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Feed Conversion Efficiency of Murrah Buffalo Heifers Due to Supplementation of Commercial Bypass Amino Acids and Fish Meal

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ABSTRACT

Eighteen Murrah buffalo heifers were equally divided into three groups of equal number on the basis of age and body weight i.e. T_1 (control group, fed with conventional ration), T_2 (fish meal supplementation by replacing conventional concentrate) and T_3 (with 10 g commercial bypass Lysine per animal per day + 2 g commercial bypass Methionine per animal per day). The results of the study revealed that after first fifteen days average daily weight gain were 622.22, 677.78 and 666.67 g/d in T_1, T_2 and T_3, respectively. The data did not show any significant increase in average daily weight gain among the different treatments up to 45 days but after 60 days there was significantly higher ($P<0.05$) gain in T_2 treatment which was similar to T_3 as compared to control T_1. The average daily gain then followed similar trend till the end of experiment. Average daily weight gains at the end of experiment, for the corresponding groups were 677.78, 844.44 and 777.78 g/d, respectively. Statistical analysis of data revealed that there was no significant difference in the dry matter intake among the different treatments. Overall DMI after 90 days was found to be 6.99, 7.04 and 7.02 kg/day in T_1, T_2 and T_3 respectively. After first fifteen days feed conversion efficiency (FCE) values were 10.21, 11.11 and 10.90 in T_1, T_2 and T_3, respectively. The results did not show any significant difference in FCE values among the different treatments up to 45 days but after 60 days FCE values was significantly differ ($P<0.05$) in T_2 and T_3 treatments as compared to T_1. The FCE values then follow similar trend till the end of experiment i.e. up to 90 days. The FCE values at the end of experiment, for control T_1, T_2 and T_3 treatments was 8.58, 10.61 and 9.81, respectively. The present study concluded that feeding of commercial bypass amino acids and fish meal have beneficial effect on feed conversion efficiency of Murrah buffalo heifers.

Key words: *Commercial bypass amino acids, Fish meal, FCE, Dry matter intake*

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INTRODUCTION

Ruminal microorganism alters the quality and quantity of dietary protein before it reaches in small intestine. The protein absorbed in small intestine is named as metabolizable protein which has little resemblance to quantity and quality of protein provided by diet. Metabolizable protein is efficiently utilized when there is balance of amino acids which are required for maintenance of animals and milk production. In growing ruminants, metabolizable protein used for tissue synthesis however, microbial protein alone is unable to meet metabolizable protein requirement of rapidly growing calves[1,16], therefore, requires the highest intake of crude protein in diet. Two essential amino acids Lysine (Lys) and Methionine (Met) are limiting amino acids[17]. Lys and Met are found in low concentration in feed protein and it cannot fulfill the animal requirement, secondly microbial protein is also insufficient to meet the animal requirements. So, protected Lys and Met are added in feed to fulfill the deficiency of these amino acids. Ruminally-protected Methionine (RPM) bypasses the ruminal degradation, because of the coating process, and enters the small intestine where it can be directly absorbed. Thus, RPM could improve growth and retain N in ruminants. Supplementation of RPM increases the proportion of dietary amino acids that is absorbed from the intestine[4]. Deficiency in Methionine often limits ruminants' growth[20].

Protein supplement that are naturally high in rumen un-degradable protein, used mainly in ruminant diets is fish meal. Fish meal contains high levels of available Lysine and Methionine which are deficient in plant protein supplements[13]. Fishmeal protein is high in biological value, provides twice the Lysine and four times the Methionine to the small intestine[6].

Keeping in view the above facts, the present investigation was conducted to assess the effect of rumen protected methionine, lysine and fish meal on feed conversion efficiency in Murrah buffalo heifers.

MATERIAL AND METHODS

The experiment was conducted for the period of three months to study the effect of supplementation of rumen protected methionine, lysine and fish meal on the feed conversion efficiency of Murrah buffalo heifers. Eighteen healthy Murrah buffalo heifers of nearly same age and body weight were randomly distributed into three treatment groups each having six buffalo heifers following Completely Randomized Design (CRD).

