# CHAPTER I

# INTRODUCTION

## 1.1 Introduction

The primary role of food is to provide sufficient nutrients to meet metabolic requirements while giving the consumer a feeling of satisfaction and well-being. In addition to meeting nutritional needs, consumption of specific food composition may also modulate various physiological functions resulting in increased health and prevention of certain diseases (Koletzko, Aggett, Bindels, Bung, & Ferra, 1998). The definition of healthy daily dietary consumption has therefore expended from emphasis on survival and hunger satisfaction to the promotion of well-being and reduction of acquiring disease. These concepts are particularly important in light of the increasing cost of health care, the steady increase in life expectancy, and the desire for improved quality of life post-retirement age (Roberfroid, 2002).

High intake of sugars, salt, saturated and trans-fatty acids, low intake of fibers, vitamins, and essential minerals are increasingly becoming the norm of current dietary intake of developing nations. These habits are causing the main problems of non-transmissible chronic-degenerative diseases. The development of new food products

that contain biologically active substances, has become the mainstay of recent research activities to help reduce the risk of such illness (Roberfroid, 2002). This food, categorically called functional food, was defined initially in Japan during the 1980's as "foods for specific health use" (FOSHU). This definition is now extended to describe foods or nutrients whose ingestion lead to important physiological changes in the body that are separate and distinct from those associated with their role as nutrients. All foods are functional at some physiological level because they provide nutrients or other substances that furnish energy, sustain growth, or maintain/repair vital processes. However, functional foods move beyond these necessities, providing additional health benefits that may reduce disease risk and/or promote optimal health. Functional foods include conventional foods, modified foods (fortified, enriched, or enhanced) and medical foods.

Phenolic compounds with antioxidant activities play important roles in enriching the nutritional and therapeutical properties of functional food. This is because the antioxidant activities of these compounds exhibits a myriad of biological activities such as antibacterial, anti-carcinogenic, anti-viral, anti-allergic, anti-inflammatory and immune-stimulating effects (Scalbert, Manach, Morand, & Remesy, 2005). There are opportunities to enhance the nutritional as well as the functional properties of yogurt by adding green tea. This is because Yogurt eating, apart from the nutritional benefits of consuming conserved milk, is associated with a number of health benefits including improvement in lactose metabolism, anti-mutagenic properties, anti-carcinogenic properties, reduction in serum cholesterol and management of hypertension, anti-diarrheal properties, immune system stimulation, improvement in inflammatory bowel disease and suppression of *Helicobacter pylori* infection (Shah, 2000). Lactic acid bacteria in yogurt produced lactic acid from milk sugars by a process called fermentation (Adams & Moss, 1995). *Lactobacillus delbrueckii spp. bulgaricus*, along

with *Streptococcus thermophilus* are the essential starter microorganisms for the production of yogurt (Heller, 2001). These bacteria are linked with positive health effects, such as improvement of lactose digestion and elimination of symptoms of lactose intolerance (Guarner et al., 2005).

## 1.2 Statement of Problem

The fermentation of food is made possible by the metabolic activities of microbes which results in partial degradation of macronutrients and the formation of many useful and healthy fermentation byproducts. This is evident from traditional fermentation of soya bean, vegetables and milk i.e. Tempeh, Kim-chi and kefir respectively. Yogurt is a microbial fermentation of milk and its consumption is linked to long life associated with healthy gastrointestinal tract. The present study has explored the approach of co-incubating green tea, a plant material known to be rich in polyphenolic compounds with many therapeutic properties, together with milk and starter culture with the hypothesis that the manipulation of LAB growth by green tea during fermentation of milk would enhance microbial growth and fermentation of milk thus yielding altered microbial metabolic products with enhanced nutritional and therapeutic values. Unfortunately phenolic compounds can undergo severe changes resulting from exposure to heat (Chen & Lin, 2007) and to some extent microbial fermentation (Aura, 2008). There are limited studies on the reactivity and stability of phenolic acids and flavonoids during thermal treatments such as boiling, frying or roasting. The thermal effects on phenolic compounds in *C. sinensis* infusions seem to be highly probable. This is based on lowered contents of flavonoids after boiling vegetables (Crozier, Lean, McDonald, & Black, 1997) and the formation of various degradation products of the flavonol quercetin after boiling onions at 100 °C in an aqueous medium (Rohn, Buchner, Drimel, Rauser, & Kroh, 2007). The aims of this

study were to establish the phenolic compounds of *C.sinensis* both before and after fermentation by yogurt bacteria and subsequently to estimate the antioxidant capacity of the tea-yogurts after fermentation and during refrigerated storage. To obtain the assumed benefits of green tea yogurts it is important to ascertain the followings:

- To investigate the *in vitro* antioxidant activities of Malaysian and Japanese green tea by using ferric-reducing antioxidant power (FRAP) and DPPH radical-scavenging assays. In addition, the total content of phenolics, concentration of phenolic compounds and organic acids **in plant extracts**,
- To determine the effects of green tea on the formation of organic acids, crucial in the acidification process of yogurt, investigate effects of green tea on antioxidant activity of yogurt during fermentation; establish the effects of green tea on the growth of *Lactobacillus spp.* and *S. thermophillus*. **during fermentation,**
- To enrich yogurt with phenolic compounds using green tea-rich natural compounds to produce functional foods exhibiting high antioxidant activity, determine the effects of green tea on yogurt acidification during storage at 4˚ C, investigate the effects of green tea on the microbial production exopolysaccharide in yogurt and determine effects of green tea on *in vitro* inhibition of $\alpha$-glucosidase and $\alpha$-amylase **during storage**
- To determine the influence of green tea supplemented yogurt on its sensory characteristics and various physical and rheological properties, WHC, whey separation and total solid values **during storage**.

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