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Effect of Monensin Supplementation on Growth Performance of Crossbred Male Kids

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ABSTRACT

The present study was conducted to study the effect of monensin supplementation on the attainment of sexual maturity and semen quality in bucks. Eighteen weaned kids aged 3 months were divided into three groups. The control animals were fed according to the requirement of ICAR (2013) standards, with 40:60 ratios of concentrate and green roughage. The treatment group was fed similar to control with addition of 10 mg/head/d and 20 mg/head/d of monensin in T1 and T2 group respectively. One month period of adaptation allowed before starting the experiment. The supplementation experiment was started at the age of four months for sixty days. The final body weights of animals (kg) did not differ (P>0.05) significantly; i.e. 19.32 ± 0.54, 20.44 ± 0.78 and 21.42 ± 0.36 kg in control, treatment I and treatment II respectively. The ADG was higher (P<0.01) in treatment groups (119.3 ± 3.9 and 127.3 ± 6.09 respectively in T1 and T2)as compare to control (91.00 ± 2.33). There was no significant effect on DMI in treatment groups.

HIGHLIGHTS

- Supplementation of monensin significantly increases the average daily gain of kids.
- Monensin improves the body weight of animal without altering the dry matter intake.

Keywords: Monensin, body weight, average daily gain, dry matter intake

Male animals are selected at an early age as future breeding bulls. However, a considerable number of animals are rejected at various stages of life due to limited growth and reproductive potentialities. The fertility problems in ruminants, like inadequate libido and poor seminal profile, may be attributed to genetic, environmental and management factors. Antibiotic growth promoters have extensively been employed since 1970 to enhance animal health and productivity in livestock systems (McGuffey *et al.,* 2001). In United States, the use and regulation of antibiotic growth promoters are controlled by the Food and Drug administration (FDA). To date, FDA has approved the use of ionophore (e.g., monensin) and non ionophore (e.g., bambermycin) antibiotics, as feed additives, in cattle (CFR, 2006).The productive benefits derived from feeding antibiotic growth promoters, mainly ionophores, to feedlot cattle are well known. It has also been used in dairy heifers for growth promotion. Ionophores inclusion positively induces growth and increases feed efficiency in ruminants receiving diets with high concentrate inclusion (Duffield *et al.,* 2008). Dikeman (2007) reported that rumen metabolic modifiers including monensin have a positive effect on live weight gain, FCR. Due to these changes in rumen fermentation, the efficiency of energy and nitrogen metabolism is improved. Increased energy efficiency due to the increased propionate production may lower the heat production increment which results in the increase of energy available to the animal for production purposes. Numerous reports are available to verify the effect of

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monensin to improve body weight, average daily gain and improve feed efficiency in ruminants. Feed efficiency has been improved by reducing dry matter intake with little or no effect on average daily gain when animal fed with grain based feedlot diet (Tedeschi *et al.,* 2003). In goats the supplementation of monensin in feed at 10mg dose significantly increased the ADG and body weight (Mousa *et al.,* 1999). Barman *et al.,* (2000) reported the effect of rumensin on growth, nutrient utilization, feed conversion efficiency and economy of feeding to growing buffalo calves. Twelve murrah buffalo calves (11-16 months, 90-164 kg body weight) were divided into three groups according to their body weight and after 100 days of feeding they found the increase body weight and average daily gain. Down *et al.* (2000) reported that laidliomycin propionate did not influence daily gain, dry matter intake, feed efficiency, subcutaneous or intramuscular fat deposition, but longissimmus muscle deposition was enhanced in Angus bull. Singh *et al.* (2005) reported that supplementation of monensin in heifers fed concentrate mixture and green fodder to meet the requirements on the basis of body weight. Monensin supplemented 200 mg/h/day for 35 days (experimental phase). Average weight gain was 17.59 % higher in monensin supplemented group than control.

Chavira *et al.* (2010) reported that there were no interactions (P>0.05) between dietary ionophores and breed type on the growth rate and carcass characteristics of the lambs. Ionophore did not affect (P>0.05) the weight gain of lambs and result was agreement with Chavira *et al.* (2010) who reported that there was no effect of 25 µg/g sodium monensin in the diet on weight gain in feedlot lamb. Santos (2005) also reported that lambs obtained 275, 291, 301 and 285 (g/d) with 0, 21.35, 43.25 and 65.62 monensin (µg/g feed) and concluded that there was no effect of monensin on weight gain. Tedeschi *et al.* (2003) suggested that ionophore effects on animal performance may vary depending on dosage, animal, and diet.

