THE EFFECT OF SYNBIOTIC ON RELATIVE WEIGHT OF DUODENUM, JEJUNUM AND ILEUM OF NATIVE CHICKEN

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ABSTRACT

The research was to study the effect of synbiotic on relative weight of duodenum, jejunum and ileum of native chicken. A much as of 120 bird native chickens 6 weeks age old used in this study. The study consists of 6 treatments and 4 replicates. The treatments were P0: control, P1: diet with synbiotic 1%, P2: diet with synbiotic 1.5%, P3: diet with synbiotic 2%, P4: diet with synbiotic 2.5% and P5: diet with synbiotic 3.0% of synbiotic. Parameter observed were relative weight of duodenum, jejunum and ileum of native chicken. The result of study showed that the supplementation of synbiotic significat different ($p<0.05$) on relative weight of duodenum of native chicken but not significant effect on relative weight of jejunum and ileum of native chicken. In conclusion that the supplementation of synbiotic increased the relative weight of duodenum.

Keywords: Native Chicken, Small Intestine, Synbiotic

INTRODUCTION

Native chicken was one of Indonesia's local chickens that was kept by rural communities and does not have special characteristics (Nataamijaya, 2010). The farming of native chicken was widely developed by the Indonesian people, because the native chickens have a stable selling price, relatively more resistant to diseases and more adaptable to environmental conditions (Sumantri *et al*., 2020). However, the farming of native chicken had a problem that was low of the growth of native chickens so it was needed the longtime of rearing process. Therefore, an alternative was needed to increase the growth of native chickens, one of which was the supplementation of synbiotics.

Synbiotics was a combination of prebiotics and probiotics that work synergistically by providing a substrate to support the growth of probiotic bacteria (Adil and Magray, 2012). Inulin was a prebiotic that can stimulate the growth of lactic acid bacteria in the digestive tract so that nutrient absorption becomes more effective (Mookiah *et al*., 2014; Huang *et al*., 2015). Local ingredients from Indonesia that contain of inulin were gembili tubers. Winarti *et al.* (2011) stated that the inulin contained in gembili tubers was 14.77%. Inulin in gembili tubers was able to support the growth of *Lactobacillus plantarum* bacteria (Zubaidah and Akhadiana, 2013). In a previous study, synbiotic from inulin extract from gembili tuber combined with *Lactobacillus plantarum* was able to improve the intestinal ecology and efficiency of protein utilization of broiler chickens (Setyaningrum *et al*., 2019; Setyaningrum *et al*., 2020). Increasing the balance of the microbial ecosystem in the intestine will affect the improvement of intestinal health so support of the development of the digestive tract. Satimah *et al*. (2019) reported that supplementation of *Lactobacillus sp* increased of weight and length of duodenum of broiler chicken. This will have an effect on increasing nutrient absorption so the growth performance also increased. Based on this, in this study aimed to the effect of synbiotic on relative weight of duodenum, jejunum and ileum of native chicken.

LITERATURE REVIEW

Native chicken was one of the domestic chickens with a small and lean body size that was kept by the community for meat and eggs (Cahyono, 1997). To increase the productivity of native chickens, it was necessary to supplementary of feed additives, like of synbiotic which

were a combination of prebiotics and probiotics. Inulin was a type of prebiotic that was able to balance of microorganisms in the digestive tract (Roberfroid, 2007). Nabizadeh (2012) and Kozlowska *et al*. (2016) reported that the inulin can be reduced the pH of the digestive tract of broiler chickens, so it can to support the increased of the growth of beneficial bacteria. Gembili (*Dioscorea esculenta*) was a tuber from the Dioscoreacea family which contains of 82.82% starch, 13.26% amylose and 69.56 amylopectin and also inulin of 14.77% (Winarti *et al*., 2011).