All the animals were dewormed and disinfested for ectoparasites before start of the experiment adopting standard protocol. Control group T_1 was fed with conventional ration, T_2 with fish meal supplementation by replacing conventional concentrate and T_3 with 10 g commercial bypass Lysine and 2 g commercial bypass Methionine per animal per day along with conventional ration. All the animals were maintained under isomanagerial conditions and similar husbandry practices except the different feeding treatments. During the experimental period, the animals were given green fodder and concentrates mixture as to meet their protein and energy need for growth as per ICAR [19], feeding standard. Animals were given *ad lib* fresh water throughout the experimental period.

OBSERVATION RECORDED

1. Body weight gain

Experimental animals were weighted at the beginning of the experiment and thereafter at fortnightly intervals using standard platform weighing balance (Avery, capacity 1000 kg). The body weights were recorded in the morning before providing any water or feed to the animals. These body weights were used for determining the growth rate and also for the purpose of the computing the ration for the animals.

2. Feed intake

The animals were given weighted quantity of feed and fodder daily as per computed ration. Daily feed intake during the experimental period was determined on the basis of feeds and fodder offered and left over and data were compiled on fornightly basis.

3. Feed conversion efficiency (FCE)

On the basis of feed and fodder consumption, dry matter (DM) consumed by the animals were estimated. The feed gain ratio is a measure of efficiency of utilization of feed. For the calculation of FCE, body weight gain (g) per kg of DM intake was calculated.

Statistical analysis

The data were analyzed statistically using standard methods[23]. The data were expressed as Mean ± SE and were analyzed by one-way ANOVA using general linear model of SPSS version 20 and Duncan's multiple range tests was applied to test the significance. Significance was declared when P value is less than 0.05[10].

Chemical composition of the concentrate mixtures (AOAC, 2005)

Chemical analysis of feed ingredients and composition of the concentrate mixtures with chemical analysis has been presented in table 1 and 2.

Table 1: Chemical analysis of feed ingredients (on DM basis)

Ingredients	DM	CP	CF	EE	Ash	OM	NFE
Wheat straw	94.27	1.78	35.31	1.04	12.49	87.51	49.38
Green sorghum	24.92	7.45	26.82	3.4	10.7	90.3	51.63
Wheat	91.61	10.89	2.77	3.15	2.23	97.77	80.96
Barley	93.32	9.55	7.88	1.74	4.96	95.04	75.87
Groundnut cake (GNC)	93.47	40.23	9.43	9.05	8.9	91.1	32.39
Mustard cake	93.46	35.62	8.33	6.25	6.83	93.17	42.97
Fish meal	89.97	45.8	1.81	11.4	27.07	72.93	13.92
Wheat bran	92.86	13.86	11.83	1.01	4.12	95.88	69.18

Table 2: Ingredients of concentrate mixture (kg) and its chemical composition (on DM basis)

Sr. no.	Ingredient	T_1 (kg)	T_2 (kg)	T_3 (kg)
1.	Barley	25	25	25
2.	Wheat	10	12	10
3.	Ground Nut Cake	20	13	20
4.	Mustard Cake	10	10	10
5.	Wheat Bran	32	33.5	32
6.	Fish Meal	0	3.5	0
7.	Bypass Methionine	0	0	*
8.	Bypass Lysine	0	0	**
9.	Mineral Mixture	2	2	2
10.	Salt	1	1	1
	Total	100	100	100
* supplemented @ 2 g/ animal/day **supplemented @ 10 g/ animal/day				
Chemical composition (% DM basis)				
1.	Dry matter (DM)	90.46	90.17	90.67
2.	Crude protein (CP)	24.51	24.88	24.66
3.	Crude fiber (CF)	6.31	6.49	6.12
4.	Ether extract (EE)	5.07	5.02	5.59
5.	Ash	7.41	7.77	7.91
6.	Organic matter (OM)	92.59	92.23	92.09
7.	NFE	55.70	55.84	55.72

RESULTS AND DISCUSSION

Average daily gain (ADG)

Average daily weight gain (g/day) by growing Murrah buffalo heifers under different treatments has been presented in Table 3 and with Figure 1. After first fifteen days average daily weight gain were 622.22, 677.78 and 666.67 g/d in T_1, T_2 and T_3, respectively. The data did not show any significant increase in average daily weight gain among the different treatments up to 45 days but after 60 days there was significantly higher ($P<0.05$) gain in T_2 treatment which was similar to T_3 as compared to control T_1. The average daily gain then followed similar trend till the end of experiment. Average daily weight gains at the end of experiment, for the corresponding groups were 677.78, 844.44 and 777.78 g/d, respectively.

