RADICAL SCAVENGING ACTIVITY AND MICROBIAL QUALITY OF CHICKEN MEAT BALLS INCORPORATED WITH LEMON GRASS LEAF POWDER

***Awodoyin, O.R., Adediran, O.A. and Olayemi, G.T.**
Department of Animal Science, University of Ibadan, Ibadan, Oyo state, Nigeria.
*Corresponding author: kasyem@yahoo.com; +234(8)027290842

ABSTRACT
The live chickens used as experimental material were procured from the Teaching and Research Farm, University of Ibadan). These were slaughtered and meat was excised from all parts and the meat was grounded using a meat grinder with 5mm mesh. Other ingredients (red pepper, black pepper, garlic, onions, salt, refined vegetable oil (Grand soya oil®) ice flakes and Lemon Grass Leaf Powder (LGLP) were thoroughly mixed with the grounded meat for homogeneity. Four emulsions batter were produced viz: T1 = (0g LGLP)), T2 = (2g LGLP), T3 = (4g LGLP), T4 = (6g LGLP) and was each formed into an identical weight (50±1 g) and oven cooked. Scavenging radical potential (DPPH) (%) and microbial load (cfu/g) of the chicken meat balls were assessed at days 0, 7 and 14. Data were analysed using ANOVA and significant test at pα0.05. Irrespective of the storage days, the scavenging potential of lemon grass leaf powder in the meat ball increased as the inclusion level increased while the microbial load of the meat ball decreased as the lemon grass leaf powder inclusion increased.
The inclusion of lemon grass leaf powder in meat ball improved the shelf life of the product.
Keywords: Lemongrass leaf, Scavenging potential, Microbes, Shelf stability, Antioxidant

INTRODUCTION

Lipid oxidaation is a complicated, irreversible and unavoidable process that occur in meat during processing and storage period. The high-water activity and nutrients of meat and meat product provide an ideal environment for spoilage or foodborne pathogenic microorganisms Shaltout *et al*., 2017; Abd Elaziz *et al*., 2021). Furthermore, the acceptance and shelf stability of meat products depend on factors of which lipid oxidation and microbial proliferation are of major concern (Karabagias *et al*., 2011). In order to produce products with high quality and degree of safety, therefore, these factors (microbial and lipid oxidation) need to be controlled (Mastromatteo *et al*., 2009)
This study aimed at investigating the potency effect of lemon grass leaf powder on lipid oxidation and spoilage microorganisms of oven cooked chicken meat balls during refrigerated storage

MATERIAL AND METHODS

Production of chicken meat ball

The production of the chicken meat balls was carried out at the Animal Product and Processing Unit of the Department of Animal Science University of Ibadan. Four treatment groups of meat balls emulsion were formulated, viz. T1 = (Control (0% LGLP), T2 = (2% LGLP), T3 = (4% LGLP), T4 = (6% LGLP). Each treatment was oven cooked separately and replicated three times

EXPERIMENTAL DESIGN

Four different emulsion-type chicken meatball formulations were prepared (four treatments) comprising0g, 2g, 4g, 6g LGLP/kg meat respectively. Each batch was produced in triplicates.

Parameter Measured

Radical scavenging potential

The effectiveness of lemon grass in scavenging free radicals in the oven cooked chicken meat balls during storage was assessed using DPPH solution. This was carried out throughout the refrigerated storage period at 0, 7 and 14th day. The method adopted was described by Koçak (2024).

Microbial load of chicken meat balls

Microbial stability of the chicken meat ball during storage was also determined using the necessary nutrient agar for each microorganism to be assessed.

Statistical Analysis

All experiments were done in triplicate. Data generated from radical scavenging activity was analysed using ANOVA and Duncan Multiple Range Test (DMRT) was used to compare the means between samples and the statistical significance was established at $P<0.05$. Numerical assessment of the microbial load was carried out

RESULTS AND DISCUSSION

Radical scavenging activity of lemon grass leaf powder in chicken meat balls

At the end of 14th day, the DPPH 47.06% (0gLGLP) and 46.81% (2gLGLP) were similar (P>0.05) but significantly lower(P<0.05) than 50.57% (4gLGLP) and 56.52%(6gLGLP) (Table 1).

