GROWTH RATE PERFORMANCE OF SONADI SHEEP IN TERMS OF GROWTH EFFICIENCY

ABSTRACT

The present study was conducted to assess the effect of non-genetic factors on growth efficiency of Sonadi sheep of different age groups. In this study,data on 1396 Sonadi sheep maintained ~~over the period of 2012-2019~~from 2012 to 2019 under the Mega Sheep Seed Project, College of Veterinary and Animal Science, Navania, Vallabhnagar, Rajasthan, were analysed to assess the effect of non-genetic factors (sex, type of birth, year of birth, season of birth)on growth efficiency viz. 0-3, 3-6, 6-9 and 9-12 months age groups. The overall least-squares mean along with standard error for GE1 (0-3M), GE2 (3-6M), GE3 (6-9M) and GE4 (9-12M)were 2.57±0.10, 0.496±0.03, 0.244±0.24 and 0.266±0.02 kg/kg, respectively.Year of birth had a highly significant (P≤0.01) effect on all growth traits~~. Effe~~Theeffects~~ct~~ of the season of birth on growth efficiency was also highly significant (P≤0.01) for GE1 and GE2~~group~~ groupswhile significant for GE3 and GE4 groups. ~~Sex~~ The sexof lamb showed a significant (P≤0.05) effect on GE1 and non-significant on the rest of the groups (GE2, GE3, GE4), whereas the effect of the type of lamb on growth efficiency was found to be non-significant on all groups.

Keywords: Growth Efficiency, Least Square Mean, Non-genetic factors, Significant,Sonadi.

INTRODUCTION

Sheep, with its multi-faceted value for fleece, meat, milk, skin and compost, form a significant segment of rustic economy, especially in dry, semi-dry and hilly zones of the nation where the atmosphere stays unfavourable. Sheep husbandry ~~play~~ playsan important role in the livelihood of rural masses and a crucial function in the financial upliftment of a

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large portion of the ~~under privileged~~underprivileged communities and ranchers. They contribute greatly to the agrarian economy, especially in areas where crop and dairy farming are not economical. An amount of 535.95 million kg of meat and 43.50 million kg of fleece were produced by sheep in 2016-2017 (DAHD, 2020). As per NBAGR (2020), Rajasthan ~~which is also~~, also the 4th biggest ~~sheep rearing~~sheep-rearing state of India, has 8 ~~well defined~~well-defined breeds out of total of 44 enlisted breeds.

Sonadi breed of sheep is reared for mutton ~~purpose because towards mutton there is no prejudice by any community in India~~purposes because there is no prejudice by any community in India towards mutton. Meat is a nutritious food that ~~has~~ plays a significant part in ~~human balanced~~balanced human diet. Accordingly, there is an interest ~~to increase~~in increasing the rate of meat production and utilization all through the world (Ahmed *et al.*, 2004). Consequently, an expansion in small ruminant production could ~~add to the achievement of~~increase food self-sufficiency in the nation, especially because of protein necessity for the increasing human population and improve the export of mutton. Attributes identified with growth are of intricate qualities. They reflect the impacts of an intricate net of ~~gene actions affected by the climate~~climate-related gene actions. Accordingly, to improve the growth performance of animals, improvement in both their hereditary structure and the climate they are encircled by is required. Growth profile attributes are acceptable markers of the versatility of an animal to the current ecological conditions. In this manner, better growth is fundamental for suitable proliferation, creation and survivability in sheep. The growth characteristics assume a significant function in efficiency and are one of the significant selection attributes in sheep breeds. ~~Life~~ an animal's life is known to be impacted by both hereditary and natural elements, which must be assessed before~~of an animal is known to be impacted by both hereditary and natural elements which must be assessed prior to~~ arranging and actualising a sheep breeding plan (Mandal*et al.*, 2003; Gbangboche*et al.*, 2006). Growth

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efficiency (GE) is the weight gain during a given time interval comparable to the weight toward the start of the ~~time span~~period(Sharma, 1994). It expresses the proportionate weight gain in contrast with initial weight. Higher growth effectiveness in the pre-weaning stage shows early selection (Khadda*et al.*, 2019).

MATERIAL AND METHOD

The data on the growth of 1396 animals (Sonadi sheep) spread over a period of 8 years from 2012-2019 were taken from Mega Sheep Seed Project coordinating Sonadi sheep unit, Vallabhnagar, Udaipur (Rajasthan), where they are maintained under a semi-intensive system of management. On the basis of a year of birth, data ~~was~~ werecategorized into eight classes and coded from i_1- i_8 for the corresponding year. Season of birth was categorised into three seasons ~~as~~ j_1 (monsoon: July to October),j_2 (winter: November to February) and j_3 (summer: March to June). ~~Sex~~The sexof the lamb was classified according to male (k_1) and female (k_2), whilethe type of birth was according to single (l_1) and twin (l_2). The data on growth efficiency wasanalysed through the Mixed Model Least-Squares and Maximum Likelihood method designed by Harvey (1990).

