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THE EFFECT OF NATURAL ADDITIVES ON MICROBIOTA AND BODY WEIGHT ON BROILER CHICKEN

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Abstract. This study was conducted to evaluate the effects of natural additives (synbiotics) made from *Lactobacillus casei* and dahlia tuber extracts (LDT) and synbiotics made from *Lactobacillus casei* and garlic tuber extract (LGT) on the number of lactic acid bacteria and coliform in the small intestine and body weight of broiler chicken. One hundred and sixty 1-day-old broilers were randomly placed in 20 experimental units for 3 weeks. The study used a completely randomized design with 5 treatments and 4 replications, each experimental unit consisted of 8 birds. The treatments tested were level of additives, T0 (control), T1 = LDT 1%, T2 = LDT 2%, T3 = LGT 1% and T4 = LGT 2%. The parameters observed were the amount of lactic acid bacteria (LAB) and coliform in the small intestine and the body weight of the starter phase of broiler chickens. The collected data were analyzed for variance and if there was a significant effect, then continued by Duncan multiple region test. The results showed that used of LDT1% and LDT 2% no significantly affected on lactic acid bacteria, coliform and body weight of broiler chickens. Giving LGT 1% and LGT 2% significantly increased the amount of LAB in the small intestine and increased body weight, while the number of coliform was significantly lower than the control. The conclusion was that the natural additives LGT 1% and 2% could increase LAB, reduce colliform and improve the performance of broiler chickens.

1. Introduction

Health conditions and productivity of chickens are strongly influenced by microbiota in the gastrointestinal tract. Intestinal microbiota is generally considered important for its nutritional, health, and immunomodulatory [1]. The intestine contains both bacteria that are beneficial for the health, such as gram-positive lactobacilli and bifidobacteria, and potential pathogenic bacteria, such as Clostridium spp., Salmonella and Escherichia coli. It is generally accepted that a proper bacterial balance between the number of beneficial bacteria and bad bacteria in the intestine (at least 85% of total bacteria should be good bacteria) is vital for the host, and the impact on gut health often comes from microbial imbalance in the gut of chicken [2] [3]. Dietary is possible to modify the gut microbial population, concomitant with the growth of favourable bacteria in the gut of chicken [4] [5]. One way to optimize intestinal microbiota is to provide natural additives to the feed, in the form of synbiotics.

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Sinbiotics are a combination of probiotics and prebiotics [6]. Several research have shown the potential benefits of synbiotics on the intestinal microbial ecosystem and immune functions of chicken. Synbiotics were effective in improving the growth of broiler, which corelated the effect of inclusion of either probiotics or prebiotics in the diet of chickens [7]. The intestinal morphology and nutrient absorption due to feeding synbiotics could improve performance of broiler chicken [8]. Oral administration of probiotics is able to fight vitro Salmonella pullorum and E. coli infections [9]. The Lactobacilli spp. population in birds supplemented with probiotic significantly was higher and coliforms population was lower than control groups at 42 d of age, increased broiler performance by enhancing body weight, daily feed intake and decreasing the feed conversion ratio [10]. The addition of prebiotics in broiler rations can improve digestion and absorption of nutrients in the feed [11]. Several synbiotic studies have also been carried out including the bacterial synbiotic Lactobacillus acidophilus and 10,000 ppm red onion inulin that can inhibit the growth of Escherichia coli bacteria [12]. Although many studies have reported the health benefits of synbiotics in chickens, research is still limited, so this study examines the synbiotic effects of Lactobacillus casei and inulin from dahlia and garlic bulb extracts on intestinal microbiota and body weight of broiler chickens. Intestinal microbiota is related to digestive tract health and influences the utilization of feed nutrition and chicken growth.

2. Materials and Methods

One hundred and sixty 1-day-old broilers were randomly placed in 20 experimental units for 3 weeks. The study used a completely randomized design with 5 treatments and 4 replications, each experimental unit consisted of 8 birds. The treatments tested were level of additives, T0 (control), T1 = LDT 1%, T2 = LDT 2%, T3 = LGT 1% and T4 = LGT 2%.

2.1 In vivo Study

Feed was prepared using corn, rice bran, soybean meal, meat bone meal (MBM), and premix with the composition and nutritional content as in Table 1. Chicks aged 1-7 days were given commercial feed, while ages 8-21 days were given experimental food. The parameters observed were the amount of lactic acid bacteria (LAB) and coliform in the small intestine and the body weight of the starter phase of broiler chickens.

