CHAPTER I

INTRODUCTION

1.1 Background and Significance of the Study

Epidemiological studies suggest that carcinogenic contamination of the environment as well as mutagenic precursors in foods may be important factors in the occurrence of cancer (Doll and Peto, 1981). Thus, manipulation of the diet may be a noninvasive approach to minimize cancer incidence (Liu, Lin and Milner, 1992). Increased consumption of fruits and vegetables has been found to be associated with a lower incidence of various types of cancer and lower cancer mortality rates in several human cohort and case-control studies for all common cancer sites (Ames, Shigena and Hagen, 1993)

Thailand is well known as a rich tropical-flora country. Some flowers have been used as food and for medicinal purpose for centuries. Different parts of flowers have been incorporated into Thai dishes, such as Somtam flower (กองบรรณาธิการ, 2547). Edible flowers are becoming more popular in Thailand as evidenced by an increase in the number of edible flower cookbooks, culinary magazine articles and television segments. Edible flowers are now being promoted as a healthy food. Many edible flowers, as indigenous vegetable, are high in vitamin C or carotenoids, along with other essential nutrients and non-nutrient components (Ministry of Public Health, 2001). Moreover, many flowers have medicinal properties. It is believed that consumption of these edible flowers can cure some illness and diseases. Flowers are also candidates for cancer chemoprevention. Example, the flowers of *Ixora coccinea* Linn. have been used in traditional Indian systems of medicine for dysentery, healing of ulcers and, more recently, for an anti-tumour activity (Latha and Panikkar, 1998). It was found that methanolic extracts of *Sesbania grandiflora* Desv. flower (Dok-khae) and *Sesbania javanica* Miq. flower (Dok-sano) had antimutagenic activity against Trp-P-1 mutagen in the Ames test (Nagahara *et al.*, 2002). Tangvarasittichai *et al.* (2005) found that DMSO extract of *Sesbania javanica* Miq. flower showed a strong inhibitory effect against aflatoxin B1 and benzo(a)pyrene mutagens in the Ames test. Murakami *et al* (1995) found that methanolic extracts from *Sesbania grandiflora* Desv. flower and leaves possed anti-tumor promoting activity in EBV

activation test. Furthermore, Busayaskul (2006) studied the antimutagenicity of raw and conventional processed (boiled, battered and fried) samples of eight edible flowers namely hua-plee (*Musa sapientum* Linn.), dok-khachon (*Telosma minor* Craib.), dok-khem (*Ixora coccinea* Linn.), dok-khae (*Sesbania grandiflora* Desv.) , dok-bualuang (*Nelumbo nucifera* Gaertn.), dok-fueangfa (*Bougainvillea glabra* Choisy.), dok-sano (*Sesbania javanica* Miq.), and dok-anchan (*Clitoria ternatea* Linn.) using somatic mutation and recombination test (SMART). It was found that none of the samples was mutagenic; however, all samples reduced the mutagenicity of urethane.

Therefore, this study was aimed to investigate the mutagenic and antimutagenic effects of selected flower extracts namely, red hibiscus (*Hibiscus rosa-sinensis* Linn.; ชบา), Mexican creeper (*Antigonon leptopus* Hook. & Arn.; พวงชมพู), ixora (*Ixora coccinea* Linn.; เข็ม), white frangipani (*Plumeria obtusa* Linn., ลั่นทมขาว), malay apple (*Syzygium malaccense* (Linn.) Merr.& Perry; ชมพู่มะเหมี่ยว), kra chiew (*Curcuma sessilis* Gage; กระเจียว) sacred lotus (*Nelumbo nucifera* Gaertn.; บัวหลวง), Indian cork tree (*Millingtonia hortensis* Linn.; ปีป), thong pun chang (*Rhinacanthus nasutus* ((Linn.) Kurz.; ทองพันชั่ง), and pomegranate (*Punica granatum* Linn.; ทับทิม). The assays used in this study were somatic mutation and recombination test (SMART) using *Drosophila melanogaster* and the Ames test using histidine-dependent *Salmonella typhimurium* strains TA 98 and TA 100. In addition, the other biological activity of the flower extracts such as cytotoxicity and antioxidative activity were evaluated.

1.2 Objectives of the Study

The specific objectives of the present study were as follows:

1.2.1 To determine the cytotoxicity of the extracts of selected flowers including, red hibiscus (*Hibiscus rosa-sinensis* Linn.), Mexican creeper (*Antigonon leptopus* Hook. & Arn.), ixora (*Ixora coccinea* Linn.), white frangipani (*Plumeria obtusa* Linn.), Malay apple (*Syzygium malaccense* (Linn.) Merr.& Perry), kra chiew (*Curcuma sessilis* Gage) sacred lotus (*Nelumbo nucifera* Gaertn.), Indian cork tree

(*Millingtonia hortensis* Linn.), thong pun chang (*Rhinacanthus nasutus* ((Linn.) Kurz.), and pomegranate (*Punica granatum* Linn.) using brine shrimp assay.

1.2.2 To evaluate the antioxidative activity and total phenolic content of the selected flowers.

1.2.3 To determine the mutagenicity of the selected flowers and nitrite treated selected flowers using Ames test

1.2.4 To determine the modulating effect of the selected flowers on mutagenicity of 1-aminopyrene-nitrite model after 4 h incubation using Ames test.

1.2.5 To determine the mutagenicity and modulating effect of the selected flowers on urethane in the improved high bioactivation cross of *Drosophila melanogaster*.

1.3 Benefits of the Study

1.3.1 This study provides the information regarding the cytotoxicity, mutagenicity and antimutagenicity of flowers from red hibiscus, Mexican creeper, ixora, white frangipani, malay apple, kra chiew, sacred lotus, Indian cork tree, thong pun chang and pomegranate.

1.3.2 This study provides the information regarding the antioxidative activity and total phenolic content of selected flowers.