A significant increase was observed in the antioxidant activity of (DPPH) in chicken meatball samples with lemon grass leaf powder as compared with control sample. Also, there was a proportional increase in the antioxidant activity of the meat balls as the inclusion level of lemongrass increased. Thus, chicken meat balls with 6% LGLP exhibited highest antioxidant activities irrespective of the storage days. This implied that presence of LGLP in the chicken meat ball formulation will increase the shelf stability and thus storage life of the product. The initial oxidative activity (47.91-53.49%) of burger with lemon grass powder as reported by Awad (2019) was lower than what was obtained in this study for chicken meat balls. The effectiveness of lemon grass in this regard is attributed to the high amount of phenolic composition of lemon grass which was also reported by El-Gharably and Ashoush (2011) and Sara (2019).

Table 1: Radical scavenging potential of lemon grass leaf powder in oven-cooked chicken meat balls during storage

Weeks	LGLP (g) Inclusion	DPPH values (%)
0	L4	75.50[a]
0	L6	73.97[b]
0	L2	72.11[c]
0	L0	70.55[d]
1	L6	63.64[e]
1	L4	62.25[f]
1	L2	61.30[g]
1	L0	60.92[g]
2	L6	56.52[h]
2	L4	50.57[i]
2	L0	47.06[j]
2	L2	46.81[j]

[a,b,c,d,e,f,g,h,i,j]:Means in the same column with different superscripts are statistically different (P<0.05)

Microbial load of lemon grass leaf powder marinated chicken meat balls

The study further revealed that during storage and up till the 14th day of storage (Table 2), control samples exhibited a higher microbial counts when compared with LGLP samples irrespective of the microbes. Another interesting observation was that products with 6%LGLP had no growth of coliform counts throughout the 14days storage period although other inclusion had lower counts. This further confirm that LGLP may have potency against gram negative bacteria such as coliform (Sada et al., 2023).

Table 2: The loads of some selected microorganisms in LGLP incorporated chicken meat balls

		Types of Microorganisms			
Days	**LGLP(g)**	**THC**	**TFC**	**TCC**	**Staphylococcus**
……	0	8.8×10^{-5}	0	7.0×10^{-1}	0
0	2	8.0×10^{-5}	0	8.0×10^{-1}	0
	4	1.0×10^{-5}	0	0	0
	6	0	0	0	0
7	0	6.0×10^{-6}	12.8×10^{-1}	6.0×10^{-2}	16.8×10^{-1}
	2	1.0×10^{-6}	4.2×10^{-1}	2.4×10^{-1}	4.8×10^{-1}
	4	2.1×10^{-5}	2.8×10^{-1}	1.0×10^{-2}	1.2×10^{-1}
	6	1.0×10^{-5}	2.3×10^{-1}	0	0
14	0	2.16×10^{-4}	9.8×10^{-1}	14.2×10^{-1}	TNCT
	2	1.48×10^{-4}	4.2×10^{-1}	9.6×10^{-1}	TNCT
	4	1.36×10^{-4}	3.3×10^{-1}	4.8×10^{-1}	TNCT
	6	1.26×10^{-4}	1.0×10^{-1}	0	1.6×10^{-1}

LGLP= Lemon Grass Leaf Powder
L0 = Chicken meat balls with 0gLGLP
L2 = Chicken meat balls with 2gLGLP
L4 = Chicken meat balls with 4gLGLP
L6 = Chicken meat balls with 6gLGLP

CONCLUSION

The noticeable outcome of reduced lipid oxidation and microbial growth during refrigerated storage of two week found in oven cooked chicken meatballs after addition of lemon grass leaf powder showed that lemon grass leaf powder can be included in the formulation of chicken meat balls.

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