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SUMMARY

The development of biodegradable active packaging materials is one of the challenges of society in order to solve the environmental problems associated with plastic waste and improving food preservation, lengthening its shelf life. This thesis focuses on the development of melted gelatine-starch films with good functional properties, providing bioactive characteristics by adding essential oils from barks of cinnamon, clove and oregano, with proven antimicrobial activity. Film microstructure, and physical properties (water vapour and oxygen permeability, optical -gloss and transparency-, and mechanical properties) of films of cassava starch or bovine gelatine, with 25 % glycerol, as well as blend films with starch:gelatin ratios of 50:50 and 75:25, have been characterized. These films were also prepared incorporating a lipid (mixture of mono and diglycerides of fatty acids: E-471) in polymer: lipid ratio of1:0.15. In the films, crystallinity was analysed, using X-ray diffraction, and phase transitions by differential scanning calorimetry. The different properties were analysed at 1 and 5 weeks of storage of the films conditioned at 25 °C and 53% of relative humidity. The addition of gelatine had a positive effect on the mechanical properties of cassava starch films, as they gained hardness and resistance to fracture and, for the 50:50 ratio, became more extensible. Polymers of starch and gelatine were not compatible and they presented phase separation, showing typical association areas of helical gelatine chains in an amorphous matrix, which glass transition temperature was within

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the range of the one found for starch by other authors. All aged films were harder and more resistant to fracture after five storage weeks, although, except formulation with 50% gelatine, they become less extensible. X-ray analysis revealed the presence of crystalline regions in the gelatine films which increased in size during this storage period.

The incorporation of the lipid to these films resulted in a reduction of water vapour permeability, but in an increase in oxygen permeability and brittleness, associated with the presence of a dispersed lipid phase, and a decrease of brightness. They also showed development of their properties during storage. The crystallization degree of the lipid in the films was very low due to the more complex composition in the matrix.

Adding essential oils to the blend 50:50 starch-gelatine matrix did not change the mechanical properties of these films and reduced their water vapour and oxygen permeability and brightness. Likewise, it gave them antimicrobial properties against molds like *Fusarium oxysporum*, and *Colletotrichium gloeosporoides*. *In vitro* tests showed growth inhibition of *Fusarium oxysporum*, especially with cinnamon oil and *Colletotrichium gloeosporoides*, especially with clove oil. The application of bioactive films, as coatings, in papaya fruit inoculated with the two molds reflected no antifungal effect, probably because of the drying method of the coating. Nevertheless, it limited moisture loss of the fruit during seven days storage without affecting the development of quality parameters.