The Effect of Vegetable Waste Flour as Substitution of Feed on Production Performance and Income Over Feed Cost of Male Quail (Coturnix coturnix japonica)

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Abstract. The aim of the research was to determine the effects of vegetables waste flour use on the production performance and income over feed cost (IOFC) of male quail. Four hundred of male quails were divided into four groups with five replications. The experiment used completely randomized design and the data were analysed by analysis of variances. The observed variables were feed consumption, body weight gain, feed conversion ratio and calculation method of income over feed cost (IOFC). If there is a difference of treatment continued by Duncan's Multiple Range Test (DMRT). The experimental diet were P0 = basal diet, P1 = 97% basal diet + 3% vegetables waste flour, P2 = 94% basal diet + 6% vegetables waste flour, and P3 = 91% basal diet + 9% vegetables waste flour. Result showed that the used of vegetable waste flour had no effect on production performances but income over feed cost had IDR. 333 more efficient for each quail than basal diet (control).

1. Introduction
Quail has been known to the public and these last few years have grown as an industry farm. Not only as producers of quail eggs, also known as poultry boiler quail from males as well as females who reject [1]. The biggest cost in raising quails is the feed cost reach to the 60%-70% of the total overall cost [2]. Vegetable waste is a vegetable that have been through the sorting process, it is not worth human consumed so disposed of or ordinarily used as livestock feed. Vegetable waste that usually plentiful in the market are namely mustard and cabbage [3]. To cope the increasing number of vegetable waste market, hence the need for the utilization of the waste or recycle the vegetable. Vegetable waste content a good crude protein but has a limiting factor in the form of crude fiber potentially used as livestock feed quail. Quail feed manufacture of vegetable waste can be done by doing a simple processing into flour. Flour vegetable waste utilization as alternative livestock feeding quail is expected to depress production cost mainly the provision feed cost [4]. The aim of the research was to determine the effects of vegetables waste flour use on the production performance and income over feed cost (IOFC) of male quail.

2. Materials and Methods

2.1. Sample preparation
The study used Completely Randomized Design. It consisted of three treatments and each treatment was repeated 10 times. The treatment were: P0 = 100% basal rations, P1 = 97% basal rations + 3% vegetables waste flour, P2 = 94% basal rations + 6% vegetables waste flour, P3 = 91% basal rations + 9% vegetables waste flour.
The quail used in this research is male quail (Coturnix coturnix japonica) 7 days old as many as 400 head with an average weight of 12-17 grams every tails. The quails were placed in 20 units colony cage made of wire and wood. Every 5 units colony cage are located in a single stack of group cages. Each single colony cage unit is 0.9 m long, 0.6 m wide and 0.25 m tall. Every single unit of colony cage is filled with 20 quails. The diet given to the 8-day-old quail were basal diet consists of soybean meal, fine bran, yellow corn, fish meal, limestone, premix, NaCl. The treatment are given according to the proportion at 9 to 42 days. the Treatment diet made of basal diet and addition of cabbage waste flour, white mustard waste flour and green mustard waste flour. The nutrient content of the feed material and the arrangement of basal and treatments diet showed in Tables 1 and 2.

### Table 1. Nutrient content of feedstuff

| Feedstuff          | Metabolisable Energy Kcal/kg | Crude Protein | Coarse Fat | Crude Fibre | Ash | Ca | P is Available |
|--------------------|-----------------------------|---------------|------------|-------------|-----|----|----------------|
| Yellow Corn        | 3958.33                     | 6.89          | 2.83       | 0.94        | 1.55| 0.02| 0.08          |
| Fine bran          | 3607.00                     | 10.02         | 10.57      | 7.21        | 6.85| 0.07| 0.21          |
| Soybean Meal       | 2992.10                     | 37.65         | 1.20       | 7.83        | 8.08| 0.29| 0.27          |
| Fish Flour         | 2258.32                     | 30.90         | 2.78       | 11.63       | 19.91| 5.11| 2.88          |
| Limestone          | -                           | -             | -          | -           |     |     |                |
| Premix:            | -                           | -             | -          |     |     |     |                |
| NaCl               | -                           | -             | -          | -           |     |     |                |
| Mustard Green Waste| 3879.49                     | 2.27          | 0.36       | 0.36        | 1.45| -   |               |
| Cabbage Waste      | 3876.37                     | 1.30          | -          | 0.34        | 1.09| -   |               |
| Mustard White Waste| 3862.23                     | 1.09          | -          | 0.32        | 1.48| -   |               |

