Smart packaging film based on cassava starch and blueberry fermentation waste flour

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Resumo

Traditional packaging facilitates the transportation, distribution, and storage of food; however, it is inadequate for controlling microbial deterioration and ensuring food safety. In recent years, new technologies have been developed in the field of packaging, notably including smart packaging equipped with pH-sensitive pigments that provide information about the condition of the food. The residue from blueberry fermentation is rich in anthocyanins, antioxidants, and phenols. The aim of this study was to utilize this residue for the production of smart packaging based on cassava starch (*Manihot esculenta Crantz*), flour and blueberry must extract (*Vaccinium corymbosum*) obtained during the fermentation stage of wine production. The antioxidants, total phenols, and total anthocyanins in the blueberry residue flour were characterized. The films were produced using the casting method, with 3% starch and 0%, 5%, 10%, and 15% blueberry must flour (BMF), as well as 10% blueberry must flour extract (BME). The functional, active, and mechanical properties of the films were characterized. The data were analyzed using ANOVA and Tukey's test with a significance level of 5%. The blueberry flour has a high content of antioxidants, phenols, and anthocyanins. All films with BMF and BME exhibit a purple coloration and are more opaque than the starch film. The film with BME was more effectively incorporated into the starch polymer matrix, increasing the tensile strength (from 5.64 MPa to 10.41 MPa) and elongation (from 3.68% to 12.55%) of the starch film. Thermogravimetric analysis (TGA) shows that the incorporation of BMF and BME enhances thermal stability, especially at high temperatures. Additionally, the addition of this residue significantly increased the phenolic and antioxidant compounds in the films. The films with BMF and BME were immersed in buffer solutions, and visual color changes were observed as a function of pH, showing a reddish color at acidic pH and a greenish color at basic pH. We conclude that the better film formulation was cassava starch with 10% blueberry must flour extract, as it improved the mechanical properties of the starch film and demonstrated potential as a pH indicator for smart packaging.

Palavras chaves:

Informe de 4 a 8 palavras chaves, por exemplo:

Smart packaging; blueberry must; cassava starch; antioxidants.

Área temática:

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Preferência de apresentação:

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