Evaluation of growth traits in Muzaffarnagari sheep reared under semi intensive feeding management

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ABSTRACT

Data on 2845 Muzaffarnagari lambs born during 2001-2015 at ICAR-Central Institute for Research on Goats, Makhdoom, Farah, Mathura were recorded to study growth traits in terms of body weights and average daily weight gains at various age stages. The overall least squares means for body weights at birth, 3, 6, 9 and 12 months age were 3.46±0.06, 16.11±0.37, 24.13±0.32, 28.49±0.28 and 32.68±0.27 kg and average daily gains (ADGs) during 0–3, 3-6, 6-9, 9-12 and 3-12 months age groups were 137.59±4.14, 88.49±3.57, 56.47±3.07, 55.57±2.93 and 65.12±1.68 g, respectively. Sex, season and period of lambing had highly significant (P<0.01) influence on all the body weights and average daily weight gains while parity of dam showed highly significant influence on birth weight, 3 month weight, ADG during 0-3 & 3-12 months and type of birth of lamb had similar effect on birth, 3 and 6 month weights and ADG during 0-3 and 3-6 month age intervals. Male lambs gained higher weights and ADGs than female lambs at all the growth stages while, period of lambing did not show any definite trend. Comparison of body weights and ADGs of single and twin lambs indicated that lambs born as single had higher birth and 3 month weights and ADG (0-3M) and thereafter twins showed higher body weights as well as ADGs at subsequent age stages. Dams' weight at lambing showed highly significant influence on birth and 3 month body weight and preceding weights had highly significant effect on their subsequent body weights. Maximum growth of lambs was recorded during 0-3 month (pre-weaning) age followed by 3-6, 6-9 and 9-12 age groups. This period of growth may be considered very crucial and should be ensured with proper management, feeding and health care for better productivity and outcome.

Keywords: Muzaffarnagari sheep, Body weights, Average daily gain, Parity, Type of birth
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INTRODUCTION

Muzaffarnagari, the heaviest mutton breed among 42 sheep breeds of the country, is mainly distributed in Muzaffarnagar and its adjoining districts of Western Uttar Pradesh viz. Meerut, Bulandshahar, Saharanpur and Bijnor. At present, the animals of this breed are also found in and around Mathura & Agra districts of Uttar Pradesh and in some parts of Rajasthan, Haryana and Delhi states. The breed is generally reared for mutton production as wool production is low with course quality, thus not suitable for carpet manufacture. The breed is considered as less known genotype exhibiting better growth and good adaptability than other Indian sheep breeds. The animals are famous for highest growth and good adaptability to semi arid region. Survival and growth rate are two important factors in sheep production that directly reflects the economics of the sheep production. In sheep husbandry, the sale of surplus animals, wool and manure are three source of income, but the most important is the sale of animals as it alone contributes about 65% income and remaining 35% jointly contributed from the sale of wool and manure. Evaluation of growth of lambs at birth and subsequent ages is important to know the growth rate of lambs at particular age which helps in deciding the continuation of particular animal in the flock and average daily gain per day tells about importance of particular growth period for special

care of lambs. This study was therefore, conducted to assess the impact of sex, season of lambing, period of laming, parity and type of birth of lamb on body weights & average daily weight gains and to evaluate growth traits in terms of body weights at various ages and daily growth in different age intervals of Muzaffarnagari lambs.

MATERIALS AND METHODS

Data on 2845 Muzaffarnagari lambs born during the years 2001-2015 (15 years) at the ICAR-Central Institute for research on Goats Makhdoom, Farah, Mathura were utilized for this investigation. The animals were maintained under the research project entitled "Genetic improvement in Muzaffarnagari Sheep for body weight and wool yield" of Network Project on Sheep Improvement. The lambs were weaned at 2 months of age due to poor milk production and short lactation period of their dams. After weaning, the lambs were maintained under the semi intensive feeding management, in which they were provided 100- 400g growth ration (concentrate) during various growth stages with some dry and green fodder and 5-6 hours grazing daily. The concentrate was containing 72% TDN and 16% DCP prepared from maize (15%), Barley (20%), Groundnut cake (35%), wheat bran (20%), Molasses (7%), Mineral mixture (1.5%) and salt (1.5%) Breeding rams were selected using selection index constructed from 6 month body weight and greasy fleece yield in first 6 monthly clip.

The growth of lambs were evaluated through body weights at different ages and average daily gains during various age intervals. The data were recorded for lamb number, sex of lamb, year of lambing, dams' weight at lambing, parity of dam and type of birth of lamb and body weights at birth, 3, 6, 9 and 12 months of age. The average daily weight gain of individual lamb during 0–3, 3-6, 6-9, 9-12 and 3-12 months were generated from body weights as weight gain during a particular period divided by duration of that period in days. All the lambings were took place in two major lambing seasons i.e. season 1 (February-March) and season 2 (September-October) and duration of data recording was divided in five periods of three years each. The statistical analysis was carried out using LSMLMW computer programme (Harvey, 1990) to assess the impact of various factors on growth traits (Body weights and ADGs) of Muzaffarnagari sheep.

