	800

Clean water was supplied ad-lib in buckets in the kidding pens. The buckets were cleaned daily.

**Behavioral observation**

Were kept in loose housing pens (3m×3m) as observation pens with cemented floor, bedded with rice straw. Behavioral activities of does and/or kids were observed and video recorded for six days/doe (6 days X 24 hr X 60 min = 8640 minutes) using digital video time-lapse recorder (Panasonic WJ-HD100) and the output recording from digital video camera (Panasonic WV-CS850) supplied with control unit (Panasonic WV-CU161). Normally, natural light entered the stable through windows during the daylight. At night, artificial light (at the minimum level of lightness) were necessary to enable observations to be recorded.

**Timing of incidence of the following events was recorded:**

- Daily activities of does and kids.
- Duration from kids standing up until the first attempt to suckle (FAS).
- Duration from the first attempt of suckling until the kids starting suckling his/her mother (SS).
- Duration from kids standing up until starting suckling (KS).
- Frequency and duration of nursing behavior.
- Frequency and duration of joint nursing.
- Frequency and duration of suckling.

**Statistical analysis**

From continuous observation, the frequency and duration of behavioral activities were analyzed by analysis of variance (ANOVA) using the compare means procedure of SPSS (Statistical Package for Social Science) Program version 16 (2007). Furthermore, the data were analyzed using Linear Model Procedures (GLM) with the following model:

$$Y_{ijklmnop} = \mu + A_i + B_j + L_k + P_l + X_m + S_n + W_o + e_{ijklmnop}$$

Where:

$\mu$  = the overall mean

$A_i$  = the effect of  $i^{th}$  age of does ( $i=1, 2, 3$ )

1 = 4 years

2 = 5 years

3 = 6 years

$B_j$  = the effect of  $i^{th}$  body weight of does ( $i=1, 2, 3$ )

1 = 30-40 kg (light)

2 = 41-50 kg (medium)

3 =  $\geq 51$  kg (heavy)

$L_k$  = the effect of  $j^{th}$  litter size of does ( $j=1, 2, 3$ )

1 = single,

2 = twins,

$P_l$  = the effect of  $k^{th}$  parity of does ( $k=1, 2, 3$ )

1 = second parity,

2 = third parity,

3 = fourth parity,

$X_m$  = the effect of  $l^{th}$  sex of born kids ( $l=1, 2$ )

1 = male,

2 = female kid.

$S_n$  = the effect of  $m^{th}$  season of kidding ( $m=1, 2$ )

1 = winter (21 December to 20 March),

2 = spring (21 March to 20 June),

$W_o$  = the effect of  $n^{th}$  kids' birth weight classes ( $n=1, 2, 3$ )

1 = 2 – 2.5 kg (light);

2 = 2.6 – 3.0 kg (medium);

3 =  $> 3.0$  kg (heavy).

$e_{ijklmnop}$  = the effect of random error.

Genetic parameters were estimated by Harvey program 1990.

## RESULTS AND DISCUSSION

### Suckling behavior of kids

The overall mean time interval from kid successful standing until the first attempt to suckling (FAS), from standing to suckling (SS) and from kidding to suckling (KS) were  $11.7 \pm 2.7$ ,  $21.0 \pm 3.6$  and  $56.2 \pm 6.1$  minutes, respectively (Table 2). Values of KS herein were to some extent shorter than those reported for sheep by Dwyer (2003) who observed that average time between births to lamb sucks were 68.02 minutes.

On the other hand, these estimates were relatively prolonged than those reported by Sambraus and Wittman (1989) for goats; Salama (1992) for sheep and Konyali *et al.*, (2007) for goats; who reported KS time interval ranged from 42 to 54.4 minutes.

The effect of body weight of does on FAS, SS and KS were not significant (Table 2).

