FERMENTATION KINETICS OF MALTED OAT BY *LACTOBACILLUS CASEI*

Ana Herrera, Néstor Gutiérrez, Virginia Nevárez, Samuel Pérez, Enrique Ortega-Rivas, Ivan Salmerón*; School of Chemical Sciences, Autonomous University of Chihuahua, University Circuit I, New University Campus, Chihuahua, 31125, Mexico;
*Corresponding author: isalmeron@uach.mx

Key words: oat, fermentation, casei

Introduction.
Most of the probiotic market is represented by milk based products (43 %); however a major drawback is that such functional products are not suitable for consumers with lactose intolerance and cholesterol health issues. Oats confer positive effects on blood cholesterol levels and can support the growth of probiotic microorganisms (1). The malting process provides better sensorial characteristics to the grain through germination and a controlled heating process where the Maillard reactions take place (2). The aim of this work was to evaluate a malted oat medium as a fermentation substrate for the probiotic strain *L. casei 431* and its potential as a non-dairy probiotic drink.

Methods. Malted oat (Avena sativa var. Karma) was obtained as reported by Salmerón (2010). The fermentation media was formulated with malted oat 3% (w/v) and 1.5 % (w/v) of sucrose. The cereal media was inoculated at 3% (v/v) with *Lactobacillus casei* (L. casei 431®.Chr. Hansen, Milwaukee, Wis., U.S.A).The fermentation process was carried out in an incubator (I5211-DS Labnet, Germany) a 27 °C and 184 rpm. The viable cell population was monitored for 24 h during fermentation and for 30 days (every 5 days) for survivability, by the Miles and Misra method.

Results. The results shown in figure 1 and 2 exhibit that the nutrient content of the malted oat media was capable to support cell viability at probiotic levels (7 log cfu/mL) after 24 h of fermentation and during a 30 days storage period at 5 ºC. In figure 1 it is observed that the lag phase did not appear during fermentation and the maximum growth (8.4 log cfu/mL) was reached after 10 h, 2 h less than the reported time by Gokavi et al (2005).

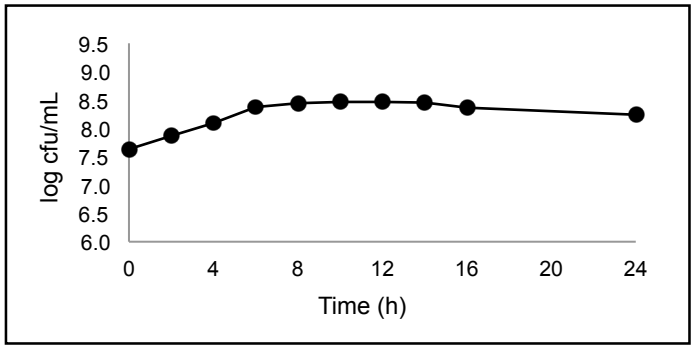

Fig.1 Kinetic fermentation of *L. casei* in malted oat based media.

The final pH value (3.1) was lower than the value reported by the same previous author (3.79) this is mainly due to the non-malted oat media used which is lower in fermentable sugars thus less levels of organic acids are produced. During the storage period (figure 2) the cell viability had a drop of around 1 log cfu/ml after 5 days afterwards the cell concentration was constant (8 log cfu/ml) during 15 days. At the end of the storage period the cell viability was of 7.6 log cfu/mL, which is within the probiotic level.

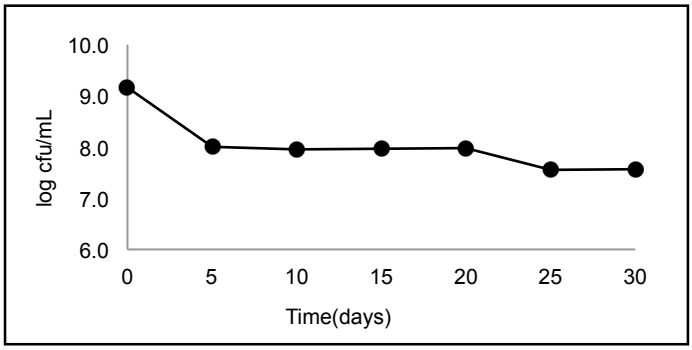

Fig.2 Survivability of *L. casei* in a malted oat based media.

Conclusions.
The malted oat media is a substrate capable to support the growth of *L. casei* 431® and maintain the probiotic cell population during a 30 day storage period. The fermented oat beverage developed in this work can be considered as a potential non-dairy probiotic beverage.

Acknowledgements.
The author A. Herrera acknowledges the support of the Mexican Council of Science and Technology (CONACYT) for the MSc studentship (Nº 389453) that made possible this work.

References.
1. Gupta, S, Cox, S, and Abu-Ghannam, N. (2010). *Biochem. Eng. J.* 52:199-204.

2. Salmerón, I. (2010). Chapter 9: Physicochemical composition and sensory evaluation of cereal-based beverages fermented with probiotic lactic acid bacteria. In: *Chemical and sensorial properties of cereals fermented with human derived lactic acid bacteria*. School of Chemical Engineering and Analytical Science, University of Manchester. 191-217.

3. Gokavi, S, Zhang L, Huang, M, Zhao, X, and Guo, M. (2005). *J. Food Sci.* 70 (4): 216-223.