Title Effect of glycerol, oleic acid and polyethylene glycol 400 plasticizer on surface and mechanical properties of zein films

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Abstract

Introduction: Zein, The most important protein in corn, has good film forming properties and can be used for fabrication of biodegradable films. Zein biofilm is formed through the development of hydrophobic, hydrogen and limited disulfide bonds between zein chainx. Pure zein film is too brittle for most applications and requires the addition of plasticizer to improve their flexibility. **Materials and Methods:** In this research, zein extracted from corn gluten meal (CGM) was used to form zein films by casing method. Plasticizer can improve surface and mechanical properties of zein films. Glycerol, oleic acid and polyethylene glycol 400 added in different proportions in zein films were used as plasticizer. The obverse and reverse surface properties of zein films were studied by Optical Contact Angle system (OCA) for determination of contact angle of zein films. Water and 60% ethanol were used as test liquid. The mechanical properties of zein films were investigated by Texture Analyser. **Results and Discussion:** Results showed that zein films containing plasticizer can significantly improve surface and mechanical properties of films. The contact angle of the films changed variation due to addition of different plasticizer. For films with polyethylene glycol 400, the contact angle changed sharply from 41.87 degree to 89.13 degree (water as test liquid, obverse surface) with increasing plasticizer level. It was interesting that the contact angle of films with glycerol decreased slightly from 41.87 degree to 26.66 degree (water as test liquid, obverse surface). Whether water or ethanol as test liquid zein films containing polyethylene glycol 400 had the highest contact angle (89.13 degree and 69.79 degree respectively) than other films containing glycerol or loeic acid plasticizer on either obverse or reverse surface of film. At the same time, it also has the largest Elongation-at-break (EB) (145.7%) and the olwest TS (11.63 MPa). Tensile Strength (TS) of zein films decreased with the increasing plasticizer level in all of the specimens. All films had the lowest contact angle with ethanol and the highest contact angle with water. The effects of the combination of above plasticizers were also investigated in this paper.