

Short communication

Effect of water restriction on productive performance and blood parameters in comisana sheep reared under intensive condition

D. Casamassima^{a,*}, R. Pizzo^a, M. Palazzo^a, A.G. D'Alessandro^b, G. Martemucci^b

^a Department of Animal, Vegetal and Environmental Sciences, University of Molise, via De Sanctis sn, 86100 Campobasso, Italy

^b Department of Engineering and Management of the Agricultural, Livestock and Forest Systems, University of Bari, Italy

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Abstract

The effect of water restriction on milk yield and composition, feed intake, body weight and blood parameters was evaluated in Comisana sheep reared under intensive condition. The experiment, lasted 40 days, was performed on 26 lactating ewes subdivided into three treatment groups; the control T group received water *ad libitum* (W-100) and Group 1 (W-80) and Group 2 (W-60) were watered, respectively, with 80 and 60% of the water consumed by the control T group. Water was supplied in the morning once a day while feed twice. Milk quality analysis was performed every 10 days for pH, fat, total protein, lactose and somatic cell content. Serum samples, performed at days 0, 13, 26 and 40, were analyzed for glucose, cholesterol, triglycerides, creatinine, total proteins, albumin, sodium, potassium, calcium and chloride. Compared to W-100, W-60 was significantly different ($P < 0.05$) for body weight and serum potassium levels and showed an increase ($P < 0.01$) in serum concentrations of triglycerides, albumin, total proteins and cholesterol ($P < 0.05$). Total proteins, triglycerides and sodium levels increased ($P < 0.05$) in W-80. Body weight showed a significant difference ($P < 0.05$) only in W-60 if compared to W-100. No significant differences were observed in milk yield, milk composition and feed intake across the treatment groups.

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1. Introduction

Drinking water is often a limiting factor for livestock in grazing areas of the semi-arid Mediterranean countries. During the dry season animals have to tolerate a stress condition due to high temperatures and low food and water availability. The lack of water consumption due to a decreased food intake affects water loss and body weight (Abdelatif et al., 1994; More and Sahni,

1981). Differences in the efficiency of water utilization have however been recorded among many species. Most mammals can die if the body water loss is higher than 15% instead ruminants and specially sheep can tolerate a water loss greater than 20% (Jaber et al., 2004) because the forestomach is able to cumulate water to use then in periods of low water supply. Sheep can tolerate dehydration and restricted feeding during summer even if the recoil on food intake (Mousa et al., 1983), body weight (More et al., 1983; Alamer and Al-Hozab, 2004) and productive performances (Lynch et al., 1972) is remarkable. Water deprivation for 72 h affects milk production for 50% in lactating sheep and goats and causes an increase in the viscosity of milk as well as protein, fat, lactose and

* Corresponding author. Tel.: +39 0874404704;

fax: +39 0874404855.

E-mail address: casamassima.d@unimol.it (D. Casamassima).

mineral salts (Aganga, 1992). A deficient water supply negatively alters the endocrine and metabolic balance; an increase in blood glucose, total protein, cholesterol, urea, creatinine and sodium concentrations and a reduction in potassium levels was observed in Awassi sheep water restricted from 2 days to 4 while chloride and calcium were similar between treatment groups (Jaber et al., 2004). Li et al. (2000) found in sheep water restricted for 4 days an increase in hemoglobin and cortisol values.

The objective of the study was to assess the effect of water restriction on performance and blood parameters of Comisana sheep intensively reared.

2. Materials and methods

The 40-day experiment was performed during winter on 26 lactating sheep (160 ± 14 days of lactation at the start of the study) of the Comisana breed subdivided into three homogeneous groups according to milk yield (500.9 ± 13 g/day), body weight (49.21 ± 0.43 kg, mean \pm S.D.) and parity. The Comisana sheep is an average size breed currently estimated at approximately 500,000 head. Comisana breed was reared in Sicily, its crib of origin, and in many areas of Central and Southern Italy as in extensive grazing rearing as in sheepfold; the milk yield of this breed is 150–200 kg in 180–210 days of lactation. Ewes were housed into three separate straw bedded boxes in the same building of 1.5 m²/head and classified as follows:

- Control T group (W-100) constitute of seven subjects, received each day water *ad libitum* (24 h/day).
- Experimental group 1 (W-80) and group 2 (W-60) constitute of 7 and 12 subjects, respectively, received every day water up to 80 and 60% of the water consumed the previous day by W-100.

Ewes were fed mixed field hay (1.5 kg), alfalfa pellets (300 g), and pelleted concentrate (500 g) divided into two daily meals (at 10:00 and 20:00 h). The chemical composition of the ration was determined by the official methods of analysis (AOAC, 1990) (Table 1). Throughout the trial the following measurements were carried out:

- Daily feed and water intake.
- Milk yield and composition every 10 days; milk samples were collected during morning (09:00 h) and evening (19:00 h) milking and were individually used to determine total protein, fat and lactose content employing an IR spectrophotometer (Milko Scan 133B, Foss Electric, DK-3400 Hillerod, Denmark), somatic cell count (SCC) using a Foss Electric Fossomatic 90 cell counter and pH using a pH meter Hanna (HI 83141, GLOGCHEM Group, Naples, Italy).
- Jugular blood samples were taken from fasting ewes in the morning (8:00 h), immediately after milking, at the beginning of the experiment (day 0) and, subsequently, at 13-day intervals (days 13, 26 and 40) to determine serum concentrations of glucose, total cholesterol, triglycerides, urea, creatinine, total protein, albumin, sodium, potassium, calcium and chloride. Blood samples were collected in 10-ml vacuum tubes and centrifuged for 15 min at 3500 rpm. After blood serum recovery, metabolites were determined using a semi-automatic ARCO spectrophotometer (Biotecnica Instruments, Roma) and a flame photometer (SEAC, Firenze).
- Body weight in the morning every 10 days in fasting ewes by using a weighting machine (Animal Electronic Scale, Sinergica Solution e-Volute, Pescara, Italy).

Environmental temperature and relative humidity were monitored throughout the trial inside each box by using a thermo-hygrograph (TIG-T1-LSI) placed at height of 1.5 m; the temperature-humidity index (THI) was also calculated to evaluate the animal's thermal stress. During the trial the mean temperature, humidity and THI were 6.08 °C, 82.39% and 44, respectively.

2.1. Statistical analysis

Milk and blood variables were tested for normality and milk SCC were log-transformed to normalize their frequency distribution before performing statistical analysis. Data were analyzed using ANOVA for repeated measures of SPSS (SPSS, 2006 Inc. Chicago, IL). The variation due to treatment, trial day and their interaction was tested. Differences among means were evaluated using Sheffè's test.

Table 1
Feed composition and chemical characteristics of the ration

Parameters	Feedstuffs			Ration
	Pelleted concentrate	Alfalfa pellets	Mixed field hay	
Dry matter (%)	87.00	87.00	88.00	87.65
Crude protein (%)	19.00	19.00	14.50	16.07
Crude fat (%)	3.20	3.00	2.50	2.72
Crude cellulose (%)	8.00	19.50	34.42	26.73
Ash (%)	8.00	12.00	8.90	9.11
Nitrogen-free extract (%)	61.80	46.50	39.68	45.37

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