Haematological indices and carcass yield of Kampong chickens administrated with turmeric (Curcuma domestica)

Endang Widiastuti¹, Isroli Isroli, Turini Yudiarti, Sugiharto Sugiharto, Tri Agus Sartono, Hanny Indrat Wahyuni and Retno Murwani

¹Department of Animal Science, Faculty of Animal and Agricultural Sciences, Diponegoro University, Semarang, Central Java, Indonesia

E-mail: endwidia@yahoo.co.id

Abstract. The study aim was to investigate the effect of turmeric (Curcuma domestica) administration on the blood profile, serum biochemical parameters and carcass yield of the Kampong chickens. A total of 200 day-old Kampong chickens were used in the study according to a completely randomized design with five treatments and five replications (containing eight chickens in each). The chicks were provided with the basal ration containing 22% crude protein. The treatment groups included T0 (chicks provided with basal ration, without turmeric), T1 (chicks provided with turmeric filtrate in drinking water 1:3), T2 (chicks provided with turmeric powder 0.5% in ration), T3 (chicks provided with fermented turmeric residue 0.5% in ration) and T4 (chicks provided with turmeric residue 0.5% in ration). The results showed that turmeric administration increased (P<0.05) the serum total protein concentration and carcass weight of the Kampong chickens at day 32. However, the treatment did not affect the growth performance and feed efficiency of the Kampong chickens measured at days 32 and 45. It could be concluded that the administration of turmeric both through diet and drinking water had minor impact on the haematological indices but increased carcass yield of the Kampong chickens especially during the starter period.

1. Introduction

Turmeric is a tuber that is usually used for drink and spices. Besides that, some studies have reported the functional roles of turmeric, including antioxidants, antimicrobial, anti-inflammatory and fat-lowering agents. The latter features may be attributed to the bioactive compounds contained in the turmeric rhizome such as essential oils, phenolic compounds (shogaol and gingerol), sesquiterpenes (bisapolen, zingiberen, zingiberol, curcumen), and other compounds (6-dehydrogingerdion, galanolactone, gingesulfonic acid, zingeron, geraniol, neral, monoakyldigalaktosylglyserol, gingerglycolipid) [1]. In poultry, turmeric may be employed as growth promoters, which can improve the body weight gain of chickens [2].

Most of farmers in the villages in Indonesia raise Kampong chickens as a source of their income. They do chicken farming as a side job especially during the spare time. However, due to the increased demand for the meat of Kampong chickens, some farmers currently raise the Kampong chicken intensively. In the latter case, in order to meet the consumer demand, various attempts to increase the productivity of the chickens have been carried out, including the use of herbal ingredients such as turmeric as feed additives, since the use of antibiotics as growth promoters has been prohibited in Indonesia since 2018.

Many studies have shown the beneficial impact of turmeric in the physiological conditions, health and growth performance of poultry. Feeding turmeric resulted in improved the erythrocyte profile and digestion and metabolism of broiler chickens [3]. This present study aim was to investigate the effect of turmeric administration on the blood profile, serum biochemical parameters and carcass yield of the Kampong chickens.
2. Materials and Methods
The current study used 200 one-day-old chick of native chickens produced by PT. Tirto Hartono, Sleman, Yogyakarta with an average initial body weight of 40.35 ± 2.13 grams. The fresh turmeric tubers and turmeric powder were purchased from the local market in Semarang, Central Java Indonesia. The fresh turmeric tubers were processed to produce turmeric juice (filtrate) and the residue of the process was also used for the current experiment. The ration used in this study was a single-complete feed containing 22% crude protein. The ingredients and nutritional contents of the ration are listed in Table 1.

| Table 1. Ingredients and chemical composition (as-dry basis) of basal diet |
|-----------------------------|-----------------|
| **Items**                   | **Composition (%)** |
| Maize                       | 45.5            |
| Soybean meal                | 17.0            |
| Wheat flour                 | 10.0            |
| Bread flour                 | 5.00            |
| Rice bran                   | 4.45            |
| Crude palm oil              | 3.50            |
| Corn gluten meal            | 3.60            |
| Distiller dried grains      | 3.00            |
| Meat bone meal              | 2.80            |
| Chicken feather meal        | 2.00            |
| Bone meal                   | 1.50            |
| Lysine                      | 0.55            |
| Methionine                  | 0.37            |
| L-threonine                 | 0.08            |
| Salt                        | 0.15            |
| Premix¹                     | 0.50            |
| **Chemical composition:**   |                 |
| Metabolizable energy (kcal/kg)² | 3.286         |
| Dry matter                  | 91.4            |
| Crude protein               | 21.7            |
| Crude fat                   | 5.90            |
| Crude fiber                 | 6.79            |
| Ash                         | 10.9            |

