Impact of Peracetic acid concentrations on microbial and quality traits of broiler meat

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I. INTRODUCTION

Poultry meat, known for its nutritional benefits and is essential for addressing global protein deficiencies [1]. However, safety concerns arise due to contamination by pathogens, often linked to the supply chain [2]. Traditional decontamination methods, such as chlorine, can negatively affect meat quality [3]. The use of peracetic acid (PAA), a safer alternative recognized for its efficacy in reducing microbial loads without compromising meat's quality attributes like pH, color, and water-holding capacity [4]. The study aims to enhance poultry meat safety and hygiene, potentially lowering chances of foodborne illness and advancing industry processing practices.

II. MATERIAL AND METHODS

Poultry breast fillets (340g ± 10g) were procured from a local wet market. The experimental design included a control, treatments with tap water and 0.015% (T1), 0.020% (T2), and 0.025% (T3) peracetic acid (PAA), applied for 30 seconds on days 0, 3, and 5, involving 135 samples in total. Fillets were treated with PAA at concentrations of 150 ppm, 200 ppm, and 250 ppm, respectively, and stored for subsequent evaluations. Microbiological assessments (Total Viable, Salmonella, Pseudomonas, and E. coli counts) followed ISO standards. Measurements included color, pH, water-holding capacity, cooking yield, and loss were recorded accordingly. Sensory attributes were rated using a 9-point Hedonic scale. Statistical analysis utilized SPSS to identify significant differences at (p<0.05) using Tukey's test.

III. RESULTS AND DISCUSSION

TVBN was highest in T3 and lowest in control and tap water treatments (p<0.01). T2 exhibited the highest cooking loss, whereas T3 had the highest cooking yield (p<0.01). Microbial analysis indicated higher Pseudomonas, E. coli, and Salmonella counts in the control and tap water treatments compared to T3 (p<0.05 for Pseudomonas; p<0.01 for E. coli and Salmonella). Total viable count (TVC) remained similar across treatments (p>0.05) but increased significantly by day 5 (p<0.01). Sensory evaluations rated T1 highest for taste, juiciness, odor, tenderness, and overall acceptability (p<0.01). Meat color analysis revealed the lowest L* values in control, higher a* in control, and higher b* in T3, T1, and tap water (p<0.01). Meat pH was notably higher in the tap water treatment (p<0.01).

Table 1: Mean *p*-values for TVBN, Cooking loss, cooking yield, WHC, pH, and microbiology among the treatments and days.

Treatment	Day	TVBN	Cooking Loss (%)	Cooking Yield	WHC	pH	TVC	Pseudomonas	E. coli	Salmonella
Control	0d	0.3±0.1^{d}	28.3±1.4^{b}	71.7±1.6^{b}	25.3±4^{bc}	6.4±0.1^{ab}	64.3±12.9	8.8±2.6^{a}	7.7±1.9^{b}	1.9±0.5^{a}
	3d	0.4±0.1^{d}	20.2±1.4^{b}	81.8±1.6^{a}	26.8±4^{bc}	6.3±0.1^{ab}	37.3±6.1	3.7±4.1	4±2.3	1±0.4
	5d	0.5±0.1^{d}	24.2±1.4^{b}	75.8±1.6^{b}	28.8±4^{bc}	6.1±0.1^{b}	93.9±4.4^{a}	11±4.1	5±2.3	1±0.4
Tap water	0d	0.4±0.1^{d}	26±1.4^{b}	74±1.6^{b}	29±4^{a}	6.5±0.1^{a}	63.6±5.7	10.9±4.2^{a}	21.4±3.6^{a}	2.4±0.6^{a}
	3d	0.5±0.1^{d}	21.8±1.4^{b}	78.2±1.6^{a}	34.4±4^{a}	6.5±0.1^{a}	37.1±3.9	3.7±4.1	12±2.3	1.7±0.4
	5d	0.7±0.1^{d}	25.5±1.4^{b}	74.4±1.6^{b}	37.4±4^{a}	6.1±0.1^{b}	67.9±5.2	16.3±4.1	19.7±2.3	1±0.4
T1	0d	0.6±0.1^{c}	29.1±1.4^{b}	70.9±1.6^{b}	23.4±4^{bc}	6.2±0.1^{b}	65.4±11.8	4.4±1^{ab}	5.6±1.6^{b}	0.4±0.2^{b}
	3d	0.6±0.1^{c}	21±1.4^{b}	79±1.6^{a}	25.3±4^{bc}	6.1±0.1^{b}	46±9.5	2.3±4.1	2±2.3	0.3±0.4
	5d	0.8±0.1^{b}	20.1±1.4^{b}	79.9±1.6^{a}	27.3±4^{bc}	6.1±0.1^{b}	43.8±10.5	5.3±4.1	4±2.3	0±0^{b}
T2	0d	0.5±0.1^{d}	29.4±1.4^{a}	70.6±1.6^{b}	21.5±4^{c}	6.3±0.1^{ab}	56.6±10.8	4±1.3^{ab}	3.8±0.9^{b}	0±0^{b}
	3d	0.8±0.1^{b}	28.7±1.4^{a}	71.3±1.6b	25.3±4^{bc}	6.1±0.1^{b}	30.4±7.1	7.7±4.1	3±2.3	1.7±0.4
	5d	0.9±0.1^{b}	27.9±1.4^{a}	72.1±1.6^{b}	27±4^{bc}	6.1±0.1^{b}	67.9±5.2	7.7±4.1	1.7±2.3	0±0^{b}
T3	0d	0.8±0.1^{b}	14.9±1.4^{c}	85.1±1.6^{a}	30±4^{a}	6.2±0.1^{b}	51.9±10.8	0±0^{b}	2.3±0.7^{b}	0±0^{b}
	3d	0.9±0.1^{b}	17.9±1.4^{c}	82.1±1.6^{a}	31.4±4^{ab}	6±0.1^{c}	30.4±7.1	1.7±4.1	0.7±2.3	0±0^{b}
	5d	1.1±0.1^{a}	25.5±1.4^{a}	75.5±1.6^{b}	35.2±4^{a}	6.1±0.1^{b}	89.7±9.8	0±0	0.7±2.3	0±0^{b}

TVBN: Total volatile basic nitrogen
WHC: Water holding capacity.

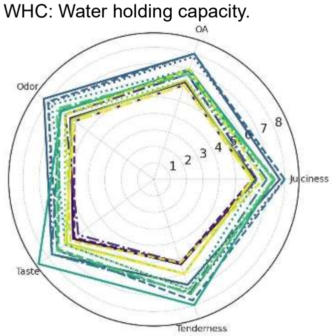

Figure 1: Radar Graph for Sensory

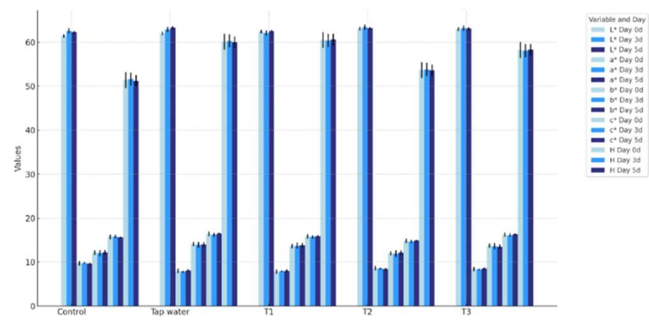

Figure 2: *L**, a* and b* values among treatment and days

IV. CONCLUSION

The study found that peracetic acid (PAA) at 200 ppm effectively enhances the physicochemical and microbiological characteristics of chicken breast fillets without altering their sensory qualities.

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