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Effects of Phytobiotic of*Curcuma aeruginosa*, *Curcuma longa* and *Zingiber officinale* on the Performance and Carsass Qualityin Broiler

(Pengaruh FitobiotikTemu Ireng (*Curcuma aeruginosa*), Kunyir (*Curcuma longa*) Dan Jahe Merah (*Zingiber officinale*) Terhadap Performa DanKualitas Karkas Ayam Pedaging)

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Abstract

The purpose of this study was to investigate the effects of the use natural antibiotics (phytobiotic)*Curcuma aeruginosa*, *Curcuma longa* and *Zingiber officinale* as an alternative antibiotic on the performance of broiler. Experimental design was a Completely Randomized Design using 440 broiler of one day-old chicksand randomly divided into 11 treatments with 4 chickens for each treatmen. The dietry treatments were negative control (T01), a basal diet without any feed additives and positive control (T02), a basal diet with bacitracin, and basal diets with additional different levels (0.75, 1.0, and 1,5%) of *Curcuma aeruginosa* (TI1, TI2, and TI3), *Curcuma longa*(KU1, KU2, and KU3) and red ginger (JM1, JM2, and JM3), respectivelly. The results showed that the addition of low-dose phytobiotic (0.75%) in broiler have produced a different effect (P <.05) on the parameters of performance, but at higher doses, the results tend to show the opposite effect. However, low-dose treatment phytobiotic parameters showed no differences (P>.05) with positive control treatment of bacitracin.In conclusion, the use of phyitobiotics *Curcuma aeruginosa*, *Curcuma longa* and red ginger has showed their function as growth promoters in low dose.
Keywords: *Curcuma aeruginosa*,*Curcuma longa*,*Zingiber officinale*,performance,Broiler

Intisari

Pembatasan penggunaan antibiotik sintetis sebagai pemacu pertumbuhan dalam industri peternakan semakin meluas karena meningkatnya resistensi dan residu pada hewan ternak. Untuk itu, tujuan dari penelitian ini adalah untuk mengetahui efek dari penggunaan antibiotik alami (phytobiotic) *Curcuma aeruginosa* (temu ireng), *Curcuma longa* (kunyit)dan *Zingiber officinale* sebagai antibiotik alternatif pada performa ayam broiler. Rancangan percobaan yang digunakan adalah rancangan acak lengkap menggunakan 440 ayam pedaging berumur satu hari dan dibagi secara acak dalam 11 perlakuan dengan 4 ulangan untuk masing-masing perlakuan. Perlakuan yang digunakan adalah kontrol negatif (T01), pakan basal tanpa fitobiotik dan kontrol positif (T02), pakan basal dengan bacitracin, dan diet basal dengan tambahan tingkat yang berbeda (0,75, 1,0, dan 1,5%) dari *Curcuma aeruginosa* (TI1, TI2, dan TI3), *Curcuma longa* (KU1, KU2, dan KU3) dan jahe merah (JM1, JM2, dan JM3). Hasil penelitian menunjukkan bahwa penambahan fitobiotic dosis rendah (0,75%) pada ayam broiler telah menghasilkan efek yang berbeda (P <0,05) pada parameter performa, tetapi pada dosis yang lebih tinggi, hasilnya cenderung menunjukkan efek sebaliknya. Namun demikian, parameter fitobiotik dosis rendah tidak menunjukkan perbedaan (P> 0,05) dengan perlakuan kontrol positif. Kesimpulannya, penggunaan fitobiotik dosis rendah *Curcuma aeruginosa, Curcuma longa* dan jahe merah telah menunjukkan fungsi fitobiotik tersebut sebagai pemacu pertumbuhan.

