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# Effect of water extract of *Curcuma domestica* and *Hylocereus polyrhizus* in drinking water on carcasses and blood lipid profile of broilers

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## Abstract

This study aims to determine the effect of water extract of *Curcuma domestica* clove (CE) and *Hylocereus polyrhizus* peel (HC) through drinking water on carcasses and blood lipid profile of broilers. This study used 180 day-old-chicks (DOD) with homogeneous body weight randomized into 4 treatment groups and 5 replications. Each repetition used 40 heads DOC with homogeneous body weight. The four treatment groups, namely: the group of chickens that were given drinking water without the addition of CE and HC extract as a control (P0); group of chickens given drinking water added with 4% CE (P1); group of chickens given drinking water added with 4% HC (P2); and the group of chickens that were given drinking water supplemented with 2% CE+2% HC (P3). The results showed that the inclusion of aqueous extracts of CE, HC and their combinations in drinking water from 1-35 days of age had no significant effect (P≥0.05) on carcass weight, carcass percentage and meat in broiler carcasses. However, blood cholesterol levels decreased significantly (P≤0.05) compared to the control group. It was concluded that supplementation of aqueous extracts of CE, HC, and their combinations in drinking water did not have a negative impact on broiler carcass characteristics. However, it can significantly improve blood lipid profiles, namely reducing total cholesterol levels.

**Keywords:** Broiler; *Curcuma domestica*; Carcass; Cholesterol; *Hylocereus polyrhizus*

## 1. Introduction

Along with the increasing population and public awareness of the important role of animal protein, the demand for meat continues to increase from year to year. Poultry meat is still seen as an important source of protein, given the very complete content of essential amino acids. In the world of animal husbandry there are many ways to improve chicken performance, namely the use of various kinds of feed additives, both in drinking water and in feed. The ban on the use of antibiotics in poultry feed has an impact on decreasing the productivity of poultry livestock. Efforts that can be made to avoid this are by switching to using natural feed additives, namely a combination of herbal extracts through drinking water.

Today, the use of phytogenic feed additives is increasingly being used to increase the productivity and health of poultry. This is because herbal feed contains phytochemical compounds which can cause improvements in growth, stimulate digestion, utilize nutrients, immune response, and suppress populations of pathogenic bacteria in poultry [1,2,3].

Turmeric (*Curcuma domestica*) is a native Indonesian herbal plant which is used for medicine. Turmeric contains curcumin compounds and essential oils which have benefits as antioxidants, antitumor, anticancer, reduce levels of fat and cholesterol in the blood and liver, and are antimicrobial [4]. Dragon fruit peel (*Hylocereus polyrhizus*) contains vitamin C, vitamin E, vitamin A, alkaloids, terpenoids, flavanoids, tinamin, niacin, cobalamin, carotene, and phytoalbumin which are thought to have benefits as antioxidants [5]. Generally, phytogenic feed additives are used to improve overall poultry health, aid the digestive process and help detoxify the body [6]. The effect of the combination

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of two types of herbal leaves in drinking water significantly increases the productivity of poultry livestock and suppresses cholesterol levels in the blood serum of poultry livestock [7,8]. It is interesting to study the efficacy as a phytogenic feed additive, namely turmeric extract and dragon fruit peel on carcasses and blood lipid profiles of broilers.

## 2. Material and methods

### 2.1. Material

This research was conducted in closed cages belonging to a poultry group in Gulungan Village, Mengwi, Badung Regency, Bali Province. The chemicals used to analyze blood lipid profiles are chloroform, acetic anhydrous and concentrated $H_2SO_4$ and hexane alcohol in a ratio of 3:1. The tools used consist of an analytical balance, vortex, waterbath, test tube, centrifuge tube, Erlenmeyer flask, micropipette, and spectrophotometer. The feed given was commercial complete feed CP511 for broilers in crumble form produced by PT. Charoen Pokhpand Tbk, Indonesia.

### 2.2. Methods

This study used 180 day old chicks (DOD) with homogeneous body weight which were randomized into 4 treatment groups and 5 replications. Each replicate used 40 DOCs with homogeneous body weights. The four treatment groups were: the group of chickens that were given drinking water without the addition of CE and HC extracts as controls (P0); group of chickens given drinking water plus CE 4% (P1); the chicken group was given drinking water plus 4% HC (P2); and the drinking water group supplemented with 2% CE+2% HC (P3), respectively.

