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Effect of graded levels of oregano powder (*Origanum vulgare*) on carcass characteristics of broiler chicken meat

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ABSTRACT

This research evaluated the effect of feeding varying levels of Oregano powder (OP) (*Origanum vulgare*) on carcass characteristics of broiler chicken meat. Two hundred broiler chicks were randomly allotted to four (4) dietary treatment groups in a completely randomized design (CRD). The dried oregano leaves were ground into a fine form, milled and incorporated into the ration over the top (above 100%). Each treatment consisted of varying levels of OP as 0, 15, 20 and 25g/100kg representing treatments T1, T2, T3 and T4 respectively. The birds were fed the experimental feed for 49 days, at the end of which 5 birds per replicate were sacrificed and their carcasses were evaluated for carcass characteristics. From the results obtained, there was no significant difference ($P>0.05$) in the mean values obtained for all the carcass characteristics and primal cuts examined. The mean weight values of the external and internal offal examined showed no significant difference ($P>0.05$) in their means except for the head which differed significantly ($P<0.05$). It was concluded that Oregano powder inclusion at 0, 15, 20 and 25g/100kg in the diets of broiler chicken did not have any effects on carcass characteristics of broiler chicken meat.

Keywords: Oregano; poultry; carcass characteristics

INTRODUCTION

In recent years, natural strategies are being studied for application in poultry production. Natural medicinal products originating from herbs and spices are being used as feed additives for farm animals. Being natural, safer or less toxic, less residue and easily available makes them highly acceptable as natural feed additives for poultry. These have multiple effects on animals which include stimulation of appetite, increased digestive enzyme secretion, immune stimulant, bactericidal, antiviral, and antioxidants, etc. (Guo, 2003).

In recent years, research have demonstrated the application of *Origanum vulgare* as antioxidant (Zhang *et al.*, 2014), antimicrobial (Dutra *et al.*, 2019), anti-inflammatory **(**Silva *et al.*, 2015**)**, antiviral (Zhang *et al.*, 2014) antispasmodic (Goncearіuc *et al.*, 2015),

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antiproliferative (Elshafie *et al.,* 2017), and neuroprotective (Gîrd *et al.,* 2016). Therefore, the interest in this plant is increasing, especially as an important therapeutic alternative.

It is generally acknowledged that nutrition or diet is one of the major factors that influence carcass and meat quality of broiler chickens (Puchała *et al*., 2015; Uhlíová *et al*., 2018). Meat quality is not only limited to visual and sensory traits but also includes the safety, health and welfare status of the production system (Becker, 2000). Dietary manipulations can alter both quantitative and qualitative traits and consequently, the quality of the meat (Oliveira *et al*., 2015).

Most of the existing literature gives more emphasis on the use of Oregano oil as phytobiotic alternative to antibiotics rather than Oregano powder. Similarly, there is a gap in information on the inclusion level of Oregano powder and effect of Oregano powder on carcass characteristics of broiler chicken as feed additives. Thus, the present study investigates the effect of feeding varying levels of Oregano powder (OP) (*Origanum vulgare)* on carcass characteristics of broiler chicken meat.

MATERIALS AND METHODS

The Study Area

The study was carried out at the Poultry Production Unit of the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto, Nigeria. Sokoto is located between latitudes $11^0\,30^1$ and $13^0\,50^1$ N and longitudes $4^0\,0^1$ and $6^0\,40^1$ E in the northern part of Nigeria and lies on altitude of 350 m above sea level (Mamman *et al.,* 2000). Sokoto is located in the semi-arid region of Nigeria. It has rainfall of about 760mm per annum and high temperature range of 35-40^{o}C characterized by scanty vegetation, made up of few trees and abundant shrubs and grasses.

Experimental Design

This study employed the use of Completely Randomized Design (CRD), using a total of 200 broiler chickens comprising of four (4) treatments (50 birds per treatment). Treatment 1 (T1) contained 0g/100Kg of Oregano Powder (OP), treatment 2 (T2), treatment 3 (T3) and treatment 4 (T4) contained 15g/100Kg, 20g/100Kg, and 25g OP, respectively replicated 5 times (10 birds/ replicate), as shown in Table 1.