Kata kunci: Temu ireng, Kunyit, Jahe, Antibiotik, Performa, Broiler)

Introduction

The use of medicinal plants especially in cattle is not yet commonly used in modern farming, despite the fact that sporadic medicinal plants commonly used either for prevention or treatment of disease in livestock. Another fact is the restriction on the use of antibiotic as growth promoters in synthetic livestock industry is increasingly widespread. Ban its use started in Sweden in 1986 and Denmark in 1995 that prohibits the use of synthetic antibiotic in the livestock industry in total. Furthermore, in 2001 the European Union banned the use of antibiotic as growth promoters in livestock industry to increase production, and then the European Union banned the use of antibiotic in total in 2004. The last in 2010, a ban on the use of most types of synthetic antibiotic extends to Asian countries, such as South Korea and Japan that prohibit its use in cattle (Smith et. al., 2011). These countries will likely prohibit the total antibiotic use in the future, and other countries follow the ban on the use of synthetic antibiotic. All of these conditions are found more and more based on empirical evidence, especially with the increasing resistance of some types of pathogenic microorganisms, and antibiotic residues in cattle due to their use are not/less controlled (Smith, 2011). Thus, the purpose of this study was conducted to compare the usage of phytobiotic (natural antibiotic) Temu ireng (*Curcuma aeruginosa*), turmeric (*Curcuma longa*) and red ginger (*Zingiber officinale*) as an alternatie antibiotic on growth performance in broiler chickens. Furthermore, the research that has been done is also expected to be the basis of consideration to produce broiler feed containing natural antibiotic /phytobiotic as a substitute for antibiotic synthesis in the future.

Materials and Methods

Feed addives of temu reng, red ginger, and *Curcuma longa*/turmeric were prepared by drying in an oven at a temperature of 60^0 C, after previously washed, sun dried, and then pulverized dry using the grinder. The phytobiotic treatments of phytobiotic *Curcuma aeruginosa*, turmeric and ginger were added to the basal feed formulated to meet energy and protein requirements for growing broilers (Table 1.; NRC, 1994) with the appropriate amount of each treatment as follows: T01 = basal ration only, T02 = antibiotics bacitracin, TI1 = 0.75% *Curcuma aeruginosa*, TI2 = 1.0% *Curcuma aeruginosa*, TI3 = 1.5% *Curcuma aeruginosa*, KU1 = 0.75% *Curcuma longa*, TU2 = 1.0% *Curcuma longa*, TU3 = 1.5% *Curcuma longa*, JM1 = 0.75 % red ginger, JM2 = 1.0%, JM3 = 1.5% red ginger.

Four hundred fourty 2-dold mixed sex broiler chickenswere purchased from a domestic commercial poultry shop. All birds used in this trial were raised in wired pens of identical floor size (1.0 m × 1.0 m), fed ad libitum, and provided a 24-h light program for

the first week. The temperature was 34^{o}C for the first week and depanding on the room temperature which had the range of 28 to 33°C for the following weeks. All chickens were randomly placed into 11 treatments with four replications, so that each pen/experimental unit comprised 10 chickens. Performance measured were feed intake (FI), water intake, body weight (BW), body weight gain (ADG), and feed conversation ratio (FCR), and

Table 1. Feed formulation of the experiment

No.	Ingredients	Period 0 – 23d	Period 24 – 34 d
		%	
1	Corn	50.0	50.0
2	Soybean meal	15.50	15.50
3	Fish meal	12.50	10.0
4	Rice barn	5.0	8.5
5	Palm carnel cake	5.0	5.0
6	Coconut meal	5.0	3.0
7	Palm oil	5.0	6.0
8	Bone meal	1.50	1.50
9	Vitamin and Mineral Premix	0.50	0.50
10	Salt	0.40	0.40
		Total CP and ME	
	Crude Protein (CP), %	22.51	20.18
	Metabolizable Energy (ME),Kcal.	3,192.04	3,196.82

carcassparameters were pH and nutritional value (water, carcass fat, protein and cholesterol), cooking shrinkage, water holding capacity, physical test and commercial slices measured at the end of the experiment. All tested parameters were analyzed as a completely randomized design by one-way ANOVA using the GLM procedure (SAS Institute Inc., 2003), and differencesamong treatment means were determined using the Duncan's multiple range test.

Results And Discussion

Performance (BW, ADG, FI and FCR) of broiler treated with phytobiotic in this study is shown in Table 2. At the beginning of the study period (1 day) and the first period (I = 14 days), body weight in all treatments showed no differences (P>.05), with the overall average of BW = 48.63 grams. Furthermore, the performance of the next two periods (II = 24 days, and III = 34 days) both BW and ADG showed significant differences (P<.05). From Table 1, it is seen that BW and ADG showed a similar pattern, where treatment JM1, T02 and KU1 produce the highest body weight, and they showed no difference (P>.05). However, the low-dose phytobiotic JM1 and KU1 (.75%) showed no difference (P>.05) with the control treatment T01 and T02

are given antibiotic bacitracin, except phytobiotic *Curcuma aeruginosa*.

