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Association between growth and reproduction traits of sangamneri goat under field conditions

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Abstract

At the AICRP on Goat Improvement (Sangamneri field unit), Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India, the data on 492 Sangamneri kids born between 2006 and 2014 was collected for growth and reproductive traits and adjusted for significant non-genetic factors. The adjusted data was used to estimate the genetic and phenotypic correlations among the growth and reproduction traits.

The genetic and phenotypic correlations among 1 month body weight (W1), 3 months body weight (W3), 6 months body weight (W6), 9 months body weight (W9), 12 months body weight (W12), age at maturity (AM), age at first kidding (AFK), prolificacy (PROL.), first service period (FSP) and first kidding interval (FKI) were estimated for Sangamneri goat. The positive and significant association amongst growth traits and negative and significant association amongst growth and reproduction traits indicate that the early stage body weights especially body weight at weaning stage can be considered for selection of animals to enhance the growth and reproduction traits.

Keywords: Body weights, reproductive traits, genetic and phenotypic correlation

Introduction

In the arid and semi-arid regions of India, goat farming has been a vital source of sustainable revenue for rural communities, meeting their requirements year-round and offering a steady source of income. Goat farming efficiency is evaluated based on growth and reproduction performance in addition to milk, meat, and fiber yield. A kid's growth is a sign of a viable economy. Body weight provides a reasonable predictor of kid's future performance. Additionally, it aids growers in determining the right breeding age, marketable slaughter weight, ration calculations, medicine dosage calculations, and animal evaluation at a given age.

The reproduction performance governs the profitability of the goat enterprise. Kidding at an early age in goat reduced generation interval, which improved the overall productivity and return from the flock. Short kidding interval is an important requisite for producing more number of kids per doe in her life time. Sangamneri is one of the well-known goat breed of Maharashtra. The breed's name comes from the Sangamner tahsil of Ahmednagar district, where it is found.

The districts of Ahmednagar, Pune and Nashik in the state of Maharashtra are the home tract to a significant concentration of pure animals of this breed. The breed is primarily used to produce milk and meat. Owing to its resilience against disease, rapid rate of multiplication, and excellent breeding efficiency, it is regarded as one of the most significant breed in this area.

The correlation of phenotypic values is the relationship between two qualities that are directly observable. Trait correlation can be attributed to two factors: genetic and non-genetic, or environmental. While linking can contribute to temporary correlation, pleiotropy is mostly responsible for the former. Genetic correlations are useful in anticipating correlated response to selection and are required for calculating the optimal weightage for each trait in the selection index. These are mostly due to the pleiotropic effects of genes and linkage of genes governing distinct phenotypes. When the same variances in environmental conditions have an impact on both qualities, the environment might act as a cause of correlation.

To enhance the production of kid meat, genetic advancements in both growth and reproductive traits are crucial.

A trait's genetic association with other traits determines much of its potential genetic improvement. For this reason, knowledge about the flock's genetic and phenotypic characteristics is essential. Therefore, the goal of the current study was to determine the genetic and phenotypic links between the Sangamneri goat's growth and reproduction attributes.

Material and Methods

The data of 492 female kids born from 2006 to 2014 maintained at All India Co-ordinated Research Project on Goat Improvement (Sangamneri field unit), Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India were taken for present investigation. The traits considered for analysis were body weights at 1 month (W1), 3 months (W3), 6 months (W6), 9 months (W9) and 12 months (W12) of age, age at maturity (AM), age at first kidding (AFK), prolificacy (PROL.), first service period (FSP) and first kidding interval (FKI). By fitting least squares constants, the data were adjusted for significant period, season, and birth type effects. The analysis did not include the rams with fewer than five progenies. Using the LSMLMW and MIXMDL computer programs on PC-2, the estimates of genetic and phenotypic correlations / associations were calculated using covariance (Harvey, 1990) [1].

Results and Discussion

Table 1 shows that the genetic correlations between the body weights at one, three, six, nine, and twelve months were all positive, highly significant, and ranged from 0.26** to 0.97**. Similar range of genetic correlations was also reported by Jitkar (2013) [2], Kamble (2013) [3] and Mandakmale *et al.* (2015) [5]. Selection of individuals at 3 months of age could be a useful criteria for genetic improvement in the future, according to significant genetic associations between 3 months of body weight and body weight at following ages.

