

HEAT TOLERANCE ABILITY AND ITS VARIABILITY IN DIFFERENT BREEDS OF GOAT WITH REFERENCE TO PULSE RATE

Thakare P.D., Sirothia A.R and Sawarkar A.R

Abstract

The pulse rates were recorded a 76.43 ± 0.602 , 79.26 ± 1.121 , 80.80 ± 0.506 , 76.81 ± 0.197 and 72.60 ± 0.43 beats / minute for Barbari, Jamnapari, Sirohi, Osmanabadi and Local breeds of goat respectively. Negative correlation observed in pulse rate in Osmanabadi and Local goat breed. However significant positive correlation between respiration rate and pulse rate was observed in Jamnapari (0.670) but it was positive and non-significant in Barbari and Sirohi. The relationship between relative humidity and pulse rate was found to be non-significant except Local where it was recorded to be highly significant. The correlation coefficient between pulse rate and environment temperature positively non-significant in Sirohi, Osmanabadi and Local and positively significant in Barbari and Jamnapari breeds of goat. Among five breeds, the ranking of animals according to their heat tolerance mechanism obtained by both the methods showed marked differences. The local goat breed was found to be readily adaptable in Nagpur climate and environment and shown by their lower respiration, pulse rate and Benezera Coefficient of Adaptability which was followed by Osmanabadi and Sirohi. Thus selection of goat with high tolerance to thermal stress is of primary importance as basis for the future development of goat industry in Vidarbha (Maharashtra).

INTRODUCTION

Breeds differ in their capacity to tolerate ambient heat stress. Evaluation of thermo adaptability of different goat breed and their cross under different geo - climatic conditions, among other things, is therefore an essential pre-requisite in formulating suitable breeding plan. It is well established that heat tolerant is hereditary nature in goats. Adequate genetic variability exists for heat tolerance in various goat breeds (Kumar et.al 1990; Singh and Saxena 1995). Factors like rectal temperature, respiration rate and pulse rate also contributes significantly to the maintenance of goat rearing. Comparative heat tolerance of various breeds of goats have not been investigated to larger extend, which should from a subject to future research programs. This aspect will help in cross breeding programs of goats in order to develop a breed most suitable to arid and semiarid climate of Vidarbha and the same time endowed with high production potential.

MATERIAL AND METHODS

One hundred and twenty five healthy goats, 25 each of Barbari, Jamnapari, Osmanabadi, Sirohi and local (both the sexes) were utilized for the present investigation. These animals (aged 11/2 to 3 years) were maintained at Shivaji Estate Livestock farm (self) (Pvt) Ltd. Chargaon, Nagpur. The duration of the study was for 9 weeks. This period was selected because it constituted normally hot dry period of the year in this region the animals were housed in conventional shed constructed in east-west direction. Physiological response i.e. respirations were recorded for all goats under study. Weekly observations of the above physiological traits were made on each animal twice a day at 7.00 and 15.00 hrs. These observations were averaged to get mean values for the day. Respiration rate was recorded by using flank movements over a period of 1 minute of uninterrupted and

pulse rate measured as beats per minutes by feeling femoral artery. Daily weather components comprising maximum and minimum temperature ($^{\circ}\text{C}$) and morning and evening relative humidity (%) were recorded from meteorological laboratory, office of the Extra Asst Director farm, College of Agriculture, Nagpur for the Experimental period. The original formulae basically developed for cattle by these workers were slightly modified for goats by putting the values of normal rectal temperature and pulse rate of Indian goats under most favourable conditions, as 39.44°C (103.0°F) and 24 breaths/ minutes (Jindal, 1984)

1. Iberia Heat Tolerance Coefficient (IHCT) (Rhoad 1944)

$$\text{IHTC} = 100 - 10 (\text{BT} - 103)$$
2. Benezera Coefficient of adaptability (BCA) (Benezera 1954)

$$\text{BCA} = \frac{\text{B.T}}{39.44} + \frac{\text{N.R}}{24}$$

Data obtained for all the physiological responses and heat tolerance indices were subjected to statistical analysis (Snedecor and cochrane, 1967)

RESULT AND DISCUSSION

The means of pulse rates of Barbari, Jamnapari, Sirohi, Osmanabadi and Local breeds of goats where 76.43 ± 0.602 , 79.26 ± 1.121 , 80.80 ± 0.506 , 76.8 ± 0.107 and 72.66 ± 0.43 beats / minute respectively (Table 2). Vihan and Sahini et al. (1981a) recorded the morning and evening pulse rate of Jamnapari breed as 75.8 ± 1.93 and 97 ± 2.19 beats/minute respectively, where askaushish et al. (1990) reported morning and evening pulse rates of Sirohi breeds as 66.53 ± 0.924 and 76.99 ± 0.995 beats/ minute respectively, Highly significant difference where observed among the breeds in the present study. The figure of the standard deviation showed highest values of 5.605 for Jamnapari breed of goat indicating maximum variation of

pulse rate between breed. The figures were treated statistically according to the analysis of variance and the "F" value showed that breed differences were highly significant. The difference in the pulse rate reported in the present study may be due to difference in relative humidity during the experimental period (April 25.80+1.68 and May 43.41+1.96). Analyses of variance revealed significant differences (Table 3) between breeds.

