

# **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 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  $2.57 \pm 0.10$ ,  $0.496 \pm 0.03$ ,  $0.244 \pm 0.24$  and  $0.266 \pm 0.02$  kg/kg, respectively. Year of birth had highly significant ( $P \leq 0.01$ ) effect on all growth traits. Effect of season of birth on growth efficiency was also highly significant ( $P \leq 0.01$ ) for GE1 and GE2 group while significant for GE3 and GE4 groups. Sex of lamb showed significant ( $P \leq 0.05$ ) effect on GE1 and non-significant on rest of the groups (GE2, GE3, GE4) whereas effect of 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 atmosphere stays unfavourable. Sheep husbandry play an important role in the livelihood of rural masses and a crucial function in the financial upliftment of a large portion of the under privileged 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 meat and 43.50 million kg fleece were produced by sheep in 2016-2017 (DAHD, 2020). As per NBAGR (2020), Rajasthan which is also the 4<sup>th</sup> biggest sheep rearing state of India has 8 well defined breeds out of total 44 enlisted breeds.

Sonadi breed of sheep is reared for mutton purpose because towards mutton there is no prejudice by any community in India. Meat is a nutritious food that has a significant part in human balanced diet. Accordingly, there is an interest to increase 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 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. 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 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 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 efficiency (GE) is the weight gain during a given time interval comparable to the weight toward the start of the time span (Sharma, 1994). It expresses the proportionate weight gain in contrast with initial weight. Higher growth effectiveness in pre-weaning stage shows early selection (Khadda *et al.*, 2019).

## **MATERIAL AND METHOD**

The data on growth of 1396 animals (Sonadi sheep) spread over 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 semi-intensive system of management. On the basis of year of birth, data was categorized 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 of lamb was classified according to male ( $k_1$ ) and female ( $k_2$ ) while type of birth according to single ( $l_1$ ) and twin ( $l_2$ ). The data on growth efficiency was analysed through 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 the following model:

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

Where,

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

$\mu$  = Population mean

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

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

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

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

$e_{ijklm}$  = Residual error, NID ( $0, \sigma^2$ )

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  $2.57 \pm 0.10$ ,  $0.496 \pm 0.03$ ,  $0.244 \pm 0.24$  and  $0.266 \pm 0.02$  kg per kg for GE1, 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 Thiruvankadan *et al.* (2011) for Mecheri sheep as  $2.57 \pm 0.03$  kg per kg while the findings of GE3 (6-9) was in close agreement with Khadda *et al.* (2019) for Pantja goats as  $0.24 \pm 0.01$  kg per kg. The lower estimate of GE4 (9-12) was reported by Joshi *et al.* (2003) as  $0.12 \pm 0.003$  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 effect of dam's milk during suckling stage which serves as a complete nutritious food for kid.

### 3.1 Year of Birth

Year of birth had highly significant ( $P \leq 0.01$ ) effect on GE1, GE2, GE3 and GE4. Similar results were reported as highly significant effect by Dass *et al.* (2003) in Magra sheep, Joshi *et al.* (2003) in Marwari lambs. On the contrary, Devendran *et al.* (2010) observed non-significant effect of year of birth on growth efficiency for GE2, GE3 and GE4 in Madras Red sheep. The effect of 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 of season of birth on growth efficiency was highly significant ( $P \leq 0.01$ ) for GE1, GE2 and GE4 while significant for GE3 of Sonadi sheep. However, similar to our findings Devendran *et al.* (2010) also observed 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 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 monsoon had high growth efficiency only for GE3 while GE2 had high growth efficiency for lambs born in winter season. The effect of season of birth on growth efficiency might be caused due to exposure to hot humid and hardy environment during 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 highly significant ( $P \leq 0.01$ ) effect of sex on growth efficiency of GE4 while just significant for GE1 & non-significant for GE2 and GE3 in Sonadi sheep. However, Joshi *et al.* (2003) observed highly significant effect of sex for GE1, GE2 and GE3 in Marwari lamb; Devendran *et al.* (2010) found highly significant for GE1 and GE4 while only significant for GE2 in Madras Red sheep. Whereas in contrast to our present findings, Devendran *et al.* (2010) observed non-significant effect of sex on growth efficiency for GE3 in Madras Red sheep while Dass *et al.* (2003) found non-significant for GE1, GE2 and GE4 in Magra sheep. The difference between both the sexes can be due to the hormonal differences in their endocrinological and physiological functions. In females, estrogen hormone restricts growth of long bones, whereas testosterone had positive impact on growth rate in males. Testosterone hormone makes the males aggressive for suckling and feeding, which may have resulted in higher intake of nutrients and consequently higher growth efficiency.