MATERIALS AND METHODS

The experiments were conducted at ICAR- National Dairy Research Institute Karnal, Haryana in 2016-17. Eighteen male crossbred kids (AlpinexBeetal) of average 103.94 ± 2.87 days old were taken from Livestock Research Centre (LRC), NDRI, Karnal. The animals were divided into three groups with six animals in each group. During entire experiment hygiene and cleanness of shed was maintained. Before start of experiment deworming was done. Fresh and clean drinking water was available for whole time. The control animals were fed mainly green fodder like maize, Berseem, cow pea, sorghum etc. during entire experiment period. Animals were fed to meet their daily nutrient requirement as given by ICAR, 2013. Roughage to concentrate ratio was 60:40. Roughage and concentrate were divided in two halves and offered at morning and evening. Treatment 1 and Treatment 2animals were fed according to control group (C) including supplementation of monensin @10 mg/h/d and 20 mg/h/d respectively. Initial body weight was taken before start of experiment. Kids were weighed at fortnightly interval before morning feeding. The change in body weight in relation to base line weight before start of experiment was considered as body gain or growth. Dry matter intake (g/d) was calculated at fortnight intervals.

RESULTS AND DISCUSSION

The mean values of initial and final body weight of growing kids supplemented with different level of monensin during 60 days supplementation phase are presented in table 1 and Fig 1. The initial body weight was 13.86 ± 0.58, 13.28 ± 0.87 and 13.87 ± 0.34 kg in control, treatment 1 and treatment 2 respectively. It increases significantly (P<0.001) during different fortnights reaching to the mean value of 19.32 ± 0.54, 20.44 ± 0.78 and 21.42 ± 0.36 kg in control, treatment 1 and treatment 2 respectively, at the end of the 60 days growth trial. The per cent increase in body weight was 39.39 in control, 53.92 in treatment 1 and 54.43 in treatment 2. The overall mean body weight is higher in treatments as compare to control but the increase was not significant (P>0.05). Higher body weight in the treatment group is due to protein sparing effect of monensin and stimulation of protein synthesis due to higher activity of liver (Singh *et al.,* 2008). Increase in body weight largely depends upon the nutrient availability, environmental factors and activation of somatotrophic axis (Katoh *et al.,* 2007). The complex regulatory system of molecules that regulates energy homeostasis affects food intake and maintains a stable body weight. The increased body weight in the supplemented group of the study is in agreement with several studies. In Murrah buffalo calf supplementation of monensin 50 mg with 40:60 ratio of

Table 1: Fortnight body weight (kg) of growing kids during 60 days supplementation

Fortnights	C	T1	T2
0	13.86 ± 0.58	13.28 ± 0.87	13.78 ± 0.35
1	15.28 ± 0.55	14.98 ± 0.85	16.16 ± 0.38
2	16.58 ± 0.55	17.02 ± 0.82	18.16 ± 0.41
3	17.96 ± 0.54	18.66 ± 0.79	20.04 ± 0.38
4	19.32 ± 0.54	20.44 ± 0.79	21.42 ± 0.35

