MATBIM2017 4th international meeting on Material/Bioproduct Interaction

LIPID OXIDATION OF A MEAT PRODUCT PACKAGED WITH POLY (LACTIC ACID) /CLAY NANOCOMPOSITES

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INTRODUCTION

PLA (polylactic acid)

Polylactic acid or polylactide (PLA) is a biodegradable thermoplastic aliphatic polyester derived from renewable resources, such as corn starch, tapioca roots, chips or starch, or sugarcane (Fig.1). The PLA manufacturing process includes biotechnology activity in the sucrose (sugar) or glucose extraction phase before transformation by fermentation (using a microorganism) into lactic acid. This lactic acid is then chemically transformed into PLA (Fig. 2).

Fig. 1 Corn: a source of PLA.

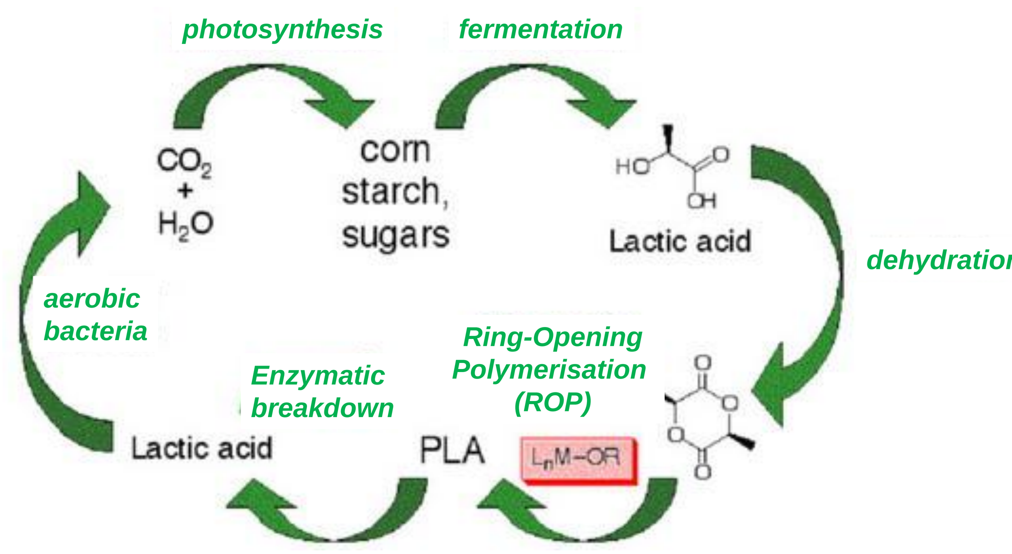

Fig. 2 General scheme of PLA Manufacturing Process.

PLA / Clay nanocomposites

Biopolymer nanocomposites are of great interest to the packaging industry as they can overcome the limitations of biopolymers compared to synthetic polymers. In the last two decades, the nanocomposites have been studied intensively, once the addition of fillers such as organoclays, in particular, montmorillonite (MMT), can improve rheological, thermal and mechanical properties of the biopolymers (Jollands *et al.* 2010). The presence of MMT can lead to materials with properties' enhancement, mainly due to its intercalation or exfoliation into the polymer chains (Strankowski *et al.* 2012).

In this work, PLA was incorporated with 5% (w/w) Cloisite Na^+. The nanocomposite was used to pack a model food (salami) in order to evaluate the ability of the new packaging to inhibit lipid oxidation.

TBARS

Thiobarbituric Acid Reactive Substances (TBARS) assay was used to evaluate the lipid oxidation stage. This assay allows to measure malondialdehyde (MDA) content, which is formed during lipid oxidation of polyunsaturated fatty acids.

