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SUPPLEMENTATION OF *MORINGA OLEIFERA* LEAVES FLOUR IN DIET ON CARCASS CHARACTERISTICS OF BROILER

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ABSTRACT

The objectives of this study was to evaluate the effects of adding differents level of Moringa oleifera leaves flour (MLF) in diet carcass characteristcis of broiler. A total of 240 day-old-chick broiler with an average initial body weight were randomly allotted into four diet treatments. The diet treatments included: diet with 0% *MLF* as control (A); diet with 2% *MLF* (B); diet with 4% *MLF* (C); and diet with 6% *MLF* (D), respectively. Result showed that the diet with *MLF* treatment had improved final body weight, slaughtered weight, carcass weight, and breast meat weight compared with control treatments ($p<.05$). The meat content in the breast weight of the carcass of the B, C, and D groups were significantly different ($P<0.05$) higher than control (Table 2). The average of abdominal-fat percentage in the B, C, and D groups was significantly different ($P<0.05$) decreasing compared to the abdominal-fat percentage in the Group control. In conclusion, supplementation of 2-6% MLF in diets can improve carcass quantity, but decreasing abdominal fat in broiler.

KEYWORDS: *Moringa oleifera*, carcass, breast meat, broiler.

INTRODUCTION

The trend of using phytochemical compounds from herbs in feed and drinking water has increased over the past two decades. The results of the study showed that the use of antibiotics in excessive feed would intensify the potential risks of increasing resistance in human pathogens. Bacterial resistance and antibiotic residues in animal products cause increasing concern in using antibiotics as a growth driver and ultimately result in a ban on the use of antibiotics in feed in most developed countries. Recently, in Indonesia there has been a ban on the use of antibiotics, so phytochemicals of herbal leaves have been suggested as the most beneficial alternative for livestock because of their beneficial effects (Abdelqader *et al.*, 2013; Bidura, 2020; Gheisar and Kim, 2018).

The use of herbal leaf in diets can increase feed digestibility, thereby increasing the growth of poultry and the value of the benefits of herbal leaves (Bidura, 2020; Ahmed *et al.*, 2016). According of Frankic *et al.* (2009) and Bidura (2020), supplementation of herbal plant in diets can improve taste and feed consumption, stimulate animal appetite, and then increase feed intake. As a result, increased feed intake can contribute to increased productivity of poultry. Different results regarding the effects of herbal leaves additives on livestock production performance were reported in the study that supplementation of herbal leaves, turned out to have no effect on growth, but reduced feed consumption and increased feed efficiency compared to controls (Ahmed *et al*., 2016; Ahmed *et al.* 2017; Gheisar and Kim, 2018). In general, some results of the study show the positive effects of herbal phytochemical compounds on livestock performance (Gheisar and Kim, 2018; Lei *et al*., 2018; Bidura *et al.*, 2017). These conflicting results regarding growth performance responses to natural herbs or extractions can be caused by different herb species, concentrations of herbs, and methods of processing herbs (Windisch *et al.*, 2008; Embuscado, 2015).

It is interesting to study the use of medicinal properties of phytochemicals, because some elements of phytochemical compounds in *Moringa oleifera* which are antibacterial, and contain Beta-carotene which act as carbohydrate color active substances, and are in principle as one of the conditions for evaluating meat quality. Phytochemical compounds contained in *Moringa oleifera* leaf include: *flavonoids*, *saponins*, *tannins*, and several other *phenolic* compounds that have antimicrobial activity (Bukar *et al.*, 2010; Gomez *et al*., 2019), reduce blood cholesterol levels and increase HDL levels, whereas *saponins* are proven to be efficacious as anticancer, antimicrobial, and reduce blood cholesterol levels (Santoso *et al.*, 2015; Bidura *et al.*, 2017).

The purpose of this study was to evaluate of *Moringa oleifera* leaf flour supplement in rations to increase carcass weight and breast meat of broiler.

MATERIAL AND METHODS

Animal treatments and experimental design. Two hundred and fourty day-old-cheaks were used in a completely randomized design experiment. All diets were isonitrogenous (CP: 20.60%) and isoenergetic (ME: 3000 kcal/kg). The diets were formulated to meet the nutrient requirements for poultry (Scott *et al*., 1982) for 5 weeks of experiment. The ingredients and chemical compositions of the feed are shown in Table 1

Table 1: Ingredients and calculated composition of the diets (percentage as-fed-basis).

