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Effect of source of supplemental nitrogen on characteristics of digestion and utilization of Almond hulls-based diets by sheep

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Almond hulls (AH), a by-product of the almond crop (Prunus amygdalus) that includes the mesocarp and exocarp of the fruit, are widely available in the mediterranean region. This by-product may be used as an energy source for ruminants, but it is deficient in N (6 % CP) and contains relatively high levels of phenolic compounds (7 % condensed tannins) which may interfere with N metabolism in the rumen. Effects of source of supplemental N on characteristics of digestion and performance of lambs fed AH-based diets were evaluated in 2 trials.

Four isonitrogenous (14 % CP) diets containing (DM basis) 50 % AH and 25% alfalfa hay (17 % CP) were supplemented with either sunflower meal (38 % CP, A), urea (D), or combinations of both (B and C). Urea levels were 0, 0.6, 1.2 and 1.7 % in diets A, B, C and D, respectively. As urea level was increased, sunflower meal was replaced by sugar beet pulp to equalize energy content of diets.

Trial I : Diets A, B and D were fed to 3 ruminally and intestinally cannulated rams (45 kg body weight) in a 3x3 latin square design experiment. Intake was limited to 0.8 kg DM/day. Chromic oxide was added to the diets (0.5 % DM) as digesta marker, and purines were used as microbial marker. Ruminal ammonia concentration increased with increasing urea, while ruminal pH, ruminal and post-ruminal digestion of OM and fiber were not influenced ($P>0.05$) by source of supplemental N. Net microbial N synthesis (17 vs 14 g/day) and microbial efficiency (37 vs 29 g of microbial N/kg OM truly fermented) were greater ($P<0.05$) for A than for B and D. Nitrogen efficiency (duodenal non-ammonia N/total N intake) decreased ($P<0.05$) with increasing urea level in the diet (1.3, 1.2 and 1.1 for A, B and D, respectively).

Trial II : Four balanced groups of 8 lambs (D'man x Sardi ; 21 kg and 4 months average initial weight and age) were randomly assigned to one of the 4 diets. Lambs were individually fed *ad libitum* for 98 days. Feed intake and daily gain decreased ($P<0.05$) with increasing dietary urea level (90.7, 88.7, 85.0 and 79.2 g DM/$kg^{0.75}$/day ; 179, 153, 136 and 117 g/day, for A, B, C and D, respectively). Feed efficiency also declined as urea level in the diet was increased (7.1, 7.4, 7.8 and 8.4 kg DM/kg gain for A, B, C and D, respectively).

Although digestibility was not affected, non protein N (urea) was less efficient than natural protein for enhancing ruminal microbial protein synthesis and performance of lambs fed AH-based diets.