



BATCH PRODUCTION OF ANTIMICROBIAL ACTIVITY FROM *Streptococcus* sp., ISOLATED FROM POZOL, GROWING IN COMPLEX MEDIA CONTAINING WHEY OR MOLASSES

Mayra-Alejandra López-Ortega¹, Javier Pineda-González¹, Wendy-Yazmín Sánchez-Reyes¹, Adriana-Inés Rodríguez-Hernández¹, Javier Piloni-Martini², Gloria Díaz-Ruiz³, Norberto Chavarría-Hernández¹

¹Cuerpo Académico de Biotecnología Agroalimentaria y ²Cuerpo Académico de Zootecnia y Calidad de Productos en Especies Pecuarias. Instituto de Ciencias Agropecuarias, Universidad Autónoma del Estado de Hidalgo. Tulancingo, Hidalgo, CP 43600 norberto@uaeh.edu.mx; ³Departamento de Alimentos y Biotecnología, Facultad de Química, Universidad Nacional Autónoma de México, México DF, CP 04510

Key words: bacteriocins, Listeria, sustainability

Introduction. Nowadays, industry is interested in looking for alternatives for the control of microorganisms on the basis of sustainability. In the specific case of bacteriocins, which are antimicrobial (AM) peptides produced by certain bacteria, where the roll of lactic acid bacterium (LAB) specimens are outstanding, some groups have proposed to apply them as antibiotics in clinical settings [1], and other groups have found versatile applications in the food industry mainly as preservatives for processed foods [2], being emblematic the case of nisin from *Lactococcus lactis*, which has been used in the food industry since 1969. In this sense, researchers do continue improving the fermentation processes for AM production, where the bioreactor operating conditions and the culture medium formulation are important factors that must be taken into account [3]. The present work deals with the AM production by *Streptococcus* sp., LAB isolated from the Mexican fermented beverage called *Pozol*. Fermentations were batch-run into an agitated reactor using culture media containing whey or molasses.

Methods. *Streptococcus* sp. (AMStrep) (Dra. C. Wachter, FQ-UNAM). *Listeria monocytogenes* was used as indicator. For the AM production, AMStrep was activated in MRS (1%) incubating at 30°C, 24h; then, inoculated into a 3L stirred tank (Applikon) containing 2.4 L of M1 culture medium (APT medium [4] added with 1% w/v whey) or M2 medium (4% w/v molasses, 2% w/v soy trypticase broth, 0.5% w/v yeast extract, 0.3% w/v Tween 80, 1.4×10⁻³ % w/v MnCl₂). Process conditions: 30°C; 200 rpm (2 Rushton turbines); aeration, 0 or 0.5 vvm. 100mL-samples were taken every 3h during 15h, to evaluate biomass (X, g/L) by the dried weight method, and AM activity (AU/mL) by the well diffusion method against *L. monocytogenes* [5].

Results. As a main result due to the organic acids realising by AMStrep, all fermentations exhibited a similar pH evolution, decreasing from 6.5 to 4.5 at t=6 h, to got a value of 4.4 at the end of processes. On the other hand, no matter of the used media and operating conditions, the exponential growth phase appeared to finished by the sixth hour (Fig. 1a) giving place to maximum values of X from 1.2 to 1.6 g/L. Furthermore, AM production exhibited an important dependence on the used culture media as well as on the aerating conditions (Fig. 1b). In general, the

maximum AM production values were achieved between the third and ninth hour of cultivation, being notably higher (i.e., 116 AU/mL) those of M2 medium processes, which contained molasses, with aeration rate of 0.5 vvm. Moreover, for this system the maximum specific AM activity of 127±2.38 AU/mg_{biomass} was exhibited at t=3h.

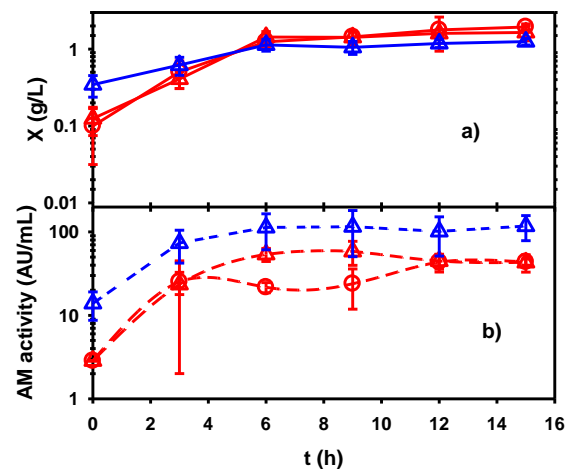


Fig.1 *Streptococcus* sp., isolated from *Pozol*, growing in a 3L fermentor using media containing whey (M1, red symbols) or molasses (M2, blue symbols). Two aerating conditions: 0 vvm (circles) and 0.5 vvm (triangles). AM activity was tested against *Listeria monocytogenes*.

Conclusions. It was characterised the antimicrobial activity production of *Streptococcus* sp., isolated from *Pozol*, in batch fermentations, testing the effects of culture medium formulations and aerating conditions. Better results were obtained with M2 medium that contained molasses, using 0.5 vvm.

Acknowledgements. PROMEP 2012 "Biotecnologías basadas en biomoléculas funcionales para el sector agroalimentario" and PIFI-2012-13MSU0017T-04, UAEH. MA López-Ortega and WY Sánchez-Reyes are CONACYT fellows, No. 258212 and 273766, respectively.

References

1. Cotter PD, Ross RP, Hill C (2012) *Nat Rev Microbiol.* 11: 95-105.
2. Balciunas EM, Castillo FA, Todorov SD, Gombossy BD, Converti A, Pinheiro de Souza R (2013) *Food Control.* 32:134-142.
3. González-Toledo SY, Domínguez J, García BE, Prado LA, Regalado C (2010) *J Food Sci.* 75: M347-M353.
4. Evans JB, Niven CF (1951) *J Bacteriol.* 62:599-603.
5. Mendoza-Mendoza B (2012) Tesis de Maestría. ICAp, UAEH. Hidalgo, México.