

# Quality of blended hamburger with rosemary as a substitute for synthetic antioxidant: physicochemical characterization

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**Objective:** To elaborate a blended hamburger with rosemary as a substitute for synthetic antioxidants and to evaluate the physico-chemical characteristics such as oxidation by the TBARS method, color parameters L\*, a\* and b\* (CIELab system) and pH of the hamburgers under storage for 30, 45, 60, 90 and 120 days. Natural products are a trend in the consumer market considering the presence of bioactive compounds with recognized antioxidant activity such as polyphenols and tocopherols. Rosemary is widely used in the elaboration of meat products, it has a characteristic and pleasant flavor, and recently it has been sought to incorporate aromatic herbs mainly to improve healthiness. Synthetic additives, such as sodium erythorbate and BHT, have caused controversy about the long term safety in consumption, with prohibition in some countries of the inclusion of these additives for consumption. Considering the characteristics of rosemary, it is possible that the addition of the aromatic herb in different presentations (fresh herb, dried herb, essential oil and in different combinations) can substitute the synthetic additive.

**Materials and Methods:** The burgers were prepared in a meat products industry using beef cutlets and chicken breast fillets. The experiment was developed in an entirely randomized design considering as treatment the replacement (m/m) of the synthetic antioxidant BHT and sodium erythorbate by rosemary as follows: T1 (dried herb 0.1%), T2 (fresh herb 0.1%), T3 (oil 0.1%), T4 (dried herb 0.05% and oil 0.05%), T5 (BHT 0.01%), T6 (sodium erythorbate 0.1%) and T7 (without antioxidant). To evaluate the antioxidant activity of the essential oil and the hydroalcoholic extract of the aromatic herb, the DPPH method was employed. The quality of the hamburger was evaluated from the physical-chemical parameters of oxidation by the TBARS method, color parameters L\*, a\* and b\* (CIELab system) and pH of the hamburgers under storage for 30, 45, 60, 90 and 120 days. The characterization of the major components of the essential oil was analyzed by gas chromatography coupled to a mass spectrometer and complemented with analysis by Raman spectroscopy. All the values obtained from the physical-chemical analyses were root transformed (X+1) and submitted to analysis of variance (ANOVA) for each storage time and later submitted to the Lilliefors normality test. The means were compared by Skott Knott's test (p<0.05) when significant by the F test of ANOVA using the Assstat 7.7 program.

**Results and Discussion:** The compounds camphor, eucalyptol (1,8-cineole) and  $\alpha$ -pinene were the majority in the essential oil identified by GC/MS and RAMAN spectroscopy. In the analysis of total antioxidant activity (DPPH), the essential oil showed lower activity (38%) than the hydroalcoholic extract (93.8%), both for concentrations of 100  $\mu$ g/mL. At 30 days of storage, there was no difference in luminosity between treatments (p>0.05), indicating that the addition of the aromatic herb as well as the synthetic antioxidants did not influence this parameter. There was no difference between the parameters C\* (color saturation) and hue (hue index) at 60 days. The quantification of the malonic dialdehyde content (mg of MDA/kg of sample) indicated that the treatments that used fresh or dried aromatic herb (T1, T2, T4) presented lower values (p<0.05) of the compounds from the oxidation, being statistically equal to the treatment with sodium erythorbate (T6). The presence of phenolic compounds in the aromatic herb corroborated the decrease in the release of compounds from oxidation. The values demonstrate that the substitution of the synthetic antioxidant maintained the quality of the hamburger stored for up to 60 days. At 90 days of storage, treatment T6 (0.1% sodium erythorbate) showed the highest pH value, and there was no difference in oxidation between the treatments in this storage period. Lucke (2000), the pH elevation is due to the presence of basic compounds resulting from the decarboxylation and deamination reactions of some amino acids by the enzymes present in the meat. Furthermore, an increase in pH is associated with the degradation of proteins and amino acids by gram-negative bacteria (Verma & Sahoo, 2000). According to the results, the lowest pH value (6.27) was observed in the treatment with the addition of 0.05% dried grass and 0.05% essential oil (T4) at 45 days of storage. The presence of the essential oil alone did not prevent the oxidation of the meat product.

**Conclusion:** The addition of rosemary in the meat product, both in the form of fresh herb and dried herb, in the presented level replaces the antioxidant sodium erythorbate, thus contributing to the provision of a product free of synthetic additive.

## References:

- Lucke, F.K. (2000). Utilization of microbes to process and preserve meat. *Meat Science*, v.56, p.105-115.  
Verma, S.P., Sahoo, J. (2000). Improvement in the quality of ground chevon during refrigerated storage by tocopherol acetate pre-blending. *Meat Science*, v. 56, p. 403-413.

**Key words:** Rosmarinus officinalis L. syn. Salvia rosmarinus Spenn, Oxidation, Shelf life, Essential oil, Hydroalcoholic extract

