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The phytobiotic effect of herbs as a growth promoter on the performance and digestibility of alabio meat ducks

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Abstract

Antibiotics in feed as a growth promoter or AGP (antibiotic growth promoter) have begun to be avoided and even banned by the Indonesian government since 2017. For this reason, it is necessary to look for alternatives to the origin of herbs plants that do not cause residues in livestock. The aim of the study was to (1) analyze the response of the growth performance of ducks (final body weight, body weight gain, consumption, feed conversion ratio (FCR) at different doses of phytobiotic products from herbs. The research method used a completely randomized design with five treatments and four replications, where each replication consisted of 5 DOD of Alabio meat ducks. The treatments of this research were the dosage of using phytobiotics herbs in the rations, including J0 (control); H1 (1.0% phytobiotic); H2 (2.0% phytobiotic); H3 (3.0% phytobiotics) and H4 (4.0% phytobiotics). The variables observed were final body weight (BW), body weight gain (BWG), feed consumption, feed conversion ratio (FCR), protein digestibility and fiber digestibility. The results showed that the use of different doses of phytobiotics herbs showed a significant effect on final body weight (BW), body weight gain (BWG) and feed conversion ratio (FCR), while feed consumption did not show a significant effect on Alabio meat ducks. The best dose was obtained in the treatment of doses of herbs of 2% (J2) with the final body weight (BW) of 1.118 g/bird/week, BWG of 209.37 g/bird /week and FCR of 2.71. On the other hand the addition of phytobiotic doses of livestock herbs had a significant effect on protein digestibility and had no significant effect on fiber digestibility. The conclusion of this study showed that phytobiotics herbs could replace antibiotics as a growth promoter for performance of Alabio meat ducks.

Keywords: alabio meat duck, digestibility, herbs, performance, phytobiotics

Introduction

Antibiotic growth promoter (AGP) is starting to be avoided and even banned by the government in Indonesia since 2017, for use in poultry because it causes residues in livestock products both in meat and in poultry eggs (Yakheshi et al 2011; Rahayu, 2014). Besides that, the problem of antibiotic resistance is also felt in the field of poultry health (Vinus et al 2018; Biyatmoko 2016). In the current era in the world of modern livestock, the use of antibiotics has been largely replaced by products derived from probiotics (Manafi et al 2015; Biyatmoko 2014). Even now, herbs plant herbs called phytobiotics are used to maintain the performance of livestock growth as well as a substitute for AGP which boosts poultry growth (Al-Massad et al 2018). Herbs are natural growth promoters and are safe for consumption by humans and livestock. The less use of antibiotics and chemical drugs, the less residue will be in a livestock product, especially in poultry products such as meat and eggs (Ognik et al 2016). The use of herbs, of course, is also cheaper.

The types of herbs that we often encounter in Indonesia are included in the herbs category, namely in a group called food herbs that are safe if eaten by humans, do not contain toxins, are not acutely harmful and can be used long term, such as turmeric, ginger, garlic, kencur, galangal, ginger, cinnamon and betel leaf (Mawandana, 2014). This is our natural wealth, easy to obtain at these herbs plants (Ana et al 2012). Another group of herbs are "medicine herbs", which are herbs that aim for the right dosage of medicine and for example *Andrographis*, *Blue Cohosh*, *Cascara Sagrada*, *Celandine*, *Ephedra*, *Goldenseal*, *Senna* and *Oregon Grape Root*. Third, "poison herb". The types of herbs are potentially toxic and require medical approval for their use, such as *Belladonna*, *Bryonia*, *Datura*, *Gelsemium*, *Henbane*, *Male Fern*, *Phytolacca*, *Podophyllum*, and *Veratrum*.

Phytobiotics medicines is the origin of herbs plants known as phytobiotics. Phytobiotics are herbs plants that contain chemical compounds that are beneficial to livestock, where the function of phytobiotics has a dual role as a feed additive in feed to increase productivity (Mallick et al 2016). The concept of giving herbs plants as therapeutic ingredients has been around for a long time. As a herbs therapy, it has far less side effects than antibiotics or synthetic drugs in general (Sarica et al 2005). Traditional herbs medicine in various countries such as in India, China, Europe or Africa generally uses all parts of herbs plants both roots, seeds and leaves together to be more effective (Castanon, 2007).

