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Changes in the concentration of urea in whey related to udder health status of goat

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Abstract
A total of 60 samples of goat milk from udder halves were analysed. Based on the score of California Mastitis Test (CMT), the samples were equally grouped into Normal, Subclinical 1^+, Subclinical 2^+, Subclinical 3^+ and Clinical. The average of urea concentration in whey was highest (33.96 ± 0.96 mg/dl) in the normal group, followed by Subclinical 1^+ (24.25 ± 0.97 mg/dl), Subclinical 2^+ (14.55 ± 0.61 mg/dl), Subclinical 3^+ (12.96 ± 0.46 mg/dl) and lowest (9.42 ± 0.33 mg/dl) in the Clinical group. The results showed significant decrease in urea concentration with an increase in the severity of mastitis. The urea concentration of normal group, subclinical combined group and clinical group ranged from 32.00 to 39 mg/dl, 10.50 to 30.00 mg/dl and 9.50 to 12.50 mg/dl respectively.

Keywords: Whey, CMT, Urea, Mastitis, Goat

Introduction
Among all ruminants, only goats can utilize the naturally available bushes and pastures very efficiently. They are also contributing to the subsistence of many landless labourers in different climatic areas, specially arid and hilly tracks, where crop production is difficult or uncertain (Tantia & Vij, 2000) [13]. According to the surveys conducted so far, the consumption of goat milk in underdeveloped as well as developing countries is increasing day by day and so the goat industry is coming up as a full-fledged agro-business. Udder health status is of great importance in goat too because the consumption of infected milk produced from infected udder can cause health hazards not only to the kids but also to the human beings. It is still difficult to arrive at the confirmative diagnosis of the various stages of mastitis in goat, although, some of the milk constituents are known to serve the clinical indicators for prediction and diagnosis of mastitis (Choudhary *et al.,* 1995) [3]. Therefore the present investigation is aimed to arrive at the prediction and diagnosis of mastitis in goat.

Materials and methods
After thorough clinical examination of the udder and performing CMT carefully, 60 samples (12 samples for each group), each of about 30 ml foremilk was collected halve wise, separately in sterilized, clean and dry plastic bottles by hand milking. All the samples were collected in the morning hours. The milk samples were kept immediately into icebath to carry out subsequent analysis in the laboratory.

Preparation of whey
Ten (10) ml of each of milk sample was centrifuged at 2500 rpm for 20 minutes and kept in a refrigerator to make the upper lipid layer hard and compact. After 20 minutes, pierced by a needle, a hole was made into the upper hard fat layer through which the liquid portion was poured off carefully into another centrifuge tube. To this liquid portion, 1 ml of 1N HCl was added and the mixture was centrifuged again at 2500 rpm for 20 minutes, when the casein settled at the bottom, the clear whey formed the supernatant. The whey was then collected in sterilized vials and stored in the refrigerator at 4ºC for further biochemical analysis.
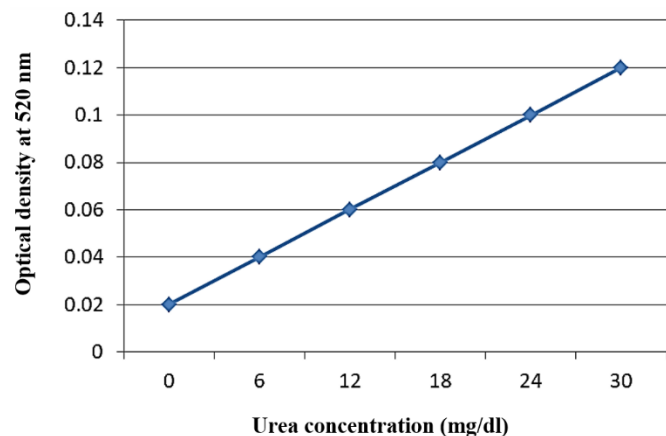
Fig: Standard Graph for Urea Estimation

Estimation of urea

Urea concentration was determined according to DAM method described by Wybenga (1971) [15] using the reagent kit marketed by Siddham Diagnostics. The optical densities were recorded setting the calorimeter (CAT No. S – 201000) at 520 nm and the urea concentration was calculated by plotting a standard graph.

The statistical analysis like 't' test, completely randomized design and regression coefficient of the experimental data was carried out using the statistical procedures laid down by Snedecor and Cochran (1968) [12].

