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Effect Of Cage Density And Suplementation Black Cumin In The Diet On Blood Status Of Broiler

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ABSTRACT

This study was aimed to determine the effects of black cumin and different cage density on blood status of broiler chickens. Materials used in this study were 240 chickens of 8 days old with average initial body weight were 163,12+8,10 g, chickens were randomly transferred to 27 units with the maintenance of the experimental cage density and treated with black cumin (*Nigella sativa*). The experimental design used was a completely randomized design (CRD) with 3x3 factorial patron. The first factor is the cage density (D) is the normal density (D1) with 8 birds / m² , moderate (D2) 10 birds / m² and a high density (D3) with 12 birds / m². The second factor is the provision of black cumin (J), namely (J1) 1 % / kg feed, (J2) 2 % / kg feed and (J3) with cumin powder 3 % / kg feed. Parameters observed were performances and blood status. Data were analyzed by analysis of variance with the F test to known the effects of the treatments, if there are effects of treatment, test will be continued by Duncan Multiple Range test. The results showed that there was no significant interaction effect between cage density and black cumin on all parameters. But, feed intake (FI) were increased significantly (P<0,05) by addition black cumin 2 and 3%, and feed conversion ratio (FCR) was significantly (P<0,05) lower in 2% black cumin and 12 birds/m2 density. There was no effect of black cumin and cage density on body weight gain, cholesterol, low density Lipoprotein (LDL) and Serum Glutamic Oxaloacetic Transaminase (SGOT), but at density 12 birds/m2 was significantly (P<0,05) increased to triglycerides. The result shown that the denser enclosure will increase triglycerides broiler. The conclusion of this study is that 2% black cumin was good level for supported to FI and decreased FCR, and cage density at 12 birds/m2 was again triglyceride of broiler chickens.

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INTRODUCTION

Physiological status of good animal health is crucial productivity of livestock. Broiler is a type of cattle that are particularly vulnerable to the physiological status either due to feed quality, stress and disease. The use of antibiotics in conventional health programs are very effective to deal with various cases of disease and animal health. But the use of these antibiotics in addition to the relatively expensive cost also has a negative effect include increasing the dose causing a disease resistance and the presence of residues that may endanger public health. Antibiotics are often mixed into the feed is Bacitracin, kuramicin, higromicin, colistin, kiamisin, spiramycin, Tiamulin, virginiamisin, aviamisin, flavomisin and tetracycline (Directorate General of Livestock Services, 1991). Maintenance broiler using antibiotics in the feed mixture may cause residues in chicken meat. This was due to antibiotics that are not secreted properly so that there is still a residue that is stored in broiler meat. Wuryaningsih (2005) and Rahmianna (2006) stated that food safety issues plaguing the society animal origin such as microbial pathogen contamination and antibiotic residues in meat as a side effect of antibiotics in the feed which functions as an antibiotic growth promoters (AGP). So that the necessary efforts to deal with the disease and animal health by spurring the body's natural immunity in cattle and simultaneously to increase productivity by using natural ingredients are cheap, easy to obtain and does not leave a residue, such as by making use of black cumin (Nigella sativa). According Achyad and Rashid (2000), the content of black cumin seeds include essential oils, fatty oils, melantin (saponins), bitter substances nigelin, nigelon, and timoquinon. Essential oils are generally anti- bacterial, anti- inflammatory, and can warm the stomach.

Black cumin seed oil (*Nigella sativa*) contains a number of chemicals that have activity as anti- allergic, anti- asthmatic, anti -inflammatory, anti- histamine and anti prostaglandins (Subiyanto and Diding 2008). The

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content of thymoquinone (TQ) on the black cumin seed oil and has shown potential in the treatment of traditional medicine (Salem 2005). In the Middle East, cumin is used as a traditional medicine to improve human health conditions (Al- Saleh *et al*. 2006). Cumin can increase the ratio of CD4 + and CD8 + 55 % and an increase in natural killer cell function by 30 %, so it can function as black cumin immunomodulator (Salem 2005). Cumin is very important for the Arab Countries and the Islamic traditional medicine to treat a wide range disease primarily treat stomach upsets and colic. Black cumin is also considered effective against seizures, asthma, headaches, and intestinal worms (Van Wyk and Wink, 2004).

