Haemato-biochemical profiles, body condition and FAMACHA scores at various ages and their interrelations in Surti goats

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ABSTRACT

The effect of age on haemato-biochemical parameters, BCS and FAMACHA scoring were studied in traditionally reared Surti goats in south Gujarat. Total 240 adult goats, 72 yearlings (1 year to 1st kidding) and 48 kids (Upto 6 month age) were selected for study. All were monitored for FAMACHA and BCS simultaneously with blood samples collection. The PCV was measured by micro-haematocrit method and biochemical parameters were measured on biochemical analyzer. BCS and PCV were significantly higher in kids and yearlings than adult goats. The younger goats were also having low FAMACHA scoring. Blood glucose, cholesterol, total protein, albumin, A:G ratio, urea, creatinine, calcium, magnesium, ALT and AST did not vary significantly between kids, yearlings or adults Surti goats, whereas, triglycerides and phosphorus were found significantly higher in younger goats and globulin was significantly higher in adult goats. BCS and PCV have significantly positive whereas FAMACHA has significant negative correlations with most of blood parameters.

Key words: Age, BCS, FAMACHA, Goats, Haemato-biochemical, PCV

The haemato-biochemical parameters of any animal species and breeds are having great value in disease diagnosis. BCS (Body Condition Score) and FAMACHA (FAffa MAlan CHArt) are described as good methods to diagnose nutritional and parasitic infection (*Haemonchus contortus*) status of goats[17]. Physiological and pathological changes can be best evaluated when normal values are available for comparison. The values may vary with environment and management conditions[15]. The Surti goat rearing in heavy rainfall area by traditional way in south Gujarat region are little different from other goat keepers of semi arid region of Gujarat, Rajasthan and other state. Hence, the haemato-biochemical parameters may be different at all physiological age categories of goats. Therefore, Surti goats were monitored to study haemato-biochemical parameters, BCS and FAMACHA scoring at different age groups.

MATERIALS AND METHODS

The study was conducted on goats from randomly selected 4 villages from Navsari and 4 villages from Valsad district. Study was conducted by selecting 45 goats consisted of 30 adults female goats, 9 yearlings (1 year to 1st kidding) and 6 kids (Up to 6 month age) from each village. All experimental goats were monitored as per sampling schedule for FAMACHA[9] and BCS[5] during period of whole year covering all seasons to minimize seasonal differences. BCS was judged by 5 point method with increment of 0.25. The blood samples were collected to study haemato-biochemical parameters. The PCV was measured by micro-haematocrit method. The serum samples were analyzed for different biochemical parameters using commercial kits (Randox) on semi automatic biochemical analyzer made (Merck). The test results were tabulated as per standard statistical methods[16]. The data were analyzed in IBM® SPSS® Statistics Version 20.0. The means were analyzed by using one way ANOVA technique. The Duncan's method in

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post hoc test was used to compare various means. The correlations were analyzed using Kendall's tau_b test in bivariate correlations.

RESULTS AND DISCUSSION

Basic information of the study area

There are three distinguishable agricultural seasons in study area viz., Kharif, Rabi and Summer. The average rainfall of the study area is 1800-2200 mm with 55-60 rainy days[17]. Winter is fairly cool; the temperature may fall about 10 ^{0}C during winter. Temperature may raise upto 35 ^{0}C during summer. May-October is characterized by hot-humid season, as maximum relative humidity remains more than 80%[17]. The June- September is the months of monsoon. Hills in Valsad, Navsari and Dangs are extension of the Western Ghats. Purna, Ambika and Daman Ganga irrigate plains in Navsari and Valsad districts[17]. Mango, Teak, Chikoo, Bengali baval and Khair are main species, constituting over 60 % of total tree population in the district. Both districts of south Gujarat is rich in livestock population.

BCS, PCV and FAMACHA

BCS and PCV were significantly higher in kids and yearlings than adult goats. The young goats were also having low FAMACHA scoring. Previous study in goats was also revealed higher PCV in kids compared to adult lactating and non-lactating goats[11]. This might be attributed with stress associated with lactation, reproductive stress which is on adult goats. The values of PCV reported by them were almost double than present study because their data were from farm goats which are supposed to be well fed throughout the year. Lower PCV observed in present study might be associated with higher prevalence of parasites due to heavy rainfall in the study area. Moreover, study goats were traditionally managed by mostly grazing without proper supplementation; therefore, they have low PCV mostly due to under nutrition.

Table 1. BCS, PCV and FAMACHA of kids, yearlings and adult female Surti goats at south Gujarat heavy rainfall region

	Kids	Yearlings	Adults	Pooled	P value
N	48	72	240	360	
BCS	3.08^b±0.07	3.10^a±0.05	2.88^a±0.03	2.95±0.02	0.000
PCV	23.08^b±0.59	22.36^{ab}±0.42	21.68^a±0.26	22.00±0.21	0.057
FAMACHA Score	1.94^a±0.13	1.97^a±0.10	2.28^b±0.06	2.18±0.05	0.005

Blood biochemical parameters

The means of glucose, triglycerides, cholesterol, total protein, albumin, globulin, A:G ratio, urea, creatinine, calcium, phosphorus, magnesium, ALT and AST in three age categories of Surti goats is depicted in Table 2. It is showing that most of blood biochemical parameters i.e. glucose, cholesterol, total protein, albumin, A:G ratio, urea, creatinine, calcium, magnesium, ALT and AST were non-significant between age groups in Surti goats whereas, triglycerides and phosphorus were found significantly higher in younger goats and globulin was significantly higher in adult goats.