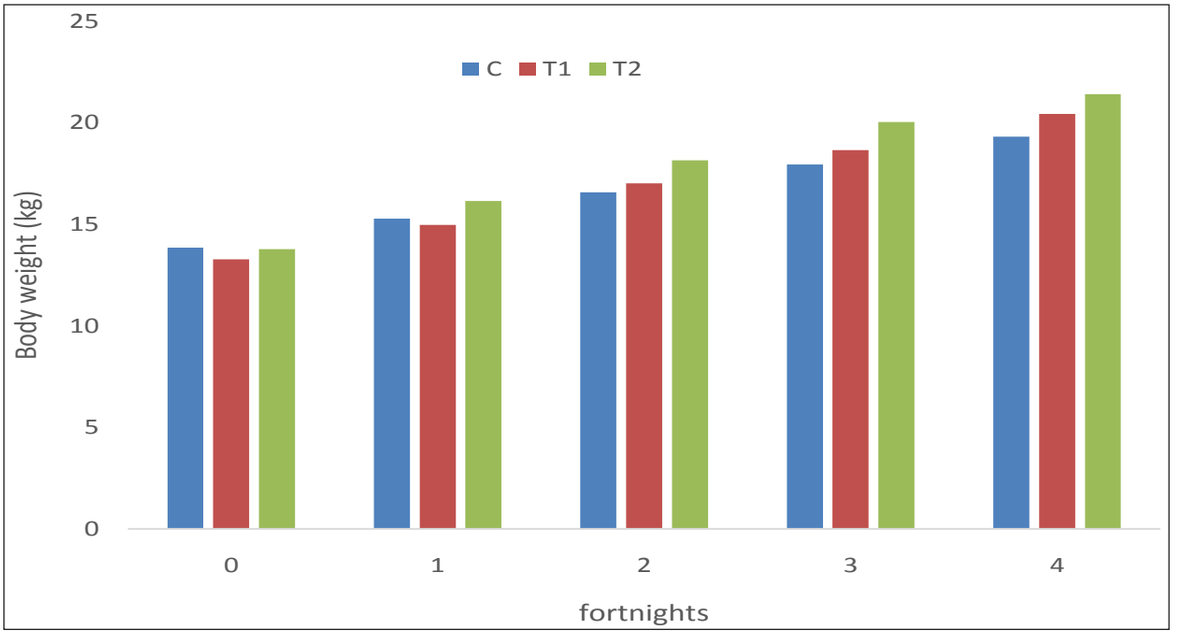

Fig. 1: Fortnight body weight (kg) of growing kids during 60 days supplementation

concentrate roughage diet during 100 days growth trial showed higher but non-significant value of body weight than control (Barman, 2000). In growing Karan Fries heifer, supplementation of 200 mg monensin per head per day in 35 days supplementation period showed non-significant increase in the body weight (Singh *et al.,* 2005). Similarly supplementation of monensin in growing crossbred KF calf with 200 mg/h/day showed non-significant increase in body weight in 75 days growth trial (Patir *et al.,* 2002).

The mean value of average daily gain of growing kids supplemented with different level of monensin is presented in table 2 and Fig. 2. The average daily gain was 91.00 ± 2.33, 119.3 ± 3.9 and 127.3 ± 6.09 in control, treatment 1 and treatment 2 respectively at the end of the growth trial. The ADG was significantly higher (P <0.01) in treatment groups (1 & 2) as compared to control which indicates that monensin have positive and significant effect on average daily gain. Improved ADG in monensin supplemented group is due to better rumen fermentation and energy utilization. The efficient energy utilization is mainly due to increased propionate proportion and decreased methane production in the rumen (Suber and Boumen, 1998). The eructed methane contributes around 12% of total gross energy. Reduction of methane emission would benefit both production efficiency and the environment (Moss *et al.,* 2000). This loss can however be reduced by as much as 30% if ionophore is added to the diet (Al-Dobaib and Mousa, 2009). Increased propionic acid accumulation in the rumen of ionophore-fed animals may be the consequence of redirected hydrogen utilization caused

Table 2: Fortnight average daily gain (g/d) of growing kids during 60 days supplementation

Fortnights	C	T1	T2
1	94.6 ± 5.3^{a}	113.3 ± 5.6^{a}	158.7 ± 7.1^{b}
2	86.6 ± 5.6^{a}	136.0 ± 8.1^{b}	133.3 ± 4.7^{b}
3	92.0 ± 5.7^{a}	109.3 ± 8.6^{ab}	125.3 ± 4.4^{b}
4	90.6 ± 1.6^{a}	118.7 ± 4.4^{b}	92.0 ± 6.8^{ac}
Overall mean	91.00 ± 2.33^{A}	119.3 ± 3.9^{BC}	127.3 ± 6.09^{B}

Within row means having different superscripts in upper case letters (A, B,C) and lower case letters (a, b,c) differ significantly at 1% ($P < 0.01$) and 5% ($P < 0.05$), respectively.

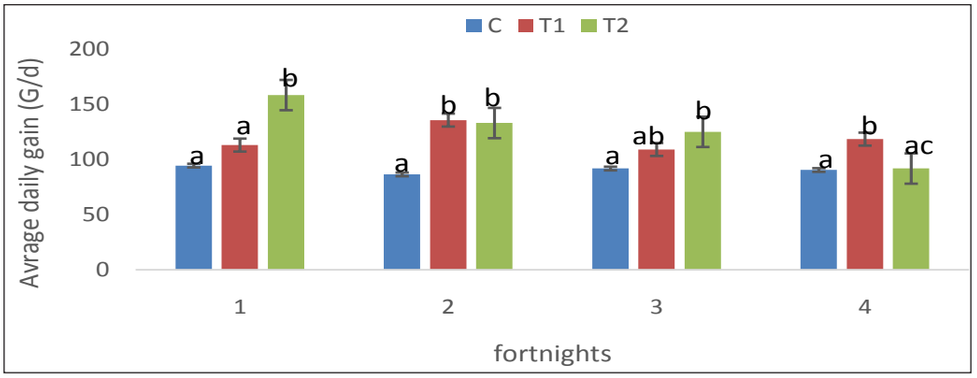

Fig. 2: Fortnight average daily gain (g/d) of growing kids during 60 days supplementation