According to El-Dakhakhny *et al*. (2002), black cumin has efficacy as an immune enhancer, anti-inflammatory, and antibacterial. In addition, black cumin can also eliminate worms and parasites in the intestine (Topozoda *et al*., 1965). Research carried out by Al-Beitawi and Ghousein (2008) showed that administration of cumin in broiler chickens can increase live weight, weight gain, and feed consumption.

Feed quality is the most prominent factor in the formation of fatty tissue in the meat and livestock. Potential broiler feed has the ability to transform nutrients into fat high allowing high levels of blood cholesterol.

Measurement of cholesterol levels of broiler chickens is important to note, this is related to the quality of livestock products and consumer safety. Because of the high total blood cholesterol may increase the incidence of atherosclerosis and further increase the risk of coronary artery disease is associated with cardiovascular disease. Based on several epidemiological and clinical studies that exist, the National Cholesterol Education Program (NCEP) in 2004 determined that the concentration of cholesterol levels correlated to the risk of coronary heart disease events. A prospective cohort study in the United States in 1980 that made *et al*. have shown that cholesterol levels increase the risk of heart disease by 17%, while the meta-analysis of 4 cohort studies conducted by Mozaffarian *et al*. get that 2% increase in energy intake from trans fatty acids was associated with an increased incidence of coronary heart disease by 23%.

One of the factors causing the decline in the physiological condition of livestock is the stress caused by the high density enclosure and ambient temperature and high humidity due to heat stress. Decline in livestock physiological conditions characterized by decreased feed intake, feed efficiency is low and a low body weight gain. Cage density that exceeds the limit will negatively affect the performance of poultry, but usually ignore this breeder to obtain greater benefits from the savings cage area. Leisure livestock in pens, one of which is influenced by the balance between the number of cattle and extensive stables. The area of the cage affects livestock activity levels (French, 1981).

MATERIALS AND METHODS

Study the effects of cage density and black cumin in broilers was done on July-October 2012, with implementation occurring in at Poultry Production Laboratory and Biochemistry and Animal Feed Nutrition, Faculty of Animal and Agricultural Science, University of Diponegoro in Semarang

Research Materials:

Materials used in this study was 240 broiler chickens at 8 days old, Cobbs strain, with average initial body weight were 163,12+8,10 g The chickens were randomly transferred to 27 units with the experimental cage density maintenance and the addition of black cumin (*Nigella sativa*). Removal or selection of chicken based on the uniformity of the same weight with a weight range of 130 grams. The chickens was given two factors treatment (density and black cumin). The research was conducted over 27 days from 8 to 35 days old.

The experimental diet was formulated base on yellow corn, rice brand, soybean meal, fish meal, palm oil and lime. The composition and nutrition content of basal diet for starter and grower was shown in Table 1.

Table 1: Composition of Basal Rations Research

	Component	Starter	Grower
		(1 – 2 week)	(2 – 5 week)
Feed Ingredients		---------- % ----------	
	Corn	54,00	55,00
	Rice bran	10,00	15,00
	Soybean meal	22,50	15,50
	Fish meal	11,00	11,00
	Palm oil	2,00	3,00
	Lime	0,50	0,50
Nutrient Content			
	EM (kkal/kg)	2.991,00	3.017,00

	Component	Starter	Grower
		(1 – 2 week)	(2 – 5 week)
	PK (%)	21,91	19,31
	Fatty Rough (%)	4,53	5,61
	Row Fiber (%)	4,24	4,37
	Calcium (Ca) (%)	0,97	0,96
	Fosfor (P) (%)	0,62	0,64
	Metionine (%)	0,46	0,43
	Metionine + Sistin (%)	0,78	0,72
	Lysine (%)	1,39	1,22

Research Method:

The research design used in this experiment was factorials design with two factors with 4 times replication. The first factor is cage density, namely (D) were used with tree levels, namely the normal density of 8 chickens/m² (D1), 10 chickens/m² (D2) and high density 12 chickens/m² (D3). Second factor were black cumin (B) supplementation were 1% / kg diet, 2% / kg diet and 3% / kg diet.

