# Rice Bran Inclusion in the Fruit and Vegetable Waste-Based Diets for Fryer Rabbits

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(Diterima dewan redaksi 10 Agustus 2004)

**ABSTRAK**

PRAWIRODIGDO, S., MURYANTO dan D.M. YUWONO. 2004. Pemberian dedak padi dalam pakan berbasis limbah sayuran dan buah-buahan untuk kelinci potong. *JITV* 9(3): 151-156.

Penelitian ditujukan untuk mengevaluasi pengaruh pemberian dedak padi dalam pakan berbasis sampah sayuran dan buah-buahan terhadap penampilan pertumbuhan kelinci potong. Tiga puluh enam ekor kelinci (New Zealand x Flemish Giant) sedang tumbuh yang rata-rata bobot awalnya 1070,8 g dikandangkan secara individu dalam kandang kawat, dan dialokasikan ke dalam salah satu di antara tiga macam pakan yang mengandung dedak padi 20% (Pakan 1), 10% (Pakan 2) dan 0% (Pakan 3), sehingga masing-masing perlakuan memiliki 12 ulangan. Koleksi data dilakukan selama 28 hari. Hasil penelitian menunjukkan bahwa pemberian dedak dalam pakan, nyata (P<0,05) menekan konsumsi bahan kering pakan (2888, 2830 and 3095 g, masing-masing untuk Pakan 1, 2 dan 3). Rata-rata pertambahan bobot hidup harian kelinci yang menerima Pakan 1 (23 g), Pakan 2 (25 g), dan Pakan 3 (33 g), berbeda nyata (P<0,05). Pemberian dedak padi dalam pakan berpengaruh nyata (P<0,05) terhadap konversi pakan (3,4 *vs* 4,4 dan 4,1, masing-masing untuk Pakan 3 *vs* Pakan 1 dan Pakan 2). Secara konsisten, rata-rata bobot karkas kelinci yang menerima Pakan 3 (1140 g) nyata (P<0,05) lebih baik daripada yang menerima Pakan 1 (1022 g) atau Pakan 2 (1046 g). Secara keseluruhan, pemberian dedak padi dalam pakan kelinci berbasis sampah sayuran dan buah-buahan tidak perlu.

**Kata kunci:** Sampah sayuran dan buah-buahan, dedak padi, kelinci potong, pertumbuhan, karkas

**ABSTRACT**

PRAWIRODIGDO, S., MURYANTO and D.M. YUWONO. 2004. Rice bran inclusion in the fruit and vegetable waste-based diets for fryer rabbits. *JITV* 9(3): 151-156.

The aim of the study is to investigate the effect of rice bran inclusion in the fruit and vegetable waste (FVW)-based diets on the growth performance of fryer rabbits. Thirty-six growing rabbits (New Zealand x Flemish Giant) of about 1070.8 g initial body-weight were housed individually in the wire mesh cages and assigned to either one of a FVW-based diet containing 20% rice bran (RB 20%), 10% rice bran (RB 10%) or zero rice bran (RB 0%). Thus, each treatment consists of 12 replicates. Data were collected for 28 days. Results showed that inclusion of rice bran in the diet significantly decreased (P<0.05) dry matter intake (2888, 2830 and 3095 g, for Diets RB 20%, RB 10%, and RB 0%, respectively). Average daily weight gain of the rabbits consuming RB 20% (23 g), RB 10% (25 g) and RB 0% (33 g) was significantly different (P<0.05). Inclusion of rice bran in the FVW-based diet significantly (P<0.05) affected the feed conversion ratio of the diets (3.4 *versus* 4.4 and 4.1, for RB 0% *versus* RB 20% and RB 10%, respectively). Consistently, the average carcass weight of rabbits consuming RB 0% (1140g) was superior (P<0.05) to the carcass weight of rabbits fed RB 20% (1022 g) or RB 10% (1046 g). Overall, inclusion of rice bran in the FVW based diet is not necessary. Simultaneously, use of FVW for rabbit is promising to avoid the accumulated fermenting FVW problem and produce healthy meat instantly for food.

