EFFECT OF OPTIGEN® FEED INTAKE AND PERFORMANCE OF GROWING CALVES

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ABSTRACT: Optigen is a superior non-protein nitrogen source for ruminant nutrition and ensures sustained release of non-protein nitrogen.This research was conducted to test the influence of various levels of Optigen® in diet on dry matter (DM) intake and average daily weight gain in growing buffalo calves. Twenty four (24) male calves of average body weight (mean ± SD) 168 Kg ± 38 were divided into four groups of 6 animals. Four experimental diets were designed to include 0 (T1), 25 (T2), 50 (T3) and 75 g/Kg of diet DM (T4) of Optigen®. The diets were fed according to a completely randomized design for 100 days. Different groups of calves showed a curvilinear ($P<0.05$) response in DM intake and a quadratic ($Q<0.05$) response in final body weights with increasing level of Optigen® in the diet. Average daily gain of the calves was not altered (L; $P>0.05$ and Q; $P>0.05$). However, the calves fed T4 diets showed numerically the highest weight gains 0.67 kg. Supplementation of slow releasing ammonia products increased the N availability. It improved the synchronization between carbohydrates degradation and daily gains on reduced feed intake.

Keywords: Average daily gain, dry matter intake, Optigen®, non-protein nitrogen.

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INTRODUCTION

Animal feed is comprised of crop residues; mainly stovers and wheat straw. However, these crop residues are not only deficient in certain nutrients (proteins, vitamins and minerals) but also have poor digestibility and palatability by animals. Feeding of buffalo calves is mainly comprised on agricultural wastes i.e. crop residues; these are not only poor in palatability but also have poor feeding value. True and non-protein nitrogen (NPN) contents of these feedstuffs are very low resulting in declined crude protein availability at rumen level.The animals consuming these feedstuffs show a characteristic slow average daily weight gain (ADG), delayed puberty and poor feed efficiency (Shahzad *et al*., 2016).

In the tropical areas low quality forages and high priced protein sources such as soybean and other oil cakes are the main constraints in the livestock feeding. This protein deficiency can be fulfilled by addition of nitrogen sources other than protein. One of the alternative nitrogen sources is urea. It is used in protein synthesis by ruminal microbial flora after its hydrolysis into ammonia.

Urea is an economical nitrogen source for improving nitrogen availability to the ruminant animals when supplied through the diets. But the direct supply of urea in the diet may leads to ammonia accumulation in rumen due to inefficiency of ruminal flora to synthesis protein from rapidly hydrolysing urea. This is mainly caused by asynchronous fermentation of urea and dietary carbohydrates (Taylor-Edwards *et al*., 2009). Further, higher concentrations of NH_3 beyond a certain level may cause toxicity and lead to animal death in no time. This might be due to faster release of ammonia exceeding the capacity of ruminal microbes to synthesize the protein (Galo *et al*., 2003). To avoid rapidly producing ammonia and optimizing the nitrogen availability, various methods for the use of NPN products as in form of multi nutritional blocks and in the form of urea compound as optigen are in practice. Optigen is a concentrated NPN source; producers are adding optigen by replacing other protein sources, so other ingredients can be added, such as fodder or by products, which help in reducing the ration cost in addition to the improvement of rumen health and animal welfare. Balanced ration containing optigen not only enhances the number of fibrolytic bacteria which utilizes NPN for growth but also optimizes protein production by microorganisms and produce a better nitrogen managing environment (Alltech Inc. 2004). Some slow-releasing NPN products have efficiently increased ammonia production in rumen (Huntington *et al*., 2006) When soyabean was replaced with slow-releasing NPN products in dairy cows, it improved the efficacy of ration (Golombeski *et al*., 2006). In consequences, feed efficiency improves in ruminants by favouring the obtainability of nitrogen.

Thus, slow release urea has an advantage on conservative urea (Tedeschi *et al*., 2002).

