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CHITOSAN INTELLIGENT FILM: TIME-TEMPERATURE INDICATOR

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Chitosan is a biodegradable polymer, obtained from renewable source and could form flexible and resistant films with an efficient oxygen barrier [1]. Natural polymers could be an ecological alternative to synthetic polymers packaging applications to reduce the waste world. In this work, chitosan intelligent films were obtained to indicate time-temperature variations. The consumers are requiring feed-products healthier. In food area, the temperature control during transport and storage is an important quality and safety variable [2]. Thermal-sensitive and natural pigment (anthocyanin) was incorporated into chitosan matrix film. Anthocyanins are low toxic pigments responsible for the strawberry, raspberry, purple cabbage and other foods coloration [3]. Anthocyanin (0.25% w/w) was incorporated into chitosan matrix films (2,0%, w/w). A complete experimental design for two variables was applied to verify the temperature (10 to 50℃) and luminosity (0 to 1000 Lux) effect on chitosan intelligent films. The oxygen concentration was fixed as the ambient condition. The colour parameters L* (black to white), a* (green to red) and b* (blue to yellow) and mechanical properties were analyzed.

Color analysis

The color response was measured (L*, a*, b* parameters) using colorimeter (Konica Minolta, Japan).

Mechanical properties analysis

The mechanical properties (tensile strength, elongation at break and Young's Modulus) of chitosan smart films were determined based on ASTM D 882 (ASTM, 1995) [4].

Homogeneous, flexible, transparent and dark violet films were obtained. Films were submitted to different conditions of temperature and luminosity.
In this condition the color parameter b* had the higher variation than L* and a*.

In Figure 1, the parameter b* was measured in function of exposition time at 50°C and 1000 Lux.

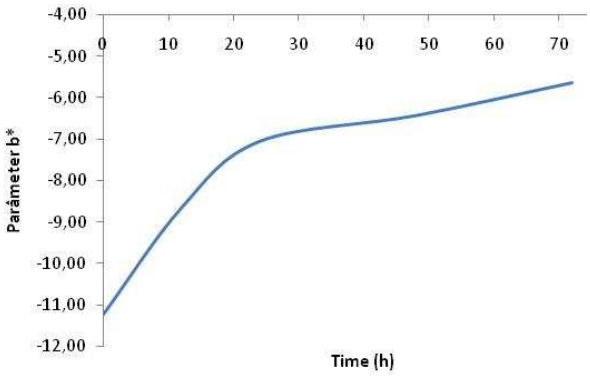

Fig 1. Parameter b* of chitosan smart films in function of exposition time at 50ºC and 1000 Lux.

Films became darker after 24h. The chitosan films color changed from violet to black after 72h.

Mechanical properties

The mechanical properties did not present significant differences after temperature and lumminosity exposition.

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REFERENCES

1. Yoshida, C.M.P.; Oliveira-Junior, E.N.; Franco, T.T. Chitosan Films: additives effects on barrier and mechanical properties. Packaging Science and Technology, 22(3), 161-170, 2009.
2. Tsai, P.; Mcintosh, J.; Pearce, P.; Cardem, B.; Jordam, B.R. Anthocyanin and antioxidant capacity in Roselle (*Hibiscus sabdariffa* L.) extract. Food Research International, v.35, 351-356, 2002 Flory, P.J., *Principles of Polymer Chemistry*, Cornell Univ. Press, New York, 1953
3. Conceição, M.P.J. Cinética da degradação térmica de antocianinas em suco de acerola (Malphigia glabra L). Dissertação de mestrado, Universidade Federal de Viçosa, 1997.
4. ASTM. Tensile properties of thin plastic sheeting. Annual Book of ASTM Standards. American Society for Testing and Materials, Philadelphia, D882, 1995.