The variables observed in this study were carcass weight, carcass percentage (final body weight: carcass weight x 100%), carcass components (bones, meat and fat including skin). Each carcass component was then divided by carcass weight x 100 g carcass weight. Blood lipid profile includes total cholesterol, triglycerides, high density lipoprotein (HDL), and low density lipoprotein (LDL).

### 2.3. Water extract of Turmeric cloves and dragon fruit skin

Water extract of turmeric cloves or dragon fruit skin was made by blending 1 kg of turmeric cloves or 1 kg of dragon fruit skin (1:1; g/g). Then add 1 liter of clean water, let it simmer for 6 hours, then filter it with a double cloth and put it in a dark plastic bottle. The water extract was then stored in the refrigerator and ready to be used to be mixed into drinking water according to the treatment level.

All data were analyzed by one-way ANOVA, if there was a significant difference ($P \leq 0.05$) between treatments followed by Duncan's multiple range test.

## 3. Results and discussion

### 3.1. Carcass characteristics

Supplementation of 4% aqueous extract CE, HC, and their combination in broiler drinking water from 1-35 days old, did not have a significant effect ($P > 0.05$) on carcass weight, carcass percentage, and carcass components, namely: bone, meat, and fat including skin (g/100 g carcass weight). More detail is presented in (Table 1).

Supplementation of water extract of turmeric and dragon fruit skin and their combination through drinking water did not have an impact on broiler carcasses. Broiler carcasses are meat with chicken bones after being separated from the head to the base of the neck, from the feet to the knees, as well as the contents of the abdominal cavity, feathers and blood. The growth of the carcass component begins with bone growth, then muscle growth which will decrease after reaching puberty, then followed by increased fat growth.

Turmeric extract and dragon fruit peel at a dose of 4% did not provide a significant nutritional contribution to increase carcass percentage. If the essential nutrients, such as protein, energy, amino acids, vitamins, and minerals are insufficient or unbalanced in the ration, then supplementation with turmeric extract and dragon fruit peel also does not provide a significant change in carcass percentage. The results of this study are supported by [9] who reported that the addition of dragon fruit peel flour (*Hylocereus polyrhizus*) as a feed additive in feed did not have a significant effect on broiler carcass weight. Different results were reported by [10] that the administration of herbal extracts has an effect on carcass weight and carcass percentage.

**Table 1** Supplementation of CE, HC, and their combinations in drinking water on broiler carcass characteristics at 5 weeks of age

| Variable | Chicken Group1) | | | | SEM2) |
|---|---|---|---|---|---|
| | P0 | P1 | P2 | P3 | |
| Carcass weight (g/head) | 1409.50 | 1463.50 | 1448.75 | 1285.50 | 74.261 |
| Presentasekarkas (%) | 67.28 | 71.58 | 71.06 | 70.50 | 1.230 |
| Bones (g/100 carcass weight) | 23.22 | 22.21 | 24.40 | 24.55 | 2.209 |
| Meat(g/100 carcass weight) | 64.63 | 67.54 | 64.26 | 64.23 | 2.761 |
| Fat+skin (g/100 carcass weight) | 12.15 | 10.25 | 11.34 | 11.22 | 1.445 |

Note: 1) The group of chickens that were given drinking water without the addition of CE and HC extract as a control (P0); group of chickens given drinking water added with 4% CE (P1); added with 4% HC (P2); and supplemented with 2% CE+2% HC (P3), repectively; 2) SEM= Standard Errort of the Treatment Mean

The higher the ratio of bone meat to the carcass, the higher the proportion of carcass parts that can be consumed, thus the higher the quality of the carcass [11]. Based on the results of the study showed that the bones and meat were not significantly different in the control group and the treatment group. This means that giving turmeric extract at a dose of 4%, dragon fruit peel extract at a dose of 4% or a combination of both at a dose of 2% each has not been able to increase the percentage of bone and meat in broiler chickens.

A low percentage of meat will show a high percentage of bones [12]. High carcass weight will have an effect on the ratio of meat and bone weight, the range of bone percentage varies between 17-25% [13]. The high weight of chicken meat will affect the ratio of meat to bones in these chickens [11]. Inhibition of tissue growth will affect the carcass produced and can lead to a smaller ratio of meat to bones [14]. Body weight gain occurs due to an increase in muscle, not by adipose tissue and bone, so that the ratio of bone to meat does not change[15].