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**Table (2): Least squares means (LSM) ± standard error (SE) for suckling behaviour**

Factors studied	No of kids	First attempt to suckling (FAS, min.)	Standing to suckling (SS, min.)	Kidding to suckling (KS, min.)
Overall mean	17	11.7 ± 2.7	21.0 ± 3.6	56.2 ± 6.1
<b>Body weight (kg) Sig.</b>		NS	NS	NS
Light (30- 40 kg)	4	7.3 ± 5.9	21.3 ± 11.1	48.5 ± 12.0
Medium (41-50 kg)	5	7.2 ± 7.4	13.2 ± 10.3	61.0 ± 11.2
Heavy (>51 kg)	8	14.9 ± 5.2	27.2 ± 7.3	58.7 ± 7.9
<b>Parities Sig.</b>		*	*	*
Second	4	16.5 ± 6.7 <sup>a</sup>	29.2 ± 9.4 <sup>a</sup>	65.0 ± 10.2 <sup>a</sup>
Third	8	17.2 ± 3.9 <sup>a</sup>	27.2 ± 5.4 <sup>a</sup>	61.9 ± 5.9 <sup>a</sup>
Fourth	5	4.4 ± 3.2 <sup>b</sup>	9.8 ± 7.2 <sup>b</sup>	42.8 ± 8.4 <sup>b</sup>
<b>Age of does Sig</b>		*	*	*
Young (4 years)	8	16.4 ± 3.4 <sup>a</sup>	26.9 ± 4.7 <sup>a</sup>	66.7 ± 5.2 <sup>b</sup>
Middle (5 years)	4	16.0 ± 5.6 <sup>a</sup>	28.5 ± 7.7 <sup>a</sup>	61.7 ± 8.4 <sup>b</sup>
Old (6 years)	5	6.2 ± 6.5 <sup>b</sup>	12.0 ± 8.9 <sup>b</sup>	38.8 ± 9.8 <sup>a</sup>
<b>Litter size Sig.</b>		NS	NS	*
Single	7	9.3 ± 5.4	20.1 ± 7.5	51.8 ± 9.9 <sup>a</sup>
First twins	5	12.1 ± 6.2	20.8 ± 8.6	56.3 ± 9.4 <sup>b</sup>
Second twins	5	13.3 ± 6.9	21.9 ± 9.5	59.8 ± 10.4 <sup>b</sup>
<b>Season Sig.</b>		*	*	NS
Winter	10	19.3 ± 5.5 <sup>a</sup>	32.0 ± 12.4 <sup>a</sup>	54.4 ± 8.4
Spring	7	3.7 ± 2.3 <sup>b</sup>	9.5 ± 7.1 <sup>b</sup>	53.4 ± 7.8
<b>Sex of kids Sig.</b>		*	NS	*
Male	10	8.4 ± 3.5 <sup>a</sup>	18.1 ± 4.9	50.4 ± 5.3 <sup>a</sup>
Female	7	14.8 ± 4.9 <sup>b</sup>	21.7 ± 6.9	57.4 ± 7.5 <sup>b</sup>
<b>kids birth weigh (kg) Sig.</b>		*	*	*
Light (2- 2.5 kg)	6	17.1 ± 4.5 <sup>a</sup>	27.4 ± 7.6 <sup>a</sup>	57.7 ± 8.4 <sup>a</sup>
Medium ( 2.6- 3.0 kg)	4	12.2 ± 3.4 <sup>a</sup>	20.4 ± 6.2 <sup>b</sup>	57.1 ± 6.9 <sup>a</sup>
Heavy ( >3 kg)	7	5.2 ± 3.4 <sup>b</sup>	16.1 ± 5.2 <sup>b</sup>	46.8 ± 12.3 <sup>b</sup>

\*\* = Highly significant (P<0.01) \* = significant (P<0.05) NS = Not significant

