

THE USE OF TURMERIC (*Curcuma domestica* Val.) AND ZINGIBER (*Zingiber aromaticum*) MEAL MIXTURE IN THE BROILER DIET

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ABSTRACT

In poultry production, antibiotic is one of common feed additives being used in order to improve growth and feed conversion. However uncontrolled use of antibiotics would give negative effects to the consumers health. Indonesian herbal medicines are very common to be used as human as well as animal medicines. Turmeric (*turmeric*) and zingiber (*zingiber*) contain bioactive agents which can kill microorganisms. Some previous experimental results showed that the use of turmeric and zingiber meal in broiler diet, may improve feed efficiency, weight gain, carcass and income over feed and chick cost (IOFCC).

Keywords : Bintang, turmeric, zingiber, broiler.

INTRODUCTION

The broiler industry is growing rapidly because it can provide meat very fast due to its high growth rate. Feed cost in broiler industry is around 60 – 70 % of the total cost, hence the farmers should be able to improve the feed efficiency as high as possible. Yet, it is not easy because Indonesia is a tropical country which is very suitable for the growth of microorganisms that may depress the broiler growth rate. Usually the farmers utilize the antibiotics as feed additives to help control the diseases. However, there is a tendency that farmers try to reduce the use of antibiotics in order to avoid negative effects to the consumers. In fact, many consumers both in developed and developing countries put more attention and interest in organic foods which is believed to be healthier and safer food. According to Guo *et al.* (2003) more than 6000 natural medicines are recognized in China, some 77 % of these originating in plants. He believed that these plants are containing polysaccharide derivatives which are immunoactive. Currently small scale farmers are using traditional herbal medicines to prevent or cure the diseases, also to give better yellow color to the carcass and egg yolk (Somaatmadja, 1981). Curcumin acts as antibacteria while zingiber containing flavonoid with characteristics of antibacteria, anti virus and anti oxidant. This paper elaborate the use of zingiber and turmeric mixture as part of broiler diet.

Turmeric and Zingiber

Turmeric has been for long time considered as one of herbal medicines, which is also function in giving better aroma, taste, yellow color and reduce the fishy smell of the (chicken) meat. Turmeric is also used as traditional cosmetics (Nurfina, 1998). The color of turmeric meat is yellowish orange, with specific odor, bitter and hot ((Nurfina, 1998; Rahmat, 1994). The main biochemical contents of turmeric are its oil (atsiri), curcuminoid and bisdemetoxy curcumin. Mature turmeric tuber contains 10 %

curcuminoid, 1-5 % curcumin and the rest are demetoxoy curcumin and bisdemetoxoy curcumin. The oil content is 4 – 5 % composed of turmerone (60%) and zingiberene 25 % (Purseglove *et al.*,1981).

Curcumin is also able to stimulate the bile sac to release bile emulsion to take part in digestion process while the oil prevent excessive acid secretion in the stomach (Tampubolon, 1995; Darwis and Hasiyah,1991).

The addition of turmeric into the chicken diet improves the yolk color and reduces the feces odour, improves the immunity and gives better taste to the meat. Turmeric is also known as good remedies for some digestive difficulties and eliminate bad smell of human sweat.

Several studies revealed that turmeric the extracts have anti microbial effects (Allievi and Gualandris, 1984; Apisariyakul and Niyomika,1986; Niaz *et al.*, 1994; Torreset al., 1995). The main active substance of turmeric extract is identified as curcumin, a strong anti oxoxidant (He, 1998; Torres *et al.*, 1998; Uncherm, 1998; Asai *et al.*,1999; Murray and Pizzorno, 1999; Dang et al.,2000). Another anti oxidant as turmerin has also been isolated from turmeric extract (Srinivas et al.,1992).Darwis and Hasiyah (1991) found that zingiber contains Zerumbon, Koriofler, Kamfer, Siniol. Humular and Limonen. According to Tampubolon (1995) Zerumbon is an anti stiffness agent while limonen is good for increasing the blood erythrocytes number.