Different patterns occur in feed intake. Feed consumption in period I and II have not shown differences (P>.05), but the FI in the third period there has been a difference (P<.05). The highest FI parameter in the second period occurs in T02 treatment, and followed sequentially by KU2 and JM1, despite of all treatments showed no difference (P>.05). In the third period the shift pattern occurred, treatment JM1 was the highest, and during this period there has been a difference in the FI (P<.05). On feed conversion (FCR = feed conversion ratio), there is a difference (P<.05) in period II and III with the same pattern with parameters BW and ADG. In brief, the results showed that the addition of treatment with the lowest dose phytobiotic (.75%), especially JM1 produce the lowest FCR (P<.05), although these results show no difference with control T01 and T02 (P>.05).

Table 2. Performanceof broiler chiken; body weight (BW), average daily gain (ADG), feed intake (FI) and feed conversion ratio (FCR) at the end of experiment in Periods 0 (1day), I (14 days), II (24 days), and III (34 days)

		Treatment*										
		T01	T02	JM1	JM2	JM3	KU1	KU2	KU3	TI1	TI2	TI3
Body weight (BW), *g*	0	47.80	49.15	48.43	48.95	49.00	48.58	49.10	48.78	48.83	48.65	47.85
	I	282.0	291.7	286.0	286.73	289.2	289.7	284.8	294.2	289.9	279.8	277.0
	II	612.5	664.1	637.6	635.17	617.8	646.1	637.0	617.8	603.8	612.5	592.7
	II	887.2	983.1	1021.	898.83	911.8	973.2	918.0	910.4	922.4	839.2	889.3
Daily gain (ADG), *g/d*	I	23.43	24.26	23.77	23.78	24.05	24.11	23.58	24.55	24.11	23.12	22.92
	II	33.05	37.24	35.16	34.84^{a}	32.86	35.64	35.22^{a}	34.26	31.39	33.27	31.57
	II	27.46	31.91	38.43	26.37^{b}	29.39	32.71	28.10^{a}	29.26	31.86	22.67	29.67
Feed intake, *g/d* (FI)	I	28.06	27.98	26.98	26.22	28.26	27.49	27.38	28.79	28.18	27.33	27.81
	II	49.89	44.24	49.11	45.19	46.44	48.26	49.78	46.75	44.33	44.60	42.06
	II	56.68	59.96	64.54	57.32^{a}	56.07	59.41	59.85^{a}	59.51	58.77	51.63	59.81
Feed conversion Ratio (FCR)	I	1.21	1.16	1.14	1.11	1.19	1.15	1.18	1.18	1.18	1.18	1.21
	II	1.51^{a}	1.19^{b}	1.43^{ab}	1.30^{ab}	1.43^{a}	1.39^{ab}	1.43^{ab}	1.45^{a}	1.43^{a}	1.36^{a}	1.34^{a}
	II	2.14^{a}	1.95^{ab}	1.68^{b}	2.19^{ab}	1.98^{a}	1.85^{ab}	2.15^{ab}	2.12^{a}	1.85^{a}	2.36^{a}	2.06^{a}
Drink water, *ml/d*	I	80.23	72.00	73.55	79.28	71.82	63.90	63.78	69.56	76.75	66.00	76.56
	II	191.0	188.9	193.8	190.39	187.4	178.1	191.3	191.2	188.4	172.9	190.5
	II	291.1	304.9	310.9	296.21	289.6	291.0	282.2	291.0	290.8	303.3	288.3

Note: * *Different superscrip letters in the same raw is significantly different (p<.05).*

