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The Effect of Concentrate Supplementation on Feed Intake and Weight Gain of Sheep Grazing the Inner Mongolian Steppe, China

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Abstract

Sheep grazing is the main reason for grassland degradation in the Inner Mongolian steppe, China. Strategies to protect the natural vegetation while satisfying farmers' interests are strongly needed. Hence, this study analysed the effects of concentrate supplementation on feed intake and live weight gain (LWG) of grazing sheep to evaluate its potential contribution to steppe conservation and sustainable livestock production.

In September 2009, a grazing trial with 77 Mongolian fat-tailed sheep (40.1 ± 4.4 kg live weight (LW)) was conducted on the Inner Mongolian Ecosystem Research Station near Xilinhot ($116^\circ 42'$ E, $43^\circ 38'$ N). Sheep were allotted to two moderately (GI M) and two intensively (GI I) grazed plots according to herbage allowances of 1.5–2.5 (GI M) and <1.5 (GI I) kg herbage dry mass/kg LW. Organic matter intake (OMI), digestibility of ingested organic matter (dOM), and LWG were determined in four non-supplemented and four supplemented sheep per plot. The latter received 250 g d^{-1} of a corn-based concentrate for 24 d. Fecal grab samples were collected on days 19–24. dOM was estimated from fecal crude protein content and fecal excretion quantified using the external marker titanium dioxide. All sheep were weighed before and after the experiment to determine daily LWG.

Sheep's daily OMI varied between 73 (GI I) and 82 (GI M) $\text{g kg}^{0.75}$ LW. Although dOM was higher in supplemented than in non-supplemented sheep at all plots (0.60 ± 3.7 vs. 0.57 ± 1.6 ; $p < 0.05$), concentrate feeding did not increase their OMI ($p > 0.05$). While OMI during grazing of GI M sheep was similar with ($1.11 \pm .26 \text{ kg d}^{-1}$) than without concentrate feeding ($1.04 \pm 0.11 \text{ kg d}^{-1}$; $p > 0.05$), supplementation tended to decrease herbage intake of GI I sheep (1.15 ± 0.36 vs. $0.97 \pm 0.35 \text{ kg d}^{-1}$; $p > 0.05$). Concentrate feeding increased LWG of supplemented GI M ($43 \pm 29 \text{ g d}^{-1}$) and GI I ($34 \pm 61 \text{ g d}^{-1}$) sheep compared to non-supplemented sheep in the respective plots ($6 \pm 44 \text{ g d}^{-1}$ and $-33 \pm 69 \text{ g d}^{-1}$; $p < 0.05$).

Feeding concentrates to grazing sheep increases their LWG and might compensate for farmers' economic losses caused by the recent de-stocking policies of the local government. At high grazing intensities, it decreases the animals' feed intake during grazing and thus appears to offer a promising contribution to sustainable sheep production.

Keywords: Inner Mongolia steppe, overgrazing, sheep, supplementation