In phytobiotic research, the use of herbs ingredients will be combined with other types of herbs plants, so that the active ingredient content is more complete and more effective (Banong and Hakim 2011). The mechanism of action of herbs as a feed additives is known to have anti-parasitic activity and is an immunomodulator (Suganya et al 2016). Several herbs plants are able to increase the production of cytokines, namely extra cellular proteins that act as regulators and intercellular mobilizers (interleukins, interferons and chemokines) which also have activities to increase immunity, digestibility through the mechanism of blood circulation and absorption of animal feed (Mallick et al 2016). So it is deemed necessary to not only see the impact of the resulting growth, but also to measure the effectiveness of the use of herbs on the digestibility of rations in ducks. How much can the digestibility of rations be improved, including the growth of livestock and the ability to prevent and treat disease in livestock (Hileman and Whasington 2010).

Based on the description above, it is important to study the phytobiotics of origin herbs which act as a substitute for the role of antibiotics as growth promoters and their effect on increasing the digestibility of Alabio meat ducks, so that their dependence on antibiotics can be eliminated towards organic meat products. The aim of this study was to analyze the growth performance

response of Alabio meat ducks (final body weight (BW), body weight gain (BWG), feed consumption, feed conversion ratio (FCR) and digestibility of rations) at different doses of phytobiotic products from herbs.

4 Materials and methods

Experimental livestock

This research was conducted in a poultry cage laboratory for four weeks. Using day old ducks of Alabio (DOD) as the main research material. The research method used a completely randomized design with five treatments and four replications, and consist of five doc each replication with a total number 100 of Alabio day old duck.

Feed ingredients and treatment rations

The rations is made with a formula consisting of concentrate ingredients, BR I, rice bran, yellow corn, and vegetable oil. The research treatment was given after the ducks passed the age of 2 weeks or starting from 3 - 6 of weeks so that the ducks has reached the development of its digestive organs.

The research treatment was the difference in dosage of using herbs phytobiotics in basal rations of ducks. The research treatments consists of H0 (control); H1 (1.0% phytobiotics in rations); H2 (2.0% phytobiotics in rations); H3 (3.0% phytobiotics in rations); and H4 (4.0% phytobiotics in rations).

Basal rations of ducks are made of iso energy and iso protein according to the National Research Council (NRC 1994). The composition and nutritional requirements are adjusted to the growth phase of meat Alabio ducks in the finisher period, which are 16% crude protein and a metabolic energy of 3,000 kcal/kg (Table 1). Drinking water is given adlibitum.

Table 1. The nutritional composition of the basal rations of duck

No	Feed Materials	Crude Protein (%)	Metabolizable Energy (kcal.kg ⁻¹)	Crude Fiber (%)	Proportion (%)
1	Concentrate	40	3.000	4,10	10
2	BR I	20	2.900	3,25	36
3	Yellow corn	9	3.400	3,37	20
4	Rice bran	10,5	1.890	11,60	29
5	Vegetable oil	0	8.800	0,00	5
Total					100

Kandungan Nutrisi Ransum :

Crude Protein (CP) : 16,05 %

Metabolizable Energy (ME) : 3,012 kcal/kg

Crude Fiber (CF) : 5,62 %

Note : Laboratory Analysis of Nutrition and Animal Feed, Faculty of Agriculture ULM (2020)

Herbal phytobiotic for ducks

The phytobiotic combination in this study was a combination of eight herbs plants including turmeric, ginger, garlic, kencur, galangal, ginger, cinnamon and betel leaf, with a ratio of 1 : 1 where each was 250 g for a total of 2,000 g of mixed ingredients herbs. The liquid herbs extract material is then mixed into 150 liters of water, then fermented by adding 5% of sugar and 1 ml/L of EM-4. Anaerobic fermentation of the herbs mixture in a closed bucket for 7 days to harvest, where from day 2-7 the containers are opened once a day to stir for 30 seconds and then close again.

