The Pharma Innovation Journal 2022; SP-11(3): 595-597

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(3): 595-597

www.thepharmajournal.com
Received: 04-01-2022
Accepted: 06-02-2022

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Effect of monensin sodium on reproductive development of alpine beetal male crossbred kids

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Abstract
The present study was conducted to study the effect of monensin supplementation on reproductive development of male kids. 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. Scrotal biometry were done in fortnight intervals for scrotal circumference, testis length and testis width. it was found that Scrotal circumference was higher (P<0.05) in T2 (15.03±0.44) as compare to control (14.02±0.35) and T1 (14.36±0.32) whereas testis length and width did not differ (P>0.05).

Keywords: Monensin, scrotal biometry**,** scrotal circumference, testis length, testis width

Introduction
Testicular biometry was taken at the monthly interval with the help of measuring tape and Varnier callipers. Scrotal circumference was measured with a flexible tape at the point of greatest circumference of the scrotum with the animal being restrained in a lateral recumbent position (Ahmad *et al.*, 2010) [1]. It was measured in centimetres (cm) after pushing the testes firmly into the scrotum. Testis length was measured with Vernier callipers by manipulating the testes to obtain the distance between the distal and proximal poles of the testes avoiding as much as possible, the caput and cauda aspects of the epididymis (Schinkel *et al.*, 1983) [9]. Testes width was measured with vernier calipers at the same point the scrotal circumference was measured (Ugwu and Nwakalor, 2006) [10]. Two-way analysis of variance was used for the comparison among means. The significance of differences was determined by the Tukey's multiple range test. Significance was determined at P<0.05.

Results and Discussion
Scrotal circumference
The mean ± SE values of scrotal circumference (cm) in different groups during 60 days supplementation are presented in Table 1 and Fig 1. The initial scrotal circumference was 11.4±0.09 for control while 11.87±0.20 and 12.1±0.34 for treatment 1 and treatment 2. The mean values for final scrotal circumference was 16.43±0.33, 16.58±0.33 and 18.52±0.42 cm in control, treatment 1 and treatment 2 respectively at the end of the supplementation. The final scrotal circumference was significantly higher (P<0.05) in treatment 1 and 2 as compared to control. But there was no significant difference (P>0.05) found between treatment 1 and 2. The overall mean of scrotal circumference was significantly higher (P<0.05) in treatment 2 groups (15.3±0.44) as compared to control (14.02±0.35). At the end of the supplementation significant effect of monensin supplementation was seen on scrotal circumference. This increase was probably a result of more spermatogenic activity by the germinal epithelium of the seminiferous tubules or deposition of fat in scrotum.
Neuendroff *et al.* 1985 [7] reported that Bulls fed lasalocid also exhibited a greater growth in scrotal circumference (P<.05) and in testicular volume (P<.07) through 175 d of the trial. Scrotal circumference and TV were not different between treatments at puberty. The Feeding of bull with high energy diet results average daily change in scrotal circumference as reported by Chase *et al.* (1993). Conversely Downs *et al.*, (2000) [2] reported that laidlomycin propionate does not have any effect on scrotal circumference. Busby *et al.*, (1971) also found that monensin had no effect on scrotal circumference in yearling bulls and also found the positive correlation between scrotal circumference and body weight.

The recorded value of scrotal circumference was in accordance to the value reported by many researchers, Gupta *et al*., (2018) [4] in alpine beetal crossbred bucks and Naskar *et al*. (1995) [6] in crossbred bucks. The scrotal circumference is positively correlated with body weight and testicular dimensions which was affected by plane of nutrition.

Testis width and testis length

The mean ± SE values of testis length (cm) in different groups during 60 days supplementation are presented in Table 2 and Fig 2. The initial testis length was 3.83±0.11for control while 3.80±0.18 and 3.72±0.19 for treatment 1 and treatment 2. The mean values for final testis length was 5.30±0.05, 5.22±0.11 and 5.63±0.16 cm in control, treatment 1 and treatment 2 respectively at the end of the supplementation. The overall mean of testis length was 4.56±0.10, 4.51±0.11 and 4.75±0.15 for control treatment 1 and treatment 2 respectively. There was no significant difference (P>0.05) between control and treatment groups. At the end of the supplementation, a significant effect of monensin supplementation was observed on testis length.