To estimate the effect of various non-genetic factors on growth efficiency was estimated through ~~thefollowing~~ the followingmodel:

$$\mathbf{Y_{ijklm} = \mu + A_i + B_j + C_k + D_l + E_m + e_{ijklm}}$$

Where,

Y_{ijklm}= Growth records of the m^{th} progenybelonging to k^{th} sex, j^{th} season, i^{th} period and l^{th} type of birth

μ = Population mean

A_i = Fixed effect of i^{th} period of birth (i = 1, 2, 3, 4, 5, 6, 7, 8)

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B_j= Fixed effect of j^{th} season of birth (j = 1, 2, 3)

C_k= Fixed effect of k^{th}sex of birth (k = 1, 2)

D_l = Fixed effect of l^{th} type of birth (l = 1, 2)

e_{ijklm}= Residual error, NID (0, σ^2)

Duncan's Multiple Range Test (DMRT) was used to make pair wise comparison among the least squares means (Kramer, 1956).

RESULT AND DISCUSSION

The overall least-squares mean along with standard error of growth efficiency were observed as 2.57±0.10, 0.496±0.03, 0.244±0.24 and 0.266±0.02 kg per kg forGE1, GE2, GE3 and GE4 respectively which are shown in table 1 and figure 1-4.

Our findings of GE1 (0-3) were found to be in close agreement with Thiruvenkadan*et al.* (2011) for Mecheri sheep as 2.57±0.03 kg per kg, while the findings of GE3(6-9)~~was~~were in close agreement with Khadda*et al.* (2019) for Pantja goats as 0.24±0.01 kg per kg. The lower estimate of GE4 (9-12) was reportedby Joshi *et al.*(2003) as 0.12±0.003 kg per kg for Marwari lamb.

It was observed that the growth efficiency amid GE1 was higher as compared to GE2, GE3 and GE4. This might be due to the effect of the dam's milk during the suckling stage, which serves as a complete nutritious food for ~~kid~~kids.

3.1 Year of Birth

Year of birth had a highly significant (P≤0.01) effect on GE1, GE2, GE3 and GE4. Similar results were reported as highly significant ~~effect~~ effectsby Dass*et al.* (2003) in Magra sheep, Joshi *et al.* (2003) in Marwari lambs. On the contrary, Devendran*et al.*(2010) observeda non-significant effect of year of birth on growth efficiency for GE2, GE3 and GE4

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in Madras Red sheep.The effect of the year of birth on growth efficiency might be due to differences in agro-climatic conditions & differences in nutrition and management conditions over the years.

3.2 Season of Birth

~~Effect~~ The effectof season of birth on growth efficiency was highly significant (P≤0.01) for GE1, GE2 and GE4 while significant for GE3 of Sonadi sheep. However, similar to our findings,Devendran*et al.*(2010) also observed a significant effect of season of birth on growth efficiency for GE3 in Madras red sheep. Whereas in contrast to our present findings, Devendran*et al.*(2010) also observed a non-significant effect of season of birth on growth efficiency for GE1, GE2 and GE4 in Madras red sheep. The growth efficiency for GE1 and GE4 was high for the lambs born during summer. The lambs born in the monsoon had high growth efficiency only for GE3, while GE2 had high growth efficiency for lambs born in the winter season.The effect of season of birth on growth efficiency might be caused due to exposure to hot, humid and hardy ~~environment~~ environmentsduring summer or may be due to regional differences in the climatic conditions, availability of pasture during different seasons and classification of seasonal data. The changes in nutritional factors due to season have more effect of season on growth efficiency.

3.3 Sex of lamb

Our present findings showed a highly significant (P≤0.01) effect of sex on the growth efficiency of GE4, while just significant for GE1& non-significant for GE2 and GE3 in Sonadi sheep. However, Joshi *et al.*(2003) observed a highly significant effect of sex forGE1, GE2 and GE3 in Marwari lamb; Devendran*et al.*(2010) found highly significant forGE1 and GE4 while only significant for GE2in Madras Red sheep. Whereas in contrast to our present findings, Devendran*et al.* (2010) observed a non-significant effect of sex on growth efficiency

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forGE3 in Madras Red sheep, while Dass*et al.*(2003) found a non-significant for GE1, GE2 and GE4in Magra sheep.The difference between both ~~the~~ sexes can be due to ~~the~~ hormonal differences in their endocrinological and physiological functions. In females, the estrogen hormone restricts the growth of long bones, whereas testosterone had a positive impact on the growth rate in males. ~~Testosterone~~ The testosteronehormone makes the males aggressive for suckling and feeding, which may have resulted in a higher intake of nutrients a,nd consequently higher growth efficiency.

