Full Length Research Paper

EFFECT OF DIETARY ENZYME SUPPLEMENTATION ON NUTRIENT UTILIZATION AND GROWTH PERFORMANCE OF RABBIT

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ABSTRACT

The experiment was conducted using 24 growing rabbits with an average live weight of 432-440 g for a period of 56 days to study the effect of dietary multi-enzyme (NATUZYME plus®) on growth, feed intake, dressing percentage and digestibility of nutrients. The dietary treatments were A, B, C and D consisting of 0, 25, 50, 70 g NATUZYME plus®/100 kg concentrate mixture respectively. The daily live weight gain for rabbits fed diets A, B, C and D was 14.1, 14.26, 14.23 and 15.30 g respectively and the differences among the dietary groups were not significant (P>0.05) but it numerically increased by 1, 1 and 9% respectively as compared to control (A). Dry matter (DM) intake of animals for different treatments from green grass was insignificant (P>0.05). Total DM intake decreased for the increasing levels of enzyme. When considered only the concentrate intake the values showed 4.0, 6.3 and 2.5% decreased than the control. The feed conversion ratio of different dietary groups did not differ significantly (P>0.05). However, 7, 7 and 8% improvement was observed due to addition of 35, 50 and 70 g enzyme/100 kg diet offering group. The digestibility co-efficient (COD) of DM, CP (Crude protein) and EE (Ether extract) were similar (P>0.05). But the COD for CF (Crude fibre) and NFE (Nitrogen free extract) found better in group supplemented 50 g enzyme/100 kg diet than others. Although the data was statistically non significant, but numerically better performance was obtained due to addition of NATUZYME plus® in rabbit diet. So, further study is needed to recommend a specific supplemented dose of NATUZYME plus® in growing rabbit diet.

Key words: Dietary enzyme, enzyme supplementation, nutrient utilization, growth performance, rabbit

INTRODUCTION

A variety of feed ingredients are used in the formulation of rabbit ration. Feed millers and rabbit farmers are shifting their old formula to a new dimension to increase profitability through multi-enzyme technology. Multi-enzyme product containing optimized dose levels of amylase, xylanase and protease have been specifically selected to improve the normal digestibility of grain starch and vegetable protein in diets. Numerous studies on enzymes in broiler diets have demonstrated beneficial effects on the production performance of broiler. Supplementary microbial phytase improves bio-availabilities of dietary P (Ravindran *et al.,* 1995, Um *et al.,* 2000) and other minerals such as Ca, Mg, Cu, Zn, Fe and K, bound to phytate (Um and Palk, 1999). Exogenous microbial enzymes enhanced the digestion of non starch polysaccharide (NSP) leading to an improvement in animal performance (Choct *et al.,* 1994). Mc Nab (1999) indicated that enzyme supplementation increased metabolizable energy values of several plant protein sources by 4 to 14%. Most of the research works with enzyme supplementation have been done on the performance of broiler. Supplementation of rabbit diet with multi-enzyme may improved the performance of growing rabbit and the digestibility of nutrients. Therefore, the present research work was designed to investigate the effect of supplementation of multi-enzyme (NATUZYME plus®) on feed intake, nutrient digestibility, growth and carcass yield of growing rabbits fed green grass and concentrate based diet.

MATERIALS AND METHODS

The experiment was carried out at Animal Nutrition Field Laboratory, Bangladesh Agricultural University (BAU), Mymensingh. A total of 24 weaned crossbred New Zealand White (NZW) rabbits (aged about 4 to 6 weeks) were used for a period of 56 days. These rabbits were selected from the Rabbit Research Project of the Department of Animal Nutrition, BAU, Mymensingh. A total number of 24 (twenty four) growing rabbits were weighed initially and blocked into three groups according to live weight. The animals in each block were then assigned at random to four dietary treatments having six rabbits in each treatment. All the dietary treatments consisted of green grass (Dhal) and concentrate mixture supplemented with variable levels of multi-enzyme at levels of 0, 35, 50 and 70 g/100 kg concentrate mixture in diets A, B, C and D respectively. Green grass and concentrate mixture were offered *ad libitum* while clean fresh water was made available at all times. A commercial exogenous enzyme brand named "NATUZYME plus®" was collected from Area Office of Novartis Animal Health (Bangladesh) Limited, at Charpara, Mymensingh. This exogenous enzyme is manufactured by Bioproton, Australia and marketed by Novertis Animal Health, BD. The concentrate mixture for growing rabbit was formulated using broken maize, wheat, wheat bran, til oil cake (TOC), soybean meal (SBM), common salt (CS), Dicalcium phosphate, Vit-min premix and DL-Methionine containing 16.68% CP and 2600 Kcal ME/kg feed (NRC, 1977). The feed was offered twice daily, once in the morning at 8.00 a.m. and other in the afternoon at 4.00 p.m. The ingredients composition and nutritive value of concentrate mixture is shown in Table -1, while the composition of NATUZYME plus® is shown in Table -2.

