

A Preliminary Study on the Use of Enzyme and Organic Acids in Rice Bran-containing Diet at Two Levels of Dietary Protein for Rabbit

Tuti Haryati and Yono C. Raharjo

Indonesian Research Institute for Animal Production
PO Box 221 – Bogor 16002. Indonesia.
Email : purringcats2001@yahoo.com.au

ABSTRACT: Rice bran has long been used as an ingredient for animal diet in Indonesia. It has moderate content of protein, digestible energy and crude fiber. In monogastric animal, including rabbit, rice bran is moderately used due to its rather low digestibility. The use of enzyme that is able to improve nutrient digestibility of the feedstuff is well known. This experiment was carried out to study the inclusion of enzyme and organic acids in a diet containing high level of rice bran on the performance of rabbit. A factorial 2 x 4 design applying 2 levels of dietary protein (14 and 18 %) and addition of enzymes and organic acids in each protein level was carried out. Basal diet contained 45 % rice bran. Treatments at each level of dietary protein were (i) basal without addition, (ii) basal + 0.03 % multienzyme, (iii) basal + 0.03 % multienzyme + 0.03 % propionic acid and (iv) basal + 0.03 % multienzyme + 0.03% sodium butyrate. Each treatment consisted of 5 replications of 3 Rex rabbits. Parameters measured were feed consumption, daily bodyweight gain (BWG), feed conversion (FCR) and dry matter digestibility in adult and young rabbits. No interactions were detected among treatments on parameters measured. No significant differences were also observed with the treatments on the inclusion of enzymes and organic acids for all parameters. There were however, better performances on rabbit fed higher protein level, regardless of the additives inclusion. Corresponding values for those parameters at 14 vs 18 % dietary protein were 93 vs 86 g/h/d for consumption, 13 vs 15 g/h/d for BWG, and 7.4 vs 6.0 for FCR, respectively. Dry matter digestibility in adult (56 vs 58 %) and young (54 vs 58 %) animals were also higher for diet with 18 %. Bodyweight of rabbits on the digestibility trial were also higher in adult (2666 vs 2443 g/head) and young (1621 vs 1557 g/head) fed 18 % protein. It is concluded that higher protein levels gave better performance for rabbit, including its digestibility. Inclusion of enzymes and organic acids did not give significant effect on the Rex performances.

Keywords: enzyme, organic acids, protein levels, rabbit

INTRODUCTION

A rabbit is small herbivore whose feed depends on forage and agricultural by-product. It utilizes crude fiber less efficiently as compared to the large herbivores (Maynard *et al.*, 1979). It is generally known that the feed is the largest cost component in the production of a commercial intensive livestock business, so utilization should be optimum. Efforts to improve feed efficiency among others, by the accuracy of the determination of nutrient requirements among the various components of nutrition, protein, are the most expensive component. Nowadays, supply of protein and amino acids are essential to meet the needs of rabbits for the production, which is used in feed formulation. The use of higher fiber and reduce the starch content is expected to avoid digestive problems that required a higher protein content than recommended (> 15%) (Carabano, *et al.*, 2008). High incidence of diarrhea in weanling rabbits caused high rate of mortality. Diarrhea or

enteritis problem in rabbits is usually triggered by the increased population of pathogenic bacteria in the caecum. This population may, however be controlled by high dietary level of indigestible fiber, and low protein and carbohydrate, and also by some feed additives that have bacteriostatic and peristaltic regulation properties, including herbals.

Agricultural by-products such as rice bran which is relatively inexpensive has great potency for feeding rabbits. However rice bran is nutritionally poor in quality due to its high fiber contents and low digestibility. Lately, it has done a variety of techniques to improve the quality of feed ingredients of agricultural by-products, such as by the addition of enzymes. The use of enzymes in animal feeds are becoming more common, in order to obtain maximal benefits from enzyme inclusion in animal feeds, it is necessary to ensure that the enzymes are chosen on the basis of the feed composition.

The organic acid is routinely used in monogastric animal diets in Europe as a preservative and acidifier, to replace antibiotics as a growth promoter and to prevent or control pathogens.

In recent years, the occurrence of digestive disorder was prevented by inclusion of antibiotics in the feed. However, as the trend of the ban on the use of antibiotics as growth promoters in conjunction with restrictions on price and authorized law the product is the reason search alternative materials.

A Study on the use of enzymes in rabbits have been long conducted (Remóis *et al.*, 1996; Fernandez *et al.*, 1996; Pinheiro and Almeida, 2000; Falcão - e - Cunha *et. al.*, 2004; Garcia *et al.*, 2005) show results that are not significant effect on rabbit performance, except for reductions of mortality in the use of proteases and proteases + xylanase (García *et al.*, (2005) that probably due to a decrease in the flow of protein to the cecum.

