Partial replacement of animal fat in pork burgers with vegetable oil premix: physicochemical characterization and fatty acid profile

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Objective: To evaluate physicochemical characteristics such as the formation of secondary compounds from oxidation, water activity, total titratable acidity, pH, cooking loss, percentage of shrinkage, shear force, color parameters, carotene content (α and β) during 90 days of storage. Meat products have good acceptability among consumers due to the convenience and the sensory properties of texture and juiciness promoted mainly by additives and animal fat used in the formulation. However, the addition of chemical additives and animal fat compromises the healthiness demonstrated by studies associated with cardiovascular problems. For the meat products industry, the reduction and/or substitution of animal fat presents technological difficulties, since reformulations can improve the fatty acid profile, but affect the cohesion between the components of the mixture. Vegetable oils have bioactive com- pounds such as carotenoids and unsaturated fatty acids that can improve the intake of essential fatty acids in the diet as well as the ratio between these fatty acids. The inclusion of a premix developed with vegetable oils overcomes the problem of replacing animal fat with vegetable oil, collaborating with the cohesion of the elements necessary to maintain the structure of the meat product during cooking.

Materials and Methods: The experiment was developed in a completely randomized design considering the level of buriti oil in the premix as a treatment. The premix was prepared with pork shoulder muscle and skin, cold water, and soy protein isolate. Pork (shoulder muscle) and fat were comminuted in an electric meat grinder with an 8 mm disc, and spices were used to prepare the hamburger. The premix was added to the meat mass according to treatment; thus, each treatment was established as follows: ham- burger without buriti oil in the premix ($T_{0\%}$); 0.86% buriti oil in the hamburger mass ($T_{0.86\%}$); 1.73% buriti oil in the hamburger mass ($T_{1.73\%}$); and 2.60% buriti oil in the hamburger mass ($T_{2.60\%}$). The physical-chemical characteristics of the meat product were evaluated through the parameters of malonic dialdehyde content (mg of MDA/kg of sample) by the TBARS method, water activity, total titratable acidity pH, cooking loss (CL), percentage of shrinkage (%E), shear force (CF), color parameters (CIELab system) in the L*, a* and b*, β-carotene/linolenic acid system and carotene content (α and β) over 90 days. The quality index, cholesterol con- tent and fatty acid profile were analyzed at 90 days. Normal variables were subjected to ANOVA and Scott Knott test ($p<0.05$), and the others were analyzed by Kruskal Wallis test ($p<0.05$). Carotenoids, pH, titratable acidity, oxidation, L*, a*, b*, C, h* and aw variables were submitted to principal component analysis (PCA) after clustering using a cluster dendrogram.

Results and Discussion: At 90 days, the $T_{2.60\%}$ treatment showed a higher concentration of compounds (0.90 mg MDA.kg-1) from oxidation ($p<0.05$). Free fatty acids from oil extraction and from enzymatic or chemical reactions contributed to the release of these prooxidant compounds (Frega et al., 1999). According to Selani et al. (2016) and Kumar (2019), the increase in TBARS values may also be related to the composition of vegetable oils. Unsaturated fatty acids make them more susceptible to lipid oxidation. The burgers with higher concentrations of buriti oil showed higher values of a* and b*, lower PPC compared to the treatment with- out added oil ($p<0.05$). However, there was no change in %E or shear force ($p>0.05$). At 90 days, the saturated fatty acid content decreased, while the monounsaturated fatty acid content increased ($p<0.05$). The replacement of animal fat by buriti oil lowered cooking loss (CL) but did not inhibit oxidation. The treatment without addition of buriti oil ($T_{0\%}$) showed a / ratio of 23.82 when compared to $T_{1.76\%}$ (18.27; $p<0.05$). However, the replacement reduced the / ratio, improving the lipid profile in comparison with the treatment that did not receive buriti oil, even though it is not an ideal value (ratio<4). The variables of color parameters b* and C* showed a positive correlation, indicating that the addition of buriti oil positively influenced these parameters.

Conclusion: The partial replacement of animal fat by buriti oil maintained the technological quality without affecting the reduction of diameter and shear force, improving the color intensity and fatty acid profile as well as in the reduction of saturated fatty acids.

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Key words: Mauritia flexuosa L., Oxidation, Shelf life, Meat product, Fatty acid profile