

Sensory Evaluation and Fatty Acid Composition of Broiler Chickens Fed Diets Containing with *Prosopis Africana* Essential Oil



Alagbe Olujimi John*

Department of Animal Science, University of Abuja, Nigeria

Submission: June 19, 2023; **Published:** September 29, 2023

***Corresponding author:** Alagbe Olujimi John, Department of Animal Science, University of Abuja, Nigeria. Email: dralagbe@outlook.com

Abstract

Exploring the use of phytochemical components in plants is one of the ways to ensure safety in food and sustainable livestock production. This experiment was designed to investigate the sensory evaluation and fatty acid composition of broiler chickens fed diets containing *Prosopis africana* essential oil. A total of 540 – one- day- old broiler chicks (Arbo Acres) were randomly distributed into 6 treatments, each containing six replicates of 15 birds. Experimental diets were adequate in all nutrients (NRC, 1994). Birds in treatment one was fed basal diet without *Prosopis africana* oil, basal diet with antibiotic growth promoter (oxytetracycline at 2.5 g/kilogram) was fed to treatment two while treatment three, four, five and six were fed basal diet supplemented with 200 mg, 400 mg, 600 mg and 800 mg per kilogram respectively. Completely randomized design was used and the experiment lasted for 56 days. Feed and fresh water were offered ad libitum and other management practices were rigorously followed. Result revealed that the composition of total monosaturated fatty acid and total polyunsaturated fatty acid were significantly ($P < 0.05$) influenced by the treatments. Total saturated fatty acid (TSFA) levels decreases as the level of *Prosopis africana* oil increases across the treatments ($P < 0.05$). TSFA values were highest in treatment 1, intermediate in treatment 2 and lowest in treatment three through six. Omega 3: omega 6 fatty acid and atherogenicity index were significantly ($P < 0.05$) different among the treatments. *Prosopis africana* oil also influenced color, flavor, tenderness, juiciness, texture, and general acceptability of broilers meat. It was concluded that the dietary supplementation of *Prosopis africana* oil has a number of Phyto-constituents that can modify the fatty acid of meat, enhancing its quality, shelf life and sensory attributes. Without having a negative impact on the health of birds. It can be added to the diet of broiler chickens up to 800 mg per kilogram.

Keywords: Phytochemicals; *Prosopis Africana* Oil; Fatty Acid; Sensory Qualities; Oxytetracycline

Abbreviations: TSFA: Total Saturated Fatty Acid; ANI: Atherogenicity Index; HDL: High Density Lipoprotein

Introduction

The need for the animal sector to create ever-more-sophisticated strategies for producing animal protein in increasingly environmentally and economically responsible ways is growing. In addition to setting up ethical and environmentally friendly structures for subsequent generations, this is done to ensure that food is safe for consumption today [1,2]. The incorporation of feed additives to accomplish these objectives has grown increasingly crucial as regulations and consumer interest demand that nutrition for animals be gain more accurate than ever, particularly in light of the worldwide prohibition on the use of antibiotic growth promoters that was implemented in 2009 by the European Union and other nations [3,4]. Phytochemical compounds are the most viable class of feed additives among antibiotic replacements. Due to their wide spectrum of efficiency

and additional benefits on sustainability and safety, phytochemical feed additives are expected to have a bright future in animal nutrition [5]. Phytochemical feed additions include a variety of plants, including herbs, spices, and essential oils obtained from plants, including *Prosopis africana* oil [6-8]. Because of the variety of their constituents and other impacting variables like location, harvest, species, stage, and storage conditions, *Prosopis africana* essential oils exhibit some diversity in their chemical composition. Numerous constituents of essential oils have antibacterial properties [9-11]. For instance, Prosogerin A and B in *Prosopis* essential oil work alongside the cell membrane to create their antibacterial effects. The linking of an ion through the cell membrane results from this contact, which alters the shape of the membrane structure [7-14].

