EFFECT OF LEMON JUICE (*CITRUS LIMON*) ON ON PHYSICOCHEMICAL QUALITY OF CHICKEN FILET

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ABSTRACT
This study was conducted to investigate the influence of lemon juice on quality of chicken fillets. Chicken fillets were assigned to five treatment groups of lemon juice extract (LJE), at different inclusion levels and a control group. Treatment 1 to 5 received 2.0%, 4.0%, 6.0%, 8.0% and 10.0% lemon juice extract (LJE) respectively. All treatments were sun-dried before they were kept in a Ziploc bags and analysis was done at interval of 1st month, 2nd month and 3rd month. The parameters evaluated were pH, water holding capacity (WHC) and oxidative rancidity (OR). The results showed a significant difference (P<0.05) in the physiochemical properties. Chicken fillet had the highest pH in control (6.20), WHC (75.00%), and OR (2.07mg/kg). As the lemon juice inclusion level increases, there was a reduction in pH with lowest value of pH (5.97) at 8.00%, WHC (68.33%) at 4.00% inclusion level, and oxidative rancidity (1.42mg/kg) at 10.00% inclusion level. Physicochemical quality of chicken fillet was affected by storage duration for pH value, WHC and OR of chicken fillets. The pH (6.24) was higher in the second month and lower in the third month. WHC was recorded highest in the third month with (84.17%) and lowest in the second month with (60.00%). While OR was recorded highest in the third month with (2.12 mg/kg) and lowest in the first month with (1.51 mg/kg). The study concludes that lemon juice extract provides antioxidant benefits to chicken fillet during storage.

Keywords: lemon Juice, physicochemical, chicken, fillet, shelf-life

INTRODUCTION

Previous studies have indicated that the use of synthetic preservatives may promote undesirable health effects on humans due to the toxicity of such compounds (Liu *et al,* 2020). For this reason, consumers are increasingly cautious of processed meat product with an increasing demand for natural processed products. Likewise, researchers have explored the use of natural compounds, derived mainly from plants, with antioxidant and antimicrobial characteristics as alternatives for the conservation of meat products (Pateiro *et al.,* 2018; Lacerda, 2021).

Lemon extract are being used as an antibacterial potential against diarrhea- causing pathogen. The main content of lemon juice is vitamin C and citric acid. It is also known to contain bioactive compounds such as phenolics (gallic acid, chlorogenic acid, rutin, quercetin etc) and essential oils which are believed to be responsible for a range of protective benefits including anti-oxidative and antimicrobial activities (Karimi *et al*., 2016). Addition of lemon extract as a natural antioxidant can help to prevent lipid peroxidation process and increase shelf life of foods (Disha *et al*., 2020).

This research attempts to use lemon as a source of natural antioxidant to preserve chicken fillet.

MATERIALS AND METHODS

Experimental Site

This experiment was carried out at Animal Products Laboratory of Animal Production Department Faculty of Agricultural Science University of Jos, Jos, Plateau State Nigeria.

Experimental Design

6×3 arrangement in a completely randomized design.

6= 6 lemon juice concentrations 0, 2.0%, 4.0%, 6.0%, 8.0% and 10.0% in 100mls of water
3= 3 evaluation intervals, 30days, 60days and 90days.

Lemon Juice Preparation

Fresh lemons were harvested, washed thoroughly, the juice was then removed with the aid of juice squeezer. The juice was then added to 100ml of water at different concentrations thus; 0, 2.0%, 4.0%, 6.0%, 8.0% and 10.0% lemon juice extract (LJE)

Parameters evaluated

pH

The pH was determined according to method described by AOAC (2000)

Water Holding Capacity

Water Holding Capacity (WHC) was determined according to Wardlaw *et al.* (1973).

Oxidative Rancidity

Thiobarbituric acid value (TBA) was estimated by modified methods of Buege and Aust (1978).

Statistical Analysis

The collected data were statistically analysed using one-way ANOVA. A 95% confidence interval was used to determine the statistical difference between the control and the treatments and between groups.