Results and Discussion:

The averages of urea concentration with their standard errors for comparisons of different udder health status of does are presented in Table 1. The average of urea concentration in whey was highest (33.96 ± 0.96 mg/dl) in the normal group, followed by Subclinical 1+ (24.25 ± 0.97 mg/dl), Subclinical 2+ (14.55 ± 0.61 mg/dl), Subclinical 3+ (12.96 ± 0.46 mg/dl) and lowest (9.42 ± 0.33 mg/dl) in clinical group. The result indicated significant decrease in urea concentration with the increase in the severity of mastitis. The urea concentration of normal group, subclinical combined group and clinical group

ranged from 32.00 to 39, 10.50 to 30.00 and 9.50 to 12.50 mg/dl respectively. The statistical analysis of the data on average urea concentration showed a trend of significant ($P<0.01$) decrease from normal to clinical groups (Table 1). The average urea concentration for normal group in the present study was close to the findings reported by Barbosa *et al.* (2012) [1], 29.83 to 40.76 mg/dl and Giaccone *et al.* (2007) [4], 41.90 to 44.43 mg/dl.

The concentration of urea in milk was found to be affected by the type of feed (Vignon & Laurent, 1972) [14], yield of milk (Gulli *et al.*, 1976) [5], parity (Oltner, 1983) [9] and also by the location and season of milk production (Pecaroni, 1993) [10]. Hepatectomized animals ceased the formation of urea (Bollman *et al.*, 1924) [2], because most of the ammonia channelled to the liver was converted to urea almost exclusively by the liver (Lehninger *et al.*, 1993) [7]. The decreased concentration of urea in whey, although had no correlation with the type of causative agents, indicated even the subclinical condition of mastitis in cow milk (Licata, 1985) [8]. A similar opinion based on the estimation of significantly low level of urea in mastitic milk as compared to that in normal cow was reported by Gutjahr *et al.* (1997) [6]. The decreased level of urea in the milk could be due to its breakdown by the urease released by mastitis causing organisms like *Corynebacterium pyogenes*, *Pseudomonas aeruginosa* and *Cryptococcus neoformans* (Sharma & Adlakha, 1997) [11] and also because of its decrease synthesis from arginine even in the presence of arginase in the tissues of mammary gland following infection and the injury thereby.

Table 1: Urea Concentration in Whey of Goat in Different Udder Health Status

Udder health status	Normal milk	Subclinical milk				Clinical milk
		1+	2+	3+	Combined (1+, 2+, 3+)	
Urea (mg/dl)	33.96e ± 0.60	24.25d ± 0.97	14.55c ± 0.61	12.29b ± 0.46	17.25 ± 0.68	9.42a± 0.33

Different superscripts indicate significant difference ($P<0.01$) between udder health status
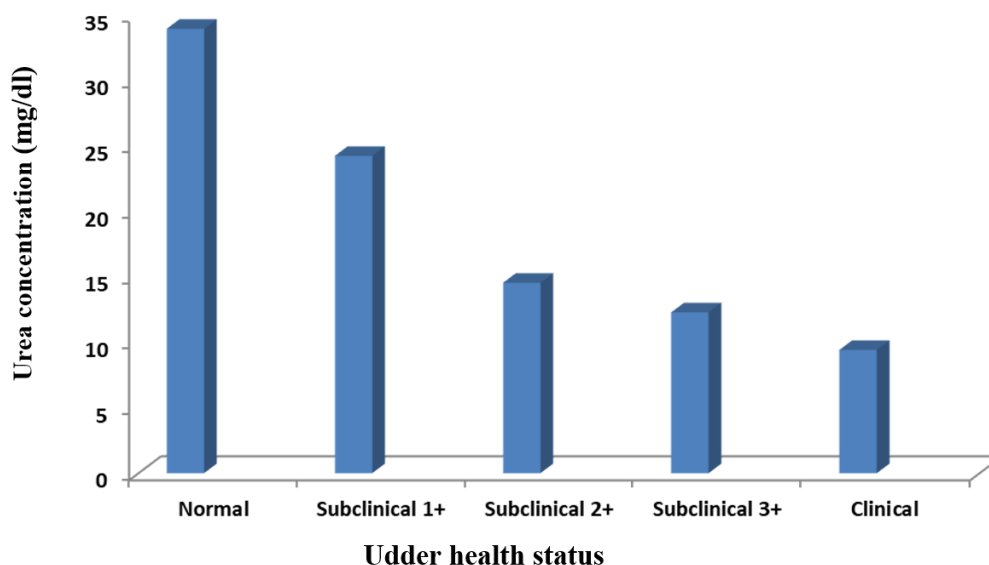

Fig 1: Urea Concentration in Different Udder Health Status

The variations obtained in the present investigation in the level of urea concentration of whey within and between the groups could be attributed to the normal and specific causes of mammary gland infection rather than to the feed, parity, yield and season of milk production. Therefore, in view of the above observations, the estimation of urea could be used to assess the udder health status, as well as to diagnose the advanced stage of udder infection in goats.

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