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CIGR 2008 / BRAZIL
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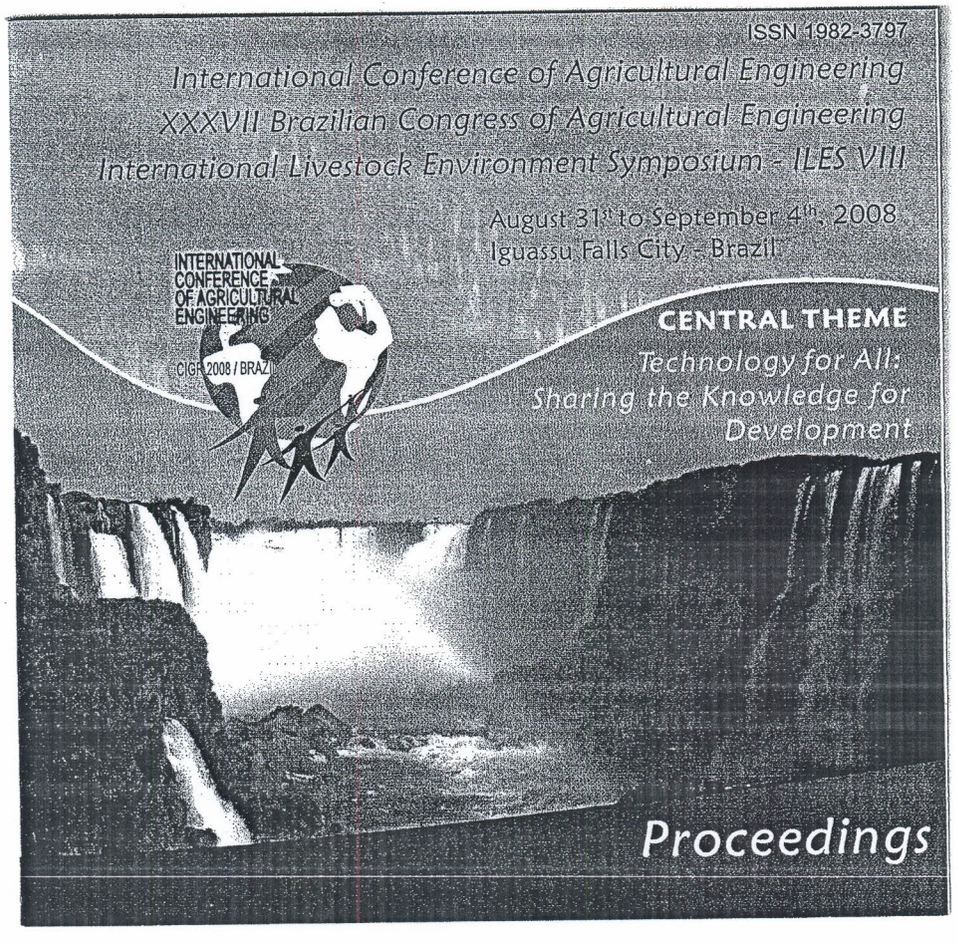
Proceedings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ZEINS BASED COATINGS TO PROTECT PEARS: A PRELIMINARY STUDY

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ABSTRACT: In the present work α zein proteins are extracted from corn gluten meal aiming at the use as protective post-harvest coatings on pears. Coatings were produced from formulation with 4.0% protein in mass with addition of oleic acid as plasticizing at two different concentrations (0.25 and 1.0%). The pears (*Pyrus communis* L.) were analyzed during twelve days following their loss of mass. The samples coated with 4.0% of zeins and 0.25% attained better results with minimum loss of mass, being an indicative of formulation for shelf-life extension.
KEYWORDS: edible coating, zein, pear, oleic acid, shelf-life.

INTRODUCTION: Zeins, the maize storage proteins, have great potential for application as structural materials in packaging and as precursor gels for use as protective edible coatings on food (ASSIS & FORATO, 2007). Maize proteins correspond to approximately 10% of the grain's dry mass, in where zeins (a mixture of proteins with different molecular sizes and solubility), accounts for 80% of the total proteins. Because of their low lysine and tryptophan content, several studies towards the improvement of the nutritional value of maize have been focused on raising the intrinsic quality of zeins by modifying their amino acid content or even by reducing their relative proportion within the seeds (LASTITY, 1996). Chemically, the zeins are polypeptides whose molecular masses range from 10 to 28 kDa and are classified as α, β, γ and δ zeins. α-Zeins represent from 75 to 85% of the total zeins.

α-Zeins are soluble in alcoholic solutions and have many technological applications. They are extracted from renewable sources, are biocompatible and environmentally friendly. Zeins are highly hydrophobic material, making them suitable for use as protective films against oxygen and moisture, especially on perishable foods and drugs. Although zeins themselves have the capability to forming films, the resultant film is brittle making necessary the addition of plasticizer agents in order to obtain more flexible matrices (COVRE, 2006).

