

Evaluation of addition of “ora-pro-nóbis” (*Pereskia aculeata* Miller) as antioxidant in sausages containing mechanically deboned poultry meat during refrigerated storage

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I. INTRODUCTION

The ora-pro-nóbis (*Pereskia aculeata* Miller) is a type of Non-conventional Food Plant (PANC) found in the Brazilian Atlantic Forest, though it is rarely used commercially. Due to its high nutritional value, lack of toxicity, and emulsifying, thickening, and gelling properties, this plant make it attractive for applications in the food, cosmetic, and pharmaceutical industries [1; 2]. However, there is a lack of studies that report the potential antioxidant of this species in meat products. Thus, the objective of this work was to evaluate the antioxidant capacity and color properties of sausages containing mechanically deboned poultry meat (MDPM) with natural extracts during refrigerated storage.

II. MATERIALS AND METHODS

The leaves of ora-pro-nóbis (OPN) plant were freeze-dried (Modulyo, Markham, ON, Canada) at -50°C for 96 h. Rosemary (ROS®) and green tea (GT®) commercial extracts were donated by International Flavors and Fragrances (IFF®). Five treatments of sausages containing MDPM were prepared: CON – control (without antioxidant); ERY (Sodium erythorbate) – 0.05%; OPN – 0,05%; ROS® – 0,05% and GT® - 0,05%. The sausages were stored under refrigeration at 4°C and analyzed at two-time points: 1 and 30 days. Color analysis was conducted using a Colorflex 45/0 spectrophotometer (HunterLab, Reston, VA, USA). Color parameters were expressed as lightness (L*), red color intensity (a*), and yellow color intensity (b*). The lipid oxidation (TBARS) was determined according to Vyncke [3] and expressed in MDA/kg sample. For the statistical analysis of the results, analysis of variance (ANOVA) was performed using the General Linear Model (GLM). The production time and the treatment were considered fixed effects, while the manufacturing repetition was a random effect. The software used was Statistica version 7 (StatSoft, Inc., 2004).

III. RESULTS AND DISCUSSION

The TBARS values of all treatment are shown in Table 1. On the first day, no significant difference was observed among the treatments. However, on 30th day, the addition of ERY and OPN were significantly lower ($p < 0.05$) to TBARS values in the sausages when compared to CON, showing that lyophilized OPN leaves have a significant antioxidant effect in sausages at the studied concentration. ROS and GT were like CON and OPN. This antioxidant effect of lyophilized OPN leaves could be due to the phenolic compounds found [4].

Regarding the color parameters (Table 2), the addition of natural extracts resulted in lower a* values ($p < 0.05$), likely due to the inherent greenish hue of OPN leaves and the brown tones of ROS and GT extracts, and the absence of sodium erythorbate (that serves as a cure accelerator and stimulant to color development) and absence of colorant in the formulations. These results agree with those reported by Lise et al. [5], that also observed a decrease in the same parameters with the addition of OPN mucilage in *mortadella*-type meat product.

Table 1. Effect of extracts and ERY on TBARS (mg MDA/kg) in sausage during refrigerated storage.

Treatment	Refrigerated storage (days)	
	1	30
CON	0.188 ^{ns}	0.303 ^a
ERY	0.201 ^{ns}	0.220 ^b
OPN	0.147 ^{ns}	0.218 ^b
ROS	0.169 ^{ns}	0.245 ^{ab}
GT	0.154 ^{ns}	0.255 ^{ab}
SEM	0.007	0.008
<i>p-value</i>	0.111	0.003

a–b Mean values in the same column with different letters indicate significant difference ($p < 0.05$) while ^{ns} mean within the same column aren't significantly different ($p > 0.05$). SEM: standard error of the mean. *p-value*: significance $p < 0.05$. Treatments: CON: control (without antioxidant); ERY: sausage with erythorbate at 0.05%; T1: sausage with OPN at 0.05%; T2: sausage with ROS at 0.05%; T3: sausage with GT at 0.05%.

Table 2. Color parameters of sausage during refrigerated storage.

Parameters	Days	Treatment					SEM	<i>p-value</i>
		CON	ERY	OPN	ROS	GT		
L*	1	61.15 ^b	62.08 ^a	59.22 ^c	59.35 ^c	61.31 ^{ab}	0.229	0.000
	30	58.90 ^{ns}	59.41 ^{ns}	58.70 ^{ns}	59.20 ^{ns}	59.68 ^{ns}	0.199	0.566
a*	1	6.17 ^b	9.56 ^a	5.76 ^c	5.80 ^c	5.27 ^d	0.289	0.000
	30	9.06 ^b	9.64 ^a	7.83 ^c	7.96 ^c	7.10 ^d	0.176	0.000
b*	1	15.58 ^a	12.83 ^b	15.61 ^a	15.85 ^a	15.84 ^a	0.218	0.000
	30	12.85 ^b	13.09 ^b	14.14 ^a	14.35 ^a	14.26 ^a	0.130	0.000

a–d Mean values in the same row with different letters indicate significant difference ($p < 0.05$) while ^{ns} mean within the same row aren't significantly different ($p > 0.05$); SEM: standard error of the mean. *p-value*: significance $p < 0.05$. Treatments: CON: Control (without antioxidant); ERY: sausage with at 0.05% erythorbate; T1: sausage with OPN at 0.05%; T2: sausage with ROS at 0.05%; T3: sausage with GT at 0.05%.

IV. CONCLUSION

Lyophilized OPN leaves have demonstrated potent antioxidant effects comparable to sodium erythorbate, establishing them as a promising natural food additive for use as a preservative in meat products. Furthermore, exploring their potential applications in developing new products is imperative.

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