[15-20] observed that essential oil might modify the fatty acid composition of the flesh of broiler chickens and relieve the growth depression caused by a challenge with *Clostridium perfringens*, in accordance with [17-19] findings. *Prosopis africana* oil supplementation up to 800 mg/kg was found to enhance growth performance, boost the number of fecal lactobacillus, lower *Escherichia coli* counts, and stimulate animal immunological responses, according to [21-23] and [24-26]. Numerous studies suggest beneficial impacts on the morphology of the digestive tract in chickens. Birds fed *Prosopis africana* oil supplemented diets showed increased trans-epithelial resistance of the duodenal mucosa [27,28]. *Prosopis africana* essential oil has a wealth of potentials and contains naturally occurring bioactive substances. Presuming that it cannot be hazardous to animals at specific amount is incorrect. Modulating the meat's polyunsaturated fatty acid will extend its shelf life and contribute to a decrease in the prevalence of cardiovascular ailments which can be achieved by the supplementation of essential oil in the diet of birds [9,10]. Therefore this study was undertaken to evaluate the effects of dietary supplementation of *Prosopis africana* essential oil on sensory evaluation meat quality of broiler chickens.

Materials and methods

Experimental site

The Department of Animal Science, Faculty of Agriculture, University of Abuja Teaching and Research Farm, Main Campus, located along Airport Road, Gwagwalada, Abuja, Nigeria was where this study was conducted. The Gwagwalada Area Council's administrative center is in Gwagwalada, which is situated between latitudes 8o571 and 8o551N and longitudes 7o051 and 7o061E (NPC, 2006).

Gathering, identifying a sample of plants and *Prosopis africana* oil extraction

Prosopis africana seeds used in this investigation were from the Gwagwalada area. The seeds were recognized and confirmed by the Department of Crop Protection Herbarium, University of Abuja, Gwagwalada, Nigeria, with voucher code ANS - 2021D. The steam-distillation process, which also requires the use of an electronic scale, a round-bottom flask, water from distillation, a heating mantle composed of glass fiber, a measuring cylinder, and a separatory funnel, was used to extract *Prosopis africana* oil. A round-bottom flask was filled with 250 mL of distilled water and 50 g of pulverized *Prosopis* seed. The condenser was set up above the flask with a circular bottom after the mixture was transferred to a glass yarn heating mantle and heated to a temperature of eighty degrees centigrade. The mixture is forced to boil for a period of fifteen minutes, after which the distillate is gathered in a beaker until no more oil drips are visible, and then it is poured into a separatory funnel to yield *Prosopis africana* oil.

Diets and other aspects of animal care

540 mixed-sex broiler chicks (Arbo Acres) were randomly distributed into 6 treatments, each containing six replicates of 15 birds. The birds were bought from a well-known commercial hatchery in Oyo State, Nigeria. In a galvanized battery cage with semi-open pens measuring (100 cm × 75 cm × 50 cm) (length depth height), galvanized hand feeders and automatic nipple drinkers were installed. When the chicks arrived, they were measured to determine their average beginning body weight before being fed anti-stress (Vitalyte wsp + glucose) at a rate of 2 grams of glucose to 5 liters of water. A totally random experimental design was used in this study. Diets were created based on the nutritional requirements for broilers published by NRC (1994), which are displayed in Table 1. The trial diet contains 23.30% crude protein (CP), 21.40% CP, and ME at the starter phase (1-28 days) and finisher phase (29-56 days) of 2991.5 Kcal/kg and 3108.1 Kcal/kg, respectively. All birds had unlimited access to food and water for the eight-week period of the trial. Vaccination schedule is presented in Table 2. The experimental set-up structure is shown as follows:

- a) First-line treatment (T1) *Prosopis africana* oil -free basic diet
- b) 2nd-line treatment (T2): oxytetracycline 2.5 g/kg added to the standard diet
- c) 3rd - line treatment: basal diet plus 200 mg per kg *Prosopis africana* oil
- d) Fourth-line treatment (T4): basal diet plus 400 mg per kg *Prosopis africana* oil
- e) Fifth-line treatment (T5): basal diet plus 600 mg per *Prosopis africana* oil
- f) Sixth-line treatment (T6): basal diet plus 800 mg/kg *Prosopis africana* oil

