

In vitro digestibility of low-quality rice bran by the addition of Natuzyme®

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Abstract. Rice bran quality is subjected to instability due to season, processes and counterfeiting. The aim of this determine was to study the effect of *Natuzyme*® addition on low-quality rice bran on the concentration of methane gas, pH value and dry matter digestibility by *in vitro* technique. *Two* series of the experimental design with 4 treatments; P0 (Rice Bran), P1 (Rice Bran + *Natuzyme*® 0.02%), P2 (Rice Bran + *Natuzyme*® 0.04%), P3 (Rice Bran + *Natuzyme*® 0.06%) and 5 replications were applied on completely randomized design to determine the hypothesis. The observed parameters were the concentration of methane gas, pH value and dry matter digestibility *in vitro*. The results showed that the addition of different *Natuzyme*® on low-quality rice bran showed no significant difference ($P > 0.05$) on dry matter digestibility and pH value but had significant difference ($P < 0.05$) on the concentration of methane gas. The addition of *Natuzyme*® on low-quality rice bran has not been able to increase dry matter digestibility and pH value but decreasing the concentration of methane gas.

1. Introduction

Rice bran is one of the local feed ingredients given to livestock including ruminants and non-ruminants because it is easily found and widely sold in feed stores. Rice bran can be used as a concentrate feed containing energy and is preferred by livestock. The value of high nutrient content makes rice bran one of the easiest feed ingredients to be used in the ration formulation so that the demand for rice bran is high and causes the price of rice bran to be expensive.

The price of rice bran which is relatively expensive is one of the causes of the forgery of rice bran which is quite high [1]. Counterfeiting is done by mixing rice bran with other ingredients which have characteristics that are almost the same as forged raw materials, thereby reducing nutrient levels in feed. Counterfeiting is generally done by adding chaff and lime or sand causing a variation in the quality of rice bran. This is what causes rice bran to be one of the feed ingredients whose quality is very unstable. Rice bran that has been mixed can cause digestive problems in livestock as well as errors in ration formulation. Husk mixed in rice bran contains silica and lignin which are difficult to digest so that it can cause interference with digestion and livestock production. The abundance of rice bran which has been falsified has made rice bran one of the feed ingredients that often experience counterfeiting which causes the quality of rice bran to be low and difficult to control.

Although enzymes can be produced and used by living cells to catalyze reactions such as energy conversion and cell defense metabolism, the body of living things sometimes still need the addition of enzymes to feed. The addition of this enzyme is caused by several factors such as the presence of

antinutrients in feed ingredients, low efficiency of feed digestibility, and unavailability of certain enzymes in the body of livestock. One of the enzymes commonly used in the feed based on agricultural by-product is Natuzyme® [2].

Natuzyme® as a supplementary enzyme work to enhance feed digestibility so that the maximum nutritional value of feed is obtained. Natuzyme® is a multi-activity feed supplement enzyme for various types of feed made in rough forms, such as corn, soybean, grain, sorghum-based feed ingredients plus local basic ingredients. Natuzyme® works to increase the digestibility of all important components in feed, thereby improving the performance and growth of livestock [3].

The addition of Natuzyme® to feedstuffs were 0.04% per weight as recommended by the manufacturer, nevertheless the information on the optimal dosage of the application of Natuzyme® in low-quality rice bran was not available. Moreover, feed digestibility in ruminants has a close relationship with the production or concentration of methane from rumen fermentation. Therefore, this study was conducted to study the effect of giving Natuzyme® on low-quality rice bran to the concentration of pH value, dry matter digestibility, and methane gas concentration *in vitro*.

2. Material and methods

2.1. Materials

Samples of visually low-quality rice bran obtained from local Poultry Shop were tested by using tester kit and the low-quality rice bran as shown by the result then be used as substrates in this experiment., Natuzyme® which contained multienzyme including cellulose, xylanase, β glucanase, α amylase, pectinase, proteinase, phytase and lipase Bioproton, AUSTRALIA rumen fluid was obtained freshly from a local slaughterhouse and immediately brought to laboratory and chemicals for *in vitro* digestibility method.

2.2. Methods

The experiment was done as previously describe in [4]. The *in vitro* digestibility of low-quality rice bran with the addition of various dosage of Natuzyme® as substrates were done to obtain the rumen fermentation characteristics of each substrate. Observed parameters were dry matter digestibility, post-incubation fermentation pH value and methane concentration. A completely randomized experimental design method was applied with 4 treatments and 5 replications as follows:

P0 = Rice Bran (control)

P1 = Rice Bran + 0.02% Natuzyme®

P2 = Rice Bran + 0.04% Natuzyme®

P3 = Rice Bran + 0.06% Natuzyme®

The *in vitro* experiment was performed in 2 consecutive time and the data were pooled to obtained the mean. Data were subjected to one-way analysis of variance followed by the Duncan Multiple Range Test where appropriate. Differences of $P < 0.05$ were considered significant.