**Key words:** Fruit and vegetable waste, rice bran, fryer rabbit, growth rate, carcass

## INTRODUCTION

Indonesians are facing protein-malnutrition and environmental pollution problems. The fermenting accumulated fruit and vegetable waste (FVW) from the traditional market has been highlighted to cause an environmental problem. The FVW, however, could be a potential feed resource for rabbits. Previously, in a seminar directed to ward improving agriculture production in Indonesia, some major issues in the use of appropriate technology for producing foods were highlighted (SATOTO, 1999). The agriculture production improvement was addressed to help the people who are suffering from mal-nutrition. SATOTO (1999) reported that no reduction in rice consumption was indicated during the monetary crisis period in Indonesia. However, SATOTO (1999) highlighted that many people in Central Java have been suffering from deficiency of protein, iodine, vitamin A and iron. Furthermore, SATOTO (1999) suggested to the Indonesian Department of Agriculture for planning efforts in increasing animal products to nourish the hunger people.

Nevertheless, in a difficult condition, it is necessary to decide a rapid-inexpensive technique for producing animal protein. Thus, investigations should be addressed to evaluate the possibility to grow the productive animals require inexpensive feed and equipment for producing a low-cost meat. Rabbit, a prolific animal (VIETMEYER, 1985) is able to produce a healthy meat in a short time, and requires an inexpensive feed and housing (FARRELL and RAHARJO, 1984; CHEEKE, 1986; PRAWIRODIGDO, 1992).

Indonesia is a rice producer country. Therefore rice bran is always available and commonly used as animals feed. CHEEKE (1983) and RAHARJO *et al*. (1988) reported that rice bran was used as the main concentrate in village rabbits farms. In an earlier study, PRAWIRODIGDO *et al*. (1985a) found that the live-weight of rabbit increased 9.6 g/head/d when fed diet containing fresh wasted cabbage (*ad libitum*) and 50 g of boiled cassava root. PRAWIRODIGDO *et al*. (1985b) also documented that the weight gain of rabbits consuming diet containing alfalfa meal, soybean meal, wheat mill run, tallow, molasses, dicalcium phosphate and trace minerals was 40.5 g/head/d. However, such diet is expensive and not recommendable for producing rabbit meat in Indonesia. Thus rabbit diet should be formulated using inexpensive feedstuffs such as agriculture waste.

Previous study (PRAWIRODIGDO *et al*., 1999) documented that a large amount of decomposing fruit and vegetable waste (FVW) from the traditional market produced a noxious odor and caused an environmental pollution. Thus, the aim of the present study was to investigate the effect of diets containing rice bran and fruit and vegetable waste on the performance of fryer rabbits.

## MATERIALS AND METHODS

### Feed sources and diets

The present experiment used FVW and the local rice bran (RB) as feeds sources. The FVW was collected from the traditional market, sorted according to the species, washed with water, sun-dried and finely ground. Samples from each species of FVW and rice bran were collected and kept separately in the plastic containers and analyzed for dry matter, crude protein, acid detergent fiber, fat, and ash determination. The chemical compositions of the feed sources are presented in Table 1.

Three experimental diets (RB 20%, RB 10% and RB 0%) were formulated to contain iso crude protein (170 g/kg) and digestible energy (10 MJ/kg). Thus the diets contained 200 g rice bran/kg diet, 100 g rice bran/kg diet or no rice bran inclusion (Table 2). The experimental diets were offered to the rabbits in a steamed pelleted form. Water was provided *ad libitum* using ceramic bowl, and replaced everyday throughout the experiment.