On the other hand, parity effect on FAS, SS and KS were significant (P≤ 0.05). Differences between second (16.5 ± 6.7 min) and third parity (17.2 ± 3.9 min.) on FAS were not significant, while it was significant with fourth parity (4.4 ± 3.2 min). However, differences between second parity does (29.2 ± 9.4 min) and third parity does (27.2 ± 5.4 min.) on SS were not significant, while it

was significant with that of the fourth parity ( $9.8 \pm 7.2$  min.). Furthermore, kids born from fourth parity. Fourth parity does took shorter KS time interval ( $42.8 \pm 8.4$  min), than kids born from second and third parity does ( $65.0 \pm 10.2$  and  $61.9 \pm 5.9$  min., respectively. These results were comparable to those reported by Dwyer (2003) who found that lambs born to first parity ewes were slower to stand and suckle than lambs born to experienced ewes. The differences between second and third parity on KS were not significant, while it was significant with that at the fourth parity.

The effect of age of does on FAS, SS and KS were significant ( $P < 0.05$ ). Means of FAS for young, middle and old does were  $16.4 \pm 3.4$ ,  $16.0 \pm 5.6$  and  $6.2 \pm 6.5$  min., respectively (Table 2). Also, the differences between young and middle age does were not significant in FAS, SS and KS activities.

The effect of litter size on FAS and SS were not significant, while it was significant on KS activities. Obviously single born kids suckled early (KS= $51.8 \pm 9.9$  min.) than first born twins kids (KS= $56.3 \pm 9.4$  min.) and second born twins kids ( $59.8 \pm 10.4$  min.). These values were shorter than those reported by Manal Abdel-Latif (1995) who found that the intervals from birth till first attempt to suckle (FAS) and first successful suckling (SS) were 39.8 min and 68.54 min for singles, respectively. While, it was 79.53 min and 135.25 min for twins in goats.

The effects of season on FAS and SS activities were significant, while there were no significant effect on KS activities. Winter born kids needs more time FAS ( $19.3 \pm 5.5$  min.) and SS ( $32.0 \pm 12.4$  min.) than spring born kids (FAS= $3.7 \pm 2.3$  min).and (SS= $9.5 \pm 7.1$  min.).

Sex of kids affected FAS and KS activities significantly ( $P < 0.05$ ). However there were no significant effect of sex on SS. Males required less FAS time ( $8.4 \pm 3.5$  min.) and less KS time ( $50.4 \pm 5.3$  min.) than Females (FAS=  $14.8 \pm 4.9$  min. and KS= $57.4 \pm 7.5$  min.).

Furthermore, table (2) shows that the effects of birth weight on FAS, SS and KS were significant. It was obvious that lighter weight kids needed more FAS time ( $17.1 \pm 4.5$  min.), SS time ( $27.4 \pm 7.6$  min.) and KS time ( $57.7 \pm 8.4$  min.) than medium and heavy weight kids (Table 2). However, the differences between lighter birth weight kids ( $57.7 \pm 8.4$  min.) and medium weight kids ( $57.1 \pm 6.9$  min.) in KS time were not significant. Moreover, differences in FAS period, between lighter weight kids ( $17.1 \pm 4.5$  min.) and medium weight ones ( $12.2 \pm 3.4$  min.), were not significant.

### **Nursing frequency and nursing duration**

Nursing episode was defined as the period during which a dam nurse without interruption for more than 3 s, regardless of the number of kids that suckle. Rejection was defined as any attempt by a kid to suckle that lasted less than 3 s after its beginning and was interrupted by the dam either moving away or responding aggressively toward the kid (Delgadillo *et al.*, 1997).

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The overall mean of nursing frequency in the present study was  $36.4 \pm 1.5$  bouts throughout the whole day Table (3). These results were less frequent than those reported by Delgadillo *et al.*, (1997) who reported that the number of nursing activities of Creole mother goats were 42 bouts per day. However, Hernandez *et al.*, (2002) arrive at that the number of nursing behavior was 3.3 /2h in Alpine and Saanen Goat breeds.

On the other hand, the time spent nursing were  $44.1 \pm 2.3$  minutes per day (Table 3). These results lasted longer than those reported by Delgadillo *et al.*, (1997) who gave evidence that goats total nursing duration were only 19.3 minutes per day.