The results of the data analysis performance of broiler chickens showed any difference precisely at the end of the experiment. In general FCR, as the primary measure of the performance showed that broiler chickens given additional phytobiotic red ginger and turmeric improved FCR (P<.05), although not different from control T01 and T02. These results are in line with previous studies (Gowda et al., 2008) that the turmeric treatment with a dose of 0.5 % had no effect on performance. Also, administration of ginger 5 g/kg (.5 %) in the 5 differences in feed particle size flour also had no effect on performance (intake and feed conversion), but carcass weight at the end of the trial tended to show improvement (Zhang et al., 2009). However, It can be assumed that the dose of .75 % addition of turmeric and ginger have an effect on the performance improvement of the chicken. The results of the study as a whole it appears that the use of phytobiotic (red ginger and turmeric) in chicken does not repair or improvement of the performance, especially at high doses. In contrast, at a dose of .75 % mainly turmeric and ginger red treatment has demonstrated improved outcomes, including treatment when compared with T02 that uses the addition of the antibiotic bacitracin.

Further explanation of these results is done by comparing some of the research that has been done previously in broiler chickens. Ginger contains many active compounds that can serve them as an antioxidant (Rababah et al., 2004), antimicrobial (Mahady et al., 2003) and various other functions (Ali et al., 2008). A variety of functions in principle is to improve the function of the digestive tract, so that the results of these studies generate improved performance in general. From this research result can be explained that the same pattern occurs for observation performance at doses of .75% for phytobiotic red ginger, turmeric and *Curcuma aeruginosa* at the end of the experiment. Thus, the treatments influenced on the performance improvement in low dose, but this condition did not occur at a higher dose (1.5%).

In addition, the results of this study showed a decreasing effect on the provision of above 0.75% phytobiotic red ginger, turmeric and *Curcuma aeruginosa* or the negative effects of the loss in performance. This can be explained from the results of previous studies which stated that the provision exceeds the tolerance limit may indicate a reverse effect, especially at the level of the blood proteins. This is affected by the presence of poliphenolic compounds that are part of the active chemical compound that plants can decrease protein synthesis in the liver (Naveena et al., 2004). In contrast, Sinurat et al. (2009) found that administering turmeric to a dose of .5% (500 mg/kg) made no difference to the growth, efficiency of feed use, mortality, feed nutrient digestibility and broiler carcass percentage compared to the control diet (without antibiotic) and virginiamycin supplemented broiler feed.

The results of this study also reinforced by the most recent research

that has been conducted to compare the use of natural antibiotic that have been commercialized (AV/AGP/10). This product is a mixture of *Allium sativum, Zingiber officinale, Trigonella foenum graecum, Eruca sativa* with a natural antibiotic Bacitracin Methylene Dicyticylate and Oregostim which serves as a growth promoter (Kanduri et al., 2013). In this study the dose used is the maximum dose of 500 g AV/AGP/10, Bacitracin Methylene Dicyticylate 100 g/ton and Oregostim 250 g/ton of feed. The results showed that at the end of week 6 live weight and FCR better on a natural antibiotic treatment. Accordingly, the addition of turmeric in broiler feed up to a dose of .5 % has been managed to improve the overall performance (Durrani et al., 2012). Lastly, Zomrawi et al. (2013) conducted research premises addition of ginger powder treatment to a dose of 2 % in broiler feed. The results on the performance indicate that at doses of 1.5 and 2 % addition of ginger powder decrease in ADG and feed intake, FCR even though all treatments did not differ. These results are consistent with research Durrani et al. (2012) which has been a decrease in feed intake in broilers.

Having seen publicly on performance, the results indicate a trend that the best results in the treatment of broiler chickens is phytobiotic phytobiotic low-dose treatment (.75 %). In this study, feed efficiency occurs at the end the study of the treatment of TI1. The result varies when compared to the results of this study. In a study conducted by Rajput et al. (2013) with the aim of them to see the performance and carcass quality of broilers on the addition of curcumin on the finding that the addition of 200 mg/kg significantly improve growth of body weight, but feed intake did not differ so improved feed efficiency occurred until the age of 42 days. The results showed even at doses addition of 150 mg/kg of feed has been able to improve the digestibility of energy and can lower the fat body cavity. Research with the addition of ginger powder treatment to a dose of 2 % in the feed of broilers showed that the decline in slaughter weight (Zomrawi et al., 2013).

