


Environmental Factors Affecting Kid Mortality in Shami Goats

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Summary

A total of 1.190 records from Shami goat kids were collected between 1993 and 2006 from Izra'a Research Station, south of Damascus, Syria. The records were used to evaluate the some environmental factors affecting kid mortality rate at birth (0-3 days) and from the forth day after birth until weaning at 90 days. The least squares means of mortality rate at birth and from birth to weaning were 0.12 ± 0.01 and 0.06 ± 0.01 , respectively. Parity had a significant effect ($P < 0.05$) on the mortality at birth and from birth to weaning. Year of birth had a highly significant effect ($P < 0.01$) on kid mortality at birth, but no effect was found on the mortality from birth to weaning. Similarly type of birth significantly affected ($P < 0.05$) kid mortality at birth, but not from birth to weaning. It was concluded that kid mortality of Shami goats could be affected by environmental factors. However, better management might reduce the effect of these factors.

Keywords: *Shami goats, Kid, Mortality rate, Environmental factors, Syria*

Şam Keçilerinin Oğlak Ölümelerini Etkileyen Çevresel Faktörler

Özet

Suriye'de Şam'ın güneyindeki Izra'a araştırma istasyonunda bulunan 1.190 Şam keçisi oğlaklarından 1993 ve 2006 yılları arasında veriler toplanmıştır. Toplanan veriler oğlakların doğum ve doğumdan 4 gün sonra ile 90. gündeki sütten kesim arasındaki sürede ölüm oranlarına etki eden çevresel faktörleri değerlendirmek için kullanılmıştır. Doğum ve sütten kesimdeki ölüm oranlarının en küçük kareler ortalamaları sırasıyla 0.12 ± 0.01 ve 0.06 ± 0.01 olarak bulunmuştur. Gebelik sayısı doğum ve sütten kesimdeki ölüm oranlarını önemli düzeyde etkilemiştir ($P < 0.05$). Yıl faktörü doğumdaki ölüm oranını etkilerken, sütten kesime bir etki yapmamıştır. Aynı şekilde doğumdaki oğlak sayısı da doğum anındaki ölüm oranını etkilerken sütten kesim dönemine bir etki oluşturmamıştır. Sonuç olarak Şam keçisi oğlaklarının ölüm oranlarının çevresel şartlar tarafından etkilendiği fakat bu oranın iyi bakımla düşürülebileceği belirlenmiştir.

Anahtar sözcükler: *Şam keçisi, Oğlak, Ölüm oranı, Çevresel faktörler, Suriye*

INTRODUCTION

Goat is valuable livestock in the arid and semi-arid zones. Especially adopted goat breeds in a certain area are indispensable for the local people. The Shami (Damascus) goat breed originated around the Al-Ghotta Oases, 10-30 km east of Damascus, Syria. Due to its

reputation as a prolific breed capable of high milk production, in addition to its desirable shape, special attention was paid to the breed in Al-Sham countries as well as other Arab and non-Arab countries including Cyprus, Italy, Turkey and Spain ¹. The population of this



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breed in Syria was estimated at 43035 heads in 2005 ².

Genetically and environmental factors are dramatically affect the goat production. Among these factors, preweaning mortality of young kids is the essential problem for the breeders. Each alive born kid from a dam is a significant feature in enhancing the productivity for a farm as it supplies more weaned weight and more milk. It is acceptable that, higher kid mortality happens at birth and from birth to weaning while mortality is relatively low from weaning to breeding age in many production systems ³⁻⁶. It was reported that preweaning mortality rate of 47% in small East African goats and their crosses ⁷. Environmental factors are mostly accepted to contribute to kid mortality ^{8,9}. Numerous researches have stated that kid birth weight, sex, year of birth, parity of doe and litter size affect preweaning survival of kids ^{5,9,10}.

Mortality rate of kids from birth to weaning is one of the crucial elements in the economic process of goat raising programs ^{11,12}. This rate was reported to range from 32 to 40% in different goat breeds ^{6,13,14}. Environmental factors, other than diseases, were reported to have a significant effect on mortality rate ¹⁵. Kidding year ¹⁶, parity ¹⁷ and birth type ¹⁸ were also reported to influence kid mortality rate at birth and at weaning.

High mortality rates greatly reduce the efficiency and profitability of a goat production enterprise. Therefore detailed analyses of the effect of these environmental factors on survival of goat breeds under different production environments are needed in order to realize the character and amount of these influences ⁵.

The present study was conducted to determine mortality rate at birth (classed as birth to three days postpartum) and from birth to weaning (90 days) to investigate some environmental factors affecting mortality of Shami goat kids.

MATERIAL and METHODS

The study was conducted at Izra'a Research Station for Shami goats, 80 km south of Damascus, Syria. A total of 1.190 records of Shami goat kids were collected during 1993-2006. Kid Mortality at birth was calculated from birth until three days of age, and kid mortality from birth to weaning was calculated from the fourth day after birth until 90 days of age. Season of kidding was divided into two periods, early (before 15 January) and late (on and after January 15th).