Data collected

Meat sample fatty acid content

Twelve birds per group had their breast and thighs removed, and the overall lipids from all these parts was obtained using Bligh and Dyer's method (1959). According to Christie's description, 0.01 % sulfuric acid solution in dry methanol was used for 14 hours to produce the methyl esters of the total lipids that were extracted by sample preparation thin layer chromatography (1973). Gas-liquid chromatography examination employing a chromatograph CSci 200 fitted with a capillary column (DM-2330:30 m 0.25 mm 0.33 m) with hydrogen as a carrier gas was used to assess the fatty acid contents of lipid content. The temperature of the detector and

injectors was 230 °C, and the oven temperature was first set to 160 °C for 0.2 min. After that, it was increased to 220 °C at a speed of five °C min⁻¹ and maintained there for 5 min comparing the retention periods of the benchmarks to the methyl esters allowed for their identification. By contrasting the comparable chain length with that of genuine fatty acid methyl esters, the peaks

were identified. With the use of the Agilent gas chromatography Chem Station software, peak areas were calculated automatically (Gujarat Technologies, USA). The fatty acid concentrations are expressed as a proportion of the overall amount of peaks that were recorded for each sample and were recognized.

Table 1: Ingredient composition of the experimental diets.

Components	Starters mash (0-4 weeks)	Finishers mash (5-8 weeks)
Maize	52.00	60.00
Wheat offal	2.50	5.00
Soya bean meal	30.00	25.00
Groundnut cake	8.00	4.00
Fish meal (72%)	2.00	2.00
Limestone	1.50	1.50
Bone meal	3.00	3.00
Lysine	0.20	0.20
Methionine	0.20	0.20
*Premix	0.25	0.25
Salt	0.30	0.30
Toxin binder	0.10	0.10
Total	100	100
Determined analysis (% DM)		
Crude protein	23.30	21.40
Crude fibre	4.18	5.01
Ether extract	4.03	4.47
Calcium	1.50	1.60
Phosphorus	0.58	0.66
Energy (Kcal/kg)	2900.3	3200.8

*Premix supplied per kg diet: - vit A, 13,000 I.U; vit E, 5mg; vit D3, 3000I.U, vit K, 3mg; vit B2, 5.5mg; Niacin, 25mg; vit B12, 16mg; choline chloride, 120mg; Mn, 5.2mg; Zn, 25mg; Cu, 2.6g; folic acid, 2mg; Fe, 5g; pantothenic acid, 10mg; biotin, 30.5g; antioxidant, 56mg (starter's mash)

**Premix supplied per kg diet: - vit A, 9,000 I.U; vit E, 10mg; vit D3, 1500I.U, vit K, 3.8mg; vit B2, 10 mg; Niacin, 15mg; vit B12, 10mg; choline chloride, 250mg; Mn, 5.0mg; Zn, 56mg; Cu, 1.6g; folic acid, 2.8mg; Fe, 5.1g; pantothenic acid, 10mg; biotin, 30.5g; antioxidant, 56mg (finisher's mash).

Table 2: Vaccination program for birds.

Age / day	Vaccines	Route of administration
7	Lasota (1 st dose)	Drinking water
11	Gumboro (1 st dose)	Drinking water
15	Lasota (2 nd dose)	Drinking water
21	Gumboro (2 nd dose)	Drinking water
28	Gumboro (3 rd dose)	Drinking water

Table 3: The impact of Prosopis Africana oil on the chicken breast flesh.

