FATTY ACID PROFILE OF BROILER CHICKEN'S MEAT ON DIETS SUPPLEMENTED WITH DRIED POWDERED SPICES AND TOMATO FRUIT

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ABSTRACT
This study investigated the effects of dietary supplementation of dried powdered spices and tomato fruit on fatty acid profile of broiler chicken meat. A total of 225 Ross day-old chicks were randomly allotted to T1 Basal diet (BD), T2 Basal diet +Black pepper powder (BD+BPP), T3 Basal diet + Tomato fruit powder (BD+TFP), T4 Basal diet + Ginger powder (BD+GNP), T5 Basal diet + Chilli pepper powder (BD+CPP) for six weeks. Birds were fed diets containing 21% CP, 2900 Kcal/kg metabolisable energy from 0 – 28 days of age and 17% CP, 3,000 Kcal/kg metabolizable energy from 29 – 42 days of age using a completely randomised design experiment. At 6 weeks, BD and BD + BPP birds have higher (P<0.05) saturated fatty acid profiles compared with other treatment birds. The mono-unsaturated fatty acid content of bird's meat on BD +CPP waslower (P>0.05) than those bird's meat on other treatments. Likewise, the poly-unsaturated fatty acid content of bird's meat on BD + BPP) were more compared with those bird's meat on other treatments. In conclusion, the dietary supplementation of dried powdered Black pepper played a pivotal role in enhancing the fatty acid profile, especially the poly-unsaturated fatty acid of broiler chicken meat, making it a relevant area of study for improving poultry nutrition and meat quality.
Keywords: Black pepper, Tomato, Ginger, Chilli pepper, Supplementation

INTRODUCTION

The addition of tomato fruits and dried powdered spices to the diet has a substantial impact on the fatty acid profile of the meat of broiler chickens. According to research, adding different spices and tomatoes might improve the nutritional value of poultry meat by changing the composition of its fatty acids, which could result in meat products that are healthier. For example, it has been shown that spices like oregano and cinnamon improve fatty acid profiles by raising unsaturated fatty acid levels and lowering saturated fat levels (Khan *et al*., 2019). Furthermore, the bioactive components in tomato fruit, which are high in antioxidants, can help to improve the quality of meat (Rizvi *et al*., 2021). To maximize broiler chicken production and satisfy customer needs for healthier meat options, the interaction between diet and fatty acid profile is essential (Smith and Brown, 2020).

Furthermore, the combined impacts of these dietary elements can enhance the meat's overall health advantages as well as its fatty acid composition, making it a worthwhile topic for additional chicken nutrition research (Adeleye *et al*., 2022). In line with consumer preferences for quality and nutrition, this study advocates dietary modifications to increase the health benefits of broiler chicken meat

MATERIALS AND METHODS

The experiment was carried out at the poultry unit of teaching and research farm, poultry unit of Department of Animal Production, Kwara state university, Malete. Moro local government, Kwara state, Nigeria

Experimental Animals and Management

A total number of 225 Ross broiler day-old-chicks were randomly assigned into five (5) treatments and were fed diets containing 21% CP, 2900 Kcal/kg metabolisable energy from 0 – 28 days of age and 17% CP, 3,000 Kcal/kg metabolisable energy from 29 – 42 days of age.

Preparation of Black Pepper Powder, Tomato Fruit Powder, Ginger Powder and Chili Pepper Powder

Ripe black pepper, ginger, chili pepper and tomato were washed with distilled water and oven dried at 40^{o}C for 72hours. The dried samples were blended into fine powder using a blender and passed through a sieve with a diameter of 142.56mm.

Experimental Design

The birds were placed into five (5) treatments and three (3) replicates with fifteen (15) birds per replicate using completely randomise design.
The following are the supplemental level of the treatments:

- Treatment one (T1) basal diet (control)
- Treatment two (T2) diets with black pepper powder 5g per kilogram of diet
- Treatment three (T3) diets with tomato fruit powder 5g per kilogram of diet
- Treatment four (T4) diets with ginger powder 5g per kilogram of diet
- Treatment five (T5) diets with chili pepper powder 5g per kilogram of diet

Data Collection

Procedure for fatty acid profile analysis

Five (5) grams of pectoralis muscle were dissected from the breast meat of a bird per replicate and used for fatty acid composition determination using the procedure described by Folch *et al.,* (1957), modified by Rajion *et al.,* 1985 and adopted by Ishola *et al*., (2020).

