Evaluation of Fermented Rice Bran-Tofu Waste by Monascus purpureus in the Diet on Performance and Quality of Meat Broiler

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Abstract

An experiment was conducted with 80 unsexed broilers of the Arbor Acres strain to evaluate utilization of fermented product by Monascus purpureus in broiler diet on performance and carcass quality. This study involved a completely randomized design (CRD) with 5 treatments (0, 5, 10, 15, and 20% of fermented product by Monascus purpureus in diets) and 4 replicates per treatment. Diets were isonitrogenous (22% crude protein) and isocaloric (3000 kcal/kg diet). Measured variables were performances (feed consumption, weight gain, feed conversion), quality of meat carcass (fat and cholesterol). Data were analyzed by analysis of variance for CRD. Increasing fermented product by Monascus purpureus levels in the diets increased feed consumption, weight gain but decreased (P<0.01) feed conversion, meat carcass (fat and cholesterol). In conclusion, up to 20% of fermented product by Monascus purpureus could be included for the broiler diet to increased performances and decreased 33.88% cholesterol of meat broiler.

Keywords: feed conversion, fermentation, meat cholesterol, Monascus purpureus

Introduction

Product fermented high carotenoids (β carotene and monacolin) based on by-product could be used as alternative poultry diet, substituted conventional feed stuffs still import. In Indonesia some of corn, soybean meal and fish meal are still imported from abroad. It resulted in a high cost of diets for poultry. The utilization of waste materials from agricultural or industrial wastes (by-products) is often applied to overcome the problem of feed shortage in poultry industry. Feed diversification in the poultry diet is one of many attempts to reduce the cost of feed in the poultry industry.

Another advantage using fermented product high monacolin was reduced egg and meat cholesterol, so egg and meat safe to eat for anyone including people with
Results of the research before, reported that utilization fermented products by *Monascus purpureus* (high monacolin) substituted corn 40.06% and decreased cholesterol of meat 35.09 respectively (Nuraini, 2012). Eisenbrand (2005) reported that used of 2.4 g/day product fermented with *Monascus purpureus* containing 10 mg monacolin (lovastatin) for 12 weeks decreased total cholesterol, LDL cholesterol, triglycerides and increased HDL cholesterol blood serum of rats. According Endogrul (2004), monacolin or lovastatin is secondary metabolites produced by *M. purpureus* as hypocholesterolemia agent.

Substrate for fermented product high carotenoid can used solid substrate based on agro waste/waste agricultural products such as waste of (sago, cassava and tofu) are widely available in the area of West Sumatra (Nuraini *et al.*, 2009). Wastes are potentially large to be used as animal feed, because high availability, while still containing nutrient content and not compete with human needs. The success of a solid media fermentation of carotenoid fungi is depend on the given optimum conditions such as: substrate composition, substrate thickness, inoculum dose and duration of incubation. Result of the research before reported that the optimum conditions of *M. purpureus* to produce rich monacolin and to increase the nutrient content of fermented products were composition of substrate contain of a mixture of 80% rice bran and 20% tofu waste, the thickness of the substrate 1-2cm, inoculum dose 10% and long incubation 8 days. Nutrient content of fermented product by *M. purpureus* increased if compare with before fermentation. Protein content increased from 14.85% to 20.22 %, monacolin increased from 0 mg/kg to 400.71 mg/kg. So that this experiment want to study the effect of feeding fermented product by *M. purpureus* (high carotenoid monacolin) in the diet on performance and quality of meat broiler.

### Materials and Methods

One hundred (100) 4 days old CP 707 broiler chicks were study in this experiment. The chicks were individually weighed and randomly selected and allocated to each of the five different level of fermented product by *M. purpureus*. Product fermented contain 60% rice bran with 40% tofu waste then added aquades (water content 70%), stirring evenly, sterilized the material 30 minute after boiling water, then allowed to reach room temperature. Inoculated with 10% inoculum *M. purpureus* and incubated for 8 days (Nuraini *et al.*, 2009). After the fermentation products are harvested, dried by using sunlight. Own diets were formulated from ingredients such as corn, soybean meal, fish meal, rice bran, product fermented by *M. purpureus*, coconut oil and CaCO$_3$. The broilers were given a diet with 22% crude protein and 3000 ME kcal/kg feed. Composition of ration and their nutrient content are presented in Table 1 and 2.
The experimental design used was Completely Randomized Design (CRD) with 5 treatments: 0%, 5%, 10%, 15%, and 20% of fermented product in the diet and 4 replications. The variables observed were feed intake (g/bird), weight gain (g/bird), feed conversion, meat cholesterol (mg/100g), and meat fat (%). Data obtained was subjected to analysis of variance. Where significant differences occurred, the means will be separated using Duncan multiple range test (DMRT).

