



Improving Tibetan sheep daily weight gain by concentrate in the cold season to overcome overgrazing on the Qinghai-Tibetan Plateau

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Key word: Tibetan sheep; overgrazing, degradation, daily weight gain; feed processing

1 SUMMARY

Overgrazing and grassland degradation are ongoing concerns for the Qinghai-Tibetan Plateau. There is a need to have fewer numbers of grazing animal units (sheep, yak and dzo (yak-cattle cross)) on the grasslands. The objective of this study was to investigate a proper forage to raise Tibetan sheep and prevent grassland from overgrazing. A diet that would give faster weight gains, and improve efficiency was investigated on 18 castrated Tibetan sheep by measuring the effects on performance using three different concentrate processing methods (Non-processed concentrate + oat grass, Steam flaked concentrate + oat grass, Steam flaked concentrate + silage oat grass). The results showed that a flaked concentrate feed mixed with silage oat grass had the highest average daily gain (ADG) among three different concentrate processing methods. This would thus shorten the lifecycle and reduce the number of Tibetan sheep and therefore, decrease the grazing pressure on the open grasslands.

2 INTRODUCTION

Tibetan Sheep, one of the dominant livestock species on the Qinghai-Tibetan Plateau, have been grazed on the plateau for thousands of years. The use of the traditional grazing methods presently leads to low efficiency of sheep meat production, and is compensated for by increasing the number of sheep to reach appropriate numbers for the economic needs. This in turn results in more overgrazing culminating in the continued vegetation and

land degradation of the *Qinghai-Tibetan* Plateau (Wang Xiuhong, *et al*, 2007). Wang reported that finishing sheep through an indoor feeding system is better for increasing the income of local herders while reducing stocking rates (Wang Xiuhong, *et al*, 2007). To change the production systems from traditional grazing to indoor feeding, best feeding methods should be determined. Anyhow, growing animals on concentrate-based diets generally have higher

ADG, dressing percentage and carcass quality than those solely on pasture (Priolo, A., *et al*, 2002), (Lee.M.R.F., *et al*, 2009) and support high levels of performance in beef animals without the need for additional concentrate supplementation (Kim, E. J., *et al*, 2000). Numerous reports of improved performance in feedlot cattle fed steam-flaked vs. dry-rolled corn have been published (Zinn, 1987 ; Barajas and Zinn, 1998 ; Leibovich *et al*, 2009). Steers fed steam-flaked corn consumed 6% less feed, increased their rate of weight gain by 22%, and were 30% more efficient than those fed dry-rolled corn (N. DiLorenzo, *et al*, 2011). The

effects of silage and steam-flaked concentration on the performance of Qinghai Tibetan sheep has yet to be reported. The objective of this study was to compare the performance of Tibetan sheep under similar management with the differences between feeding a non-processed mixed concentrate feed versus a steam-flaked mixed concentrate feed with either roughage of oat hay or oat hay silage. All these redounded to the increasing of sheep production efficiency, reduction of the sheep life cycle, reduction in numbers and decreasing grazing pressures on the Qinghai Tibetan.



3 MATERIAL AND METHODS

3.1 Animals, diets and experimental design: Eighteen castrated Tibetan sheep, aged 10 months, were bought from nomadic herders of Guinan County, Qinghai Province in December 2010 and were randomly divided into three groups with 6 sheep in each group. The 3 groups were Group I (control Group), Group II, and Group III respectively. Each group of sheep was kept in separate warm pens equipped with watering and feeding facilities. The diet was designed according to locally available feeds in Guinan County. The concentrate mix contained 50% corn, 30%

barley, 17% rape cake, 2% trace minerals and 1% salt. Sheep in Group I were fed on non-processed concentrate (500g DM day⁻¹ per sheep) with oat grass, sheep in Group II were fed on a steam flaked concentrate (500g DM day⁻¹ per sheep) with oat grass, sheep in Group III were fed on steam flaked concentrate (500g DM day⁻¹ per sheep) with oat grass silage. The experiment was set in Guinan County from November 21, 2010 to February 10, 2011. The 81-day study was divided into two periods, a 21-day preliminary period for the sheep to



adjust to the diets and their surroundings, and a 60-day feeding trial.