Conclusion

In this study, phytobiotic red ginger (*Zingeber offocinale*), *Curcuma longa*/turmeric (*Curcuma longa*) and temu tireng (*Curcuma aeroginosa*) are indicated function as a growth promoter, because they show improvement some growth performance parameters measured in all treatments compared with T01 and T02 control treatments. Indeed, the results show that the supplementation of phytobiotic at dose of .75 % for the treatment of red ginger and turmeric has showed a trend toward improvement. In contrast, at doses higher than .75 % of these treatments showed the reverse effect, even *Curcuma aeruginosa* does not give effect to all treatment level.

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References

Ali B.H., G. Blunden, M. O. Tanira, and A. Nemmar. 2008. Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale* Roscoe): A review of recent research. *Food Chem. Toxicol.,* 46: 409–420.

Durrani F. R, M. Ismail, A.Sultan, S. M. Suhail, N. Chand and Z. Durrani. 2012. Effect of different level feed added tumeric (*Curcuma longa*) on the performace of broiler chicks. *J. Agric. and Biol. Sci.,* 1(2): 9-11.

Gowda N. K. S., D. R. Ledoux, G. E. Rottinghaus, A. J. Bermudez and Y. C. Chen. 2008. Efficacy of Turmeric (*Curcuma longa*), Containing a Known Level of Curcumin, and a Hydrated Sodium Calcium Aluminosilicate to Ameliorate the Adverse Effects of Aflatoxin in Broiler Chicks. *Poult. Sci*., 87: 1125–1130.

Kanduri A.B., V.K. Munde, M.A. Khan, P.N. Thakur, M.J. Saxena, K. Ravikanth, A. Thakur and S. Maini. 2013. Study on the comparative efficacy of natural growth promoter (AV/AGP/10) with antibiotic supplements on overall growth performace and intestinal micrometry of broiler birds. *Br. Microbiol. Res. J. 3(4): 623-634.*

Mahady G.B., S.L. Pendland, G.S. Yun, Z.Z. Lu and A. Stoia. 2003. Ginger (*Zingiber officinale* Roscoe) and the gingerols inhibit the growth of Cag A+ strains of *Helicobacter pylori*. *Anticancer Res*. 23: 3699–3702.

Naveena B. M., S. K. Mendiratta and A.S.R. Anjaneyulu. 2004. Tenderization of buffalo meat using plant proteases from *Cucumis trigonus* Roxb (Kachri) and *Zingiber officinale* Roscoe (Ginger rhizome). *Meat Sci.,* 68: 363–369.

NRC. 1994. Nutrient Requirements of Poultry. 9th. Rev. ed. Natl. Acad. Press, Washington, DC.

Rababah T. M., N. S. Hettiarachchy and R. Horax. 2004. Total phenolics and antioxidant activities of fenugreek, green tea, black tea, grape seed, ginger, rosemary, gotu kola, and ginkgo extracts, vitamin E, and tert-butylhydroquinone. *J. Agric. Food Chem*. 52: 5183–5186.

Rajput N., N. Muhammad, R. Yan, X. Zhong and T. Wang. 2013. Effect of Dietary Supplementation of Curcumin on Growth Performace, Intestinal Morphology and Nutrients Utilization of Broiler Chicks. *J. Poult. Sci., 50: 44-52.*

SAS Institute. 2003. The SAS System for Windows, Release 9.1. SAS Inst. Inc., Cary, NC.

Sinurat A.P., T. Purwadaria, I.A.K. Bintang, P.P. Ketaren, N. Bermawie, M. Raharjo dan M. Rizal. 2009. Pemanfatan kunyit dan temulawak sebagai imbuhan

pakan untuk ayam broiler, *JITV* 14(2): 90-96.

Zhang G. F., Z. B. Yang, Y. Wang, W. R. Yang, S. Z. Jiang and G. S. Gai. 2009. Effects of ginger root (*Zingiber officinale*) processed to different particle sizes on growth performace, antioxidant status, and serum metabolites of broiler chickens. *Poult. Sci.,* 88: 2159–2166.

Zomrawi W. B., K.A.A Abdel Atti, B.M. Dousa and A.G. Mahala. 2013. The Effect of Dietary Ginger Root Powder (Zingiber officinale) on Broiler Chicks Performace, Carcass Characteristic and Serum Constituents. *J. Anim. Sci. Adv.,* 3(2): 42-47.