Probiotics were live microorganisms which can increased the growth of beneficial bacteria and kept the balance of microbes in the digestive tract of the host if given at certain amount (Hesmati *et al*., 2018). *Lactobacillus plantarum* was a one of probiotic commonly used. Peng *et al*. (2016) reported that *Lactobacillus plantarum* increasing of the growth, short chain fatty acids (SCFA), lactic acid production in the ileum and cecum and also reduced the E. coli bacteria in caecum of broiler chicken. *Lactobacillus plantarum* also can grow in inulin media (Zubaidah and Akhadiana, 2013).

Synbiotics were combinations of prebiotics and probiotics that can provide benefits to the host, where the prebiotics provide the nutrition that can be utilized by probiotics (Sekhon and Jairath, 2010; Rooks and Garrett, 2016). Several studies on the use of synbiotics in chickens had good results on increasing of the growth performance. Hassanpour *et al*. (2013) and Abdel-Wareth *et al.* (2019), reported that the use of synbiotic can increase the growth, immunity and intestinal morphology of broiler chickens. The combination of inulin from gembili tuber extract and *Lactobacillus plantarum* can improve the growth performance of broiler chickens (Setyaningrum *et al*., 2019).

METHODS

Synbiotic preparation

Synbiotic preparation begins with preparation of gembili tuber flour. The manufacturing of gembili tuber flour was peeling of gembili tubers then sliced, dried and ground into gembili tuber flour. Manufacturing of synbiotic by mixing of gembili tuber flour with 5% of *Lactobacillus plantarum* (1 x 10^9 cfu/ml) and then incubated at 37 ºC of temperature for 4 days.

Treatments and collecting data

This study used 120 birds of native chicken at 6 weeks of age old, synbiotic from combination of gembili tuber flour and *Lactobacillus plantarum* and diet with 3000 kcal/kg of metabolizable energy (ME) and crude protein (CP) of 19% (Table 1). Treatments were P0: control, P1: diet with synbiotic 1%, P2: diet with synbiotic 1.5%, P3: diet with synbiotic 2%, P4: diet with synbiotic 2.5% and P5: diet with synbiotic 3.0% of synbiotic.

Table 1. Basal Diet

Ingredient	Composition (%)
Rice bran	10.00
Corn	55.00
Fish meal	10.00
Soy bean meal	20.00
Salt	1.00
Premix	1.00
Coconut oil	3.00
Amount	**100.00**
Metabolizable energy (kcal/kg)	3074.22
Crude protein (%)	19.17

Crude fiber (%)	5.02
Crude fat (%)	6.54

Native chicken at 6 weeks age old given of supplementation of synbiotic up to 11 weeks age old. As much as 120 birds of native chicken was placed at 24 units of experimental cages, each of contains of 5 native chickens. Data was collected consist of relative weight of duodenum, jejunum and ileum of native chicken. At the end of experiment the native chicken in each of replicated were fasted, then slaughtered, scalded, evisceration and selected of observed organs (duodenum, jejunum and ileum). Measurement of weight of duodenum, jejunum and ileum conducted by emptied of those organs and then weighted (Sugiharto *et al*., 2020).

Completely randomized design (CRD) used in this study with 6 treatments and 4 replications. Completely randomized design (CRD) was used in this study with 6 treatments and 4 replications. Data were obtained then analysed with ANOVA and continued with Duncan's multiple range test if different significant between treatments.

RESULTS AND DISCUSSION

Relative Weight of Duodenum, Jejunum and Ileum

The study showed that the relative weight of duodenum of native chicken was significant ($p<0.05$) affected by supplementation of synbiotic, but the weight relative of jejunum and ileum did not different by synbiotic supplementation. The data of relative weight of duodenum, jejunum and ileum presented at Table 2.

