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Relative Expression and Detection of MUB Adhesion Domains and Plantaricin-Like Bacteriocin among Probiotic Lactobacillus plantarum-Group Strains Isolated from Fermented Foods

Authors : Sundru Manjulata Devi, Prakash M. Halami

Abstract : The immemorial use of fermented foods from vegetables, dairy and other biological sources are of great demand in India because of their health benefits. However, the diversity of Lactobacillus plantarum group (LPG) of vegetable origin has not been revealed yet, particularly with reference to their probiotic functionalities. In the present study, the different species of probiotic Lactobacillus plantarum group (LPG) i.e., L. plantarum subsp. plantarum MTCC 5422 (from fermented cereals), L. plantarum subsp. argentoratensis FG16 (from fermented bamboo shoot) and L. paraplantarum MTCC 9483 (from fermented gundruk) (as characterized by multiplex recA PCR assay) were considered to investigate their relative expression of MUB domains of mub gene (mucin binding protein) by Real time PCR. Initially, the allelic variation in the mub gene was assessed and found to encode three different variants (Type I, II and III). All the three types had 8, 9 and 10 MUB domains respectively (as analysed by Pfam database) and were found to be responsible for adhesion of bacteria to the host intestinal epithelial cells. These domains either get inserted or deleted during speciation or evolutionary events and lead to divergence. The reverse transcriptase qPCR analysis with mubLPF1+R1 primer pair supported variation in amplicon sizes with 300, 500 and 700 bp among different LPG strains. The relative expression of these MUB domains significantly unregulated in the presence of 1% mucin in overnight grown cultures. Simultaneously, the mub gene expressed efficiently by 7 fold in the culture L. paraplantarum MTCC 9483 with 10 MUB domains. An increase in the expression levels for L. plantarum subsp. plantarum MTCC 5422 and L. plantarum subsp. argentoratensis FG16 (MCC 2974) with 9 and 8 repetitive domains was around 4 and 2 fold, respectively. The detection and expression of an integrase (int) gene in the upstream region of mub gene reveals the excision and integration of these repetitive domains. Concurrently, an in vitro adhesion assay to mucin and exclusion of pathogens (such as Listeria monocytogenes and Micrococcus leuteus) was investigated and observed that the L. paraplantarum MTCC 9483 with more adhesion domains has more ability to adhere to mucin and inhibited the growth of pathogens. The production and expression of plantaricin-like bacteriocin (plnNC8 type) in MTCC 9483 suggests the pathogen inhibition. Hence, the expression of MUB domains can act as potential biomarkers in the screening of a novel probiotic LPG strain with adherence property. The present study provides a platform for an easy, rapid, less time consuming, low-cost methodology for the detection of potential probiotic bacteria. It was known that the traditional practices followed in the preparation of fermented bamboo shoots/gundruk/cereals of Indian foods contain different kinds of neutraceuticals for functional food and novel compounds with health promoting factors. In future, a detailed study of these food products can add more nutritive value, consumption and suitable for commercialization.

Keywords : adhesion gene, fermented foods, MUB domains, probiotics
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