In this work zeins are extracted from corn gluten meal, a byproduct of the wet milling industry (WU et al., 1997), and films processed using oleic acid (OA) as plasticizer agent. Protective coatings were evaluated on pears.

METHODOLOGY:

Zeins were extracted from corn gluten meal (CGM), gently supplied from Corn Products. The CGM was treated with hexane in soxlhet apparatus (along 24 h) to remove the oil fraction. The residual mass was mixed with 70% ethanol aqueous solution during 24 h. The zein proteins were obtained by solvent evaporation and then lyophilized (FORATO et al., 2003). Zeins solutions were prepared using 70% ethanol as solvent (4.0% in mass), and oleic acid added at 0.25 and 1.0% proportions in mass. Supermaket pears (*Pyrus communis* L.) were dipped into the gels and the excess gel allowed to drain off and the film formed by drying at room temperature. The samples (coated and uncoated) were stored in non-controlled conditions (an ambient temperature of between 25-30 °C and relative

humidity of 76%) whilst loss of mass was recorded daily. Losses were estimated as the average of individual weights (five samples).

RESULTS AND DISCUSSION:

The zeins coating takes place by means of solvent evaporation, forming a thin gloss film. The characteristics of the cured film are, within certain range, related to the amount of zeins in precursor gel and the plasticizer addition. After drying, the deposition becomes a tough and flexible coating, slightly yellowish (COVRE et al., 2006). Concerning protection action, in Figure 1 is presented the relative mass loss against storage time, in non-controlled environment. Data for uncoated samples are plotted for comparison. The best results were attained from the formulation with addition of 0.25% of plasticizer, showing a minor loss of weight especially after the sixth day of storage.

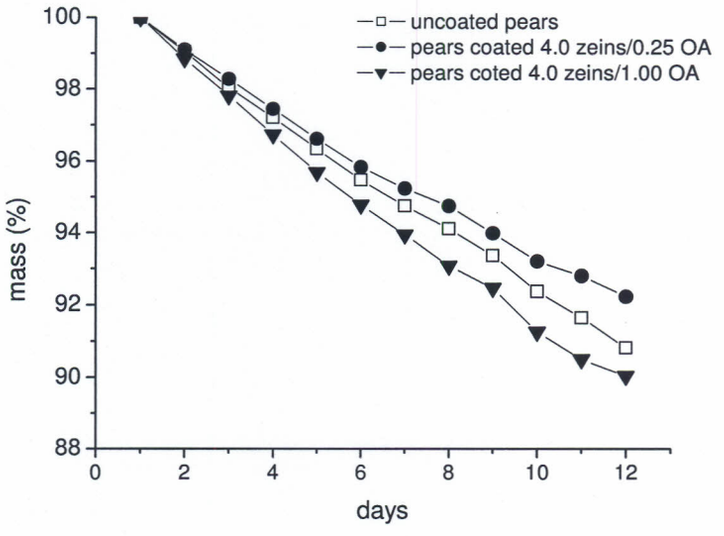

Figure 1. Pears weight loss in function of storage time.

We can observe that in the testing period (twelve days) there is a clear tendency to a daily loss of mass for all samples, what is assumed as mainly water loss due to transpiration mechanism. The data show that for pears coated with 4.0% of zeins and 0.25% of OA, there is a reduction of loss when compared to other samples. According to WORRELL at al., 2002, one of the main features of a protective coating is the capability to establish a good difference in vapor pressure between the fruit and its surroundings reducing the water vapor permeation. It is worth noticing that uncoated pears presented a less pronounced loss of mass when compared with pears coated with 4.0% of zeins with 1.0% of OA addition. Such effect can be atributted to the higher concentration of plasticizer. Oleic acid contains a polar group (carboxilic) which presence can provoke a reorientation of the polar groups towards the interface and also a reduction on the number of aminoacid residues of the protein exposed to the solvent (MUTHUSELVI & DHATHATHREYAN, 2006). This effect was observed by SCRAMIN et al., 2006, when they measured the contact angle on films of zeins with different OA concentration. The initial contact angle values ranged around 68° which could be interpreted as an indicative of absorption capacity or water being trapped due capillary forces in the film-water interface. In this regard, a zein's tendency of a hydrophilic character is observed instead of hydrophobic when using this kind of plasticizing agent.

CONCLUSION: Zein coatings with 0.25% of oleic acid as plasticizing resulted in the best protection concerning loss of mass of pears along twelve days storage in non-controlled environment. These results preliminary indicate that zeins can be an alterantive material for use as edible coating to improve pears shelf-life. Additional studies however are necessary to clarify the effect of plasticizer concentration.

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