NATURAL ANTIOXIDANTS FOR MECHANICALLY DEBONED CHICKEN MEAT

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Background

A major cause of meat product deterioration is oxidative rancidity. Oxidation of lipids in meat and meat products is responsible for changes in its nutritional quality – loss of vitamins and essential aminoacids – colour, flavour, odour and texture (Aguirrezábal et al., 2000). Due to the low costs, the Brazilian meat industry, greatly use the mechanically deboned chicken meat (MDCM) in the meat products, mainly in the Bologna, Frankfurter sausages and other sausage type. The chicken meat presents relatively high levels of acid unsaturated fat acids and low concentrations of natural antioxidants (tocopherols), becoming very unstable for the lipid oxidation. The studies involving the MDCM stability are very important, because the MDCM characteristics are transmitted to the meat products. Various synthetic antioxidants have been utilized to retard the development of rancidity in meat products, and thus extend their shelf-life, such as BHT, BHA, and propyl gallate. However, questions regarding the safety of synthetic antioxidants together with consumer's preference have led to increased interest and research on natural antioxidants. It has been demonstrated many times that spices inhibit rancidity, often showing synergism (Madsen & Bertelsen, 1995). With the modern preservation techniques, the research on the effect of plants extract as an antimicrobial and antioxidant activity had been sporadic. However, it is possible to observe that there is an increased interest on the antimicrobial and antioxidant activity by several plant composition in the nature (CERDEIRAS et al., 2001; CHEAH and GAN, 2000; CUTTER,2000; SHAHIDI et al. ,1992; ECONOMOU et al., 1991; BEUCHAT and GOLDEN, 1989; LARSON, 1988).

Objectives

The objective of this work was to evaluate the antioxidant activity of the ethanolic and methanollic extracts of green tea, black tea (*Camellia sinensis*) and "mate" (*Ilex paraguariensis*) when incorporated mechanically into the mecanically deboned chicken meat (MDCM).

Methods

The extracts were prepared using a 8:2 liquid:solid relationship. To obtain the ethanolic extract, a mixture of ethanol 96°GL and distilled water (8:2); for the methanollic extract a mixture of methanol and distilled water (8:2) was used. The solvent was concentrated under reduced pressure, obtaining the crude aqueous extract. Paralleled samples treated with rosemary spice (*Rosmarinus officinalis* L.) (0,10%) and samples non-treated with extracts were kept as controls. The green tea, black tea and "mate" extracts (1% of each) were homogenized in the MDCM (3Kg each) and divided into small portions which were packed into polyethylene bags. Rosemary extract was obtained from Christian Hansen. Half of the control and treated samples were stored at +5°C and the other half at -25°C. Every three days and monthly the refrigerated and frozen samples were taken for 2-thiobarbituric acid-reactive substances (TBARS) assay as a measure of lipid oxidation (TARLADGIS et al, 1960). Results of TBA were calculated as mg malonaldehyde per Kg MDCM. Statistical analyses involved used of the statistical Analysis Systems (SAS, 1989) Software package. Analyses of variance were performed by ANOVA procedures. Significant differences between means were determined by Duncan´s Multiple Range tests.

Results and Discussion

It can be observed in Table 1 that the refrigerated and frozen control samples showed an increase in the TBARS values during the storage period. However, all the extracts provided protection against the MDCM lipid oxidation, where the TBARS values followed the values obtained for rosemary samples. The methanollic extracts showed to be more effective as antioxidants when compared to their respective ethanolic extracts. The difference on the antioxidant effect of the extracts probably is related to the phenol composition extracted by different solvents. SHAHIDI et al. (1992) obtained better results on inhibiting the lipid oxidation in meat system models using methanollic extracts than with water, ethanol and ethyl acetate.

Table 1. Antioxidant activity of green tea, mate, black tea and rosemary extracts (methanol –M- and ethanol – E) on refrigerated and frozen mecanically deboned chicken meat (MDCM). Results are expressed as mg malonaldehyde per Kg MDCM

	Refrigerated MDCM (days)			Frozen MDCM (months)				
	1	2	3	0	1	2	3	4
Control	$0,31^{d}$	$0,65^{a}$	$1,29^{a}$	$0,31^{d}$	$9,15^{a}$	$10,44^{a}$	$14,88^{b}$	$14,27^{b}$
Green tea (M)	$0,41^{d}$	$0,65^{a}$	$0,03^{c}$	$0,41^{d}$	$0,30^{b}$	$0,13^{e}$	$0,72^{f}$	$7,03^{e}$
Green tea (E)	$1,01^{b}$	$0,67^{a}$	$0,09^{bc}$	$1,01^{b}$	$0,66^{b}$	$0,53^{d}$	$9,23^{c}$	$12,69^{c}$
Mate (M)	$0,41^{d}$	$0,49^{b}$	$0,26^{bc}$	$0,41^{d}$	$0,42^{b}$	$0,65^{d}$	$6,54^{d}$	$12,95^{c}$
Mate (E)	$0,61^{c}$	$0,35^{c}$	$0,30^{b}$	$0,61^{c}$	$1,10^{b}$	$7,67^{b}$	$15,28^{ab}$	$15,6^{a}$
Black tea (M)	$1,13^{ab}$	$0,41b^{c}$	$0,35^{b}$	$1,13^{ab}$	$2,64^{b}$	$1,82^{c}$	$5,09^{e}$	$9,38^{d}$
Black tea (E)	$0,44^{d}$	$0,74^{a}$	$0,36^{b}$	$0,44^{d}$	$0,72^{b}$	$7,45^{b}$	$15,6^{a}$	$15,6^{a}$
Rosemary	$1,23^{a}$	$0,51^{b}$	$0,19^{bc}$	$1,23^{a}$	$0,42^{b}$	$0,63^{d}$	$0,78^{f}$	$1,63^{f}$

Mean scores in the same column which are not followed by the same letter are significantly different (P< 0,05).

In our study, some samples were also kept under freezing to evaluate the oxidative alterations for a longer time period, since the refrigerated temperature doesn't avoid the microbial and protein deterioration, which determined the analyses interruption. The "mate" extracts inhibited the lipid oxidation of frozen MDCM, being the methanollic extract efficient by two months and the ethanolic extract for only a month (Table 1). According to the literature, the "mate" have phenollic compounds (MUCCILLO BAISCH et al. ,1999; GUGLIUCCI and STAHL, 1995) that probably are the responsible for the antioxidant action of these extracts. Experiments done by SCHINELLA et al. (2000) confirmed the antioxidant properties of "mate" water extracts in the lipid peroxidation inhibition in rat liver microsomes. The methanollic extract of green

tea added to the MDCM frozen samples presented a closer TBA index to that obtained when rosemary extract, used as a reference in this experiment. The incorporation of the methanollic green tea extract into the MDCM showed a greater antioxidant effect than the other tested extracts.

Conclusions

All the tested extracts showed an antioxidant activity on MDCM, but the green tea extract presented a powerful antioxidant action than the other tested extracts.

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