CHAPTER 1

Introduction

1.1 Statement of problems

Colorectal cancer is a disease more frequently encountered in every year. According to Thailand's latest statistics, colorectal cancer is the third leading cause of death among patients who died from cancer after lung and liver cancers (Attasara and Buasom, 2011). In the United States, colorectal cancer has become the second leading cause of death in all cancer patients (Gloeckler *et al*., 2003). The transformation of normal cells to cancer cells is the result of the interaction between genetic factors and external carcinogens (Suzuki *et al*., 1997). For an example of genetic factors such as persons who have a family history of colorectal cancer, are considered at higher risk for developing this cancer. Furthermore, persons with colonic polyps or certain types of chronic inflammatory bowel diseases are 15-20 times more likely to have colorectal cancer. A number of genes have been found to be related to the occurrence of colorectal cancer such as *MSH2*, *MLH1* and *PMS2* (Solomon and Burt, 2003; Winawer *et al*., 2003). External factors such as diet, consumption of high fat or low fiber foods and eating behaviors with greater preference for fast foods create risk factors for colorectal cancer. Colorectal cancer is currently encountered more in developed countries due to the environmental pollution and exposure to radiation, chemicals, viruses, bacteria and certain types of parasites (Suzuki *et al*., 1997). In addition to those factors, oxidative stress has been reported as another key factor for the development of cancer (Pincemail *et al*., 1998; Valko *et al*., 2006). Among various cures for cancer, plants having efficacy to inhibit the growth and viability of cancer cells have become one of the most popular choices of alternative therapies. Numerous plant species have been reported for their potency to resist cancer, i.e., *Centella asiatica* (Bunpo *et al*., 2005), *Dioscorea membranacea* Pierre ex Prain & Burkill, *Dioscorea birmanica* Prain & Burkill

(Dioscoreaceae), *Siphonodon celastrineus* Griff (Celastraceae) (Itharat *et al*., 2004) and *Millingtonia hortensis* (Tansuwanwong *et al*., 2007). These plants contain various types of antioxidants such as phenolic compounds and Vitamin C. The natural phenolic compounds include flavonoids, flavones, gallic acid, ellagic acid, anthocyanins, carotenoids and derivatives of cinnamic acid (Cowan, 1999; Helmja *et al*., 2007). In addition, the stability of phenolic compounds can also prevent the oxidation of linoleic acid and low-density lipoproteins (LDL), which protect tissues and DNA from destruction by oxidation. Moreover, the phenolic compounds has properties to prevent the occurrence of various types of cancer such as breast cancer, esophageal cancer, skin cancer, colonic cancer, prostate cancer and liver cancer. Furthermore, Vitamin C or ascorbic acid is also a substance capable to prevent cell destruction caused by free radicals and play a role in recycling antioxidants by interacting with other antioxidants. The other properties of vitamin C include dissolve cholesterol, synthesize collagen, anti-cancer and anti-inflammation (Christen *et al*., 2005; Wannamethee *et al*., 2006). Consumption of foods with high antioxidants, results in a high level of antioxidants in the bloodstream capable to prevent the damages from free radicals. According to the aforementioned data, consumption of medicinal plants with antioxidant properties is alternative to prevent and minimize the chances in the development of diseases. Therefore, an exploitation of medicinal plants with high antioxidants efficacy and safe was attempted to treat disease and promote health. From an extensively therapeutic properties or ethnobotany knowledge. In Thailand, *Moringa oleifera* Lam. and *Pseuderanthemum palatiferum* (Nees) Radlk. have recently been reputed for their anticancer properties. However, an evaluation of their effectiveness is still rare. In this research project we are interested in testing the capacity of the extracts from these two plants on colon cancer, one of the main cancer types leading to overall cancer mortality each year (Peng *et al*., 2002; Chen *et al*., 2003; Zhao *et al*., 2004). Besides being used as cancer curing plants, *M. oleifera* and *P. palatiferum* have also been used for gaining health benefits. The latter purpose of use led to the hypothesis that these two plant species might be the rich sources of antioxidants. Since oxidative stress is involved in the development of cancer (Pincemail *et al*., 1998) and antioxidants play a role in preventing cancer by enhancing the immunomodulator, preventing gene transformation and cytotoxicity (Han, 1994; Huang and Williams, 1999; Wargovich *et al*., 2001; Ho *et*

al., 2002), the main purpose of this research is, therefore, to evaluate the capacity of extracts from *M. oleifera* and *P. palatiferum* in inhibiting the proliferation of colon cancer cell lines and in reducing free radicals both *in vitro* and *in vivo*. The results of this study will support the possibility of consumer use and contribute to further research concerning the development of effective medicinal plants for treating colon cancer and enhancing human health and wellness.

1.2 Objectives

1.2.1 To investigate the efficacy of aqueous, ethanolic and hexane extracts from *Moringa oleifera* Lam. and *Pseuderanthemum palatiferum* (Nees) Radlk. in inhibiting the proliferation of colon cancer cell lines.

1.2.2 To determine the antioxidant property of the investigated extracts.

1.2.3 To examine the capacity of extracts with high antioxidant property from 1.2.2 in reducing free radicals in laboratory rats.