¹Mineral-vitamin premix provided (per kg of feed) Ca 2.250 g, P 0.625 g, Fe 3.570 mg, Cu 0.640 mg, Mn 5.285 mg, Zn 0.003 mg, Co 0.001 mg, Se 0.013 mg, I 0.016 mg, vit A 375 IU, vit D 150 IU, vit E 0.080 mg
²Values were obtained based on the formula according to [4], in which metabolizable energy = 40.81 \{0.87 \text{ [crude protein + 2.25 crude fat + nitrogen-free extract]} +2.5 \} 

The study was designed as a completely randomized design consisting of five treatments and five replications (each consisting 8 chickens). The treatment groups included T0 (chicks provided with basal ration, without turmeric), T1 (chicks provided with turmeric filtrate in drinking water 1:3), T2 (chicks provided with turmeric powder 0.5% in ration), T3 (chicks provided with fermented turmeric residue 0.5% in ration), and T4 (chicks provided with turmeric residue 0.5% in ration). Blood collection and carcass measurement were conducted on days 32 and 45 of the experiment. The parameters measured were complete blood count and serum biochemistry including total cholesterol, triglycerides, high-density lipoprotein (HDL) and low-density lipoprotein (LDL), total protein, albumin, globulin and uric acid [4]. The data obtained were statistically analyzed according to Gomez and [5]. Some data are missing in this study, which were because of the insufficient of the serum during the laboratory analysis.
3. Results and Discussion
Data on growth performance and carcass yield of the Kampong chickens are presented in Table 2 and Table 3. It was apparent that the administration of turmeric had notable effect (P<0.05) on the live body weight and absolute weight of carcass of the Kampong chickens aged 32 days, but had no significant impact on the parameters measured at aged 45 days. The less significant effect of turmeric treatment was also seen with regard to the carcass yield at both times of measurements. The body weight of the T1 and T3 chickens at 32 days differed from that of other treatments. The Kampong chickens provided with either turmeric filtrate or fermented turmeric residue had higher (P<0.05) average body weight as well as the carcass weight when compared especially with the chickens administrated with turmeric meal or unfermented turmeric residue. Yet, the carcass relative weight was not affected by the treatments. In the current study, there was no difference (P>0.05) in body weight and carcass weight between the dietary treatment with turmeric meal (T2) and unfermented turmeric residue (T4). It was most likely that turmeric meal had decreased its quality (in terms of the active compounds) due to the drying processes prior to milling into turmeric powder. Interestingly, feeding fermented turmeric residue resulted in better growth performance and carcass yield of the chickens as compared to that of unfermented turmeric treatment. Fermentation may improve the nutritional quality as well as the functional properties of the waste products [6].

| Parameters measured | Treatments |
|---------------------|------------|
|                     | T0         | T1         | T2         | T3         | T4         |
| BW (g)              | 242<sup>a</sup> | 244<sup>a</sup> | 213<sup>b</sup> | 252<sup>a</sup> | 204<sup>b</sup> |
| Carcass weight (g)  | 112<sup>bc</sup> | 122<sup>ab</sup> | 106<sup>c</sup> | 129<sup>a</sup> | 99.4<sup>c</sup> |
| Relative weight of carcass (% live BW) | 46.3 | 50.0 | 49.5 | 51.1 | 48.9 |

<sup>a,b,c</sup>Means with different letters indicates significant difference (P<0.05)

Table 2. Performance and carcass yield of the Kampong chickens at 32 days of age

| Parameters measured | Treatments |
|---------------------|------------|
|                     | T0         | T1         | T2         | T3         | T4         |
| BW (g)              | 595        | 612        | 555        | 607        | 549        |
| Carcass weight (g)  | 327        | 339        | 309        | 342        | 312        |
| Relative weight of carcass (% live BW) | 55.0 | 55.5 | 55.7 | 56.4 | 56.8 |

The data on serum biochemical parameters of the Kampong chickens are presented in Table 4 and 5. There was a treatment effect (P<0.05) on the level of total protein in serum, but there was no effect of treatment on the levels of other biochemical parameters measured. The definite explanation for the increased concentration of serum total protein in T4 chickens was not known, but the increased protein catabolisms resulting in higher total protein in serum [7] may be the reason. This inference was supported by the relatively lower body weight of T4 groups compared to other chickens.

