



DEVELOPMENT, PHYSICOCHEMICAL CHARACTERIZATION, AND MICROBIOLOGICAL SAFETY OF MEIA CURA CHEESE MADE FROM A2A2 MILK WITH AMBARELLA (*Spondias dulcis*) JAM

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ABSTRACT

The dairy market is experiencing a growing demand for innovation, healthier products, and regional valorization. A2 milk emerges as a high-digestibility alternative because it does not release the BCM-7 peptide, which is responsible for gastrointestinal discomfort. Combining this trend with economic relevance, traditional Meia Cura cheese, with its smooth texture and mild flavor, shows great potential for developing differentiated functional derivatives. One way to add value is by incorporating Cerrado fruits, renowned for their bioactive compounds and sustainable appeal. This study aimed to develop, characterize the physicochemical pattern, and evaluate the safety of Meia Cura cheese made from A2A2 milk and topped with ambarella (*Spondias dulcis*) jam. Two distinct batches of cheese were manufactured at different periods, both featuring the addition of ambarella jam. The ambarella jam was produced using 60% pulp and 40% sugar under direct heating and constant manual stirring until reaching 65 °Brix via refractometry. The ambarella jam was applied as a top layer to the final cheese presentation. Physicochemical assays were performed in triplicate to determine the proximate composition (protein, fat, lactose, moisture, and ash content), alongside microbiological evaluations, both complying with Ministry of Agriculture, Livestock and Food Supply regulations. Data were analyzed using ANOVA, and means were compared by Tukey's test at a 5% significance level. The cheese exhibited a closed, smooth texture without gas holes, a thin rind, uniform creamy-white coloring, and mild acidity, meeting the technological identity requirements of Meia Cura cheese. The cheeses showed a mean acidity of 25 °Dornic and a pH of 5.2, aligning with literature benchmarks for low-acidity, closed-texture cheeses. Regarding proximate composition, no statistically significant differences were observed across all parameters ($p > 0.05$), with a mean fat-in-dry-matter (FDM) content of 40.62%. According to legislation, this value classifies the product as a semi-fat cheese. The mean moisture content was 52.08%, whereas traditional Meia Cura cheese typically falls within the medium-moisture range. The higher moisture value indicates increased water retention, primarily driven by the addition of the Cerrado fruit ambarella jam. Added fruit pulps enhance the system's hydration capacity and hygroscopicity, raising the final moisture content. Protein content averaged 20.98%. Although legislation does not stipulate specific protein standards, this outcome falls within literature records, which indicate variations from 10% to 30% for this dairy matrix. Water retention and sugar incorporation from the Cerrado ambarella jam promoted a proportional dilution effect on total solids in the cheese mass. Notably, the use of A2A2 milk ensured the preservation of the high protein nutritional value characteristic of dairy products. Microbiological safety analyses

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revealed the absence of *Salmonella* and *E. coli*, total coliforms at 2.9×10^3 CFU/g, and *Staphylococcus* spp. at 4.1×10^2 CFU/g, all within legal limits. In conclusion, the cheese production with ambarella jam met microbiological safety standards. In the physicochemical characterization, the moisture exceeded the traditional category threshold, a fact directly attributed to the presence of the ambarella jam.

Keywords: Cerrado bioma fruits, Dairy innovation, Functional food.