Turmeric and Zingiber In The Diet

Bintang and Nataamijaya (2005) reported the use of turmeric in the broiler diet (Table 1) The addition of 0 – 0,16 % turmeric meal did not give any significant effect on the growth rate. However, it reduced the feed intake if compared with the control group. The feed intake reduction caused by lower palatability of the diet due to changes of its smell, bitter and hot. The use of turmeric at level of 0,08 – 0,16 % reduced the weight gain and feed intake, but at level 0,04 % turmeric supplementation resulted in higher weight gain but lower feed conversion.

This level (0,04%) may be an optimal level where the pathogen microorganisms were killed and therefore resulted in better digestive process (Susilawati et al.,1985).

Samarasinghe *et al.*, (2003) showed turmeric as alternative to feed antibiotic for broiler. Antibiotic (virginiamycin) and turmeric low level (1g/kg) in the first trial (Table 2) generally improved the weight gain of broiler by 5,3 % and 3,4 %, respectively. In the second trial (Table 3) they increased the weight gain ($P<0,05$) by 8,8 % and 15,1 %, respectively. Additives improved the feed efficiency up to 15.1 %. Virginiamycin and turmeric 1g/ kg markedly reduced the abdominal fat content 1.44 % and 1.0 % body weight, respectively, compared with 1,91% in the group control in the first trial The second trial were 1,01% and 0,60%, respectively, compared with 1.22 % in the control group.

Table 1. Effect of turmeric supplementation in broiler performance at 7 week old¹

Parameters	Turmeric meal (%)				
	0	0.04	0.08	0.12	0.16
Weight gain (g)	1312 ^{ab}	1317 ^a	1198 ^b	1227 ^{ab}	1226 ^{ab}
Feed intake (g)	2505 ^a	2410 ^{bc}	2455 ^{ab}	2430 ^b	2355 ^c
Feed conversion	1.91 ^b	1.83 ^b	2.05 ^a	1.98 ^{ab}	1.92 ^b
Mortality (%)	0 ^a	0.66 ^a	0 ^a	0.132 ^a	0.66 ^a

^{a,b}Different superscripts the same row are different ($P<0,05$).

¹Source: Bintang dan Nataamijaya (2005)

Liang *et al.* (1985) showed that curcumin in the chicken diet reduced the body fat, so that the total body weight was also decreased. While Awang *et al.* (1992) reported that the addition of 10 mg/kg turmeric in the broiler diet increased the yellow color intensity of the meat.

Jarmani and Nataamjaya (2001) as showed in Table 4, reported that the addition of 0 – 0,16 % zingiber did not give significant effect in the broiler performance, but at level 0,08 – 0,16 % resulted is better weight gain with lower feed conversion while the IOFCC was increased. Nataamijaya *et al.* (1999) indicated that the addition of 0-0,16 % zingiber meal together with 0,04 % turmeric increased the feed intake (Table 5) this caused by the act of bioactive contents of zingiber which increased palatability. The weight gain was also better, with zero mortality and higher IOFCC at level 0,16 %. Bintang and Nataamijaya (2006), found that the use of turmeric and zingiber tended to increase the weight of carcass part such as legs, breast and wings (Table 6). The bacteriostatic activity of turmeric contents killed the E.Coli (Susilawati *et al.*, 1985; Ramprasad and Sirsi. 1975) and also micrococcus pyogenes and staphylococcus helped in decreasing the pathogenic microorganisms in the chicken house because the chicken faeces contain only very small number of it

Nataamijaya *et al.*, (1999) as showed in Table 7, elaborated that the addition of 0,16 % zingiber tended to increase the value of hematocrit and haemoglobin while the level of lymphocyte was decreased. The addition of 0,04 % turmeric meal and 0,16 % of zingiber significantly increased the number of heterophils due to its characteristics which is the most motil and responsive among the blood cells (King and Mc.Lelland, 1989; Sturkie,1970), make it easily affected by condition changes. In opposite, the addition of turmeric and zingiber reduced the pathogenic microorganisms in the body so it is relatively free of inflammation. This condition keep heterophils within the blood stream make it percentage high which in turn decreased the lymphocyte concentration. At the zingiber level of 0,02 and 0,04 % the number of microorganisms in the faeces was same as the control group. While at level 0,08 % of zingiber there was tendency that the microorganisms number was lower than control group. The addition of 0,16 % zingiber significantly decreased the microorganisms number of compared with the other group. Low number of microorganisms in the faeces make the diseases control much easier and cheaper to conduct..

