CHAPTER I

INTRODUCTION

Yeasts are responsible for the microbiological spoilage of wide range of chilled and ambient stable products including milk and dairy, fermented salads, and mayonnaises, bakery goods, jams and preserves, fruit products, raw meat, and fish. One of the yeast of major concern is *Rhodotorula muciliginosa* which is reported to be a problem in food spoilage and has been recognised as an emerging yeast pathogen in humans (Wirth & Goldani, 2012a). Indeed, *R. mucilaginosa* is usually isolated from foods and beverages. Several studies have reported the presence of *R.mucilaginosa* in peanuts, apple cider, cherries (Venturini et al., 2002), fresh fruits, fruit juice (Las Heras-Vazquez et al., 2003; Tournas et al., 2006), cheese, sausages (Gardini et al., 2001), edible molluscs (Kajikazawa et al., 2007), and crustaceans (Eklund et al., 1965; Senses-Ergul et al., 2006). Furthermore, *R. mucilaginosa* has ability to form biofilm (Ganttle et al., 2011).

Biofilms are an aggregation of microorganism attached to and growing on a surface (Costerton & Stewart, 2001). Yeast biofilms contribute to quality impairment of industrial processes and also play an important role in clinical infections. There are several techniques to control the spoilage of yeast and fungi, and these techniques have been widely accepted. Some method of preservation used in the food industries is chemical preservatives such as propionic, sorbic, and benzoic acid. However,

consumers demand for minimally processed foods and reduction in the usage of chemical preservatives is now a major concern (Cleveland et al., 2001).

Alternatively, bio-preservative from lactic acid bacteria (LAB) can be used as a replacement to chemical preservative. LABs have long history in preserving foods from spoilage microorganism. They are generally recognized as safe (GRAS) besides producing several metabolites with beneficial health effect and reducing spoilage (Magnusson et al., 2003; Crowley et al., 2013a). Indeed, LAB are found in many environments and occur naturally in variety of food products such as dairy, meat products, vegetables, fruits, and fermented product (Carr et al., 2002). Most of the researches of antifungal ability of LAB were due to the production of an antifungal protein or proteinaceous compound. Furthermore, some of the LAB, such as *L. plantarum* and *L. sanfrancisco*, produce special organic acids with antifungal properties (Corsetti et al., 1998; Lavermicocca et al., 2003).

Bacteriocins are known to exhibit good potential for use in the food industry and as bio-preservation agents (Ennahar et al., 1999). The notable property of LAB supernatant is the heat stability of the antifungal compounds present in it. This will promote the use of LAB supernatant and/or antifungal compounds in heat-treated foods. The supernatant of certain LAB have been reported to be active within a wide range of pH, starting from as low as pH 3 and up to pH 9 depending upon the strain (Muhialdin et al., 2011b). This could be considered as a major breakthrough in the use of LAB in food preservation compared with the chemical preservatives which are usually active at low pH between pH 3 and 4.5.

Lactic acid bacteria isolated from different sources are well documented to have anti-adhesion activity. Indeed, LAB cell free supernatants isolated from various sources of honey sample have anti-adhesion activity against biofilm produced by several types of *Candida* spp. (Bulgasem et al., 2015).

In Malaysia, studies on inhibitory activity of LAB against *R. mucilaginosa* have not been well documented. Therefore, the aim of this study was to evaluate the possibilities of LAB to act as an inhibitory agent against *R. mucilaginosa*. These LABs and their secondary antimicrobial metabolites could be use to extend food shelf life. Thus the objectives of this study were to:

1. Isolate and identify spoilage yeast *R. mucilaginosa* from vegetables and fruits.
2. Evaluate inhibitory activity of LAB and identify the species by API 50CHL and 16S rDNA gene sequence.
3. Determine the effect of pH, heat and enzymatic treatment of cell free supernatant of LAB on inhibitory activity against *R. mucilaginosa*.
4. Determine anti-adhesion activity of cell free supernatant of LAB against biofilm produced by *R. mucilaginosa*.