Table -1 Ingredients and nutrient composition of concentrate mixture

Ingredient composition	(Kg/100 kg diet)
Broken maize	34.80
Wheat	25.00
Wheat bran	14.10
Til-oil cake	15.00
Soybean meal	10.00
Common salt	0.50
Dicalcium phosphate	0.20
Vit-min premix	0.25
DL methionine	0.15
Nutrient composition	**(g/100 g DM)**
Crude protein	20
Crude fibre	9
Ether extract	6.5
Nitrogen free extract	61
Ca	0.47
P	0.30
ME (Kcal/kg)*	2600

*ME value was calculated according to NRC, (1994)

Table -2 Composition of NATUZYME plus® and its functions

Name of enzymes	Amount/kg	Function
Cellulase	1,00,00,000 U	It breaks down feed fibre into glucose
Zylanase	60,00,000 U	It converts feed xylan into xylose by hydrolysis
β-glucanase	7,00,000 U	It converts carbohydrate (β-glucan) into glucose
α-Amylase	7,00,000 U	It converts starch into glucose and maltose
Pectinase	70,000 U	It breaks down protein into peptides and amino acids
Protease	30,00,000 U	It shows activity on protein and above other
Lipase	500 U	It breaks down feed oil and fat and produces energy
phytase	5,00,000 U	It releases phosphorus which is bonded as phytate

Trace amount of Amyloglycosidase, Hemicellulase, Pantosanase, Acid phytase, Acid phosphatase are also present.

Source: Novartis Animal Health (Bangladesh) Limited.

At the end of the experiment, a conventional digestibility trial was conducted for 7 days. The faeces of each treatment was collected and weighed out and recorded. A polyethylene sheet was placed on the floor for rapid passage of urine in order to avoid contamination with faeces. From the total amount of faeces voided, 10% was collected, dried in the sun and stored in polyethylene. A portion (15 g) of fresh faeces was stored into deep freeze for determination of dry matter and CP. At the end of the collection period, the sun dried faeces were mixed together and ground and stored for chemical analysis. At the end of experiment, two rabbits from each treatment were slaughter for the measurement of carcass yield and dressing percentage. Feed, faeces and green grass were analyzed for proximate components following the method of AOAC (1990).

Data collected for different parameters were analyzed by using MSTAT Statistical Programme developed by Russel (1986) to compute the analysis of variance (ANOVA) in a Randomized Block Design. Least significant difference (LSD) was done to compare the treatment means for different parameters.

RESULT AND DISCUSSION

Live weight changes: The effect of different levels of NATUZYME plus® with concentrate mixture on live weight gain of rabbits is shown in Table -3. The average final live weight of rabbits of different treatment were 1220, 1230, 1233 and 1297 g for the diet A, B, C and D respectively and it did not differ significantly (P>0.05). Average daily body weight gain of rabbits increased numerically as the level of NATUZYME plus® supplementation increased from control diet A (0 g NATUZYME plus®/100 kg diet) to treatment D (70 g NATUZYME plus®/kg diet). The highest daily growth rate in the rabbits was recorded for treatment D (15.30 g) while lowest was observed for control treatment A (14.07 g), however, the growth rate among the different treatments did not differ significantly (P>0.05). Considering weight gain relative to control, NATUZYME plus® improved weight gain by 1.27, 1.14 and 8.76% due to supplementation of 35, 50 and 70 g/100 kg diet, respectively. Similar results were reported by Ranade and Rajmane (1992) in the growth of chicken who found that addition of NATUZYME plus® in the chicken diets increased live weight gain but the rate of increase was not significant (P>0.05). Hauzhong *et al.* (1999) also stated that addition of compound enzyme in broilers diets improved daily weight gain. In contrast, Pizzolante *et al.* (2002), Mohana and Nys (1999) and Wilson *et al.* (1999) did not find any improvement due to addition of multi-enzyme in the broiler diet.

