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Sensory Attributes of Broiler Meat with Dietary Supplementation of Fermented Turmeric (*Curcuma longa*) Tubers (FTT)

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Abstract

Broilers are specifically raised for meat purposes. Feed and water supplements are provided to the birds in order to hasten growth and development. The study was conducted to evaluate the sensory attributes of broiler chickens with Dietary Supplementation of Fermented Turmeric Tubers (FTT). A total of sixty (60) day-old broiler chicks were randomly assigned into four treatment groups with three (3) replicates with (5) birds per replication. The experimental treatments were T1(antibiotic-control), T2 (20 ml FTT), T3 (30ml FTT) and T4 (40 ml FTT) per liter of water. The birds were raised under standard management practices for thirty (30) days. After 30 days, the breast cut of the experimented birds was roasted and sensory attributes of meat based on taste, tenderness, juiciness, odor, texture and overall acceptability were determined by a group of testing panel using hedonic scale of evaluation. The data gathered were analyzed using ANOVA for Complete Randomized Design (CRD). Results showed that T3 got the highest mean value for Taste, T1 for Tenderness, T4 for juiciness and odor, T1 and T4 for Texture, T2 and T4 for the overall acceptability. However, Statistical Analysis showed no significant differences among treatment means which indicates that supplementation of FTT in broilers did not markedly vary in all treatments. Nevertheless, the supplementation of FTT in the diet of broilers proved to have a positive influence on the taste, juiciness, odor, texture and overall acceptability of broiler meat. It could be concluded that the use FTT as water supplement had enhanced the sensory attributes of broiler chickens.

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Introduction

Broiler chickens need supplements and nutrients to have faster growth rates and development. Feed supplement and feed additive are nutrient substances used to improve the growth performances (Choi *et al.*, 2023) of broilers chickens. One of feed additives that are frequently used in broiler production is Antibiotic Growth Promoter (AGP) that was reported to increase the bacterial resistance resistance (Haque *et al.* 2020; Untari *et al.*, 2021;) in human consuming the broiler's meat due to the residue of AGP in the broiler tissue. The issues of antibiotic resistance make some countries to prohibit the use of AGP in broiler chickens and food producing animals (Maron *et al.*, 2021). In order to counteract this issue, alternatives to substitute the use of AGP in animal husbandry that improve productivity and health performances were studied and one of this are the utilization of herbal products (Sugiharto, 2021) with the purpose of producing safe meat for human consumption (Ratiq *et al.,* 2022).Turmeric (Curcuma longa Linn.) is one of these herbs to substitute antibiotic that exhibit antimicrobial activity (Gobiraju *et al.,* 2019; Lagua *et al.,* 2021; Samarasinghe *et al.,* 2023). It is known as the "Golden Spice" from Asia to Africa (Jagganath, 2020) that contains bioactive compounds with powerful medicinal properties, curcumin a natural inflammatory compound (Sharifi-Rad *et al.,* 2020). The medicinal properties of turmeric (Prasad *et al.,* 2011) have been proven to be very effective in broilers, but the use in broilers through fermentation process was not yet studied, hence, this study was conducted to evaluate the effects of fermented turmeric tubers on the sensory attributes of broiler meat as water dietary supplement.

Turmeric tubers are locally available, widely cultivated, very affordable because it is considered as one of the cheapest spices (Haque *et al.,* 2020), herbal remedy (Rolfe *et al.*, 2020) and extensively utilized as dietary spice (Jagganath, 2020). As medicinal herb, it is used to treat inflammation, pain, for wound healing, and digestive syndromes (Singletary, 2020). Current studies have shown that turmeric can be a practical alternative to antibiotics considering that misuse of synthetic drug like antibiotics can led to the development of antibiotic-resistant bacteria that poses a risk in both animals and human health (Aderemi *et al.*, 2023).