### Animals and management

The experiment was conducted at the animal house of Central Java Assessment Institute for Agricultural Technology, Bergas, Semarang. Thirty-six growing rabbits (New Zealand x Flemish Giant) of about 1070.8 g initial body-weight supplied by the rabbitry of the Feed and Breeding Laboratories were housed individually in the wire mesh cages and assigned to either one of three dietary treatments (RB 20%, RB 10% and RB 0%; See Table 2). Thus, each treatment consists of 12 replicates. Moreover, the

**Table 1.** Nutrient composition of the rice bran, and the fruit and vegetable waste (FVW) used in the experimental diets (g/kg, air-dry basis)

| Feedstuffs | Chemical composition | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dry matter* | Crude protein* | Crude fiber* | Fat* | Ca* | P* | DE** (MJ/kg) |
| Cabbage waste | 970.0 | 268 | 230 | 19.5 | 20.2 | 7.3 | 9.2 |
| China cabbage waste | 970.1 | 270 | 162 | 26.5 | 33.0 | 7.1 | 10.1 |
| Pine apple skin | 955.9 | 63 | 159 | 18.5 | 3.5 | 2.1 | 10.2 |
| Shredded coconut waste | 983.0 | 85 | 195 | 224.1 | 1.2 | 2.6 | 9.7 |
| Banana peeling | 981.0 | 63 | 177 | 110.4 | 6.6 | 2.6 | 9.9 |
| Rice bran | 860.0 | 138 | 116 | 141.0 | 1.2 | 15.1 | 10.7 |

DE= digestible energy; *Determined analysis; **Calculated analysis (CHEEKE, 1987)

**Table 2.** Composition of the experimental diets (g/kg air dry basis)

| | Composition | | |
|---|---|---|---|
| | RB 20% | RB 10% | RB 0% |
| Ingredients: | | | |
| Cabbage waste | 250 | 285.7 | 321.4 |
| China cabbage waste | 200 | 228.6 | 257.1 |
| Pine apple skin | 100 | 114.3 | 128.6 |
| Shredded coconut waste | 100 | 114.3 | 128.6 |
| Banana peeling | 50 | 57.1 | 64.3 |
| Rice bran | 200 | 100 | 0 |
| Molasses | 30 | 30 | 30 |
| $CaCO_3$ | 20 | 20 | 20 |
| NaCl | 5 | 5 | 50 |
| Methionine | 3 | 3 | 3 |
| Lysine | 2 | 2 | 2 |
| Minerals + vitamin premix* | 10 | 10 | 10 |
| Coconut oil | 30 | 30 | 30 |
| Calculated analysis: | | | |
| Crude protein | 167 | 173 | 178 |
| Digestible energy (MJ/kg) | 10.3 | 10.2 | 10.1 |
| Determined analysis: | | | |
| Dry matter | 936.8 | 939.7 | 935.9 |
| Crude protein | 148 | 153 | 166 |
| Acid detergent fiber | 232 | 235 | 240 |
| Fat | 135 | 139 | 130 |
| Ash | 147 | 150 | 151 |
| Calcium | 23.5 | 24.5 | 23.5 |
| Phosphorus | 7.8 | 6.5 | 5.4 |
| Gross Energy (MJ/kg) | 20.2 | 20.6 | 18.9 |

* The minerals and vitamins premix was added to contribute retinol, 1200 IU; thiamin, 2 mg; riboflavin, 5 mg; pyridoxine, 0.5 mg; cyanocobalamin, 12 mcg; vitamin D, 2000 IU; α-tocopherol, 8 IU; vitamin K, 2 mg; ascorbic acid, 25 mg; niacin, 40 mg; Ca D-phantothenate, 6 mg; Mg, 120 mg; Fe, 20 mg; iodine. 0.2 mg; zinc, 100 mg; cobalt, 0.2 mg; copper, 4 mg; and santoquin, 10 mg/kg air dry diet

present study used a completely randomized design (STEEL and TORRIE, 1981). The rabbits were acclimated to their diets for 7 days. The diets were offered *ad libitum* to the rabbits for further 28 d using metal feeders.

During the experimental period each cage was equipped with a tray fitted below the front part of the cage underneath the feeders. The diets were offered in 2 meals/day (8.00 a.m. and 6.00 p.m.), and any spillage feed found in the trays was returned into the original feeders. A metal tray was fitted underneath of each cage

to enable collection of voided faeces for measurement of the total faecal digestibility nutrient. Faeces were weighed and collected daily for 28 days, bulked into marked plastic bags corresponding to the identification of each rabbit, and stored until analyzed.