Growth velocity: Table -3 also shows the growth velocity of different dietary groups. It can be seen from the table that the growth velocity did not differ significantly (P>0.05) due to supplementation of NATUZYME plus® but the highest growth velocity was recorded 1.99 g for group D which was fed 70 g NATUZYME plus®/100 kg concentrate mixture. Average growth velocity of A, B and C was 1.87, 1.91 and 1.84 g. Comparison to control the growth velocity increased

by 2.14 and 6.42% when 35 and 70 g NATUZYME plus®/100 kg diet was supplemented. The improved growth velocity due to supplementation of NATUZYME plus® in the present experiment are in agreement with the report of Naher (2002), Lgbasan *et al.* (1997) and Mohammad (1995), who found increased growth velocity for the addition of enzyme to the poultry diet.

Table-3 Effect of supplementation of NATUZYME plus® in rabbit diet on the feed intake, growth performance and dressing percentage of rabbit

Parameters		Dietary treatments #				SED	Level of Significance
		A	B	C	D		
Initial live weight (g)		432±80 (100)*	432±92 (100)	437±83 (101)	440±85 (102)	49.05	NS
Final live weight (g)		1220±62 (100)	1230±70 (101)	1233±186 (101)	1297±90 (106)	92.71	NS
Total live weight gain (g)		788±18 (100)	798±36 (101)	797±104 (101)	857±15 (109)	46.02	NS
Growth rate (g/d)		14.1±0.31 (100)	14.26±0.64 (101)	14.23±2 (101)	15.30±0.27 (109)	0.82	NS
Total dry matter intake	a) Concentrate (g)	1982.35±143 (100)	1909±98 (96)	1857.5±164 (94)	1934±96 (98)	98.09	NS
	b) Green grass (g)	926±74.5 (100)	830±28.5 (90)	853±69 (92)	992±51.5 (107)	45.83	NS
	c) Total (g)	2908±217 (100)	2739±78.5 (94)	2710.5±168 (93)	2926±44 (101)	118	NS
Daily dry matter intake	a) Concentrate (g)	35.4±2.55 (100)	34.09±1.75 (96)	33.17±2.94 (94)	34.54±1.71 (98)	1.75	NS
	b) Green grass (g)	16.54±1.33 (100)	14.83±0.51 (90)	15.23±1.24 (92)	17.71±0.93 (107)	0.82	NS
	c) Total (g)	52±4 (100)	49±1.5 (94)	48.5±3 (93)	52.5±1 (101)	2.11	NS
Growth velocity		1.87±0.37 (100)	1.91±0.44 (102)	1.84±0.13 (98)	1.99±0.41 (107)	0.29	NS
FCR		3.69±0.30 (100)	3.43±0.11 (93)	3.42±0.29 (93)	3.41±0.09 (92)	0.18	NS
Dressing percent		50.78±0.1 [c] (100)	53.78±0.2 [a] (106)	52.24±0.14 [b] (103)	47.90±0.4 [d] (94)	0.20	**

Legends: #= treatments; A= green grass (Dhal) and concentrate mixture supplemented with 0g NATUZYME plus® /100kg diet; B= green grass (Dhal) and concentrate mixture supplemented with 35g NATUZYME plus® /100kg diet; C= green grass (Dhal) and concentrate mixture supplemented with 50g NATUZYME plus® /100kg diet; D= green grass (Dhal) and concentrate mixture supplemented with 70g NATUZYME plus® /100kg diet; g= gram; d= day; NS= Non-significant; * The values in parentheses indicate the relation with the value of control (A)

Feed intake: Average daily dry matter intake was 52, 49, 48.5 and 52.5 g for treatments A, B, C and D respectively (Table -3). Numerical value for dry matter intake decreased in group B and C but slightly increased in D due to addition of different amounts of NATUZYME plus® compared to control (A). The feed intake of rabbit was decreased with the addition of NATUZYME plus® in the diet. Decreased DM intake with NATUZYME plus® supplementation in treatments B and C in the present experiment agreed with the finding of Wilson *et al.,* (1999), Batungbacal *et al.* (2002) and Pizzolante *et al.,* (2002).

Feed conversion ratio: The average FCR in group A, B, C and D was 3.69, 3.43, 3.42 and 3.41 respectively (Table-3) and no significant difference was noted (P>0.05). It is revealed that FCR of treatment D was 3.41 which possessed best performance possibly caused by the addition 70 g NATUZYME plus®/100 kg diet. Numerically FCR value increased by 7.05, 7.32, 7.52% due to addition of 35, 50 and 70 g NATUZYME plus®/100 kg concentrate mixture respectively. Feed conversion efficiency was increased by the addition of NATUZYME plus® in the rabbit diets. The present findings of increased FCR by the supplementation of NATUZYME plus® to rabbits diets is in agreement with the result of Ranada and Rajmane, (1992), Moshad (2001) and Batungbacal *et al.* (2002). They found that addition of NATUZYME plus® and enzyme in the chicken diet increased the feed conversion efficiency because multi enzyme increased the digestibility of CP, CF and other nutrients. So, the feed conversion efficiency increased.

