ANTIOXIDANT ACTIVITY OF YERBA MATE (Ilex paraguariensis) EXTRACT IN LOW COST SAUSAGE

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I. INTRODUCTION

The food business is investing a lot of money in ingredient development research as a result of consumer demand for healthier options. The current study evaluated the use of free and microencapsulated yerba mate extract in low cost sausage, emphasizing the preservation of the extract's physical and antioxidant properties during storage at 5 °C. The study's findings demonstrate the potential of yerba mate extract as a useful ingredient for sausages, providing advantages in terms of the food's physical stability, antioxidant capacity, and antibacterial activity during storage.

II. MATERIALS AND METHODS

Low-cost sausage manufacture: 60% mechanically deboned chicken meat, 10.46% pork meat, 10% crushed ice, 2% isolated soy protein, 1.6% salt, 0.25% cured salt (94% salt and 6% sodium nitrate), 0.3% sodium tripolyphosphate, 0.09% sodium erythorbate, 0.8% spices and 2.0 manioc starch made up the formulation of the control low-cost sausage (10 kg each bath).

The three formulations with yerba mate free extract (0.1%), microencapsulated extract (1%) and control without yerbs mate are processed. The sausages were made in accordance with industry standards at Meat Technology Center of the Institute of Food Technology's. The emulsion was stuffed in 22mm celullosic casing and cooked to an internal temperature of 72ºC. Cooking loss was determined (HAYES, 2011).The sausages were kept at 5ºC during storage. The following physical-chemical parameters were asessed at 1 and 45 days of storage: water activity (Aw), chemicals reactive substance to thiobarbituric acid - Tbars (KONIECKO, 1985), objective color (KONICA MINOLTA, 2007), phenolic compounds (ERKAN-KOÇ et al., 2015), and antioxidant activity (JIMÉNEZ-ZAMORA et al.,2016). Data were submitted analysis of variance (ANOVA) and Tukey's Test in order to identify differences ($p<0.05$) between pairs of means with Statistic 7 (Stasoft v.7).

III. RESULTS AND DISCUSSION

The control sample in the low-cost sausage lost 7.72% (0.01) of its weight during cooking; the sample containing free yerba mate extract showed a percentage of 5.39% (0.01), which is a 30% decrease in cooking weight loss compared to the control sample; and the sample containing microencapsulated yerba mate extract showed a percentage of 6.82%.

The free extract sample exhibited a rise in TBARS-reactive chemicals over the course of the days, indicating that the free extract may not have been added in a way that would have prevented lipid oxidation during storage. It is important to assess whether the results were affected by other parameters, such as the extract's stability and the high initial oxidation load of the mechanically deboned poultry meat, or whether the concentration of free extract was sufficient.

It was observed that, in the case of sausages containing microencapsulated extract, microencapsulation might not have offered sufficient defense against lipid oxidation. In low-cost sausages, the inclusion of free or microencapsulated extract did not fully prevent lipid oxidation as compared to the control.

The a* and b* color components increased in control, microencapsulated extract, and free extract samples from day 1 to day 45. (Table 1). Compared to the other samples, the control sample had a higher concentration of phenolic chemicals. Consequently, it is evident how sensitive these compounds are to the usage of a raw material with a high initial oxidation concentration. The free yerba mate extract was shown to be susceptible to the initial oxidation load, as indicated by the antioxidant activity measured by the DPPH and ABTS method (Table 1), however, it was able to maintain or even increase its antioxidant value during the sausage's oxidation process.

Table 1 – Chemical and physical parameters means for low cost sausage containing yerba mate free extract and microencapsulated extract between 1 and 45 days.

Parameters	Dia 01			Dia 45		
	Control	Free extract	Microencapsulated extracted	Control	Free extract	Microencapsulated extracted
Analysis						
Aw[3]	0.966^{a}(0.002)	0.967^{a}(0.000)	0.969^{a}(0.001)	0.960^{b}(0.001)	0.962^{b}(0.002)	0.960^{b}(0.002)
L*[9]	63.52^{a}(0.58)	63.43^{a}(0.70)	64.04^{a}(1.02)	64.11^{a}(0.36)	64.32^{a}(0.54)	65.52^{b}(0.76)
a*[9]	11.81^{a}(0.18)	11.82^{a}(0.45)	10.95^{b}(0.35)	12.30^{a}(0.28)	12.14^{a}(0.30)	11.23^{b}(0.39)
b*[9]	13.96^{a}(0.33)	13.98^{a}(0.36)	14.01^{a}(0.35)	15.08^{b}(0.12)	15.33^{b}(0.26)	15.45^{b}(0.22)
Phenolic compounds (mg EAG/100g)[3]	52.54^{b}(0.55)	48.61^{a}(1.19)	49.53^{bc}(0.14)	51.49^{bc}(0.29)	49.82^{bc}(1.42)	48.61^{c}(1.27)
Antioxidant activity ABTS (µmol TE/g b.u)[3]	3.64^{ab}(0.006)	3.14^{d}(0.013)	3.77^{a}(0.006)	3.49b^{c}(0.010)	3.34^{cd}(0.001)	3.22^{cd}(0.008)
Antioxidant activity DPPH (µmol TE/g b.u)[3]	2.35^{a}(0.004)	1.70^{bc}(0.018)	2.47^{a}(0.008)	1.96^{b}(0.013)	1.79^{bc}(0.016)	1.65^{c}(0.004)
TBARs (mg/kg)[3]	5.53^{a}(0,09)	2.24^{c}(0.02)	3.97^{b}(0.10)	5.04^{a}(0.03)	5.14^{a}(0.03)	5.08^{a}(0.02)

^{abc} Mean values in a row treatment followed by different letter are significantly different ($p<0.05$) from each other
( ) Standard deviation Number of replicates ^{3}N=3; ^{9}N=9

IV. CONCLUSION

The use of both free and microencapsulated yerba mate extract showed promise as a natural antioxidant in inexpensive sausages. Notably, using the microencapsulated extract offered additional benefits, particularly for inexpensive sausages. Thus, the findings of this study demonstrate the potential of yerba mate extract as a natural preservative for sausages. Regarding antibacterial and antioxidant properties, yerba mate is a promising ingredient to improve the stability of emulsified sausages.

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