THE EFFECT OF TUMERIC (*Curcuma domestica*) SUPPLEMENTATION ON BROILERS PERFORMANCES

Wiranda G. Piliang[1], A. Sengngeng and A. Agustiana

INTRODUCTION

The animal productivity is very much influenced by the quantity and quality of the ration consumed. Many factors can influence the quality of the ration, among them is the procedure to store feedstuff or ration.

Under tropical temperature like Indonesia where the humidity is relatively high, more than 70% yearly average, some feedstuffs with high fat content are prone to deteriorate easily due to oxidation processes that cause rancidity. As a media or substance for the growth of microorganisms such as mold, feedstuffs with high fat content would easily get toxic.

The addition of chemical substances such as antioxidants, antitoxins and antibacterial or feed additive would increase the production cost and might cause some negative effect as the residues of some chemicals retain in the animal products (milk and carcass).

According to some previous researches some medicinal plants that grow in Indonesia contain antioxidant, antitoxin and anti bacteria activities which is very beneficial for human and animals, for example tumeric (Curcuma domestic). Somaatmadja (1985) reported that tumeric has preservative activity.

This research was conducted in order to study the effect of tumeric supplementation as antioxidant, antitoxin and antibacterial in broilers' diet.

MATERIALS AND METHODS

Five different treatments; 0% (To), 0.20% Butylated Hydroxy Toluene, BHT (T1), 200 ppm (T2), 400 ppm (T3) and 600 ppm (T4) of tumeric was added in the diets. Broilers were raised from one day old up to 8 weeks of age. The parameters observed were the aflatoxin content, thiobarbituric acid (TBA) and peroxide number in the diet. As for the broilers, the data were taken for the average body weight, the weight and the percentage of the Bursa fabricius and the average percentage of lymphocytes and heterophyls.

The data were analyzed statistically using a complete Randomized Design (Steel and Torrie, 1981) with 5x4 factorial design, and split-plot design.

RESULTS AND DISCUSSIONS

The peroxide number was an early indicator to detect the fat deterioration in the diet. Adding tumeric powder in the ration

Table 1. The Peroxide Number Content in the Diet during the Storage

Treatments	Peroxide Number (meq/kg)			
	0 week	2 weeks	4 weeks	8 weeks
Control	3.22	3.65	7.07	6.46
0.02% BHT	2.95	3.44	6.59	6.29
0.2% tumeric	2.55	3.44	6.08	5.39
0.4% tumeric	2.42	3.14	4.95	4.85
0.6% tumeric	2.21	2.91	4.68	4.59

[1] Faculty of Animal Science, Bogor Agricultural University, Bogor, Indonesia

Table 2. The TBA content in the Diet during the Storage

Treatments	TBA content (mg/kg)			
	0 week	2 weeks	4 weeks	8 weeks
Control	0.51	0.35	0.32	0.17
0.02% BHT	0.45	0.27	0.29	0.14
0.2% tumeric	0.45	0.31	0.31	0.11
0.4% tumeric	0.43	0.37	0.25	0.12
0.6% tumeric	0.42	0.23	0.22	0.11

decreased the peroxide number. The treatment diets with different levels of tumeric supplementation gave lower peroxide number as compared to the control diet or the diet with BHT supplementation (Table 1). Tumeric (Curcumin) contributed the H-atom to free the radical site as to avoid the formation of peroxides (figure 1). Another way to evaluate fatty acid oxidation is to measure the thiobarbituric acid (TBA). All diets with different levels of tumeric had low level of TBA number as compared to that of the level in the control or in the diet with TBA supplementation (Table 2). Jitoe *et al.* (1992) reported that the antioxidant activities in some curcumin species such as *Curcuma domestica, C. xanthorrhiza, C. mangga, C. aeruginosa, C. heyneana, Alpinia galanga, Zingiber cassumunar, Amomun kapulaga, and Phaeomeria speciosa* as compared to that of the alpha-tocopherol , found out that the *Curcuma domestica* gave the lowest TBA number.

The total aflatoxin content (B1, B2 and G1) in the diet with antioxidant supplementation gave significant influence, so as to the effect of the period of storage and the interaction between the addition of antioxidant and the length of storage (Table 3). This table showed that the longer the ration was stored the higher the concentration of the aflatoxin content. Curcumin in tumeric is in the form of phenolic. The addition of tumeric in the treatment diets prevented the aflatoxin production. Pelczar *et al.* (1977) reported that the phenolic compound had antimicroba activity Curcumin in tumeric prevented the aflatoxin accumulation and converted the aflatoxin into a compound that could dissolve easily.

