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The effect of *Curcuma zedoaria* on feed efficiency of Kampung Super chicken

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Abstract. The purpose was to analyze the effect of *curcuma zedoaria* on feed efficiency of Kampung Super chicken and to explore the best level of *curcuma zedoaria* addition in the feed. This research was conducted for 57 days in UMM closed house with battery cage system. The material was 100 day old chick (DOC) of Kampung Super chicken. Experimental method was used in this research by completely randomized design (CRD) with 4 treatments and 5 replications. The treatments were (TO) feed control without *Curcuma zedoaria*, (T1): feed with 1% *Curcuma zedoaria* (T2): feed with 2% *Curcuma zedoaria* (T3): feed with 3% *Curcuma zedoaria*. Variables observed were feed efficiency, income over feed cost (IOFC), carcass and abdominal fat percentage. The data were analyzed by ANOVA. Conclusions from the results of the research were that *Curcuma zedoaria* had no significant effect on feed efficiency and percentage of carcass weight, but *Curcuma zedoaria* had a significant effect on IOFC and the percentage of abdominal fat weight in the Kampung Super chicken. The highest treatment was *Curcuma zedoaria* 0% for IOFC while treatment of *Curcuma zedoaria* 1% produces the lowest percentage of abdominal fat weight.

1. Introduction

Kampung Super chicken is a result of the crossing of native chickens and broilers to get fast growth and has the characteristics of meat and the shape of native chicken. The growth of Kampung Super chicken is relatively faster than ordinary native chicken, influence factors include genetic environment and feed. The growth of Kampung Super chicken can be maximized by providing feed ingredients from herbal plants, namely *Curcuma zedoaria*.

Curcuma zedoaria is one of a kind of medicinal plant such as rhizome, turmeric, ginger, etc. *Curcuma zedoaria* contains cineole, curcumol, curcumadiol, curdione, demetoxicurcumin, curcumin and essential oils. Essential oils in *Curcuma zedoaria* mixed in feed can stimulate the central nervous system, which ultimately results in increased appetite and consumption of nutrition. The presence of essential oils stimulates the production of digestive fluids that produce pH that is suitable for digestive enzymes, such as peptidase. At the same time an increase in digestive enzyme activity and regulation of microbial activity. The stability of microflora in the digestive tract reduces cases of diarrhea and other digestive diseases. The real effect of this mechanism is the improvement of digestion of nutrition. The presence of essential oils stimulates the walls of the gallbladder to secrete bile fluid and stimulates the release of pancreatic sap containing amylase, lipase, and protease enzymes [1,2]. Curcumin in *Curcuma zedoaria* acts as an anti-bacterial, anti-oxidant and anti-hepatotoxic. The rhizome is efficacious to strengthen digestion and appetite, stimulate bowel movements and eliminate flatulence [3]. Therefore, the treatments of *Curcuma zedoaria* are expected to be able to influence the feed efficiency. The study aims



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to analyze the effect of *Curcuma zedoaria* on feed efficiency of Kampung Super chicken and to explore the best level of *Curcuma zedoaria* in the feed to increase feed efficiency of Kampung Super chicken.

2. Method

This research was conducted in January - March 2019 at the UMM closed house, Department of Animal Science, Faculty of Agriculture-Animal Science, University of Muhammadiyah Malang, Tegalondo Village, Karangploso district, Malang regency, East Java province. The material used in this research was 100 day old chickens (DOC) of Kampung Super chickens with 57 days of raising time. The other material was *Curcuma zedoaria* in the feed.

Variables were feed efficiency, IOFC, carcass and abdominal fat percentage. Feed efficiency shows how much weight gain is generated from one kilogram of feed expressed by the formula: Feed efficiency = Daily weight gain/Daily consumption × 100%. IOFC is a reduction from the selling price of chicken with the cost of consuming feed with the formula: IOFC = total chicken sales (IDR) - feed costs (IDR), where total sales = final weight/kg x selling price/kg. Carcass weight is obtained by slaughtering chickens separated from feathers, legs, head, neck, internal organs, blood, and abdominal fat. Then the carcass is weighed using a digital scale. Carcass percentage is the result obtained from carcass weight divided by final weight and then multiplied by 100%. Percentage of carcass = carcass weight/final weight x 100%. Percentage of abdominal fat obtained by separating fat in the abdominal cavity, then the fat is weighed using a digital scale. The percentage of abdominal fat is calculated by the formula: Percentage of abdominal fat = fat abdominal weight/final weight x 100%.

The experimental method was used in this research by Completely Randomized Design (CRD) with a total of 4 treatments and 5 replications and produced 20 flocks. The treatments were divided into 4 types as follows: T0 = Feed with 0% *curcuma zedoaria*, T1 = Feed with 1% *curcuma zedoaria*, T2 = Feed with 2% *Curcuma zedoaria* and T3 = Feed with 3% *curcuma zedoaria*. The data were analyzed using Analysis of Variance (ANOVA). If the treatments have a significant effect, then was continued by the Least Significant Difference Test (LSD) to find out the best treatment.

3. Results and discussion

Based on the research, the analysis of variance for the effect of *Curcuma zedoaria* in feed toward the feed using the efficiency of Kampung Super chicken is presented in table 1.

Table 1. Data of *Curcuma zedoaria* in feed toward feed efficiency of Kampung Super chicken.

