Research Article

Effect of Slow Release Urea Supplementation (Optigen®) on the Production Performance of Kaghani sheep

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Abstract | The study was conducted to evaluate the effect of slow release urea supplementation (Optigen®) on the growth performance of grazing Kaghani sheep with special reference to weight gain, fleece weight and wool quality. Thirty healthy post-weaned male lambs of Kaghani sheep were selected and divided into two groups viz Group-A (treated group) and Group-B (control group) containing fifteen animals each. Sheep in both groups were kept on grazing and maize silage feeding ad libitum; however sheep in group A were additionally supplemented with Optigen® at the dose rate of 10 grams/animal twice a day for 60 days. The animals were weighed individually at the start of experiment and weekly thereafter. Sheep were shorn at the end of experiment and fleece weight was recorded. The fiber types were determined by Benzol method before and after the experiment. Average body weight and fleece weight of animals treated with Optigen® was significantly *(P<0.05)* higher as compared to control group. True, kemp and modulated fiber's quality was significantly *(P<0.05)* improved except heterotypical fiber with the Optigen® supplementation. It was concluded that slow release urea supplementation (Optigen®) with maize silage feeding was effective in increasing body weight, fleece weight and wool quality in growing lambs.

Keywords | Fleece weight, Kaghani sheep, Optigen®, Weight gain, Wool quality

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INTRODUCTION

Small ruminants' rearing is an important agricultural subsector in developing countries where these animals are kept for mutton, wool and milk purposes (Devendra and Burns, 1970). Pakistan has well distinguished 28 breeds of sheep including Kaghani sheep (Ahmad et al., 2001). Kaghani sheep is a medium sized low producer breed and normally graze traditionally on naturally grown grasses (Rafiq et al., 2013; Nawaz et al., 1992). Small ruminants are valuable animal resource but paid no value in developing countries like Pakistan (Sarwar et al., 2010). These are reared solely on the grazing and are not fed with any supplementary ration (Liesegang et al., 2008). Such under nourished sheep marketed and slaughtered for mutton or wool purpose are mostly lean and emaciated. The body weight considered as great bearing due to the mutton producing capacity of sheep (Afzal and Naqvi, 2003-04).

Intensive production system was introduced in developing countries based on concentrate feed stuffs, smaller use of grazing and pastures, early weaning and introduction of exotic improved breed but failed due to high production costs (Morand-Fehr and Boyazoglu, 1999). The alternative is to improve the performance of sheep in existing grazing system (Dickhoefer et al., 2014). Dietary proteins are important in ruminant's nutrition because they serve as a source of amino acids and nitrogen for the synthesis of microbial protein (Kaur and Arora, 1995; Nocek and Russell, 1988). The use of non-protein nitrogen (NPN) compounds can be used as alternative to grasses, fodder and concentrates of low nutritive value (Cherdthong and Wanapat, 2010; Burgstaller, 1983). Urea is a source of non-protein nitrogen (NPN) for growing lambs because of its low cost compared to other NPN sources and protein feeds (Colmenero and Broderick, 2006). Addition of slowly released ruminal urea compounds has a long history in ruminant feeding (Kertz, 2010). Slowly rumen released nitrogen compounds primarily stems from their potential to release slow ammonia post-feeding, thereby decreasing peak ammonia concentrations in the rumen (Pinos-Rodriguez et al., 2010). Slow released urea causes minimum utilization of urea by ruminal microflora and increased absorption from the rumen (Taylor-Edwards et al., 2009).

The total sheep population of Pakistan is 29.1 million (Anonymous, 2013-14). Keeping in view the importance of sheep and the need to meet their nutritional deficiencies, the present study was conducted to evaluate the effect of slow release urea compound (Optigen® Alltech Int.) on the growth performance of grazing Kaghani sheep.

MATERIALS AND METHODS

Source Of Animals

The trial was conducted at Livestock Research Station, Jaba, District Mansehra, Khyber Pakhtunkhwa, Pakistan. Thirty post-weaned male lambs of Kaghani sheep breed with age group of < 1 year and weight ranging 13 to 25kg were incorporated in this study.

Grouping Of Animals

Thirty animals were equally divided into two groups (Treatment-A and Control-B) containing fifteen animals each. Both experimental groups were subjected to identical grazing and were offered maize silage feeding ad libitum (Saric et al., 2013).

