INFLUENCE OF DIFFERENT ELECTRICAL STIMULATION TREATMENTS AT THE CUTTING ROOM ON QUALITY PARAMETERS OF DEBONED CHICKEN BREAST FILETS

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I. INTRODUCTION

As the demand for poultry meat as an affordable source of protein continues to increase, the industry is constantly challenged with meeting consumer needs. Maximizing production efficiency, through selection practices and improved nutritional programs have made possible to provide a affordable protein source to a variety of consumers [1]. To deal with the increasing production volume, it's became necessary to decrease the aging period, deboning early and chilling rapidly. However, these practices carry negative effects in regards to meat quality [2], introducing new obstacles to overcome. Electrical stimulation is a technology that may be used to improve meat tenderness of early deboned broilers, by accelerating the post mortem metabolism and rigor mortis development [3]. Therefore, this study aimed to observe the influence on physical-chemical meat quality parameters of nine different electrical stimulation treatments applied on deboned chicken breasts.

II. MATERIALS AND METHODS

Seventy two deboned chicken breasts from Cobb 500 male broilers (live weight ranging from 2.8 to 2.9 kg) were subjected to electrical stimulation at the cutting room. The birds were slaughtered at a line speed of 200 birds per minute and stimulated at 3 hours and 25 minutes *post mortem*, after reaching 4ºC. A prototype of a benchtop electrical stimulator was developed using a controlling font Fluxo LFX-500. It was applied 3 different electrical current intensities (500, 1000 and 2000 mA) during 3 different times (10, 20 and 30 s), totalizing 9 treatment groups, with 8 samples each. The left portion of each breast was stimulated, whereas the right portion was not, being kept as control. Subsequently the samples were frozen at -18ºC and thawed at 4ºC for 48h for the analysis.
The meat quality parameters evaluated were pH (benchtop pHmeter Kasvi K39-2014B), color according to CIE L*a*b* system (chroma meter Konica Minolta CR-400/410), water holding capacity (filter paper press method), drip loss, cooking loss, and Warner-Bratzler shear force (texturometer model TAXT2i, software Texture Expert V).
The results were subjected to analysis of variance and the difference between electrically stimulated and the respective non-electrically stimulated breasts was tested with the Student's t-test, at a significance level of 5% ($P < 0,05$).

III. RESULTS AND DISCUSSION

The meat quality parameters analysis (Table 1) indicated that there was no significant difference ($P > 0.05$) between all the 9 different electrical stimulation treatments evaluated and their respective controls. It's been demonstrated that electrical stimulation is a efficient method of reducing cold shortening and improving tenderness, however it is usually applied sooner, immediately after bleeding or after scalding [4]. Nevertheless, fillets stimulated after defeathering have also shown improvements [5]. Electrical stimulation induces a faster rate of glycolysis and rigor development in poultry, accelarating biochemical postmortem changes involved in the conversion of muscle to meat, therefore reducing the aging time [3]. As in the present study already deboned breasts were stimulated and soon after subjected to freezing, it's possible that the period was insufficient for the manifestation of signifficant effects.

Table 1 – Effect of current and time on meat quality parameters.

	Current (mA)	Time (s)	pH	L*	a*	b*	DL (%)	WHC (%)	CL (%)	WBSF (N/s)
T1	500	10	5,767	64.414	11.128	13.990	5.5	24.3	18.6	6.478
C1	-	-	5.808	64.098	11.338	13.815	4.6	25.3	17.1	6.415
T2	500	20	5,713	64.225	11.715	13.606	6.4	27.7	19.6	6.585
C2	-	-	5.795	64.663	11.687	14.535	5.7	26.5	27.9	6.486
T3	500	30	5.910	63.793	10.814	14.541	6.1	26.0	19.4	5.867
C3	-	-	5.852	64.087	11.043	15.257	5.4	25.2	19.5	6.119
T4	1000	10	5.815	64.319	11.615	15.151	6.3	26.2	17.3	6.689
C4	-	-	5.843	64.604	11.226	15.962	5.4	26.4	12.4	6.602
T5	1000	20	6.009	65.782	10.925	15.197	3.9	29.0	19.4	6.803
C5	-	-	5.936	65.500	11.100	15.054	3.9	30.6	18.6	6.475
T6	1000	30	6.052	62.948	11.556	13.235	4.1	25.1	20.6	10.215
C6	-	-	6.085	63.216	11.688	13.336	3.6	30.4	19.5	8.873
T7	2000	10	6.043	63.971	10.991	13.403	2.8	20.1	17.1	7.866
C7	-	-	6.076	62.811	11.690	12.875	2.5	25.1	15.7	7.691
T8	2000	20	5.908	63.464	11.467	12.942	5.3	22.7	22.0	8.755
C8	-	-	5.910	63.495	12.038	13.401	4.2	24.7	19.7	9.424
T9	2000	30	6.094	64.511	10.303	12.994	5.4	20.0	21.5	8.564
C9	-	-	6.083	64.257	10.396	13.595	4.0	26.5	19.8	8.204

[1] Abbreviations: DL, drip loss, WHC, water holding capacity, CL, cooking loss, WBSF, Warner-Bratzler shear force.
[T1-T9] Indicates the treatment means.
[C1-C9] Indicates respective control means.

IV. CONCLUSION

Electrical stimulation on deboned broiler breasts at the cutting room didn't show statistically significant differences ($P > 0.05$) in quality traits in comparison to non-stimulated filets, regardless of the current and duration of the application. It is possibly due to the moment in which the samples were stimulated. Therefore, it's necessary to determine until when it is possible to obtain significant improvements on meat quality using electrical stimulation, as well as the most efficient moments of application during poultry meat processing.

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