Treatment	Variables			
	Feed efficiency (%)	IOFC (IDR)	Carcass (%)	Abdominal fat (%)
T0	33.29±2.27	23423.40±1561.94 ^b	63.20±3.19	0.82±0.08 ^b
T1	27.25±4.66	19330.80±1070.80 ^a	65.00±2.24	0.63±0.18 ^a
T2	33.03±5.43	19830.40±2302.90 ^a	63.60±5.46	1.05±0.04 ^c
T3	35.86±7.53	20421.20±2746.82 ^a	62.80±1.92	0.83±0.05 ^b

Note: ^{abc} different superscripts on the same column indicate statistical difference (P<0.05).

The treatment of *Curcuma zedoaria* has no significant effect (P>0.05) on feed efficiency and Kampung Super chicken carcass percentage. The opposite results that *Curcuma zedoaria* treatment has significant effect (P<0.05) on IOFC and abdominal fat percentage. Table 1 shows giving of *Curcuma zedoaria* in feed has no significant effect on the feed efficiency of Kampung Super chicken. The variables that determine the value of feed efficiency are consumption and body weight gain. Feed consumption can increase at any time along with increasing body weight so that consumption increases compared to before. The using of *Curcuma zedoaria* in feed does not affect feed efficiency because body weight gain and daily consumption have relatively the same value so that it has relatively the same feed efficiency results.

The treatment of *Curcuma zedoaria* has no significant effect on the carcass weight percentage of Kampung Super chicken. Giving of *Curcuma zedoaria* showed results no significant effect on the

variable body weight gain and final weight so that these results would affect the carcass weight of Kampung Super chicken. Likewise, the carcass weight obtained will affect the results of carcass percentage of Kampung Super chicken.

Based on table 1, the giving of *Curcuma zedoaria* has a significant effect ($P < 0.05$) toward IOFC of Kampung Super chickens. The LSD test showed that T1 treatment was the same as T2 and T3 but it was different from T0 so that the best treatment was T0, namely IDR. 40,926. This is due to the low price of feed in T0 treatment (IDR. 61,780) and followed by relatively higher chicken price increases (IDR. 23,423). Chicken prices and feed prices are relatively the same which makes IOFC in treatments T1, T2, and T3 no different.

According to Suci et al (2005), income from broiler chickens is influenced by feed prices and sales prices [4]. The more efficient at turning rations into the meat, the better the Income Over Feed Cost (IOFC). The amount of Income Over Feed Cost depends on increasing the bodyweight of chicken because the more efficient the chicken converts nutrients in the ration into the meat, the better the Income Over Feed Cost [5]. Technical efficiency includes the relationship between input or feed that is given and the output of daily body weight gain, technical efficiency can occur if there is a production process that can utilize small inputs to produce the same amount of output [6]. Increased productivity according to [7–9] due to essential oils in *Curcuma zedoaria* mixed in cattle's basal feed stimulates the central nervous system, which ultimately results in increased appetite and consumption of feed. The presence of essential oils stimulates the production of digestive juices that produce pH that is suitable for digestive enzymes. At the same time, an increase in digestive enzyme activity and regulation of microbial activity will accelerate the emptying of stomach contents. Essential oils also function to regulate the release of stomach acid so that it is not excessive and it helps the intestines work. Improvement of the digestion process will increase consumption and have an effect on improving productivity in body weight which affects the selling price of chicken so that IOFC is high.

Based on table 1 shows *Curcuma zedoaria* significantly affected ($P < 0.05$) on the percentage of abdominal fat. The LSD test showed that T1 was different from treatment T0, T2 and T3, while T0 was the same as T3 but different from T2, so the best treatment was T1. *Curcuma zedoaria* 1% can reduce the percentage of abdominal fat. The low percentage of abdominal fat shows that the fatty system tends to be better. Therefore, the lower the percentage of abdominal fat obtained, the better the carcass obtained. The low of percentages of abdominal fat indicates the content of active substances in *Curcuma zedoaria* function in increasing fat metabolism and digestion. Essential oils in *Curcuma zedoaria* is efficacious to regulate the release of stomach acid so that it is not excessive and reduces intestinal work. Essential oils are antimicrobial compounds that can increase chicken immunity to avoid disease and function to increase bile secretion so that it can facilitate digestion and fat emulsion [8,10,11].

Feed treatment with 2% *Curcuma zedoaria* (T2) can increase fat in Kampung Super chicken, this is in line with the statement of [12] that herbal ingredients can indirectly improve the performance of livestock through their bioactive substances. Bioactive substances such as essential oils and curcumin can increase the digestive organs activity, stimulate the bile wall to release bile, and stimulate the release of pancreatic sap containing lipase enzymes to improve fat digestion [13–15].

Essential oils in the *Curcuma zedoaria* can increase feed intake and average daily weight in animal. The content of essential oils in *Curcuma zedoaria* can cause consumption of Kampung Super chicken rations to increase. However, the ration given to Kampung Super chickens in this study had a high energy content, so that the ration did not turn into the meat but in the form of fat accumulation resulting in a low percentage of carcass weight. According to [16–18] excess energy will produce fat, fat is stored in the body so that broilers will look fat, accumulation of fat will increase after the broiler enters its final period [16,18].

The using of essential oils in the *Curcuma zedoaria* also need to pay attention to the dosage and anti nutritional properties. According to [19–21] the using of essential oils with high doses are toxic to chickens. The optimum dose of the using of essential oils as feed additives in chickens is 0.002 to 0.02%. In this study, *Curcuma zedoaria* up to 3 percent apparently still produces a percentage of carcass which is relatively the same as a control treatment, so that *Curcuma zedoaria* has not been toxic.

4. Conclusion

Based on the research results it can be concluded that *Curcuma zedoaria* had no significant effect on feed efficiency and percentage of carcass weight, but *Curcuma zedoaria* had a significant effect on IOFC and the percentage of abdominal fat weight in the Kampung Super chicken.

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