Fatty Acids	T1	T2	T3	T4	T5	T6	SEM	P-value
C14:0	3.10 ^a	2.91 ^b	2.41 ^b	2.21 ^b	2.19 ^c	2.02 ^c	0.63	0.08
C16:0	22.1 ^a	20.0 ^b	14.2 ^b	14.1 ^c	13.7 ^c	12.7 ^c	1.3	0.02
C18:0	11.1 ^a	10.3 ^b	6.72 ^b	6.01 ^c	5.64 ^c	5.02 ^c	0.72	0.8
C20:0	4.10 ^a	3.11 ^a	2.50 ^b	2.26 ^b	1.81 ^c	1.73 ^c	0.23	0.08
C22:0	0.30 ^a	0.27 ^b	0.20 ^b	0.15 ^b	0.14 ^b	0.10 ^b	0.04	0.29
C14:1c	1.25 ^c	1.14 ^a	2.91 ^a	3.11 ^a	3.90 ^a	3.94 ^a	0.08	0.46
C16:1c	2.01 ^b	2.71 ^b	3.41 ^b	3.48 ^a	3.56 ^a	4.03 ^a	0.06	0.5
C18:1c	10.9 ^c	14.2 ^b	20.1 ^b	21.8 ^a	23.1 ^a	23.71 ^a	1.05	0.4
C18:1n9t	1.00 ^c	1.13 ^b	1.51 ^b	1.54 ^b	1.80 ^a	1.93 ^a	0.08	0.27
C18:1n9c	0.61	0.8	1	1.05	1.4	1.44 ^a	0.03	0.21
C:22:1	0.10 ^b	0.17 ^a	0.84 ^a	0.92 ^a	1.00 ^a	1.02 ^a	0.06	0.61
C18:2n6	11.7 ^c	14.0 ^b	21.5 ^a	23.1 ^a	24.6 ^a	25.1 ^a	0.54	0.37
C18:5n3	0.61 ^c	0.65 ^b	0.93 ^b	1.10 ^b	1.28 ^a	1.34 ^a	0.07	0.75
C18:3n3	2.80 ^c	3.09 ^b	7.36 ^b	9.19 ^a	11.3 ^a	13.9 ^a	0.4	0.31
C20:4n6	1.17 ^b	1.85 ^b	2.50 ^b	2.67 ^b	3.06 ^a	3.21 ^a	0.18	0.2
C20:3n6	0.42 ^b	0.78 ^a	1.10 ^a	1.35 ^a	1.40 ^a	1.64 ^a	0.12	0.004
C22:6n3	0.10 ^c	0.25 ^b	0.84 ^b	1.02 ^b	1.63 ^a	1.72 ^a	0.1	0.02
TSFA ¹	53.80 ^a	50.70 ^a	39.21 ^b	18.67 ^c	17.80 ^c	16.94 ^c	2.71	0.21
TUFA ²	36.20 ^c	49.30 ^b	79.45 ^a	81.33 ^a	82.20 ^a	83.06 ^a	4.47	0.05
MUFA ³	20.08 ^c	27.90 ^b	34.10 ^a	35.22 ^a	35.60 ^a	36.06 ^a	2.32	0.01
PUFA ⁴	26.12 ^c	31.40 ^b	45.35 ^a	46.11 ^a	46.60 ^a	47.00 ^a	2.6	0.02
n-6:n-3 ⁵	3.58 ^a	3.11 ^a	3.00 ^a	2.92 ^b	2.77 ^b	2.60 ^b	0.03	0.01
Ant. Index ⁶	0.92 ^a	0.97 ^a	0.62 ^b	0.50 ^b	0.36 ^c	0.25 ^c	0.01	0.001

¹Total saturated fatty acid= C14:0 + C16:0 + C18:0 + C20:0 +C22:0

²Unsaturated fatty acid [TSFA] = (3 + 4)

³Mono unsaturated fatty acid [TMUFA] = C14:1C + C16:1C + C18:1C + C18:1n9t + C18:1n9c + C22:1

⁴Polyunsaturated fatty acid [TPUFA] = C18:2 n6 + C20:5 n3 + C18:3n3 + C20:4n6 + C20:3n6 + C: 22:6n3

⁵n-6: n-3 = (C18:2 n6 + C20:4n 6 + C20:3n 6 / (C20:5n 3 + C18:3n 3 + C:22 6n 3), ⁶Antherogenic index = (C12:0+ 4×C14:0+ C16)/Σ of UFA

Table 4: Potential impact of Prosopis africana oil on the chicken broiler's thigh muscle