Makled *et al.*, (2005) the use of multiple enzymes in feed rabbits showed that supplementation of 0, 500 and 750 mg Kemzyme/kg feed can improve ($P>0.05$) in live weight at of 6, 8, 10 and 12 weeks age due to addition of Optizyme 500 mg/kg of rabbit feed. In contrast, rabbits supplemented with high level of Optizyme (750 mg/kg feed) showed a significant reduction of body weight at 8 weeks age. Feed consumption did not significantly increase during the period from 6-8 and 8-10 weeks.

Growing rabbit that supplemented with Superzyme at the rate of (0.25 g and 0.5 g/kg feed), Natuzyme (at a rate of 0.35 g and 0.5 g/kg feed) were not significantly their final body weight (10.09% and 12.3%, 7.2% and 9.9% respectively) compared to control (basal diet without enzymes addition (El-Katcha *et al.*, 2013). Supplementation of Citric acid up to 2% in diet can improve performance, digestibility of nutrient and immune status of growing rabbit (Debi *et al.*, 2001).

The purpose of this research is to investigate the possibility of using enzymes, organic acids in the right level of protein in the ration of Rex Rabbits.

MATERIALS AND METHODS

This experiment was carried out at rabbitry complex of Research Institute of Animal Production, Bogor, Indonesia. One hundred and twenty of unsexed Rex rabbits were allocated randomly to a factorial 2 x 4 design applying 2 levels of dietary protein (14 and 18 %) and addition of enzymes and organic acids in each protein level was carried out. Basal diet contained 45 % rice bran. Treatments at each level of dietary protein were (i) basal without addition, (ii) basal + 0.03 % multienzyme (natuzyme), (iii) basal + 0.03 % multienzyme + 0.03 % propionic acid and (iv) basal + 0.03 % multienzyme + 0.03% sodium butyrate. Each treatment consisted of 5 replications of 3 rabbits. Treatment were carried out for 6 weeks and parameters measured were feed consumption, daily bodyweight gain (BWG), feed conversion (FCR) and measurement for

dry matter digestibility in adult and young rabbits were carried out for 7 days. Collected data were subjected to statistical analysis by 2X 4 factorial design (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The evaluation of consumption, daily growth and feed efficiency showed that difference between the treatment (Table 1). There were no differences of daily consumption among treatment, eventhough the lower protein content diet tend have higher consumption. The highest consumption is the treatment with addition of enzyme and organic acid mixture.

Table 1. Performance of rabbit in 6 weeks raising.

Treatment	Consumption (g/h/d)		BWG (g/h/d)		FCR	
	14%	18%	14%	18%	14%	18%
1	92	84	15	12	6.4	7.1
2	90	81	14	16	6.5	5.3
3	92	91	11	17	9.4	5.5
4	97	86	14	14	7.1	6

All treatments were not different with control basal. Basal rabbit feed usually contain approximately 14% of fiber and mostly from grass or cane shoot, but in this experiment grass or cane shoot were substitute with 45% of rice bran which mostly contain undigestible fiber. The feed treatment formulated with higher rice bran content than control, with the addition of a number of enzymes, organic acids or a mixture of both can comparable with control.

Treatment 2, 3 and 4 with the use of higher protein content (18 %) showed a better feed efficiency. Haryati *et al.*, (2013) recorded that the higher protein level increase the feed efficiency, feed with > 16% protein resulting better FCR, this value consistent with DM digestibility, feed with higher protein levels can be digested and adsorbed better. Therefore, the optimal level for crude protein in a diet depends on its digestibility and the DE content. A recommended ratio of 23.5 kcal DE/g DP (or 10 g DP/MJ DE) was suggested to optimize the growth rate and the mortality (Trocino *et al.*, 2009). Digestibility of feed with level protein 16, 18 and 20 % were better than the lower level, DM digestibility is depends on the diet composition.

Dry matter digestibility of young or adult rabbits were no different in almost treatment, eventhough the treatment which used 18% of protein content tend to have better digestibility.

Table 2. Dry Matter Digestibility of young rabbits

Treatment	Body weight 0 (g)		DMD (%)	
	14	18	14	18
1	1640	1505	53	56
2	1537	1579	53	59
3	1476	1727	54	59
4	1574	1674	56	59

Tabel 3. Dry Matter Digestibility of adult rabbits

Treatment	Body weight 0 (g)		DMD (%)	
	14	18	14	18
1	2435	2837	57	57
2	2454	2759	60	55
3	2330	2609	54	60
4	2551	2457	51	60

Age differences associated with decreased activity include gastric lipase and urease in the cecum and colon in adult rabbits. Gastric lipase activity is positively correlated with the daily fat intake in rabbits in the experiment of Borel *et al.* (1991).