by lower methane production. Improved average daily gain of animals is due to the inhibition of degradation of dietary protein in the rumen. The use of ionophores antibiotics in animal ration is for the growth promotion and improved feed efficiency is well documented (Cinar *et al.,* 2001). Increase in body weight and ADG in our study agrees with several studies conducted in ruminants including goat. Body weight and ADG of lamb was significantly higher when feed was supplemented with 30 ppm of monensin in their diet (Heyderi *et al.,* 2008). The effect of different inclusion level of monensin (10, 20, and 30 mg monensin per kg of DM) in Masal local lambs feed, results in significant increase in average daily gain (Abedinzadeh, 2015). Supplementation of monensin in growing crossbred KF calf with 200 mg/h/day showing significant increase in average daily gain in 75 days growth trial (Patir *et al.,* 2002). In growing Karan fries heifers supplementation of 200 mg monensin per head per day in 35 days supplementation period showed significant increase in average daily gain (Singh *et al.,* 2005). Hales *et al.* (2017) reported that feeding a higher dose (400 mg/d) of monensin improved final BW and ADG compared with a low dose of monensin (200 mg/d) or control in steers and heifers.

The mean value of dry matter intake (DMI) of growing kids supplemented with different level of monensin is presented in table 3 and Fig. 3. The average DMI (g/day) was 629.6 ± 7.5, 626.8 ± 7.2 and 624.6 ± 6.9 in control, treatment 1 and treatment 2 respectively at the end of growth trial. The DMI was apparently less ($P > 0.05$) in treatment group (1 & 2) as compare to control. This apparent decrease in DMI after supplementation of monensin indicates increased feed conversion efficiency and nutrient utilization due to increased propionate production, decreased ammonia production and decreased degradation of protein. The results showing apparent decrease in DMI, agree with the results of Singh *et al.* (2005), Patir *et al.* (2002), Barman *et al.* (2000), Heyderi *et al.* (2008) and Abedinzadeh and Orang (2015). In lactating ruminants there were no significant differences in DMI of control and ionophores treated cows. In another studies, the administration of

Table 3: Fortnight dry matter intake (g/d) of growing kids during 60 days supplementation

Fortnights	C	T1	T2
0	569.5 ± 5.4	572.8 ± 6.8	571.3 ± 4.8
1	609.6 ± 4.6	605.0 ± 7.9	606.0 ± 5.6
2	628.9 ± 6.2	623.5 ± 5.7	624.9 ± 6.0
3	660.5 ± 7.0	657.4 ± 5.4	649.5 ± 8.7
4	679.5 ± 3.8	675.3 ± 6.4	671.5 ± 6.2
Overall mean	**629.6 ± 7.5**	**626.8 ± 7.2**	**624.6 ± 6.9**

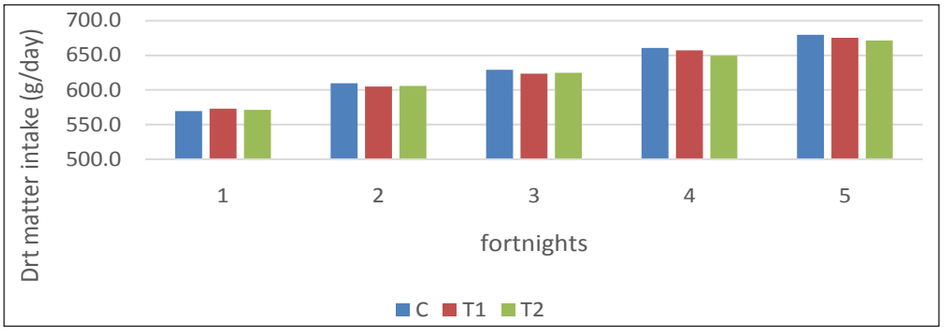

Fig. 3: Fortnight dry matter intake (g/d) of growing kids during 60 days supplementation

ionophores to lactating cows decreased DMI from 0.4 to 1.7 kg per day (Ipharraguerre and Clark, 2003) and averaged 1.2 kg per day (7%). Even though in growing cattle (Goodrich *et al.,* 1984), the largest decrease in DMI was associated with doses of ionophores that largely exceeded the effective concentration of ionophores in dairy diets (240 mg/h/d). Monensin also reduced ruminal movements, thus providing a physiological rationale for filling the digestive system and there will be a reduction in food intake (Rodrigues *et al.,* 2001).

CONCLUSION

Supplementation of monensin in ration of growing kids at the rate of 20 mg/h/day improved the growth rate of the kids. Monensin significantly increases the average daily gain and improves the body weight without affecting the dry matter intake.

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