ORGANOLEPTIC CHARACTERISTICS AND SHELF STABILITY OF CHICKEN PATTEIS MARINATED WITH BLACK COFFEE SEED POWDER

*Awodoyin O. R., Adediran, O. A., Abedor, A. I. and Ogundadegbe, A. O.
Department of Animal Science, University of Ibadan, Ibadan, Oyo State, Nigeria.
*Corresponding author' s Email: kasyem@yahoo.com; Tel: +234(8)027290842

ABSTRACT
Coffee contains significant amounts of antioxidants compounds such as chlorogenic and caffeic whose potential has not been maximized in the meat industry. Four independent patties containing 0, 1.25, 2.50 and 3.75g/kg Black Coffee Seed Powder (BCSP). Molded raw patties (approximately 50g, 5cm diameter, 0.6 cm thickness) were oven cooked at 180±2□C for 20 minutes. Each batch was repeated three times. Moisture, crude protein and organoleptic characteristics (9point hedonic scale) of freshly cooked patties were assessed. Thiobarbituric Acid Reactive Substances (TBARS) (µ/g) were assessed on 0, 7 and 14 days. Data were analysed using one way ANOVA and DMRT to test significance level at Pα0.05. Patties with 3.75g BCSP contained higher (P<0.05) moisture (62.96) than 2.50g (59.71), 1.25g (56.82) and 0g (42.19) BCSP patties. Crude protein: 16.52 (1.25g) and 16.64 (2.50g) were similar (P>0.05) but lower (P<0.05) than 17.76 (3.75g.) and 14.38(0g). Juiciness of 1.25g (6.80) and 2.50g (6.40) BCSP pattie were similar (P>0.05) with 0g (5.60) but higher (P<0.05) than 3.75g (4.20) BCSP patties. The TBARS (1.59, 2.51, 3.21) of patties with 3.75g BCSP were higher (P<0.05) than 1.65, 2.60, 3.27 (2.50g), 1.72, 2.67, 3.34 (1.25g) and 2.19, 3.13, 3.82 (0g) at 0, 7 and 14 days respectively. Increased juiciness and reduced thiobarbituric acid reactive substances showed that black coffee seeds powder do not have adverse organoleptic characteristics in patties and can be a good antioxidant. In preserved meat

Keywords: Antioxidant, black coffee seed, sensory evaluation, patties, shelf stability

INTRODUCTION

Lipid oxidation is one of the quality deterioration that occur in meat and meat products. This is due to the high nutrients together with the high polyunsaturated fatty acids especially linoleic acid which is a significant fat in human diet (Ruban, 2009). However, the severe effect of lipid oxidation in meat can be prevented, delayed or retarded through the addition of antioxidants (Kenawi *et al.*, 2011). The increased demand for natural food has made the food industry to continue to explore all natural sources of antioxidants which can be found in various plants. The presence of these natural oxidative compounds in food may at the same time modify the nutritive value of such food (Korczak *et al*., 2004). Coffee is a rich source of dietary antioxidants whose antioxidant property is attributed to its high concentration of polyphenols (Acidri *et al.,* 2020) such as hydroxycinnamic acids, caffeic and chlorogenic acid derivatives (Klingel *et al.,* 2020). This study addressed the nutritional advantages, sensory characteristics of freshly cooked patties with trained panelists and the shelf life of refrigerated cooked patties of including BCSP as an antioxidant in chicken patties recipes.

MATERIALS AND METHODS

Experimental Material

Coffee seeds (*Coffea arabica*) were sourced from Cocoa Research Institute of Nigeria (CRIN), Ibadan, Nigeria. The coffee seeds were cleaned from dirts and milled and kept inside air tight container until further use.

Production of chicken meat patties

Six weeks old broiler chicken (twenty four) were procured from Teaching and Research Farm University of Ibadan. These were slaughtered and defeathered (cold carcass defeathering), eviscerated and cut into primal cuts. Meats were taken from every part of the broiler carcasses (the skin and bones removed) and refrigerated at -4□C