Observed variables

The variables observed were final body weight (FBW), body weight gain (BWG), feed consumption, feed conversion ratio (FCR), protein digestibility and fiber digestibility using total collecting methods from Ranjhan (1980).

Results

Achievements to the growth performance of Alabio meat ducks that were treated with different phytobiotic doses of herbs herbs for six weeks of observation are presented in Table 2. It is shown in table 2 that of the four observed variables, the addition of herbal phytobiotics in the ration only had a significant effect on the three observed variables ($p < 0.05$), namely final body weight (FBW), body weight gain (BWG), and feed conversion ratio (FCR). Meanwhile, the variable feed consumption has no significant effect. The response curves of the significantly affected variables are presented in Figures 1 - 3.

Table 2. Performance achievement of Alabio meat ducks at 6 weeks age variation of phytobiotic doses

Parameter	Treatment					SE	P value
	H0	H1	H2	H3	H4		
Final body weight (FBW) (g/bird)	928,33 ^a	983,33 ^b	1118,33 ^c	980,00 ^{ab}	940,00 ^a	33,85	0,00
Body weight gain (BWG) (g/bird/week)	164,12 ^a	187,81 ^b	209,37 ^c	198,43 ^b	182,03 ^b	7,65	0,00
Feed consumption (g/bird/week)	546,00	551,00	560,00	556,00	548,00	2,58	0,35
Feed Conversion Ratio (FCR)	3,74 ^c	3,06 ^b	2,71 ^a	2,96 ^b	3,17 ^b	0,17	0,00

a,b,c. Means in the same row with different letters show significant differences ($p < 0.05$) among dietary treatments

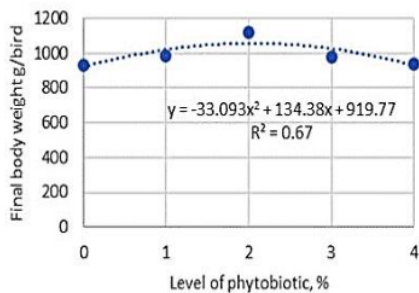


Figure 1. Effect of level of phytobiotic on final body weight

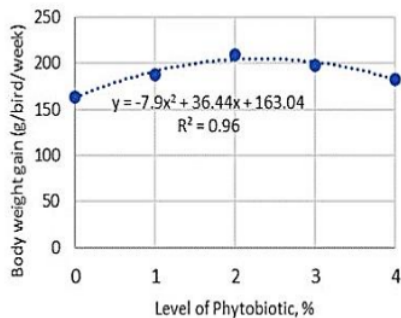


Figure 2. Effect level of phytobiotic on weight for week

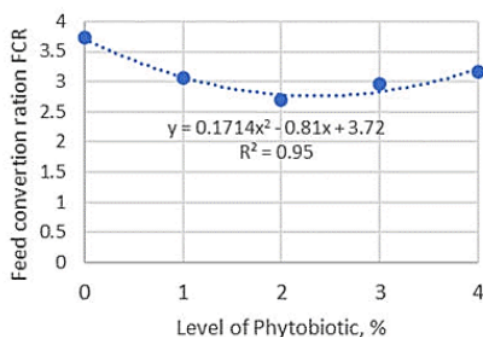


Figure 3. Effect of level phytobiotic on feed conversion ratio (FCR)

Table 3 shows analysis of data on protein and fiber digestibility of the effect of adding phytobiotics from herbs at treatment doses 0; 1; 2; 3; 4% in rations. The results showed a significant effect ($p < 0.05$) on food digestibility of Alabio meat ducks compared to controls without the addition of phytobiotics (H_0), both on protein digestibility and fiber digestibility.

