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Edible films made of Corn Zein protein and cellulose derivatives

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EDIBLE FILMS MADE OF CORN ZEIN PROTEIN AND CELLULOSE DERIVATIVES

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INTRODUCTION

Edible films are coatings used to wrap food products to protect them against microbial deterioration, loss of moisture, and to extend the shelf life of the product. These edible films are consumed together with the product.

Typically bio-petroleum based polymers are materials used to wrap food products, but there is a rapid increase of arguments about their production of toxic substances and environmental pollution.

As an alternative, a composite film made of zein and cellulose derivatives provide an enhanced nutritional, sensory (color, texture), mechanical properties with an extended shelf life and ecofriendly to environment.

Zein is a hydrophobic protein in nature, so zein films serve as good moisture blockers. Plasticizer are used to induce flexibility films are brittle. Cellulose derivatives are tasteless, transparent, odorless, and resistance to oil.

OBJECTIVES

- Fabrication of edible composite film made by corn zein proteins and cellulose derivatives with a water barrier property
- Apply the films on strawberries and predict the proper shelf life of the coated strawberries
- Examine physical properties of the films

MATERIALS & METHODS

Purified corn zein, Hydroxypropyl methyl cellulose (HMC), M.N 86,000, viscosity 4,000 cP (2% solution), Ethanol (95%), deionized water, glycerol (50%). Fig.1 summarizes the production of film and their application.

Zein film was prepared by mixing 6.00 g of pure corn zein powder with 100 ml aqueous ethanol (95%) stirred for 3 minutes with a magnetic stir and followed by the addition of (1:3 gly/zein) glycerol (50%) as a plasticizer . The stock solution was obtained after centrifuged at 200 rpm for 10 minutes at room temperature.

HMC solution was prepared by dissolving 5g of HMC powder in 100ml deionized water. After that, glycol (1:5 gly/HMC) was added, the solution was stirred for 30 min at 60°C. The temperature was adjusted to 100°C and stir for 1hr.

The HMC stock solution was obtained after ultrasonic degassing for 15 min.

MATERIALS, METHOD CONT

The composite film of zein and cellulose was casted on the Petri dish at different ratio (zein/cellulose) - 10:2, 8:4, 6:6, 12:0, 0:12 and then dried over night. Another portion of the ratios with the addition of the Ethanol(95%) and the control were applied on the strawberries and stored at room temperature to analyze their shelf life.

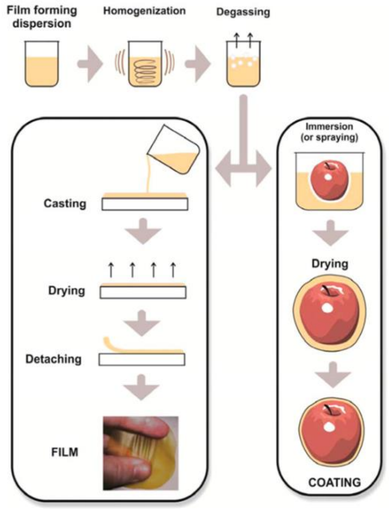

Fig.1 Schematic of preparation of films and application (Chen,2019)

RESULTS

Fig2. Coated Day 7 (8:4 Z/C) Treatment

Fig3. Coated Day 9 (8:4 Z/C) Treatment

Fig4. Uncoated day 5

RESULTS Ctd…

Z/C	COLOR OF THE FILM	SMELL	HAND TEXTURE	MOLD GROWHT	PEDICEL	SEEDS THE BERRY
10:2	yellow coat of the film is detectable	alcoholic smell	Hard shell	No	Brown/ black and dry	Blackish
8:4	Transparent yellow coat	Strawberry aroma	Hard shell	No	Green tips and dried	Light green/yellow
6:6	yellow spots on the strawberry	Strawberry Alcoholic smell	Hard shell	Yes & No	Green tips, dark brown bottom	Green and yellow
CONTROL	-	Rotten smell Over ripen	Soft, mushy	Yes	dark green	Dark green
ETHANOL (95%)	-	Alcohol smell	Moderate soft	No	Blackish	Dark green

DISCUSION

The quantitative study of the film wasn't done due to the outbreak of COVID-19. Further analysis about thickness, water vapor permeability, color, will be done. The appearance of the films was influence at large by ingredient composition. The film took the color of the film with the highest ratio. The cellulose film demonstrated poor mechanical properties and water barrier properties. Further studies need to be done for this issue. It can bee seen from table 1 ratio (8:4) indicated the potential of coating the strawberry at an extended shelf lie (fig 2&3). Results indicate that only significance addition of zein affect the capacity of the film.

CONCLUSION

The composite film based on corn zein protein and cellulose derivative was developed, and the effect of zein and cellulose on mechanical properties were studied. As the increase addition of cellulose and reduction of cellulose, as flexibility of the film increased and exhibited a smooth surface. And the addition of zein had a big influence on the final color of the film. The (8:2 z/c) film indicated potential barrier properties against the mold growth than the 10:2 Z/C and 6:6 Z/C films. So far, the composite Z/C film show a promise as a potential packaging material that can be used in food industry.

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