At the end of the experimental period, commencing at 6.00 p.m., the rabbits were denied to access to their feeds. The rabbits were then slaughtered to enable measurement of the carcass weight. The dead rabbits were then skinned, eviscerated, the head and four bottom legs cut, and the carcass weighed.

### Chemical analyses

Dry mater (DM) of feedstuffs, experimental diets and faeces was determined after drying in a fan-forced air oven at 100$^{o}$C for 24 hours. Nitrogen (N) contents of the feedstuffs and diets were assayed using the Macro Kjeldahl method (AOAC, 1990). The samples were digested in sulfuric acid and a selenium catalyst followed by steam distillation, and analyzed by a semi-automatic N analyzer (Radiometer Copenhagen, Denmark) consisting of a PHM82 Standard pH meter, TTT80 Titrator and ABU80 Autoburette. Acid detergent fiber content of the ingredients and the experimental diets was determined by the method of AOAC (1990). Gross energy (GE) of the experimental diets was determined by adiabatic bomb calorimetry.

### Statistical analyses

Data of feed consumption, growth rate, and carcass performances of the rabbits were subjected to analysis of variance (ANOVA). The statistical analyses were performed using MSUSTAT as described by LUND (1985). Least Significant Difference (STEEL and TORRIE, 1981) was employed to compare differences between the means of treatment.

## RESULTS AND DISCUSSION

The results showed that DM intake of rabbits fed diet containing no rice bran in FVW base (RB 0%) was larger ($P<0.05$) than in rabbits receiving RB 20% or RB 10%. Differences between DM intake of the experimental diets are presented in Table 3.

Moreover, the distinction between DM intake of rabbits fed RB 20% and RB 10% was not significant. It was found that the apparent faecal digestibility of DM in rabbits consuming RB 0% significantly ($P<0.05$) higher than the DM digestibility of RB 20% and RB 10%. However, the apparent faecal digestibility of DM of RB 20% and RB 10% was similar.

It was documented that the rabbits fed diet containing no rise bran performed better ($P<0.05$) growth rate and carcass weight than the other groups of rabbit (Table 3). Similarly, the distinction pattern between growth rate of rabbits fed RB 20% and RB 10% was in accordance with the pattern of DM intake, which was not significant. Nevertheless, feed conversion ratio (DM intake/gain, FCR) of rabbits fed RB 0% was also better ($P<0.05$) than that of fed RB 10% or RB 20%. However, FCR of the rabbits consuming RB 10% was less ($P<0.05$) that of the rabbits fed RB 20%.

**Table 3.** Effect of rice bran inclusion in the fruit and vegetable waste-based diet on the average dry matter (DM) intake, apparent faecal digestibility (AFD) of dry matter, and rabbit performance

| Item | Level of rice bran (%) | | | SE |
|---|---|---|---|---|
| | 20 | 10 | 0 | |
| Daily DM intake (g) | 103$^{b}$ | 101$^{b}$ | 111$^{a}$ | 1.40 |
| Total weight gain (g) | 653$^{b}$ | 697$^{b}$ | 920$^{a}$ | 21.93 |
| Daily weight gain (g) | 23$^{b}$ | 25$^{b}$ | 33$^{a}$ | 0.78 |
| Feed (dry matter) intake/gain | 4.43$^{c}$ | 4.08$^{b}$ | 3.37$^{a}$ | 0.09 |
| AFD (%) | 59.98$^{b}$ | 61.73$^{b}$ | 69.20$^{a}$ | 0.69 |
| Slaughter weight (g) | 1664$^{b}$ | 1704$^{ab}$ | 1839$^{a}$ | 35.4 |
| Carcass weight (g) | 1022$^{b}$ | 1046$^{b}$ | 1140$^{a}$ | 30.8 |
| Carcass percentage (%) $^{NS}$ | 60.75 | 61.30 | 62.03 | 0.31 |

$^{a, b, c}$ values in the same row were significantly different ($P<0.05$), SE, standard error

Data of the present experiment suggest that the FVW-based diet without rice bran inclusion is more palatable compared the diet containing either 20% or 10% rice bran. The present study showed that DM consumption of the diets declined significantly ($P<0.05$) when rice bran was added at the level of 10% as well as 20%. CHEEKE (1987) stated that rabbits exhibit different preferences for some dietary characteristics. It was concluded that the most important factors controlling feed intake is the dietary energy level of the feed (CHEEKE, 1987).