These variations among different estimates of nursing duration and frequency may be due to genetics, and/or environmental conditions practiced in different studies.

**Table (3): Least squares means (LSM)  $\pm$  standard error (SE) for nursing frequency and duration in Damascus does.**

Factors studied	No. days	Nursing Frequency (bouts/day)	Nursing duration (minutes/day)
Overall mean	72	$36.4 \pm 1.5$	$44.1 \pm 2.3$
<u>Does body weight (kg) Sig.</u>		*	*
Light (30-40 kg)	30	$30.2 \pm .1^b$	$36.4 \pm 3.1^b$
Medium (41-50 kg)	18	$38.4 \pm 3.2^a$	$39.0 \pm 3.7^b$
Heavy (>51 kg)	24	$41.6 \pm 4.9^a$	$57.3 \pm 4.8^a$
<u>Parities Sig.</u>		**	*
2	18	$31.3 \pm .8^b$	$37..4 \pm 5.5^b$
3	30	$32.8 \pm 3.0^b$	$46.1 \pm 3.4^a$
4	24	$44.3 \pm 3.8^a$	$46.5 \pm 4.4^a$
<u>Does age Sig</u>		*	*
Young (4 years)	36	$33.1 \pm 2.5^b$	$44.8 \pm 2.9^{ab}$
Middle (5 years)	18	$40.3 \pm 2.6^a$	$46.4 \pm 3.1^a$
Old (6 years)	18	$37.7 \pm 4.4^a$	$39.8 \pm 5.1^b$
<u>Litter size Sig.</u>		*	*
Single	42	$28.8 \pm 2.4^b$	$28.5 \pm 2.8^b$
Twins	30	$34.9 \pm 3.1^a$	$59.1 \pm 3.5^a$
<u>Season sig.</u>		**	**
Winter	30	$38.8 \pm 2.4^a$	$54.3 \pm 2.7^a$
Spring	42	$24.9 \pm 2.3^b$	$33.3 \pm 2.6^b$

\*\* = Highly significant (P<0.01) \* = significant (P<0.05) NS = Not significant

## **Factors affecting nursing frequency and duration**

### **Effect of does body weight (kg)**

The effect of body weight of does on nursing frequency and nursing duration were significant ( $P \leq 0.05$ ). Means of nursing frequency for light, medium and heavy body weight were  $30.2 \pm 3.1$ ,  $38.4 \pm 3.2$  and  $44.3 \pm 3.8$  bouts per day, respectively (Table 3). The differences between medium and heavy ones were not significant.

On the other hand, it was found that means of nursing duration for light, medium and heavy body weight were  $36.4 \pm 3.1$ ,  $39.0 \pm 3.7$  and  $57.3 \pm 4.8$  minutes per day, respectively. Differences between light and medium body weight were not significant, while they were significant with heaviest ones. It was obvious that does with heavier body weight nursed their kids more frequently and for a longer time than lighter body weight does.

### **Effect of parities**

Means of nursing frequency for the second, third and fourth parity were  $31.3 \pm 4.8$ ,  $32.8 \pm 3.0$  and  $44.3 \pm 3.8$  bouts per day, respectively (Table 3). The differences between second and third parity were not significant, but was highly significant with fourth parity. Furthermore, it was found that the effect of different parities on nursing duration were significant ( $P \leq 0.05$ ). Means of nursing duration for second, third and fourth parities were  $37.4 \pm 5.5$ ,  $46.4 \pm 3.1$  and  $46.5 \pm 4.4$  minutes per day, respectively.

### **Effect of age of does**

It seems from Table (3) that the effect of age on nursing frequency and nursing duration were significant ( $P \leq 0.05$ ). Means of nursing frequency for 4, 5 and 6 years old does were  $33.1 \pm 2.5$ ,  $40.3 \pm 2.6$  and  $37.7 \pm 4.4$  bouts per day, respectively. The differences between five and six years old were not significant, while it was significant with four years old. Differences between third and fourth parities were not significant, while it was significant with second parity. It was found that nursing duration for four, five and six years old does were  $44.8 \pm 2.9$ ,  $46.4 \pm 3.1$  and  $39.8 \pm 5.1$  minutes per day, respectively. Differences between five and six years old mothers were significant.