Animals were kept in semi-open yards and housed in concrete barns at night and during the winter. Adult

animals were allowed to graze on pastures for 2-4 h per day throughout the year. Alfalfa hay and concentrates were provided in winter. The amount of concentrates ranged from 0.4 to 1.2 kg a day according to the animal's physiological stage. Animals had free access to drinking water.

During the mating season, which extended from August 15th until October 15th, bucks were assigned to mate the females naturally at a ratio of one male to 25 females. Flushing feed (1/2 kg of feed concentrates per head per day) was offered to the females during the two weeks prior to the breeding season.

Kids were allowed to suckle their dams ad libitum from birth until weaning and were given free access to feed concentrates and roughages.

In order to determine the environmental factors affecting kid mortality at birth and from birth to weaning, data were analyzed using Harvey ¹⁹ program according to the following formula:

$$Y_{ijklmn} = \mu + Y_i + P_j + S_k + T_l + M_m + e_{ijklmn}$$

where:

Y_{ijklmn}	Mortality at birth or birth-weaning of the $ijklmn^{\text{th}}$ records,
μ	Overall mean,
Y_i	Overall mean, effect of i^{th} year of kidding, ($i=1, 2,$ and $14,$ for the years 1993-2006 respectively),
P_j	Effect of j^{th} parity of dam coded ($j=1, 2,$ and 6 for 1 st , 2 nd and $\geq 6^{\text{th}}$ respectively),
S_k	Effect of k^{th} gender of kids, ($k=1$ and $2,$ for the male and female respectively),
T_l	Effect of l^{th} type of birth, ($l=1, 2$ and $\geq 3,$ for the single, twin and triplet or quadruplet respectively),
M_m	Effect of m^{th} kidding period, ($m=1$ (early) and 2 (late)),
e_{ijklmn}	Random error term associated with the Y_{ijklmn} observation

The SAS ²⁰ programme was used to separate means of studied factors according to the Duncan methodology.

RESULTS

Analysis of variance (*Table 1*) showed that year of kidding had a highly significant effect ($P<0.01$) on kid mortality rate at birth but not on mortality from birth to weaning.

The current study showed that parity had a significant

Table 1. Analysis of variance for mortality rate of kids at birth and at weaning adjusted to 90 days of age, in Shami goats**Tablo 1.** Şam keçilerinin 90 güne göre düzeltilmiş doğum ve süten kesimdeki oğlak ölüm oranlarının varyans analizleri

Source of Variance	At Birth		At Weaning	
	D.F.	MS WM	D.F.	MS WM
Year of kidding (Y)	13	0.310935 **	13	0.084928
Parity of dam (P)	5	0.384110 *	5	0.130102 *
Gender of kid (S)	1	0.025190	1	0.088986
Type of birth (T)	2	0.409372 *	2	0.017638
Kidding period (M)	1	0.001166	1	0.108638
Remainder	1167	0.125141	982	0.054675

MS: Mean square, **BM:** Birth mortality; **WM:** Weaning mortality
*: $P < 0.05$, **: $P < 0.01$

effect ($P < 0.05$) on both mortality rates at birth and from birth to weaning (*Table 2*).

Least squares means of the mortality rates (*Table 2*) showed that the mortality rate was the highest in 1993. Mortality rates at birth and from birth to weaning ranged from 4% to 24% and 3% to 18% respectively during the study period.

Mortality rates were highest (20% at birth and 11% from birth to weaning) in the first parity. Male kid mortality rates were not significantly different from those of female kids either at birth (13% vs 12%) or at weaning (7% vs 5%).

Table 2. Least Squares Means±Standard Errors (LSM±SE) of the kid mortality rates at birth and from birth to weaning (90 days) in Shami goats**Tablo 2.** Şam keçilerinin oğlaklarında doğumda ve doğumdan 90. güne kadarki ölüm oranlarının en küçük kareler ortalamaları ve standart hataları

Source of Variation	No. of Kids Born	Mortality at Birth	No. of Kids Survived to Day 4	Mortality from Birth to Weaning (%)
		LSM ± SE		LSM ± SE
μ	1190	0.12 0.01	1005	0.06±0.01
Year				
1993	72	0.24±0.04 ^a	47	0.18±0.03
1994	69	0.06±0.04 ^{ed}	63	0.08±0.03
1995	71	0.09±0.04 ^{ecd}	63	0.04±0.03
1996	119	0.07±0.03 ^{ed}	109	0.07±0.02
1997	110	0.22±0.03 ^{bc}	85	0.03±0.02
1998	138	0.12±0.03 ^{bcd}	120	0.04±0.02
1999	103	0.19±0.03 ^{bcd}	82	0.03±0.02
2000	85	0.21±0.04 ^{ab}	64	0.09±0.03
2001	117	0.12±0.03 ^{bcd}	99	0.06±0.02
2002	42	0.06±0.05 ^{ed}	39	0.03±0.02
2003	82	0.10±0.04 ^{bcd}	71	0.04±0.02
2004	53	0.15±0.05 ^{bcd}	43	0.10±0.03
2005	68	0.08±0.04 ^{ed}	62	0.07±0.03
2006	61	0.04±0.02 ^e	58	0.04±0.03
Parity				
1 st	449	0.20±0.01 ^a	345	0.11±0.01 ^a
2 nd	259	0.15±0.02 ^b	227	0.04±0.01 ^b
3 rd	161	0.12±0.03 ^b	144	0.05±0.02 ^b
4 th	154	0.11±0.03 ^b	138	0.05±0.02 ^b
5 th	81	0.10±0.04 ^b	72	0.06±0.02 ^b
≥ 6 th	86	0.07±0.04 ^b	79	0.07±0.02 ^b
Gender of Kids				
1 (male)	603	0.13±0.01	516	0.07±0.01
2 (female)	587	0.12±0.01	489	0.05±0.01
Type of Birth				
1 (single)	335	0.17±0.02 ^a	256	0.06±0.01
2 (twin)	623	0.10±0.01 ^b	544	0.05±0.01
≥3 (triplet)	232	0.11±0.02 ^b	205	0.07±0.01
Kidding Period¹				
1 (early)	412	0.13±0.02	359	0.08±0.01
2 (late)	877	0.12±0.01	646	0.05±0.01

