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Bitter vetch grains as a substitute for soybean meal for growing lambs

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Abstract

Thirty-six male Awassi lambs, born within 8-day period, were reared on their mother's milk until they were weaned at 65 days of age. After weaning, lambs were divided into 3 groups of 12, according to their live weight, and housed in individual pens and offered three isonitrogenous experimental diets. The experimental diets consisted of a 15 to 85 forage to concentrate ratio differing in the proportions of soybean meal (SBM) and bitter vetch (*Vicia ervilia*) grain. Soybean meal and bitter vetch grain were present in the experimental diets in the following proportions: 14:0% (S), 7:8.4% (SV) and 0:15% (V), all on dry matter basis. The experiment lasted for 80 days in which lambs had ad libitum access to feed. Organic matter (OM), crude protein (CP) and neutral detergent fiber (NDF) intakes were all unaffected ($P>0.05$) by the dietary treatment and averaged 875, 152 and 226 g/day, respectively. However, intake of rumen undegradable protein was decreased in the SV and V diets as compared to the S diet. Dry matter, OM, CP, NDF and energy digestibilities were all unaffected ($P>0.05$) by the dietary treatment. Average daily gain (ADG) of all lambs was not affected by the dietary treatment and averaged 196 g/day. Feed to gain ratio was also unaffected by the treatment and averaged 5.3. However, feed cost/kg body weight change was reduced by more than 9% with the substitution of SBM with bitter vetch grain. In conclusion, partial or complete substitution of SBM with bitter vetch grain did not affect nutrient intake or growth performance of Awassi lambs and resulted in a decrease in feed cost.

Keywords: Soybean meal; Bitter vetch grain; Rumen undegradable protein; Awassi

1. Introduction

Production efficiency of meat animals can be defined as the return of salable product per unit of feed input (Beermann et al., 1986). Therefore, any reduction in feed cost would have a tremendous effect on production efficiency.

In Middle East, 80% the production cost of red meat from fattening Awassi lambs is attributed to feed (Harb and Habbab, 1989). Therefore, an important objective for Mediterranean farmers is to promote the use of local feedstuffs to reduce cost (Lanza et al., 2001). The most expensive feedstuff used in rations for growing lambs is soybean meal (SBM).

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Soybean meal has been well established as a main protein source for animal nutrition (Schingoethe et al., 1977). However, SBM is largely imported and, besides, its widespread diffusion as a genetically modified organism has in recent times produced a feeling of mistrust (Lanza et al., 2003).

Bitter Vetch (*Vicia ervilia*) is a locally produced crop that is seasonally available throughout the Middle East area. Legumes are grown in rotation with cereal crops to increase soil fertility, improving the management of diseases and weeds which leads to greater yields in the low to medium rainfall Mediterranean-type environment (Jones and Singh, 2000). In most cases, these crops are grazed by small ruminant. However, in northern Jordan, bitter vetch crop is harvested and the grains are sold in prices that equal 50% to 65% the price of soybean meal.

Soybean meal has been successfully substituted by peanut meal (Economides and Koumas, 1999) and sunflower meal (Erickson et al., 1980). However, the authors are unaware of any research that used bitter vetch grain as an alternative for SBM for growing small ruminants. Therefore, the objective of this study was to study the effects of substituting SBM with bitter vetch grain on growth performance of growing Awassi lambs and to economically asses this substitution.

2. Materials and methods

Thirty-six male Awassi lambs, born within 8-day period at the Jordan University of Science and Technology farm located in northern Jordan, were reared on their mother's milk until they were weaned at 65 days of age. After weaning, lambs were divided into 3 groups of 12, according to their live weight, and housed in individual pens (1.5 m × 0.75 m) in a barn having one side open and offered three isonitrogenous experimental diets. Lambs were allowed 1 week for adjustment before receiving the experimental diets. The experimental diets consisted of a 15 to 85 forage to concentrate ratio differing in the proportions of soybean meal and bitter vetch grain. The chemical composition of all the ingredient used in the experiment is shown in Table 1. Soybean meal and bitter vetch grain were present in the experimental diets in the following proportions: 14:0% (S), 7:8.4% (SV) and 0:15% (V), all on dry matter basis as shown in Table 2. Experimental diets were mixed manually for the whole period and were sampled upon mixing. Vitamins–mineral premix was added to the experimental diets to meet or exceed requirements (NRC, 1985).

Table 1
Chemical composition (g/kg of DM) of the dietary ingredients used in the experiment

	n	Organic matter	Crude protein	Rumen undegradable protein	Neutral detergent fiber	Acid detergent fiber
Wheat straw	5	901	42	10	801	506
Barley grain	5	970	133	36	175	65
Corn grain	5	978	93	51	105	35
Soybean meal	5	917	492	167	83	65
Bitter vetch grain	5	920	219	49	97	91

The experiment lasted for 80 days. Lambs were offered the experimental diets twice daily at 0800 and 1600 h and had ad libitum access to feed during the 80-day trial. Amounts of feed offered and refused were recorded daily before the 0800 feeding. Animals were maintained at ambient temperature and natural day length. Clean drinking water was available in plastic buckets.

Feed samples were oven-dried (60 °C), ground through a 1-mm screen and analyzed for neutral detergent fiber (NDF) according to Van Soest et al. (1991). Crude protein content of feed ingredients was analyzed by the combustion method (AOAC, 1996) using a nitrogen analyzer (Perkin-Elmer, Norwalk, CT). The gross energy of the diets was determined by using Parr Adiabatic Calorimeter (Model 1241EF, USA). The Rumen undegradable protein (RUP) content of feed ingredients was measured in vitro as detailed by Haddad et al. (2005).

At day 50 of the feeding period (80 days), five randomly selected lambs from each treatment were used to measure nutrient digestibility by the acid insoluble ash technique as described by Van Keulen and Young (1977). Fecal grape samples were obtained twice daily for 4 days such that a sample was obtained for every 3-h interval of a 24-h period for a total of