International Journal of
Science and Engineering Investigations vol. 2, issue 20, September 2013
ISSN: 2251-8843

Study of Non Genetic Factors Affecting Growth Traits of Sistani Goat

Hossein Bazzi[1], Mojtaba Tahmoorespur[2]
[1]Ph.D Student of Animal Breeding (Molecular Genetics), Department of Animal Science, Faculty of Agriculture, Ferdowsi University Of Mashhad, Iran
[2]Department of Animal Science, Excellence Center for Animal Science, Ferdowsi University of Mashhad, Mashhad, Iran
([1]h.bazzi21@gmail.com, [2]tahmoores@um.ac.ir)

Abstract- The aim of this study was to determine the impact of some non-genetic factors on pre-weaning and post-weaning growth in Sistani goat kids. Data of growth traits of Sistani calves were collected from the Institute of Research Domesticated Animals, Zabol University in Sistan and Baluchestan province and Iran in 2008. Traits under study were birth weight (BW), weaning weight at 90 days (WW3), weaning weight at 120 days (WW4),weight at 180 days (W6), weight at 270 days (W9), weight at 365 days(W12) and average daily gains from birth to weaning weight (BW-WW), from weaning weight to 180 days (WW-W6), from 180 to 270 days (W6-W9) and from 270 to 365 days (W9-W12). General linear model with class effects of dam weight, sex, type of birth and stage of weaning was used for analyses. The average birth weight of male kids was about 3% higher than female kids. The overall means of body weight at BW, WW3, WW4, W6, W9 and W12 were 1.915, 7.796, 9.900, 15.597, 26.253 and 34.2 kg, respectively. Birth weight averaged 2.398, 2.355, 1.858 and 1.865 kg for single males and females, twin males and females, respectively. Kids had a faster growth rate from 180 to 270 days with daily gain 118.4 (g/d) that the average daily gain in kids decreased with the age increase from 270 to 365 days. Average pre-weaning daily gain of female was also higher than male, but there was no significant difference observed in pre-weaning gain Heavy dam produced heavy kid (r=0.319), but later weight had no relation with dam weight. Male kids in comparison with female kids and single born kids in comparison with twin born kids had higher birth weight and weaning weight.

Keywords- *Sistani goat, Pre-post-weaning, Growth traits, Environmental factors*

I. INTRODUCTION

The Sistani goat is one of the meat type breeds in eastern Iran which has a dry and hot climate. A high percentage of the goat population is managed under a migratory system, utilizing the ranges as the major source of feed. To determine optimal breeding strategies to increase the efficiency of goat production, knowledge of genetic parameters for weight traits at various ages and also the genetic relationships between the traits is needed. Various environmental effects on kid growth have previously been studied in several investigations on other breeds (Bharathidhasan et al. 2009; Hermiz et al. 2009; Jimenez-Badillo et al. 2009; Soundararajan et al. 2011).

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 unit the puberty age can be divided in to 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).

Growth of kids from birth to marketing or for replacement is traits of great economic importance and required particular attention for increasing total goat productivity although weight is an important objective in selection the potential for 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 (Hermiz et al. 2009; Hermiz et al. 1998; Mavrogenis et al. 1984 and Das et el. 1996).

The birth weight and early growth rate of animals are determined not only by genetic potential but also by maternal and environmental factors (Yan Zhang et al. 2009 and Mandal et al. 2006).

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

Goats are known to be potential genetic resources for meat, milk, skin and fiber throughout the tropical and developing countries. They also play an important role in the socio-economic life of the people as they feature prominently in socio-cultural functions like ceremonies and religious festivities. In fact, goats play a significant role in household nutrition and food security of pastoral people (Alade et al. 2010).

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 birth, weaning weight and pre and post weaning weight gain of Sistani goat under southeastern agro-climatic conditions of Iran.

II. MATERIAL AND METHODS

The data were collected from the research center of domestic animal of university of Zabol in 2008.

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

They consisted of birth weight and monthly weight up to 12 month of 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.

birth weight (BW), weaning weight at 90 days (WW3), weaning weight at 120 days (WW4),weight at 180 days (W6), weight at 270 days (W9), weight at 365 days(W12)

were used 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 adlib.

