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Pelletized rice bean (*Vigna umbellata*) based ration as alternative feeds for improving goat production

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Abstract

The aim of the study was to develop a pelletized rice bean-based ration for goats and determine their effect on their growth performance. Sixty (60) days feeding trial utilizing twelve (12) Philippine native goats was conducted. There were two treatments, with six (6) animals per treatment. Goats in Treatment 0 were given 1.5 kg. of fresh cogon plus 250 grams of commercial pullet developer pellets and goats in Treatment 1 were given 1.5 kg. of fresh cogon plus 250 grams of rice bean-enhanced pellets. The rice bean (tahori) seeds were sun-dried for 3 to 4 days to obtain 80 to 85% DM, then milled. Using the Pearson square method of feed formulation, ingredients were mixed, then pelletized using a manual pelletizing machine, sun-dried for 2 to 3 hours, then oven-dried at 100 degrees Celsius `for 15 to 20 minutes, and air-dried. The daily feed consumed and refused were gathered and weekly growth and gain in weight performance traits were evaluated. The data revealed a comparable result between the two treatments, suggesting that pelletized rice bean can be used as a substitute for the costly commercial pullet developer pullet. A *similar study should be conducted on the effects on the* digestibility of dry matter (DM) and crude protein in native goats.

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Introduction

Goat farming is a viable rural venture; thus, it is a highly popular business venture in the Philippines. In fact, goats provide a living for around 15 million Filipinos due to their low initial investment and high rates of return (Rupa and Portugaliza, 2016). According to the survey by Philippine Statistics Authority (PSA), the total goat production was estimated at 73.04 thousand metric tons of live weight for January to December 2021. This was 1.8 percent higher than the previous year's output of 71.72 thousand metric tons. Among the provinces, Cebu produced the most goats at 6.38 thousand metric tons of live weight or 8.7% of the nation's goat production. Despite this, the goat industry faces many challenges, including problems relating to poor nutrition. Goats are typically fed readily available, low-quality local resources that are erratic in supply. Forages are considered the cheapest major nutritional component in the diets of ruminants, particularly in the rural areas of the tropics (Akinsoyinu Onwuka, 1998).

In terms of feeding management, Mowlem (2001) discusses the subsistence factors that will influence the type of feedstuff fed to make up a daily ration for goats and whatever feed materials are utilized, a goat should always obtain both forage and concentrates. An applied feeding program for goats should be based on the type and quality of concentrate and roughage that is desired to supplement their diet.

Throughout the tropics, and especially in the humid regions, there exist a variety of feed resources. These include a variety of forages and abundant supplies of crop residues, agro-industrial by-products and non-conventional feed resources. According to Steyn *et al.* (2001), many traditional vegetables and indigenous cereal crops are essential sources of vitamins, micronutrients and protein; and contribute to high nutritional status and role in countering malnutrition (Maxwell *et al.*, 1998). For many nations, the primary source of dietary proteins is provided by legume seeds. Taking advantage of auxiliary legumes is essential to meet the high nutritional protein need.

The rice bean is an annual vine widely cultivated throughout East Asia for its small (long) bean. The rice bean (*V. umbellata*) is an indigenous cereal crop that is neglected despite its remarkable features and high nutritional content. (Bhagyawant *et al.* (2019) confirm the nutritional value of the underutilized rice bean (*Vigna umbellata*), a type of legume. There is still very little use of wild Vigna species for human consumption and animal feed due to ignorance of their advantages (Harouna *et al.*, 2018). There has been little research into using these indigenous cereals as animal feed additives, but according to a study, rice beans have a robust nutritional profile primarily because of the high protein content, which is essential for growth. It has reduced fat content and a relatively high concentration of advantageous, unsaturated fatty acids (Katoch, 2013).

A common situation in Philippine backyard goat raising is the utilization of a concentrate feed like PDP (Pullet Developer Pellet), which is intended for layer birds. While pellets are available for swine, poultry and buffalo in the Philippine market, pellets for goats are not currently available. Concentrate feeds for goats are complete feeds formulated by pelleting feed ingredients needed to supply the animals' nutritional needs for growth and lactation. Pelleting is the most widely used thermal processing in livestock diets (Dozier *et al.*, 2010). The benefits of pelleting include reduction of ingredients segregation, ease of handling, better feed flow in the equipment, and making it possible to reduce formulation costs by including alternative ingredients (Behnke, 1994; Fairfield, 2000).

