Effects of Dietary Supplementation of Natural Feed Additive on Leucocyte Profile and Lymfoid Organ of Broiler

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Abstract

Herbal, probiotic and prebiotic as natural feed additive have potential to replace antibiotic in poultry diet. This experiment was conducted to study the effect supplementation of herbal, probiotic, prebiotic and synbiotic in the diet on leucocyte profile and lymfoid organ of broiler. The experiment used 180 day- old Ross broiler chicks (unsexed) which were reared for 5 weeks. This experiment used completely randomized design with 6 dietary treatments and 3 replications. The dietary treatments were : 1. Basal diet as negative control (without feed additive), 2. Basal diet + antibiotic (bambermycin 0.05%) as positive control, 3.Basal diet + probiotic (EM4, 1cc/l), 4. Basal diet + prebotic (fermacto, 0.2%), 5. Basal diet + herbal mixed (Curcuma longa, Curcuma xanthorriza and Zingiber officinale, 1.5%), 6. Basal diet + synbiotic (EM4 , 1cc/l and Fermacto, 0.2%). At the end of feeding trial (5 weeks of age), 6 birds each treatment were sacrificed to measure the lymfoid organ (sleen and bursal fabricius). Blood sample were collected for heterofil and lymfosit measurement. There were no significant difference on spleen, heterofil (H) and lymfosit (L) due to dietary treatments. However, bursal fabricius of birds fed antibiotic, probiotic and synbiotic diets significantly ($p<0.05$) lower than birds fed negative control diet. Birds fed probiotic diet had lowest mortality as compared to other treatments. In conclusion, probiotic supplementation gives better health performance than other natural feed additive.

Key words: broiler, herbal, lymfoid organ, prebiotic, probiotic

Introduction

Feed additives have become essential components of feeds especially for monogastric animals. The use antibiotics as growth promoters has been banned in many countries due to public concern about their residues in animal products and the development of antibiotics resistance bacteria (Lee *et al*., 2004). This condition lead the nutritionist to investigate natural products as alternative to replace antibiotics.

Probiotic, prebiotic and herbal can be used as alternatives to replace antibiotic as growth promoter in poultry diet. Probiotics are living microorganism, not absorbed in the digestive tract, no tissue residue, no mutation of other mocroorganism and they improved growth and feed efficiency (Lopez, 2000). It was reported that probiotics benefit to host animal by improving immunity, preventing harmful microorganism, providing digestive enzymes and stimulating syntesis B groups vitamin (Rolfe, 2000; Gunai *et al*., 2006; Asli *et al*., 2007). Prebiotic have been defined as non digestible feed ingredient as substrates for growth beneficial bacteria already existing in caecum and colon. Several studies have shown that addtion of prebiotics to poultry diet improved the performace and immune response through improving gut microflora (Piray *et al*., 2007, El- Husseiny *et al*., 2008). Synbiotic was combination of prebiotic and probiotic. The aplication of probiotics and prebiotics in broiler diet improved the performace (Aftahi *et al*., 2006; Kermanshahi and Rostami, 2006).

Herbs and spices can be use as alternatives to AGPs (antibiotic growth promoters) in poultry diet due to their anti microbial properties, antioxidant activity and digestion aid including stimulation of endogenous enzym activity. Among the herbs, *Curcuma longa* (turmeric), *Curcuma xanthorrhiza* (javanese turmeric) and *Zingiber officinale* (ginger) has been used for centuries as medicinal plant in Indonesia. The main bioactive compound from *Curcuma longa* and *Curcuma xanthorrhiza* is curcumin. Curcumin have wide spectrum of biological actions including anti inflammatory, antioxidant, anticarcinogenic, antimutagenic, anticoagulant, antifertilty, antidiabetes, antibacterial, antifungal, antiprotozoa, antiviral, antivibrotic, antiulcer, hypotensive and hypocholesteremic activity as reviewed recently (Chattopadhyay *et al*., 2004). *Curcuma xanthorrhiza* also had essential oil known as xanthorrhizol. This compound have some biological action including antibacteria, antifungal (Rukayadi, 2011), antioxidant, antiplatelet effect, immnomodulatory and cardiovascular protective properties (Jantan, 2011). *Zingiber officinale* or ginger contain zingiberen and zingerol as mayor componen that can stimulate digestive enzyme. The bioactive of ginger can reduce phatogenic bacteria and improve the appetite. Herawati (2010) reported that feeding red ginger in the diet improved broiler performance and feed efficiency.

Today, the farmer can choose one of some natural products for improve poultry productivity and health performance. Therefore, this study was conducted to evaluate the effects of dietary probiotic, prebiotic and herbal on leucocyte profile and lymfoid organ of broiler.