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 different age were analyzed using the following model:

The General Liner Model (GLM) procedure of Statistical Package for the Social Sciences (SPSS 16) was used to analyze the data. Fixed effects evaluated for pre and post weaning growth were sex of kids (male, female), litter size of kids (single, twin), dam weight (light, medium, heavy) and time of weaning (3months, 4months).

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 n^{th} animal

μ = the overall Mean

Y_i =the fixed effects of i^{th} sex (i = 1 or 2; 1=female, 2=male)

P_j = the fixed effect of the j^{th} type of birth (j = 1 or 2 1=Single, 2=Twin)

S_k = the fixed effect of the k^{th} weight of dam (k= 1 1,2 or 3 1=light, 2= medium 3= heavy)

Z_l = the fixed effect of the l^{th} time of weaning (l= group1 or group 2 group1 = 3months and group 2 = 4months)

e_{ijklm} = the residual effects

III. RESULT AND DISCUSSION

Number of records (N), Least-squares means (LSM) and standard errors (SE) of BW, WW,W6M , W9M, W12M and ADG(BW-WW), ADG(WW-6M), ADG (6M-9M) and ADG(9M–12M) for Sistani goat in various fixed effects are given in Tables 1 and 2.

The overall means of BW, WW, W6M, W9M and W12M were 1.915 ± 0.046, 8.852 ± 0.209, 15.597 ± 0.297, 26.253 ± 0.535 and 34.201 ± 0.675 kg, respectively.

Birth weight range of Sistani kids were 1.823 to 2.007kg. Its range was 2.215 to 2.451 for single males and 1.958 to 2.165kg for single females. Those of twins were 1.903 – 2.356 and 1.858-2.142kg respectively.

Kids 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.

Table 1 show that male kids were heavier than females. The average birth weight of male and female kids was 1.94 ± 0.05 and 1.88 ± 0.05 kegs respectively. Even though male kids weighed 3.09 % higher birth weight than female kids, there was no significant difference observed.

These results agree with other studies by several authors (Jimenez-Badillo et al. 2009; Amoah et al. 1996; Husain et al. 1996; Mahgoub and Lodge 1996; Alexander et al. 1999; Al-Shorepy et al. 2002; Portolano et al. 2002; Browning et al. 2004 and Liu et al. 2005).

Average pre-weaning daily gain of female was also higher than male, but there was no significant difference observed in pre-weaning gain. In this study effect of sex on pre-weaning weight gain of Sistani goat found non-significant. Similarly, Bharathidhasan et al.(2009) found no significant effect of sex on pre-weaning weight gain of Barbari goat.

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 (Roshanfekr et al. 2011 and Rashidi et al. 2008).

ADG for male kids was higher than females as it can be seen in Table 2. Differences between male and female kids were small and non-significant before weaning ( ).

Hence average pre-weaning daily gain of female was also higher than male, but there was no significant difference observed in pre-weaning gain. Similarly, Bharathidhasan found non-significant effect of sex on pre-weaning weight gain of Barbari goat.

Birth and weaning weight Kids born as singles (Table 1) were heavier than twins.

The influence of type of birth on birth weight was also highly significant (P<0.01), with single, and twin recording 2.21±0.05 and 1.61±0.06 kg, respectively. The kids born as single were significantly heavier birth weight than those born as twins. This finding was in agreement with that of Mukundan et al (1981) in Malabari and its Sannen half-breeds, Khan and Sahni (1983) in Jamunapari kids, Sheikh at al (1996) in Changithangi kids, Malik and Kanaujia (1991) in Beetal kids, Singh et al (2000) in Beetal half-bred kids and Soundararajan et al (2006) in non-descript kids.

In general, kids body weights decreased as litter size increase. According to the results reported in the literature (Das and Sendalo 1992; Husain et al. 1996; Mahgoub and Lu 1998; Mourad and Anous 1998; Alexander et al. 1999; Al-Shorepy et al. 2002; Portolano et al. 2002; Browning et al. 2004 and Liu et al., 2005). This effect is attributed mainly to the fact that single kids do not have to compete for space or nutrients in their mother's uterus, unlike what happens when two or three kids were developed. The type of birth did not significantly affect the weaning weight, whilst no differences were found between single and twin kids (Table 1). Despite the presence of numerical differences in the ADG, they were not statistically significant. This result agrees with results (Husain et al. 1996 and Liu et al. 2005).