3.4 Type of birth

Type of birth had a non-significant effect on growth efficiency for GE1, GE2, GE3 and GE4. However, similar findings had been observed by Kumar *et al.*(2005) in Tellicheri kids for GE1 and GE2, while a significant effect ~~of~~ onthe type of birth was observed by Khadda*et al.* (2019) in Pantja goats for GE3.The growth efficiency for GE1 and GE3 was high for the lambs born single, while for GE2 and GE4, growth efficiency was high for the twin type of birth. Single born ~~lamb~~ lambshad higher growth efficiency than twin born because of ~~compete~~ completefeeding of mother milk in twin lambs during pre-weaning age. Single born lambs with higher birth weight grew faster due to better nutrient supply during prenatal ~~as well as pre-weaning period~~and pre-weaning periods. Twin lambs may show growth spurt during post-weaning periods and utilize feed more efficiently than single lamb.

CONCLUSION

The present study highlights that the non-genetic factors *viz.*, year and season of birth and sex of lamb, were the major factors affecting the growth efficiency of Sonadi sheep. The result obtained in this study showed that the effect of year of birth and season of lambing had a significant effect onthe growth efficiency of Sonadi sheep, as environmental and managemental factors affect the provision of feed requirements.The sex of lamb had shown a

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significant effect on pre-weaning (GE1) growth efficiency, but it did not show any significant effect on post weaning (GE2, GE3, GE4) growth efficiency.The type of lambing showed a non-significant effect for GE1, GE2, GE3 and GE4. Therefore, the assessment of non-genetic factors plays an important role ~~to formulate~~in formulatingan effective breeding programme for improvement of ~~growth performance of Sonadi sheep and measure~~Sonadi sheep's growth performance and measures to be taken for standardizing the management of the flock for sustainable production.

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Table 1: Year, Season, Sex, TOL wise least square mean and standard error of growth efficiency trait of Sonadi sheep

Effect	GE1 (0-3 months)	GE2 (3-6 months)	GE3 (6-9 months)	GE4 (9-12 months)
μ	2.57±0.10	0.496±0.03	0.244±0.02	0.266±0.02
N	1060	831	630	506
Year	**	**	**	**
2012	3.42^{c}±0.13 (130)	0.412^{b}±0.04 (94)	0.286^{cb}±0.03 (74)	0.338^{c}±0.03 (64)
2013	1.50^{a}±0.12 (188)	0.701^{d}±0.04 (163)	0.346^{d}±0.02 (136)	0.442^{d}±0.03 (120)
2014	1.34^{a}±0.12 (127)	0.805^{e}±0.04 (106)	0.392^{e}±0.02 (91)	0.370^{c}±0.03 (79)
2015	2.75^{b}±0.14 (99)	0.447^{cb}±0.04 (85)	0.173^{ab}±0.03 (54)	0.228^{ab}±0.03 (54)
2016	2.80^{b}±0.12 (157)	0.381^{b}±0.04 (92)	0.233^{b}±0.03 (71)	0.271^{b}±0.03 (59)
2017	2.74^{b}±0.13 (135)	0.334^{b}±0.04 (104)	0.123^{a}±0.03 (72)	0.225^{ab}±0.03 (62)
2018	3.42^{c}±0.12 (147)	0.239^{a}±0.04 (138)	0.157^{a}±0.02 (115)	0.191^{a}±0.03 (61)
2019	2.57^{b}±0.14 (77)	0.647^{d}±0.05 (49)	0.243^{ab}±0.05 (17)	0.274^{abc}±0.06 (7)
Season	**	**	*	*
Season I (Monsoon)	2.48^{a}±0.10 (413)	0.499^{b}±0.03 (354)	0.267^{b}±0.02 (272)	0.282^{a}±0.02 (216)
Season II (Winter)	2.36^{a}±0.10 (517)	0.573^{c}±0.03 (384)	0.221^{a}±0.02 (283)	0.264^{a}±0.02 (219)
Season III (Summer)	2.86^{b}±0.13 (130)	0.415^{a}±0.04 (93)	0.244^{ab}±0.03 (75)	0.331^{b}±0.03 (70)
Sex	*	**NS**	**NS**	**NS**