Source: 
1) NRC (1994) [5] 2) Analysis Laboratory of Center for Food and Nutrition Studies of Gadjah Mada University, Yogyakarta (2017) 3) Saputra (2016) 4) Based on Sibbald et al. (1980) [6]

\[
ME = 3951 + (54.4 \times \text{Coarse Fat}) - (88.7 \times \text{Crude Fibre}) - (40.8 \times \text{Ash})
\]

The process of making flour vegetable waste for feed quail, can be done with the following stages. The first, the vegetable waste separation between a decent with improper use. A decent vegetable used criteria i.e. vegetables that the surface is clean and not much tampered with pest. Wash vegetable until clean, and drain. After that, vegetable waste that have a high water content (70%) advance > minced, thus spending up the drying process [7]. Next, drying vegetable waste is performed using sunlight with temperatures the temperature of 550°C to water levels up to 10%, with long drying 2 until 5 days. When it’s dry, make it become flour using the rolling pin till vegetable waste passes 100 mesh sieve, and ready to be used feed material.

There are few steps of maintenance of quail. Quail reared from 1 till 45 days. Before the quail's age is 10 days, give a tag as a mark to the one of the leg of quail to simplify the process of recording the performance of quail. At the age 1 till 7 days, give the commercial feed quail form BR 1. At the age 9-42 days, quail was given preferential treatment in the form of flour feed white mustard waste, green mustard, and cabbage. Every 7 days is carried out to find which bodyweights weighting development of quail weights. During maintenance in progress, all the data are recorded, Data recorded in the form are the amount of feed that is given, the amount of feed consumed, the remaining feed (per day), number of a dead quail, temperature and humidity. After quail harvested, performed calculations (IOFC) to know the difference between the cost of the feed with the total revenue.
Table 2. Feedstuff composition and nutrient content of treatment

| Feedstuff                  | Proportion (%) |
|----------------------------|----------------|
|                            | T0  | T1  | T2  | T3  |
| Yellow Corn                | 46.5| 43.5| 40.5| 35.5|
| Fine Bran                  | 17  | 17  | 17  | 19  |
| Soybean Meal               | 25  | 25  | 25  | 25  |
| Fish Flour                 | 10  | 10  | 10  | 10  |
| Limestone                  | 1   | 1   | 1   | 1   |
| Premix                     | 0.25| 0.25| 0.25| 0.25|
| NaCl                       | 0.25| 0.25| 0.25| 0.25|
| Total of Basal Diet        | 100 | 97  | 94  | 91  |
| Flour of Mustard Green Waste| 0   | 0.3 | 0.6 | 0.9 |
| Flour of Cabbage Waste     | 0   | 0.9 | 1.8 | 2.7 |
| Flour of Mustard White Waste| 0   | 1.8 | 3.6 | 5.4 |
| Total of Vegetable Waste Flour| 0   | 3   | 6   | 9   |
| Total                      | 100 | 100 | 100 | 100 |
| Nutrient Content*          |     |     |     |     |
| Metabolizable Energy (kcal/kg) | 3427.67 | 3425.14 | 3422.61 | 3413.05 |
| Crude Protein (%)          | 17.41| 17.26| 17.11| 17.02|
| Coarse Fat (%)             | 3.69 | 3.61 | 3.53 | 3.61 |
| Crude Fibre (%)            | 4.78 | 4.77 | 4.75 | 4.86 |
| Ash (%)                    | 5.90 | 5.89 | 5.89 | 5.99 |
| Calcium (%)                | 0.98 | 0.98 | 0.98 | 0.98 |
| P is Available (%)         | 0.43 | 0.43 | 0.42 | 0.42 |

*Calculated based on the nutrient content of the rations in Table 1 and percentage of Table 2

2.2. Measurement Variable

2.2.1. Feed Consumption (gram/bird)
Obtained by calculating the difference in ration given with the rest of the ration during maintenance.

2.2.2. Increase of Body Weight
Obtained by calculating the difference between the final quail weight and the initial quail weight of the treatment divided by the number of treatment days.

2.2.3. Economic Analysis
Obtained by calculating the total difference of the total cost of feed used during the maintenance.

\[ \text{IOFC} = \frac{(\text{Body weight of end of quail} - \text{initial body weight} \times \text{price of quail} / \text{kg}) - (\text{total feed consumption} \times \text{feed price} / \text{kg})}{\text{number of treatment days}} \]

2.2.4. Data Analysis
Data were analyzed using variance analysis and was continued with Duncan's Multiple Range Test (DMRT).

