Evaluation of Proximate Composition and Color of Rabbit Feed with Combinations Moringa Leaves Flour and Guava Leaves Flour

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Abstract. This study aims to analyze the proximate composition and color of the rabbit feed. This research method uses a kinetic method that starts with drying, mixing ingredients and pelleting. The next step is to analyze rabbit feed in combination (0:0; 0:15; 5:10; 10:5; 15:0)% moringa leaves flour and guava leaves flour. The research parameters observed included: the determination of protein, crude fiber, crude fat, water, ash, calcium, and phosphorus. This research uses a completely randomized design. The results showed that the combination of moringa leaves flour and guava leaves flour affected the proximate composition and color of rabbit pellets. The combination (5:10)% of moringa leaves flour and guava leaves flour has the best proximate composition and dark chocolate colour.

1. Introduction
Diarrhea is one of the main causes of rabbit death, especially during the growth of these animals. This situation is caused by poor maintenance, dirty sanitation, and poor quality of animal feed [9]. Rabbits are pseudo-ruminant animals, which are herbivores that cannot digest fiber well. The process of digestion by cecum bacteria in the stomach. The main symptom of diarrhea is dehydration. This can be observed from liquids and electrolytes in the stool [7]. In intensive rabbit farming, breeders provide forage as the main feed and dry feed such as concentrate and hay (dry grass). A good solution besides improving management is improving feed quality. Steps to improve feed quality are to choose fresh, high-quality nutritional ingredients. In addition to meeting the needs of rabbits, the feed also needs to have health value for diarrhea.

The addition of natural feed ingredients and antibacterial properties will certainly improve the quality of production [3]. Moringa leaves and guava leaves contain antioxidants and some good nutrients to improve the quality of feed [2, 5, 6]. The antibacterial properties of moringa and guava leaves (Psidium guajava) are expected to increase the rabbit's resistance to diarrhea. The addition of moringa leaves and guava (Psidium guajava) leaves in pellets is expected to be a preventative measure for diarrhea in rabbits [8, 10].

This study aims to analyze the proximate composition and color of the rabbit feed. The research parameters observed included: the determination of protein, crude fiber, crude fat, water, ash, calcium, and phosphorus. The color of the pellet was observed to see the effect of giving Moringa leaves flour and guava leaves flour.
2. Materials and Methods

2.1 Materials and tools
Materials consisting of rabbit, moringa leaves and guava leaves, corn waste flour, coconut waste flour, rice waste flour, soy waste flour, tapioca flour, mineral flour, molasses, water [4]. The tools were oven, grinding machine, pellet machine, mask, and gloves.

2.2 Experimental design
The research method used was a completely randomized design (RAL) with 5 treatments and 5replications. The data has been analyzed using analysis of variance and a comparison test of mean values with the duncan test. The treatment given as follows : [P0;P1;P2;P3;P4] = pellet with combinations [0:0; 0:15; 5:10; 10: 5; 15: 0]% moringa leaves flour and guava leaves flour. Parameters of research were the determination of protein, crude fiber, crude fat, water, ash, calcium, and phosphorus.

2.3 Preparation of moringa leaves flour, guava leaves flour, and pelleting
Moringa leaves and guava leaves are randomly collected and cleaned with water, followed by drying in an oven with circulation for about 30 hours at 40 °C. Throughout the process, the material is homogenized to ensure uniform drying. After drying, the leaves are grinding, then the leaves flour mixing with the others, pelleting, drying, packaging with vacuum-packed and storage at 25 °C (Fig. 1).

![Figure 1. Flowchart of Preparation of moringa leaves, guava leaves flour, and pelleting](image)

2.4 Determination of protein, crude fiber, crude fat, water, ash, calcium, and phosphorus.
Total Nitrogen was determined by the Kjeldahl method, according to A.O.A.C method 31.1.08. Crude fiber content was determined by digestion of samples, according to the A.O.A.C. Method. Crude fats were determined by the Soxhlet extraction method using ethyl ether, according to the A.O.A.C method 31.4.08. Ash content was determined by incineration in a muffle at 550 °C according to the A.O.A.C method 31.1.04. Water content, calcium and phosphorus were determined and according according to the A.O.A.C methods [1].
3. Results and discussion

The result for the chemical composition of rabbit feed (pellet) are shown in the Table 1.

| Determination | P0     | P1     | P2     | P3     | P4     |
|---------------|--------|--------|--------|--------|--------|
| Protein       | 16.50 ± 0.30b | 16.00 ± 0.20bc | 18.20 ± 0.26a | 15.20 ± 1.11c | 18.40 ± 0.62a |
| Crude fiber   | 8.88 ± 0.34b | 7.17 ± 1.04c | 8.17 ± 0.15bc | 10.20 ± 0.35a | 7.29 ± 1.04c |
| Crude fat     | 6.28 ± 0.23c | 7.26 ± 0.17b | 8.50 ± 0.50a | 6.49 ± 0.41c | 7.82 ± 0.52ab |
| Water         | 8.68 ± 0.49a | 7.37 ± 0.15b | 4.94 ± 0.32c | 7.75 ± 0.35b | 7.84 ± 0.53b |
| Ash           | 7.82 ± 0.33b | 8.04 ± 0.07b | 7.91 ± 0.26b | 8.06 ± 0.11b | 9.46 ± 0.56a |
| Calcium       | 0.38 ± 0.03b | 0.37 ± 0.04b | 0.97 ± 0.15a | 0.33 ± 0.04b | 0.50 ± 0.26b |
| Phosphorus    | 1.38 ± 0.36a | 0.99 ± 0.21a | 0.21 ± 0.11b | 0.98 ± 0.18a | 1.01 ± 0.26a |

Note: P0 : control (0% leaves), P1-P4 combination with leaves.

Table 1 shows that the pellet: [P0; Q1; P2; Q3; P4] with a combination of [0: 0; 0:15; 5:10; 10: 5; 15: 0]% moringa leaves flour and guava leaves flour have different chemical composition. The pellet (P4) with a combination 15 % moringa leaves has protein higher than the other treatment. This can be caused by the content of Moringa leaves more than others. Rabbits need enough fiber in their feed. Pellets (P3) have the optimal fiber content for rabbits. This table shows that guava leaf flour affects the fat content of pellets. This is indicated by the trend of increasing fat content from pellet (P0) to pellet (P2) (10%) guava leaf flour and decreases at pellet (P3 and P4). The less water and ash content ratio is at pellet (P2).

Various feed processing techniques are used in preparing animal feed ingredients. Care of feed ingredients can significantly change the nutritional value of these ingredients. The heat will damage some nutritional content, some other nutrients will increase. the process of making pellets can increase consumption while grinding can affect the digestibility of proteins and carbohydrates.

Color is a characteristic of feed and can be considered in the selection of feed. The color of the pellet produced varies between dark chocolate, brown, and yellowish-brown. The difference is caused by differences in the concentration of moringa leaf flour and guava leaf flour. The difference color of the feed biscuits was based on the sight and judgement of man, animals especially rabbits cannot distinguish colors as humans can. The P2 pellet color is dark chocolate compared to other treatments, while the pellets P0, P1, P2, and p4 have a brown color and a yellowish-brown color. Different colors of each pellet treatment are shown in Figure 2.
4. Conclusions
The combination (5:10)% moringa leaves flour and guava leaf flour has the best proximate composition and dark chocolate color when compared with other treatment. It have the optimal chemical composition required by rabbits.

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