

147^a DEFESA DE TESE EM ENGENHARIA INDUSTRIAL

PROGRAMA DE PÓS-GRADUAÇÃO EM ENGENHARIA INDUSTRIAL - PEI



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Título: PRODUCTION OF FILM WITH ACTIVE PROPERTIES FROM STARCH EXTRACTED FROM AVOCADO SEEDS (*Persea americana* mill) AS A RENEWABLE ALTERNATIVE.

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Resumo:

Packaging plays a fundamental role in the food industry due to its application in food preservation, quality and safety. In view of this, new technologies are being studied as sustainable alternatives to conventional packaging, taking into account the concern with disposal and the impacts they can cause to the environment. Given the need to apply environmentally sustainable actions, this work aims to extract, characterize and apply the starch present in avocado seeds (*Persea americana* mill) in the development of biodegradable film, with the addition of plasticizer and incorporation of avocado oil as an antimicrobial agent. This use also represents an opportunity for the processing of residue from the avocado processing industry, and the product developed can be used in the future for the development of extrusion films. The seeds were removed from the fruits and starch was extracted with a yield of 19.54%, presenting moisture content of 41.35%, ash content of 0.33%, titratable acidity of 4.64%, lipid content of 1.68%, protein content of 1.60% and carbohydrate content of 55.07%. The water activity was 0.986 g/g, the water absorption index was 0.333 g/g, the oil absorption capacity was 0.691 g/g and the water solubility was 0.888%. The transmittance was 14.30%. The most significant water release occurred in the third freezing cycle. The extracted starch presented a high amylose content (39.56%). Thermogravimetric analysis showed stability up to 366 °C, and the granule presented an oval shape and smooth surface. Regarding the pasting properties of the starches, the RVA presented an initial temperature of 88.5 °C and a viscosity of 2880.5 cP at the recoil. The results indicate that the starch extracted from avocado seeds offers opportunities for application in the preparation of edible and/or biodegradable films, since the amylose content, thermal stability and pasting properties are indicative of this applicability. The starch extracted from avocado seeds was used for the production of biodegradable films with subsequent incorporation of avocado essential oil to improve the antimicrobial properties of the film. The films were produced by casting, where the plasticizer concentration was fixed and the starch concentration was varied. The starch concentration statistically influenced the thickness and moisture values, but did not influence the opacity, solubility and permeability. The improvement in the mechanical properties could be observed due to the increase in the percentage values of stretch and modulus of elasticity. All concentrations showed good thermal stability. The formulation with 4 g/100 mL of starch was incorporated with 20% of avocado oil and, after characterization, no significant changes were observed in the film properties. The essential oil presented a minimum inhibitory concentration of 16%; in the halo test, it was possible to observe the growth of *Staphylococcus aureus*, while for *Escherichia coli* the result was negative. When incorporated into the film and the diffusion test was performed, there was no inhibition. This means that, both for the inhibition of *Staphylococcus aureus* and for use when incorporated into films, it is suggested to increase the concentration of the oil to be used. The proposal to use starch extracted from avocado seeds is promising. The results found, such as amylose content, yield, thermal analysis, permeability and mechanical tests, were satisfactory and are indicative for tests with incorporation into polymer blends by extrusion.

Palavras-chave: *Persea americana* mil. Biodegradable packaging. Starch. Sustainability.