Developing a Novel Biodegradable Plastic Film With Psidium guajava' Byproduct

Pereira da Silva, Juliana (School: EEMTI Marconi Coelho Reis)

The use and disposal of synthetic plastics is a relevant environmental problem. On the other hand, guava's pruning leaves byproduct also negatively affect nature when burned. Therefore, my goal was to investigate the guava byproduct reuse. Can it be used to synthesize a novel biodegradable polymer? First, I produced a Guava Leaves Byproduct Flour (GLBF). Then, I elaborated different filmogenic solutions by casting method with the GLBF. A 2 squared factorial design with response surface methodology was performed to evaluate the influence of GLBF (g) and starch (g) on the response variables. The following aspects were evaluated: Thickness, Water Vapor Permeability (WVP), Moisture, Solubility, Young's modulus, Elongation at break, Tensile strength, and Biodegradability. The results were subjected to an analysis of variance at 95% reliability and Principal Component Analysis (PCA). The statistical analyzes were significant on all parameters. The best polymer formulation according to the statistical analyzes presented Young's modulus of 106.65 MPa (± 0.02), Tensile Strength of 67.76 MPa (± 5.50), Solubility of 90.02% (± 0.02); Moisture of 16.00% (± 0.06), WVP of 6.62 g.mm/k.Pa.h.m² (± 0.00), Thickness of 0.29 mm (± 0.03) and Biodegradability of 99.10% (± 0.03). These results follow the American Society for Testing and Materials norms. I developed seedling packaging with my biopolymer that does not need to be removed at planting time. 0.19sqft of the product costs US$ 0.0076. This research proved the hypothesis was correct. This project has scientific and social relevance, being a sustainable alternative for the total or partial replacement of synthetic polymers in agricultural activities.

Awards Won: