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# The Economic Value of Papaya Leaves, Noni Leaves and Moringa Leaves Application in Commercial Feed in Broilers

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## ABSTRACT

The research was conducted to determine the feed cost effectiveness of bioherb supplementations in commercial feed for broilers. A total of 60 day-old broilers (Ross strain) were divided into four groups of treatments. The commercial feed control diet (T-PK) was supplemented by 2% papaya leaf powder (T-DP). The T-PK provides a 2% concentration of noni leaf powder (T-DM). The T-PK was supplemented by 2 % moringa leaf powder (T-DK). The objective was to evaluate the broiler growth parameters listed as feed conversion, feed cost per gain and income over feed cost. Feed conversion is 2.6 (T-PK), 2.3 (T-DP), 2.4 (T-DM) and 2.4 g/head/day (T-DK), feed cost per gain is IDR 20.696,0,- (T-PK), IDR 19.837,5,- (T-DP), IDR 21.912,0,- (T-DM) and IDR 21.588,0,- (T-DK), and income over feed-cost is IDR 2.304,0,- (T-PK), IDR 3.162,5,- (T-DP), IDR1.088,0,- (T-DM) and IDR 1.412,0,- (T-DK). The result showed that T-DP can decrease of feed conversion, feed cost per gain and increase of income over feed-cost but the T-DM and T-DK only able to decrease feed conversion, and have not been able to reduce feed cost per gain and increase income over feed-cost. Research conclusion is T-DP can increase of income over feed-cost but the T-DM and T-DK have not been able to increase of income over feed cost in broilers.

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## 1. Introduction

Government policy through the Strategic Policy of the Ministry of Agriculture of the Republic of Indonesia particularly reducing the use of Antibiotics Growth Promoters derived from chemicals. An alternative ingredient to Antibiotic Growth Promoter derived from chemicals is utilizing *bioherb* in livestock farming, especially poultry. An alternative to replace AGP is the attempt to return to the potency of these herbs with the aim of maintaining and improving the quality of livestock products. The government program is carried out in order to meet the availability of safe, healthy, whole and halal animal food (ASUH). In Indonesia there are many herbal plants that can be used as *bioherb*, namely papaya leaf, noni leaf and moringa leaf which are widely planted by the community.

Papaya leaf contain several compounds that can facilitate the work of the intestines and are useful for the digestive process [1]. Papaya leaf also contains a lot of papain enzymes which have the ability to form pasterin, and proteolytic enzymes which increase the effectiveness of the digestive process. According to [2], papaya contains the enzyme papain which functions as antimicrobial. The antimicrobial properties inhibit the performance of some microorganisms and has alkaloids as

antibacterial. The pro-vitamin A as  $\beta$ -carotene-active component in papaya leaf can be an antioxidant as well [3].

The noni contains anthraquinone compounds (*damnacanta*), which function as antiseptic, antibacterial and anticancer and are found in leaf and root [4]. Noni leaves also contain *xeronine*, which is popular to help absorbing protein [5]. Noni plant (*Morinda citrifolia L*) is one of the plants that has been widely used as herbal medicine [6]. It contains protein, calcium, iron, carotene, and ascorbic acid that have pharmacological effects, in which young noni leaves are ineffective. In vitro, it has anthelmintic activity, which benefits *Ascaris lumbricoides* worms in the intestine [7].

Moringa leaf (*Moringa oleifera*) contain primary metabolites such as protein, fat, carbohydrates, various minerals, vitamins and amino acids so that they can be used as an alternative food in cases of malnutrition, besides that Moringa leaf also contain secondary metabolites. Giving Moringa leaf as additional feed at low levels (0 - 2%) in starter and finisher broilers (ad libitum) showed a decrease in the value of several hematological parameters, lowered triglyceride and serum cholesterol levels, and decreased fat content in meat [8]. Based on the description above, it is necessary to know the effect of adding papaya leaf powder, noni leaf powder and moringa leaf powder commercial feed with the focus on feed conversion ratio, feed cost per gain and income over feed cost in broilers. The benefits of this research are expected to provide details about the effect of adding papaya, moringa, and noni leaf powder on income over feed-costs and feed cost per gain for broilers.

## 2. Research Methods

### Materials

#### Poultry and feed

60 day-old broilers of the Ross strain produced by PT. Super Unggas Jaya with an average initial weight of 34.7 g/bird were the subjects of the study. Commercial feed used were produced by PT. Japfa Comfeed Indonesia listed as Papaya Leaf Powder, Noni Leaf Powder and Moringa Leaf Powder.