RESULTS AND DISCUSSION

Body Weights

Least squares means and their standard errors for body weights at birth, 3, 6, 9 and 12 month age were 3.46±0.06, 16.11±0.37, 24.13±0.32, 28.49±0.28 and 32.68±0.27, respectively (Table 1). In contrast to present findings Mandal *et al.* (2003), Dass *et al*.(2008) and Dass *et al*.(2012) reported lower body weights at same ages in Muzaffarnagari sheep under semi intensive feeding management. The influence of sex, season and period of lambing on all the body weights were found highly significant (P<0.01). Similar to these findings, Dass *et al.* (1998) in Marwari sheep, Mandal *et al.* (2003) and Dass *et al*. (2018) also observed highly significant (P<0.01) impact of sex and year of lambing on body weights in Muzaffarnagari sheep. Comparison of body weights in two sexes indicated that male lambs gained significantly higher weights than female lambs at all growth stages which might be due to quantitative differences in the secretion of growth and sex hormones in two sexes. These findings were supported by the earlier workeòr (Dass *et al.*, 1998) in Marwari, Mandal *et al*., (2003) and Dass *et al.* (2018) in Muzaffarnagari sheep. Body weights in two seasons did not show any definite trend. However, the lambs born in season2 (Sept.-Oct.) gained comparatively better. The comparison of body weights in different periods showed the highest weight gain in period 5 (2013-15) and body weights in different parities indicated significant increase up to third parity and thereafter fluctuation in weights were observed. The difference in the weights in different seasons and periods may be attributed to variation in availability of foraging material in pasture during different years and variation in the genetic composition of the flock over the period. Comparison of body weights of single and twin lambs indicated that the lambs born as singles showed superiority over twin lambs at birth and 3 months weights and afterwards twin lambs gained faster than singles. Regression of dam's weight at lambing on birth & 3 month weight and preceding body

Table 1: Growth performance of Muzaffarnagari lambs (kg)

Particulars	Birth Wt.	3M Wt.	6M Wt.	9M Wt.	12M Wt.
Overall mean	3.46 ±0.06 (2845)	16.11 ±0.37 (2646)	24.13 ±0.32 (2363)	28.49 ±0.28 (2077)	32.68 ±0.27 (1865)
Sex	**	**	**	**	**
Male	3.56 ±0.06 (1408)	16.55 ±0.37 (1301)	25.16 ±0.32 (1141)	29.33 ±0.28 (979)	33.54 ±0.28 (844)
Female	3.37 ±0.06 (1437)	15.68 ±0.38 (1345)	23.09 ±0.33 (1222)	27.64 ±0.28 (1098)	31.83 ±0.28 (1021)
Season	**	**	**	**	**
S1 (Feb. - Mar.)	3.51±0.06 (1305)	15.73±0.38 (1201)	23.67±0.33 (1124)	28.19±0.29 (994)	32.93±0.28 (942)
S2 (Sep. - Oct.)	3.41±0.06 (1540)	16.50±0.37 (1445)	24.58±0.32 (1239)	28.78±0.28 (1083)	32.44±0.28 (923)
Period	**	**	**	**	**
P1 (2001 - 03)	3.31 ±0.06 (665)	16.06 ±0.37 (604)	24.17 ±0.34 (542)	28.67 ±0.30 (443)	32.93 ±0.30 (449)
P2 (2004 - 06)	3.28 ±0.07 (619)	16.26 ±0.39 (552)	23.76 ±0.35 (458)	27.95 ±0.31 (424)	32.24 ±0.31 (343)
P3 (2007 - 09)	3.61±0.07 (335)	15.69±0.40 (316)	23.31±0.34 (294)	27.83±0.30 (242)	32.04±0.30 (234)
P4 (2010 - 12)	3.54±0.06 (608)	15.37±0.39 (578)	23.68±0.34 (513)	28.79±0.30 (478)	32.83±0.30 (411)
P5 (2013 - 15)	3.57 ±0.06 (618)	17.18 ±0.39 (596)	25.73 ±0.34 (556)	29.19 ±0.30 (490)	33.39 ±0.30 (428)
Parity	**	**	NS	NS	NS
1	3.32±0.06 (1004)	15.81±0.38 (929)	24.10±0.32 (826)	28.38±0.28 (739)	32.41±0.28 (640)
2	3.45±0.06 (694)	16.22±0.39 (627)	23.92 ±0.34 (535)	28.48 ±0.30 (469)	32.75 ±0.29 (436)
3	3.53 ±0.07 (451)	16.24 ±0.40 (428)	24.16 ±0.35 (383)	28.59 ±0.30 (336)	32.00 ±0.30 (306)
4	3.45 ±0.07 (321)	16.39 ±0.41 (304)	24.26±0.36 (282)	28.37±0.32 (238)	32.76±0.32 (220)
>5	3.56±0.18 (375)	15.90±0.40 (358)	24.20±0.35 (337)	28.60±0.31 (295)	32.80±0.31 (263)
Type of birth	**	**	**	**NS**	**NS**
Single	3.73±0.01 (2291)	16.32±0.08 (2128)	23.35±0.07 (1896)	27.91±0.07 (1670)	32.28±0.07 (1508)
Twins	3.04±0.02 (554)	14.47±0.16 (518)	24.01±0.14 (467)	28.02±0.13 (407)	32.17±0.13 (357)
Regression	Dwtl**	Dwtl**	Wt3**	Wt6**	Wt9**
Coefficient	0.032±0.001	0.069±0.0009	1.108±0.016	0.892±0.011	0.907±0.012
Average	38.83±0.14	38.93±0.15	16.17±0.08	23.39±0.12	27.67±0.13