Research Design:

Research Design was used factorial design of 3 x 3 with basically randomized design, with 4 replication, so there are 36 research units, and each research unit consist of 5 birds. The treatments consisted of two factors cage density and supplementation of black cumin. The first factor is cage density there are 3 densities were 8birds/m2 (D1); 10birds/m2 (D2) and 12birds/m2 (D3). The second factor is supplementation black cumin there are 3 levels were 1% (B1); 2% (B2) and 3% (B3). The parameters were performance, consisted of feed intake, body weight gain and feed conversion ratio. The blood constituent parameters consisted of cholesterol, HDL, LDL blood of broiler.

Data Analysis:

The data were analysis using Analysis of Variance (ANOVA) at *P* 0.05 with F Test to know the effect of treatment. If there are effect of treatment continuous to Duncan Multiple Range Test according to Still and Torrie (1991).

RESULTS AND DISCUSSION

Performance Parameters:

Feed Intake:

The influence of black cumin and cage density on feed intake can be seen in Table 3. Statistical analysis showed that the addition of black cumin in the feed provides a significantly different effect on feed intake ($P < 0.05$), whereas no cage density influence on feed intake $P > 0.05$).

Table 2: Effects of Black cumin and Cage Density on Feed intake

Cage Density	Black Cumin			Average
	1%	2%	3%	
8	2152.8	2829.3	3540.8	2840.9[a]
10	2150.3	2983.9	3523.0	2885.8[a]
12	2149.9	2744.9	3514.1	2803.0[a]
Average	2,151.0[c]	2,852.7[b]	3,526.0[a]	

Note: Means with the same superscript indicate no significant difference, while with different superscript indicates a significant treatment effect on the level of $P < 0.05$.

Giving black cumin in feed providing significant effect on broiler feed intake this is because the components of the active substances contained in the black cumin. Black cumin seeds and leaves contain saponins and polyphenols (Hutapea, 1994). Chemical constituents are black cumin essential oils, fatty oils, melantin (saponins), nigelin (bitter substances), tannin substances, nigelon, timokuinon (Hargono 2009, referred to in Astawan). Meanwhile, according to Al-Jabre *et al*. (2003), the content of black cumin seeds, among others: timokuin, timohidrokuinon, ditimokuinon, thymol, carvacrol, nigellicine, nigellidine, nigellimine-N-oxide and alpha-Sanhedrin. Some chemical compounds contained in black cumin are compounds that act as antioxidants and can counteract free radicals. Research carried out by Al-Beitawi and Ghousein (2008) showed that administration of cumin in broiler chickens can increase live weight, weight gain, and feed consumption Feed consumption was also due to the different energy content and nutrients in balanced feed and nutritional needs

have been fulfilled for the chicken. Wahju (2004) states that the breed of chicken, ambient temperature, and energy in the production phase can affect feed consumption. National Research Council (1994) stated that the chicken body weight, gender, activity, environmental temperature and quality of feed can affect feed intake. Energy level determines the amount of ration consumed. Chickens tend to increase their consumption if the content ration energy consumption is low and vice versa will be decreased if the energy content of the ration increased (Scott *et al*., 1982).

Body Weight gain:

Statistical analysis showed that the addition of black cumin in feed and cage density effect is not significantly different to the final body weight (P> 0,05).

Tabel 3: Effect of Black cumin and Cage Density on Body Weight gain

Cage density	Black cumin			Average
	1%	2%	3%	
8	1380	1313.9	1381.3	1358.4[a]
10	1358.1	1310.6	1311.3	1326.7[a]
12	1414.4	1414.9	1319.5	1382.9[a]
Average	1384.2[a]	1346.5[a]	1337.4[a]	

Note: Means with the same superscript indicate no significant difference (P>0,05) between treatment on body weight gain.