F. Acids	T1	T2	T3	T4	T5	T6	SEM	P-value
C14:0	3.18 ^a	2.48 ^b	2.42 ^b	2.37 ^b	2.21 ^c	2.18 ^c	0.08	0.32
C16:0	22.9 ^a	18.0 ^b	17.2 ^b	16.3 ^c	15.0 ^c	14.3 ^c	0.51	0.61
C18:0	11.2 ^a	8.71 ^b	7.62 ^b	6.00 ^c	5.73 ^c	4.18 ^c	0.3	0.31
C20:0	4.21 ^a	3.93 ^a	2.81 ^b	2.40 ^b	1.88 ^c	1.45 ^c	0.73	0.74
C22:0	0.31 ^a	0.21 ^b	0.27 ^b	0.20 ^b	0.24 ^b	0.20 ^b	0.07	0.005
C14:1c	1.81 ^c	2.88 ^a	2.73 ^a	2.91 ^a	2.97 ^a	2.66 ^a	0.08	0.007
C16:1c	2.01 ^b	2.21 ^b	2.93 ^b	3.18 ^a	3.51 ^a	3.40 ^a	0.04	0.28
C18:1c	13.4 ^c	18.7 ^b	19.5 ^b	21.0 ^a	21.7 ^a	22.8 ^a	0.26	0.02
C18:1n9t	1.20 ^c	1.51 ^b	1.40 ^b	1.44 ^b	1.86 ^a	2.00 ^a	0.06	0.02
C18:1n9c	0.51 ^c	0.56 ^c	0.80 ^b	0.83 ^b	0.87 ^b	1.00 ^a	0.02	0.11

C:22:1	0.13 ^b	0.47 ^a	0.51 ^a	0.53 ^a	0.66 ^a	0.87 ^a	0.04	0.64
C18:2n6	15.4 ^c	19.8 ^b	22.0 ^a	22.8 ^a	23.4 ^a	24.0 ^a	0.23	0.16
C20:5n3	0.88 ^c	1.05 ^b	1.10 ^b	1.14 ^b	1.51 ^a	1.89 ^a	0.18	0.0001
C18:3n3	3.04 ^c	8.08 ^b	10.3 ^b	13.1 ^a	14.3 ^a	15.6 ^a	0.22	0.06
C20:4n6	2.08 ^b	2.21 ^b	2.59 ^b	2.87 ^b	3.81 ^a	4.00 ^a	0.05	0.02
C20:3n6	0.92 ^b	1.08 ^a	1.17 ^a	1.21 ^a	1.28 ^a	1.88 ^a	0.01	0.001
C22:6n3	0.05 ^c	1.35 ^b	1.40 ^b	1.44 ^b	2.00 ^a	2.31 ^a	0.61	0.03
TSFA1	49.80 ^a	40.56 ^a	30.40 ^b	25.80 ^c	21.56 ^c	20.18 ^c	0.06	0.05
TUFA2	50.20 ^c	56.14 ^b	70.60 ^a	75.20 ^a	79.44 ^a	78.82 ^a	0.02	0.001
MUFA3	23.12 ^c	25.70 ^b	29.85 ^b	31.41 ^a	32.38 ^a	31.22 ^a	0.14	0.26
PUFA4	27.08 ^c	33.74 ^b	40.75 ^a	43.79 ^a	47.06 ^a	47.60 ^a	0.47	0.02
n-6:n-3	3.91 ^a	3.00 ^a	2.97 ^b	2.80 ^b	2.77 ^b	2.59 ^b	0.03	0.001
Ant. Ind6	0.82 ^a	0.72 ^a	0.54 ^b	0.50 ^b	0.42 ^c	0.38 ^c	0.05	0.012

¹Total saturated fatty acid [TSFA] = C12:0 + C14:0 + C16:0 + C18:0 + C20:0 + C22:0

²Unsaturated fatty acid = (3 + 4)

³Mono unsaturated fatty acid [TMUFA] = C14:1C + C16:1C + C18:1C + C18:1n9t + C18:1n9c + C22:1

⁴Polyunsaturated fatty acid [TPUFA] = C18:2 n6 + C20:5 n3 + C18:3n3 + C20:4n6 + C20:3n6 + C: 22:6n3

⁵n-6: n-3 = (C18:2 n6 + C20:4n 6 + C20:3n 6 / (C20:5n 3 + C18:3n 3 + C:22 6n 3), 6Antherogenic index = (C12:0+ 4×C14:0+ C16)/Σ of UFA

Table 5: Sensory assessment of broiler chicken fed *Prosopis africana*.