Poultry skin functions to protect the surface of the body mechanically, there is the possibility of entering its substances, regulating body temperature, as a secretory gland, namely sweat, where respiration takes place.The skin has oil glands located at the base of the tail [16].The results showed that there was no difference in the percentage of skin and fat in the control group and the treatment group. The results of this study are in line with [17] who revealed that administration of turmeric extract did not affect the water, protein and fat content of broiler chicken meat. Yuniza [18] emphasized that with increasing age, the fat content increases and female chickens accumulate fat faster than male chickens.

### 3.2. Blood lipid profile

**Table 2** Blood lipid profile of broilers fed drinking water with the addition of CE, HC, and their combinations of water extracts

| Variable | Chicken Group1) | | | | SEM2) |
|---|---|---|---|---|---|
| | P0 | P1 | P2 | P3 | |
| Cholesterol total (mg/dl) | 70.50a3) | 50.25b | 54.50b | 54.25b | 3.274 |
| HDL (mg/dl) | 38.12 | 22.70 | 26.37 | 26.80 | 7.139 |
| LDL (mg/dl) | 25.62 | 19.20 | 22.02 | 29.45 | 6.372 |
| Triglyserides (mg/dl) | 33.75 | 41.75 | 55.50 | 42.50 | 11.414 |

Note: 1) the group of chickens that were given drinking water without the addition of CE and HC extract as a control (P0); group of chickens given drinking water added with 4% CE (P1); added with 4% HC (P2); and supplemented with 2% CE+2% HC (P3), repectively; 2) SEM= *Standard Errort of the Treatment Mean; 3)* Values with different letters in the same line indicate different significant (P<0.05).

Supplementation of CE, HC, and their combination in broiler drinking water from 1-35 days of age significantly reduced the total cholesterol content of broiler blood serum (Table 2). Total cholesterol content in chicken groups P1, P2, and P3, were: 28.72%; 22.70%; and 23.05% significantly (P<005) lower than the control group (P0).

HDL, LDL and blood triglyceride levels in the P1, P2 and P3 chicken groups did not show a significant difference (P>0.05) compared to the control chicken group (P0). More details are presented in Table 2).

Total cholesterol levels in the P1, P2, and P3 chicken groups were significantly lower than the P0 chicken group. The decrease was due to the phytochemical content in CE, HC, and their combinations. As reported by [7,8], that the savonin, alkaloid, and tannin compounds contained in herbal leaves can significantly reduce cholesterol content in serum and yolk. Herbal *Turmeric* has several compounds, such as *Curcumin* which are known to have anti-inflammatory and antioxidant effects, which provide significant nutritional contributions to significantly change cholesterol levels. Different results were reported by [19] that rations with fermented dragon fruit peel flour (*Hylocereus ploryrhizus*) up to 7% had no effect on cholesterol in broiler chickens.

High density lipoprotein (HDL) is a class of proteins that functions to transport cholesterol from peripheral cells to liver cells and other body glands. HDL is a lipoprotein which contains protein and is secreted by the liver. HDL plays a role in collecting excess cholesterol from the body's tissues to be returned to the liver, and removing it with bile salts from the body. Based on the results of the study showed that HDL was not different in the control group with the treatment group. Even though dragon fruit peel contains several bioactive compounds and nutrients such as fiber, vitamin C, and antioxidants, dragon fruit peel extract at a dose of 4% may not provide a significant enough nutritional contribution to change HDL levels significantly. The results of this study are in line with [21] which revealed that turmeric extract had no effect on broiler blood cholesterol levels.

Low density lipoprotein (LDL) is a lipoprotein that plays a role in the process of sending cholesterol from the liver to the rest of the body [22]. Based on the results of the study, there was no significant difference between the control group and the P1, P2, and P3 chicken groups. The opinion of [23] cholesterol levels are influenced by genetic factors, the amount of fatty acids in the feed and the amount of HDL in the blood. The results of this study are in line with [22] which revealed that turmeric extract had no effect on broiler blood cholesterol levels. The high fat content in the tissues is affected by the triglyceride levels in the serum which come from fat synthesis in the liver. The results of this study are in line with [22] which revealed that turmeric extract had no effect on broiler blood cholesterol levels.

## 4. Conclusion

It was concluded that supplementation of aqueous extracts of CE, HC, and their combinations, in drinking water did not have a negative impact on broiler carcass characteristics. However, it can significantly improve blood lipid profiles, namely reducing total cholesterol levels.

## Compliance with ethical standards

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### *Disclosure of conflict of interest*

No conflict of interest

### *Statement of ethical approval*

This research was approved by the Research Ethics Commission from the Faculty of Animal Husbandry and the Faculty of Veterinary Medicine, Udayana University.

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