Table 1: Experimental design

	Treatments			
	T1	T2	T3	T4
Replication	5	5	5	5
Oregano(g/100kg)	0	15	20	25
Birds/Replicate	10	10	10	10

Experimental Birds and their Management

Day-old broiler chickens for this study were obtained from a reputable company in Nigeria. The house was cleaned, washed and disinfected a week before the arrival of the birds. Birds were vaccinated against Gumboro and Newcastle diseases as at when due. Proper

sanitation and hygiene were ensured. Adequate floor spacing was maintained to accommodate the birds in each replicate to avoid variation in size and growth (Oluyemi and Roberts, 2000). The birds were raised on deep litter in a tropical house type, with open sidewalls and concrete floor. Feed and clean fresh water were given to the birds *ad-libitum* according to the recommended practices.

Experimental Diets

Four (4) Iso-caloric and Iso-nitrogenous diets were formulated both at the starter and the finisher phases and were fed to the experimental broiler chickens for seven (7) weeks. (Table 2). However, Oregano powder was added over the top as additive (above 100%) at 15g/100Kg OP, 20g/100Kg OP, 25g/100Kg in treatments 2, 3 and 4 respectively while treatment 1 served as the control diet with no (0%) OP.

Table 2: Gross and calculated chemical composition of starter and finisher diets

Ingredients (Kg)	Starter	Finisher
Maize	53.5	50.5
SBM	14.0	15.0
GNC	15.0	13.0
Fish meal	2.0	2.0
Wheat Offal	11.0	12.0
Limestone	2.0	5.4
Bone meal	1.5	3.0
Minerals and Vitamins Premix	0.25	0.25
Salt	0.25	0.25
Methionine	0.25	0.25
Lysine	0.25	0.3
Total	100Kg	100Kg
Crude Protein	21 %	19 %
Energy (Kcal/Kg)	3000	2800
Methionine	0.5	0.5
Lysine	1.0	1.0
Calcium	1.3	2.8
Phosphorus (Available)	0.5	0.7
Crude Fibre (%)	5.3	5.5

* T1 = Diet + 0g Oregano Powder; T2 = Diet + 15g Oregano Powder; T3 = Diet + 20g Oregano Powder; T4 = Diet + 25g Oregano Powder; SBM = Soya Bean Meal; GNC= Ground Nut Cake

Data Collection

At the end of the growth period (7 weeks), data were collected on carcass characteristics according to the treatment groups. Qualitative analysis was carried out on the aqueous extracts of Oregano powder using standard procedures to identify the constituents as described by El-Olemy *et al.* (1994).

Sampling and Sample Size

Stratified sampling method was used to select five (5) birds per replicate, making 25 birds per treatment and a total of 100 birds from the four treatments. The sampled birds were

starved of feed but left with drinking water for 8 hours to obtain fasted weight. Birds were weighed and slaughtered by severing the jugular vein closest to the head. The birds were hoisted for about 10 minutes to obtain the bled weight. Then the birds were defeathered and eviscerated and then cut into primal parts for evaluation. Organs such as liver, intestine, abdominal fat, lungs, and gizzard were also weighed and recorded.

Data Analysis

Data on carcass analysis were analyzed using the General Linear Model procedure of Statistical Analysis System (SAS) package version 9.2 software (SAS, 2007) and statistical significance was set at $P<0.05$.

RESULTS AND DISCUSSION

Phytochemical Constituents of Oregano (*Oreganum vulgare*)

Qualitative analysis of the test ingredients indicated the presence of Flavonoids, tannins, saponins, glycosides, alkaloids, cardiac glycosides, steroids, saponins glycosides, balsam and volatile oils as shown in (Table 3).

Table 3: Qualitative constituents of oregano powder

Phyto-chemical	Result
Flavonoids	+++
Tannins	++
Saponins	+++
Glycosides	++
Alkalids	+
Cardiac glycosides	++
Steroids,	++
Saponin glycosides,	++
Balsams	++
Volatile oils	+
Anthraquinones	ND

Key: ND= Not detected; + = Trace; ++= Moderate; +++ = Concentrated

The phytochemical composition of the oregano used in this study is similar to the report of Veni and Neeru (2013) who indicated the presence of glycosides, steroids, tannins and flavonoids from Oregano. Also, research by Prathyusha *et al*. (2009), indicated the presence of the following phytochemicals: alkaloids, saponins, glycosides, flavonoids, tannins and steroids. This implies that Oregano is a potential source of phytochemicals most of which have been reported to represents an efficient alternative as an antimicrobial agent (Dutra *et al.,* 2019), antifungal activity (Khan *et al.,* 2019), antioxidant activity **(**Zhang *et al.,* 2014), antiparasitic activity (Giannenas *et al.,* 2003), anti-inflammatory activity (Silva *et al.,* 2015), beneficial activity on skin disorders and effects on melanin production (Sarikurkcu, *et al.,* 2015).

