

Effects of Environmental Factors on Growth Curve Variation for Kids 6-10 Months Old of Sistani Goat

Hossein Bazzi

Department of Animal Science, Faculty of Agriculture, University of Zabol, P.O. Box 98615-538, Zabol, Iran
(h.bazzi21@gmail.com)

Abstract- The aim of this study was conducted to analyze the effect of sex, dam weight after kidding, weaning age and litter size on growth curve variations for kids 6-10 months old of Sistani goat. The data (81 records) were collected from the Institute of Research Domesticated Animal, Zabol University in Sistan & Baluchestan Province, Iran in 2008. The male Sistani kids showed significantly ($P < 0.01$) higher weight at 10 months old (W10M) than female i.e., 31.1 ± 0.616 and 25.63 ± 0.418 kg respectively. Weight kids at 10 months old for kids born as twins (27.32 ± 0.534 kg) were significantly heavier than those born as singles (29.13 ± 0.82). Influence of dam weight after kidding on body weight at 10 months old (W10M) was not found to be significant during the entire period of study. At weaning, (on the 90th and 120th day) the kids weighed 28.03 and 28.09 kg respectively. The kids gained 96.44g on average daily in the period from 6 to 10 months old, but in comparison to female kids, male kids had higher average daily weight gain (98.25: 95.00 g). The kids in present research work had a faster growth rate from 6 to 9 months with daily gain 118.4 (g/d) that the average daily gain in kids decreased with the age increase from 9-12 months of age.

Keywords- Sistani goat, Environmental effect, Kids 6-10 months old, Daily growth

I. INTRODUCTION

The growth traits are important factors influencing profitability in any meat producing enterprise. Rapid growth during the early period can minimize the cost of rearing and thus provide more profit to the farmer. The birth weight and early growth rate of animals are determined not only by genetic potential but also by maternal and environmental factors (Mandal *et al.*, 2006; Zhang *et al.*, 2009).

Body weights and growth rates in pre-weaning are often considered as an early indicator of the late growth and economic benefit (Portolano *et al.*, 2002)

Growth of kids from birth to marketing age or for replacement is traits of great economic importance and required particular attention for increasing total goat productivity (Hermiz *et al.*, 2009).

Growth dynamic of young generation may be used as one of indicators to evaluate the level of adaptation of a gene fund under conditions of a production system which is different from its origin place. Growth period of young generation until the puberty age can be divided into three phases: (i) maternal phase from birth to weaning, (ii) phase of development of bio physiological mechanisms of growth and individual response to environmental conditions from weaning to 6 months old and (iii) growth phase from the age of 6 months to puberty one (Kume and Hajno, 2010).

The birth weight and early growth rate of animals are determined not only by genetic potential but also by maternal and environmental factors (Zhang *et al.*, 2009).

Production traits are affected by various non-genetic factors like sex, season, year and type of birth (Bharathidhasan *et al.*, 2009; Kumar *et al.*, 2007).

Age at the time of weaning can differ very much. According to preformed research the transition to feeding only dry feed, can be implemented successfully already at 3 weeks of age (Memisi *et al.*, 2009).

Goats comprise one of the most important domestic livestock species in Iran and play an important role in the livelihood of a large proportion of small and marginal farmers and landless laborers. Since, the goat provides a good source of meat, milk, fiber and skin, it is popularly known as the 'poor man's cow' (Sadeghi *et al.*, 2010).

Hence, an attempt has been made to know the effects of various non-genetic factors on the body weight at 6 to 10 months of old of Sistani goat under southeastern agro-climatic conditions of Iran.

This study aimed to study the effects of some genetic and non-genetic factors on kid body weights from 6 to 10 months of age and to estimate non-genetic and phenotypic parameters among them in Iranian local goat (Sistani goats).

Major purpose of this study was to investigate the differences between growth curves of Sistani kids in different time periods.

II. MATERIAL AND METHODS

A. Animals and study site:

The data were collected from the Institute of Research Domesticated Animal, Zabol University in Sistan & Baluchestan Province, Iran in 2008.