Materials and Methods

Animals and Diets

This experiment was conducted at Laboratory of Poultry Nutrition, Faculty of Animal Science, Bogor Agricultural University. The experiment used 180 day-

old *Ross* broiler chicks (unsexed) which were reared for 5 weeks. The chicks were reared on deep litter system in open side house with standard management conditions. The dietary treatments were : 1. Basal diet as negative control (without feed additive), 2. Basal diet + antibiotic (bambermycin 0.05%) as positive control, 3.Basal diet + probiotic (EM4, 1cc/l), 4. Basal diet + prebotic (fermacto, 0.2%), 5. Basal diet + herbal mixed (*Curcuma longa*, *Curcuma xanthorriza* and *Zingiber officinale*, 1.5%), 6. Basal diet + synbiotic (EM4 , 1cc/l and Fermacto, 0.2%). *Curcuma longa*, *Curcuma xanthorrhiza* and *Zingiber officinale* powder were purchased from local market. These herbal were mixed (ratio 1:1:1) before incorporated at level 1.5% to the experimental diet. Level of herbal in this experiment base on our previous research. Antibiotic, probiotic and prebiotic used in this experiment were commercial product. All level of these feed additive according to company recomendation. Basal diet was formulated to met broiler requirement according to NRC (1994) recommendation. The ingredient and nutrient composition are presented in Table 1. Proximate analysis of basal diet was conducted according to AOAC (1984). At the end of feeding trial (5 weeks of age), 6 birds each treatment were sacrificed to measure the lymfoid organ (spleen and bursal fabricius). Blood sample were collected for heterophil and lymphocyte measurement.

Table 1. Composition of basal diet, *as fed*

Ingredients	%
Yellow corn	46.0
Rice bran	12.2
Soybean meal	27.0
Fish meal	10.0
Vegetable oil	3.5
CaC03	0.8
Premix[1]	0.5
Total	100.0
Nutrients analysis	
Gross Energy (kcal/kg)	4,455
Crude Protein (%)	23.15
Crude Fiber (%)	5.28
Ca (%)	0.97
P total (%)	0.58

Note: [1]Each kg premix contain : Vit.A 9000 IU, Vit.D 2000 IU, Vit.E 12 IU, Vit.B1 0.5 mg, Vit. B6 1 mg, Niacin 15 mg, Panthotenic acid 12.5 mg, antioksidan 100 mg.

Statistical analysis

This experiment used completely randomized design with six dietary treatments and three replications (10 birds/replication). All data were subjected to analysis of variance according to Steel and Torrie (1995). Significant treatment means were futher tested using Duncan's multiple range test (Duncan, 1955).

Results and Discussion

The effects dietary supplementation of natural feed additive on leucocyte profile and lymfoid organs of broiler are presented in Table 2.

There was no significant different on spleen, heterophil and lymphocyte percentage due to dietary treatments. Spleen is cite for lymphocyte production. Supplemented natural feed additive did not affect the spleen organ, it indicated that lymphocyte production did not affected by the treatments. Lymphocytes are important immune cells that play critical role in maintaining immune function. Results in this experiment showed that hen fed natural feed additive had a good immun function as compared to that of antibiotic.

Bursa fabricius of hen fed herbal diet significantly ($p<0.05$) higher than those of other treatments. Herbal used in this experiment contain some bioactive compound from ginger, turmeric and javanese turmeric. These bioactive compound might be cause bursal fabricius bigger than other natural feed additive. Our results showed that natural feed additive can replace antibiotic in poultry diet. Among natural feed additive, probiotic was better than prebiotic, synbiotic and herbal, it has the lowest mortality rate.

Table 2. Effects of natural feed additive on spleen,bursal fabricius, heterofil, lymfosit, and mortality of broiler at 5 weeks of age

Treatment	Spleen (%)	B. Fabricius (%)	Heterophil (%)	Lymphocyte (%)	Mortality (bird)
Basal diet	0.17±0.06	0.12±0.02^{b}	34.67±19.60	64.33±18.04	6
Antibiotic	0.18±0.05	0.09±0.01^{c}	22.33± 4.04	77.00± 5.00	5
Herbal	0.14±0.01	0.36±0.01^{a}	20.67±15.04	78.67±14.57	8
Probiotic	0.17±0.04	0.08±0.01^{c}	51.33±24.83	48.33±25.38	3
Prebiotic	0.24±0.09	0.11±0.03^{b}	21.00± 8.19	78.00± 7.94	8
Synbiotic	0.20±0.07	0.09±0.01^{c}	36.67± 5.69	62.67± 5.13	4

Note: $^{a-c}$ Means in the same coloum with different superscript are significantly different ($p<0.05$)

Conclusion

In conclusion, probiotic, prebiotic, synbiotic and herbal could replace antibiotic as antibiotic growth promoter in poultry diet. Among natural feed additive, probiotic was better in decreasing mortality.

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