The higher the curcumin content in the diet the lower the aflatoxin content in the diet (Table 4). The aflatoxin content in the diet with BHT supplementation was higher than that of the treatment diets with tumeric supplementation. The diets with tumeric

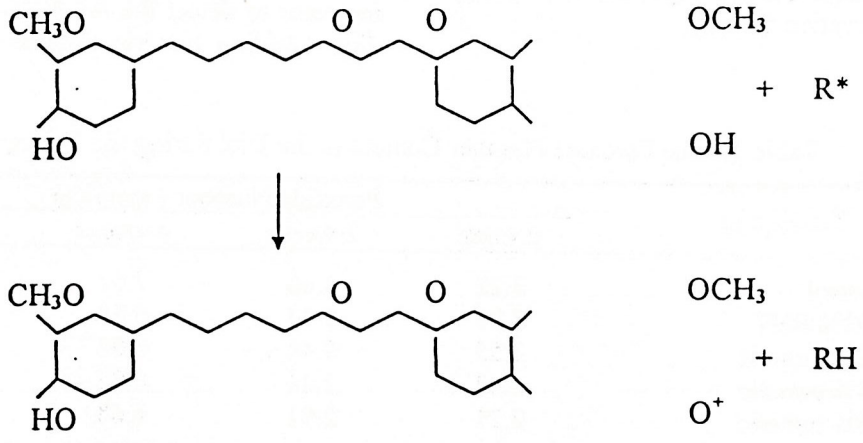

Figure 1. Reaction between Curcumin and Free radical (R*)

Table 3. The Total Aflatoxin content in the Diets during the Storage

Treatments	Total Aflatoxin content (ppb)			
	0 week	2 weeks	4 weeks	8 weeks
Control	109.0	304	344	384
0.02% BHT	51.2	41.6	162	190
0.2% tumeric	58.4	62.4	67.6	352
0.4% tumeric	16.0	49.6	62.4	140
0.6% tumeric	58.4	58.4	62.4	140

Table 4. The Percentage of Total Aflatoxin decrement in the Diets after 8 week-storage

Treatments	Total Aflatoxin at 8-week storage	Δ (ppb)	Δ (%)
Control	384	-	-
0.02% BHT	190	194	50.52-
0.2% tumeric	352	32	8.33
0.4% tumeric	140	244	63.54
0.6% tumeric	140	244	63.54

Table 5. The Average Body Weight of the Broiler (grams)

Period (week)	Treatments			
	T 0	T2	T3	T4
I	122.3	117.0	126.0	129.2
II	272.2	257.3	277.2	277.5
III	523.3	496.2	506.7	510.0
IV	852.8	859.8	859.8	835.9
V	1252.2	1285.0	1291.5	1255.7
VI	1607.3	1654.0	1663.8	1636.7
VII	1916.9	1950.9	1975.5	1935.4
VIII	2124.4	2202	2139.6	2247.9

Table 6. The average Percentage of the Bursa Fabricious over the live Body Weight of the Broilers

Period (week)	Parameter	Treatments			
		T0	T2	T3	T4
IV	Bursa f (gram)	2.57	3.16	2.76	2.72
	Bursa f (%)	0.29	0.36	0.30	0.31
VI	Bursa f (gram)	2.94	2.17	3.88	3.49
	Bursa f (%)	0.18	0.12	0.24	0.21
VII	Bursa f (gram)	2.34	2.81	3.23	2.73
	Bursa f (%)	0.13	0.12	0.14	0.12

Table 7. The average Percentage of Lymphocytes and Heterophyls

Period (week)	Leucocyts	Treatments			
		T0	T2	T3	T4
IV	Lymphocyt (%)	84.00	77.00	76.67	56.67
	Heterophyls (%)	11.00	21.00	19.33	41.0
VI	Lymphocyt (%)	80.33	76.33	80.00	67.67
	Heterophyls (%)	18.00	22.00	18.67	31.33
VII	Lymphocyt (%)	70.33	69.67	76.00	65.67
	Heterophyls (%)	26.67	27.67	22.00	34.00

supplementation when given to the broilers gave higher body weight as compared to that of the broilers given the diet without tumeric (Table 5).

The effect of tumeric as an antibacterium for broilers was observed from the size and weight of the bursa fabricious, the percentage of lymphocyte and heterophyl. There was a tendency that the weight and the percentage of the bursa fabricious of the broilers were higher than that of the broilers with no tumeric supplementation in the diet (Table 6).

The addition of tumeric in the diet decreased the percentage of lymphocytes and increased heterophyls in the blood. The highest percentage of heterophyls and the lowest lymphocytes were found in the bloodof the broilers given 0.6% tumeric powder (Table 7).

The highest heterophyl content in the blood reflected the resistantcy of the chicken to prevent diseases, and followed by the lymphocyte activity in protecting the body against diseases.

CONCLUSION

Tumeric (Curcuma domestica) in a form of powder supplemented in broilers' diets has the capacity to prevent the diet from fat deterioration and therefore prevent rancidity and depressed aflatoxin development. The level of tumeric powder that gave the best performance for broilers was 600 ppm (0.6%). The tumeric powder also increased the broiler body resistant.

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