Based on the analysis of variance cumin and cage density had no effect on final body weight. This is due to nutrient content of the feed, as well as the maintenance of the environment among all the equal treatment. Rasyaf (1993) stated that body weight is influenced by the quality and quantity of feed consumed, thus the difference in content of nutrients and the amount of feed consumed volume should have any effect on body weight gain of chicken because the content of nutrients that are absolutely necessary balanced for optimal growth

Feed Conversion Ratio (FCR):

Statistical analysis showed that the addition of black cumin in feed and cage density effect is significantly different to the FCR (P< 0,05).

Table 4: Effects of Black Cumin and Cage Density on Feed Conversion Ratio

Cage Density	Black Cumin			Average
	1%	2%	3%	
8	1,5600	2,1533	2,5633	2.0922[ab]
10	1,5833	2,2767	2,6867	2.1822[a]
12	1,5200	1,9400	2,6633	2.0411[b]
Rata-rata	1,5544[a]	2,1233[c]	2,6378[b]	

Note: Means with the same superscript indicate no significant difference (P>0,05), while with different superscript indicates a significant treatment effect on the level of P <0.05

This result showed that increasing FCR on treatment numbers due to increased feed consumption is not followed by an increase in body weight, showed a less than optimal growth in chickens. Rasyaf (1993) states that the function of chicken feed in the body is to meet basic needs, forming tissue cells, replacing the damaged parts, as well as for production needs. This means less efficient use of ration. Factors affecting feed conversion is the physical form of feed, body weight, Feed nutrition, environment maintenance, strain, and sex (Jull, 1982). Nasheim, austic and Card (1979) states that the environmental factors that influence feed conversion is less comfortable temperature, disease and feed or drinking water supplies are limited, genetic factors, management of maintenance, environmental temperature, feed quality, cage density and disease.

Blood Parameters:

Results Analysis of variance on the parameters of cholesterol, HDL and LDL broilers during the study are shown in Table 5, 6, 7, and 8.

Cholesterol:

Analysis of variance results showed no effect of black cumin and cage density on broiler cholesterol. (P> .05). There is no effect of the use of black cumin against the possibility of a lack of cholesterol in broiler timing of black cumin. Al - Jawfi *et al*. (2008) stated that the effect of black cumin oil is only temporary and dependent on time and dosage, so as to get maximum results, cumin should be taken regularly and continuously.

Furthermore, according to (Anonymous, 2011) The content of normal HDL will help remove bad cholesterol from the blood vessels and other tissues, with open spots or blockages LDL attached to the artery and tissue blood flow and to normalize excess of LDL will be taken to heart. Furthermore opinion (Sutianto, 2006) HDL cholesterol is a good type of cholesterol that serve clean the blood vessels of excessive LDL, high

HDL cholesterol levels is well marked along the LDL cholesterol less than 150 mg / dl. According to (Center of Information Technology-LIPI, 2009) referred to as fat HDL "good" because in operation it clear excess cholesterol from the blood vessel wall to the liver.

Table 5: Effect of Black Cumin and Cage Density on Cholesterol

Cage Density	Black Cumin's			Average
	1%	2%	3%	
8	145.10	117.65	113.73	125.49[a]
10	137.26	129.41	121.57	129.41[a]
12	109.80	133.33	129.41	124.18[a]
Average	130.72[a]	126.8[a]	121.57[a]	

Note: Means with the same superscript indicate no significant difference (P>0,05) between treatment on cholesterol of blood of broiler.

LDL (Low Density Lipoprotein):

Based on the analysis of variance, there was no effect Black Cumin and Cage Density on LDL (P> .05).The effect of black cumin have different levels of success because it depends on the origin of black cumin, the condition of the individual and the use of different evaluation techniques (Al - Jawfi *et al*., 2008).

Table 6: Effect of Black Cumin and Cage Density on LDL

Cage Density	Black Cumin's			Average
	1%	2%	3%	
8	98.166	74.383	70.460	81.003[a]
10	95.456	88.346	81.236	88.347[a]
12	60.670	84.933	86.880	77.494[a]
Average	84.764[a]	82.554[a]	79.524[a]	

Note: Means with the same superscript indicate no significant difference (P>0,05) between treatment on LDL of blood of broiler.