Table 2. Relative Weight and Length of Duodenum, Jejunum and Ileum of Native Chicken

Treatments	Relative Weight (%)		
	Duodenum	Jejunum	Ileum
P0	0.73[b]	1.02	0.85
P1	0.87[ab]	1.18	0.94
P2	0.75[b]	1.20	1.05
P3	0.78[ab]	1.04	0.92
P4	0.84[ab]	1.19	0.91
P5	0.93[a]	1.12	0.89

Means with different letter it the same column was significant different

Discussion

The data in Table 2 showed that the synbiotic treatment had a significant effect ($p<0.05$) on the relative weight of the duodenum of native chickens. The treatment of giving synbiotic as much as 3% (P5) had a better result of relative weight of duodenum compared to treatment without synbiotic administration (P0). The highest relative weight of the duodenum was achieved in treatment P5 of 0.93%, followed by treatment P1 at 0.87%, treatment P4 0.84%, treatment P3 0.78% and treatment P2 0.75%. The lowest of relative weight the duodenum was found in the P0 treatment of 0.73%. The results of this study similarly with the research of Satimah *et al*. (2019), the administration of Lactobacillus sp had a significant effect on the relative weight of the duodenum of broiler chickens. The results different from Wang et al. (2016), reported that prebiotic, probiotic and combination treatment had no significant effect on the relative weight of the duodenum.

The results of this study indicated that the synbiotic treatment can increase the relative weight of the duodenum of native chickens. This was because the administration of synbiotics can be stimulate an increase in the secretion of digestive enzymes so that an

increased in the activity of digestive enzymes in the digestive tract which will affects the increased of digestive and the absorption process of nutrients, especially in the duodenum (Chen *et al*. 2009; Sugiharto and Ranjitkar, 2019). Synbiotic supplementation was able to improve the morphology of the small intestine of broiler chickens as a result of the increased balance of microbes in the digestive tract due to inhibition of the growth of pathogenic bacteria, resulting in an increase in intestinal health (Setyaningrum *et al*., 2019, Shirani *et al*., 2019).

Data on Table 2 showed that the treatments of synbiotic had no significant effect ($p>0.05$) on the relative weight of the jejunum of native chickens. Treatment with synbiotics as much as 1.5% (P2) had the highest relative weight of jejunum compared to the treatment without synbiotic (P0). The highest relative weight of the jejunum was achieved in treatment P2 at 1.20%, followed by treatment P4 at 1.19%, treatment P1 1.18%, treatment P5 1.12% and treatment P3 1.04%. The lowest jejunum relative weight results were found in the P0 treatment of 1.02%.

Although not significant different, the results of this study indicated that the synbiotic treatment could increase the relative weight of the jejunum of native chickens. Sugiharto *et al*. (2020), as a result of the absorption of nutrients in the duodenum, so reduced the nutrients which can be absorbed in the jejunum, that was affected the reduced of activity of jejunum and ultimately affects the development of the jejunum. The results of this study liniearly with the research of Mashayekhi *et al*. (2018), the administration of eucalyptus leaves powder, antibiotics and probiotics did not significant effect on the relative weight of the jejunum. In contrast with Awad *et al*. (2006), giving probiotics to feed contaminated with deoxynivalenol (DON) was able to increase the relative weight of the jejunum of broiler chickens.

The study showed that the synbiotic treatment had no significant effect ($p>0.05$) on the relative weight of the ileum of native chickens (Table 2). The highest relative weight of the ileum was achieved in treatment P2 of 1.05%, followed by treatment P1 of 0.94%, treatment P3 0.92%, treatment P4 0.91% and treatment P5 0.89%. The lowest ileal relative weight results were found in the P0 treatment of 0.85%.

The results of this study indicated that the synbiotic treatment can increase the relative weight of the ileum of native chickens. The results of this study similarly the research of Yudiarti *et al*. (2020) that the administration fermented used rice did not significant effect on ileal weight. The results of this study were not in line with Wang *et al*. (2016), reported that prebiotic, probiotic and combination treatment had a significant effect on the relative weight of the broiler ileum.

CONCLUSION

In conclusion that the supplementation of synbiotic increased the relative weight of duodenum.

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