# THE EFFECTS OF CURCUMA (*CURCUMA LONGATA*) AS NATURAL TENDERIZER ON POULTRY MEAT

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***Abstract***

*Forty day old chicks Arbor Acres CP-707 were used randomly in this experiment, to study the effects of various levels of Curcuma (Curcuma longata) as natural tenderizer on poultry meat, were studied for six weeks. Research using Completely Randomized Design (CRD). The dietary treatments are: R0 basal diet as control (0% curcuma meal), R1 basal diet + 2% curcuma meal, R2 basal diet + 4% curcuma meal and R3 basal diet + 6% curcuma meal, and each treatment were repeated five times. Results indicated that for the meat fat in broiler which was added curcuma meal in the ration will have less fat to the broiler meat (1.65% - 1.92%) versus 1.99% for basal diet. And for the meat tenderness; the highest meat tenderness was get from the broiler with basal diet + 6% curcuma meal (187,2 mm/g/10sec) and the lowest was get from the broiler with basal diet + 0% curcuma meal (151.6 mm/g/10sec). The results of the study indicated that there is beneficial effect of dietary inclusion of curcuma (Curcuma longa) powder at 0, 2.0, 4.0 and 6.0 per cent on meat fat and meat tenderness of broiler.*

***Keywords** : curcuma meal, meat fat, meat tenderness*

## Introduction

Texture of foods is mostly determined by the moisture and fat contents, and the types and amounts of structural carbohydrates and proteins. Changes in texture are caused by loss of moisture or fat, and coagulation or hydrolysis of protein (Fellows, 1990). Lean meat contain a very high amount of protein and water and very little fat. In chicken, the protein content are 21 g/100 g; fat 3 g/100g and water 75 g/100g (Simonsen, et al, 1988 in Cross and Overby, 1988). Meat usually cooked before being eaten, and in gastronomic terms, meat is rare if cooked to an internal temperature of 60$^{o}$C and well done if cooked at 80$^{o}$C. The endomysial tissue begin to shrink at 50$^{o}$C and complete at 70$^{o}$C. When the heating prolonged, the collagen fibres become swollen and gradually denature; and above 70$^{o}$C will caused further disruption of collagen, and eventually the collagen will solubilized as gelatin. The fat content of meat and meat products has to be judged primarily from the standpoint of calories (Hostetler and Landmann, 1968; Schmidt and Parrish, 1971 in Cross and Overby, 1988).

Tenderness is the process of partial relaxation of the fibres. Resolution of rigor is due to enzymatic activity and physical stretching of the muscles fibres attached to bones. Tenderness is measured by use of specialized laboratory equipment or by a taste-panel (Bell and Weaver, 2002). Contrary to popular belief, what the animal is fed does not directly influence tenderness. Many factor influence meat tenderness. The most important factors are genetics, age of the animal, location of the cut on the carcass, processing, method of cooking and degree of doneness (Epley, 2011).

*Curcuma* (Zingiberaceae) is a large genus of rhizomatousherbs distributed in tropical and subtropical regions especially in India, Thailand, the Malay Archipelago, Indochina, Northern Australia and Indonesia. Many species have been cultivated, and their powdered rhizomes have been widely used as flavours in native dishes and ingredients in many traditional medicines to treat various ailments (Jantan, et al, 2012). Curcuma longa has significantly greater total polyphenols, flavonoids and anthocyanidins and anti-oxidant activity (Trinidad et al, 2012). According to Jantan et al, (2012) the three curcuminoids

showed strong inhibition on LDL peroxidation, with curcumin and demethoxycurcumin showing comparable antioxidant activity and more potent than bisdemethoxycurcumin. The three curcuminoids showed strong inhibition on LDL peroxidation. The present study was in accordance with previous studies which indicated that the absence of one methoxy group (demethoxycurcumin) on the phenyl ring did not have effect, but the absence of both methoxy groups (bisdemethoxycurcumin) resulted in decreased antioxidant activity in curcuminoids. The phenolic hydroxyl and the methoxyl groups on the phenyl ring and the 1,3-diketonesystem are important structural features for antioxidant activity. The fermentable dietary fiber from Zingiberofficinale and Curcuma longa was shown to produce only the short chain fatty acid, propionate which was significant for both samples indicating protective effect for cholesterol-lowering. Propionate release in the colon after dietary fiber fermentation is readily taken up by the liver. Its action is to inhibit the limiting enzyme HMG Co-enzyme reductase for cholesterol synthesis(Trinidad, et al, 2012). Accordng to Basavaraj (2011), results of meat parameters such as live weight (g), and carcass weight (g), dressing percent, meat to bone ratio are lower and chemical composition of meat, there is no significance between control and curcuma treatments, because the broiler rabbit are on summer stress.