Overall, average daily body weight gain under three treatments during the whole experimental period was 668.51, 783.33 and 764.81 g/d, in T_1, T_2 and T_3 groups, respectively. The overall, average weight gain was significantly ($P<0.05$) higher in T_2 and T_3 treatments as compared to those of T_1.

Table 3: Average daily body weight gain (g) of experimental Murrah buffalo heifers at fortnightly intervals

Fortnight	Treatments		
	T_1	**T_2**	**T_3**
1	622.22 ± 88.89	677.78 ± 150.47	666.67 ± 62.06
2	644.44 ± 99.88	733.33 ± 66.67	788.89 ± 58.16
3	744.44 ± 52.82	800.00 ± 51.64	788.89 ± 31.82
4	655.56^{b} ± 52.82	811.11^{a} ± 40.06	777.78^{ab} ± 37.18
5	666.67^{b} ± 45.54	833.33^{a} ± 50.52	788.89^{ab} ± 43.60
6	677.78^{b} ± 40.06	844.44^{a} ± 32.96	777.78^{ab} ± 32.96
Over all	668.51^{b} ± 26.22	783.33^{a} ± 30.55	764.81^{a} ± 18.87

Values are means ±standard errors

The means in a row with different superscripts differ significantly between the treatments ($P<0.05$)

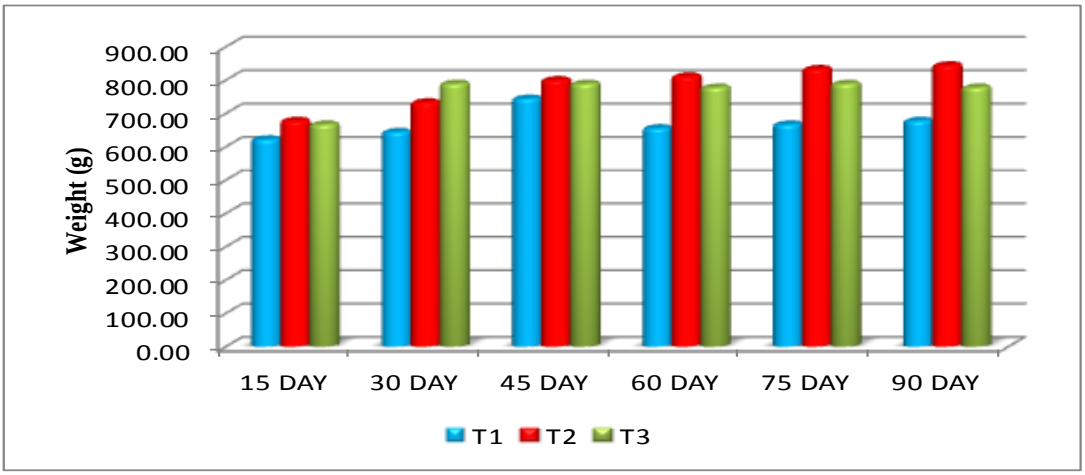

Fig. 1: Average daily body weight gain (g)

Findings of Zerbini and Polan[27], and Davenport *et al.*[9], reveal similar results that feeding fish meal as a source of protected amino acids significantly increased average daily weight gain in calves. Similarly Rocha *et al.*[21], reported that group of Brahman bulls fed with fish meal had significantly higher average daily gain as compared to control group. Alam *et al.*[3]; Ortigues *et al.*[18], and Calzadilla *et al.*[7],observed that daily weight gain of heifers was significantly higher when basal diet was supplemented with fish meal. Gajera *et al.*[11], in

the group of Jaffrabadi buffalo heifers and Sai *et al*.[22], in the group of crossbred calves, reported higher daily weight gain in treatment group supplemented with bypass Methionine and Lysine in the ration over that of control group. Arewad *et al*.[5], and Vahora *et al*.[25], also reported the similar pattern of significant (P<0.05) improvement in average daily weight gain by supplementing bypass nutrient in treated group over control.

