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OF FOOD PACKAGING

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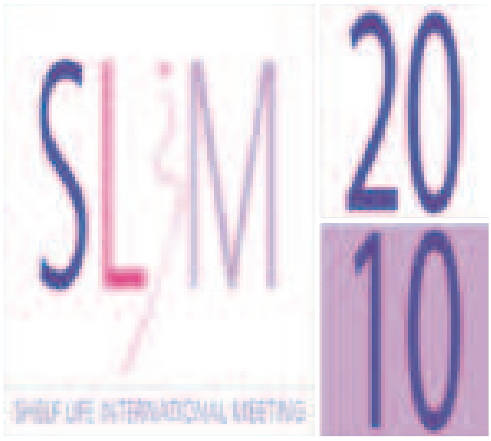

SLIM 2010

Shelf-life International Meeting

Zaragoza, 23 – 25 June 2010

Edited by

CRISTINA NERÍN & JESÚS SALAFRANCA

Special Issue

ITALIAN JOURNAL
OF
FOOD SCIENCE

CHIRIOTTI EDITORI

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THE ITALIAN SCIENTIFIC GROUP of
FOOD PACKAGING

In cooperation with

THE ARAGÓN INSTITUTE OF ENGINEERING RESEARCH (I3A) OF THE UNIVERSITY OF ZARAGOZA

Zaragoza, June 23rd-25th 2010

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This Special Issue of the Italian Journal of Food Science collects the presentations given at the "SLIM 2010, Shelf Life International Meeting" organized by GSICA and the Aragón Institute of Engineering Research (I3A) of the University of Zaragoza, held at Zaragoza on June 23-25th 2010.
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Reviews and surveys on specific topics relevant to the advance of the Mediterranean food industry are particularly welcome.
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QUALITY EVALUATION OF SHRIMPS *(PARAPENAEUS LONGIROSTRIS)* AS AFFECTED BY EDIBLE FILMS

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ABSTRACT

The effect of chitosan blends with different components as coatings for the shelf-life extension of fresh shrimps was evaluated during chilled storage. Blended films were: chitosan solution, chitosan solution added with tapioca starch, cornstarch flour and locust bean gum (LBG). Untreated shrimps were used as control. These coating solutions were characterised by means of pH, viscosity and color measurements. The effects of these edible films on the shelf-life of shrimps were monitored during storage by physical (color and rheological measurements), chemical (pH, total volatile basic nitrogen, TVBN) and microbiological (total bacterial counts) analyses. Sensory analyses were also performed to define the state of freshness of the products. The coating solutions showed similar characteristics, such as pH, viscosity and color, but different effects on the shelf-life of shrimps. Generally the effect of coating solutions on shrimps shelf-life is positive but in necessary to continue the research to improve the results.

Key words: chitosan, coating, edible film, shelf-life, shrimps.

INTRODUCTION

Shrimp is highly perishable and the maintenance of quality depends upon number of factors, including storage time, storage conditions and temperature. Therefore studies on alternative methods to extend the shelf-life, like the use of edible coatings, are needed. Functional edible active coatings may contribute to prolong minimally processed food shelf-life, working as barrier to gases, water vapor, solutes and guaranteeing microbiological safety (Pavlath and Orts, 2009).

The aim of this study was to determine the changes in the quality of shrimps (*Parapenaeus longirostris)* after coating with edible materials.

The effect of chitosan, blends with different components (tapioca starch, cornstarch flour and locust bean gum), as coatings for the shelf-life extension of fresh shrimps was evaluated during chilled storage.

MATERIALS AND METHODS

Chitosan of high molecular weight (Sigma-Aldrich) was dispersed in lactic acid (1% v/v) to prepare solution of proper concentration (0.5% v/v). The other solutions were obtained blending chitosan solution with other coating solutions (Tapioca starch, Cornstarch flour and LBG) in same proportions (50 g of each one) under gently stirring for 20 min (Chillo *et al.*, 2008); final solutions were brought to pH 2.8.

Fresh samples of shrimps were collected from local fishermen in Jonio sea and immediately were transported to the laboratory under refrigeration and dipped into sodium metabisulphite solution (E224) (Omar, 1998). Shelled and headless shrimps were dipped in the test solutions, dried, packaged and stored a 4°C.

The viscosity values of coating solutions (cps) were measured at 25°C with a rotational viscometer (Visco Star R, Selecta, Milan, Italy), using different spindles (R2-R3) and share rates (10-100 rpm).