Parameter measurements using 20 chickens aged 21 days, randomly taken from 20 experimental units to be weighed and slaughtered. Then all the digestive organs are removed. proventriculus, gizzard, heart, liver, pancreas, small intestine (duodenum, jejunum, and ileum), cecum, and large intestine are separated and weighed. The number of lactic acid bacteria and pathogenic bacteria in the small intestine. Intestinal digestion was taken from 20 chickens aged 21 days and analyzed the number of bacteria. The small intestine is separated to take a sample of intestinal digesta, then the digesta is removed and collected. Samples were taken to the laboratory to calculate the total LAB and Coliform, using total plate count (TPC). The collected data were analyzed for variance and if there was a significant effect, then continued by Duncan multiple region test.

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Table 1. Composition and nutrient contents of the experimental rations

Ingredients (%)	Jumlah
Maize	44.50
Rice bran	18.50
Soybean meal	27.10
MBM	8.6
$CaCO_3$	0.3
premix[1]	1.00
Total	100
Nutrient contents:	
Metabolizable energy (kcal/kg)[2]	3001.11
Crude protein (%)[3]	21.5
Crude Fiber (%)[3]	5.68
Ether extract (%)[3]	3.82
Calcium (%)[3]	1.17
Phosphorus (%)[3]	0.64
Methionine (%)[4]	0.42
Lysine (%)[4]	1.31

[2] *Metabolizable energy was calculated based on formula (Bolton 1967) as follows: 40.81 {0.87 [Crude Protein + 2.25 crude fat + nitrogen -free extract] + 2.5}*
[3] *Analisis was conducted by the Laboratory of Nutrition and Feed Science, Faculty Animal and Agricultural Sciences, Diponegoro University*
[4] *The values were calculated based on table of National Research Council (1994)*

3. Results and Discussion

The results of the analysis of variance showed that the use of both LDT and LGT synbiotics significantly (P <0.05) increased the number of LAB (Table 2). Inulin from dahlia tubers extract and garlic tubers extract combined with Lactobacillus casei is able to live in the digestive tract and multiply, so the amount of LAB increases Commercial synbiotics (BiominImbo) in feed could increase the LAB population and reduced *E. coli* and total *coliform* populations in the intestine [13]. Increasing the number of lactic acid bacteria will produce lactic acid and short chain fatty acids (SCFA). LAB also produces metabolites in the form of organic acids, hydrogen peroxide and carbon dioxide (CO2), and produces antimicrobials (bacteriocin) that are antagonistic to the growth of pathogenic bacteria and repair beneficial bacteria in the small intestine [14]. Table 1, shows that the use of LDT 1 and 2% has not been able to reduce the amount of E. coli in the small intestine. Whereas the use of LGT 1 and 2% can significantly reduce E. coli in the small intestine. LAB is able to stick strongly to intestinal cells and cause the LAB to develop properly and reduced pathogenic microbes from the intestinal cells of host animals, so that the development of pathogenic microbes encountered obstacles. Microbes in synbiotics inhibit pathogenic organisms by competing to obtain a limited number of food substrates for fermentation. The use of 2% natural synbiotics can increase the amount of lactic acid bacteria in the duodenum, lumen and ileum, decrease the amount of Escherichia colli in the ileum and increase intestinal villi in the duodenum, jejum, ileum and intestinal dilatation. villi in the ileum [15]. Additional of Lactobaciluus in feed increases the total number of anaerobic bacteria in the ileum and caeca, and the numberlactic acid bacteria and lactobacilli in caeca; and small bowel weight (jejunum and ileum) [16]. Furthermore, probiotics tend to reduce the amount of Enterobacteriain ileum, compared with control treatments. Probiotics do not affect pH and concentrationshort chain fatty acids (SCFA) and lactic acids in the ileum and caeca.

Table 2. Effect of sinbiotic on LAB and Coliform in broiler chicken intestine

Parameter	Level of sinbiotic				
	0	LDT 1%	LDT 2%	LGT 1%	LGT 2%
LAB (10^{9} cfu/g)	5.01^{c}	5.55^{a}	5.18^{b}	5.24^{b}	5.29^{b}
Coliform (10^{6} cfu/g)	4.22^{a}	4.36^{a}	4.16^{a}	3.51^{b}	3.84^{b}
BW of 21-d	659.16^{c}	670.76^{b}	676.71^{b}	696.63^{a}	705.23^{a}

The body weight of 21-day-old chickens given 1 and 2% LGT was significantly higher compared to controls and chickens given 1% and 2% LDT. Feeding combinations of 1.2% inulin dahlia tuber and Lactobacillus sp. at 1.2 mL (108 cfu / m) in crossbreeding chickens has the effect of lowering intestinal pH, increasing the amount of LAB, decreasing total *coliform* and increasing body weight [16]. Use of synbiotics could improve performance of broiler chicken [8].

4. Conclusion

The natural additives LDT and LGT 1% and 2% could increase LAB and improve the performance of broiler chickens. The use of LGT 1% gives the best results on increasing LAB, decreasing total *Coliform* and increasing body weight of starter phase broiler chickens.

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