CHAPTER I

INTRODUCTION

Bitter gourd (*Momordica charantia* L.) is a tropical plant, belonging to the Cucurbitaceae that includes squash, watermelon, muskmelon and cucumber. It was originally found only in the tropics of the Old World (Ross, 1999). It is probably native to China or India. Its introduction to the New World apparently took during the slave trade. It subsequently escaped from cultivation becoming a common weed in tropical and subtropical regions from Brazil to southeastern USA (Robinson and Decker-Walters, 1997). It grows in tropical areas, including parts of Amazon, East Africa, Asia, Caribbean and is cultivated throughout South America as food and medicine (Taylor, 2002). There have been several reports on proteins from bitter gourd fruit and seed and pharmacological activities. Immature or young fruits are consumed as a vegetable similar to balsam pear. It is supposed to have medicinal properties with potential for hypogycemic, blood sugar lowering and actions of potential benefit in diabetes mellitus (China Daily, 2002). The polypeptide-protein with the molecular weight of 11 kilodalton (kDa) was isolated from fruit, seeds and tissue of this species. Scientists isolated a hypoglycemic principle called charantin (Robinson and Decker-Walters, 1997). It was reported to decrease the blood sugar level in test animals and diabetic patients (Khanna and Jain, 1981). In numerous studies, all parts of bitter gourd were clinically demonstrated to be of potential benefit against diabetes mellitus, which is believed to increase beta cells by the pancreas and can improve the ability of humans to produce insulin (Ahmed *et al.*, 2003). Furthermore, *in vivo* studies of bitter gourd fruit and/or seed are shown to reduce total cholesterol and triglycerides (Jayasooriya *et al.*, 2000). Seeds, fruits and leaves contain many ribosome-inactivating proteins with many different molecular weights such as 10 kDa (Parkash *et al.*, 2002), 24 kDa, 29 kDa and 30 kDa (Jiratchariyakul *et al.*, 2001 and Paul *et al.*, 1999). Seeds carry the major proportion of proteins and contain more water-soluble proteins than flesh (Cai *et al.*, 2002). Because of its wide spread use, the plant has long been a research focus for scientists at scientific institutions in countries where it is found. One of these

researchers, Ng *et al.* (1992 and 1997) at Chinese Medical Material Research Center of the Chinese University of Hong Kong found a series of proteins that have anti-HIV activity. This protein is known as momorcharin and has a molecular weight at the range of 24-30 kDa. Momorcharin was isolated from seeds, fruit and leaves. It was reported to inhibit the replication of human immunodeficiency virus (HIV) (McGrath *et al.*, 1989). Recently, Lee-Huang *et al.* (1990) isolated another protein *Momordica* anti-HIV protein 30 kDa (MAP30) from seeds and ripe fruit of bitter gourd that also has anti-HIV activity. These two discoveries have considerable potential as a therapeutic agent for anti-HIV activity. MAP30 is one of the proteins found in bitter gourd that is believed to have multiple functions that could be beneficial for anti-HIV activity. It been shown in laboratory tests to effectively inhibit herpes virus *in vitro*, yet is not toxic to normal uninfected cells. Breeding and development of varieties for high MAP30 or high protein at 30 kDa is needed in order to increase these proteins for quality improvement. Increased protein content has been done for soybean (Wilcox, 1998), *Brassica* species (Patel *et al.*, 1999) and lupin (Hrstkova, 1998) etc. There are several forms of population improvement methods that are used for high protein plant selection such as mass selection, recurrent selection and the pedigree method. Seeds of local bitter gourd from many provinces of Thailand were collected and evaluated for their 30 kDa protein levels. Collection of germplasm of local bitter gourd and evaluation 30 kDa protein levels of the collected accessions should be studied. Variety improvement for high 30 kDa protein will be studied later. This data will be useful for the production of MAP30 in a large scale.

In Thailand, there are both local and cultivated bitter gourds. Fruits of local bitter gourd are consumed less than to cultivated ones. There are two forms of local bitter gourd. The elongated fruit-type is a wild form and the stout fruit-type is an indigenous cultivar. Local bitter gourd often grows in home gardens and sometimes it is sold to a specialized consumer market as an indigenous medicine (Nath, 1999). It is scattered naturally throughout in Thailand as a weed. There are variations of size and shape of fruits as well as plant and leaf types. Not much has been studied on it as a crop because of low its economic value.

Objectives

1. To study the morphology of local bitter gourd.
2. To study the yield and horticultural characteristics of local bitter gourd.
3. To measure levels of protein at 30 kDa of local bitter gourd and F_1 hybrid seeds.
4. To analyze the genetics of 30 kDa protein in F_1 hybrid seeds.