Ingredients (%)		Level of MLF in Diets (%)			
		0	2	4	6
Yellow corn		55.50%	53.70%	53.20%	53.20%
Rice bran		8.50%	8.70%	9.20%	9.20%
Coconut meal		9.00%	8.80%	7.20%	7.20%
Soybean meal		12.50%	11.50%	11.50%	11.50%
Fish meal		14.00%	14.00%	13.50%	13.50%
Coconut oil		0.00%	0.80%	0.90%	0.90%
MLF		0.00%	2.00%	4.00%	4.00%
Mineral-Mix*)		0.50%	0.50%	0.50%	0.50%
Total		100	100	100	100
Chemical composition **)					
Metabolizable energy	(Kcal/kg)	3002	3002	2998	3000
Crude protein	%	20.58	20.6	20.59	20.59
Ether extract	%	6.94	7.59	7.75	7.75
Crude fibre	%	4.25	4.35	4.36	4.36
Calcium	%	1.37	1.42	1.43	1.43
Phosphor	%	0.72	0.74	0.74	0.74
Arginine	%	1.55	1.54	1.50	1.50
Histidine	%	0.5	0.5	0.5	0.5
Isoleucine	%	1.06	1.05	1.04	1.04
Leucine	%	1.88	1.87	1.86	1.86
Lysine	%	1.44	1.44	1.43	1.43
Methionine	%	0.47	0.47	0.46	0.46
Phenylalanine	%	1.00	1.00	1.00	1.00
Treonine	%	0.88	0.89	0.89	0.89
Tryptophan	%	0.23	0.24	0.24	0.24
Valine	%	1.07	1.07	1.06	1.06

*) The mineral composition of B12 per 10 kg contains: Calsium: 49%; Phosphor 14%; Iron: 40000 mg; Manganese: 27500 mg; Mg: 27.500 mg; Zinccum: 25 mg; Vit-B12: 4.50 mg and Vit D3: 500000 IU. PT. Eka Farma. Deptan RI No. D 8109127 FTS **) Based on calculation according to Scott *et al*. (l982)

Slaughter procedures: At the end of the experiment, all of the birds were fasted for 12 hours, but drinking water were still provided, so that the birds were not stress. The method of slaughtering was adapted to the instructions of slaughtering a poultry in sloughtering house.

Five chickens were slaughtered in each experimental unit, or as many as 30 in each treatment group, so that the total number of chickens that were slaughtered was 120. Slaughtering chickens begins with bleeding through the jugular vein. After the chicken dies, then put it in hot water at a temperature of 50^0C. Then the chicken is put into a feather removal machine. After the chicken is clean, the digestive tract organs (esophagus, crop, proventriculus, ventriculus, small intestine, cecum, colon) and internal organs (liver, heart, and lungs, except the kidneys) are removed. Carcass weight is the weight of a chicken without feathers, blood, digestive tract organs, internal organs, head and feet. The carcass percentage is the weight of the chicken before slaughter divided by the carcass weight times 100%.

To get the amount of breast meat, first do the separation of the chicken breast from the carcass, namely cutting the breastbone link with the back and wings of the chicken carcass. After the chicken breast pieces were obtained, then separated between the bones, meat and skin. Percentage of breast meat is the weight of breast meat divided by carcass weight x 100 g carcass weight (g/100 g carcass weight).

Process of making flour *Moringa* leaves

The old *Moringa oleifera* leaves (yellow to dark green) are dried in the sun for two days. After drying, then crushed and sieved with a 2-4 mm diameter sieve. *Moringa* leaf flour is then put in a plastic bag and ready to be used in rations. More details are presented in Figure 1.

Figure 1: *Moringa oleifera* leaf flour.

Statistical analysis. All data were analyzed by one-way ANOVA to determine the difference (P<0.05) between treatments. If differences were found (P<0.05), further analysis was carried out with Duncan's multiple range test.

RESULTS

Carcass characteristics

The final body weight, carcass weight, carcass percentages, breast weight, and abdominal-fat in groups fed the experimental diets are shown in Table 2. The treated birds exhibited (Group B, C, and D) higher significantly different (P<0.05) on final body weight, carcass weight, carcass percentages, and breast weight than the control bird. But, abdominal fat on the treated birds exhibited (Group B, C, and D) lower significantly different (P<0.05) than the control bird. No significant differences (P>0.05) in the born and subcutaneous-fat include skin on the breast of birds were observed among the dietary treated groups.

The average of final body weight in the B, C, and D groups was significantly different (P<0.05) increasing by 5.78%; 8.28%; and 6.35%, respectively, compared to the final body weight in the Group control (Group A). The average of carcass weight in the B, C, and D Groups were: 11.25%; 13.93%; and 11.67%, respectively, significantly different (P<0.05) higher than control. The percentage of carcass in the birds of the B, C, and D Groups were: 5.10%; 5.21%; and 5.01%, respectively, significantly different (P<0.05) higher than group A (control).

The average of breast weight in the B, C, and D groups was significantly different (P<0.05) increasing by 4.64%; 5.34%; and 5.12%, respectively, compared to the breast weight in the Group control (Group A). The meat content in the breast weight of the carcass of the B, C, and D groups were: 4.65%; 5.23%; and 4.93%, repectively, significantly different (P<0.05) higher than control (Table 2).

Abdominal-fat

The average of abdominal-fat percentage in the B, C, and D groups was significantly different (P<0.05) decreasing by 6.12%; 8.50%; and 6.80%, respectively, compared to the abdominal-fat percentage in the Group control (Group A).

Table 2: The effect of *MLF* in diets on carcass weight, breast meat, and abdominal fat in broiler.