B. Traits and records:

After kidding, the new-born kids were marked and weighed. The birth weight was recorded and the kids were left with their dams for suckling till weaning age at three or four months. They received ad libitum fresh alfalfa and hay beginning the third week.

They consisted of birth weight and monthly weight up to marketing age from 81 Sistani goat kids divided in to 2 groups: group1 contained 39 kids (18 male and 21 female) were weaned at 3 months age and group2 contained 42 kids (18 male and 24 female) were weaned at 4 months age.

C. Nutrition and management:

In this study as the dependent observations kids were kept on door most of the time during the first four months and permitted to outdoor environment when it was suitable. Then they stayed out door all day time with shade against direct solar radiation and indoor during night period.

Dams and their kids were kept together in the same pen at night. The animals (mothers) were released daily to graze and browse natural pastures during the day and were penned after grazing.

Kids were fed a concentrate mixture (prepared on the farm) with a standard chemical composition with 16.5 % protein (barely 32%, corn 19%, cotton seed 3%, soya 9%, Alfalfa 30%, straw 5%, limestone 0.5% ,salt 1% and min+vita 0.5%) water was also provided ad libitum.

D. Statistical analysis:

Study the weight effect of mother on kid weights at different age kids were divided into 3 groups according to the dam weight after kidding. Groups of the dam's weight were as follows:

Light (less than 30 kg) medium (30-37 kg) and heavy (over 37 kg).

The effects of dam weight, sex, type of birth and stage of weaning on kids weights at 6- 10 months old were analyzed using the following model:

The General Linear Model (GLM) procedure of R 2.14.0 was used to analyze the data.

Fixed effects evaluated on growth curve variations for kids 6-10 months old were sex of kids (male, Female), type of birth (single and twin), dam weight(light, medium and heavy) and time of weaning (3 and 4 months).

The following Model was fitted:

$$Y_{ijklm} = \mu + Y_i + P_j + S_k + Z_l + e_{ijklm} \quad (1)$$

Where:

Y_{ijklm} = Records of the nth animal

μ = the overall Mean

Y_i =the fixed effects of ith sex (i = 1 or 2; 1=female, 2=male)

P_j = the fixed effect of the jth type of birth (j = 1 or 2 1=Single, 2=Twin)

S_k = the fixed effect of the kth weight of dam (k= 1, 2 or 3 1=light, 2= medium 3= heavy)

Z_l = the fixed effect of the lth time of weaning (l= i = 3months and 4months)

e_{ijklm} = the residual effects

III. RESULT AND DISCUSSION

The overall least-squares means for body weight at 10 months age and the average daily gain from 6- 10 months old were 28.06 ± 0.468 kg and 96.44 (g/d), respectively.

Number of records (N), Least-squares means (LSM) and standard errors (SE) of for body weight at 10 months and the average daily gain from 6- 10 months for Sistani goat in various fixed effects are given in Tables 1 and 2.

According to the data in Table 1 and 2 the average body weight at 10 months age of male kids was higher than female kids (31.1 : 25.63 kg), Therefore, The male Sistani kids showed significantly ($P < 0.001$) higher weight at 10 months old (W10M) than female. On other hand, the research determined the significant influence of sex on average daily weight gain of kids in the period 6 until 10 months old ($P < 0.01$).

Differences in sexual chromosomes, probably in the position of genes related to growth, physiological characteristics, difference in endocrinal system (type and measure of hormone secretion especially sexual hormones) lead to difference in animal growth. In relation to endocrinal system, estrogen hormone has a limited effect on the growth of long bones in females. That could be one of the reason in which females have smaller body and lighter weight against males (Roshanfekar *et al.*, 2010; Rashidi *et al.*, 2008).

In comparison to the average daily weight gain of Sistani goat kids at 6 to 9 months old determined (118.4g), Boer goat kids gain 200 g daily on average in better feeding

Conditions during the first twelve months (Mioc, 2008). Pavic *et al.* (1988) determined an average daily weight gain of 149.7 g for Alpine kids and somewhat higher weight gains (164.92 g) by Saanen kids (in the period from kidding to the 102nd day of life).

Feral kids achieve an average daily weight gain of 126 g up to the age of 180 days.