Table 3. Protein and fiber digestibility of Alabio meat ducks at six weeks age variation of phytobiotic doses

Parameter	Treatment					SE	p value
	H0	H1	H2	H3	H4		
Protein digestibility (%)	50,12 ^a	57,66 ^b	71,07 ^d	64,30 ^c	56,94 ^b	3,56	0,00
Fiber digestibility (%)	41,43	45,98	58,29	48,76	42,88	2,99	0,85

^{a,b,c,d} Means in the same row with different letters show significant differences ($p < 0.05$) among dietary treatments

Discussion

The results showed that the treatment of phytobiotics of herbs with a dose of 2% in the rations (H2) showed the best and highest results on the variables of final body weight, body weight gain and FCR of Alabio meat ducks until the age of six weeks. The combination of eight herbs

ingredients is very effective in improving the growth of ducks. This result strengthens the statement of Wreda et al (2014) that the effectiveness of the combination of phytobiotic active ingredients of herbs plants is higher than in the single form. Hedayati and Manafi (2017) also reported the pharmacological effects of each component of the active compound that can support one another. Improved growth is also due to the presence of active substances from herbs given in the form of essential oils that act as high antioxidants (Dhama et al 2015) and increased immunity of livestock with an increase in IgG antibody concentrations (Aroche et al 2018), and a decrease in the main pathogenic bacteria that is *escherichia coli* in crop and poultry caecum (Ren et al 2019).

At the final body weight (FBW), it showed that the highest average final body weight was achieved by a 2% phytobiotic dose (H2) of 1,118.33 g/bird, while the lowest average was the control (H0) of 928.33 g/bird. The FBW in the 2% phytobiotic dose treatment was supported by the contribution of the highest weekly body weight gain in H2 during the observation, which was 230.4 g; 176.6 g; 230.0 g and 200.4 g at 3, 4.5 and 6 weeks, respectively. This rate of body weight gain (BWG) determines the final body weight of the ducks. According to Knarreborg et al (2002) and Lu et al (2003), stated that the improvement in poultry weight was due to the active phytobiotic in herbs that had the effect of maintaining the balance of pathogenic and non-pathogenic bacteria. Clavijo et al (2019) stated that the balance of the digestive tract can further improve the immune system and improve body weight. Petrolli et al (2012) also confirmed that giving phytobiotics of 75-150 ppm of garlic herbs extract and cinnamon can replace the antibiotic avilamicyn in boosting chicken weight up to 40 days of age. Meanwhile, Hyden (2000) and Dieumou et al (2011) state that the active phytobiotic substances in herbs medicine play a role in suppressing pathogenic microbes and adding non-pathogenic microbes that benefit the intestines so that acid-base balance is created. This acid-base balance in the small intestine is able to prevent damage to the small intestine so that it can absorb nutrients optimally.

In the weekly body weight gain of ducks, the results of analysis of variance showed that the addition of phytobiotic dose of livestock herbs to the rations had a significant effect on body weight gain of Alabio meat duck ($p < 0.05$). This result is in line with the research of Purwanti et al (2015), which states that the addition of various doses of herbs has a significant effect ($P < 0.05$) on body weight gain of livestock. In Table 2, the results show that the highest body weight gain was achieved at the phytobiotic dose of herbs of 2% (H2) of 209.37 g/bird/week. This result is far different from the control treatment (H0), namely 164.125 g/bird/week. Meanwhile, for H1 treatment with a dose of 1%, body weight gain reached 187.813 g/bird/week, H3 treatment (4%) was 198.438 g/bird/week and H4 treatment (4%) was 182.033 g/bird/week. This result is corroborated by the opinion of Cheldra et al. (2017) reported that the provision of 2% phytobiotics in the form of turmeric juice was also able to improve chicken body weight gain compared to controls. Similar results were reported by Rajput et al (2013) on giving phytobiotics with different variations of turmeric 1-3% in chickens.