*** Significant (P<0.01), NS: Non-significant, Figures in parentheses are number of observation.*

weight at later weight was highly significant (P<0.01) which indicated that lambs born from heavier mothers had significantly higher weights at birth & 3 month age and the lambs having preceding higher weights gained higher weights at subsequent ages. This might be due better pre-natal environment received by foetus during pregnancy and availability of more milk to lambs for suckling. Similar to these findings, Dass *et al.* (2008) also observed highly significant regression of dam's weight at lambing on birth and 3 month body weights in Muzaffarnagari sheep.

Average Daily Gain (ADG)

Overall least squares means with standard errors of average daily gains during 0-3, 3-6, 6-9, 9-12 and 3-12 age group were 137.59±4.14, 88.49±3.57, 56.47±3.07, 55.57±2.93 and 65.12±1.68 g, respectively (Table 2). In comparison to present findings, Lal *et al*., 2000 (124.4±2.3, 48.4±1.2g) and Mandal *et al.*, 2003 (127.8±3.33, 49.4±1.60g) in Muzaffarnagari and Dey and Poonia, 2005 (84.72, 37.36g) in Nali sheep reported lower ADG during pre-weaning (0-3 month) and post-weaning (3-12

Table 2: Average daily weight gain (ADG) of Muzaffarnagari lambs (g).

Particulars	**ADG (0 -3M)**	**ADG (3 -6M)**	**ADG (6 - 9M)**	**ADG (9 - 12M)**	**ADG (3 -12M)**
Overall mean	131.10±0.98 (2290)	84.39±0.75 (1999)	39.07±0.61 (1612)	40.45±0.67 (1415)	53.56±0.38 (1477)
Sex	**	**	**	**	**
Male	135.59±1.44 (1038)	94.40±1.11 (886)	44.01±0.93 (663)	48.16±1.08 (4844)	62.30± 0.61 (499)
Female	126.61±1.30 (1252)	73.38±0.98 (1113)	34.13±0.75 (949)	32.75±0.74 (931)	44.83±0.42 (978)
Season	NS	**	**	*	**
S1 (Feb. -Mar.)	130.39±1.43 (1077)	78.81±1.09 (966)	32.22±0.91 (723)	41.76±0.94 (686)	49.53±0.53 (711)
S2 (Sep. -Oct.)	131.81±1.32 (1213)	89.97±1.01 (1033)	45.92±0.77 (889)	39.15±0.86 (729)	57.59±0.48 (766)
Period	**	**	**	**	**
P1 (2001 -03)	149.17±2.32 (387)	96.80±1.80 (328)	29.61±1.54 (233)	39.92±1.60 (215)	54.33±0.89 (230)
P2 (2004 -06)	109.59±2.51 (331)	80.52±1.91 (290)	30.57±1.50 (236)	21.24±1.62 (191)	45.79±0.93 (193)
P3 (2007 -09)	125.71±2.25 (414)	88.33±1.68 (380)	37.00±1.40 (275)	41.51±1.56 (216)	51.65±0.87 (232)
P4 (2010 -12)	135.50±1.85 (605)	80.58±1.39 (542)	53.04±1.08 (443)	53.97±1.05 (449)	61.40±0.60 (458)
P5(2013 -15)	135.52±1.93 (553)	75.72±1.51 (459)	45.11±1.10 (425)	45.63±1.93 (344)	54.62±0.67 (364)
Type of birth	****	****	**NS**	NS	NS
Single	141.41±0.96 (2128)	79.83±0.84 (1896)	50.09±0.77 (1669)	50.95±0.76 (1507)	59.04±0.44 (1508)
Twins	123.74±1.73 (517)	87.13±1.54 (467)	51.78±1.39 (406)	50.52±1.39 (357)	60.71±0.83 (357)