Table 1: Scrotum circumference (cm) of bucks during monensin supplementation

Fortnights	C	T1	T2
0	11.4±0.19	11.87±0.20	12.1±0.34
1	12.7±0.16	13.37±0.17	13.68±0.27
2	14.05±0.31^{a}	14.43±0.30^{ab}	15.22±0.25^{b}
3	15.5±0.32^{a}	15.57±0.30^{ac}	17.00±0.34^{b}
4	16.43±0.33^{a}	16.58±0.33^{bc}	18.52±0.42^{b}
Overall mean	14.02±0.35^{a}	14.36±0.32^{ab}	15.3±0.44^{b}

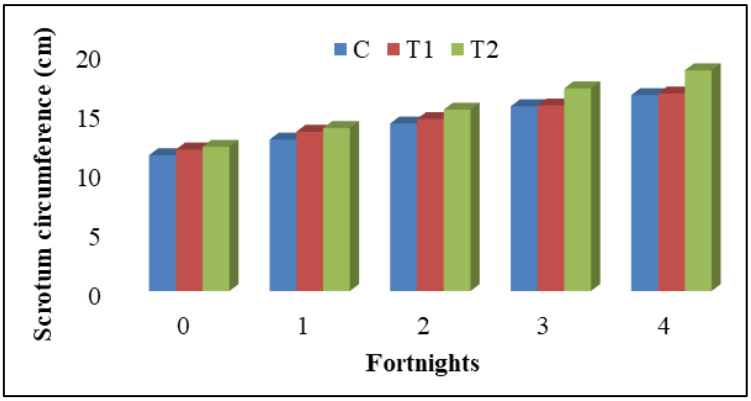

Fig 1: Scrotum circumference (cm) of bucks during monensin supplementation

Table 2: Testis length (cm) of bucks during monensin supplementation

Fortnights	C	T1	T2
0	3.83±0.11	3.80±0.18	3.72±0.19
1	4.20±0.09	4.17±0.14	4.33±0.22
2	4.52±0.05	4.45±0.15	4.75±0.22
3	4.95±0.05	4.93±0.13	5.33±0.20
4	5.30±0.05	5.22±0.11	5.63±0.16
Overall mean	4.56±0.10	4.51±0.11	4.75±0.15

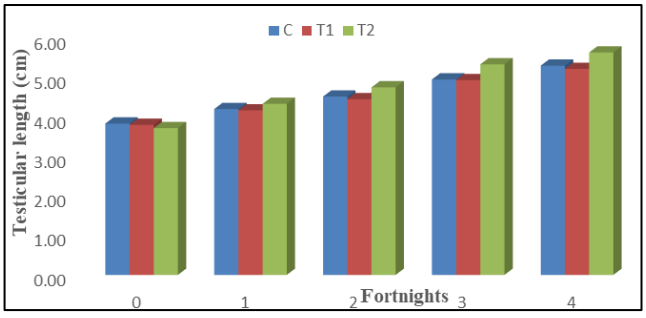

Fig 2: Testis length (cm) of bucks during monensin supplementation

Table 3: Testis Width (cm) of bucks during monensin supplementation

Fortnights	C	T1	T2
0	2.36±0.05	2.14±0.08	2.11±0.08
1	2.45±0.05	2.24±0.07	2.37±0.08
2	2.72±0.04	2.58±0.07	2.74±0.13
3	2.93±0.04	2.89±0.10	3.10±0.11
4	3.13±0.04	3.14±0.10	3.46±0.13
Overall mean	2.721±0.05	2.599±0.07	2.756±0.10

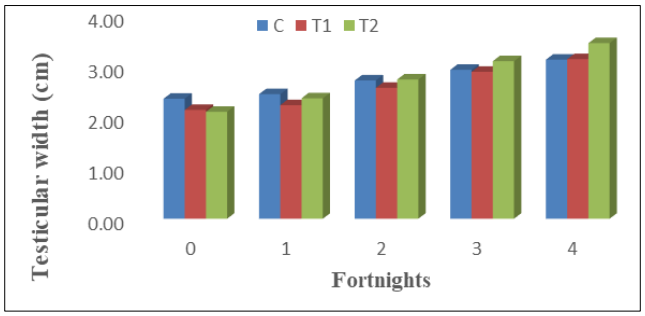

Fig 3: Testis Width (cm) of bucks during monensin supplementation

The mean ± SE values of testis width (cm) in different groups during 60 days supplementation are presented in Table 3 and Fig.3. The initial testis width was 2.36±0.05 for control while 2.14±0.08 and 2.11±0.08 for treatment 1 and treatment 2. The mean values for final testis width was 3.13±0.04, 3.14±0.10 and 3.46±0.13 cm in control, treatment 1 and treatment 2 respectively at the end of the supplementation. The overall mean of testis width was 2.72±0.05, 2.59±0.07 and 2.756±0.10 for control treatment 1 and treatment 2 respectively. There was no significant difference (P>0.05) between control and treatment groups. At the end of the supplementation significant effect of monensin supplementation was seen on width. Supplementation of monensin does not significantly alter the testicular biometry. The final value of testis length and width was similar to the finding of Gupta *et al*., (2018) [4] and Golhar *et al*., (2016) [3]. Testis length, width and thickness of right and left testis differ significantly with age. Moreover high positive correlation (0.80-0.90) between the body weight and testis measurements

suggest that there was a linear increase in testis mass with advancement of age, increase in body weight gain and body condition score (Rajauna *et al.*, 2012) [8]. Testicular morphometric parameters like scrotal circumference, testis length and width are positively correlated with body morphometric traits (Benoit *et al.*, 2016).

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