Probiotic Potential of *Saccharomyces cerevisiae* and *Kluyveromyces marxianus* strains Isolated from Indigenous Fermented West African Foods

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Introduction

Saccharomyces cerevisiae and *Kluyveromyces marxianus* are two yeast species associated with the traditional fermentation of many African indigenous fermented foods and beverages. While strains of *S. cerevisiae*, especially those originating from the Western countries, have been extensively studied for their probiotic properties, *K. marxianus,* which is an emerging probiotic species, has received little attention for its probiotic potentials. Now, there is limited information on the potential probiotic effect of these strains from African origin. Therefore, the purpose of this study was to isolate and characterize *S. cerevisiae* and *K. marxianus* strains from three different traditional fermented foods from West Africa, and to determine their effect on the permeability of polarized monolayers of human intestinal epithelial model based on Caco-2 cells.

Method

Strains of *S. cerevisiae* and *K. marxianus* were isolated from three different indigenous spontaneously fermented products, namely *nunu* (cattle-milk based), *lait caillé* (cattle-milk based) and *mawè* (cereal-based dough) obtained from Ghana, Burkina Faso and Benin respectively. The strains were identified using phenotypic and genotypic methods including micro- and macro-morphology of colonies, carbohydrate fermentation tests and sequencing of the D1/D2 region of the 26S rRNA gene. Survival and growth of yeasts strains in Yeast Nitrogen Base (YNB (pH 2.5) and YNB (0.3% (w/v) oxgall) at 37^{o}C for 24 h were used as indicators of survival in the human GIT. The effect of yeast cultures on the transepithelial electrical resistance (TER) of polarized Caco-2 monolayer was used as a measure of their impact on the intestinal epithelial barrier integrity.

Results

In total, 121 strains of *S. cerevisiae* were isolated from *nunu*, *lait caillé* and *mawè* while eighty. K. *marxianus* strains were isolated only from *mawè*. Identifications were based on 99-100% homology of D1/D2 region of 26S rRNA gene sequences with GenBank sequences. Fifteen *S. cerevisiae* strains and five *K. marxianus* strains selected for further studies, grew in bile salts by average growth rate of 0.11 ± 0.04 - 0.24 ± 0.03 OD_{600}/h. Only *S. cerevisiae* and *K. marxianus* strains from *mawè* grew in low pH (2.5) with average growth rate of 0.04 ± 0.02 OD_{600}/h for *K. marxianus* and 0.01± 0.01 OD_{600}/h for *S. cerevisiae* as compared to average growth rate in positive controls (0.10 - 0.20 OD_{600}/h). Although, *S. cerevisiae* from *nunu* and *lait caillé* did not grow in pH 2.5, they showed between 57-74% survival in the same conditions after 4h of incubation.

Discussion

According to the results, the strains of *K. marxianus* have a better chance of survival in the human GIT than *S. cerevisiae* strains. Identifying probiotic yeasts in these traditional fermented West African foods is of high value, as they would add potential health benefits to the consumers of these nutritious food products.

Keywords: *S*. cerevisiae, *K. marxianus*, transepithelial electrical resistance, Caco-2, West African traditional fermented foods