



# Effects of different levels of protein with or without probiotics on growth performance and blood metabolite responses during pre- and post-weaning phases in male Kurdi lambs



V. Vosooghi-poostindoz<sup>a</sup>, A.R. Foroughi<sup>b,\*</sup>, A. Delkhoroshan<sup>a</sup>,  
M.H. Ghaffari<sup>c</sup>, R. Vakili<sup>a</sup>, A.K. Soleimani<sup>a</sup>

<sup>a</sup> Department of Animal Science, Islamic Azad University, Kashmar Branch, Kashmar, Iran

<sup>b</sup> Department of Animal Science, Jihad-e-Agricultural Education Center of Khorasan Razavi, Institute of Scientific – Applied Higher Education Jihad-e-Agricultural, Mashhad, Iran

<sup>c</sup> Department of Animal Science, Ferdowsi University of Mashhad, Mashhad, Iran

## ARTICLE INFO

### Article history:

Received 11 September 2012

Received in revised form

12 November 2013

Accepted 15 November 2013

Available online 26 November 2013

### Keywords:

Dietary protein

Probiotics

Kurdi lambs

Weaning

Growth performance

## ABSTRACT

The effects of different levels of protein and probiotics offered before and after weaning on growth performance, blood metabolites, and rumen fermentation were investigated in two experiments. In Exp. 1 (the pre-weaning phase), twenty-four single lambs, 10 days of age with an average live body weight of  $15.3 \pm 1.8$  kg, were individually penned and randomly assigned to the treatments in a  $2 \times 2$  factorial arrangement of protein levels (16% vs. 18% CP of DM) and probiotic levels (0 vs. 2 g Protexin®/d). The diets consisted of 20% lucerne hay and 80% concentrate (on a DM basis) offered over a total of 60 days including 15 days of adjustment period and 45 days of experimental period until weaning. The lambs were transferred to separate pens where they were allowed to suckle their respective dams twice a day (in the morning and in the evening). The experimental procedure in Exp. 2 (the post-weaning phase) was the same as that in Exp. 1 except for the protein levels (14.5% vs. 16.5% CP of DM) administered and the lucerne hay (30.0%) included in the diets. Twenty-four 78-days-old lambs, weighing  $30.5 \pm 2.6$  kg, were individually penned and offered the diets for 60 days inclusive of 15 days of feed adjustment. The results of Exp. 1 showed that raising the protein content of the diet from 16% to 18% CP led to increased weaning weights ( $28.2$  vs.  $32.4 \pm 1.83$  kg;  $P < 0.05$ ), average daily gain (ADG) ( $288$  g/d vs.  $381 \pm 19.4$  g/d; NS), and feed intake ( $490$  g/d vs.  $541 \pm 19.4$  g/d;  $P < 0.05$ ). However, no significant differences were observed in food conversion ratio (FCR;  $P > 0.05$ ) among the treatments. BUN concentration was on the 18% CP diet ( $14.3$  mg/dl vs.  $17.4 \pm 0.50$  mg/dl;  $P < 0.05$ ), and on diets without probiotics compared to those with probiotics ( $15.0$  mg/dl vs.  $16.7 \pm 0.50$  mg/dl;  $P < 0.05$ ). Probiotic supplementation increased feed intake ( $485$  g/d vs.  $546 \pm 19.4$  g/d;  $P < 0.05$ ) and rumen  $\text{NH}_3\text{-N}$  ( $7.13$  mg/dl vs.  $8.39 \pm 0.19$  mg/dl;  $P < 0.05$ ) during the pre-weaning period. Cortisol concentration was significantly lower ( $P < 0.05$ ) in lambs fed the probiotic significantly lower in the 16% CP diet than that supplemented diets than in those fed probiotic-lacking diets 24 h after weaning ( $17.3$  mg/dl vs.  $16.6 \pm 0.21$  mg/dl) and 48 h after weaning ( $16.8$  mg/dl vs.  $15.9 \pm 0.21$  mg/dl). In Exp. 2, final weight, ADG, feed intake, and FCR were not significantly different among the diets with different protein levels or between those with or without probiotic supplementation. In addition, feeding diets with the lower CP level (14.5% vs. 16.5%; DM basis) resulted in lower concentrations of blood

\* Corresponding author. Tel.: +98 9155180731; fax: +98 511 8717142.