Results of fingerprint analysis of fourth Broadcaster significant effect on LDL levels remained within the normal range. This is in accordance with the opinion (Basmacioglu *et al*., 2005) the average chicken blood LDL is <130 mg / dl. Content of LDL from each treatment were still within normal limits, hence the quality of broilers produced with LDL content safe for consumers. This is in accordance with the opinion (Tilman *et al*, 1986), is closely related to cholesterol atherosclerosis, where there is accumulation of materials containing cholesterol on the walls of the blood vessels can cause clotting. Arteries may thicken and in severe circumstances can cause sudden death

Triglycerides:

Results of analysis of variance Table 8, showed there is the influence of cage density on triglycerides, while giving black cumin had no significant effect on triglycerides, so for black cumin treatment does not need further tests or Duncan test. (P> 0,05). Duncan test can be seen that the density of 12 birds produces the highest triglycerides compared with 8 birds density and 10 birds, so it can be concluded that the denser enclosure will increase triglycerides.

Table 7: Effect of Black Cumin and Cage Density on Triglycerides

Cage Density	Black Cumin			Average
	1%	2%	3%	
8	28.573	42.856	23.811	31.747[a]
10	52.380	42.856	57.143	50.793[ab]
12	42.856	57.143	100.000	66.667[b]
Average	41.270[a]	47.618[a]	60.318[a]	

Note: Means with the same superscript indicate no significant difference (P>0,05), while with different superscript indicates a significant treatment effect on the level of P <0.05.

This is due to the low energy savings is the impact of heat stress experienced during treatment so that chicken is more energy used for temperature adjustment. Plus sick chickens conditions require repair damaged tissues and cells. Triglycerides are used as an energy source in metabolism in the cells that need. Triglycerides are hydrolyzed by the enzyme lipase into glycerol and fatty acids and release it into the bloodstream to be distributed to the cells that require energy (Coles, 1986).

SGOT or AST (aspartate aminotransferase enzyme):

Based on the analysis of variance, there was no effect of black cumin and cage density on SGOT (P> .05). According to Anwar (2005) that the elements of the black cumin plant Sabine can strengthen the immune system against viruses, germs and bacteria because it has functions such as corticosteroids. Cumin also play a role in stimulating cell immune response, it is because the content of the essential oil of black cumin has the potential to stimulate the immune response cells (Parakh, 2010).

Black cumin usability by El Kandi and Kandil (1987) strengthening the immune system against viruses and bacteria. One of the properties that have been tested for the immune system is able to increase the number of lymphocytes and monocytes. Black cumin can increase the ratio between helper T cell suppressor T cells by 72%, which means increasing the functional activity of immune cells.

Table 8: Effect of Black Cumin and Cage Density on SGOT

Cage Density	Black Cummins			Average
	1%	2%	3%	
8	46.730	32.350	26.960	35.347[a]
10	26.960	35.943	41.336	34.747[a]
12	21.570	32.353	36.554	31.753[a]
Average	31.753[a]	33.549[a]	36.544[a]	

Note: Means with the same superscript indicate no significant difference (P>0,05) between treatment on SGOT.

Black cumin essential oil contains several substances such as 4 Terpineol, thymohydroquinone, thymoquinone, carvacrol, carvone and thymol. Thymoquinone element containing the most active and has a response with a beneficial effect (Diding and Subijanto 2008). Thymoquinone can lower blood histamine produced by mast cells reduce Ca2 +, and a decrease in serum IgE (Gazzar *et al*. 2006).

Conclusions And Recommendations:

The addition of black cumin on different cage density no interaction effect on performance and blood status. This study shown that 2% black cumin was good level for supported to FI and decreased FCR, and cage density at 12 birds/m2 was again triglyceride of broiler chickens. Suggestion in the high ambient temperature broiler chicken need black cumin supplementation for increased feed intake and cage density no more 8 birds/m2.

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