In this notion, this study was brought about to prove the valuable influence of turmeric in broilers. The main objective of the study was to determine the effects of Fermented Turmeric Tubers (FTT) dietary supplementation on the sensory attributes of broiler meat based on its tenderness, juiciness, texture, odor, taste and overall acceptability.

Material and methods

Study area

The production of fermented turmeric tubers and the rearing of broiler chickens were conducted at the Broiler Project of Camiguin Polytechnic State College, Institute of Agriculture, Tangaro, Catarman, Camiguin (Fig. 1). Basically, what was needed during the conduct of the study was the 60 heads broiler chicks and broiler feeds. The raw materials used as components of Fermented Turmeric Tubers were molasses and fresh turmeric, facilities such as feeders, waterers, incandescent bulb. Other materials and equipment used were the weighing scale, oven, newspaper, dark empty bottles, bamboo pool, rubber band, knife and chopping board.

Camiguin Polytechnic State College, Institute of Agriculture (Fig. 2) is a satellite campus of Camiguin Polytechnic State College, Balbagon , Mambajao, Camiguin and formerly known as Central Mindanao University External Studies, Tangaro, Catarman, Camiguin. The Institute of Agriculture, Catarman campus existed for 23 years educating the youth of the province with the three major curricular programs in Agriculture; Animal Science, Crop Science and Agro-forestry. The campus has total land area of 8.9 hectares which comprises 0.12% of the entire municipality.

Fermentation process of turmeric tubers

The procedure on the preparation of fermented Turmeric Tubers is in accordance with the procedure

described in Natural Farming Manual (Jensen *et al.,* 2006). The raw materials for fermented Turmeric Tubers were gathered, washed and combined in a ratio of 1:1 with molasses. The mixture was placed in a container using bamboo pole, covered with manila paper and stringed with rubber band. The container was kept in a cool placed for seven days to complete the fermentation process. The FFT was filtered, residues were discarded, transferred to a dark bottle and stored in a dark and cool place.

Fig. 1. Locale of the study at the Broiler Project of Camiguin Polytechnic State College, Institute of Agriculture, Tangaro, Catarman, Camiguin.

Experimental design and treatment

The study utilized sixty (60) heads day-old broiler chicks that was randomly selected and assigned into to four (4) treatments with and three (3) replicates with five birds in each replication following the Randomized Complete Block Design (RCBD). The birds were supplemented with antibiotic T1 (control-No FFT) and varying levels of FFT, T2 (20 ml FFT), T3 (30 ml FFT) and T4 (40ml FFT) per liter of water. Supplementation of FFT was started after two days of arrival of broiler chicks up to 28 days of rearing. However, an antibiotic in the control was provided every other day and withdrawal of the antibiotic was observed before marketing of live and dressed birds.

Care and management of broilers during rearing period

The broilers chicks were raised for 30 days and provided with uniform management practices. Artificial heat using incandescent bulb was provided for 24 hours during brooding for two weeks. Commercial feeds and water with supplements were supplied in ad libitum system throughout the experimental period. As preventive measures for disease occurrence, waterer and feeders were washed daily in the morning before use and birds were vaccinated against New Castle Disease. Dead birds were properly disposed to prevent spread of diseases. Farm sanitation was strictly observed during the conduct of the study**.**

Sensory evaluation and data analysis

The meat quality of broilers was evaluated following the Hedonic Scale of Evaluation. After dressing broilers, the breast cut was removed from the representative bird of each treatment. The breast cut

was prepared again for roasting in preparation for sensory evaluation according to odor, texture, tenderness, taste, juiciness and overall acceptability.

The process of roasting started by wrapping the randomly selected breast cut from each treatment using aluminum foil and cooked in the oven at a temperature of 325°F or 163°C for one and a half hour. A part of the roasted breast cut was sliced and placed in coded plates for identification and sensory evaluation of the testing panel consisting of three (3) evaluators who were non- smokers, non- alcoholic drinkers and has no false teeth in order to obtain accurate response upon testing. The results obtained were analyzed using the Analysis of Variance (ANOVA) of Completely Randomized Design.

