



Abstract

Inhibitory Activity of Three Lactic Acid Bacteria Strains: Bacteriocin Production [†]

Zahia Benmouna Benamar ^{1,*} , Fatiha Dalache ^{2,3}, Halima Zadi Karam ² and Nour-Eddine Karam ²

- ¹ Department of Living and Environment, Faculty of Natural Sciences and Life, University of Science and Technology Mohamed BOUDIAF, USTOMB, P.B. 1505, El Mnaouar, Bir El Djir, Oran 31000, Algeria
- ² Laboratory of Micro-Organisms Biology and Biotechnology, University of Oran 1, P.B. 1524, El M'Naouer, Oran 31000, Algeria; fdalache2@yahoo.fr (F.D.); karam_halima@yahoo.fr (H.Z.K.); nek1948@yahoo.fr (N.-E.K.)
- ³ Department of Biology, Faculty of Natural Sciences and Life, University of Mostaganem, P.B. 188, Mostaganem 27000, Algeria
- * Correspondence: zahia_benmouna@yahoo.fr; Tel.: +213-797-572-557
- [†] Presented at the 2nd International Electronic Conference on Foods—Future Foods and Food Technologies for a Sustainable World, 15–30 October 2021; Available online: <https://foods2021.sciforum.net/>.

Abstract: Background: The bacteriocins from lactic acid bacteria (LAB) are candidates for applications such as biopreservation of food. Due to their potential as alternatives to antibiotics, their antimicrobial activities against pathogenic and spoilage bacteria are of great research interest. The enterocins, which are produced by the *Enterococcus* species have been widely studied; they are recognized as probiotics by several researchers [1]. In the present study, we explore three LAB strains: *Enterococcus* sp. CM9, *Enterococcus* sp. CM18, and *Enterococcus* sp. H3 that produce bacteriocins named enterocins CM9, enterocins CM18, and enterocins H3, respectively [2]. Method: For the antimicrobial test, fifteen pathogenic bacteria were tested by the spot agar [3] and the well diffusion assays [4]. For the characterization of enterocins, the effect of pH, heat, and chemical agents on the activity of enterocins was evaluated by the well diffusion assay [5]. Results: The LAB used in the present work showed inhibitory activity against all pathogenic bacteria tested, while the supernatant of LAB exhibited inhibitory activity against *L. monocytogenes*, *E. coli* and *S. Typhimurium*. The enterocins produced by the three LABs appeared stable to adjustment of an acidic or basic pH. They were resistant to the temperature until 121 °C for 15 min, therefore demonstrating their thermostability. Excepting the triton X100, they remained stable after treatment with between 20 and 80, NaCl, SDS, urea, and EDTA. Conclusion: The results indicate that the enterocins CM9 and CM18 belong to class IIa bacteriocins and experimentation will be required for their application.

Keywords: lactic acid bacteria; stability; bacteriocins; characterization



Citation: Benmouna Benamar, Z.; Dalache, F.; Zadi Karam, H.; Karam, N.-E. Inhibitory Activity of Three Lactic Acid Bacteria Strains: Bacteriocin Production. *Biol. Life Sci. Forum* **2021**, *6*, 117. <https://doi.org/10.3390/Foods2021-10939>

Academic Editor: Susana Casal

Published: 13 October 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/Foods2021-10939/s1>.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Zommiti, M.; Chevalier, S.; Feuilloley, M.G.; Connil, N. Special Issue “Enterococci for Probiotic Use: Safety and Risk”. *Microorganisms* **2022**, *10*, 604. [[CrossRef](#)]
2. Benmouna, Z.; Dalache, F.; Zadi-Karam, H.; Karam, N.E.; Vuotto, C. Ability of Three Lactic Acid Bacteria to Grow in Sessile Mode and to Inhibit Biofilm Formation of Pathogenic Bacteria. In *Advances in Microbiology, Infectious Diseases and Public Health. Advances in Experimental Medicine and Biology*; Donelli, G., Ed.; Springer: Cham, Switzerland, 2020; Volume 14, pp. 105–114.
3. Fleming, H.P.; Etchells, J.L.; Costilow, R.N. Microbiological inhibition of isolate of *Pediococcus* from cucumber brine. *Appl. Environ. Microbiol.* **1975**, *30*, 1040–1042. [[CrossRef](#)] [[PubMed](#)]
4. Schillinger, U. Antibacterial activity of *Lactobacillus* sake isolated from meat. *Appl. Environ. Microbiol.* **1989**, *55*, 1901–1906. [[CrossRef](#)] [[PubMed](#)]
5. Albano, H.; Todorov, S.D.; Van Reenen, C.A.; Hogg, T.; Dicks, L.M.T.; Teixeira, P. Characterization of two bacteriocins produced by *Pediococcus acidilactici* isolated from “Alheira”, a fermented sausage traditionally produced in Portugal. *Int. J. Food. Microbiol.* **2007**, *116*, 239–247. [[CrossRef](#)] [[PubMed](#)]