Average weight for dams of light, medium and heavy groups was 27.35±0.551, 35.153± 0.179 and 38.788 ±0.318 kg., respectively. These weights influenced kid early weights (at birth and weaning weight), but not at later ages. Significant regression of birth weight on weight of dam at kidding revealed that heavier kids were born to heaviest dams (r : 0.319) ,which was in agreement with the findings of Biswas et al (1990), Koul et al (1996) and Karna et al (2001).

Weight of doe at kidding significantly affect BW (P<0.01) and WW (P<0.05) and W6M, W9M and W12M (P>0.05).

As it can be seen in Table 2, kids born from dams of light had a faster growth rate from birth to 6 months old age than those which were born from heavier does.

Time of weaning had a significant effect (P <0.05 and P <0.001) on all traits studied except for 9M and 12M.

The kids weaned at 120 days of age were significantly (P <0.01) heavier by 2.13 kg than the kids weaned at 90 days of age.

The higher weight 6M and 9M of group 2 kids than group 1 kids was 1.118 and 0.597 kg., respectively.

Different periods post weaning, already at the WW until 6M, results for trends of average daily gain for kids show significant differences (p<0.01) between two groups.

TABLE I. NUMBER OF RECORDS (N), LEAST SQUARES MEAN (±S.E.) FOR BW, WW,W6M , W9M, W12M BY SEX, TYPE OF BIRTH, WEIGHT OF DAM AND TIME OF WEANING

Effects	N	BW(kg)	N	WW(kg)	N	W6M(kg)	N	W9M(kg)	N	W12M(kg)
Mean	81	1.91±0.04	81	8.85±0.2	81	15.6±0.3	81	26.25±0.53	81	34.2±0.67
Sex	---	----------								
Male	36	1.94±0.05	36	9.44±0.25	36	16.93±0.36	36	28.73±0.65	36	37.53±0.81
female	45	1.89±0.05	45	8.27±0.25	45	14.27±0.35	45	23.77±0.63	45	30.87±0.8
type of birth										
single	48	2.21±0.05	48	8.98±0.21	48	15.32±0.3	48	26.03±0.55	48	33.48±0.69
twins	33	1.61±0.06	33	8.72±0.3	33	15.87±0.43	33	26.47±0.77	33	34.92±0.97
weight of dam										
Light	6	1.36±0.11	6	7.81±0.52	6	15.52±0.73	6	26.5±1.32	6	34.36±1.66
Medium	57	2.15±0.03	57	9.51±0.16	57	15.6±0.22	57	26.57±0.4	57	34.64±0.51
heavy	18	2.23±0.06	18	9.23±0.3	18	15.67±0.44	18	25.69±0.79	18	33.6±0.99
time of weaning										
3months			39	7.8±0.26	39	15.04±0.36	39	25.95±0.66	39	34.46±0.83
4months			42	9.91±0.26	42	16.16±0.37	42	26.55±0.66	42	33.94±0.83

TABLE II. NUMBER OF RECORDS (N), LEAST SQUARES MEAN (±S.E.) FOR ADG(BW-WW), ADG(WW-6M), ADG (6M-9M) AND ADG(9M–12M) OF SISTANI GOAT IN VARIOUS FIXED EFFECTS AS SEX, TYPE OF BIRTH, WEIGHT OF DAM AND TIME OF WEANING

Effects	N	BW-WW(g)	N	WW-6M(g)	N	6M-9M(g)	N	9M–12M(g)
Mean	81	14.86 ±0.45	81	90.8±3.6	81	118.4±4.08	81	88.31±2.95
Sex	---	----------						
Male	36	14.73±0.54 14.99±0.53	36	100.8±4.3	36	131.18±4.92	36	97.72±3.55
female	45		45	80.79±4.22	45	105.6±4.8	45	78.91±3.5
type of birth								
single	48	12.17±0.46	48	85.2±3.7	48	118.98±4.2	48	82.71±3.03
twins	33	17.55±0.65	33	96.4±5.18	33	117.8±5.89	33	93.92±4.25
weight of dam								
Light	6	20.97±1.1	6	102.28±8.83	6	121.96±10	6	87.4±7.26
Medium	57	12.21±0.34	57	84.223±2.7	57	121.88±3.08	57	89.66±2.22
heavy	18	11.4±0.66	18	85.88±5.3	18	111.34±6	18	87.89±4.36
time of weaning								
3months		11.44±0.55	39	80.83±4.4	39	121.29±5	39	94.52±3.6
4months		18.29±0.55	42	100.76±4.4	42	115.5±5	42	82.11±3.63

IV. CONCLUSION

This study showed the importance of certain environmental factors on growth traits. The BW, W6M, W9M andW12M, as well as ADG from Birth until slaughter weight were influenced by sex, type of birth, weight of dam and time of weaning.

