CHAPTER 1

INTRODUCTION

Exopolysaccharides (EPS) or microbial extracellular polysaccharides are the class of water-soluble polymers produced by a wide range of microorganism. Different bacterial species produce EPS located outside the cell wall (Sutherland, 1990). Some lactic acid bacteria (LAB) secrete a polysaccharide polymer. This EPS is economically important because it can impart functional effects to food and confer beneficial health effects. LAB have a Generally Recognized As Safe (GRAS) classification and are likely candidate for the production of functional EPS. Current challenges are to improve the productivity of EPS from LAB and to produce EPS of a structure and size that impart the desired functionality. The engineering of improvements in these properties will depend on a deep understanding of the EPS biosynthetic metabolism and of how the structure of EPS relates to a functional effect when incorporated into a food matrix (Welman and Maddox, 2003).

EPS from LAB have found their most valuable application in the improvement of the rheology, texture and mouthfeel of fermented milk products, such as yoghurt. There is a high consumer demand for smooth and creamy yoghurt products, which is typically met by increasing the content of fat, sugars, proteins or stabilizers (e.g. pectin, starch, alginate or gelatin). Consumer demand for products with low fat or sugar content and low levels of additives, as well as cost factors, make EPS a viable alternative (de Vuyst and Degeest, 1999). An additional hypothesized physiological benefit is that EPS will remain for longer in the gastrointestinal tract, thus enhancing colonization by probiotic bacteria (Duboc and Mollet, 2001). In addition, EPS from LAB have been claimed to have antitumor effects (Kitazawa *et al.*, 1998).

EPS, which was produced by lactic acid bacteria, has been interested recently because the food grade produce polymers important in determining the rheological properties of dairy products and may have application in nondairy foods (Sutherland, 1998). Evaluation of the functional attributes of potentially useful EPS in foods requires available material in sufficient quantities.

This generally requires scale-up from bench to pilot scale fermentation, which once optimal conditions have been identified (Kimmel *et al.*, 1997)

The production of bacterial EPS in submerged cultivation is often accompanied by a substantial increase in the fermentation broth viscosity resulting in impaired air distribution in the medium. Under this condition, oxygen availability might become the limiting factor for cell metabolism, thus negatively affecting EPS synthesis and quality (Peter *et al.*, 1989). In addition, the agitation of viscous culture fluids is much more costly both in terms of energy expenditure and of stirring equipment than in low viscosity broth.

Solid substrate fermentation (SSF) has been suggested as a suitable alternative to submerged fermentation in order to prevent the problems connected with high viscosity of culture broth. Using cheap and easily available substrates, such as agriculture and food industry by-products, are another advantages of this process. Many processes based on SSF have been developed for the production of enzymes, organic acids, alcohol, protein enriched feed, secondary metabolites, unsaturated fatty acids and other microbial products (Pandy, 1992; Soccol *et al.*, 1994)

The objectives of this investigation are:

1. To study on growth and exopolysaccharide productivity of *Pediococcus urinae-equi* TISTR 1499 under submerged and solid state culture.

2. To select for the suitable solid support for EPS production by *P. urinae-equi* TISTR 1499.

3. To investigate the optimal conditions for EPS production by *P. urinae-equi* TISTR 1499 cultured under solid support.