**Materials and Methods**

Forty broilers, day old chicks Arbor Acres CP-707 were assigned randomly and studied for six weeks. Research using Completely Randomized Design (CRD). They were randomly allotted to four dietary treatment groups of ten chicken broilers in each group namely R-0, R-1, R-2 and R-3. The dietary treatments are: R-0 basal diet as control (0% curcuma meal), R-1 basal diet + 2% curcuma meal, R-2 basal diet + 4% curcuma meal and R-3 basal diet + 6% curcuma meal, and each treatment were repeated five times. Carcass composition of meat were analyzed for the fat content. The broiler carcass tenderness was established by meat tenderness instruments.

**Results and Discussions**

**The effect of Curcuma meal on broiler meat fat.**

In Table 1, there are the results of the effect of curcuma meal in ration on broiler meat fat.

**Table 1. The effect of curcuma meal in ration on broiler meat fat (%)**

| Replication | R-0 | R-1 | R-2 | R-3 |
|---|---|---|---|---|
| **I** | **2.01** | **1.92** | **1.69** | **1.64** |
| **II** | **1.99** | **1.93** | **1.73** | **1.64** |
| **III** | **1.97** | **1.91** | **1.70** | **1.66** |
| **IV** | **1.98** | **1.91** | **1.71** | **1.65** |
| **V** | **2.00** | **1.93** | **1.72** | **1.66** |
| **Average** | **1.99** | **1.92** | **1.71** | **1.65** |

Notes :
R-0 basal diet as control – 0% curcuma meal,
R-1 basal diet + 2% curcuma meal,
R-2 basal diet + 4% curcuma meal and
R-3 basal diet + 6% curcuma meal

From Table 1, the average of meat fat are between 1.65% to 1.99%. The highest meat fat is from R-0 the basal diet without curcuma meal (1.99%) and the lowest is from R-3 that using basal diet plus 6% curcuma meal (1.65%). It means that adding curcuma meal in the ration will give less meat fat to the broiler. According to Jantan et al, 2012 the three curcuminoids showed strong inhibition on LDL peroxidation, with curcumin and demethoxycurcumin showing comparable antioxidant activity and more potent than bisdemethoxycurcumin. The fermentable dietary fiber from Curcuma longa was shown to produce only the short chain fatty acid, propionate which was significant for the samples indicating protective effect for cholesterol-lowering. Propionate release in the colon after dietary fiber fermentation is readily taken up by the liver. Its action is to inhibit the limiting enzyme HMG Co-enzyme reductase for cholesterol synthesis (Trinidad, et al, 2012).

**The effect of Curcuma meal on broiler carcass tenderness.**

In Table 2, there are the results from using of curcuma meal in ration, to the broiler carcass tenderness. The highest carcass tenderness was get from the broiler that fed R-3 basal diet with 6% curcuma meal (187.2 mm/g/10sec) and the lowest was get from the broiler that fed basal diet R-0 (151.6 mm/g/10sec).

**Table 2. The effect of curcuma meal in ration on broiler carcass tenderness (mm/g/10 sec)**

| Replication | R-0 | R-1 | R-2 | R-3 |
|---|---|---|---|---|
| **I** | **146.0** | **141.0** | **182.0** | **192.0** |
| **II** | **162.0** | **171.0** | **178.0** | **195.0** |
| **III** | **142.0** | **154.0** | **175.0** | **185.0** |
| **IV** | **149.0** | **177.0** | **185.0** | **182.0** |
| **V** | **159.0** | **162.0** | **172.0** | **184.0** |
| **Average** | **151.6** | **163.0** | **178.4** | **187.2** |

Notes :
R-0 basal diet + 0% curcuma meal, as control,
R-1 basal diet + 2% curcuma meal,
R-2 basal diet + 4% curcuma meal and
R-3 basal diet + 6% curcuma meal.

From Table 2, adding curcuma meal has effect to the broiler carcass tenderness. And the tenderness will increase when the curcuma meal level percentage more higher. In R-0 (basal diet + 0% curcuma meal), the tenderness are 151.6 mm/g/10sec, will increase when the level of curcuma meal are 2% (R-1 = 163.0 mm/g/10sec); and in R-2 (basal diet + 4% curcuma meal) the tenderness is 178.4 mm/g/10sec; compared to the R-3 basal diet + 6% curcuma meal in ration (187.2 mm/g/10sec). Tenderness of the carcass was increase, because the curcuma has enzymatic activities. Because of the activities of the enzyme, even the fat content in the meat decreased, but the meat tenderness will higher than the meat with no curcuma in the ration. Tenderness is the process of partial relaxation of the fibres. Resolution of rigor is due to enzymatic activity and physical stretching of the muscles fibres attached to bones (Bell and Weaver, 2002). According to Jantan et al, 2012 the three curcuminoids showed strong inhibition on LDL peroxidation, with curcumin and demethoxycurcumin showing comparable antioxidant activity and more potent than bisdemethoxycurcumin.

## Conclusions

The effect of curcuma in the ration on poultry meat, will decreased the meat fat, but it also will increased the tenderness of poultry meat. So, the curcuma can be used as natural tenderizer on poultry meat.

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