E-mail address: [afroghi@yahoo.com](mailto:afroghi@yahoo.com) (A.R. Foroughi).

metabolites, urea nitrogen ( $19.9 \text{ mg/dl}$  vs.  $25.0 \pm 1.16 \text{ mg/dl}$ ;  $P < 0.05$ ), rumen pH ( $5.99 \pm$  vs.  $6.22 \pm 0.03$ ;  $P < 0.05$ ), and ruminal  $\text{NH}_3\text{-N}$  ( $10.99 \text{ mg/dl}$  vs.  $11.22 \pm 0.03 \text{ mg/dl}$ ;  $P < 0.05$ ). It was concluded that the higher protein level (18% CP; DM basis) fed during the pre-weaning phase led to increasing feed intake and weaning weight compared to the lower CP diet (16%) but that a higher level of protein in the post-weaning diet (16.5% vs. 14.5% CP; DM basis) did not affect performance. Supplementing the diets with probiotics might have reduced stress (lower cortisol concentration) after weaning but it did not improve the performance of the lambs.

© 2013 Elsevier B.V. All rights reserved.

## 1. Introduction

Numerous studies have focused on improving the efficiency of feed utilization for various production goals, especially in regions of the world where ruminants are fed low quality feed proteins. The use of feed additives like probiotics is one of the strategies commonly employed to improve the efficiency of microbial protein synthesis in the rumen (Mwenya et al., 2004) as well as N-retention by enhancing microbial peptidolytic and proteolytic activities in the rumen (Cole et al., 1992) as it stimulates desirable microbial growth in the rumen and accelerates weaning. Addition of probiotics in feeding systems has been shown not only to improve post-weaning live-weight gain in calves but also to stimulate rumen development in calves during weaning (Theodorou et al., 1990).

The increased consumer concern about the long-term effects of antibiotics has led to more focused research into the use of probiotics instead of ionophores and antibiotics as manipulators of rumen fermentation to improve animal performance and ruminal function (Chaucheyras-Durand and Durand, 2010). Probiotics are classically defined as live microbial dietary supplements that beneficially affect the host animal by improving its intestinal microbial balance (Cruywagen et al., 1999). Probiotic supplementation improves microbial activities in the rumen resulting in enhanced  $\text{NH}_3\text{-N}$  capture to synthesize microbial protein (Erasmus et al., 1992).

Proper protein levels in livestock feed are essential for optimum microbial growth and protein synthesis, which might otherwise result in wastage of large amounts of nutrients, particularly nitrogen, adding to the cost of production and finally leading to environmental pollution (Chandrasekharaiah et al., 2011). The present study investigated the effects of one probiotic, which may have a positive influence on rumen fermentation in ruminants (Jouany, 1991) when animals are offered different protein levels. For the purposes of this study, two protein levels were used to examine the potential interactions between probiotics and dietary protein supply. More specifically, the study aimed to determine the effects of different protein levels with or without probiotics on nutrient intake, blood metabolites, and growth performance in Kurdi male lambs.

## 2. Materials and methods

This study was conducted in 2012 at the Kurdi Animal Breeding Station in North Khorasan Province (Iran). The experimental protocols were reviewed and approved by the Animal Care Committee of Ferdowsi University of Mashhad, Iran.