Moreover, the birth weight, weaning weight and growth rate of males were found to be higher than females. These weights influenced kid early weights (at birth and weaning weight), heavier does produced heavier kids indicating the influence of the mothering ability of doe. Hence, the producers should consider maternal ability for improvement of weaning weight and growth rate of kids in the population. In addition, weaning weight of kids should be considered for selection of parent stock in order to increase productivity and eventually the economic efficiency of the farm herd.

V. ACKNOWLEDGMENTS

We would like to thank the Institute of Research Domesticated Animals, Zabol University for providing a scholarship and help collect the data on the Sistani goats for this research.

VI. REFERENCES

[1] Alade, N.K., Dilala, M.A. and Abdulyekeen, A. O., 2010. Phenotypic and genetic parameter estimates of litter size and body weights in goats, I.J.S.N., 2 , 262- 266

[2] Alexandre, G., Aumont, G., Mainaud J.C., Fleury J. and Naves M., 1999. Productive Performances of Guadeloupean Creole goats during the suckling period, Small Ruminant Research, 34, 155–160.

[3] Al-Shorepy, S.A., Alhadrami, G.A. and Abdulwahab K., 2002. Genetic and phenotypic parameters for early growth in Emirati goat, Small Ruminant Research, 45, 217–223.

[4] Amoah, E.A., Gelaye, S., Guthrie, P. and Rexroad Jr., C.E., 1996. Breeding season and aspects of reproduction of female goats, Journal of Animal Science, 74, 723–728.

[5] Bharathidhasan, A., Narayanan, R., Gopu, P., Subramanian, A., Prabakaran, R. and Rajendran, R., 2009. Effect of no-genetic factors on birth weight, weaning weight and pre-weaning gain of Barbari goat, Tamilnadu Journal of Veterinary and Animal Sciences, 5, 99-103.

[6] Biswas, J.C., Koul, G.L. and Bisht, G.S., 1990. Body weight and morphometry at birth in Chegu Pashmina producing goat, Indian Veterinary Medical Journal, 14, 256-258.

[7] Browning, Jr. R., Kebe, S.H. and Byars, M., 2004. Preliminary assessment of Boer and Kiko does as maternal lines for kid performance under humid, subtropical conditions, South African Journal of Animal Science, 34, (Suppl. 1).

[8] Das, S.M., Rege, J.E.O. and Shibre, M., 1996, Phenotypic and genetic parameters of growth traits of Blended goats at Malya, Tanzania, Proceeding of the third Biennial Conference of the African Small Ruminant Research Network. ILRI., 63-70.

[9] Das, S.M. and Sendalo, D.S., 1992. Comparative performance of improved meat goats in Malya, Tanzania, Small Ruminant Research, Dev. Afr., http://www.sasas.co.za/sajas.html.

[10] Hermiz, H.N., 1998. Additive and multiplicative adjustment factors for milk traits in Iraqi local goat, Iraqi J. Agric., 3, (2), 164-173.

[11] Hermiz, H. N., Alkass, J.E., Hobi, A.A., Asofi, M.K., 2009. Genetic and phenotypic parameters of body weight in Iraq local goat and their crosses with Damascus, J. Duhok University, Vol., 12, (1), 189-194.

[12] Jiménez-Badillo, M.R., Rodrigues, S., Sañudo, C. and Teixeira, A., 2009. Non-genetic factors affecting live weight and daily gain weight in Serrana Transmontano kids, Small Ruminant Research, 84, 125-128.

[13] Karna, D.K., Koul, G.L. and Bisht, G.S., 2001. Birth weight, morphometry and relative gain in body weight in Cheghu kids, Indian Journal of Animal Sciences, 71, 180-182.

[14] Khan, B.U. and Sahni, K.L., 1883. Pre-weaning body weight and linear body measurements in Jamunapari goats, Indian Journal of Animal Sciences, 53, 835-840.