3. Result and discussion

Table 1 showed the nutrition quality of selected low-quality rice bran which analyzed by using proximate analysis and fiber fraction of van soest methods. The crude fiber were higher on tested samples of rice bran which suggest high possibility of counterfeiting substance on the rice bran. The testing method were based on the reaction of phloroglucinol with lignin. Further analysis on its nutrition quality reveal the high value of crude fiber.

Table 1. Nutrition quality of low-quality rice bran[§] and rice bran obtained directly from rice plantation^{§§}

Parameters	§	§§
Dry matter	89.76 ± 1.12	82.26 ± 1.92
Crude protein	6.21 ± 0.16	7.41 ± 0.56
Extract ether	9.65 ± 0.68	11.25 ± 0.18
Crude fiber	12.96 ± 0.56	7.92 ± 0.26
Neutral detergent fiber	38.22 ± 2.45	41.12 ± 2.25
Acid detergent fiber	22.45 ± 1.43	26.45 ± 1.03
Lignin	9.58 ± 1.21	4.78 ± 0.21
Ash	13.45 ± 2.12	9.45 ± 2.12

*values are presented as mean ± standard deviation (n = 3)

On table 2, The pH value greatly influences microbial activity in the rumen. A low pH value will cause the rumen atmosphere to become acid and reduce the activity and rumen microbial population, especially cellulolytic bacteria that are sensitive to low pH conditions which later it will inhibit the process of feed degradation. The pH value greatly influences microbial activity in the rumen [5]. The mean pH value produced in the rumen of each treatment is 6.08. This study shows that the pH value is still in optimal condition to degrade substrate for cellulolysis, proteolysis and deamination processes which in the range of 6-7 [6].

Table 2. Observed parameters of *in vitro* low-quality rice bran with the addition of Natuzyme®

Treatments/ Parameters	P0	P1	P2	P3
pH value	6.00	6.00	6.15	6.20
Dry matter digestibility (%)	38.39±2.86	39.73±1.36	41.24±2.57	39.76±1.81
Methane concentration (ppm)	771.10±31.82 ^a	635.52±38.85 ^a	441.70±28.76 ^b	155.00±25.75 ^c

Values are presented as mean ± standard deviation (n = 5); Superscript ^{a,b,c} means within a row with different superscripts differ significantly (P<0.05)

The pH value produced in each ration formula is in the range that meets the requirements to guarantee rumen microbial activity, namely the ideal rumen pH for the development of rumen microbes is 6.0-7.0. The lower pH value indicates higher levels of fermentation by rumen microbes. This shows that the rumen environment is in a balanced state, so the fermentation process is balanced. The activity of cellulolytic bacteria in the rumen if the rumen pH is lower than 5.3, the activity of cellulolytic bacteria will decrease [7].

The normal range of dry matter digestibility in feed is between 50.63-56.30% [8]. This shows that the digestibility of dry matter in this study has a lower value than the value of the normal range of dry matter. The addition of Natuzyme® to low-quality rice bran has not been able to increase the digestibility value of dry matter. The low value of dry matter digestibility in each treatment due to the high crude fiber in rice bran (table 1), this result similar to the previous study on high content crude fiber [9]. A high-value feed digestibility reflects the large contribution of certain nutrients to livestock, while feeds that have low digestibility indicate that the feed is less able to supply nutrients for basic living and for livestock production purposes [10].

In this study the concentration of methane gas in each treatment tended to decrease. The average value of the concentration of methane gas produced decreases with the increasing use of Natuzyme®. The reduction in methane gas production in the treatment of rice bran with Natuzyme® provides hope to reduce the contribution of methane gas from ruminants to the accumulation of greenhouse gases.

The addition of Natuzyme® to rice bran at low quality was able to reduce methane gas emissions but was followed by a decrease in dry matter digestibility. Nevertheless, the reason why the methane concentration decrease was not clear. The type of feed consumed by livestock, especially the content of organic matter and fiber, affecting the amount of methane gas production. The higher the crude fiber

content, the greater the methane gas produced [11]. This can be seen in the low-quality rice bran without the addition of Natuzyme® (control treatment) which has a highest average value of methane gas compared to Natuzyme® treatments, this suggests that the high fiber content of low-quality rice bran were affected by the enzymes.

In this study, the treatment with the addition of Natuzyme® on low-quality rice bran can reduce the concentration of methane gas, where the greater the dose of Natuzyme® used the greater the concentration of methane gas that can be reduced, this indicates that the treatment increases the efficiency of feed use and reduce energy loss in livestock. This finding is similar to a previous study [12]

4. Conclusion

The addition of Natuzyme® has not been able to increase dry matter digestibility but can reduce the concentration of methane from rumen fermentation *in vitro*.

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