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SITTHIPHONG SORADECH : ENHANCEMENT OF MECHANICAL
PROPERTIES AND STABILITY OF SHELLAC BY FORMATION OF COMPOSITE
POLYMER WITH GELATIN. THESIS ADVISOR : ASSOC. PROF. MANEE LUANGTANA-
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The purpose of this study was to enhance the mechanical properties and stability of shellac by the formation of composite polymer with gelatin. The study of composite polymers based on shellac and various concentrations of gelatin was prepared in free film by casting method and also investigated for physicochemical properties such as acid value, insoluble solid, chemical structure, thermal analysis, powder X-ray diffraction, morphology, wettability, surface free energy, water content, water solubility, water uptake, moisture sorption isotherm, water vapor permeability and mechanical properties. The results demonstrated that the modification of shellac by the formation of composite polymer with gelatin could improve the strength and flexibility of shellac as the gelatin increased to 50%. Further study was to investigate the effect of gelatin content on stability of shellac. The stability studies of all film samples were performed at 40 °C and 75% RH in the stability chamber and investigated for the change in physicochemical properties upon storage for 180 days. The result showed that the modification of shellac by formation of composite polymer with gelatin at the high concentrations (30, 40 and 50%) could protect among carboxyl and hydroxyl groups of shellac, resulting in the increase in stability of shellac under the long period of storage for 180 days. However, the composite polymer with gelatin could not prolong the brittleness and fracture of shellac under the long period of storage. Therefore, the addition of plasticizer played an important role for improving the mechanical properties of composite polymer. Among concentrations of gelatin, 40% gelatin was the suitable concentration for further study. Two types of plasticizers i.e., polyethylene glycol 400 (PEG 400) and diethyl phthalate (DEP) at 5 and 10% w/w were chosen to study. The addition of both types and concentrations of plasticizers could improve the stability of composite polymer in term of mechanical properties upon 180 days of storage. Between both plasticizers, PEG 400 at 5% was the proper type and concentration for further investigation. The film coating efficiency of shellac over hydrophilic and hydrophobic substrates was then evaluated. The coating potential of shellac over hydrophilic substrate could be modified by the addition of gelatin and hydrophilic plasticizer while the hydrophobic surface and addition of hydrophobic plasticizer in the composite polymer showed the opposite trend. Further investigation was to study the application of composite polymer based on 40% gelatin unplasticized and plasticized with 5% PEG 400 as film coating for extending the shelf life of banana under the longer period. The result indicated that the composite polymer could prolong the aging of banana for more than 30 days in comparison to uncoated banana indicated by the slower change in color, sugar, acid, weight loss and firmness. Hence, the disadvantages of shellac could be improved by the modification of shellac into the formation of composite polymer and addition of plasticizer, contributing to the wide application of film coating in food and pharmaceutical industries.

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