The fresh chicken meat was allowed to thaw then cut into small chunks and minced in a commercial meat mincer/ grinder (Electric meat grinder, model KNG762, Kenwood) using a plate with 5 mm diameter holes. The ground meat was separated into four parts and four independent chicken patties were produced. The first part was control (C) (without addition of BCSP).while patties requiring the

addition of dry/powdered BCSP, the minced meat was marinated with the BCSP at 1.25, 2.50, and 3.75g/kg. All ingredients (each batch separately) were mixed thoroughly with the ingredients (whole eggs, breadcrumbs, condiments, spice mix and ice water) the mixed patty emulsion was weighed (50 g per patty) and shaped into patty mold using a Petri dish (approximately 9 cm diameter and 0.6 cm a thickness). The molded raw patties were placed on cooking trays (each batch separately) and cooked in a preheated hot air oven at 180±2□C for 25 minutes with intermittent turning (Jamwal *et al*., 2015). After doneness (internal core temperature (72□C)), patties were spread on a clean tray and allowed to cool down to room temperature after which they were packaged separately in high density polyethylene Ziploc bags and stored in refrigerated temperature (4±1°C). The patties were evaluated for their quality at seven days interval up to 21 days.

Experimental Design

Four different emulsion-type patties formulations were prepared (four treatments) comprising of 0g, 1.25g, 2.50, 3.75g/kg BCSP respectively. Each batch were produced in triplicates.

Parameters Measured

Proximate composition

The proximate analysis was determined in the patties according to the procedure of AOAC (2019). The moisture, crude protein, crude fat and total ash was determined through the drying, Khejal flask, Soxhlet and furnace methods respectively.

Panelist Organoleptic assessment of Broiler Chicken Patties

This was carried out in the Meat Science Laboratory, Department of Animal Sciences, University of Ibadan, Nigeria where a total of twenty trained students and staff of the Department were used to evaluate the sensory attributes of the chicken patties. The sample were coded with three-digit numbers before presentation to the panelists for evaluation. The sensory attributes evaluated include flavour, tenderness, juiciness, texture and colour on a 9-point hedonic scale (ASTM, 1996) where 9 = like extremely and 1 = dislike extremely. Water and biscuits (crackers) were provided for the panelists to chew and drink in order to eliminate the carry over effect of the previous sample.

Thiobarbituric Acid Reactive Substances (TBARS)

The extend of lipid oxidation of the chicken patties during the three weeks storage was determined by measuring the Thiobarbituric Acid Reactive Substances (TBARS) assay technique. The modified extraction method of Liu *et al.* (2010) was employed. Each sample of chicken patties was placed in a polyethylene bag and fifty ml of chilled (4°C) solution of 20% trichloroacetic acid in 1.6% phosphoric acid was added to the same bag and massaged for two minutes in a stomacher to mix the sample. Fifty ml of chilled distilled water (4°C) was then added into the bag and the stomacher was again used to blend the sample for 30 seconds. The slurry was filtered through Whatman No. 1 filter paper into a 100 ml cylinder. Five ml of the filtrate was pipetted into a test tube, and five ml of fresh chilled 0.02 M 2-thiobarbituric acid solution was added to this tube. The intensity of colour was measured in a spectrophotometer at 532 nm to calculate the TBARS value. The amounts of TBARS were expressed as micrograms of malondaldehyde (MDA)/kg meat (μg MDA/g).

STATISTICAL ANALYSIS

Data obtained from the study were submitted to one-way analysis of variance (ANOVA).Duncan Multiple Range Test at Pα 0.05 was used to compare the means using the SAS version 12.0 statistical package (2020).

RESULTS AND DISCUSSION

Patties proximate composition

The moisture (42.19), protein (14.38) and ash (0.55) of patties with 0g/kg BCSP was the least ($P<0.05$) compared with (56.82; 16.52; 0.73), (59.71; 16.64; 0.87) and (62.96; 17.76; 0.88) obtained in 1.25, 2.50 and 3.75g/kg BCSP patties. Ether extract of 0g/kg (6.35) was higher ($P<0.05$) than 5.55, 5.36 and 5.23 obtained in 1.25, 2.50 and3.75g/kg BCSP patties respectively (Table 1).The proximate composition of BCSP patties were improved as shown in the proximate composition of the cooked chicken patties which could be attributed to the nutritional content of the coffee.