### 3.4 Type of birth

Type of birth had 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 significant effect of 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 twin type of birth. Single born lamb had higher growth efficiency than twin born because of complete feeding 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. 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 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 on growth efficiency of Sonadi sheep as environmental and managerial factors affect the provision of feed requirements. The sex of lamb had shown a 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 non-significant effect for GE1, GE2, GE3 and GE4. Therefore, assessment of non-genetic factors plays an important role to formulate effective breeding programme for improvement of growth performance of Sonadi sheep and measure 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)
$\mu$	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 <sup>c</sup> ±0.13 (130)	0.412 <sup>b</sup> ±0.04 (94)	0.286 <sup>cb</sup> ±0.03 (74)	0.338 <sup>c</sup> ±0.03 (64)
2013	1.50 <sup>a</sup> ±0.12 (188)	0.701 <sup>d</sup> ±0.04 (163)	0.346 <sup>d</sup> ±0.02 (136)	0.442 <sup>d</sup> ±0.03 (120)
2014	1.34 <sup>a</sup> ±0.12 (127)	0.805 <sup>e</sup> ±0.04 (106)	0.392 <sup>e</sup> ±0.02 (91)	0.370 <sup>c</sup> ±0.03 (79)

2015	2.75 <sup>b</sup> ±0.14 (99)	0.447 <sup>cb</sup> ±0.04 (85)	0.173 <sup>ab</sup> ±0.03 (54)	0.228 <sup>ab</sup> ±0.03 (54)
2016	2.80 <sup>b</sup> ±0.12 (157)	0.381 <sup>b</sup> ±0.04 (92)	0.233 <sup>b</sup> ±0.03 (71)	0.271 <sup>b</sup> ±0.03 (59)
2017	2.74 <sup>b</sup> ±0.13 (135)	0.334 <sup>b</sup> ±0.04 (104)	0.123 <sup>a</sup> ±0.03 (72)	0.225 <sup>ab</sup> ±0.03 (62)
2018	3.42 <sup>c</sup> ±0.12 (147)	0.239 <sup>a</sup> ±0.04 (138)	0.157 <sup>a</sup> ±0.02 (115)	0.191 <sup>a</sup> ±0.03 (61)
2019	2.57 <sup>b</sup> ±0.14 (77)	0.647 <sup>d</sup> ±0.05 (49)	0.243 <sup>ab</sup> ±0.05 (17)	0.274 <sup>abc</sup> ±0.06 (7)
<b>Season</b>	<b>**</b>	<b>**</b>	<b>*</b>	<b>*</b>
Season I (Monsoon)	2.48 <sup>a</sup> ±0.10 (413)	0.499 <sup>b</sup> ±0.03 (354)	0.267 <sup>b</sup> ±0.02 (272)	0.282 <sup>a</sup> ±0.02 (216)
Season II (Winter)	2.36 <sup>a</sup> ±0.10 (517)	0.573 <sup>c</sup> ±0.03 (384)	0.221 <sup>a</sup> ±0.02 (283)	0.264 <sup>a</sup> ±0.02 (219)
Season III (Summer)	2.86 <sup>b</sup> ±0.13 (130)	0.415 <sup>a</sup> ±0.04 (93)	0.244 <sup>ab</sup> ±0.03 (75)	0.331 <sup>b</sup> ±0.03 (70)
<b>Sex</b>	<b>*</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>
Male	2.64 <sup>b</sup> ±0.10 (509)	0.517±0.03 (400)	0.256±0.02 (95)	0.297±0.02 (235)
Female	2.49 <sup>a</sup> ±0.10 (551)	0.474±0.03 (431)	0.232±0.02 (335)	0.288±0.02 (270)
<b>TOB</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>
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**