MATERIAL AND METHODS

Packaged salami (Fig.3) was homogenized trichloroacetic acid in orthophosphoric acid (0.02 M) and the solution was filtered. The filtered solution was homogenized with thiobarbituric acid (TBA) aqueous solution (0.3 % (w/v)) and heated at 100 °C for 40 min. Solutions were cooled down and absorbance was measured at 530 nm (Fig. 4). Results were expressed as mg MDA per kg of salami (Fig. 5).

Fig. 3 Slice of salami packed.

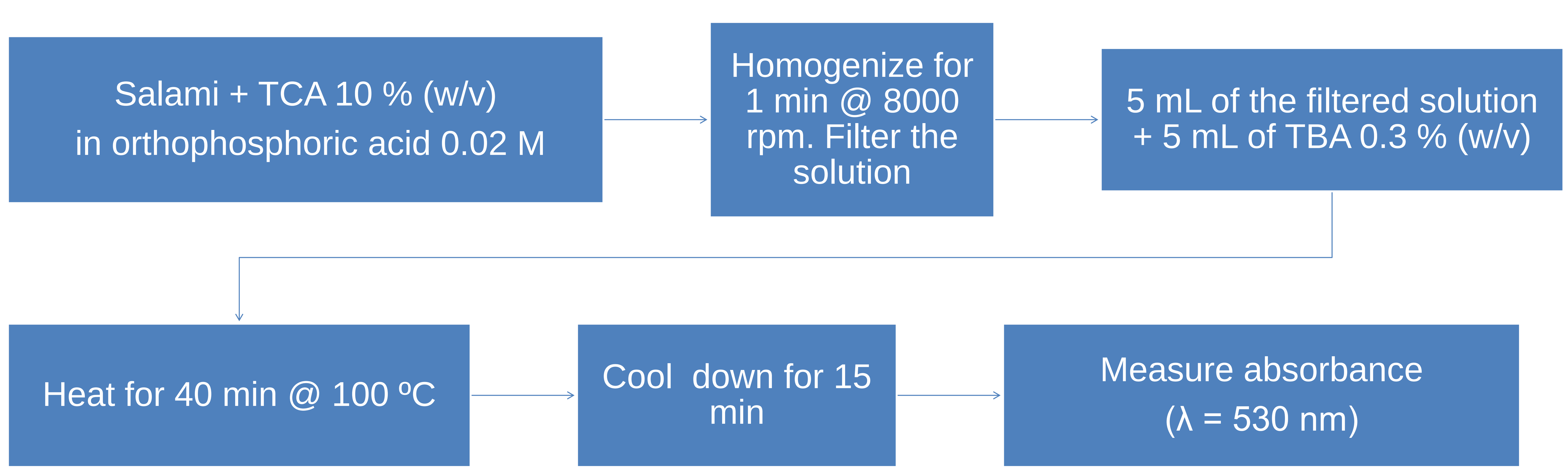

Fig. 4 TBARS assay.