| Parameters measured | Treatments |
|---------------------|------------|
|                     | T0         | T1         | T2         | T3         | T4         |
| BW: body weight     |            |            |            |            |            |
Table 4. Serum biochemical indices of the Kampong chickens at 32 days of age

| Parameters measured          | Treatments |
|-----------------------------|------------|
|                             | T0         | T1         | T2         | T3         | T4         |
| Total protein (g/dl)        | 3.08b      | 3.74b      | 3.90b      | 3.84b      | 5.48a      |
| Albumin (g/dL)              | 1.03       | 1.18       | 1.12       | 1.19       | 1.07       |
| Uric acid (mg/dL)           | 4.96       | 6.67       | 6.61       | 6.03       | 6.41       |
| Total cholesterol (mg/dL)   | 78.5       | 95.5       | 110        | 6.19       | 112        |
| HDL (mg/dL)                 | 56.6       | 62.0       | 70.0       | 66.0       | 96.8       |
| LDL (mg/dL)                 | 12.7       | 33.6       | 41.8       | 18.2       | 30.8       |
| Triglyceride (mg/dL)        | 46.3       | 56.1       | 41.5       | 54.3       | 55.5       |

Means with different letters indicates significant difference (P<0.05)

Table 5. Serum biochemical indices of the Kampong chickens at 45 days of age

| Parameters measured          | Treatments |
|-----------------------------|------------|
|                             | T0         | T1         | T2         | T3         | T4         |
| Total protein (g/dl)        | 5.65       | 4.53       | 4.98       | 5.46       | 6.39       |
| Albumin (g/dL)              | 1.72       | 1.52       | 2.03       | 1.48       | 1.62       |
| Uric acid (mg/dL)           | 3.93       | 3.01       | 2.95       | 3.97       | 4.77       |
| Total cholesterol (mg/dL)   | 5.63       | 6.90       | 6.14       | 5.24       | 5.69       |
| HDL (mg/dL)                 | NM         | NM         | NM         | NM         | NM         |
| LDL (mg/dL)                 | NM         | NM         | NM         | NM         | NM         |
| Triglyceride (mg/dL)        | NM         | NM         | NM         | NM         | NM         |

NM: not measured

Dietary inclusion of herbal products such as turmeric has been attributed to the compromised liver health. In this study feeding/drinking of turmeric products or residue did not show any detrimental effect on the liver health, as indicated from the data of SGPT and SGOT as well as the liver relative weight (Table 5).

Tabel 5. Liver health indicators of the Kampong chickens at 45 days of age

| Parameter                     | Perlakuan |
|-------------------------------|-----------|
| SGPT (U/L)                   | T0        | T1        | T2        | T3        | T4        |
| 1.71                          | 2.10      | 2.42      | 2.53      | 2.10      |
| SGOT (U/L)                   | T0        | T1        | T2        | T3        | T4        |
| 218                           | 245       | 266       | 231       | 259       |
| Liver relative weight (% BW)  | T0        | T1        | T2        | T3        | T4        |
| 8.14                          | 8.11      | 6.27      | 7.84      | 6.21      |

BW: body weight

4. Conclusion

It could be concluded that the administration of turmeric both through diet and drinking water had minor impact on the haematological indices but increased carcass yield of the Kampong chickens especially during the starter period.
References
[1] Kemper, K. J. 1999. Ginger (Zingiber officinale). Longwood Herbal Task Force and The Center for Holistic Pediatric Education and Research
[2] Sulistyoningsih, M. 2015. Pengaruh variasi herbal terhadap organ dalam broiler. Seminar Nasional Konservasi dan Pemanfaatan Sumber Daya Alam. Pendidikan Biologi, Pendidikan Geografi, Pendidikan Sains, PKLH – FKIP UNS. 93-97
[3] Sugiharto, Isroli, E. Widiastuti and N. S. Prabowo. 2011. Effect of turmeric extract on blood parameters, feed efficiency and abdominal fat content in broilers. J. Indonesian Trop. Anim. Agric. 36(1): 21-26
[4] Bolton, W. 1967. Poultry Nutrition. London: MAFF Bulletin
[5] Gomez, K.A. dan A.A. Gomez. 1995. Prosedur Statistik untuk Penelitian Pertanian. Universitas Indonesia, Jakarta. (Diterjemahkan oleh S. Endang dan J.S. Baharsjah)
[6] Sugiharto, S., 2016. Role of nutraceuticals in gut health and growth performance of poultry. Journal of the Saudi Society of Agricultural Sciences 15, 99–111
[7] Dong H, Lin H, Jiao HC, Song ZG, Zhao JP, Jiang KJ. 2007. Altered development and protein metabolism in skeletal muscles of broiler chickens (Gallus gallus domesticus) by corticosterone. Comp Biochem Physiol a Mol Integr Physiol. 147(1):189-95