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Preparation of antioxidant film from *Musa sapientum* Linn. peel extract and fruit

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Musa sapientum Linn. (commonly called Kluai Namwa; KNW) is a herbaceous plant of the Musaceae family, which is extensively cultivated throughout Thailand. Peel of green KNW contains various effective compounds of tannins and flavonoids, which provide usefulness in antibacterial, antioxidant activities [1]. Fruit starch from green KNW is also useful in the thickeners, binding, especially biopolymer agents [2,3].

Antioxidant film was formulated by using starch from green KNW fruit as film forming agent, and consisting antioxidant agent from peel extract. Conditions of starch film preparation were optimized by varying heating time of starch solution as 1, 2 and 3 h, and starch concentration as 2%, 3% and 4% (w/v). Physicochemical of KNW film was carried out by visual appearance, thickness, water uptake, and dissolution. Increasing of heating time could increase strength and homogeneity, average thickness was about 0.18 mm, but not reduce brittleness, water uptake and dissolution of film properties. Uniaxial orientation of densely starch molecule at the highest content could have an effect on change of physicochemical properties of film, especially strength improvement. The suitable condition of film preparation was 2% (w/v) KNW starch, heated at 70 °C for 3 h, and dried to be film at 50 °C. Concentration effect of glycerol (Gly) as a plasticizer was then studied at 50%, 70% and 100% (w/w). Each sample of KNW films with plasticizers was more clear, homogenous, and tough than that of original one. The increasing of Gly could increase the thickness, moisture uptake, dissolution, but decrease puncture strength of film properties. Similarly, water uptake and elongation were decreased with the increasing of Gly. KNW peel extract was added into starch film with 70% Gly, resulting in dark-brown color (Fig. 1), tough, homogeneity, pH 5.63 ± 0.01, 0.19 mm of thickness, 31.8% moisture uptake, 65.6% water uptake, 60.8% dissolution. Mechanical properties were 0.92 MPa of puncture strength, and 37.7% elongation, which were significantly different ($P < 0.05$) from original film without the extract (2.93 MPa and 21.5% elongation). The film also presented antioxidant activity at IC_{50} = 182.1 μg/mL which has significantly lower activity from crude extract about 3 times ($P < 0.05$). Consequently, KNW native starch could be used as biopolymer to form KNW film as well as additional peel extract

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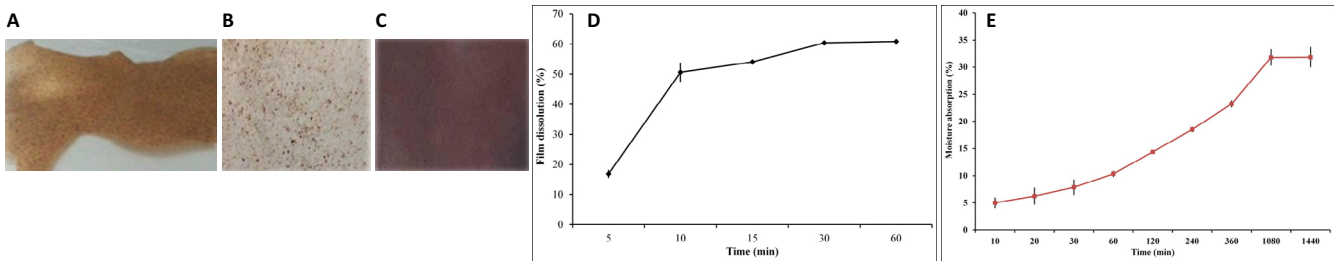

Fig. 1 – KNW film (A), KNW film with Gly (B), KNW film with Gly and peel extract (C), dissolution (D) and moisture absorption (E) of KNW film.

provided the beneficial antioxidant product. It could therefore be applied for topical applications and other uses.

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