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Male	2.64[b]±0.10 (509)	0.517±0.03 (400)	0.256±0.02 (95)	0.297±0.02 (235)
Female	2.49[a]±0.10 (551)	0.474±0.03 (431)	0.232±0.02 (335)	0.288±0.02 (270)
TOB	**NS**	**NS**	**NS**	**NS**
Single	2.677±0.38 (1031)	0.488±0.01 (810)	0.252±0.01 (614)	0.252±0.01 (495)
Twin	2.46±0.19 (29)	0.504±0.06 (21)	0.236±0.04 (16)	0.333±0.05 (11)

Figure 1: Yearwise least square mean of Growth Efficiency trait of Sonadi sheep

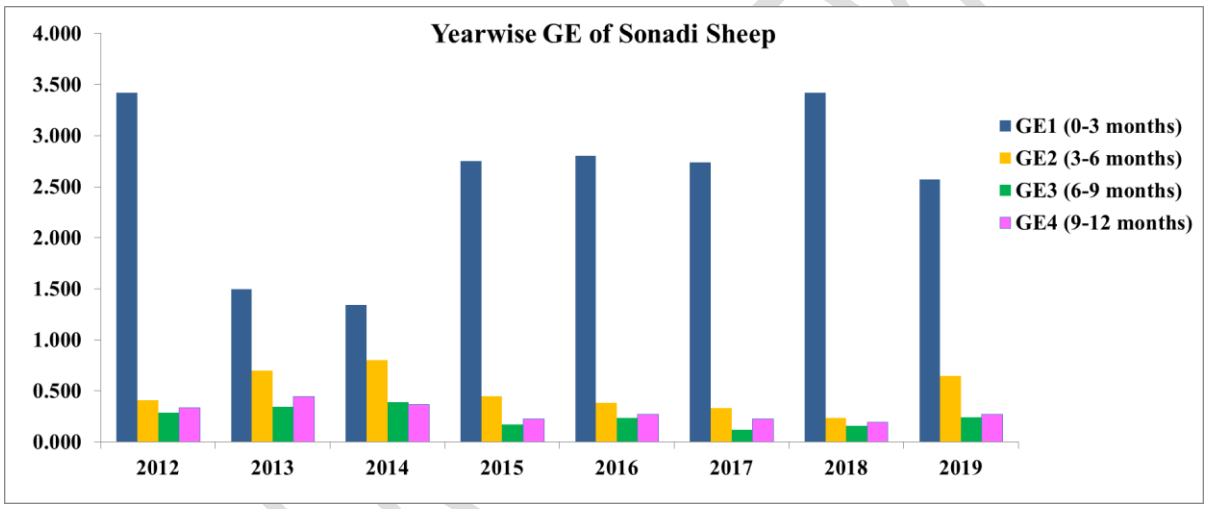


Figure 2: Season wise least square mean of growth efficiency trait of Sonadi sheep