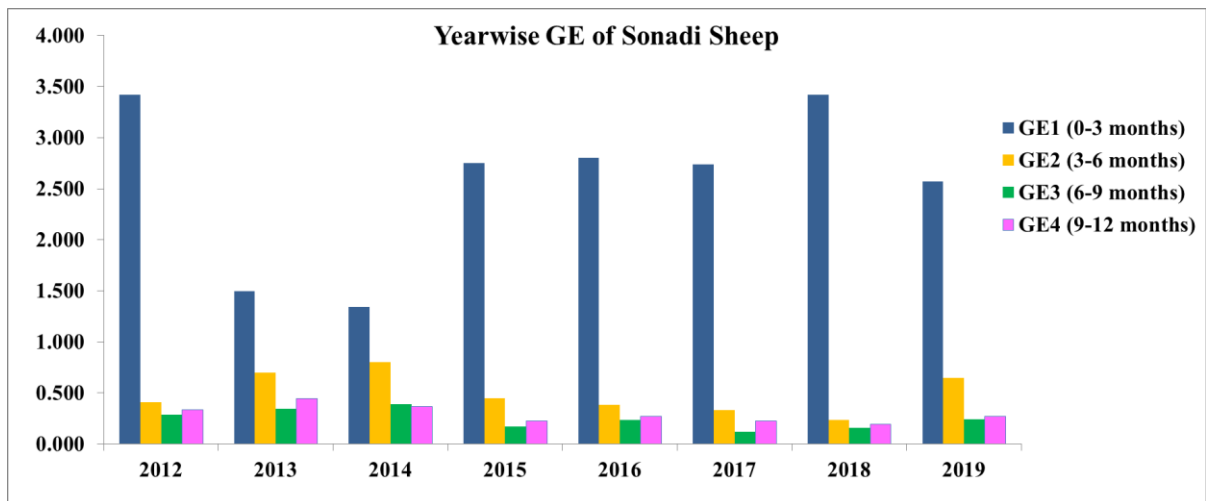


Figure 2: Season wise least square mean of growth efficiency trait of Sonadi sheep