[15] Koul, G.L., Bisht, G.S., Biswas, J.C. and Gupta, B.D., 1996. Studies on pre- and post-weaning body weights in Cheghu breed of pashmina producing goats, Indian Journal of Animal Health, 35, 1-5.

[16] Kumar, A., Singh, U. and Tomar, A.K.S., 2007. Early growth parameters of Kutchi goats under organized farm, Indian Veterinary Journal, 83,105-106.

[17] Kume, K. and Hajno, L., 2010. Study of growth curve variations for kids 0- 6 months old of Alpine goat breed in Albania, Archiva Zootechnica., 13, (2), 54-62.

[18] Liu, W., Zhang, Y. and Zhou, Z., 2005. Adjustment for non-genetic effects on body weight and size in Angora goats, Small Ruminant Research, 59, 25–31.

[19] Mahgoub, O. and Lodge, G.A., 1996. Growth and body composition in meat production of Omani Batina goats, Small Ruminant Research, 19, 233–246.

[20] Malik, C.P. and Kanaujia, A.S., 1991. Studies on growth in Beetal kids, Indian Journal of Animal and Management, 7, 49-52.

[21] Mandal, A., Neser, F.W.C., Rout, P.K., Roy, R. and Notter, D.R., 2006. Estimation of direct and maternal (co)variance components for pre-weaning growth traits in Muzaffarnagari sheep, Livestock Science, 99, 79–89.

[22] Mavrogenis, A. P., Constantinou, A. and Louca, A., 1984. Environmental and genetic causes of variation in production traits of Damascus goats.1.Pre-weaning and post-weaning growth, Animal Production, 38, 91-97.

[23] Memisi, N., Zujovic, M., Tomic, Z. and Petrovic, M. P., 2009. The effect of time of weaning on body mass and gain of kids, Biotechnology in Animal Husbandry, 25, (5-6), 993-998.

[24] Mourad, M. and Anous, M.R., 1998, Estimates of genetic and phenotypic parameters of some growth traits in Common African and Alpine crossbred goats, Small Ruminant Research, 27, 197–202.

[25] Mukundan, G., Bhat, P.N. and Khan, B.U., 1981. Genetic analysis of birth weight in Malabari breed of goats and its halfbreds, Indian Journal of Animal Sciences, 51, 630-634.

[26] Portolano, B., Todaro, M., Finocchiaro, R. andvan Kaam J.H.B.C.M., 2002. Estimation of the genetic and phenotypic variance of several growth traits of the sicilian girgentana goat, Small Ruminant Research, 45, 247–253.

[27] Rashidi, A., Mokhtari, M.S., Jahanshahi, A.S. and Abadi, M. R. M., 2008. Genetic parameter estimates of pre-weaning traits in Kermani sheep, Small Ruminant Research, 74, 165-171.

[28] Roshanfekr, H., Mamouei, M., Mohammadi, K. and Rahmatnejad, E., 2011. Estimatin of Genetic and Environmental Parameters Affected Pre-weaning Traits of Arabi Lambs, Journal of Animal and Veterinary Advances, 10, 1239-1243.

[29] Sadeghi, R., Mahmoudi, B., Bayat, M., Jafarzade, A., Montazeri, S., Seyyedsafavi, Se. and Nejadgashti, M., 2010. Genetic Diversity of Raeini Goat Population Based on Microsatellite, Journal of Animal and Veterinary Advances, 9, (4), 661-665.

[30] Sheikh, N.A., Ganai, T.A.S. and Wani, G.M., 1996. Non-genetic factors affecting body weight of Changithangi goats, Indian Journal of Animal Sciences, 66, 402-404.

[31] Singh, D.K., Singh, N.S. and Singh, L.B., 2000. Nongenetic factors affecting growth of Beetal half-bred kids, Indian Journal of Animal Sciences, 70, 1165-1166.

[32] Soundararajan, C. and Sivakumar, T., 2011. Factors affecting birth weight in Tellichery kids, Indian Veterinary Journal, 83, 803-804.

[33] Soundararajan, C., Sivakumar, T. and Palanidorai R., 2006. Factors affecting birth weight in goats, Tamilnadu Journal of Veterinary and Animal Sciences, 7, 60-63.

[34] Yan Zhang, Ch., Zhang, Y., Xu, D.Q., Li, X., Su, J. and Yang, L.G., 2009. Genetic and phenotypic parameter estimates for growth traits in Boer goat, Livestock Science , 124, 66–71.