The main objective of this study is to evaluate the effects of different level of Optigen® in diet of growing male buffalo calves on dry matter intake and average daily gain

MATERIALS AND METHODS

Animal, diets and experimental design: Twenty-four growing buffalo male calves of average body weight (mean ± SD) 168 Kg ±38 were divided into 4 groups of 6 animals. At the start of experiment, weight of animals was measured and then fortnightly. A total mixed ration with a nutrient composition of 14.5% crude protein (CP), 14.7% crude fibre (CF) and 2.4 Mcalmetabolizable energy per kg diet DM was formulated. Four experimental diets were designed to include 0 (T1), 25 (T2), 50 (T3) and 75 g/Kg of diet DM (T4) of Optigen®. Two kg of Sadabahar fodder was also provided to meet the carotene contents (Table-1). Animals were tied up and housed on a concrete floor in separate pens. Fresh and clean water was available to each individual round the clock. TMR containing concentrates, Optigen® and fodder were mixed daily for individual animal on the basis of their feeding schedule. The diets were fed for 100 days. Feed offered once daily *ad lib* in the morning on individual basis and refusal were recorded next day morning before feeding.

Samples and chemical analysis: Feeds offered, diets and orts were sampled daily and ccomposited for analysis at the termination of study. The feeds, diets and orts were analysed for proximate composition (AOAC, 1990). The feed intake was recorded daily. Average daily weight gain was calculated using the initial and final weights every two weeks.

Statistical analysis: Data collected from the study were evaluated by using Completely Randomized Design through statistical software MINITAB® (version 17.1.1.0).

RESULTS

Performance of buffalo calves over the period of 90 days trial is presented in table – 2. No significant differences was observed across all the treatment but numerically group B had higher DM intake, (6.75 Kg) fed on diet containing TMR supplemented with 25 g optigen followed by group C, A and D while group D had lowest daily DM intake. This may be due to more CP contents attributed from nitrogenous source of optigen. The Dry Matter (DM) intake was altered both linearly ($P<0.001$) and quadratically ($P<0.001$), showing a least DM intake for T4 diets. Similarly, there was found an increasing trend in daily weight gain in buffalo calves fed on diet supplemented with different levels of optigen i.e. 0, 25, 50,and 75 gm respectively. A maximum weight gain was achieved in the group D which diet was supplemented with 75 g optigen followed by group C, B, and A, but the difference was non significant.The calves fed different levels of Optigen® showed quadratic ($P<0.05$) differences in final body weights but did not show any linear or quadratic ($P>0.05$) differences in Average Daily Gain (ADG).

Table-1: Ingredients and chemical composition of the concentrate after incorporation of different levels of Optigen®.

Ingredients	Experimental total mixed rations			
	T1	T2	T3	T4
Maize Broken	11.0	10.99	10.99	10.99
Wheat bran	15.0	14.99	14.99	14.98
Cotton seed cake	11.0	10.99	10.99	10.99
Maize gluten Meal 30%	13.0	12.99	12.99	12.99
Canola meal	8.00	7.99	7.99	7.99
Cane Molasses	12.0	11.99	11.99	11.99
Wheat straw	28.0	27.99	27.98	27.97
Di Calcium Phosphate	2.00	1.99	1.99	1.99
Optigen	0.0	0.025	0.05	0.075
Chemical composition				
Crude protein	14.3	14.3	14.4	14.5
Ether extract	2.9	2.9	2.9	3.0
Crude fibre	14.7	14.7	14.7	14.7
Ash	8.8	8.8	8.8	8.8
Total digestible nutrients (%)	66.6	66.5	66.5	66.5
Metabolizable Energy (Mcal/kg diet DM)	2.4	2.4	2.4	2.4
Ca	1.1	1.0	1.0	1.0
P	0.5	0.5	0.5	0.5

The values are presented as %age of as fed basis for ingredients proportions and %age of dry matter for diets chemical composition

Table-2: Effect of increasing level of Optigen in the diet on dry matter intake and average daily weight gain of the Nili Ravi buffalo calves.