### Methods

#### Experimental Design

A total of 60 day-old broilers were randomly divided into 4 treatment groups, and replicated three times (5 chicks each). The treatment groups were:

1. Control Group (T-K): group of chickens with commercial feed without giving "Papaya Leaf Powder, Noni Leaf Powder and Moringa Leaf Powder"
2. Treatment Group 1 (T-DP): group of chicks on commercial feed and given "Papaya Leaf Powder" as much as 2%.
3. Treatment group 2 (T-DM): the group of chicks with commercial feed and given 2% "Ni Leaf Powder".
4. Treatment Group 3 (T-DK): the group of chicks on commercial feed and given "Moringa Leaf Powder" as much as 2%.

Table 1. Basal Nutritional Content, TDM and TDP Feeds

Nutritional Substance	T-PK	T-DP	T-DM
Dry Matter (%)	88	87,37	89,95
Crude Protein (%)	21	16,77	15,92
Crude Fiber (%)	4	16,28	22,12

Description: P-K (commercial feed); T-DP (papaya leaf powder); T-DM (noni leaf powder); T-DK (Moringa leaf powder)

Table 2. Composition of Research Feed and Feed Nutrition

Feed Ingredients	Research Feed Composition			
	T-PK	T-DP	T-DM	T-DK
	%			
1. Commercial Feed	100	100	100	100
2. Td-Noni	-	2,0	-	-
3. Td-Papaya	-	-	2,0	-
4. Td- Moringa	-	-	-	2,0
<b>Feed Nutrition</b>				
1. Dry Matter (%)	88,0	88,0	88,0	88,0
2. Crude Protein (%)	21,0	20,9	20,9	20,9
3. Crude Fiber (%)	4,0	4,3	4,2	4,3

### Research Variables

The variables observed were *Feed Conversion*, *Feed Cost Per Gain* and *Income Over Feed Cost*.

1. Feed Conversion is the amount of feed needed to increase 1 production unit (1 kg body weight) and is calculated by this formula:

$$\text{Feed Conversion} = \frac{\text{Feed consumption}}{\text{Body weight gain}}$$

2. Feed cost per-gain is the cost required to increase 1 unit of production (1 kg live weight) which is calculated by multiplying the ration conversion by the ration price per kg.
3. Income Over Feed Cost (IOFC) is income from raising broiler chickens and can be calculated by selling value per kg of body weight minus the cost of feed per kg of body weight.

### 3. Results and Discussion

The results of observations during the study on the effect of papaya, noni, and moringa leaf meal on feed conversion, feed cost per-gain and income over feed cost in broiler are as follows:

#### 3.1. Feed Conversion.

The effect of papaya, noni and moringa leaf powder on feed conversion value is shown in Table 3.

Table 3. Average Feed Conversion

Parameter	Treatment			
	T-PK	T-DP	T-DM	T-DK
1. Consumption (g/head/day)	113,3	98,2	106,2	103,9
2. Body weight gain (g/ec/hr)	44,4	41,9	44,8	43,1
3. Feed conversion	2,6	2,3	2,4	2,4

Notes: 1. T-PK (Commercial Feed); 2. T-DP (Papaya Leaf Meal), 3. T-DM (Noni Leaf Meal); 4. T-DK (Moringa Leaf Meal).

Feed conversion is a benchmark for assessing the efficiency of feed consumed by livestock to be converted into meat [9]. Feed conversion value can be obtained by comparing feed consumption with body weight gain achieved in certain period of time. The greater feed conversion value

indicates low level of efficiency and conversely, low feed conversion value indicates high level of efficiency.

The provision of papaya, noni and moringa leaf powder in commercial feed can reduce the feed conversion value as for each treatment of 2.6 (T-PK), 2.3 (T-DP), 2.4 (T-DM) and 2.4 (T-DK). The control treatment (PK) has conversion value of 2.6, which means that to increase 1 kg of body weight, 2.6 kg of feed is needed, while the T-DP treatment only requires 2.3 kg of feed with the savings rate of 11.54%, the T-DM treatment requires 2.4 kg of feed with a savings rate of 7.69% and the T-DK treatment requires 2.4 kg of feed with a savings rate of 7.69%. According to [10], the addition of noni leaf powder and papaya leaf powder had an effect on feed conversion ratio, in sense that the feed conversion decreased. This effect occurred as the addition of bioherbs also affected feed consumption and daily body weight gain. This statement can be interpreted as the addition of papaya leaf powder, noni leaf powder and moringa leaf powder on commercial feed is more efficient than the use of merely commercial feed.