### **Effect of litter size**

Does with twins nursed their kids significantly more frequent (Table 3) than that for single ones ( $34.9 \pm 3.1$  vs.  $28.8 \pm 2.4$  bouts per day). Moreover, nursing duration for does with twins and single were  $59.1 \pm 3.5$  and  $28.5 \pm 2.8$  minutes per pay.

### **Effect of season**

Table (3) indicates that the effect of season on nursing frequency and nursing duration were highly significant ( $P \leq 0.01$ ). Does nursed their kids



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more frequent and for a longer time ( $38.8 \pm 2.4$  bouts/day and  $54.3 \pm 2.7$  minutes/day) in winter than in spring ( $24.9 \pm 2.3$  bouts/day and  $33.3 \pm 2.6$  minutes/day). Menegatos *et al.*, (2006) found that nursing duration for summer and spring lambing were  $53.2 \pm 1$  and  $56 \pm 2$  min/ days, respectively.

The increase in nursing frequency and nursing duration in winter may indicate that kids needs more milk in winter than spring.

**Joint nursing**

Joint nursing means that does can nurse two kids at the same time. The overall means for frequency and duration of joint nursing in Damascus does were  $5.3 \pm 0.5$  bouts and  $6.5 \pm 0.7$  minutes per day, respectively (Table 4). These results were longer than those reported by Delgadillo *et al.*, (1997) who stated that frequency and duration of joint nursing in goats were 3 bouts and 1.6 minutes/day, respectively.

The higher estimates of shared nursing in the present study may be due to privilege of Damascus does in mothering ability than the other tested breeds.

Furthermore, it was found that the effect of different parities on frequency and duration of joint nursing were significant ( $P \leq 0.05$ ).

Means of the frequency of joint nursing for second, third and fourth parities were  $4.2 \pm 0.5$ ,  $4.6 \pm 0.9$  and  $7.8 \pm 1.2$  bouts per day, respectively. Differences between the second and the third parity were not significant. However the effect of body weight on frequency and duration of joint nursing were not significant.

**Table (4): Least squares means (LSM)  $\pm$  standard error (SE) for frequency and duration of joint nursing in Damascus does**

Factors studied	No. days	Frequency of joint nursing (bouts/day)	Duration of joint nursing (minutes/day)
Overall mean	27	$5.3 \pm 0.5$	$6.5 \pm 0.7$
<u>Does body weigh</u> Sig.		NS	NS
Light (30 – 40 kg)	6	$4.2 \pm 0.5$	$5.2 \pm 0.9$
Heavy( >51 kg)	21	$5.6 \pm 0.7$	$6.9 \pm 1.0$
<u>Parities</u> Sig.		*	*
Second	6	$4.2 \pm 0.5^b$	$5.2 \pm 0.8^b$
Third	6	$4.6 \pm 0.9^b$	$4.6 \pm 0.9^b$
Fourth	15	$7.8 \pm 1.2^a$	$7.8 \pm 1.2^a$
<u>Age of does</u> Sig		*	*
Young (4 years)	12	$4.0 \pm 0.4^b$	$4.9 \pm 0.6^b$
Middle (5 years)	6	$8.0 \pm 1.1^a$	$7.5 \pm 1.2^a$
Old (6 years)	9	$5.3 \pm 1.2^b$	$8.0 \pm 1.8^a$
<u>Kidding season</u> Sig.		**	**
Winter	24	$5.8 \pm 0.5^a$	$7.2 \pm 0.7^a$
Spring	3	$1.3 \pm 0.3^b$	$1.0 \pm 0.3^b$

\*\* = Highly significant ( $P < 0.01$ ) \* = significant ( $P < 0.05$ ) NS = Not significant

The effect of different parity on joint nursing duration were significant ( $P < 0.05$ ). Differences between second ( $5.2 \pm 0.8$  minutes) and third parity ( $4.6 \pm 0.9$  minutes) were not significant, however it was significant with fourth parity ( $7.8 \pm 1.2$  minutes).