Items	Experimental total mixed rations[1]				SEM	P value		
	T1	T2	T3	T4		Diet	L	Q
Dry matter intake	6.10	6.03	6.12	5.80	0.052	<0.001	0.001	0.015
Body Weight	200.1	189.1	189.7	206.0	6.73	0.214	0.546	0.043
Average daily weight gain	0.53	0.57	0.49	0.67	0.055	0.13	0.179	0.206

All values are Mean ± SEM. Data represents the average of 6 animals in each treatment. L=linear effect of various levels of Optigen on dry matter, body weight and average daily weight gain. Q: quadratic effect of various levels of Optigen on dry matter, body weight and average daily weight gain. The level of significance was set at $p<0.05$.
T1=0 g/Kg of diet, T2=25 g/Kg of diet, T3=50 g/Kg of diet, T4= 75 g/Kg of diet DM of Optigen®

DISCUSSION

A controlled release urea product Optigen® has nitrogen disappearance rate similar to soybean meal. It provides N structure to the microbial protein synthesis resulting in enhanced digestion of fibre and more microbial mass for the synthesis of milk production and growth (Tikofsky and Harrison, 2006). Addition of Optigen® numerically increased the CP level and these levels were slightly higher than anticipated from pre-trial formulation, however, these differences could not produce any significant differences in the CP levels among the treatments. The other nutrients like CF and ME were balanced among all treatments. This might be due to less energy available at rumen level to efficiently utilize excess NH_3 on such diets (Bach *et al*., 2005). It has been observed that an excess NH3 at rumen level, in addition to other abnormal functioning, causes a reduction in DM intake of the ruminants. Various authors found no differences in DM intake and DM intake as a percent of body weight of cows reared on the diet containing different levels of Optigen ® (Bourg, 2011) and another similar product (RumaPro®). These findings are not agreement with Bourg *et al*. (2012) and Koster *et al*. (2002) who reported that feed intake was unaffected when urea and optigen were added in feed. These findings are in line with previous studies who explained that increase in feed intake was due to urea treated feed (Trishna *et al*., 2012; Burque *et al*., 2008; Nisa *et al*., 2008; Parsad *et al* 1998, Khan *et al*., 2015). In another experiment, (Huff *et al*.,2000) daily DM intake observed in steers fed Ruma Pro® was three percent less as compared to steers fed with urea in a steam-flaked corn based diet. While (Taylor *et al*., 2009) observed a slight decrease in DM intake for those steers fed Optigen® II compared to urea and corn silage-based diets and the difference was non-significant (P=0.53). (Pinos*et al*.,2010) fed a diet containing 1.1% Optigen® and found no difference in DM intake when compared with the control.

Although the average daily gain differences were non-significant, the calves numerically gained the highest daily weights on T4 diets with a reduced DM intake. Although, non-significant, the calves on T4 diets showed a higher feed efficiency compared on other treatments. The findings of the current study have supported the results of López-Soto *et al*. (2015) who fed steers diets containing a 1: 1 mixture of urea and slow release urea.Similar findings were also recorded by Huff *et al*.(2000) who found no differences in treatments when increasing levels of RumaPro® were included in the diets. Co-occurrence of carbohydrate hydrolysis and NPN release in rumen improved calves ADG, resulting in efficient utilization of available N. These findings are co-similar to previous studies (Tedeschi *et al*., 2002; Trishna *et al*., 2012; Sarwar *et al*., 2006; Khan *et al*., 2015) which explained that increase in average daily weight gain was due to urea treated feed. However, Muro *et al*. (2011) disagreed with the results of present study. They reported that slow release NPN (Optigen) has good effect on average daily gain in comparison to urea in Holstein heifers.

Conclusions: It was concluded that the supplementation of slow releasing ammonia product @ 75 g/Kg of diet DM increased the N availability at rumen level. This would improve matching between the nutrient production and uptake by the microbes, resulting in improved daily gains on reduced feed intake.

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