Whereas crossbreds of Boer and Feral goats had an average daily weight gains of 148g (Dhanda *et al.*, 2003).

In contrast, most authors point out the significant influence of sex on the birth weight and growth of kids (Mavrogenis *et al.*, 1984; Ruvuna *et al.*, 1988; Kuchtik and Sedlackova, 2005). Kezic *et al.*, (2005) determined a significantly higher average daily weight gain in male kids in comparison to female Alpine kids (174.01: 129.17 g) and female kids of the Croatian white goat (161.64: 139.13 g). Male Boer goat kids achieve average daily weight gains of 250 g in the first nine months of life, while female kids gain on average 186 g daily in the same period (Mioc *et al.*, 2011).

The influence of type of birth on body weight at 10 months age, as well as on the average daily weight gain of kids in the period 6 until 10 months old.

The research determined the significantly ($P < 0.01$) higher average weight of 10 months old of twin Kids (29.13kg) in comparison to single kids (27.32kg). Which predicts that the twins have greater growth potential in late period than the single. This theory was in accordance with our previous report (Zhang *et al.*, 2006). Growth advantage of single in early period might result from its lower competition for nutrition supply of dam in gestation period than the multiple birth ones. The growth dominance of twins in late period is partly due to the balanced nutrition and environment from dam in suckling period, and partly due to their forceful adaptive capacity to the environmental variation. So it is very useful and economic to increase the number of kids at birth in order to improve the productive capacity of dam.

The average daily weight gain of twin kids was significantly ($P < 0.001$) lower than that of single kids.

According to available publications, obtained results for values of body weight of 10 months old by domestic Sistani kids that were weaned at 90 and 120 days, did not establish any significant differences.

These results agree with established by researches of Ugur *et al.* (2004), for kids of Turkish Saanen goat, that were weaned at 45 and 60 days, the authors did not establish any statistically significant difference in gain between investigated groups, and they therefore recommend earlier weaning of kids, to enable using more goat milk for the market. Similar results for body weight during individual periods are reported by Nagpal *et al.* (1995) who worked with kids of Sirohi, Marwari and Kutchi breeds and with somewhat later weaning, with 60 and 90 days, with kids subsequently reared in intensive and semi intensive systems. Also, in kids weaned at 55 days, Atasaglu *et al.* (2008) did not establish any significant differences in body weight in experimental groups of kids by individual experimental periods.

To quantify the effect of weight of dam after kidding on weight at 10 months age of kid, the data were divided into 3 groups (less than 30 kg, 30-37 kg and over 37 kg).

The maximum weight (28.5 kg) was found in group 2 and minimum (26.6kg) in group 3. The weight of dam after kidding did not significantly affect the, weight at 10 months age of kid.

TABLE I. NUMBER OF RECORDS (N), LEAST SQUARES MEAN (\pm S.E.) FOR WEIGHT OF KIDS 10 MONTHS OLD

Effects	N	Mean (kg)	Std. Error
Sex	---	-----	-----
Male	36	31.1	.616
female	45	25.63	.418
type of birth	---	-----	-----
single	48	27.32	.534
twins	33	29.13	.823
weight of dam	---	-----	-----
Light	6	28.25	1.67
Medium	57	28.5	.615
heavy	18	26.6	.509
time of weaning	---	-----	-----
3months	39	28.03	.599
4months	42	28.09	.714
Total	81	28.06	.468

TABLE II. NUMBER OF RECORDS (N), LEAST SQUARES MEAN (\pm S.E.) THE AVERAGE DAILY GAIN FROM 6- 10 MONTHS OLD

Effects	N	Mean (g/d)	Std. Error
Sex	---	-----	-----
Male	36	98.25	12.68
female	45	95.00	2.13
type of birth	---	-----	-----
single	48	103.8	2.76
twins	33	85.75	13.35
weight of dam	---	-----	-----
Light	6	113.00	12.52
Medium	57	95.24	7.96
heavy	18	94.75	3.21
time of weaning	---	-----	-----
3months	39	92.05	11.25
4months	42	100.53	3.63
Total	81	96.44	5.71

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