CONCLUSION

The supplementation of turmeric and zingiber in the broiler diet, improve the performance, IOFCC and may decrease the mortality rate to the lowest.

Table 2. Effect of antibiotic(AB) and different levels of turmeric in Experiment 1¹

Parameters	Turmeric				
	Control	AB	1g/kg	2g/kg	3g/kg
Daily weight gain (g)	51.46	54.2	53.2	51.78	52.45
Daily feed intake (g)	110,7	112,2	112,4	110,5	112.4
Feed conversion	2,15	2.07	2.11	2.13	2.18
Abdominal fat	1,91	1,44	1.20	1.41	1.00

¹Source: Samarasinghe *et al.* (2003)

Table 3. Effect of antibiotic (AB) and turmeric in Experiment 2¹

Parameters	Treatments		
	Control	AB	Turmeric 1 g/kg
Daily weight gain (g)	52,85 ^a	57,48 ^b	60,81 ^b
Daily feed intake (g)	109,7	107,6	108,4
Feed conversion	2,07	1,86	1,76
Abdomonal fat	1.22	1,91	0.60

^{a,b}Different superscripts the same row are different (P<0,05)

¹Source: Samarasinghe *et al.* (2003).

Table 4. Effect of Zingiber meal supplementation in the broiler performance at 5 week old¹

Parameters	Zingiber meal (%)				
	0	0,02	0,04	0,08	0,16
Weight gain (g)	1219 ^a	1207 ^a	1188 ^a	1297 ^a	1265 ^a
Feed intake (g)	3023 ^a	2994 ^a	3030 ^a	3095 ^a	3028 ^a
Feed conversion	2,52 ^a	2,52 ^a	2,55 ^a	2,39 ^a	2,40 ^a
IOFCC(rupiah)	5332	5491	5129	6300	6207

¹Source: Jarmani dan Nataamjaya (2001).

^{a,b}Different superscripts the same row are different (P<0,05)

Table 5. Effect of turmeric and Zingiber meal supplementation in the broiler performance¹

Parameters	Treatments (%) ²				
	Control	0,04 K+0,02 L	0,04K+0,04 L	0,04K+ 0,08 L	0,04 K+0,16 L
Feed intake (g)	2884	2853	2960	2912	2921
Weight gain (g)	1266	1367	1280	1286	1420
Feed conversion	2,28	2,09	2,31	2,26	2,06
IOFCC(Rp)	1861	2732	1813	1862	3036

¹Source: Nataamjaya *et al.* (2000).

²K= turmeric L= zingiber

Table 6. Effect of turmeric and zingiber meal supplementation on carcass cut¹

Parameters	Treatments (%)				
	Control	0,04 K+ 0,02 L	0,04 K+0,04 L	0,04K+ 0,08L	0,04K+ 0,16L
Carcass cut					
Leg	463	554	509	492	465
Breast	426	499	470	459	433
Back	336 ^a	428 ^b	411 ^b	391 ^{ab}	364 ^a
Wings	250	268	284	259	255

¹Source: Bintang dan Nataamijaya (2006)

²K= turmeric L= zingiber

^{a,b}Different superscripts the same row are different (P<0,05)

Table 7. Effect of turmeric and zingiber meal Terhadap supplementation on erythrocyte, leucocyte and bacteria faeces¹

Parameters	Treatment (%)				
	Control	0,04K +0,02 L	0,04K+ 0,04L	0,04K +0,08%L	0,04K+0,16L
Hematocrid	31,5	27,5	28,0	29,0	32,5
Haemoglobin	11,2	10,4	10,4	10,8	11,6
Heterophils	25,30 a	25,93 ^{ab}	26,34 ^b	24,32 ^a	27,52 ^c
Lymphyocyte	63,57 ^a	63,10 ^{abc}	62,66 ^{bc}	62,68 ^{bcd}	61,49 ^{bcde}
Total bacteri	28,0 ^a	30,67 ^{ab}	30,0 ^{abc}	23,0 ^{abcd}	18,0 ^{de}

¹Sumber: Nataamijaya *et al.*(1999)

²K= turmeric L= zingiber

^{a,b}Different superscripts the same row are different (P<0,05)

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