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THE USE OF ZEIN BASED FILMS TO IMPROVE PEARS SHELF LIFE.

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Abstract – The objective of this study was to analyze fruits (pears) purchased in local market coated with edible films based on zein (4.0%) and oleic acid. Analysis of mass loss and ^{13}C NMR spectroscopy, to monitor the metabolism of carbohydrates in time, indicated that pears coated with zein and the minor concentration of oleic acid used here (0.25%) showed less mass loss and also had the consume of glucose and sucrose reduced when compared to the others samples. These results are an indicative that the films containing 4% of zein and 0.25% of OA promote a reduction in respiratory rate of the pears which can improve their shelf life.

The major maize storage protein known as zein is a very hydrophobic biopolymer presenting filming forming capacity and barrier properties against moisture and oxygen. Since these kind of barrier effects can promote a slower respiratory rate in some fruits, in this work we obtained films based on zein and analyzed their effect on the pears shelf life. Zein was prepared in our laboratory from corn gluten meal (FORATO et al.) and it was used together oleic acid (OA) as plasticizing to obtain the films. These last ones were obtained from 70% aqueous ethanol solutions containing 4.0% of zein in mass, varying the proportion of OA at 0.25% and 1.0%. Pears were dipped in these solutions by three seconds and dried at room conditions. Fruits with and without zein films were analyzed by the daily mass loss measurements and ^{13}C NMR spectroscopy.

NMR measurements were performed in a Varian® INOVA 400 spectrometer using a probe of 5 mm. The ^{13}C NMR spectra were acquired using 2000 transients, pulse width of 90° (11.5 s), delay time of 10 s, acquisition time of 1.2 s, spectral width of 25 KHz and decoupling was used only during acquisition. Pear pulp samples were placed in tubes of 5 mm with a capillary tube containing D_2O for lock.

The monitoring of ^{13}C NMR signals intensity of the C_1 for α and β glucose, 94.8 and 98.6 ppm, respectively (table 1) showed that pear coated with zein and 1% OA consumed more quantity of this carbohydrate than the others samples, indicating an increase of the respiratory rate of the fruit with this film formulation. Fructose is also used in respiration but only its portion located in the cytoplasm; the other portion remains in vacuole. Because this accumulation, the fructose peaks, C_2 for α and β forms at 104, 3 and 100,8, are always more intense than glucose ones. Sucrose is also accumulated in vacuole as fructose until the acidity changes and both of them become part of the respiratory process. Then a low sucrose/fructose ratio value also indicates increase of respiratory process since sucrose was only located in vacuole, this way a decreasing in its concentration can be interpreted as a result of its use in the fruit respiration. Table 1 shows the ratio of signal intensities for sucrose/fructose for the pears coated and uncoated, where sucrose intensity was measure by anomeric C_2 from fructose present in its molecule at 107.1 ppm. As observed for the higher consume of glucose, pears coated with zein and 1.0% OA also show the higher consume of sucrose. These results are in agreement with the mass loss measurements (Figure 1) where pears coated with zein and 1.0% OA has the more pronounced mass loss. Pears coated with zeins and 0.25% OA presented the less mass loss and pears uncoated were in an intermediate range. Therefore, the zein edible coating containing a smaller percentage of OA (0.25%) caused a decreasing of the respiration process rate in the pears analyzed here and consequently it increased the pears shelf life.

Table 1: MNR ^{13}C signal intensity of the in glucose and ratio sucrose/fructose

Samples	Glucose Signal intensity	Sucrose / fructose Ratio intensity
Pears uncoated	1.0	0.38
Pears coated Zein + 0.25% OA	1.8	0.40
Pears coated Zein + 1.0% OA	0.57	0.27

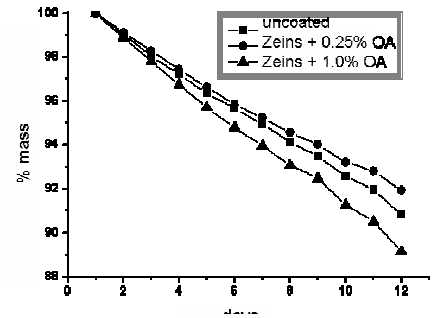

Figure 2: Graphic of mass loss in function of days

FORATO, L.A., BICUDO, T.C., COLNAGO, L.A. Conformation of the alpha zeins in solid state by Fourier Transform IR. **Biopolymers**, 72, 421-426, 2003.