Parameters	T1	T2	T3	T4	T5	T6	SEM	P-value
Breast meat								
Colour	4.62 ^b	4.90 ^b	6.01 ^a	6.50 ^a	6.59 ^a	6.73 ^a	0.1	0.96
Flavour	5.05 ^b	5.20 ^b	6.18 ^a	6.22 ^a	6.27 ^a	6.35 ^a	0.09	0.6
Texture	4.73 ^b	4.86 ^b	5.40 ^a	5.51 ^a	5.60 ^a	5.62 ^a	0.08	0.58
Juiciness	5.06 ^c	5.11 ^c	6.86 ^b	6.92 ^b	7.06 ^a	7.11 ^a	0.11	0.72
Tenderness	4.10 ^c	4.42 ^c	5.92 ^b	6.06 ^a	6.12 ^a	6.19 ^a	0.1	0.69
Acceptability	4.96 ^d	5.00 ^c	6.67 ^b	6.91 ^b	6.96 ^b	7.60 ^a	0.07	0.5
Thigh meat								
Colour	4.09 ^c	4.62 ^c	6.61 ^b	6.68 ^b	7.03 ^a	7.05 ^a	0.24	0.07
Flavour	3.81 ^b	3.90 ^b	6.00 ^a	6.04 ^a	6.81 ^a	6.88 ^a	0.06	0.17
Texture	5.06 ^b	5.11 ^b	7.03 ^a	7.30 ^a	7.50 ^a	7.55 ^a	0.3	0.57
Juiciness	3.60 ^c	4.57 ^b	6.29 ^b	7.00 ^a	7.08 ^a	7.15 ^a	0.04	0.72
Tenderness	4.71 ^d	5.33 ^c	6.92 ^b	7.00 ^a	7.08 ^a	7.21 ^a	0.94	0.59
Acceptability	4.29 ^d	5.86 ^c	6.22 ^b	6.83 ^b	6.90 ^b	7.10 ^a	0.05	0.87

Standard error of the mean (SEM) T1: control diet with no *Prosopis africana* oil; T2: control diet plus 2.5g/kg oxytetracycline; T3: baseline diet plus 200 mg; T4: baseline diet plus 400 mg; T5: control diet plus 600 mg; T6: basal diet plus 800 mg *Prosopis africana* oil.

Sensory assessment

10 panelists conducted a sensory assessment of cooked samples of minced broiler chicken breast and thigh meat from six birds per treatment (from birds used for fatty acid investigation). The panelists assessed a number of factors, including color, juiciness, flavor, tenderness, and overall acceptability. Every representative of the panel received a tagged sample of beef, which

was distributed one by one. After consuming every meat sample, each participant rinsed their mouth completely with warm water to prevent a baggage effect. Using only a nine-point hedonic scale, the panelists assigned scores: (i) Very dislike; (ii) Extremely dislike (iii) Medium dislike (iv), Minor dislike (v), Middle dislike (vi), Minor dislike (vii), Moderate dislike (viii), Extreme dislike (ix), and Like slightly.

Proximate analysis of experimental feed

Analysis of feed of experimental feed was done using Phoenix 5000 near infra-red (NIR) feed analyzer with the following specifications; wavelength (1100 – 2500 nm), photometric noise (< 15 μ Au in standard range), measurement mode (reflectance or transmittance), wavelength accuracy (< 0.3 nm for Blue Sun selected published peak positions of NIST SRM 1920a standard), wavelength reproducibility (0.02 nm based on Blue Sun Scientific specific diagnostic test), analysis time (10 to 60 seconds), ambient humidity (< 85 % RH) and detector (high performance InGaAs extended ranged detector).

Statistical investigation

Using SPSS (25.0), one-way analysis of variance was performed on all data, and Duncan multiple range tests were used to identify significant means (Duncan, 1955). If $P < 0.05$, significance was deemed to exist.