Supplementation Trial

All animals were dewormed with Albendazole (Albavet®) at the dose rate of 7.5 mg/kg body weight one week prior to the start of trial. Treatment group was fed with urea Optigen® at the dose rate of 10 grams/Animal (as per labelled manufacturer dose) twice daily at 09:00 AM and 15:00 PM for a period of 60 days, whereas control group was kept on grazing and maize silage feeding ad libitum without any supplementation. Amount of feed offered was recorded daily. Animals were maintained at ambient temperature and natural day length with clean drinking water availability. Initial and weekly body weights of individual lambs were recorded with electronic weighing balance throughout the trial period.

Determination Of Fleece Weight And Fiber Type

At the end of the experiment, animals were shorn and fleece weight was measured with electronic weighing balance. Fiber types for wool quality were determined by Benzol method (Elphick, 1932). One hundred (100) fibers were picked with the help of forceps and dropped one by one into petri-dish containing Benzol solution for visibility test. Fibers visible through the entire length were considered as modulated and kemp fibers (kemp fibers were chalky white, coarse and opaque in appearance), partially visible as heterotypical and totally invisible as true wool fibers. Thus, 100 fibers from each sample were examined before and after the experiment and proportion of each fiber type was recorded in percentage.

Statistical Analysis

Data collected regarding the weight gain, wool production and wool quality were analyzed using analysis of variance technique (ANOVA), Completely Randomized Design (CRD), while Least Significance Difference (LSD) test was used to compare means. Data were analyzed using computer based software Statistix8.1®.

RESULTS AND DISCUSSIONS

Weight Gain

The mean initial and final body weights of lambs did not differ significantly across the groups. However, the average body weight gain was significantly *($P<0.05$)* higher in Optigen® group as compared to control group (Table 1). The results showed that significant *($P<0.05$)* linear increase in body weight of Optigen® group was observed from day 0 to day 60. The change in the body weight of sheep in control group was non-significant throughout the period (Table 2).

Fleece Weight and Wool Quality

Fleece weight: The fleece weight between the two groups

Table 1: Comparison of body weight gain in Optigen® and control groups

Groups	Initial Weight (Kg)	Final Weight (Kg)	Mean of Initial and final Body Weights(Kg)	Average Weight Gain (Kg)
Optigen®	18.3 ±0.86	21.4±0.86	19.65 ± 0.38	3.1±0.6[a]
Control	19.9±0.75	21.2±0.74	20.41 ± 0.32	1.2±0.13[b]

Different superscript letters along the columns indicate significant differences ($P < 0.05$)

Table 2: Effect of Optigen® on body weight in growing lam

Groups	Day 0	Day 15	Day 30	Day 45	Day 60
Optigen®	18.3 ± 0.85[a]	18.83 ± 0.83[ab]	19.56 ± 0.84[ab]	20.36 ± 0.85[ab]	21.21 ± 0.85[b]
Control	19.9 ± 0.75	20.04 ± 0.73	20.3 ± 0.73	20.6 ± 0.72	21.04 ± 0.73

Different superscript letters along the columns indicate significant differences ($P < 0.05$)

Table 4: Comparison of wool fibers in the Optigen® and control groups at the start and end of experiment

Fiber types	Optigen®		Control	
	Start of experiment (%)	End of experiment (%)	Start of experiment (%)	End of experiment (%)
Modulated fiber	26.6 [a]	19.07 [b]	26.4 [a]	25.9 [a]
Heterotypical fiber	50.3	49.4	49.9	49.3
True wool fiber	21.5 [a]	30.9 [a]	21.9 [a]	22.8 [b]
Kemp fiber	1.4 [a]	0.5 [a]	1.6 [a]	1.8 [b]

Different superscript letters along the columns indicate significant differences ($P < 0.05$)

Table 3: Comparison of average fleece weight in the optigen® and control groups

Groups	Fleece weight after treatment (Kg)
Optigen (n = 15)	2.2 ± 0.04[a]
Control (n = 15)	1.94 ± 0.02[b]

Different superscript letters along the columns indicate significant differences ($P<0.05$)

was significant different. Treatment Group (Optigen®) yielded significantly higher *(P<0.05)* fleece weight as compared to the control group (Table 3).

Modulated fiber: No significant difference was observed in the modulated wool fiber in both Optigen® and control groups at the start of the experiment. However, significant decrease ($P<0.05$) in modulated wool fiber was observed at the end of the trial in the Optigen® group. But it remained same in case of control group (Table 4).