The color measurements of solutions and samples were performed by colorimeter (NR-3000, Nippon Denshoku Ind. Co. Ltd, Giappone). CIELab parameters (a*, b* and L*) were used to calculate the color ΔE that express the differences of color between the samples, these values were calculated according to the formulae:

$$\Delta E = [(L_f - L_i)^2 + (a_f - a_i)^2 + (b_f - b_i)^2]^{1/2}.$$

For chimical-phisical analyses samples were taken after 3, 6, 9 days of storage, after 1 and 8 days for sensory analyses and 0 and 8 days for microbiological analyses.

The pH value was determinated by a pHmeter, blending 5 g of each sample with 10 ml distilled water.

The total volatile basic nitrogen (TVBN, mg N/100 g fish flesh) was measured using the official method (GUUE n. 338/27, 2005).

The measure of the hardness of shrimps was determinated by penetrometer (TR® 53205 Forlì, Italia) inserting a needle into the sample in a prescribed manner.

For microbiological analyses, shrimps were blended in buffered peptone water (BPW, Oxoid) and homogenized using a stomacher (Bag mixer 500W) for 1 min and serially diluted. Microbial count was effected in duplicate according to the plate

official method (De Medici *et al.*, 1996). Aerobic plate counts were determined by surface spreading homogenate dilutions (0.1 mL) on Plate Count Agar (PCA, Oxoid) and incubated a 30°C for 72 h.

To evaluate the appearance of the flesh and the skin, the odor and the texture of the shrimps, 11 attributes were evaluated, each one receiving a score on a continuous scale of demerit points from 1 to 9, as changes occurred during storage.

RESULTS AND CONCLUSIONS

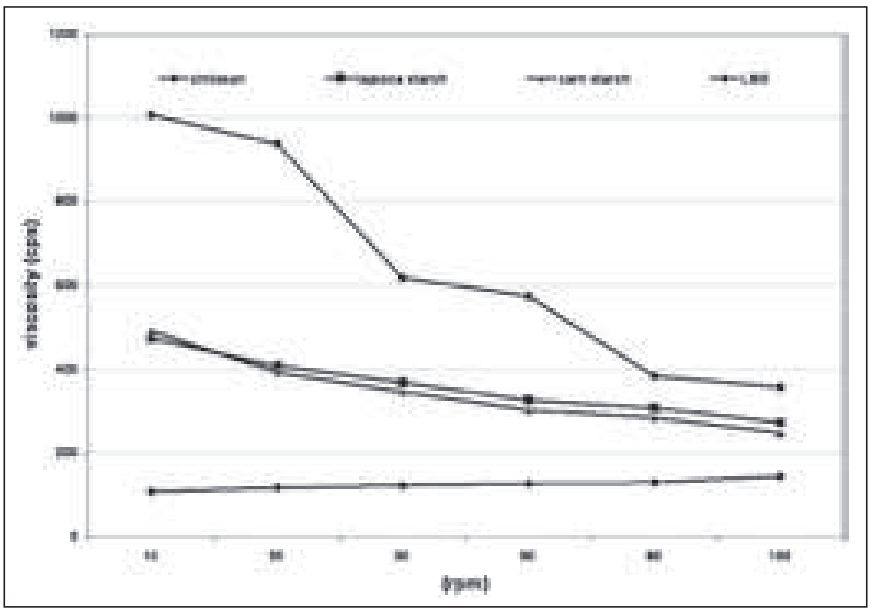

Fig. 1 - Viscosity values (cps) of coating solutions at 25°C versus shear rate.

The tested solutions showed difference in viscosity, in particular the solution of chitosan was characterized by a viscosity lower than the other, while the chitosan-LBG solution viscosity showed greater respect to all solutions (fig. 1).

The values of CIELab parameters, despite the differences in transparency between solutions, once applied on shrimps, had no influence on the samples. ΔE values ranging from a minimum of 6 for the samples treated with chitosan-LBG solution to a maximum of 15 for those treated with chitosan-cornstarch with an upward trend over time with the exception of carob solution.

For all samples pH values showed an upward trend during the period under review but, the pH values remain always below the control.

The development of TVBN concentration (fig. 2) was only contained by the solution of chitosan, despite exceeding the legal limits (30 mg/100 g).

The texture of the shrimp samples treated with the different solutions didn't show significant difference compared to control. The only exception is for samples treated with chitosan-based films that are characterized by higher values of texture at the sixth day of conservation.