Results

The impact of *Prosopis africana* oil on the chicken breast flesh

Table 3 shows the impact of *Prosopis africana* oil on the chicken broiler's breast muscle. Myristoleic acid, palmitic acid, stearic acid, arachidic acid, behenic acid, oleic acid, elaidic acid, erucic acid, vaccenic acid, linolenic acid, α -linolenic acid, eicosapentaenoic acid, docosahexaenoic acid, and linoeladic acid values varied from 12.7 to 22.1 percent, 5.02 to 11.1 percent, 1.73 – 4.10 percent, 0.10 – 0.30 percent, 1.25 – 3.94 percent, 2.01 – 4.03 percent, 10.9 – 23.7 percent, 1.00 – 1.93 percent, 0.10 – 1.02 percent, 11.7 – 25.1 percent, 0.61 – 1.34 percent, 2.80 – 13.9 percent, 1.17 – 3.21 percent, 0.42 – 1.64 percent and 0.10 – 1.72 percent correspondingly. Omega 6: Omega 3 (2.60–3.11 percent), total saturated fatty acids [TSFA; 16.94–53.80 percent], unsaturated fatty acids [USFA; 36.20–83.06 percent], with artheriogenic index (0.25–0.92 percent). Whereas USFA readings appeared statistically ($P < 0.05$) different between treatments, TSFA values were considerably ($P < 0.05$) higher in T1 and T2, midrange in T3, with smallest in T4, T5, as well as T6.

Potential impact of *Prosopis africana* oil on the chicken broiler's thigh muscle

The impact of *Prosopis africana* oil here on thigh muscle of broiler chickens is shown in Table 4. Myristic acid [C14:0; 2.18 – 3.18 percent], palmitic acid [C16:0; 14.3 – 22.9 percent], stearic acid [C18:0; 4.18 – 11.20 percent], arachidic acid [C:20; 1.45 – 4.21 percent], behenic acid [C:22; 0.20 – 0.31 %], myristoleic acid [C14:1c; 1.81 – 2.66 %], palmitoleic acid [C16:1c; 2.01 – 3.40 percent], oleic acid [C18:1n 9t; 1.20 – 2.00 percent], elaidic acid [C18:1n 9c; 0.51 – 1.00 %], erucic acid [C22:1; 0.13 – 0.87 percent], vaccenic acid [C18:2n6; 15.4 – 24.0 percent], linolenic

acid [C18:5n3; 0.88 – 1.89 percent], α -linolenic acid [C18:3n3; 3.04 – 15.6 percent], eicosapentaenoic acid [C20:4n6; 2.08 – 4.00 percent], docosahexaenoic acid [C20:3n6; 0.92 – 1.88 percent] and linoeladic acid [C22:6n3; 0.05 – 2.31 percent], total saturated fatty acid [TSFA; 20.18 – 49.80 percent], monosaturated fatty acid [TMUFA; 23.12 – 31.22 percent] and polyunsaturated fatty acid [TPUFA; 27.08 – 47.60 percent]. The highest levels of PUFA and MUFA were found in T3-T6, whereas the lowest levels were found in T1 ($P < 0.05$). The therapies had a substantial ($P < 0.05$) impact on TSFA.

Sensory assessment of fed broiler chicken fed *Prosopis africana* oil

Table 5 presents the sensory evaluation of broiler chicken given various amounts of *Prosopis africana* oil. The color, flavor, texture, juiciness, tenderness, and general acceptability of the breast and thigh meat were all significantly ($P < 0.05$) influenced by the treatments.

Discussion

Poultry meat has a low lipid content and a disproportionately high quantity of polyunsaturated fatty acids, according to [29–39]. The amount and make-up of meat fat may shift in response to alterations in the lipid profile of an animal's diet [30–34]. The results of the present investigation showed that, in comparison to the other treatments, dietary supplementation of *Prosopis africana* oil enhanced the contents of polyunsaturated fatty acids (TPUFA) in the breast and thigh meat ($P < 0.05$). Saturated fatty acid (TSFA) on the other hand, declined as *Prosopis africana* oil levels increased in all regimens. The current finding is consistent with those of [35–37] who found that broiler chicken meat given two herbal extract and virginiamycin had increased TPUFA and reduced TSFA contents. Similar findings were made by [38,40], who found that broiler chicken thigh meat had larger TPUFA concentrations and a better n-6: n-3 fatty acid ratio when oregano essential oil was added to the diet at a rate of 400 mg/kg. These results provide strong evidence that *Prosopis africana* oil can alter the nutritional value of broiler meat because phytonutrients were present in the sample. [41–43] assert that appropriate antibody synthesis in animals depends on the dietary n-6: n-3 ratio.