Dressing percent: It is revealed from the Table- 3 that the dressing percentage was 50.78, 53.78, 52.24 and 47.90 in diets A, B, C and D respectively. Among the treatments, diet B and C showed the highest dressing percentage and lowest value was recorded for diet D. The highest carcass yield at diet B agreed with the report of Leeson *et al.* (1996) and Jamroz *et al.* (1996). They reported increased dressing yield for the addition of enzyme due to higher fat deposition in carcass.

Digestibility of different nutrients: The digestibility of proximate components of different diets is shown in Table -4. The result revealed that digestibility of DM was higher in the group C followed by groups A, B and D but difference was not significant (P>0.05) among the various treatment. Results in Table -4 shows that NATUZYME plus® supplementation increased DM digestibility in diet C which agreed with the report of Salobir (1998) who stated improved digestibility (DM) due to addition of enzyme.

Crude protein digestibility was recorded as 63.84, 65.40, 71.96 and 70.47% for dietary treatments A, B, C and D respectively but the data did not differ significantly (Table -4). The value as recorded for diet C (71.96%) was 13% higher than the control diet. Increased due to supplementation of NATUZYME plus® revealed with Steenfeldt *et al.* (1998), Choct *et al.* (1995) who observed increased protein digestibility co-efficient from 0.689 to 0.745. In contrast Daveby *et al.* (1998) showed that enzyme supplementation had no effect on digestibility.

The digestibility of crude fibre was 32.31, 33.46, 41.48 and 32.77% for the diets A, B, C and D respectively and difference among the various treatments was highly significant (P<0.01). Improvement of digestibility of CF was recorded as 4, 28 and 1% in 35, 50 and 70 g NATUZYME plus®/100 kg diet offering groups respectively (Table- 4). The highest digestibility at C diet agreed with the report of Choct *et al.* (1995) who observed higher fibre digestibility due to enzyme supplementation. On the other hand, the present results contradict with the findings of Daveby *et al.* (1998) who reported that enzyme supplementation had no effect on fibre digestibility.

The digestibility of ether extract (EE) was 42.71, 37.02, 47.94 and 35.25% for treatments A, B, C and D respectively. It was observed that ether extract digestibility was highest in group fed diet C than other treatment groups. The digestibility of EE did not differ significantly (P>0.05) among the dietary treatments. Table -4 also showed that NFE digestibility of treatments A, B, C and D was 74.60, 67.10, 74.52 and 67.83% respectively. The digestibility of NFE did differ significantly (P<0.05) among the treatments. The results of present study indicated that enzyme supplementation had no effect on NFE digestibility.

Table -4 Effect of NATUZYME plus® on the digestibility of nutrients

Digestibility (%)	Dietary treatments #				SED	Level of Significance
	A	B	C	D		
Dry Matter	57.96±3 (100)*	56.59±5 (98)	65.11±4 (112)	57.09±4 (99)	3.18	NS
Crude Protein	63.84±5 (100)	65.40±1 (102)	71.96±6 (113)	70.47±3 (110)	3.37	NS
Crude Fibre	32.31±4 [b] (100)	33.46±6 [b] (104)	41.48±3 [a] (128)	32.77±8 [b] (101)	4.57	**
Ether Extract	42.71±4 (100)	37.02±9 (87)	47.94±4 (112)	35.25±10 (83)	5.90	NS
Nitrogen free Extract	74.60±2 [a] (100)	67.10±5 [b] (90)	74.52±3 [a] (100)	67.83±2 [b] (91)	2.42	*

Legends: #= treatments; A= green grass (Dhal) and concentrate mixture supplemented with 0g NATUZYME plus® /100kg diet; B= green grass (Dhal) and concentrate mixture supplemented with 35g NATUZYME plus® /100kg diet; C= green grass (Dhal) and concentrate mixture supplemented with 50g NATUZYME plus® /100kg diet; D= green grass (Dhal) and concentrate mixture supplemented with 70g NATUZYME plus® /100kg diet; NS= Non-significant; * The values in parentheses indicate the relation with the value of control (A)

CONCLUSION

From the study, it can be concluded that NATUZYME plus® can be used in rabbit's diet for obtaining better performance. Further study also necessary to recommend optimum dose of NATUZYME plus® in diet.

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