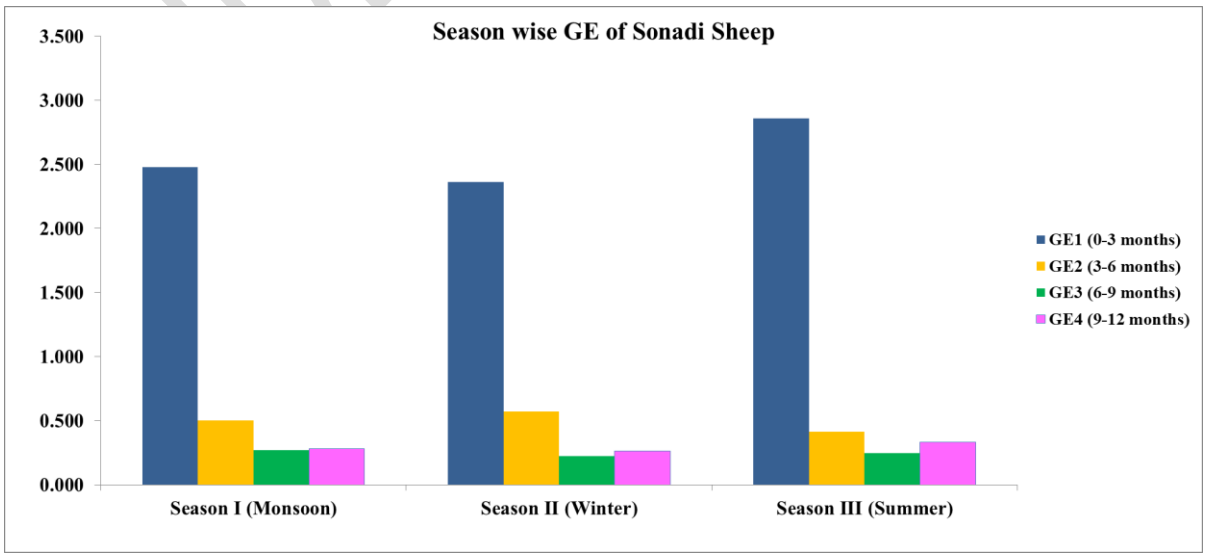


Figure 3: Sex wise least square mean of growth efficiency trait of Sonadi sheep

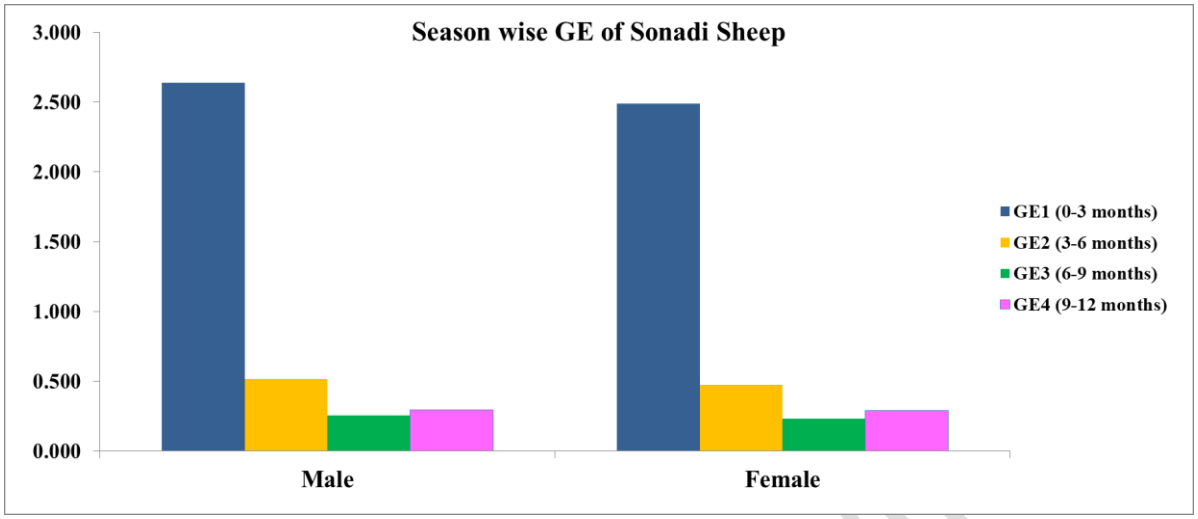
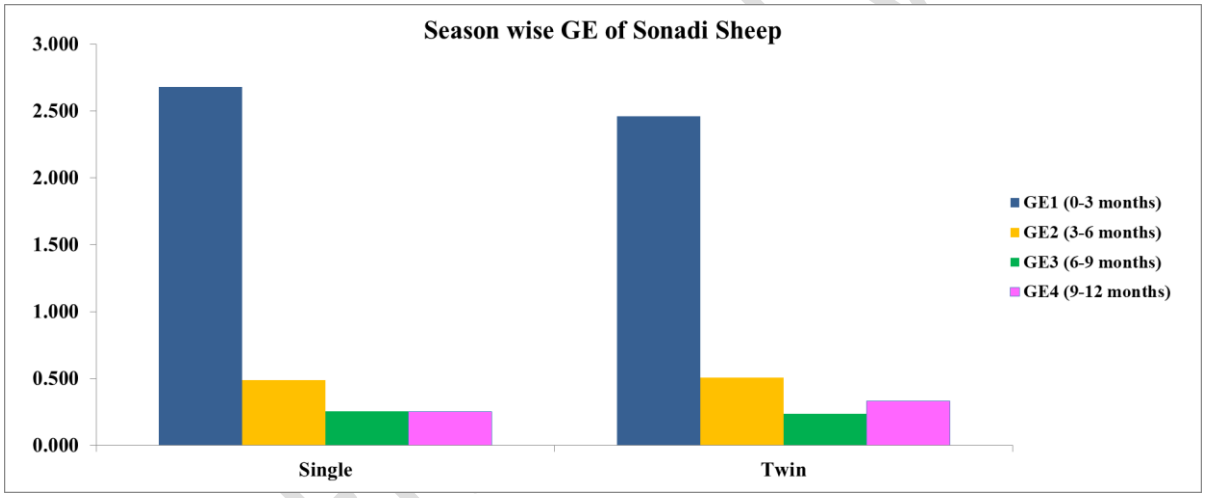


Figure 4: TOL wise least square mean of growth efficiency trait of Sonadi sheep



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