MICROBIOLOGICAL STUDY OF A TRADITIONAL SOUR GRUEL "ATOLE AGRIO", A FERMENTED MAIZE PRODUCT.

Dolores Reyes-Duarte[a], Gloria Díaz-Ruiz[b], Ma. Teresa Flores E.[b], Carlina Peña[c], Carmen Wacher-Rodarte[b], Dora Centurión-Hidalgo[d], Judith Espinosa-Moreno[d]; a)Departamento de Procesos y Tecnología, UAM- Cuajimalpa, México D.F., b)Depto. de Alimentos y Biotecnología, Fac. Química, UNAM, México, D.F., c)Posgrado en Ciencias Naturales e Ingeniería, UAM- Cuajimalpa, México D.F., d)División Académica de Ciencias Agropecuarias, UJAT, Villahermosa, Tab.; dreyes@correo.cua.uam.mx

Key words: Fermented food, sour gruel, microbiology

Introduction. Traditional fermented foods are produced by natural fermentation, where no inoculum is added. In Southeastern Mexico, maize fermented products as pozol and sour gruel "atole agrio", are usually consumed[(1)]. "Atole agrio" is an acidic beverage, non-alcoholic prepared from dough made with coarsely ground, ripe but not dry maize, which is fermented (solid or liquid fermentation), dissolved in water and boiled until a gruel is obtained. This beverage is made only in the months of May and September[(2)]. Fermented foods are composed of a complex microbiota adapted to microenvironments with extreme acidity, temperature changes, microanaerobiosis, including low mass transfer, among others, and could be an interesting source of metabolites or enzymes with potential properties for biotechnology applications.

The aim of this paper was to identify the presence of some microorganisms in the "atole agrio" before, during and after solid or liquid fermentation, that could be responsible for the changes in this fermented beverage.

Methods. Before grinding maize grains, and during fermentations, samples were taken for microbiology analysis. Non-lactic aerobic mesophilic bacteria (MB) were enumerated on Plate Count Agar plates, lactic acid bacteria (LAB) on MRS agar, amylolytic LAB (A-LAB) on MRS-starch, enterobacteria (EB) on Violet Red Bile Glucose Agar and yeasts and moulds (YE) on potato dextrose agar (PDA), all incubated at 30°C.

Results. As shown in tables 1 and 2, microbial growth was observed in all groups evaluated. Changes in pH from 6.6 to 3.64 for solid fermentation (SF) and to 3.98 for liquid fermentation (LF), shows microbial activity of lactic acid bacteria. SF shows lower growth than LF, possible for diffusion problems of substrates, oxygen or themselves. The presence of enterobacteria is diminished at the end of both fermentations. The presence of aerobic mesophilic bacteria is higher in LF than in SF.

Table 1. Concentration of microorganisms in the liquid fermentation (CFU / ml).

Time (h)	LAB	A-LAB	MA	YE	EB
0	6.5 X10^{8}	1.2 X10^{6}	1.2 X10^{7}	8.6 X10^{6}	2.0 X10^{7}
12	4.7 X10^{9}	6.2 X10^{9}	6.2 X10^{9}	>10^{8}	*
24	7.9 x10^{9}	4.4 x10^{9}	1.0 x10^{10}	1.8 x10^{8}	1.0 x10^{4}

Table 2. Concentration of microorganisms in the solid fermentation (CFU / ml).

Time (h)	LAB	A-LAB	MA	YE	EB
0	>25	>10^{6}	7.8 X10^{6}	3.9 X10^{6}	8.5 X10^{6}
12	4.9 X10^{11}	3.3 X10^{9}	1.8 X10^{9}	5.2 X10^{8}	1.6 X10^{7}
24	2.5 x10^{9}	1.1 x10^{9}	6.7 x10^{8}	1.5 x10^{8}	1.0 x10^{4}

Conclusions. The microbial composition of both solid and liquid fermentations was similar, except for the case of aerobic mesophiles, which was higher in LF. It is possible explained by diffusion problems in the SF. Acidified fermented foods are considered to be safer than the non-fermented ones, as the growth of pathogenic bacteria, as enterobacteria, is commonly suppressed[(3)] or signifcantly reduced[(4)], as occurs in these sour gruel fermentations.

Acknowledgements. We thank project CONACYT CB-2008-01 No. 101784 for financial support.

References.

1. Wacher C, Cañas A, Bárzana E, Lappe P, Ulloa M, Owens JD (2000) Food Microbiol. (17):251-256.
2. Valderrama A. (2012). Diversidad de bacterias lácticas del atole agrio de Villahermosa Tabasco. Tesis para obtener el título de Químico en alimentos. UNAM.
3. Simango C, Rukure G (1992) J. Appl. Bacteriol. (73): 37-40.
4. Mensah P, Tomkins AM, Drasar BS, Harrison TJ (1991) J. Appl. Bacteriol. (70): 203-210.