Furthermore, it seems from table (4) that the effect of age on frequency of joint nursing and duration were significant ( $P \leq 0.05$ ). Differences between the four ( $4.0 \pm 0.4$  bouts) and six ( $5.3 \pm 1.2$  bouts) years old does were not significant, where it was significant with fifth years old in frequency of joint nursing. Also, differences between five ( $7.5 \pm 1.2$ ) and six ( $8.0 \pm 1.8$  minutes) years old were not significant, while it was significant with four years old ( $4.9 \pm 0.6$  minutes) in joint nursing duration.

The effect of season on frequency and duration of joint nursing were highly significant ( $P \leq 0.01$ ). Does nurse their twins in winter more frequent ( $5.8 \pm 0.5$  bouts) and for longer time ( $7.2 \pm 0.7$  min.) than those in spring ( $1.3 \pm 0.3$  bouts and  $1.0 \pm 0.3$  min.).

### **Heritability and repeatability Estimates for nursing behaviour in Damascus does**

Heritability estimates of nursing frequency and nursing duration were 0.24 and 0.54 respectively (Table 5). No reports of genetic studies within breeds of nursing behavior were found in the literature, although it is generally thought to be an important component of maternal behavior in many species Grandinson (2005). High  $h^2$  estimate for nursing duration ( $h^2 = 0.54$ ) suggested that one of the important factors affecting Mothering ability in Damascus Goats such as nursing duration could be changed through selection or by grading up with improved breeds.

**Table (5): Heritability and Repeatability estimates for nursing behaviour in Damascus.**

<b>Nursing Behaviour</b>	<b>Heritability (<math>h^2</math>)</b>	<b>Repeatability R</b>
<b>Frequency</b>	<b>0.24</b>	<b>0.81</b>
<b>Duration</b>	<b>0.54</b>	<b>0.90</b>

Furthermore, repeatability estimates for nursing frequency and nursing duration were 0.81 and 0.90 respectively. These estimates were sufficiently high; to suggest that there were permanent environmental effects in goats, which could stimulate progress. However, results obtained herein are relatively higher due to the fact that the numbers of animals in the present study were relatively small.

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**Phenotypic correlation coefficient among nursing behavior and daily activities of does.**

Nursing frequency (Table 6) correlated highly significant with eating frequency ( $r_{ap}=0.39$ ) and ruminating frequency ( $r_p=0.39$ ). However there were no significant correlation among nursing frequency, on one hand and lying frequency ( $r_p=-0.36$ ), lying duration ( $r_p=-0.22$ ), eating duration ( $r_p=-0.16$ ), ruminating duration ( $r_p=-0.02$ ) and idling duration ( $r_p=0.10$ ) on the other hand.

Furthermore, nursing duration (Table 6) correlated negative and highly significant with lying duration ( $r_p=-0.48$ ), and positive with eating frequency ( $r_p=0.48$ ), ruminating frequency ( $r_p=0.31$ ) and nursing frequency ( $r_p=0.50$ ).

**Table (6): Phenotypic correlation coefficient ( $r_p$ ) among nursing behaviour and daily activities of does**

Behavioural activities of does	Nursing frequency (bouts)	Nursing duration(min.)
Lying frequency	-.36 <sup>NS</sup>	-.01 <sup>NS</sup>
Lying duration	-.22 <sup>NS</sup>	-.48**
Eating frequency	.39**	.48**
Eating duration	-.16 <sup>NS</sup>	-.01 <sup>NS</sup>
Ruminating frequency	.39**	.31**
Ruminating duration	-.02 <sup>NS</sup>	-.04 <sup>NS</sup>
Idling duration	.10 <sup>NS</sup>	.05 <sup>NS</sup>
Nursing frequency	1.00	.50**

\*\* Correlations is significant at the 0.01 level, NS=not significant

However there were no significant correlation among nursing duration on one hand and lying frequency ( $r_p=-0.01$ ), eating duration ( $r_p=-0.01$ ), ruminating duration ( $r_p=-0.04$ ) and idling duration ( $r_p= 0.05$ ) on the other hand.