Diet with 18 % of protein content resulted in higher DMD either in young or adult rabbit. Young and adult animals capable of digesting feed ingredients well.

The higher protein level increasing the feed efficiency, feed with > 16% protein resulting in better FCR, this value consistent with DM digestibility, feed with higher protein levels can be digested and adsorbed better. Therefore, the optimal level for crude protein in a diet depends on its digestibility and the DE content. A recommended ratio of 23.5 kcal DE/g DP (or 10 g DP/MJ DE) was suggested to optimize the growth rate and the mortality (Trocinio *et al.*, 2009). Digestibility of feed with level protein 16, 18 and 20 % were better than the lower level, DM digestibility is depends on the diet composition.

The addition of enzymes will selectively degrade the fiber in the diet which will help the digestion of fiber because of the lack of enzyme activity in the digestive tract hemicellulolytic rabbit. So that enzyme supplementation would improve digestibility of feed.

The result showed that when Rex rabbit received a diet with protein 14 % and 18 % of protein wick supplemented with enzyme and organic acids have good DM digestibility, eventhough there were not significat different. Its probably because of the quality of the rice bran. The addition of enzyme or organic acids did not affected to the digestibility, it may be due to the the addition has not been optimum or not suitable.

CONCLUSIONS

The result showed that inclusion of enzymes and organic acids did not give a significant effect on the Rex performances. A higher protein levels gave better performance for rabbit, including its digestibility. Results of this study can be used as a basic for the use of enzymes or organic acid in the next study.

REFERENCES

- Borel, P., Armand, M., Senft, M., Andre, M., Lafont, H. & Lairon, D. (1991). Gastric lipase - evidence of an adaptive response to dietary fat in the rabbit. *Gastroenterology* 100, 1582-1589.

- Carabaño R., MJ Villamide, J. García, N. Nicodemus, A. Llorente, S. Chamorro, D. Menoyo, P. García-Rebollar, A. I. García-Ruiz, J.C de Blas. 2008. New concepts and objectives for protein-amino acid nutrition in rabbits. 9th World Rabbit Congress – June 10-13, 2008 – Verona – Italy.
- Debi, M.R., KMS Islam, MA. Akbar, B. Ullha and SK. Das. 2010. Response of growing rabbits to different levels of dietary citric acid. *Bang. J. Anim.Sci.* 39(1&2):125-133.
- El-Katcha, M.I, M.A. Soltan, A. I. El-Shiekh; Ahmed H.A. and M. G. Nomir. 2013. Influence Of Dietary Enzyme Supplementation On Growth Performance, Nutrient Digestibility, Carcass traits and Health Status of Growing Rabbits. *Alex. J. Vet.Sci.*38(1):181-203.
- Fernández C., Merino J.M., Carabaño R. 1996. Effect of enzyme complex supplementation on diet digestibility and growth performance in growing rabbits. In Proc.: 6th World Rabbit Congress, Toulouse, France, 163-166.
- Falcão-e-Cunha L., Reis J., Freire J.B., Castro-Solla L. 2004. Effects of enzyme addition and source of fiber on growth and fibrolytic activities of growing-finishing rabbits. In Proc.: 8th World Rabbit Congress, Puebla, México, 1532-1537.
- Haryati, T., Y C Raharjo and B. Brahmantiyo. 2013. Effect of Graded Levels of Dietary Protein on the Performance of Exotic Rabbits. 2nd International Conference on Rabbit Production in Indonesia. 27-29 August 2013- Bali- Indonesia
- Pinheiro V., Almeida A. 2000. *Efeito da adição de pentosanases em dietas para coelhos em crescimento sobre as performances zootécnicas, saúde dos animais, parâmetros fermentativos cecais e composição química do digesta ileal.* In Proc.: I Jornadas Internacionais de Cunicultura, Vila Real, Portugal, 209.
- Remois G., Lafargue-Hauret P., Rouillere H. 1996. Effect of amylases supplementation in rabbit feed on growth performance. In Proc.: 6th World Rabbit Congress, Toulouse, France, Vol. 1, 289-292.
- Skøivanová V., Marounek M. 2002. Effect of caprylic acid on performance and mortality of growing rabbits. *Acta Vet. Brno*,71, 435-439.
- Steel, R. G. D. and J. H. Torrie. 1980. *Principles and Procedures of Statistics: A Biometrical Approach.* 2nd ed. McGraw-Hill Book Company, New York.
- Trocino. A., D. Majolini, M. Fragkiadakis, M. Tazzoli, G. Xiccato. 2009. Digestible fibre to starch ratio and protein level in diets for growing rabbits. *Ital.J.Anim.Sci.* vol. 8 (Suppl. 2), 805-807.