Results and Discussion

 Feed Consumption, Body Weight Gain and Feed Conversion: The effect of feeding fermented product by *M. purpureus* on performance and quality of meat broilers are presented in Table 3. Increasing product fermented by *M. purpureus* in
the broiler diet were significantly (P<0.05) affected feed consumption, weight gain, feed conversion meat cholesterol and meat fat.

Feed consumption of broiler highest at the treatment using 20% product fermented by \textit{M. purpureus}, it showed that the fermented product by \textit{M. purpureus} preferred (palatable) up to 20% in the diet, eventhough with reduction of corn and soybean meal in each of these treatments. This is caused by fermentation with \textit{M. purpureus} produced a distinctive flavor that is preferred bird (palatable). In accordance with the opinion of Murugesan et al. (2005), fermentation products have a preferred flavor and has a few vitamins (B1, B2, and B12) that are preferred when compared to original material.

The effect of feeding fermented product by \textit{M. purpureus} on weight gain, the present data demonstrated that treatment fed PF 20% and PF 15% (986.99g/bird and 959.70g/bird, respectively) higher than (P<0.05) as compared to birds fed PF 10%, 5%, and PF 0% (893.69g/bird, 858.72g/bird and 782.42g/bird, respectively). High weight gain of broiler, it mean high feed nutrient in the diet which use to produce meat, so it can increase weight gain. According Gunawardana et al. (2008), weight gain is influenced by feed intake, especially protein intake. High weight gain indicate that the product fermented by \textit{M. purpureus} until level 20% in broiler diets that reduce the use of corn and soybean meal (40.34% and 35.67%, respectively) was still preferred (palatable) by livestock. In addition, the high weight gain in treatment E (20% PF) compared to treatment A (0% PF) due to the product fermented by \textit{M. purpureus} produced unsaturated fatty acid were oleic acid (omega 9), linoleic acid (omega 6) and linolenic acid (omega 3) (Lin et al., 2005). According Grobas and Mateos (1999), 1.5% to 2% linoleic acid is needed for birds during growth or the production phase of the first egg laying period. Linoleic acid deficiency in the diet can reduce egg production.
The low feed conversion ratio at treatment E than in treatment A is caused by feed intake and weight gain also differed significantly (P<0.05). According Varkoohip et al. (2010), feed conversion ratio is the ratio between feed intake in producing a number of meat. Feed conversion can be used as a picture of the production coefficient, the smaller value mean more efficient use of feed to produce meat.

**Meat Cholesterol and Meat Fat**

The data of meat cholesterol and meat fat showed that the treatment fed PF 20% had lower mean value (P<0.05) of meat cholesterol and meat fat than the treatment PF 15%, PF 10%, PF 5% and PF 0%. Low cholesterol of meat broiler in treatment E compared to other treatments, associated with the use of fermented product rich monacolin. Increasing fermented product by *M. purpureus* in the diet caused the higher content of carotenoids monocolin. Monacolin is hypcholesteroleemia agent. According to Erdogrul and Azrak (2004) that red yeast rice (fermentation by *M. purpureus*) produced monacolin that can inhibit the action of the enzyme-CoA reductase Hydroksimetyl Glutaryl (HMG Co-A reductase) that play a role in the formation of mevalonat in the synthesis of cholesterol so that cholesterol is not formed. The results of this study showed that fermented product by *M. purpureus* until level 20% decreased meat cholesterol 33.88%.

**Conclusion**

Increasing fermented product by *Monascus purpureus* in the diet can improved the performance and meat quality of broiler. Feeding fermented product by *M. purpureus* up to 20% in broiler diet obtained 986.99 g/bird body weight, feed conversion ratio 2.14 can reduced meat cholesterol 33.88%.

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