BIODEGRADABLE FILM BASED ON AGROINDUSTRIAL WASTE

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ABSTRACT

In recent years, the synthesis of bioplastics has been the target of several research into new alternatives to replace conventional polymers of fossil origin. Bioplastics can be obtained from many sources, mainly from residues from agro-industrial processes. In this context, this study aimed to develop film formulations using avocado seed starch and chitosan, with and without the addition of Jatobá fruit seed extract. The films were prepared using a conventional *"casting"* technique and the moisture content, water solubility, water vapor permeability, thickness and opacity were determined. It was possible to conclude that the films showed promising potential to be used as biodegradable packaging for food.

Keywords: Biopolymers. Avocate. Bioplastics.

1 INTRODUCTION

Currently, agroindustry is one of the industrial branches that produces the most waste from the processing of fruit and animal products, resulting in economic losses related to the costs of managing this waste, as well as environmental damage caused by the inadequate disposal of these materials [1]. With the aim of promoting sustainable development, researches fronts have been performed to discover for new alternatives to use residues such as in the preparation of bioplastics, with different applications in most varied fields of Industry [2]. Bioplastics are polymers that can be easily degraded not only by naturally present microorganisms and, therefore, are an excellent alternative to reduce the use of polymers obtained from fossil, polluting and non-renewable sources [3]. In this context, the objective of this work was to develop and characterize bioplastics containing avocado seed starch, chitosan and Jatobá fruit seed extract *(Hymenaea courbaril*, L.).

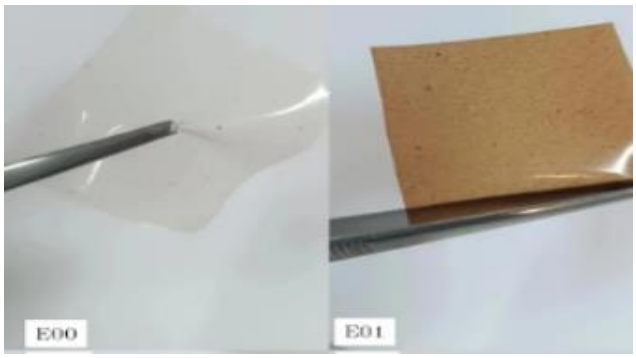
2 MATERIAL & METHODS

Bioplastics were prepared using a casting methodology [4] from a film-forming solution with of starch from avocado seeds, chitosan, glycerol dissolved in a 1% aqueous solution of acetic acid and Jatobá fruit seed 80% ethanol extract (formulation under patent secrecy). It was prepared films with (Film E01) and without extract (Film E00). The mixture was heated under stirring for 10 min and placed in petri dishes. The plates were maintained at 37 ºC for 72 h. After drying, the films were characterized for humidity [5], water solubility [6], thickness, opacity and permeability to water vapor. The means of the results obtained were subjected to analysis of variance and compared with each other using the Tukey Test ($p \leq 0.05$) using the Statistica Software.

3 RESULTS & DISCUSSION

The films showed a translucent appearance and malleability (Figure 1). The films showed significant differences between them ($p \leq 0.05$) in relation to physicochemical properties, except to thickness. A decreased moisture content, solubility and permeability to water vapor were observed in the film with extract, possibly due to the reduction in the hydrophilic character of the film caused by the interaction of the phenolic compounds present in the extract with the polymeric matrix that formed the film [7, 8, 9]. Reduced values of these parameters in bioplastics is beneficial, since food packaging must be able to protect food from moisture and gas exchange, factors that contribute to food spoilage, especially dry foods [10]. The increased opacity in film E01 was due to the dark color of the extract. Similarly, increased opacity was also observed in the chitosan films added with pomegranate peel extract films [11]. Translucent packaging allows more light to pass through to the food, which leads to oxidative deterioration. In this way, darker packaging also helps to preserve food.

Figure 1 Films obtained from avocado seed starch and chitosan with (E01) and without (E00) extract



Source: the authors (2024).

Table 1 Physicochemical characterization of films.

Film	Moisture (%)	Water solubility (%)	Thickness (mm)	WVP (g/mm² Pa s)	Opacity (%)
E00	21.23 ± 0.164 [a]	43.62 ± 0.049 [a]	0.003 ± 0.00 [a]	5.01 x 10^{-9} [a]	47.660 ± 0.029 [b]
E01	16.22 ± 0.157 [b]	37.43 ± 0.172 [b]	0.003 ± 0.00 [a]	2.47 x 10^{-9} [b]	70.880 ± 0.035 [a]

E00 - control film (without extract); E01 - film incorporated with 5% (v/v) jatobá seed extract. Mean ± Standard Deviation. Equal lowercase letters in the same column indicate no significant difference between the films ($p \leq 0.05$) by Tukey's Test.

4 CONCLUSION

Films based on chitosan and avocado seed starch incorporated with Jatobá seed extract showed good physicochemical properties to be used in future studies as packaging food.

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