Results and discussion

Sensory evaluation

The meat quality of broilers based on sensory evaluation is presented in Table 1. Results show that T4 has the highest mean value of 5.8, T1 and T3 with the lowest mean value of 5.3 for the odor of oven-cooked broiler meat. However, texture evaluation reveals that T1 has the highest mean value of 6.13 and T3 with lowest mean value of 5.47.

Table 1. Sensory evaluation of broiler meat with dietary supplementation of Fermented Turmeric (*Curcuma longa*).

	Parameters					
Treatment	Taste	Tenderness	Juiciness	Texture	Odor	Over-all acceptability
T1	5.5	6.13	5.7	5.8	5.3	5.7
T2	5.7	5.8	5.4	5.6	5.4	5.8
T3	5.8	5.47	5.4	5.6	5.3	5.7
T4	5.8	5.87	5.8	5.8	5.8	5.8
F-test	ns	ns	ns	ns	ns	ns
CV (%)	6.6	6.13	8.43	6.61	10.74	5.69

CV = Coefficient of Variation

ns = not significant.

The juiciness evaluation further shows that T4 has the highest mean value of 5.8 and T2 with 5.4 as the lowest mean value. The taste evaluation shows that T3 has the highest mean value of 5.8 and lowest is T1 with 5.5. Moreover, overall acceptability reveals that T1 and T4 has the highest mean value and T1 got 5.7 as the lowest evaluation for overall acceptability of oven-cooked of broiler meat. Nevertheless, statistical analysis shows no significant differences in between treatment means in all variables studied. This implies that dietary supplementation of Fermented Turmeric Tuber in commercial broilers chickens did not vary in all treatments. However, the supplementation of Fermented Turmeric Tubers in the diet of broilers proved to have a positive influence on the taste, juiciness, texture, odor and overall acceptability of oven-cooked broil meat. A study showed that feeding turmeric powder had improved the meat quality of broilers (Raskar *et al.*,2019) and dietary supplementation of turmeric had results to better juiciness of broiler meat (Lukasiewicz *et al.*, 2017) and enhanced meat quality (Sugiharto *et al.* 2020) Fermented feed improves the oxidative stability and thus meat quality of broilers (Sugiharto *et al.*, 2019).

Fermented feeds are considered as probiotics; hence, it holds lactic acid bacteria (LAB) grown thru fermentation that improve nutritive value food (Soemarie *et al.*, 2021). Fermentation process is a very important process that allows the utilization of microorganisms to break down complex compounds to yield a unique taste and aroma in food.

The controlled action of selected microorganisms is used to alter the texture of foods which increases the quality and value of raw materials (Adams, 1990).

Fig. 2. Camiguin Polytechnic State College, Tangaro Catarman, Camiguin.

The fact that fermentation process may alter texture and yield a unique taste and aroma in foods, these factors contributed to the acceptability of the oven-cooked meat of broilers supplemented with fermented turmeric tubers.

Conclusion

The supplementation of Fermented Turmeric Tuber (FTT) in broilers did not markedly vary in all treatments. The utilization of FTT as water supplement in the diet of broilers proved to have a positive influence on the taste, juiciness, odor, texture and overall acceptability of broiler meat. It could be concluded that the use Fermented Turmeric Tubers (FTT) as water supplement had enhance the sensory attributes of broiler chickens. Hence, fermented turmeric tubers can be used as alternative for antibiotic as supplement for broilers.

Recommendations

The influence of Fermented Turmeric Tubers on the sensory attributes of broilers at T4(40ml per liter of water) is recommended based on the prevailing results of the study. Relevant investigation is suggested for the determination on production performance and profitability of broilers supplemented with Fermented Turmeric Tubers to further identify the beneficial effects of the used of supplements in broilers in lieu to antibiotics.

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