Heterotypical wool fiber: The data showed that at the end of experiment the percentage of heterotypical wool fiber was 49.4% for Optigen® and 49.3% for control group respectively. A non-significant difference was observed between the groups before and at the end of the trial (Table 4).

True wool fiber: The data showed that at the start of the experiment there was no difference in the true wool fiber in both Optigen® and control groups. The true wool fibers in Optigen® and Control group were 30.9 and 22.8 % respectively. A significant *(P<0.05)* difference between the Optigen® and control groups was recorded (Table 4).

Kemp wool fiber: The data showed a non-significant difference at the start of the experiment between the groups 1.4% for Optigen® and 1.6% for control group. However, at end of the trial significant decrease (P<0.05) in kemp wool fiber was observed in the Optigen® group (0.5%). But in case of control group it remained same (1.8%) during the treatment group (Table 4).

It is evident from the above results that the all types of fibers except heterotypical fiber, were significantly *(P<0.05)* affected by the Optigen® supplementation in the maize silage during feeding.

Studies upon the performance of lambs based on slow release urea supplementation shows variable effect on weight and feed intake. According to Harris and Mitchell, 1941[a,b], Johnson et al. (1942) and Johnson et al. (1944), growing and fattening lambs could gain in body weight and store body nitrogen provided with rations containing 40-65 percent of the nitrogen in the form of urea. Hamilton et al. (1948) and Tillman and Swift 1953, observed balance studies in Illinois showed that nitrogen in the form of urea was as well utilized as equal nitrogen and considerable effect on weight gain in growing lambs. Hue et al. (2008) concluded that slow release urea product could be used as protein sources in diets straw based and replace a commercial concentrate without any effect on the live weight gain of the lambs. The findings of the present study are in line with Yirga et al. (2011) who concluded that lambs fed with slow release urea product based diet with minimum concentrate mix resulted in better biologic and economic performance. The findings are not in line with Lizarazo et al. (2104) who declared that slow-release urea (SRU) with a source of soluble carbohydrates on ruminal fermentation in lambs nourished with low quality forage hay has no effect on the rumen digestibility of dry matter (DM) and neutral detergent fiber (NDF) or the rate of microbial protein synthesis in growing lambs. The findings of the present study are different from that of Hernandez et al. (2011) who reported that the addition of the slow release urea had no effect on the productive parameters or indicators of rumen fermentation. Golombeski et al. (2006) and Highstreet et al. (2010) reported that slow release urea can negatively affect finishing rations when added with fibrolytic enzyme. Use of urea is also related with the advantage of hydrolysis to NH3-N in the rumen by microbial enzymes

In the current study, it has been observed that the supplementation of NPN in slow released form provided a significant effect over the wool characteristics. However, there are scanty reports available on feeding of urea as nitrogen source on wool production. Most of the studies reported no improvement on wool production in diets containing supplemental urea. According to Peirce (1951), the addition of 15g urea along with low protein ration containing a high proportion of fiber did not show any significant effect, however an increase of 32 per cent in total wool production was recorded with 15g urea along with low protein ration containing high proportion of a carbohydrate (potato starch). The findings of our study are not similar to Lofgreen et al. (1953) and Aitchison et al. (1988) who reported that urea supplementation provided with either molasses or in pellets with grain and other feeds to sheep, had no improvement in wool production. According to Black and Reis (1979), urea treatment of the straw has no significant improvement in wool growth rates. Another study conducted by Hynd et al. (1986) also suggests that 6 weeks may be required for wool growth to truly reflect dietary changes. However the findings of the present study are in some sort of similarity with findings of Coombe and Tribe (1962), Coombe and Preston (1969) and Knox and Steel (1999), who observed an improvement in the wool growth of sheep supplemented with urea and molasses fed diets containing low quality roughages.

CONCLUSIONS

It has been concluded from the above discussion that fibrous diet for ruminants can be manipulated by various ways and maize silage supplemented with Optigen® is healthy tool to improve weight gain and wool production in growing lambs. However, longitudinal study is required to evaluate growth performance, wool quality, feed intake, fermentation and digestibility of slow-release urea products with low grade forages during different seasons.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this article.

AUTHOR'S CONTRIBUTIONS

ZA designed and conducted the study; SAK helped in coordination and drafting of the manuscript; MN and IM contributed in the searching of research and review articles related to the study design; MW and ZHK contributed in the better explanation of the Slow release urea supplementation; and AS,I A and FR participated in the sequencing of this research article. All authors read and approved the final manuscript.

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