Dry matter intake (kg/day)

Mean daily dry matter intakes (kg/d) during the experimental period are given in Table 4 and with figure 2. Overall DMI after 90 days was found to be 6.99, 7.04 and 7.02 kg/day in T_1, T_2 and T_3 respectively. Statistical analysis of data revealed that there was no significant difference in the dry matter intake among the different treatments.

Table 4: Average dry matter intake (kg/day) of experimental Murrah heifers at fortnightly intervals

Fortnight	Treatments		
	T_1	T_2	T_3
1	6.09 ± 0.02	6.12 ± 0.04	6.13 ± 0.06
2	6.34 ± 0.04	6.36 ± 0.04	6.35 ± 0.04
3	6.82 ± 0.06	6.84 ± 0.06	6.83 ± 0.06
4	7.13 ± 0.10	7.19 ± 0.06	7.17 ± 0.09
5	7.67 ± 0.05	7.79 ± 0.02	7.76 ± 0.07
6	7.89 ± 0.05	7.95 ± 0.06	7.92 ± 0.03
Over all	6.99 ± 0.11	7.04 ± 0.11	7.02 ± 0.11

Values are means ±standard errors

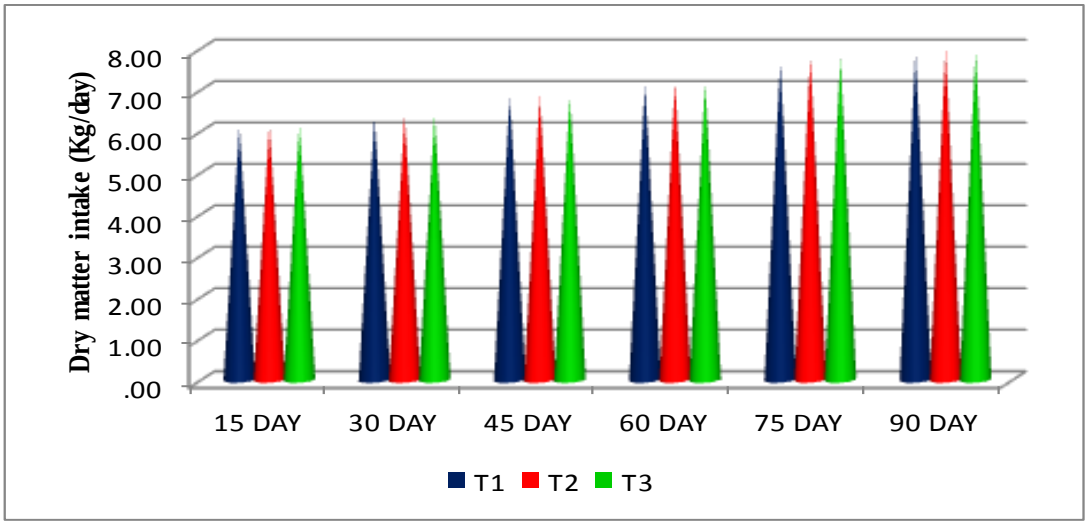

Fig. 2: Dry matter intake (kg/day)

Analogous to the findings of the present study, Socha *et al*.[24]; Lara *et al*. [14], Colin-Schoellen *et al*.[8], and Lee *et al*.[15], observed that there was no effect of Lysine and Methionine supplementation on DM intake kg/d in dairy cows. Ahmed *et al*.[2], also reported no significant difference for DMI between control and treatment groups fed Lysine and Methionine supplemented ration in Nili-Ravi buffaloes. Also, Gajera *et al*.[11], witnessed the similar results in Jaffrabadi buffalo heifers. Similarly, Sai *et al*.[22], reported no differences in average DM intake by supplementation of bypass Methionine and Lysine in the ration of crossbred calves. Arewad *et al*.[5], and Yadav[26], observed no significant difference for DMI between control and treatment groups fed bypass protein based ration to calves. Findings

of Hussein and Jordan[12], in growing finishing lambs and Davenport *et al.*[9], in crossbred beef calves reveal similar results i.e. feeding fish meal as a source of protected amino acids did not show any improvement in DMI. The present results are in agreement with most of the findings of earlier researchers. On the basis of present findings it was revalidated that there was no effect of feeding fish meal and protected amino acids on DMI/d in growing Murrah buffalo heifers.