3. Results and Discussions
There are 400 quails divided into groups of 4 treatments and 5 replicates, while 200 quails were given a marker to facilitate recording during maintenance and ease in determining quail identity. The marker is paired in the form of a bracelet on one of the quail legs written in letters and numbers. Bracelet made from the aluminium plate and covered by plastic to prevent injury to the quail legs.
3.1. Feed Consumption

The results of the data feed consumption analysis showed that, during the period of maintenance, feed consumption of research quail exceeded the average limit of recommended feed intake. When the consumption of quail feed exceeds the predetermined amount it will result in increased production costs in terms of feed costs.

**Table 3. Feed consumption**

| Treatment | Average of feed consumed every week (gram / head / day) |
|-----------|--------------------------------------------------------|
|           | 2       | 3 and 4   | 5        | 6        |
| T0        | 6.49    | 10.54     | 17.86    | 19.65    |
| T1        | 6.70    | 10.79     | 17.88    | 19.74    |
| T2        | 6.68    | 10.86     | 17.88    | 20.00    |
| T3        | 6.73    | 10.80     | 17.87    | 19.77    |

**Table 4. Total feeds per day based on quail age :**

| Age of quail | The amount of feed given (grams / head / day) |
|--------------|----------------------------------------------|
| 1 day - 1 week | 2                                             |
| 1 week - 2 weeks | 4                                             |
| 2 weeks - 4 weeks | 8                                             |
| 4 weeks - 5 weeks | 13                                            |
| 5 weeks - 6 weeks | 15                                            |
| exceed 6 weeks      | 17 – 19                                       |

*Source : Listiyowati and Roospitasari (2009) [8]*

The greater the cost of feed it will be the greater the price of quail. In livestock raising, feed determines the selling price of livestock, feed costs reach 60% - 70% of total production costs [9]

Increase of Body Weight. The result of weight increase data analysis shows that, the quail maintained has an average body weight above the standard.

**Table 5. Body weight**

| Treatment | Weights per week (gram) |
|-----------|-------------------------|
|           | 1   | 2   | 3   | 4   | 5   | 6   |
| P0        | 14.70 | 28.62 | 48.98 | 60.72 | 90.21 | 114.92 |
| P1        | 15.55 | 30.60 | 49.54 | 55.98 | 86.43 | 113.95 |
| P2        | 15.28 | 29.90 | 48.66 | 55.17 | 86.59 | 108.83 |
| P3        | 15.94 | 29.52 | 47.55 | 55.31 | 83.04 | 105.93 |

**Table 6. Body weight of quail based on age and sex :**

| Sex (gram/head) | Age in weeks (gram) |
|-----------------|---------------------|
|                 | 0   | 1   | 2   | 3   | 4   | 5   | 6   |
| Female          | 5.43 | 19.06 | 40.23 | 64.66 | 87.14 | 101.94 | 116.59 |
| Male            | 5.41 | 18.92 | 39.91 | 64.07 | 84.87 | 96.13 | 100.39 |

*Source : Aggrey et al. (2003) [10]*

According to Aggrey et al. male quail weight of 6 weeks is a range of 100.39 grams. The quail was maintenance in this research has weights ranging from 105.93 to 114.92. These results indicate that the weight of quail in this study is optimum of weight.
3.2. Economic Analysis

The result of economic analysis about the cost of production can be obtained that the cost required for 42 days at quail given feed treatment 0 that is equal to IDR. 3,223 and quail given feed treatment 3 requires feed cost of IDR. 2,954. When compared to the commercial use of Br 1, the cost of quail feed per tail for 42 days is IDR. 3,287 (Table 7).

| Treatment       | Cost of feed per head |
|-----------------|-----------------------|
| T0              | IDR. 3,223            |
| T1              | IDR. 3,170            |
| T2              | IDR. 3,089            |
| T3              | IDR. 2,954            |
| Br1 commercial feed | IDR. 3,287          |

Based on the Break Even Point (BEP) analysis, quail maintenance using feed treatment (T3) amount IDR. 2,954 while compared with the use of commercial feed Br1(control) amount IDR. 3,287 so that more efficient amount IDR. 333 per head. So of the 400 quail was maintenance, can be assumed will save the cost of feed of IDR. 133,200 (Figure 1).

![Break Even Analysis](image)

**Figure 1.** Break Even Analysis of feed costs during the 42 days of research

4. Conclusion

Result showed that the used of vegetable waste flour had no effect on production performances but income over feed cost had IDR. 333 more efficient for each quail than basal diet (control).

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