### 3.2. Feed cost per gain

Feed cost per gain is the cost incurred per kg of body weight per head which is obtained by multiplying the feed conversion by the feed price per kg [11]. Factors that affect feed costs are the price of feed and the ability of chickens to convert feed [12]. The results of the research on the feed cost per gain are shown in Table 4.

Table 4. Average Feed cost per Gain

Treatment Analysis	Indicator			
	T-PK	T-DP	T-DM	T-DK
1. Feed price (IDR/kg)	7.960	8.625	9.130	8.995
	2,6	2,3	2,4	2,4
2. Feed conversion	20.696,0,-	19.837,5,-	21.912,0,-	21.588,0,-
3. Feed cost per gain (IDR/kg BB)				

Description: 1) T-PK = IDR 7.960,- ; 2) T-DP = IDR 30.000/kg and 3) T-DK = IDR 39.000/kg

Feed costs incurred for control treatment (T-PK) amounted to IDR 20,696, - which means that IDR 20,696, - per 1 kilogram of body weight, while T-DM requires feed fee of IDR 19,837.5,-/kg body weight, TD-M requires feed costs of IDR 21,912.0, -/kg body weight, and T-DK requires feed costs of IDR 21588.0,-/kg body weight. Compared to the use of commercial feed (T-PK), the T-DP treatment provides feed cost efficiency of IDR 858.5,- (4.15%) , but the T-DM treatment has a more wasteful (inefficient) feed cost of IDR 1,216.0,- (5.88%) and the T-DK treatment had a more wasteful (inefficient) feed cost of IDR 892.0,- (4.31%). These results indicate that the addition of papaya leaf powder (T-DP) in commercial feed is able to reduce feed costs. The use of feed is more efficient commercial seen from the economic perspective (T-PK).

### 3.3. Income over feed cost (IOFC)

Feed cost is the total cost of feed incurred during maintenance, while *income* is revenue from the business of raising broilers obtained from multiplying the production of livestock with the price of chicken at that time. *Income over feed cost* is revenue from feed costs which is income from broiler raising business compared to feed costs. According to [13], *Income Over Feed Cost* (IOFC) is the difference between investment in livestock business and feed costs. *Income over feed cost* (IOFC) is an indicator of success in livestock business. The results of calculating *Income over feed cost* is presented in Table 5.

Table 5. Income *Over Feed Cost* data for each institution

Indicator Analysis	T-PK	T-DP	T-DM	T-DK
1. Feed cost per galin (IDR/kg BB)	20.696,0,-	19.837,5,-	21.912,0,-	21.588,0,-
2. Selling value of Broiler (IDR/kg BB)	23.000,0,-	23.000,0,-	23.000,0,-	23.000,0,-
3. Income; IOFC (IDR/kg BB)	2.304,0,-	3.162,5,-	1.088,0,-	1.412,0,-

Notes: Data on feed and broiler prices were taken at the time of the study.

Based on the difference in income from each treatment group compared to the control treatment, the (T-DP)-(T-PK) is IDR 858.5,- (37.26%), while in (T-DM)-(T-PK) is IDR 1,216.- (52.78%), and (T-DK)-(T-PK) is IDR 892 (38.72%). These results indicate that the application of bioherb papaya leaf powder (T-DP) was able to increase the largest profit, namely 37.26%, while the addition of bioherb with noni leaf powder (T-DM) and moringa leaf powder (T-DK) had not been able to increase profits. The high price of bioherbs in the market causes high feed costs which result the decrease in profits. This is in accordance with the research that explains *Income Over Feed-Cost* can be calculated based on the total selling price of chickens minus the total cost of feed during the rearing period [13]. Meanwhile, the other research stated that *Income over feed cost* (IOFC) is the difference between income from production sales and feed costs spent [14]. According to [15], revenue is obtained by multiplying production and selling price, while feed costs are multiplied by feed consumption and feed prices. *Income over feed costs* (IOFC) is a concept to determine business analysis as an early indicator of broiler maintenance activities in short term [16].

#### 4. Conclusions

The addition of noni leaf powder (T-DM) and moringa leaf powder (T-DK) as much as 2% in commercial feed is not able to increase *income over feed-cost*. Nonetheless, the addition of papaya leaf powder (T-DP) is able to increase the income. The high price of bioherb causes an increase in the cost of feed (feed cost per gain), reducing factor in income.

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