EFFECT OF THE ADDITION OF *BROSIMUM GAUDICHAUDII* AND *PYROSTEGIA VENUSTA* HYDROALCOHOLIC EXTRACTS ON THE OXIDATIVE STABILITY OF BEEF BURGERS

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I. INTRODUCTION

Oxidation in meat products is caused by many types of oxidative agents in muscle tissue and is one of the main factors that affects the quality of meat products. Synthetic antioxidants, such as butylhydroxytoluene (BHT), are commonly used by food industries to prevent oxidation in food. However, the use of these antioxidants has become controversial due to their potential adverse effects on health [1]. Natural compounds, especially those derived from plants, have been studied as alternative to synthetic antioxidants [2,3]. The aim of the present study was to evaluate the effect of the addition of hydroalcoholic extracts of *Pyrostegia venusta* (PV) and *Brosimum gaudichaudii* (BG) on the oxidative stability of beef burgers.

II. MATERIALS AND METHODS

Plant extracts. The plants were previously ground in mill coupled with a sieve of 12 mesh and were homogenized with hydroalcoholic solutions (50% BG) or (75% PV) in the proportion of 1:10 g/mL.
Preparation of beef burgers. Six batches of beef burgers were assigned to one of six treatments: Control (no added antioxidant), positive control with BHT (BHT, 100 ppm), positive control with sodium ascorbate (Asc, 200 ppm), *Brosimum gaudichaudii* hydroalcoholic extract 50% (BG, 1,000 ppm), *Pyrostegia venusta* hydroalcoholic extract 75% (PV, 10,000 ppm) and *Brosimum gaudichaudii* hydroalcoholic extract 50% + *Pyrostegia venusta* hydroalcoholic extract 75% (BG+PV, 400: 4,000 ppm).
Physicochemical analyses. The analyses were performed at 0, 3, 7 and 10 days of storage at 4 ºC. Lipid oxidation was determined using the TBARS method. The instrumental color coordinates (L, a*, b*, C*, h), the proportions of the myoglobin chemical forms and the pH of the burgers were also assessed. Proximate composition was determined at day 0 according with AOAC [4].
Statistical analysis. Storage time (SA) and type of antioxidant (A) were analyzed as fixed effects using the General Linear Model, as well as their interaction. In cases where the interaction between storage time and type of antioxidants was not significant ($P>0.05$), interaction was removed from the model and the main effects of SA and A were analyzed. The means were compared by Tukey's test ($P<0.05$). Results of proximate composition were analyzed by One-way ANOVA and Tukey´s test ($P<0.05$).

III. RESULTS AND DISCUSSION

The addition of plant extracts had no effect on the nutritional composition of beef burgers ($P>0.05$). Burgers added with BG extract showed higher inhibition of lipid oxidation compared to burgers with PV extract ($P=0.02$) and similar TBARS values than burgers with the commercial antioxidant Asc ($P=0.32$) and BHT ($P=0.23$) at 10 days of storage. According with Feiner [5], rancidity starts at 0.4 to 0.6 mg of malondialdehyde/kg. Thus, only the BG burgers were not at an initial rancidity state (0.32 mg malondialdehyde/kg at day 3). Despite of TBARS values, all treatments showed values lower than the threshold for off flavor perception by sensory analysis (1.0 mg malondialdehyde/ kg) [6], and for causing alarm for the human health (1.59 mg malondialdehyde/kg) [7]. BG burgers showed pH values (6.04) similar than BHT and Asc burgers (6.06 and 6.04, respectively) at 10 days of storage. Burgers of all treatments showed pH values within the limit stablished for consumption by the Brazilian legislation (≤ 6.4) [8]. BG burgers showed similar values of color coordinates (a*, b*, C* and h) than burgers added with commercial antioxidants (Asc and BHT) ($P>0.05$), indicating similar capacity to maintain the typical red color of beef

burgers. The color of raw meat is determined mainly by the predominant form of myoglobin, which can vary from purplish-red due to the presence of deoxymyoglobin (DMb), bright cherry-red due to oxymyoglobin (OMb) or brown due to metmyoglobin (MMb) formation [9]. BG burgers showed similar proportion of OMb than burgers added with the commercial antioxidants Asc (*P*=0.99) and BHT (*P*=0.97) at 10 days of storage and higher proportion than PV (*P*=0.00) and PV + BG burgers (*P*= 0.01). MMb proportion in BG burgers was also similar than in BHT and Asc burgers and lower than PV burgers (PV or PV + BG) (Figure 1).

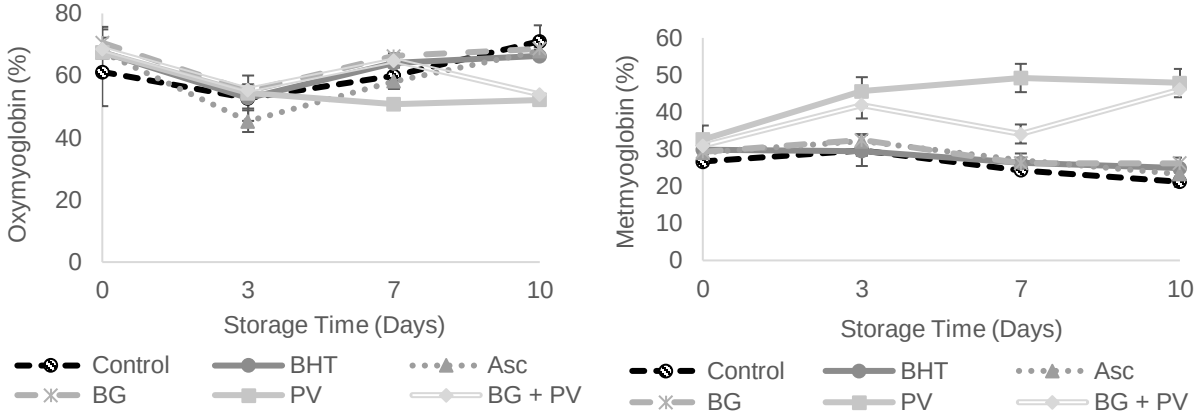

Figure 1. Proportion (%) of oxymyoglobin (OMb) and metmyoglobin (MMb) in beef burgers with different antioxidants. Control, BHT (100 ppm), Asc (200 ppm), BG (1,000 ppm), PV (10,000 ppm) and BG+PV (400:4,000 ppm). Bars represent standard errors.

IV. CONCLUSION

The addition of hydroalcoholic extract (50%) of *B. gaudichaudii* in beef burgers maintained the color stability and inhibited the lipid oxidation, with similar efficiency as the synthetic antioxidants (Asc and BHT). Thus, this plant extract has potential to be use as natural antioxidant against oxidative reactions in beef burgers. The promising results indicate the need for further studies to evaluate the sensory acceptance of the burgers added with *B. gaudichaudii* extract.

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