Table 1: Proximate composition of broiler chicken patties marinated with black coffee seed powder

	Varying inclusion levels BCSP(g/kg)				
Parameters %	**0.00**	**1.25**	**2.50**	**3.75**	**P-value**
Moisture	42.19[d]	56.82[c]	59.71[b]	62.96[a]	0.000
Crude Protein	14.38[c]	16.52[b]	16.64[b]	17.76[a]	<0.001
Ash	0.55[d]	0.73[c]	0.87[b]	0.88[a]	<0.001
Ether extract	6.35[a]	5.55[b]	5.36[b]	5.23[c]	0.001

[a,b,c]: means in the same rows with similar superscripts are not statistically different (P<0.05)

Organoleptic evaluation

No significant differences (P>0.05) in colour, aroma, flavour and overall acceptability. Tenderness of 2.50g/kg (6.00) and 3.75g/kg (6.60) were similar (P>0.05) but higher (P<0.05) than 4.40 (1.25g/kg) and 4.80 (0g/kg) while juiciness recorded in 1.25g/kg (6.00) and2.50g/kg (6.80) are similar (P>0.05) but higher (P<0.05) than 4.20 (3.75g/kg) and similar with 5.60 (0/kg) patties (table 2). The mean sensory scores of the chicken patties showed that inclusion of black coffee seed directly during processing did not have any negative effect on the sensory characteristics when compared with the control chicken patties. This is evidenced in the sensory attributes particularly in the overall acceptability where no significant differences were observed among all the patties. This further agreed with Hashimoto *et al.* (2019) who opined that coffee still maintained sensory acceptability while exhibiting antioxidant properties. The low juiciness rating of chicken patties with 3.75g/kg coffee inclusion might be that the taste of caffeine (caffeic acid) in the patties at this inclusion level become more pronounced thus the low juiciness rating by the panels.

Table 2: Organoleptic characteristics of broiler chicken patties marinated with black coffee seed powder

	Varying inclusion levels BCSP(g/kg)				
Organoleptic properties	**0.00**	**1.25**	**2.50**	**3.75**	**P-value**
Colour	6.80	6.00	5.40	5.40	0.442
Aroma	4.20	3.60	3.40	3.20	0.979
Flavour	4.40	3.80	3.40	3.40	0.971
Tenderness	4.80 [b]	4.40[b]	6.00[a]	6.60[a]	0.003
Juiciness	5.60[ab]	6.60[a]	6.80[a]	4.20[b]	0.002
Overall acceptability	5.40	5.80	5.40	4.40	0.973

[a,b]: means in the same rows with different superscripts are statistically different (P<0.05)

Lipid oxidation of chicken patties

Table (3) showed that 0/kg patties at 0 (2.19), 7 (3.13) and 14 (3.82) days of storage were higher (P<0.05) than 1.72, 2.67, 3.34 (1.25g/kg), 1.65, 2.60, 3.27 (2.50g/kg), 1.59, 2.51, 3.21 (3.75g/kg) at 0, 7 and 14 days respectively. All chicken patties experienced lipid oxidation which gradually increased with storage time however, the control sample had the greatest TBARs values irrespective of the days of storage. Storage and the presence of BCSP antioxidant influenced the lipid oxidation rate and consequently the TBARs values of the patties. This showed that black coffee seed have a protective effect against lipid oxidation irrespective of the inclusion levels. The reduced effect might be attributed to the presence of chlorogenic acid which have been reported to possess antioxidant properties (Vignoli *et al.,* 2011). The effective of black coffee seed as an antioxidants in reducing the TBARS levels was evidenced at day zero where the TBARS levels of all black coffee marinated chicken patties were reduced compared with chicken patties without no black coffee. This further demonstrated the efficacy of black coffee as an inhibitor of lipid peroxidation. This possible effect might be due to its high concentration of caffeic acid which have been reported to be an efficient inhibitor of lipid peroxidation (Sayed Mostafa and Fawzy El Azab, 2022).

Table 3: Thiobarbituric acid reactive substances (µg/g) of broiler chickens patties marinated with black coffee seed powder

	Varying inclusion levels BCSP(g/kg)				
Days of storage	**0.00**	**1.25**	**2.50**	**3.75**	**P-value**
0	2.19[a]	1.72[b]	1.65[c]	1.59[d]	<0.01
7	3.13[a]	2.67[b]	2.60[c]	2.51[d]	<0.001
14	3.82[a]	3.34[b]	3.27[c]	3.21[d]	<0.01

[a,b,c,d]: means in the same rows with different superscripts are statistically different (P<0.05)

CONCLUSION

The increased nutritional composition and the panelists' indifferent attitude as regards the overall acceptability showed that there was no adverse effect on the nutritional quality of the cooked patties. Again, the low thiobarbituric acid reactive substances level also indicate the antioxidant influence of black coffee seed powder in the chicken patties.

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