Table 2. The effect of age groups on blood biochemical parameters in Surti goats at south Gujarat heavy rainfall region

Parameters	Kid	Yearlings	Adults	Pooled	P value
N	48	72	240	360	
Glucose (mg/dL)	54.75±1.92	52.47±1.41	51.27±0.79	51.97±0.65	0.188
Triglycerides (mg/dL)	61.14^b±3.21	57.89^b±2.83	50.52^a±1.36	53.41±1.17	0.002
Cholesterol (mg/dL)	61.44±3.14	58.96±2.03	57.84±1.27	58.54±1.02	0.495
Total protein (g/dL)	6.09±0.13	6.28±0.14	6.47±0.08	6.38±0.07	0.117

Albumin (g/dL)	2.91±0.09	2.99±0.08	3.04±0.05	3.02±0.04	0.473
Globulin (g/dL)	3.13[a]±0.09	3.31[ab]±0.09	3.43[b]±0.05	3.37±0.04	0.039
A:G Ratio	0.96±0.04	0.93±0.03	0.92±0.02	0.93±0.01	0.423
Urea (mg/dL)	30.50±1.28	31.58±1.03	31.81±0.69	31.59±0.53	0.715
Creatinine (mg/dL)	0.86±0.02	0.88±0.02	0.90±0.01	0.89±0.01	0.257
Calcium (mg/dL)	8.93±0.24	9.08±0.22	9.01±0.12	9.01±0.10	0.909
Phosphurus (mg/dL)	5.73[b]±0.25	5.84[b]±0.21	5.17[a]±0.10	5.38±0.09	0.004
Magnesium (mg/dL)	2.59±0.07	2.62±0.05	2.59±0.03	2.60±0.03	0.902
ALT (U/l)	12.95±0.64	13.09±0.45	12.35±0.30	12.58±0.23	0.383
AST(U/l)	53.27±2.58	52.04±1.87	51.67±1.16	52.04±0.92	0.730

Glucose found in present study was similar with the value reported earlier[1,10]. However, Mahore and Mahanta[11] reported higher glucose in younger goats. Higher triglycerides found in younger goats is in agreement of previous studies[10,4]. But level of triglycerides reported[4] was very low might be due to difference in breed, study area and geographic situation in both studies. The level of cholesterol was similar to that reported earlier[11]. Total protein reported in present study was similar with previous findings[7,11]. Nonsignificant difference as observed on albumin concentration in the present study is similar with earlier reports[7,14]. Higher globulin in adult than younger goats are in agreement with earlier reports[7].

Increase in globulin concentrations with age might be associated with stimulation of antibody production due to increased exposure to different antigens over time. The A:G ratio remained non-significant among various age groups. The trends and values of urea and creatinine observed in present study are similar to previous findings[7]. Calcium and magnesium did not vary significantly[12,3] among various age groups. Phosphorus was found lower in older than younger goats. Phosphorus concentration has been found to decrease with age in ruminant possibly due to reduction in its absorption from the gut[8]. The ALT and AST were nonsignificant among various ages which was in accordance to other studies[10,14].

Table 3. Kendall's correlations between haemato-biochemical profiles, body condition and FAMACHA scores in Surti goats at various ages

Parameters	BCS	FAMACHA	PCV
Glucose	0.184**	-0.190**	0.238**
Triglycerides	0.277**	-0.273**	0.330**
Cholesterol	0.263**	-0.350**	0.355**
Total protein	0.120**	-0.281**	0.197**
Albumin	0.179**	-0.301**	0.221**
Globulin	0.046	-0.178**	0.141**
A:G Ratio	0.134**	-0.148**	0.077*
Urea	-0.023	-0.010	0.029
Creatinine	-0.112**	0.146**	-0.107**
Calcium	0.059	-0.230**	0.215**
Phosphurus	0.144**	-0.106**	0.127**
Magnesium	0.116**	-0.107**	0.114**
ALT	-0.051	0.114**	-0.065*
AST	-0.018	0.002	0.042

* Indicates significance at P < 0.05, ** Indicates significance at P < 0.01.

Correlations among various parameters

Kendall's Correlation coefficients of BCS, FAMACHA score and PCV with blood metabolites are depicted in Table 3. BCS has significant positive correlations with blood glucose, triglycerides, cholesterol, total protein, albumin, A:G ratio, phosphorus and magnesium, however, it has significant negative correlation with creatinine. One study in South Africa revealed significant positive correlation between BCS with glucose and albumin in goats[6]. The FAMACHA has significant negative correlations with glucose, triglycerides, cholesterol, total protein, albumin, globulin, A:G ratio, Ca, P and Mg. It has significant positive correlations with ALT and creatinine. Earlier work also revealed negative correlation of FAMACHA with albumin, total protein, globulin and A:G ratio in sheep[2,13]. The PCV has significant positive correlation with all blood metabolites under study except urea and AST.

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