The pertinent results of this study will help uplift the small ruminant industry because the utilization of indigenous feed resources will lessen the cost of feed ingredients, especially the protein source. Thus, this study aimed to include rice bean as one of the indigenous legumes that can be processed into a pelletized concentrate meal as the major protein source in the goat's diet. Specifically, the study aims to determine the effects on the growth performance of goats in terms of gain in weight feed Intake; and final

body weight

Materials and methods

IACUC protocol

Before the conduct of the study, the proposal was submitted for approval by the Institutional Animal Care and Use Committee (IACUC) of the university.

Time and location of the study

The study was conducted at CTU-Barili Campus, Cagay, Barili, Cebu, from October 2022 to December 2022 at the Goat and Sheep project.

Preparation of experimental area and test animals

The initial average body weights (BW) of the goats were taken before the experiment started. The goats were confined in open-top metabolism cages. The animals were dewormed with Albendazole (oral preparation) before the experiment started. The feed was offered in individual troughs. The animals were weighed before the conduct of the experiment for the determination of their initial weight as the basis for determining daily feed allowance and on the last day of the experiment for the calculation of weight changes.

Dietary treatments and experimental design

The dietary treatments tested were as follows: T 0 - control, all-cogon basal diet (ad libitum) plus 250 grams pullet developer pellet; T1- all-cogon basal diet (ad libitum) plus 250 grams (1% BW, DM basis) pelletized rice bean. The number of pellets that were given for Treatment 1 was based on the study of Orden *et al.* (2020). To evaluate the growth performance, a total of 12 native goats with mean body weight (BW) of 13 to 14 kg were used in a 60-day-feeding trial. The animals were kept in individual pens and divided into two groups; six (6) animals were randomly distributed in the control group (cogon +250 grams PDP) and six (6) animals in the pelletized rice bean enhanced ration.

The Feed Formulation

The feed formulation technique utilized in the study was the Pearson square method. The "Pearson Square" is a tool that can determine how much of the two feed ingredients are needed to satisfy the animals' needs for protein or energy, as shown in Fig. 1.

Formulation of test diet

The formulation was based on the crude protein requirement of the experimental animals which is 12% (PCARRD, 2009). Rice bean (tahori) seeds were sun-dried for 3 to 4 days to obtain 80 to 85% dry matter (DM), then milled. Table 1 displays the experimental rations' compositions using the Pearson square method. The rice bean seeds were milled, then all the ingredients were mixed, pelletized using a manual pelletizing machine, sun-dried for 2-3 hours, then oven-dried at 100 degrees Celsius for 15-20 minutes, and air-dried before packing.

Proximate Analysis of the Test Diet

Analysis of rice bean, corn bran and formulated test diet for the experimental animals were analyzed for their nutrient composition at the Nutrition Laboratory of the Department of Agriculture, Regional Office VII, Cebu City.

Feeding the experimental animals

The cogon (*Imperata cylindrica*) fresh forage was chopped at 2 to 4 inches long before feeding and was offered ad libitum twice a day (8:00 a.m. and 4:00 p.m.).

The supplement was given after one hour of feeding the cogon grass. The experimental animals were given access to water via the provision of drinking cups on the side of the cages.

Data Gathered

Before the treatment started, the initial weights were taken before they were distributed to their respective treatments. The body weights of the experimental goats were gathered weekly.

The amount of feed consumed was measured by getting the total amount of feed given minus the total amount of feed left on the next day, in the morning time. The feed consumed was measured every day.

1. Weekly gain in weight= Weekly Final weight-initial weight
2. Average feed consumption

$$AFC = \frac{\text{Total feed given} - \text{Total leftover feeds}}{\text{Total number of goats/ treatments}}$$

Statistical Analysis

Data gathered were analyzed using two sample T-Test

Results and discussion

Weight Gain

It is important to know the weight of a goat by monitoring its rate of gain. Fig. 2 shows the gain in weight of native goats supplemented with commercial pullet developer pellets and pelletized rice bean enhanced ration. Statistical analysis through two samples T-test revealed that there is no significant difference between the two treatments with respect to the gain in weight.

Table 1. Composition of feed ration for native goats (%). Rations contained nutrient requirement of goats (Kearl, 1982).

Ingredients	%
Rice bean	3.93
Corn bran	96.07
Molasses	4
Common Salt	1

Native goats fed rice bean enhanced ration has the same effect on the gain in weight of goats as those fed the pullet developer pellet. The result is in agreement with the study of Ahmed *et al.* (2020) where it was demonstrated that feeding complete pellet feeds helped in increasing the daily body weight gain of goats compared to traditional semi-intensive feeding.