3.2 Animal management: During the preliminary period, the concentrate supplement levels of three groups increased from 100g d⁻¹ per sheep to determined levels (500g d⁻¹ per sheep) at the end of the pre-test. All Animals were fed twice daily at 8:00 am and 18:00 pm (First the concentrate and then the roughage). Water was available at all times.

4 RESULTS

The average daily gain of sheep was summarized in Table 1. From Table 1, ADG of Group III was 83.62g greater (P<0.01) than that of Group I, ADG of Group III was 49.73g

3.3 Sampling: Sheep were weighed before the morning feeding at the beginning of the feed trial and then before the morning feeding at the end of the trial. The leftover roughage of the previous feeding was removed from each bunk, weighed and recorded to determine the next scale of feeding. This was done on an everyday feeding basis throughout the trial period.

3.4 Data analysis: All data was analyzed using One-Way ANOVA of SPSS13.0 package

greater than that of Group II (P<0.01). ADG of Group II was 33.89g greater (P<0.05) than that of Group I.

Table 1: The average daily gain of sheep

Group	Sheep number	Feed composition	Concentrate intake (g/d/sheep pen)	Initial weight (kg/sheep)	Final weight (kg/sheep)	ADG (g)
I	6	Non-processed concentrate + oat grass	3000 + oat hay GE = 200	22.8±1.17	29.43±1.9 4	110. 83±18.5 2 ^a
II	6	Steam flaked concentrate + oat grass	3000 + oat hay GE = 200	20.85±1.1 3	29.68±1.7 6	144. 72±25.2 6 ^b
III	6	Steam flaked concentrate + silage oat grass	3000 + oat silage GE = 200	21.03±2.4 5	32.65±2.7 4	194. 45±9.11 ^c

Note: means with different letters in the same column differed (P<0.05)

5 DISCUSSION AND CONCLUSION

Daily weight gain which affects the length of time from birth to slaughter of sheep determines the number and length of the lifecycle of sheep given the same production level. Grain processing is the most widely used

technology to improve animal performance in the feedlot industry (Vasconcelos and Galyean, 2007). Method of corn grain processing had a greater effect on the efficiency of bodyweight gain of finishing cattle than did corn hybrid



(Ladely et al., 1995). Steam flaking of corn is now a typical method of processing of corn grain in the world. It increased starch digestibility in the rumen and post-ruminally (Joy et al., 1997; Crocker et al., 1998). In vitro rumen digestion of starch was higher for small particles compared to large particles (McAllister et al., 1993). Steam flaking of cereals employs water and heat to cause swelling of starch granules, followed by rolling to further disrupt the swollen granules (Rooney and Pflugfelder, 1986). Kim (2000) reported that good quality silages will support high levels of performance in beef animals without the need for additional concentrate supplementation, and result in a high average live weight gain in dairy cull cows (M.R.F. Lee, 2009). Compared to the fresh plants, ensiled agave showed some advantages in terms of N retention, ruminal disappearance rate of NDF, ruminal propionate and protozoa concentrations in lambs (J.M. Pinos-Rodriguez, 2009). From this study, sheep that

were fed a steam flaked concentrate with silage oat grass had the highest ADG among the three groups. To protect grassland from over-grazing by sheep in Qinghai-Tibet plateau, flaked concentrate with silage oat grass appears to be a better way to raise Tibetan sheep. During the cold season, sheep that were raised in warm pen and were fed a steam flaked concentrate with silage oat grass had the highest ADG from this study, and that will reduce the number and lifecycle of Tibetan sheep when production level is same and thus prevent grassland from over-grazing. The grassland, it is available, it should be used in summer to avoid the expenditure from the feed produce. It is a better way to protect grassland from overgrazing and degradation to raise Tibetan sheep on grassland during the warm season and warm pen during the cold season, with a steam flaked concentrate and silage oat grass.

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