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Factors associated with milk urea concentrations in Girgentana goats

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ABSTRACT: A total of 1,481 milk samples of 166 Girgentana goats, taken along the entire lactation, were utilised to evaluate the effect of non nutritional factors on milk urea (MU). Parity, stage of lactation and month of sampling significantly influenced MU, while no effect was found for born kids number. The first kidding goats produced lower MU than multiparous goats. Trend of MU was similar to milk production course with a peak found at 60 DIM. The different MU levels between several months of production are often linked to pasture chemical variations.

Key words: Milk urea, Goat, Non-nutritional factors.

INTRODUCTION – The major determinants of urea formation are the amount of daily crude protein (CP) intake and the dietary ratio of CP to energy intake. An increasing diet CP, unbalanced with the available energy, causes a surplus of N used for microbial growth that is transformed into ammonia in the rumen. The extra ammonia, absorbed in the digestive tract, enhances formation of urea in the liver; the excess of urea is excreted as urine and with lower proportion as milk. As a consequence, milk urea (MU) has been used as an indicator of the adequacy of the ratio of CP to energy intake. However, other factors also influence milk urea, including milk yield (Oltner *et al.*, 1985; Carlsson *et al.*, 1995), age or number of lactation (Oltner *et al.*, 1985; Carlsson *et al.*, 1995), stage of lactation (Schepers and Meijer, 1998; Trevaskis *et al.*, 1999) and grazing system (Oltner *et al.*, 1985). However, the mentioned studies regarded the lactating cows, while few studies are available on goat species. The objective of this study was to determine the relationships between milk urea and seasonal factors in the Girgentana goats.

MATERIAL AND METHODS – The study was carried out on 116 Girgentana goats reared in a single flock situated in a typical hilly semi-arid area of Sicily. Does were reared under extensive husbandry conditions, 500 g/head/d of commercial concentrate was partitioned twice daily during machine milking (7:30 and 16:00 h). Lactating goats were allowed to continuously graze (9:00-15:30 h) a mixed sward of vetch and oats. The 1,481 samples were collected fortnightly at morning milking, from 30 days after lambing to the end of lactation (from January to July); morning milk yield was also recorded. The average records per goat was 12.7; lactations with fewer than three test day records were discarded. Milk from the first 30 days of lactation was suckled by the kids. The milk urea content was determined by enzymatic method using difference in pH with CL10 instrument (Luzzana and Giardino, 1999). Analysis of environmental factors was carried out with SAS software, vs 9.1, MIXED procedure. The mixed model employed was:

$$Y_{ijlmnk} = \mu + TK_i + P_j + DIM_l + MONTH_m + GOAT_n + \varepsilon_{ijlmnk};$$

where:

μ is the overall mean; TK_i is the fixed effect of type of kidding (single or twins); P_j is the fixed effect of parity (1°, 2° and ≥3° kidding); DIM_l is the fixed effect of class of days in milking (30, 60, 90…210 days); $MONTH_m$ is the fixed effect of month of production (from January to July); $GOAT_n$ is the random effect of the goat (1…116); ε_{ijlmnk} is the random error.

Table 1. Goat-level milk urea by type of kidding and parity.

Item	Milk Urea (mg/dl) Mean	SE
Type of kidding		
single	43.57	0.32
twins	43.47	0.29
Parity		
1	41.09[A]	0.52
2	45.03[B]	0.33
≥3	44.43[B]	0.33

A,B,C = *P*<0.01.

Figure 1. Trend of milk urea and morning milk yield during the lactation.

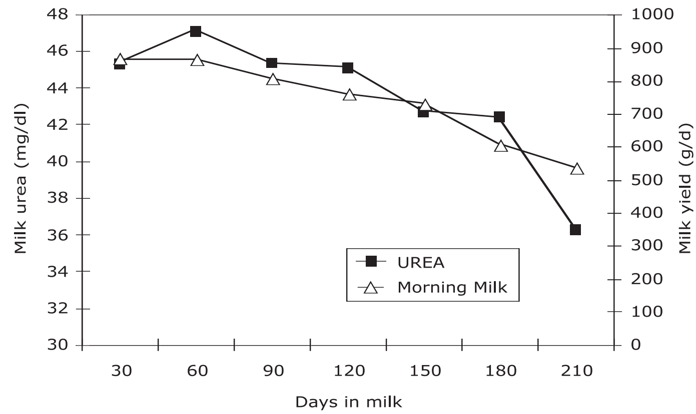
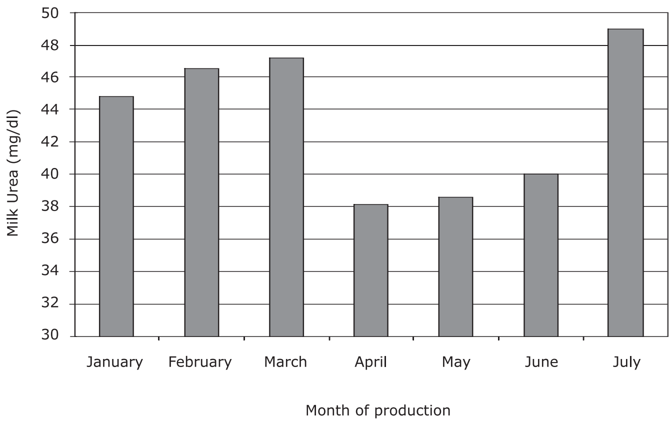


Figure 2. Effect of month of production on goat-level milk urea.



RESULTS AND CONCLUSIONS – Milk urea was significantly influenced by parity (P<0.0001), DIM classes (P<0.0001) and month of production (P<0.0001), while the type of kidding resulted non significant (P<0.7855). First kidding does showed significantly lower MU than second kidding does and multiparous (Table 1). This lower MU level in first lactation is consistent with other studies in dairy cows (Ng-Kwai-Hang *et al.*, 1985; Oltner *et al.*, 1985; Carlsson *et al.*, 1995; Godden *et al.*, 2001) suggesting that first lactation animals are still growing and, therefore, might use amino acids more effectively and, as a consequence, reduce deamination and urea formation in the liver (Oltner *et al.*, 1985). MU and morning milk yield showed a similar trend during lactation (Figure 1): the highest levels from 30 to 60 DIM were followed by a decrease until the end of lactation, in accordance with previous studies regarding dairy cows (Carlsson *et al.*, 1995; Godden *et al.*, 2001; Arunvipas *et al.*, 2003). The decreasing trend in MU during lactation could be explained by the lowering of protein intake of goats, presumably due to the reduction of both protein exigency of goats for production and protein content of herbage at pasture. On the other hand, a positive significant correlation emerged between MU and milk yield (r=0.37; P<0.001), as found in a previous study (Todaro *et al.*, 2005). On dairy cows, milk urea nitrogen (MUN) was predicted to increase with milk production (Jonker *et al.*, 1999) and a quadratic relationship between milk yield and MUN was found (Godden *et al.*, 2001). Other authors reported that the association between MUN and milk yield was drastically different between primiparous and multiparous cows (Wattiaux *et al.*, 2005). The winter months (January, February and March) were characterized by higher levels of MU in comparison with spring months (April, May and June), while July showed the highest MU concentration (Figure 2). Results are explicable by nutritional and physiological effects. In Sicily, the winter pastures are more rich in soluble nitrogen but poor in NDF and energy, contrarily to spring pastures. Moreover, several studies reported high MU observed during the summer months, when true protein decrease and NPN increase (Carlsson *et al.*, 1995).

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