Results

Effect of Lemon Extract on Physicochemical Quality of Chicken Filet

Chicken fillet as affected by natural antioxidant lemon extract is shown in the Table 1. The results showed a significant difference (P<0.05) in the pH, water holding capacity and oxidative rancidity of the chicken fillet at different treatment levels. Chicken fillet from control was recorded highest (6.20), water holding capacity (75.00), and oxidative rancidity (2.07). Showing a constant pattern of reduction as the inclusion level increased given the lowest value of pH (5.97) at 8.00%, WHC (68.33) at 4.00% inclusion level, and oxidative rancidity (1.42) at 10.00% inclusion level.

Table 1: Main effect of lemon extract on physicochemical quality of chicken filet

Parameters	Control	2.0%	4.0%	6.0%	8.00%	10.00%	SEM	P-value
pH	6.20^{a}	6.05^{bc}	6.06^{bc}	6.01^{bc}	5.97^{c}	6.11^{ab}	0.03	0.000
Water holding capacity (%)	75.00	68.89	68.33	72.78	69.44	72.78	1.56	0.000
Oxidative rancidity (mg/kg)	2.07^{a}	1.88^{c}	2.04^{ab}	1.61^{d}	1.96^{b}	1.42^{e}	0.07	0.001

$^{a, b, c}$ means with different superscripts on the same row differ significantly (P<0.05) ; SEM means standard error of mean.

Table 2 displays the impact of storage duration on the physicochemical quality of chicken fillet. Significantly (p<0.05), storage duration influenced pH value, water holding capacity, and oxidative rancidity. The pH exhibited a decreasing trend, with the highest value (6.24) in the second month and the lowest in the third month. Water holding capacity peaked at 84.17 in the third month and dipped to 60.00 in the second month. Oxidative rancidity showed variation, reaching its highest (2.12) in the third month and lowest (1.51) in the first month. These results highlight the temporal changes in chicken fillet attributes during storage, emphasizing the importance of understanding quality dynamics over time.

Table 2: Main effect of storage duration on physicochemical quality of chicken filet

Parameters	1st Month	2nd Months	3rd Month	SEM	P-value
pH	6.12^{b}	6.24^{a}	5.84^{c}	0.08	0.000
Water holding capacity (%)	69.44^{b}	60.00^{c}	84.17^{a}	3.98	0.000
Oxidative rancidity (mg/kg)	1.51^{c}	1.86^{b}	2.12^{a}	0.05	0.001

$^{a, b, c}$ means with different superscripts on the same row differ significantly (P<0.05) ; SEM means standard error of mean.

DISCUSSION

The pH of chicken fillet was significantly (p<0.05) decreased as inclusion levels and storage period increased. The most preferable pH (5.97) was observed in 8 % level over the 3 months storage period in comparison to control (6.20). The decreasing trend of pH value was probably due to the

accumulation of lactic acids from the secretions of microorganism. Bacteria and mold have a tendency to decrease with increasing storage time, and they secrete components that decrease the pH (Degrain *et al.,* 2020). Verma *et al*. (2013) also observed a similar decrease in the pH of sheep meat nuggets incorporated with guava powder. This decrease could be due to the presence of some organic acids in lemon extract which shifted the control sample to be slightly acidic. Braddock (1995) reported that the pH values of samples with added lemon albedo were lower than control samples due to the presence of some organic acids. Therefore, low pH value is a positive character in chicken fillet storage because microorganism growth is reduced in low pH conditions which will increase shelf life of the product.

Water-holding capacity (WHC) is one of the major quality properties of fresh meat as it affects some major characteristics such as potential drip loss, technological quality, appearance and sensory properties (Das *et al.,* 2011). This property is largely affected by the muscles proteins and pH value. Generally WHC decline continuously with the progression of storage period (Hayam *et al*, 2018). This result is in line with the research of Karakaya *et al.* (2012) who reported that the addition of papain, bromelin and ficin increased the WHC of beef as compared to untreated controls. The result obtained from this research could be due to the PH and the lemon extract reducing the protein denaturation level.

This result indicated that, as the inclusion level increased, the oxidative rancidity decreases. T1 (control without the extract) was significantly higher ($p<0.05$) with rancidity value of 3.02 mg/kg with the lowest value of 1.42 mg/kg was recorded at 10% inclusion level of the lemon extract. Lower oxidative rancidity obtained in this research could be due to the antioxidant ability of the lemon extract.

Conclusion

The study concludes that lemon juice extract provides antioxidant and antimicrobial benefits to chicken fillet during storage. Addition of lemon juice extracts to chicken fillet up to 10.0% can increase the shelf life up to 3 months.

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