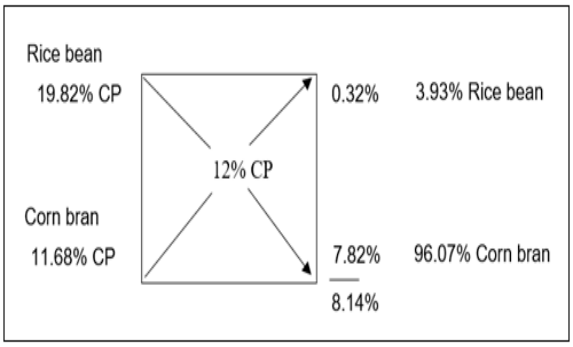

Fig. 1. Pearson square method of feed formulation for rice bean enhanced ration.

Feeding pelletized rice bean, which has 12 % crude protein value, resulted in the presence of a more degradable crude protein that resulted in a comparable DM intake of goats fed the pullet developer.

Pellet developer pellet has a nutritional content of 16% crude protein, 12% moisture, 4% crude fat and 8% crude fiber. Moreover, from the results of the study by Sharma (2014), it can be inferred that rice beans, a good source of protein, fiber, minerals, and other essential elements, can be used to create a variety of products with added value that are of higher nutritional quality.

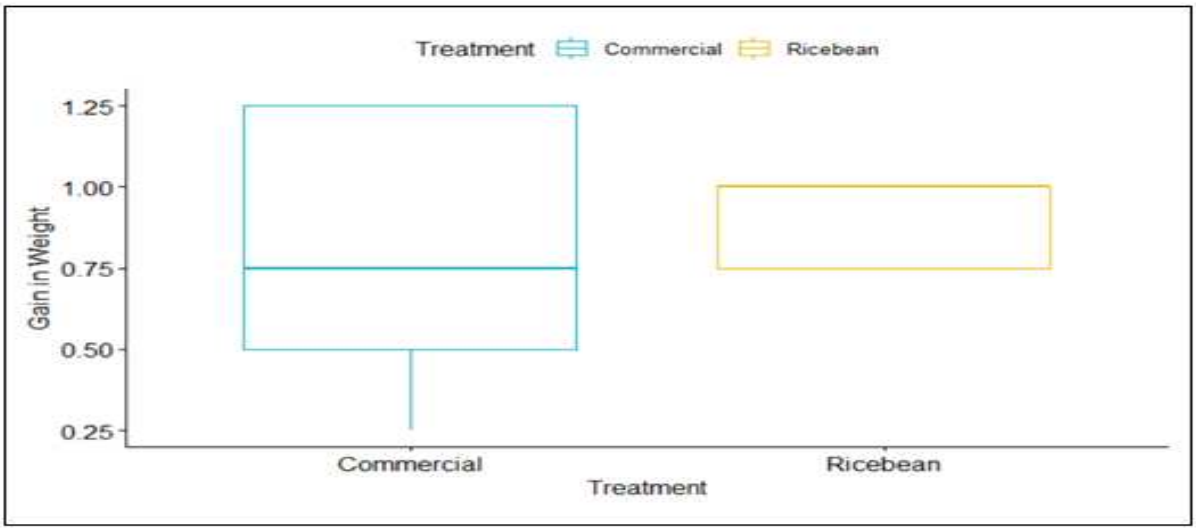

Fig. 2. Gain in weight (Kg) of goats supplemented with Pullet developer pellet and pelletized rice bean-enhanced ration.

Average feed consumption

Increasing feed intake can increase the growth performance of animals. However, several factors must be considered to increase feed consumption. The palatability, texture of feeds, weather conditions and supplements contribute the greatest impact on feed consumption.

The effect on the average feed consumption of native goats is shown in Fig. 3. Statistical analysis through two samples T-test revealed that there is no significant difference between the two treatments with respect to the average feed intake. Feeding rice bean enhanced ration has the same effect on the feed intake of goats as with goats fed the pullet developer pellet. Aribido *et al.* (Undated) findings revealed that food supplementation in pellet form could boost the productive performance of measuring the weight gain and feed-gain ratio of goats. On the other hand, feeding full concentrate pellets has several benefits, including boosting feed intake, decreasing feed waste, requiring less time and energy to eat, stopping animals from sorting feed ingredients, and increasing bulk density (Abdollahi *et al.*, 2013).