*** Significant (P<0.01), NS: Non significant, Figures in parentheses are number of observation.*

month) growth periods, respectively while Dass *et al*. (2017) recorded higher ADGs during 0-3 and 3-6 months under same management system in Muzaffarnagari sheep. In another study conducted by Dass *et al*. (2008) and Dass *et al*. (2012) in Muzaffarnagari sheep reported lower estimates of ADGs during 3-6, 6-9, 9-12 and 3-12 months age intervals in Muzaffarnagari sheep under same management system. Results revealed that average daily gain was the highest during 0-3 month (pre-weaning period) followed by 3-6, 3-12 (post-weaning period), 6-9 and 9-12 months age group. Sex, season and period of lambing showed highly significant (P<0.01) effect on all average daily gains. In consonance to present findings Lal *et al*. (2000) and Mandal *et al. (*2003) in Muzaffarnagari and Dey and Poonia (2005) in Nali sheep also observed highly significant influence of sex and lambing year on pre-weaning (0-3 month) and post-weaning (3-12 month) average daily weight gains. The significant difference of ADG in two sex and in different lambing periods were attributable to the same reasons as were for body weights. Parity of dams showed highly significant (P<0.01) influence on ADG(0-3 month) and ADG (3-12 month) and type of birth of lambs had highly significant effect on ADG (0-3 month) and ADG (3-6 month).

CONCLUSION

Present study concludes that lambs attained maximum body weight (around 44%) during 0-3 month (pre-weaning period) age group. This period of growth may be considered very crucial and proper management, feeding and health care of lambs should be ensured during this period for better productivity from this breed. Highly significant influence of regression of dam's weight at lambing on birth and three months age advocates for proper care and feeding of dams during their advance pregnancy for obtaining healthy lambs and their weights at birth and three month age to ensure higher survival rate and comparatively better growth at subsequent ages for remunerative productivity from Muzaffarnagari lambs.

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REFERENCES

Dass G, Singh VK, Mehta SC and Sharma PR. 1998. Selection in Marwari sheep: 2. Gain in body weights and growth efficiency. *Indian Journal of Small Ruminant*, 4: 47-52.

Dass G, Prasad, H, Mandal A, Singh MK and Singh NP 2008. Growth characteristics of Muzaffarnagari sheep under semi intensive feeding management. *Indian Journal of Animal Sciences,*78: 1032-1033.

Dass G 2012. Impact of selective breeding on production and reproduction traits of Muzaffarnagari sheep. National Seminar on "Future challenges and opportunities to improve health and production of small ruminants" organized by ISSGPU, Avikanagar, ICAR-CIRG, Makhdoom and ICAR-CSWRI, Avikanagar at ICAR-CIRG, Makhddom from 22-23 December, 2012, Page No.83.

Dass G, Nitika Sharma, Vinay Chaturvedi, kushwah YK and Saket Bhusan 2017. Evaluation of production traits of Muzaffarnagari sheep managed under farm conditions. National Seminar on "National scope on up-scaling production to products value addition and their safety" organized by ISSGPU, Avikanagar, ICAR-CIRG, Makhdoom and ICAR-CSWRI, Avikanagar at ICAR-CIRG, Makhdoom from 22-23 December, 2012, p83.

Dass G, Nitika Sharma, Vinay Chaturvedi, Kharche, SD and Saket Bhusan 2018. Factors influencing growth traits of Muzaffarnagari sheep reared at organized farm. International Conference on Climate change, Biodiversity and Sustainable Agriculture (ICCBSA- 2018) organized by Assam Agricultural University, Jorhat, Assam from December 13-16, 2018, p431.

Dey Bappaditya and Poonia JS. 2005. Factors affecting growth traits in Nali sheep. *Indian Journal of Small Ruminant* 11: 75-76.

Harvey WR. 1990. Users guide for LSMLMW PC-1 Version: mixed model least squares and maximum likelihood programme, IOWA State University, USA.

Lal N, Misra BS, Singh PK and Shukla SN. 2000. Growth rate and wool production in Muzaffarnagari sheep and its exotic grades. *Indian Journal of Small Ruminant* 6: 68-72.

Mandal A, Pant KP, Nandy DK, Rout PK and Roy R. 2003. Genetic analysis of growth traits in Muzaffarnagari sheep. *Tropical Animal Health & Production* 35: 271-284.