RESULTS AND DISCUSSION

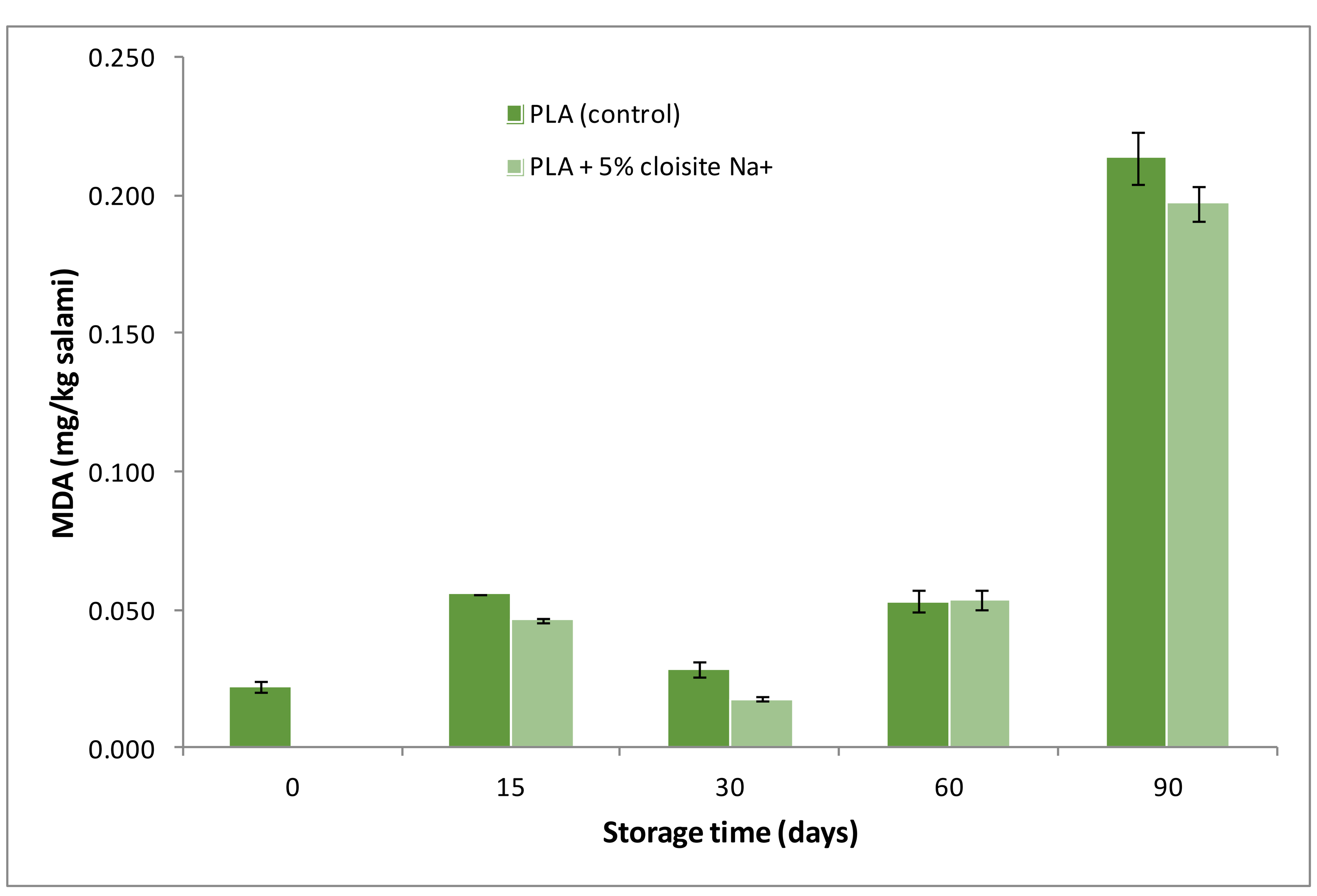

Fig. 5 Results of the thiobarbituric acid reactive substances (TBARS) assay of salami samples packaged during 90 days with a PLA film containing 5% nanoclays and a control film (PLA).

Regarding the TBARS test, results showed that salami packaged with the nanocomposite presented lower amount of MDA after all contact periods, except after 60 days, where there were no differences between control and nanofilm (Fig. 5).

CONCLUSIONS

The developed films were evaluated regarding their effectiveness against lipid oxidation. Thiobarbituric Acid Reactive Substances (TBARS) assay indicated that the new nanocomposite tends to reduce lipid oxidation of the packaged model food due to the presence of MMT. Therefore, this can be a good alternative to conventional plastics to reduce the lipid oxidation of processed meat products, extending their shelf life.

Further studies to evaluate differences between PLA and the nanocomposite (PLA-5%Cloisite®Na^+) in what regards to the mechanical and barrier properties would be valuable.

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ACKNOWLEDGEMENT

This work was supported by the research project "Development of methodologies for the evaluation of polymeric food packaging components and determination of their structural and mechanical properties" (2016DAN 1289) funded by the National Institute of Health Dr Ricardo Jorge.