However, since the digestible energy contents of the experimental diets in the present experiment were similar, the feed intake differences may be due to other factors. In the present study the effect of the taste of diet on the feed intake in rabbits (CHEEKE, 1987) may be more apparent.

Apparent faecal DM digestibility of RB 0% was superior among the experimental diets. The data suggests that inclusion of rice bran hinder the apparent faecal DM digestibility of Diets RB 20% and RB 10%. Apparently, in the present experiment the rice bran was contaminated with rice hulls, and consequently render lower DM digestibility of Diets RB 10%, RB 20%, compared with DM digestibility of RB 0%. Results of this study provide evidence for the finding of MAUST *et al.* (1972) that when it was contaminated with rice hulls containing high levels of indigestible fiber and silica, rice bran has a low nutrient digestibility value.

Nevertheless, these fact-findings are not in agreement with the study results of RAHARJO *et al*. (1988), which was concluded that rice bran could be satisfactorily included up to 60% in the rabbit diet. In the previous study, RAHARJO *et al*. (1988) exploited excellent components of the experimental diets, such as fishmeal, soybean meal, and corn. However, RAHARJO *et al*. (1988) also documented that inclusion of 40%, 60%, and 80% of rice bran in the diets resulted in a low daily weight gain (24, 23 and 14.8 g, respectively). While in the present study, inclusion of 10 and 20% of rice bran in the FVW- based diet exhibited 24.2 and 30.8% (respectively) lower weight gain of rabbits than that consuming the free rice bran diet (See Table 3). Obviously, addition of rice bran in the rabbit diet was also inappropriate for the present study. The present study confirmed that the higher the level of rice bran inclusion in the diet, the lower growth performance of rabbits appeared. Further more, although crude protein contents of the experimental diets were slightly different (See Table 2), this was not the cause of reduced growth performance of rabbits fed RB 20% and RB 10% in the present experiment. According to ABDELLA *et al*. (1998), slight difference in feeding dietary crude protein levels did not influence growth rate of rabbit. However, it could be emphasized that feed utilization should not only be examined based on growth performance of the rabbits. It is possible that some of the indices of performance (weight gain and feed conversion ratio) do not truly reflect tissue retention nutrient as well as carcass gain (PRAWIRODIGDO *et al*., 1997).

Data of carcass weights in the present experiment (Table 3) suggest that rabbits fed RB 0% utilized and deposited the nutrients from their diet into their body tissue more efficiently ($P<0.05$) than rabbits consuming RB 20% or RB 10%. Results here confirm that inclusion of rice bran in an FVW-based diet is not necessary.

In addition, although the experimental diets resulted in a significant difference ($P<0.05$) on the slaughter weights of rabbits fed RB 20% (1664 g), RB 10% (1704 g) and RB 0% (1839 g), the rabbit carcass percentages were similar. As has been presented in Table 3, the carcass percentage of rabbits in the present experiment is quite high. The high performance of this carcass percentage may be achieved due to the application of fasting program of the rabbits prior to slaughtering. CHEEKE (personal communication) explained that carcass percentage of rabbits slaughtered post-fasting was higher than when the carcass was obtained from non-fasting rabbits.

Furthermore, the best growth rate of rabbits (33 g/d; RB 0%) achieved in the current experiment was lower than that obtained in the previous investigation (40 g/d; PRAWIRODIGDO *et al*., 1985b). The rabbit raising program seems promising to assist the poor people and simultaneously prevent the people from a dangerous risk of an environmental hazard caused by fermentation of bulky fruit and vegetable waste.

## CONCLUSIONS

In conclusion, the present study suggests that fruit and vegetable waste from the traditional market can be used for rabbit feed, and inclusion of low quality rice bran in the FVW-based diet is not necessary. Concurrently, the use of FVW for rabbit feed can produce healthy meat.

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