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# Effect of recombinant bovine somatotropin on sheep milk production, composition and some hemato-biochemical components

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**Abstract**

Effect of recombinant bovine somatotropin (rbST) on milk production, composition and some hemato-biochemical characteristics were studied in Rahmani sheep. Fifteen Rahmani ewes in their third to fourth lactation season and at 30–40 days postpartum were divided into three groups, five animals each. The first group was served as control, while the second and third groups were injected, once every other week for 60 days, with low (50 mg per ewe) and high (100 mg per ewe) doses of rbST, respectively. Injection with rbST significantly ($P < 0.01$) increased total milk yield by 19.0 and 27.0% for low and high doses, respectively compared with control ewes. Body weight and dry matter intake of ewes were not affected by rbST treatment. While, average daily gain (ADG) of lambs that were suckling rbST-treated ewes was higher (7.7 and 11.0% for low and high dose of rbST, respectively) than for lambs of control ewes during the treatment period. Milk protein was significantly ($P < 0.05$) increased, while total solids, fat, lactose and ash were not affected by the treatment. Also, hematological parameters, plasma proteins and the activities of plasma aspartate aminotransferase (AST), alanine aminotransferase (ALT), glutathione *S*-transferase (GST), alkaline phosphatase (AlP), acid phosphatase (AcP), and the levels of thiobarbituric acid-reactive substances (TBARS) did not change. Administration of rbST reduced urea, creatinine, total bilirubin and cholesterol concentration in plasma. The results of the present study suggest that rbST is efficacious in increasing milk yield and kid growth up to 100 mg/14 day without adverse effects on lactating ewes.


*Keywords:* Somatotropin; Sheep; Milk composition; Blood metabolites

## 1. Introduction

Recombinant bST is a powerful technology to improve cattle performance, and its effects on milk yield

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and composition of dairy cows have been extensively reviewed (Peel and Bauman, 1987; Chilliard, 1988a,b; Ludri et al., 1989; Stelwagen et al., 1992). These studies covers the effects of bST administration on animal health, blood metabolites and dry matter intake. Treating lactating sheep with rbST increased milk yield (Fernandez et al., 1995), but the galactopoietic response to the exogenous hormone in sheep is more variable and less intense than that observed for lactating cows (Davis et al., 1989). However, most published studies with sheep and goats were short-term (<14 day), which restors the galactopoietic effect (Disenhaus et al., 1995). The purpose of the present study is to evaluate the effect of interval (every other week) of two different doses of rbST from 4 to 12 week of lactation on milk yield, milk composition, growth performance and blood metabolites of lactating ewes, and kid growth.

## 2. Materials and methods

### 2.1. Animals and treatments

The experiment was carried out at the Alexandria University Experimental Farm during winter 2002. Fifteen lactating Rahmani ewes each weighing 43.4 ± 1.78 kg with single kids at 30–40 days postpartum were used. Ewes were in their third to fourth lactation season. The animals were kept in a free stall and had free access to water. They were fed on concentrate mixture and berseem hay twice daily at 07:00 and 15:00 h. The diet was offered in amounts calculated to provide 120% of the NRC recommended amount (NRC, 1985). Individual intakes of berseem hay and concentrate were recorded daily. Feeds refusal were recorded once daily. Feed was sampled once weekly, monthly composite, dried and ground. Berseem hay and concentrate were analyzed for dry matter (DM), crude protein (CP), ether extract and ash according to procedures of AOAC (1990) (Table 1). The animals were divided into three homogenous groups, five animals each, according to lactation stage, parity and milk yield. The first group was used as a control, while the second and third groups were subcutaneously injected with 50 or 100 mg/2 weeks per ewe of rbST (Somatec) for 8 weeks. A sustained release formulation of rbST was purchased from Elanco-Eli Lilly export S.A., Geneva.

Table 1
Chemical composition of commercial concentrate mixture and berseem hay

| Parameters (%) | Concentrate | Berseem hay |
|---|---|---|
| Dry matter | 88.63 | 91.75 |
| Crude protein | 13.31 | 12.34 |
| Crude fiber | 5.68 | 23.69 |
| Ether extract | 5.42 | 2.69 |
| Ash | 6.27 | 13.57 |
| Nitrogen free extract (NFE) | 69.32 | 47.71 |

### 2.2. Milk production and composition

Milk yield was recorded twice weekly at 07:00 and 16:00 h by using weigh-suckle-weigh technique (Williams et al., 1979). At approximately 08:00 a.m., lambs were removed from their dams and placed in an adjacent pen. Following a 5-h separation period, the lambs were weighed and then joined with their dams to nurse. After lambs had finished nursing (approximately 15 min), they were re-weighed. Milk yield for the 5-h period was taken as the difference in lamb weight before and after nursing. To determine milk composition, samples were obtained 1 day each week by milking out the ewes by hand before allowing the lambs to nurse. The samples were collected into plastic vials preserved with Microtabs, stored at 4 °C, and analyzed for total solids by drying weighed 10 ml/sample to constant weight at 105 °C for 24 h. Fat was determined using Gerber method. Milk protein was determined by Kjeldahl method ($N \times 6.38$). Ash was determined by evaporating 10 ml to drying and ashed in muffle furance at 450 °C (or 600 °C for 2 h) for 6 h. Lactose was calculated by difference.

### 2.3. Hematological parameters

Blood samples were collected on day 7 of each treatment and continued throughout the 8-week experimental period. Blood samples were obtained in the morning before access to feed and water from the external jugular vein and were placed immediately in ice. Heparin was used as an anticoagulant but in part of sample, it was with held to obtain serum. Plasma was obtained by centrifugation of blood at 860 × $g$ for 20 min, and the obtained samples were stored at −60 °C until used for analyses. Noncoagulated blood was tested, shortly after collection, for hemoglobin (Hb), total erythro-