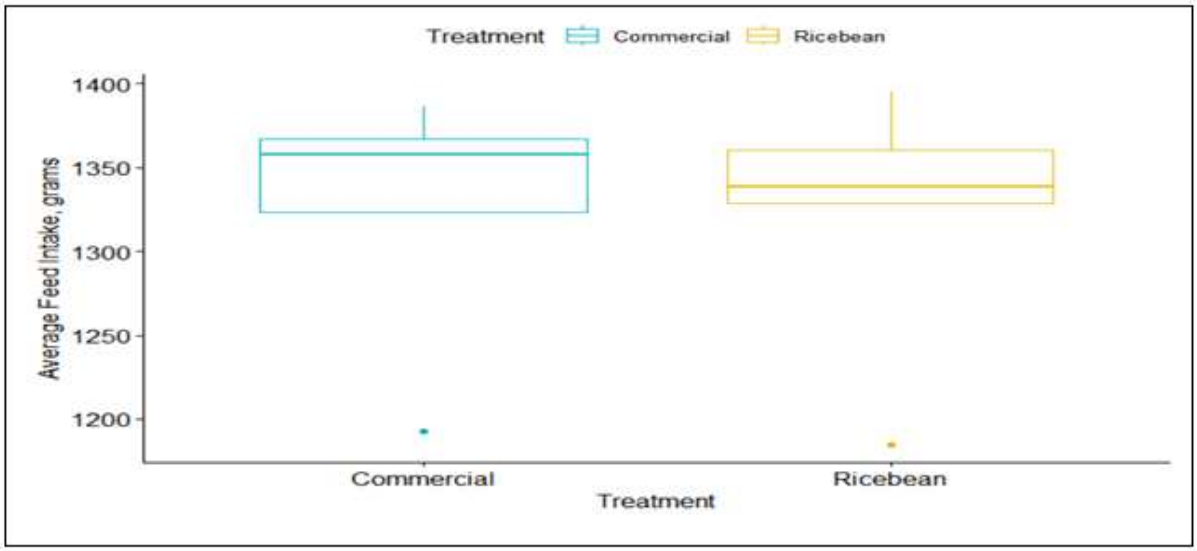

Fig. 3. Average feed intake (Kg) of goats supplemented with Pullet developer pellet and pelletized rice bean-enhanced ration.

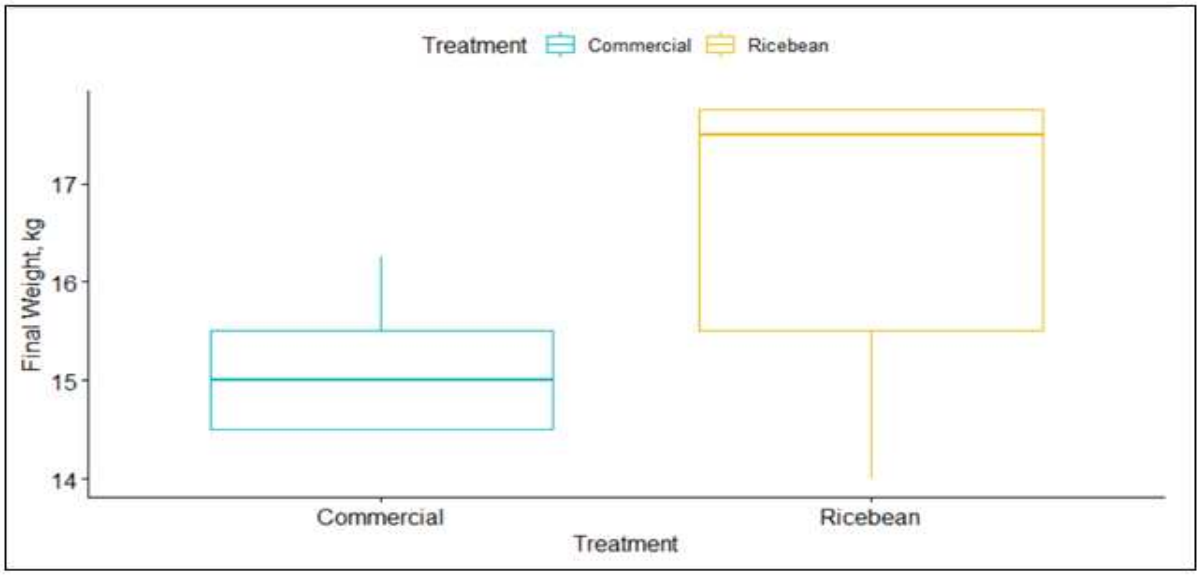

Fig. 4. Final weight Kg) of goats supplemented with Pullet developer pellet and pelletized rice bean-enhanced ration.

Average Final Weight

Fiigure 4 shows the average final weight of goats supplemented with commercial pullet developer pellets and pelletized rice bean enhanced ration. Statistical analysis through two samples T-test revealed that there is no significant difference between the two treatments with respect to the average feed intake.

Feeding rice bean enhanced ration has the same effect on the feed intake of goats as with goats fed the pullet developer pellet. The results of the feeding trial indicated the high potential of pelletized rice bean to enhance rations as alternative feeds for a productive and sustainable goat farming enterprise. This result suggests that rice bean-enhanced ration could be a viable feeding option for native goats. It is recommended that digestibility studies should be conducted.

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