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Development of novel food packaging film made up from chitosan, fish gelatin, and determination of its physical and biodegradable characteristics

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Waste accumulation is one of the burning problems faced by the fisheries industry in Sri Lanka. Fish head, skin, bones, viscera and fins like body parts directly go as waste in the fish market, harbors and retail outlets. Part of those wastes directly dumped into the sea leads to serious marine pollution. The rest is buried in the soil in haphazardous manner. This research was focused to develop a novel biodegradable film by means of fish waste based substances and explore possible value addition to overcome the waste problem faced by the fisheries industry in some extend.

Chitosan and fish gelatin are biopolymers which are extracted from marine food processing industrial waste. Chitosan 1%, Chitosan-fish gelatin 2:1, Chitosan-fish gelatin 1:1 films were prepared during the research period. Chitosan films had a slight yellow appearance which gets intense as the thickness of the films was increased. Mechanical characteristics; tensile strength and elongation at break of Chitosan 1%, Chitosan: Fish gelatin 2:1 and Chitosan: Fish gelatin 1:1 films were 36.6, 16.2, 31.0 Mpa and 25, 25 and 5% respectively. Accordingly, Chitosan 1% film exhibited the highest tensile strength. Tensile strength of the films increases with fish gelatin content. Nevertheless, it remains less than Chitosan 1% film. On the other hand, commercial cheese packaging film (reference film) displayed the least tensile strength of 5 MPa. Statistical evaluation of the films showed a relationship between mean tensile strength and fish gelatin content at 5% confidence level.

The results of biodegradation test revealed that Chitosan films visually remain unchanged for a period of about two weeks prior to initiation of biodegradation. In contrast, Chitosan film incorporated with fish gelatin exhibited faster degradation. The commercial cheese packaging film does not exhibit any visual biodegradation during the test period.

Upon optimization of the characteristics, this novel film can be developed to meet the requirements of a commercial packaging film without any burden to the environment at the end of its service life.

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