Age at maturity showed a strong and positive genetic association with age at first kidding, while age at first kidding showed a substantial negative correlation with prolificacy, first service period, and first kidding interval. Mandakmale (2002) [4] also observed strong and positive genetic relationships between the age of first kidding and maturity. According to Tesfaye *et al.* (2012) [6], there is a strong negative genetic association between the age at first kidding and the kidding interval.

The growth traits had negative and higher genetic association with age at first kidding. High and negative correlations between growth traits and age at first kidding suggest that selection of female kids which are heavier at any stage of age achieves earlier age at first kidding. The body weights had positive and higher genetic associations with prolificacy except weaning body weight. The body weight at 1 and 6 months age had positive and substantial genetic associations with age at maturity, while body weight at twelve months age had negative and higher genetic correlation with age at maturity. The body weight at 1 month age had positive and significant genetic association with first service period. The body weights at 9 and 12 months age had positive and higher genetic associations with first service period and first kidding interval. Higher and negative genetic correlations between growth traits and age at first kidding were also reported by Mandakmale (2002) [4], Jitkar (2013) [2] and Kamble (2013) [3]. Jitkar (2013) [2] and Kamble (2013) [3] also revealed strong and significant genetic associations of 9 and 12 months body weights with service period. Positive and substantial genetic association of 12 months body weight with kidding interval were observed by Mandakmale (2002) [4].

The positive and strong phenotypic associations were noticed among different body weights in Sangamneri goat except body weight at 1 month age with 9 and 12 months body weights, where it was positive but non-significant. The findings were in agreement with the reports of Mandakmale (2002) [4], Jitkar (2013) [2], Kamble (2013) [3] and Mandakmale (2015) [5].

The phenotypic association between age at maturity and age at first kidding were substantial and positive. Mandakmale (2002) [4] also noted a positive and stronger phenotypic connection between the age of first kidding and the age at maturity.

The body weights at 3, 6, 9 and 12 months age showed negative and strong phenotypic associations with age at first kidding which indicates selection of heavier female kids at weaning or later stages of age results in earlier age at first kidding. The body weight at 1 month age had positive and high phenotypic association with first kidding interval. The negative and strong phenotypic associations of 3, 6, 9 and 12 months body weights with age at first kidding were also recorded by Mandakmale (2002) [4].

Among the growth and reproduction traits, the phenotypic correlation between body weights at 3, 6, 9 and 12 months with age at first kidding found to be significant and negative, which indicate that heavier female lambs at weaning or later stages of age results in earlier kidding.

Table 1: Genetic and phenotypic associations (estimates above diagonal are genetic correlations and below diagonal are phenotypic correlations) among growth and reproductive traits.

Traits	W1	W3	W6	W9	W12	AM	AFK	PROL.	FSP	FKI
W1	--	0.38**	0.33**	0.29**	0.26**	0.11**	-0.31**	0.12**	0.10*	0.04
W3	0.29**	--	0.54**	0.80**	0.92**	NP	-0.60**	0.03	NP	NP
W6	0.14**	0.26**	--	0.97**	0.81**	0.23**	-0.49**	0.11*	NP	NP
W9	0.07	0.15**	0.37**	--	0.87**	0.02	-0.50**	0.09*	0.42**	0.49**
W12	0.04	0.18**	0.32**	0.42**	--	-0.09*	-0.58**	0.10*	0.64**	0.72**
AM	0.03	0.03	-0.04	-0.05	-0.07	--	0.33**	0.07	NP	NP
AFK	-0.06	-0.10*	-0.22**	-0.23**	-0.30**	0.15**	--	-0.13**	-0.48**	-0.50**
PROL.	0.01	0.02	-0.02	0.02	0.01	0.05	-0.02	--	0.07	0.08
FSP	0.08	0.01	NP	0.08	0.08	-0.02	-0.08	-0.03	--	1.00
FKI	0.09*	0.01	NP	0.08	0.08	-0.02	-0.08	-0.04	0.50**	--

**= $P < 0.01$, * = $P < 0.05$ and NS = Not Precise

Conclusions

The positive and significant association amongst growth traits and negative and significant association amongst growth and reproduction traits indicate that the early stage body weights especially body weight at weaning stage can be considered for selection of animals to enhance the growth and reproduction traits.

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Conflict of Interest

Not available

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Not available

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