Carcass Characteristics

Group means for fasted weight at slaughter, bled weight, blood weight, plucked weight, dressed weight and dressing percentage are shown in Table 4. The result showed that the fasted weight, bled weight, blood weight, plucked weight, dressed weight and dressing percentage at 7 weeks of age were statistically similar ($P > 0.05$) for all the treatment groups (i.e. treatment 1, 2, 3, and 4) at 0g, 15g, 20g and 25g OP inclusion level respectively. This could probably be as a result of the aromatic, warm, flavorful and slightly bitter taste of dried Oregano powder as well as the presence of less anti-nutritional factors that the diets contained, which did not affect the feed intake of the birds as the levels of OP inclusion is increasing which in turn did not affect the fasted weight. The bled weight, blood weight, plucked weight also follow the trend of fasted weight, suggestive of the reasons given for fasted weight as well as the statement by Ikeme (1990) that birds with higher pre-slaughter weights are expected to produce higher fasted weight.

As expected, dressing weight, dressing percentage also followed the normal trend as in fasted weight, bled weight, blood weight and plucked weight which supports the statement by Ikeme (1990). The dressing percentage of an animal is dependent on many factors, such as body weight, sex, age and feed. Dressing percentage may increase with increase in live weight. There was no significant difference ($P > 0.05$) between the treatments for dressing percentage, suggesting that the inclusion of graded levels of Oregano powder has no significant effects on dressing percentage.

Table 4: Varying weights of broiler chicken as affected by graded levels of Oregano powder

Parameter	Oregano Powder Inclusion level (g/100kg)				
	0	15	20	25	SEM
Fasted weight (g)	2110.00	1950.00	2133.38	900.00	0.010
Bled weight (g)	1916.74	1757.29	1935.00	707.32	0.010
Blood weight (g)	193.31	192.86	198.33	192.78	1.852
Plucked weight (g)	1826.74	1676.73	1860.00	633.34	0.008
Dressing weight (g)	1373.94	1265.97	1391.92	1220.95	0.001
Dressing percentage (%)	65.17	64.98	65.62	64.25	0.001

Weight of Primal Cuts

The cut-up parts measured include breast, thigh, back, drumstick and wings. The result of this study showed that there was no significant difference ($P > 0.05$) between the cut-up parts as shown in Table 5.

Table 5: Weights of primal cuts of broiler chicken meat as affected by graded levels of Oregano powder.

Primal cut	OP Inclusion level (g/100kg)				
	0	15	20	25	SEM
Breast (g)	650.33	635.67	85.00	89.33	0.030
Back (g)	173.25	141.30	70.09	38.87	0.069
Thigh (g)	231.00	209.00	39.33	08.00	0.010
Drumstick (g)	197.30	182.00	00.30	66.00	0.010
Wings (g)	160.00	143.30	58.30	39.00	0.007

. Thus, may be related to the non-significant differences in the fasted weights of the birds fed graded levels of Oregano powder. Amouzmehr *et al.* (2012) showed that supplementation of garlic extracts in amount of 3.0 and 6.0% did not affect carcass characteristics including carcass yield, breast, thigh and drumstick. Chang *et al.* (2017) reported in his study that neither antibiotic nor Oregano powder had positive effect on carcass yield and meat quality of broiler birds.

Weight of External Offal

The weights of external offal examined were head, neck and feet. No particular trend was observed for the values obtained for all the parameters. However, there was no statistical difference ($P > 0.05$) between the values obtained in all the treatments except for the head which varied from 35.50g - 47.00g with the lowest value recorded from birds on the diet with 25g inclusion level, as shown in Table 6. Thus, the test diets under the condition of the present study did not influence the weights of these parts significantly.

