BIOACTIVE COATINGS OF CHITOSAN AND NEEM OIL FOR PRESERVATION OF CACTUS FRUIT PITAYA IN POSTHARVEST

Hernández-Valencia C. G., Román-Guerrero A., Aguilar-Santamaría M.A. and Shirai K.*

Universidad Autónoma Metropolitana-Iztapalapa, Biotechnology Department, Laboratory of Biopolymers and Pilot Plant of Bioprocessing of Agro-Industrial and Food By-Products, Av. San Rafael Atlixco, No. 186, 09340, Mexico City, Mexico.* e-mail: smk@xanum.uam.mx

ABSTRACT

• *Stenocereus pruinatus* (pitaya) is sweet and tasty, contains phenols and betalains with high antioxidant activities. The consumption is limited for its highly perishability.

• Therefore, coatings based on chitosan (Q), hydroxypropylmethylcellulose (H), mesquite gum (MG) and neem oil (N) are applied in this study for extending postharvest life of pitaya.

• Q was crosslinked to H (Q-g-H) and the blend of Q with MG were used as polymer matrices for the microencapsulation of N (Q-Nq-H and NQMG).

• NQ-g-H produced unstable emulsion with Z-potential close to zero, on the contrary of NQMG.

• Fruits coated with NQ-g-H and NQMG presented lower physiological weight loss (WL) than untreated fruits during 15d of storage.

• The fungal contamination and firmness of flesh were significantly different for treated fruits with NQ-g-H (4.5CFU/g and 0.61N) than control (5.41CFU/g and 0.36N).

• The color of epicarps were retained with NQ-g-H and NQMG coatings, whereas the control became dark.

• The azadirachtin as bioactive compound of N was released from NQ-g-H coating at storage conditions of 10±2°C and relative humidity of 75±5%.

METHODS

Q obtained by fermentation, and heterogeneous deacetylation. Characterization of Q. Molecular weight (Mv) and degree of acetylation (DA).

COATINGS

Continuous phase: Q* grafted to hydroxypropylmethylcellulose (Q-g-H).

Disperse phase: Neem oil + mineral oil (φ=0.3)

Continuous phase: Q* mixed mesquite gum (QMG).

Q* concentration was 5 g/L.

Response variables: Z-potential, drop size and polydispersity (span).

APPLICATION

Boned Selection Coating Packed and stored 10±5°C, 75±5% RH

Response variables: Percentage weight loss (WL), fungal contamination (CFU), pulp firmness, change in color of the epicarp, the release of azadirachtin of N and scanning electron microscopy (SEM).

CONCLUSION

The coatings NQ-g-H and NQMG decreased WL of pitayas, pulp remained with firm texture, as well as maintained color. NQ-g-H decreases fungal contamination and displays higher release of N rate than NQMG. Studies on N determination of cytotoxicity is undergoing for food application.

REFERENCES

[4] Pacheco N; Garnica G; Gimeno M; Bárzana E; Trombotto S; David L; Shirai K. 2011. Biomacromolecules. 12, 3285-3290.

Table 1. Characterization of coatings

<table>
<thead>
<tr>
<th>Coating</th>
<th>Z-Potential (mV)</th>
<th>D (3,0) μm</th>
<th>Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>NQ*-g-H</td>
<td>1.08±0.67</td>
<td>2.770±0.390</td>
<td>1.28±0.01 a</td>
</tr>
<tr>
<td>NQ*MG</td>
<td>-21.83±0.97</td>
<td>0.393±0.006</td>
<td>1.86±0.05 b</td>
</tr>
</tbody>
</table>

*Q presented medium molecular weight (2850D) with DA of 9.91%. Different letters indicate significant difference (p<0.05) determined by multiple mean comparison test of Tukey-Kramer.

Table 2. Determination of WL, fungal growth (CFU) and firmness of pitaya treated with coatings and untreated (control).

\[
\text{Control} & \quad \text{NQ-g-H} & \quad \text{NQMG} \\
\%WL & 6.76±0.35 & 4.63±0.38 & 5.16±0.40 a \\
\text{Log10(CFU/g)} & 5.41±0.003 b & 4.51±0.06 a & 5.25±0.11 b \\
\text{Pulp firmness (N)} & 0.36±0.16 a & 0.61±0.06 b & 0.44±0.05 a \\
\]

Different letters indicate significant difference (p<0.05) by multiple mean comparison test of Tukey-Kramer.

Fig. 1. Release of N from coatings during storage of treated pitayas. (Different letters indicate significant difference (p<0.05) by multiple mean comparison test of Tukey-Kramer).

Fig. 2. Color change in epicarp of pitaya

Fig. 3. SEM micrographs of pitaya: a) Control, b) NQ-g-H and c)NQMG.