Table 1 Correlation coefficient between climatologically parameters and heat tolerance indices

Parameter/ Breed	IHTC	BCA	Environmental Temperature	Humidity
Barbari	-0.359	0.4	0.647**	0.670**
Jamnapari	-0.693**	0.675**	0.749**	-0.043
Sirohi	0.092	0.440	0.121	-0.073
Osmanabadi	-0.170	-0.031	0.083	0.117
Local	0.334	-0.186	0.210	0.254

*(P<0.05), ***(P<0.01)

Table 2 Breed wise average values of physiological variables and heat tolerance indices in Barbari, Jamnapari, Sirohi, Osmanabadi and Local Breeds of goat.

Parameter	Breed	Mean	S.E.	S.D.	C.V.	N
Pulse Rate	Barbari	76.43	0.602	3.01	3.939	25
	Jamnapari	79.23	1.121	5.605	7.072	25
	Sirohi	80.80	0.506	2.53	3.132	25
	Osmanabadi	76.81	0.197	0.985	1.283	25
	Local	72.66	0.430	2.15	2.959	25

Table 3 Analysis of variance for pulse rate between breeds

Source Of Variation	d.f	S.S.	M.S.S.	VR	CD
Breed	4	325.47	81.37**	24.08	2.37
Weeks	8	44.85	5.61	1.66	3.16
Error	32	108.16	3.38		

**indicates (P<0.01)

Negative correlation observed in respiration rate and pulse rate in Osmanabadi and Local goat breeds. However, significant positive correlation between respiration rate and pulse rate was observed in Jamnapari (0.670) but it was positive and non significant in Barbari and Sirohi.

The relationship between relative humidity and pulse rate was found to be non significant except Local where it was recorded to be highly significant. Significantly positive high correlation was observed between respiration rate and BCA for all breeds while significantly high and negative correlation with IHTC except Sirohi breed.

The correlation co-efficient between pulse rate and environmental temperature positively non-significant in Sirohi. Osmanabadi and local are positively significant in Barbari and Jamnapari breeds of goat.

It is thus concluded from the present study that the differences in the physiological response of five breeds studied indicated breed differences with respect to respiration pulse rate and BCA from the view point of acclimatization. Among the five breeds the ranking of animals according to their heat tolerance mechanism obtained by both the methods showed marked differences. The local goat breed was found to be readily adaptable in Nagpur climate and environment as shown by their lower respiration pulse rate and Benezera Coefficient of Adaptability which was followed by Osmanabadi and Sirohi. The Barbari breed from physiological view point seems to be less adaptable than other breeds with respect to Iberia Heat Tolerance Indices. Thus selection of goat with high tolerance to thermal stress is of primary importance as basis for the future development of goat industry in Vidarbha.

References

- Benezera.M.V. (1954). A new index for measuring the adaptability of cattle to tropical conditions. *J. Anim. Sci.* 13: 1015-1019.
- Jindal.S.K.(1984): Environmental physiology in "Goat Production" Cosmo Publi New Delhi, India: 135-145
- Kaushish. S.K. Satva Paul. Dharam Singh, Kalra. D.B. and Rawat. P.S.(1990): Cardio-respiratory response of different breeds of goat in semi – arid climate *Livestock Advisor* vol XXIII 6-11
- Kumar. P. Khubsingh and Sood. S.B. (1990): Effect of microenvironment within different types of sheds on physiological responses in Jamnapari goats in hot semi-arid zone. *Indian J. Anim. Res.* 24(2):93-100.
- Rhoad. A.D. (1944): The Iberia heat tolerance test for cattle. *Tropi. Agric.* 21:162-164
- Singh Khub and Saxena. S.K. (1995): Heat tolerance in three breeds of Indian goats. *Indian.Vetv. J.* 72:466-468.
- Vihan.V.S. and Sahni. K.L.(1981a): Note on the seasonal changes in body Temperature, Pulse and respiratory rates of Jamnapari goats in semi-arid conditions. *Indian J. Ani. Sci.* 52(1): 115-117.