### 2.1. Experimental design, animals, housing and diet

#### 2.1.1. Exp. 1: pre-weaning phase

Twenty-four male, fat-tailed Kurdi lambs, 10 days of age with an average initial body weight (BW) of  $15.3 \pm 1.8 \text{ kg}$  (at the beginning of the adaptation period), were randomly divided into four groups of six animals in a  $2 \times 2$  factorial arrangement of supplemental probiotic (0 vs. 2 g Protexin®/d) and protein levels (16% vs. 18% CP; DM basis). The experiment lasted 60 days, including 15 days for feed adjustment and 45 experiment days when the animals were fed their respective rations until weaning time. The lambs were fed isocaloric ( $2.7\text{--}2.8 \text{ Mcal ME/kg}$  of DM) diets formulated according to NRC (2001) requirements (Tables 1 and 2). Basal diet consisted of 20% lucerne hay, 30% maize, and 30% barley on a DM basis. The newborn lambs were kept with their respective dams during their first week of life. They were subsequently transferred to individual pens where they were allowed to suckle their respective dams twice a day (in the morning and in the evening). Lambs had ad libitum access to the diets and the feed supply. Feeders were replenished each day to ensure the lambs had access to feed at all times. Housed in individual pens ( $1.5 \text{ m} \times 2.5 \text{ m}$ ), the lambs were served their feeds twice daily at 06:00 and 16:00 and had fresh drinking water available at all times. Table 1 presents the ingredients and the chemical composition of the diets used in the first

**Table 1**

Composition of the diets used to compare the effects of different levels of protein with or without probiotics on Kurdi lambs during the pre-weaning phase (Exp. 1).

| Item                                           | Treatments |      |      |      |
|------------------------------------------------|------------|------|------|------|
|                                                | T1         | T2   | T3   | T4   |
| Ingredients (% of DM)                          |            |      |      |      |
| Lucerne hay                                    | 20.0       | 20.0 | 20.0 | 20.0 |
| Barley                                         | 33.4       | 33.4 | 30.4 | 30.4 |
| Maize                                          | 33.4       | 33.4 | 30.4 | 30.4 |
| Soybean meal                                   | 11.2       | 11.2 | 17.2 | 17.2 |
| Calcium carbonate                              | 0.80       | 0.80 | 0.80 | 0.80 |
| Mineral and vitamin mix <sup>a</sup>           | 0.40       | 0.40 | 0.40 | 0.40 |
| Salt                                           | 0.80       | 0.80 | 0.80 | 0.80 |
| Protexin® (g per day per lamb) <sup>b</sup>    | 0.00       | 2.00 | 0.00 | 2.00 |
| Chemical composition                           |            |      |      |      |
| Metabolizable energy (Mcal/kg DM) <sup>c</sup> | 2.81       | 2.81 | 2.81 | 2.81 |
| Crude protein (%)                              | 16.0       | 16.0 | 18.0 | 18.0 |
| Acid detergent fiber (%)                       | 27.4       | 27.4 | 27.4 | 27.4 |
| Neutral detergent fiber (%)                    | 51.0       | 51.0 | 51.2 | 51.2 |
| Ash (%)                                        | 5.71       | 5.71 | 6.01 | 6.01 |
| Calcium (%) <sup>c</sup>                       | 0.64       | 0.64 | 0.66 | 0.66 |
| Phosphorus (%) <sup>c</sup>                    | 0.35       | 0.35 | 0.37 | 0.37 |

T1 = 16% CP (DM basis) without probiotics; T2 = 16% CP (DM basis) with probiotics; T3 = 18% CP (DM basis) without probiotics; T4 = 18% CP (DM basis) with probiotics.

<sup>a</sup> Each kg of the vitamin–mineral premix contained (DM basis): vitamin A (50,000 IU), vitamin D3 (10,000 IU), vitamin E (0.1 g), calcium (196 g), phosphorus (96 g), sodium (71 g), magnesium (19 g), iron (3 g), copper (0.3 g), manganese (2 g), zinc (3 g), cobalt (0.1 g), iodine (0.1 g), selenium (0.001 g).

<sup>b</sup> Probiotic was used as Protexin®.

<sup>c</sup> Estimation based on NRC (2001).

Download English Version:

<https://daneshyari.com/en/article/2457071>

Download Persian Version:

<https://daneshyari.com/article/2457071>

[Daneshyari.com](https://daneshyari.com)