Searching references, scanty information were available about heritability and repeatability estimates of nursing behavior in Goats. Observations suggested and parameters discussed in the present study are a first attempt to develop an on- farm monitoring system for Damascus goats, so they can be considered the starting and not the conclusive point for opening a scientific debate on the importance of behavioural studies in relation to genetic parameters. In particular it is not excluded that instead of applying concepts validated in other farm species, a specific model for the evaluation of on-farm behavioural assessment in goats could be developed. Further studies are needed with more records to evaluate the impact of environmental and genetic factors on Damascus goats welfare in order to increase production and achieve good quality.

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## المعايير الوراثية والمظهرية لسلوك الإرضاع فى الماعز الدمشقى

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### الملخص العربي

تم مراقبة اثنى عشر أم من أمهات الماعز الدمشقى بالإضافة الى سبعة عشر من صغارها لمدة ٦ أيام/أم (٨٦٤٠ دقيقة) وذلك باستخدام وحدة المراقبة التلفزيونية المتخصصة لمراقبة الحيوانات بوحدة سلوك الحيوان، التابعة لقسم الإنتاج الحيوانى بكلية الزراعة جامعة المنوفية - شبين الكوم .

كان متوسط الفترات من نجاح المولود فى الوقوف وحتى أول محاولة للرضاعة (FAS)، ومن الوقوف وحتى الرضاعة (SS) ومن الولادة وحتى الرضاعة (KS)  $21.0 \pm 3.6$  و  $11.7 \pm 2.7$ ،  $56.2 \pm 6.1$  دقيقة على التوالي. كان تأثير ترتيب موسم الولادة والعمر ووزن الجدى على الصفات السابقة المدروسة معنوياً، وكان تأثير حجم البطن معنوى على الفترة من الولادة وحتى الرضاعة (KS) وكان تأثير موسم الولادة معنوياً على الفترة من نجاح المولود فى الوقوف وحتى أول محاولة للرضاعة (FAS)، والفترة من الوقوف وحتى الرضاعة (SS) ، كما كان لجنس المولود تأثير على FAS و KS.

كان متوسط تكرار عملية الإرضاع فى هذه الدراسة  $36.4 \pm 1.5$  مره خلال اليوم فى حين كان الوقت المستغرق فى الإرضاع  $44.1 \pm 2.3$  دقيقة/يوم. تم دراسة تأثير العوامل التى تؤثر على تكرار ومدة عملية الإرضاع مثل تأثير وزن الأمهات، ترتيب موسم الولادة، عمر الأمهات، حجم البطن وموسم الولادة. كان متوسط تكرار و مدة الإرضاع المشترك فى الماعز الدمشقى  $5.3 \pm 0.5$  مرة و  $6.5 \pm 0.7$  دقيقة يومياً، على التوالي . وكان تأثير كل من ترتيب موسم الولادة و العمر و موسم الولادة على تكرار و مدة الارضاع المشترك تأثير معنوى أو عالى المعنوية.

كانت قيم المكافئ الوراثى لتكرار عملية الإرضاع و مدة الارضاع المشترك  $0.24$  و  $0.54$  على التوالي، فى حين كان المعامل التكرارى لها  $0.81$  و  $0.90$  على التوالي. كان ارتباط تكرار الإرضاع بتكرار التغذية و تكرار الإجتراع على المعنوية ( $0.39$ ) و ( $0.39$ ) على التوالي.

على الجانب الآخر، كان ارتباط مدة الإرضاع بمدى الرقاد سالب وعالى المغنوية (-0.48)،  
فى حين كان موجب مع تكرار التغذية (0.48) وتكرار الإجتار (0.31) ومدى الإرضاع (0.50).