To prevent inflammatory reactions and other associated health risks, the ratio of omega-3 to omega-6 fatty acids ought to be within 1 and 4 [44, 45]. In this investigation, broiler chicks given *Prosopis africana* oil showed a more favorable ratio of omega-6 to omega-3 fatty acids. Dietary *Prosopis africana* oil was found to alter monosaturated fatty acids (TMUFA) in the flesh, it increases more noticeably in the breast than the thigh, which results in a larger overall concentration of TMUFA. [46] noted an increase in TMUFA in the breast meat of broilers given green tea extract, which is consistent with the current findings.

Additionally, broiler chickens given various combinations of essential oils showed a higher concentration of MUFA in the flesh of their breast and thighs. According to [46]. The presence of phytonutrients in *Prosopis africana* oil are helpful in lowering the surplus synthesizing TSFA, which inhibits the biosynthesis of TMUFA, may be responsible for the rise in TMUFA contents in the breast and thigh meat [45]. A rise in high density lipoprotein (HDL) will lead to arise in the ratio of HDL cholesterol to overall cholesterol as well as the Anthrogenicity index. [28, 30] reported that atherogenicity index (ANI) is used to gauge the safety of meat; the lower the ANI, the more secure the meat is, and vice versa. This suggests that essential oils have no adverse effects on the lipid quality.

Evaluation of the sensory assessment in broiler chicken fed *Prosopis africana* oil

The present study's findings revealed that the cooked breast and thigh meat had considerable ($P < 0.05$) differences in color, flavor, tenderness, juiciness, texture, and general acceptability. The current observations are consistent with those of [47] who discovered that feeding broiler chickens 200 mg/kg of clove and lemongrass oil considerably ($P < 0.05$) changed how the meat's flavor was perceived. [48] found comparable outcomes, noting that the addition of thyme oil can significantly alter the taste, softness, color, and general acceptance of the meat between groups. It was discovered that the chicken flesh samples given 300 mg/kg thyme oil were tastier, softer, and had a more vibrant color. Because the panelists judged that the thigh and breast meat from broilers administered *Prosopis africana* oil had better texture, flavor, tenderness, juiciness, and general acceptance

relative to other treatments, the results of this trial imply that the addition of *Prosopis africana* oil could improve taste of broilers meat. Conversely, [49] reported that dietary supplementation of garlic oil at 50 mg/kg did not significantly ($P > 0.05$) alter the color, softness, flavor, or general acceptance of breast meat. The disparities in these results could be attributed to the differences in the composition of bioactive compounds in essential oils. The occurrence of carotene in *Prosopis africana* oil may have impacted the substantial variations in color found ($P < 0.05$) in the breast and thigh meat [28]. The current condition of the meat colors, pre-slaughter variables (genetics, feed, managing, stress, temperatures and cold stress, gaseous surroundings), slaughter, chilling, and subsequent processing situations (stunning methods, inclusion of nitrates, components, pH, last cooking temperatures, reducing circumstances, and irradiation) are the main factors affecting meat color [50]. The maturation of the connective tissues, the contractile condition of the myofibrillar proteins, environmental stress, scalding temperature, the maturity level of the birds, the rate of rigor improvement, the rate of cooling, and the filleting period are the primary variables impacting meat tenderness.

Conclusion

It was determined that *Prosopis africana* oil has a number of phyto-constituents with the potential to alter the fatty acid composition of meat. Its addition to the diets of birds is not linked to any adverse consequences, such as the deposit of hazardous carcass residue that are related to with the use of antibiotic growth promoters. Broilers' diet can be supplemented with *Prosopis* essential oil (800 mg/kg) to enhance sensory attributes.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/ECO.A.2023.03.555616](https://doi.org/10.19080/ECO.A.2023.03.555616)

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission.php>