Statistical Analysis

Data collected were analysed for normality using the PROC UNIVARIATE SAS (2014) package Tukey HSD test at P< 0.05 significant level was used to separate the means.

RESULT AND DISCUSSION

Table 1 shows that valeric, butyric and myristoleic acids of bird's meat on the control, the basal diet BD is significantly higher (p<0.05) than birds on other treatments. Whereas caproic, capric, docosahexanoic and acetic acids of bird's meat on diet supplemented with BD+BPP is significantly higher (p<0.05) than bird's meat on other treatments. Also, bird's meat on diet supplemented with BD+TFP is significantly higher (p<0.05) in caprylic and caproleic acids than bird's meat on other treatments. Lauric, oleic and arachidonic acids of bird's meat on diet supplemented with BD+GNP is significantly higher (p<0.05) than bird's meat on other treatments including the control diet. Finally, the bird's meat on diet supplemented with BD+CPP is significantly higher (p>0.05) in myristic and linoleic acids than birds on other treatments including control.

Table 1: Effect of Dietary Spices and Tomato Fruit Supplementation on Fatty Acid Profiles of Broiler Chicken's Meat

Parameters	Treatments						
	BD	BD+BPP	BD+TFP	BD+GNP	BD+CPP	SEM	P value
Saturated Fatty Acids (%)							
Caproic acid (C6:O)	1.62^{d}	5.71^{a}	2.41^{c}	4.94^{b}	0.00^{e}	0.0007	<0.0001
Capric acid(C10:O)	25.28^{c}	39.66^{a}	12.10^{e}	30.99^{b}	20.19^{d}	0.027	<0.0001
Valeric acid(C5:O)	2.96^{a}	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	0.0005	<0.0001
Caprylic acid(C8:O)	11.71^{c}	5.72^{e}	15.96^{a}	12.33^{d}	14.50^{b}	0.001	<0.0001
Lauric acid(C12:O)	0.00^{b}	0.00^{b}	0.00^{b}	2.00^{a}	0.00^{b}	0.0005	<0.0001
Butyric acid(C4:O)	4.18^{a}	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	0.0003	<0.0001
Myristic acid(C14:O)	1.01^{c}	1.48^{b}	0.00^{d}	0.00^{d}	3.07^{a}	0.007	<0.0001
Monounsaturated Fatty Acids							
Caproleic acid (C10:1Λ9)	1.07^{e}	1.23^{d}	9.17^{a}	2.01^{c}	4.86^{b}	0.001	<0.0001
Myristoleic acid (C14:1Λ9c)	1.84^{a}	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	0.0005	<0.0001
Oleic acid (C18:1Λ9c)	1.07^{c}	0.00^{d}	0.00^{d}	6.00^{a}	2.07^{b}	0.009	<0.0001
Poly Unsaturated Fatty Acids							
Linoleic acid (C18:4(n-6))	7.98^{c}	3.58^{d}	9.08^{b}	0.00^{e}	14.62^{a}	0.0005	<0.0001
DHA(C22:(6n-3))	0.00^{b}	0.84^{a}	0.00^{b}	0.00^{b}	0.00^{b}	0.0005	<0.0001
Acetic acid	0.93^{b}	1.47^{a}	0.00^{c}	0.00^{c}	0.00^{c}	0.0006	<0.0001
Arachidonic acid(C20:4(n-6))	0.00^{b}	0.00^{b}	0.00^{b}	2.13^{a}	0.00^{b}	0.0005	<0.0001

$^{a, b, c}$ means having different superscripts along the same row are significantly different (p < 0.05). DHA-Docosahexaenoic acids

CONCLUSION AND RECOMMENDATION

The inclusion of Black pepper powder into the diet components significantly improves the fatty acid composition of the meat, by enhancing the levels of beneficial unsaturated fatty acids (Poly-unsaturated fatty acid) while reducing saturated fats.

It is recommended that poultry producers consider incorporating a variety of dried spices and tomato fruit into broiler diets to optimise meat quality.

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