¹ Dates of kidding were classified into two periods (early) before 15 January, and (late) on and after 15 January
abcde = Similar letters within the same column denote no significant difference between means

DISCUSSION

Analysis of variance showed that year of kidding had a highly significant effect ($P < 0.01$) on kid mortality rate at birth but not on mortality from birth to weaning. This is in agreement with the results of ¹³ using India goats; ¹⁸ using Alpine, Nubian and crossbred kids; and ¹⁶ using Small East African goats. Additionally, no systematic trend in relation to year of kidding was observed for either mortality rate at birth or from birth to weaning. But defined significant differences among the years might be effects of diseases, climatic conditions, rearing methods and managerial systems.

The current study showed that parity had a significant effect ($P < 0.05$) on both mortality rates at birth and from birth to weaning. This might be due to an age effect; as dams increased in maturity the survival rate of kids improved. These results are in agreement with the findings of Mazumdar et al.²¹ using Pashmina goats and kids, and Barding et al.¹⁷ working with Osmanabadi goats; but in disagreement with the results of Mandonnet et al.²² who worked with Creole goats.

Results from *Table 2* indicate that the general least square means of mortality rates were 0.12 ± 0.01 and 0.06 ± 0.01 at birth and at weaning, respectively. The mean of mortality rate from day four to weaning obtained in this study was 6.0%, which is lower than 11.3% reported by Ikwuegbu and Ofadile²³ for similar weaning age using West African Dwarf goats. A wide range of mortality rates at different weaning ages (one to six months) has been reported e.g. 32.1% in Indian dairy goats Chawla et al.¹³, 27.2% in Yaez goats Rattner et al.⁶, 29.0% in South African goats Donkin and Bayozoglu¹⁴, 37% in Indigenous goats Sebei et al.¹¹, 40.6% in Small East African goats Mtenga et al.¹⁶ and 32.4% in Bamenda goats Ndamukong²⁴. In the study, mortality of early born kids was shown to be slightly, but not significantly, higher than that of late born kids. This may be due to differing chances of survival under different environmental conditions.

It was also defined that type of birth had a significant effect ($P < 0.05$) on kid mortality at birth, but not on that at weaning. Chawla et al.¹³, Jan and Gupta²⁵, Gebrelul et al.¹⁸, Miah et al.¹⁵, Mtenga et al.¹⁶ and Ndamukong²⁴, Gökçe and Erdoğan²⁶, reported a similar effect of birth type on pre-weaning health and mortality. However other researchers have reported that birth type does not have a significant effect on mortality rate from birth to weaning (e.g. Singh et al.¹², Donkin and Boyazoglu¹⁴ and Mandonnet et al.²²). The increase of mortality rates at birth in single kids may be due to kidding difficulties. The mortality rate after birth in the multiple kidding can

be related maternity capability and/or management practices.

In the present study, no effect of gender of kid on the mortality rate at birth or from day four to weaning was observed. This is in agreement with the findings of, Singh et al.¹², Donkin and Boyazoglu¹⁴, Mtenga et al.¹⁶ and Mazumdar et al.²¹ who all reported no significant differences in pre-weaning mortality rate due to gender. However, it is in contrast to the findings of Miah et al.¹⁵, Gebrelul et al.¹⁸ and Ndamukong²⁴ who reported significant differences in pre-weaning mortality rates between sexes in goats.

Variations between the results of this work and those reported by the other investigators could be explained by the differences in breeds, managerial conditions and genetic variations such as the potential capabilities of dams in raising their kids. According to obtained results from the research, it was concluded that, mortality rate of kids at birth and at weaning was affected by some environmental factors and better management might reduce it. For example, special feeding can be applied to does in some droughty years and kids were born from young dams can be looked after with a special care. Same special care also applied to those kids born twin and triple. New researches investigate the kid mortality in detail for Shami goat will help to understand the mechanism of the survival rate in the flock.

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