Variabel	Level of *MLF* in Diets (%)[1]				SEM[2]
	0	2	4	6	
Initial body weight (g)	47.86a	48.05a	48.62a	47.79a	0.031
Final body weight (g)	2074.83b[3]	2194.81a	2246.72a	2206.51a	31.815
Carcass weight (g)	1537.03b	1709.88a	1751.09a	1716.44a	42.053
Carcass percentages (%)	74.08b	77.86a	77.94a	77.79a	0.805
Breast weight (g/100 g carcass weight)	37.28b	39.01a	39.27a	39.19a	0.409
• Born	14.18a	11.46a	10.57a	10.63a	1.219
• Breast meat	76.08b	79.62a	80.06a	79.83a	0.935
• Subcutaneous-fat include skin	9.74a	8.92a	9.37a	9.54	0.691
Abdominal-fat (g/100 g body weight)	2.94b	2.76a	2.69a	2.74a	0,.051

Note
1. *Moringa oleifera* leaf powder
2. SEM: Standard Error of Treatment Means
3. Means with different superscripts within raw values are significantly different (P<0.05)

DISCUSSIONS

In the current study, dietary inclusion of *Moringa oleifera* leaves powder to a greater final body weight, carcass weight, and carcass percentage in growing-finishing broiler compared with control diet throughout the entire experiment, indicating that the *MLF* may had some positive effects on the poultry, which is in agreement with Bidura (2020), that the main way of action of this active ingredient is the inhibition of microbial pathogens and endotoxins in the gastro intestinal tract and increased pancreatic activity, resulting in better metabolism and utilization of nutrients (Windisch *et al.,* 2008; Grashorn, 2010).

According Soliva *et al.* (2005), MLF are known to be very poor in anti-nutritional content and have been used in poultry or monogastrics. This result is contrary to that reported by Teteh *et al*. (2013) that the digestion and absorption of nutrients were reduce in high use of MLF in feed, can cause increased levels of saponin as an antinutrient.

Moringa leaves containing active compounds, such as alkaloids, flavonoids, saponins, phenolics, triterpenoids/steroids, and tannins (Putra *et al*., 2016; Gomes *et al*., 2019) its can coused improve final body weight and carcass weight in chicken groups that received FML (Ahmad *et al.*, 2017).

Table 2 shows that increasing the use of FML in feed (Groups B, C, and D), significantly ($P<0.05$) reduces abdominal-fat content in body of birds. The decrease in abdominal-fat levels is caused by antioxidant content (flavonoids and carotenoids) in herbal leaves (Benakmoum *et al.*, 2013).

The decrease in fat content is due to the fact that *Moringa* leaves contain sterols (β-sitosterol) which are quite high, which causes the storage of triglycerides in the body to decrease (Hussain *et al*., 2014).

Supplementation of *Moringa oleifera* leaf flour or extract in the ration or drinking water can reduce the cholesterol content of chicken meat (Ekayuni *et al.*, 2017; Puspani *et al*., 2018). Santoso research reports that administration of 5% herbal leaves fermented, significantly reduced fat and cholesterol content in broiler meat.

Moringa leaves are believed to have a balanced amino acid content, and contain high secondary metabolite compounds, and contain several anti-nutritional compounds. Tannin phytochemical compounds found in *Moringa* leaves can denature protein and prevent bacterial digestion, while flavonoid compounds are compounds that dissolve in water and function to inhibit the growth of pathogenic microbes (Naiborhu, 2002). According to Ahmed *et al*. (2017), *Moringa* leaves can be used as a wound dressing and laxative, as well as anti-anemia.

Decreased abdominal fat content in chickens, according to Bidura *et al*. (2008) due to the high crude fiber content in *Moringa* leaves, which can cause the digestive flow rate in the digestive tract of chickens to increase, so that the absorption of fat in the intestine is inhibited by crude fiber, so that less fat is absorbed. The type of fiber and fiber content in plants affect digestive performance and properties, and the effect varies according to fiber content (Bidura *et al*., 2008). Research results from Hernandes *et al.* (2004) reported that supplemental plant extracts could increase nutrient digestibility in the digestive tract of poultry. Herbal extracts, such as Garlic, can increase the activity of pancreatic enzymes and microenvironment conditions for better nutrient utilization in mice (Ramakrishna *et al.*, 2003).

The active compounds contained in MLF leaves, such as tannins, terpenoids, alkaloids, and flavonoids, have antimicrobial properties in vitro. These active compounds in the digestive tract of chickens can help absorb nutrients. As reported by Adibmoradi *et al.* (2006) stated that the herbal active compounds contained in garlic were found to increase villi height and crypto depth, as well as reduce epithelial thickness and villi cell numbers in the duodenum, jejunum and ileum of poultry. Increased villi height, as well as decreased epithelial thickness in the walls of the duodenum, jejunum and ileum, can increase nutrient uptake (Nusairate, 2007).

This is evident in the study of Bidura *et al.* (2017) who reported that giving *Sauropus* leaf extract through drinking water could increase feed efficiency in laying hens.

CONCLUSIONS

We conclude that supplementation of 2-6% *Moringa oleifera* leaf powder in diets positively changed carcass weight, carcass percentage, and breast meat, but decreased abdominal fat in broiler.

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