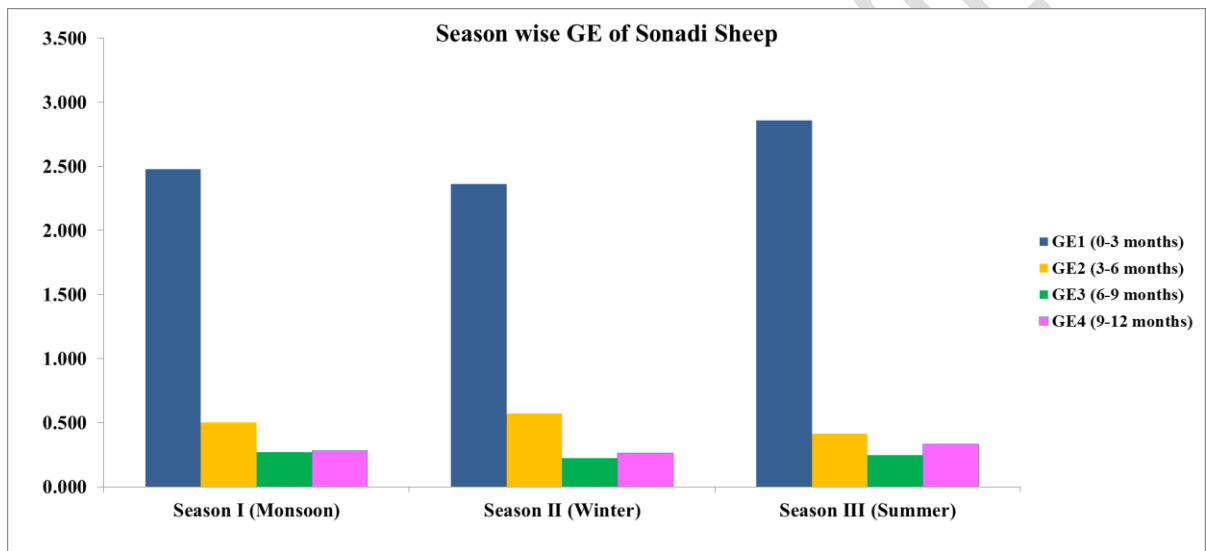


Figure 3: Sex wise least square mean of growth efficiency trait of Sonadi sheep

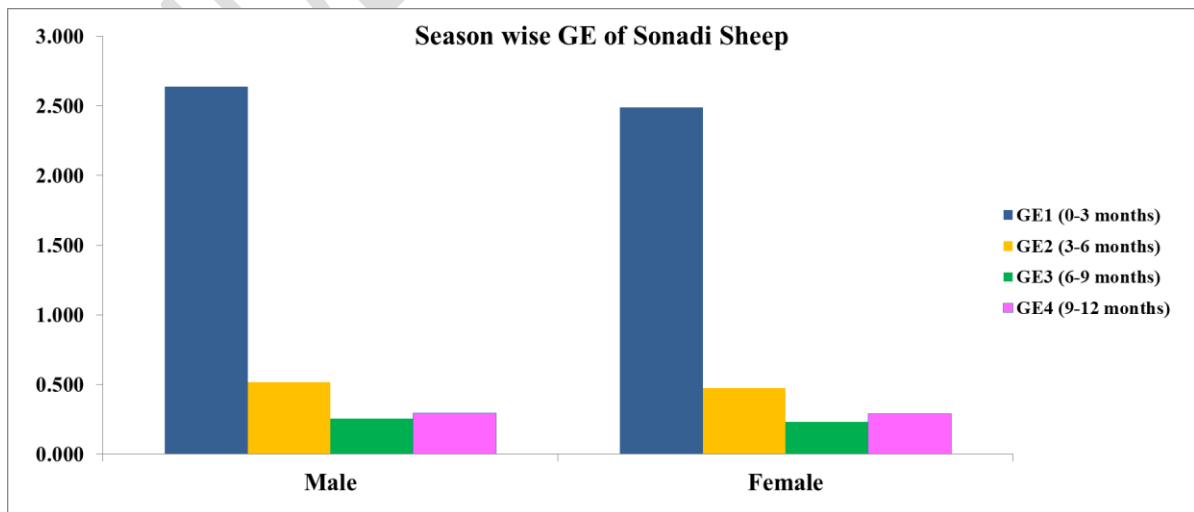
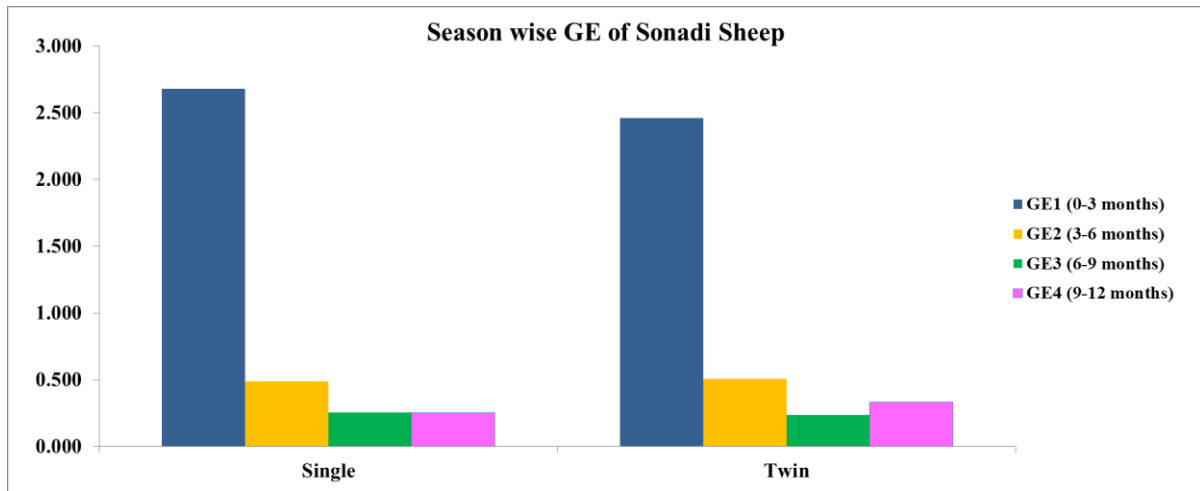


Figure 4: TOL wise least square mean of growth efficiency trait of Sonadi sheep



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