Feed conversion efficiency (FCE):

For the calculation of FCE, body weight gain (g) per kg of DM intake was calculated. The average data for body weight gain (g) per kg of DM intake at fortnightly interval have been presented in Table 5 and with figure 3.

After first fifteen days FCE values was 10.21, 11.11 and 10.90 in T_1, T_2 and T_3, respectively. The results did not show any significant difference in FCE values among the different treatments up to 45 days but after 60 days FCE values was significantly differ ($P<0.05$) in T_2 and T_3 treatments as compared to T_1. The FCE values then follow similar trend till the end of experiment i.e. up to 90 days. The FCE values at the end of experiment, for control T_1, T_2 and T_3 treatments was 8.58, 10.61 and 9.81, respectively.

Table 5: Feed conversion efficiency (BW gain g/kg DMI) of experimental Murrah heifers at fortnightly interval

Fortnight	Treatments		
	T_1	T_2	T_3
1	10.21 ± 1.46	11.11 ± 2.50	10.90 ± 1.07
2	10.20 ± 1.63	11.55 ± 1.07	12.43 ± 0.94
3	10.91 ± 0.76	11.71 ± 0.75	11.57 ± 0.52
4	9.18^{b} ± 0.66	11.27^{a} ± 0.53	10.83^{a} ± 0.40
5	8.68^{b} ± 0.57	10.79^{a} ± 0.60	10.27^{a} ± 0.54
6	8.58^{b} ± 0.46	10.61^{a} ± 0.36	9.81^{a} ± 0.36

Values are means ±standard errors

The means in a row with different superscripts differ significantly between the treatments ($P<0.05$)

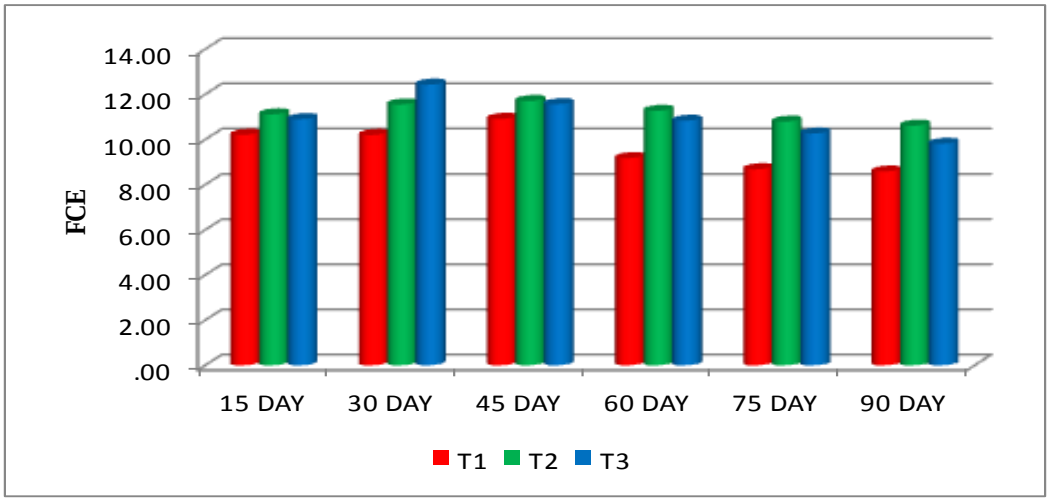

Fig. 3: Feed conversion efficiency

Similar effect on feed conversion efficiency (%) for growth (unit gain/unit DM consumed X 100) was reported by Zinn and Owens[28], in a growth trial on steers, that by incorporation of FM in the ration, efficiency of gain increased. Sai *et al.*[22], reported higher ($P<0.05$) feed efficiency in treatment group supplemented with bypass Methionine and

Lysine in the ration over that of control group in crossbred calves.

CONCLUSION

Present study suggested that feeding of fish meal and rumen protected Methionine and Lysine to Murrah buffalo heifers have significant effect on feed conversion efficiency.

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