Table 6: Weights of external offal of broiler chicken as affected by graded levels of Oregano powder

External offal	OP Inclusion level (g/100kg)				
	0	15	20	25	SEM
Head (g)	47.00[a]	45.00[a]	5.30[a]	35.50[b]	0.001
Neck (g)	74.33	69.33	78.00	68.33	0.003
Feet (g)	80.67	76.33	66.33	68.67	0.004

a,b = means bearing different superscripts along the same row differ significantly ($P<0.05$).

Weight of Internal Offal

The internal offal examined were liver, spleen, intestine, lungs, heart, gizzard and abdominal fat. The result shows that there was no significant difference ($P>0.05$) in all the parameters measured (Table 7).

Table 7**:** Weights of internal offal of broiler chickens as affected by graded levels of Oregano powder.

	OP Inclusion level (g/100kg)				
Internal offal	0	15	20	25	SEM
Liver (g)	55.00	52.00	49.66	45.33	0.0032
Spleen (g)	2.50	2.66	3.20	3.00	0.0001
Intestine (g)	153.67	163.00	136.00	139.33	0.0083
Lungs (g)	16.10	12.50	12.00	13.00	0.8313
Gizzard (g)	43.00	42.00	43.00	43.33	0.0017
Abdominal fat (g)	19.00	14.60	14.96	15.52	0.0017
Heart (g)	12.43	8.19	10.31	9.76	0.7287

The outcomes of the present study are in agreement with Oloruntola (2019), who observed that the relative internal organs weights of broilers chickens were not influenced by dietary inclusion of seed meal and pawpaw leaf meal. Similar observations were described

in the work of Rubio *et al.*, (2019) and Vispute *et al.*, (2019) where dietary addition of phytobiotics did not influence the relative organs weights in broiler chickens. The constant relative internal organs weights of the broilers across experimental groups suggested that OP Inclusion had no adverse effect on internal organs of the broiler chickens.

Carcass Percentages

Carcass percentages relative to their absolute weights shows that there was no significant difference (P>0.05) among the four treatment groups (Table 8) suggestive of the reasons given for fasted weight.

Table 8**:** Carcass percentages relative to their absolute weights of broiler chicken meat as affected by graded levels of Oregano powder

Variables	Treatment 1 (0g OP)	Treatment 2 (15g OP)	Treatment 3 (20g OP)	Treatment 4 (25g OP)	SEM
Brst%/LW	32.420	30.083	32.957	32.420	1.508
Brst%/DW	47.720	45.887	50.333	45.140	1.563
Bck%/LW	8.490	7.250	7.777	9.433	0.556
Bck%/DW	12.607	11.137	11.847	14.260	0.656
Thgh%/LW	11.400	10.690	11.303	10.833	0.408
Thgh%/DW	16.830	16.460	17.257	16.820	0.574
Drmstck%/LW	9.673	9.350	9.507	8.540	0.401
Drmstick%/DW	14.357	14.373	14.487	13.333	0.634
Wng%/LW	7.7967	7.3633	7.4400	7.2833	0.211
Wng%/DW	11.627	11.310	11.360	11.273	0.344
Nck%/LW	3.6033	3.5733	3.7000	3.5400	0.119
Nck%/DW	5.3967	5.4700	5.6467	5.5100	0.217

KEY**:** Brst%/LW=Breast percentage Live Weight, Brst%/LW= Breast percentage Live Weight**,** Bck%/LW= Back percentage LiveWeight**,** Bck%/DW= Back percentage Dressed Weight**,** Thgh%/LW= Thigh percentage Live Weight**,** Thgh%/DW= Thigh percentage Dressed Weight**,** Drmstick%/LW= Drumstick percentage Live Weight**,** Drmstick%/DW= Drumstick percentage Dressed Weight**,** Wng%/LW= Wings percentage Live Weight**,** Wng%/DW= Wings percentage Dressed Weight**,** Nck%/LW= Neck percentage Live weight**,** Nck%/DW= Neck percentage Dressed Weight

CONCLUSION

Results of this study showed that inclusion of graded levels of Oregano powder (15g, 20g, and 25g per 100kg) did not elicit negative response on the carcass characteristics of broiler chicken. Dietary supplementation with OP may be a promising alternative to the use of antibiotic/synthetic feed additive for improving poultry production in general and carcass of broiler chickens in particular.

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