Sensory evaluation

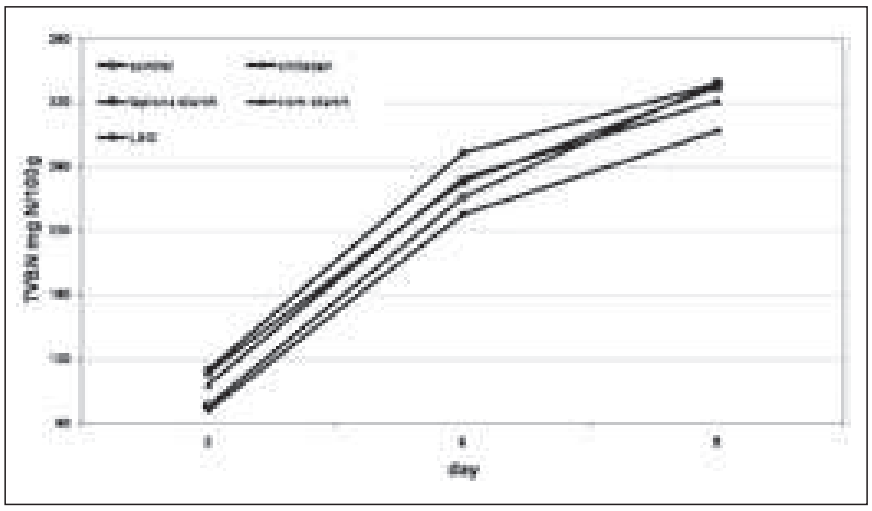

Fig. 2 - Evolution of TVBN during storage.

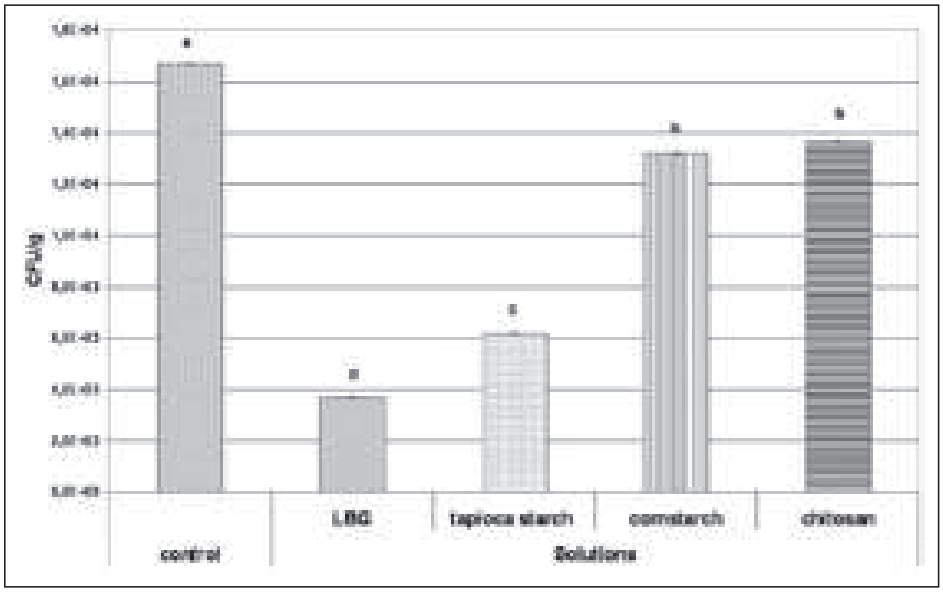

Fig. 3 - Mean values of total aerobic mesophilic bacteria (CFU/g) in samples of shrimp after 8 days of storage (P<0.01, Duncan test).

shows that the treated samples show differences compared to untreated samples, particularly on day 1 of storage samples coated with chitosan and chitosan-tapioca presenting a lower intensity of the parameter smell of ammonia, while at day 8 the sample coated with chitosan-cornstarch getting the best overall assessment.

Total mesophylic aerobic count, expressed as CFU g^{-1}, was the average of three repetitions and it was in a range from $3.70x10^3$ CFU/g, samples with chitosan-LBG solution, to $1.66x10^5$ CFU/g, control (fig. 3). The average level of bacterial contamination in the samples was very low. Moreover, the coating solutions used to improve the shelf-life has made no additional bacterial contamination than the untreated product.

This work is a preliminary characterization of the different coating materials to be used for sea food products. Further research is necessary to assess the use of coating solutions formulated with the addition of antioxidants and antimicrobials compounds.

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