For feed consumption, the results showed no significant effect on all treatments ($p > 0.05$). This shows that giving phytobiotics of herbs to meat ducks up to a dose of 4% does not affect the feed consumption of meat ducks. The difference in doses of herbs phytobiotics has no effect on feed consumption, because the amount of feed given is in accordance with the ducks' rations for each week's age by the researchers, so that it is still in accordance with the daily feed intake capacity of the ducks. In addition, it is suspected that the maintenance system, environmental conditions, genetics and age of the cattle are the same as reported by Wiryawan et al (2005) who stated that the addition of combined herbs remedies to feed did not affect feed

consumption. Park et al (2013) stated that giving phytobiotics of herbs in the rations did not decrease the palatability of the rations, and did not show the behavior of feed consumption. The addition of phytobiotics and herbs phytogetic to a certain extent does not change the taste and smell of poultry feed so it is good for use (Steiner and Syed 2015). Windisch and Kroismayr (2007) said that giving phytobiotics will only increase saliva production which is higher than the taste of better feed, and does not affect feed consumption.

In the feed conversion ratio (FCR), the analysis of variance showed a significant effect ($p < 0.05$), where the best FCR was achieved at the addition of 2% doses of herbs in the rations (H2). The FCR achievement of H2 treatment was 2.71 better than the FCR figures for other treatments including control. In the control treatment (H0) FCR was achieved at 3.74, treatment 1% (H1) was 3.060, treatment 3% (H3) was 2.968 and in treatment 4% (H4) was 3.170. The range of FCR of ducks produced by all treatments was in the range of 2.71 - 3.74. This is in line with the opinion of Zakaria (1997), that meat ducks kept for approximately eight weeks for intensive slaughter ducks, FCR ranged from 2.04 to 4.22. This is in line with the results of research by Wiryawan et al (2005) which states that phytobiotics are thought to increase the efficiency of feed use. Furthermore, said Dhama et al (2014), the presence of antibacterial from herbs phytobiotics can maintain the balance of the intestinal microflora where pathogenic bacteria such as *Escherichia coli* or other harmful gram-negative bacteria will be inhibited causing better absorption of feed nutrients and more efficient FCR. According to Samarasinghe et al (2003), feed conditions are strongly influenced by livestock conditions, digestibility, livestock sex, breed, quality and quantity of feed and environmental factors. The difference in the resulting feed conversion ratio is thought to be the difference in the efficiency level of feed utilization during the growth process during the study. According to Jamroz et al (2009), one of the indicators to measure the success of increasing growth, one of which is determined by an efficient level of feed consumption and a smaller feed conversion value.

The results of protein digestibility in this study which were achieved in the range between 50.12 - 71.07% had a significant effect on protein digestibility ($p < 0.05$), in line with the report Mangisah et al (2016) that the protein digestibility of ducks ranged from 66.7 to 81%. Increased protein digestibility according to Vinus et al (2018) because herbs extracts are able to increase the absorption of feed nutrients including protein, maintain immunity and stress the cage environment. It can be seen that the addition of up to 2% of the optimal phytobiotic of herbs increases the digestibility of protein, after that it decreases quadratically to a dose of 4% of the herbs. Purwanti et al (2015) stated that the addition of 2.5% herbs phytobiotic extracts of turmeric and garlic was able to increase the activity of pancreatic enzymes, especially protease enzymes, from 462.46 U/ml (control) to 525.75 U/ml, thereby increasing protein digestibility.

On the other hand, the addition of the variation of phytobiotic of herbs has no significant effect ($p > 0.05$) on fiber digestibility, although there is a tendency for all treatments to produce higher fiber digestibility than the control (H0). Fiber digestibility of the rations of this study, which was in the range of 41.43 - 58.29%, was still higher than that reported by Suprijatna (2010) which stated that the digestibility of fiber in poultry generally ranged from 20-30%. According to Tillman et al (2005) states that the digestibility of fiber depends on the fiber content in the rations and the amount of fiber consumed.

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Conclusion

The conclusion of the study showed that the level of administrations with a dose of 2% phytochemicals of herbs in Alabio meat ducks rations can replace antibiotics as growth promoters with the achievement of final body weight (FBW), body weight gain (BWG) and the highest feed conversion ratio (FCR), and improvement of digestibility of protein rations.

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