CHAPTER V

DISCUSSION

Thirteen local bitter gourd accessions showed differences in color and size of leave (Table 2). The color dimension in lightness scale of leaf from black (L = 0) to white (L = 100). Hunter color scale values (L, a and b) of leaves gave the difference in color. The accessions of local bitter gourd used in the experiment could be classified into the two main groups by using color scale values. Leaves of local bitter gourd accession numbers 12, 1 and 10 had the least lightness of L values at 34.46, 35.19 and 38.01, respectively. They had also the most green and yellow of leaves because leaves of them had the low of a values and the high of b values, Leaves of these three accessions could be classified into green group. Another accessions could be classified into green-white group because L and a values of leaves were high and b values were low. Skin color of fruits of local bitter gourd accessions had the nearest values. Skin color of fruits of local bitter gourd accession numbers 8, 11 and 20 had the lowest of b and L values, They could be classified into green group. Another accessions had the high of a and b values could be into green-white group. However, the color of green leaves and fruits, which depends on the concentration of chlorophyll, can be determined using a spectrocolorimeter under identical conditions (Shin and Bhowmik, 1995). Bitter gourd was cultivated all year round in tropic, twice a year in subtropic and could only be cultivated in the summer of the temperate (Dayu, 2003). It could be divided into three groups according to fruit color such as green, green-white and white. All three groups were cultivated in subtropic and Temperate Zone and green varieties were usually cultivated in the tropic (Dayu, 2003). The accessions of local bitter gourd used in the experiment could be classified into the three groups by using fruit color. Accession numbers 8, 11 and 20 could be classified into a green group. Accession numbers 1, 3, 5, 6, 12, 16 and 21 are classified into a green-white group. Accession numbers 7, 10 and 13 are classified into a white group.

Number of days to 50% female flowers were significantly different among accessions, ranging from 40 days (accession number 7) to 53 days (accession number 11). Number of days to

50% female flowers of Chinese bitter gourd could be divided into 3 groups such as early (35 days), middle (36-39 days) and late (41-42 days) (Dayu, 2003). Therefore, accession numbers 7 and 10 should be classified into an early group. The middle group contains accession numbers 5, 6, 8, 12 and 21. The late group contains accession numbers 1, 3, 11, 13, 16 and 20. First pistillate flower node of accessions ranged from 17 to 33 on the lateral branches of the first 25 nodes. Without pruning, most of female flowers in bitter gourd developed on the first forty nodes with the majority at nodes 21 to 30 (Morgan and Midmore, 2002). However, flowering behavior varied with cultivar and climatic conditions (Deshpande *et al.*, 1979).

Fruit yield of local bitter gourd accessions ranged from 772 to 2,186 kg/rai. Fruit yield is dependent on the number of female flowers, which were successfully pollinated flowers. Also, fruit yield was dependent upon the variety (Morgan and Midmore, 2002). Fruit yield was positively correlated with number of fruit/plant and fruit weight/fruit (Dayu, 2003). Lawande and Patil (1989) concluded that bitter gourd accession gave high yield when they had long vines, many primary branches, heavy fruit, many fruits/vine and long harvest duration. Furthermore, Srivastava and Srivastava (1976) and Ramachandran and Gopalakrishnan (1979) suggested that an increase in fruit weight/fruit could be helpful in increasing high fruit yield. Accession numbers 3, 12 and 13 gave the highest number of female flowers/plant and highest in number of fruit/plant but these accessions gave low yield because of the lowest fruit weight/fruit and their flesh thickness were thin. Results showed that accession numbers 7 and 10 gave the highest fruit yield because they gave the high fruit weight per fruit which has a positive correlation with fruit yield.

Ripe fruit yields were not significantly different among accessions. The accessions showed significant differences in number of times to harvest ripe fruits. Accession number 13 gave the highest ripe fruit yield and gave the highest number of times to harvest ripe fruit. Results showed that accession that gave high ripe fruit yields had more harvesting times than those that gave low ripe fruit yields.

In this experiment, fruit yields of the accessions ranged from 772 to 2,244 kg/rai. Siemonsma and Piluek (1994) reported that fruit yields of the bitter gourd ranged from 3,200 to 4,800 kg/rai were common however, yields over 8,000 kg/rai had been also reported (Kuang *et al.*, 1997). The accessions might gave low fruit yields because of rather high temperature ranging from March to April 2000 and ranging from September to October 2000 which the accessions were setting fruit during these times. Mean temperatures during March and April 2000 ranged from 28.5 to 30.1°C and between September and October 2000 ranged from 28 to 28.5°C (Appendix table 14). The best yields would be at temperature ranging from 20°C to 30°C during fruit setting but the fruit could not set when the temperature was above 30°C (Dayu, 2003). Bitter gourd required more heat than the other gourds to produce maximum yield but was also resistant to low temperature. A minimum temperature during early growth was 18°C and severe reduction in growth at night temperature of 16°C (Gallacher, 1999).

Weight of 30 kDa protein of the accessions ranged from 104.86 to 265.42 μg/5 g endosperm. MAP30 is 30 kDa protein which was found predominantly in fruit and seeds of ripe fruit (Lee-Huang *et al.*, 1990). Thus, the expressions of MAP30 gene in various parts of bitter gourd were studied. The results showed that MAP30 gene was also expressed in apical shoot, leaves and seed of young fruit (Pala-or, 2001).

Although there was significantly different of total protein and 30 kDa protein weight among treatments of local bitter gourd but mean squares of these protein weight due to general and specific combining ability were not significant (Table 13). The results indicated that both additive and non-additive gene actions were involved in determining seed yield and non-additive gene action was involved in determining partially purified protein. However, the predominance of non-additive gene action was associated with seed yield and partially purified protein. Non-additive gene action for fruit yields was reported in bitter gourd (Mishra *et al.*, 1994) and was also reported in pumpkin (Mohanty, 2000). Additionally, diallel crossing was used for improving protein and seed yield, three breeding methods were also used. They were pedigree and modified pedigree selection, recurrent selection by using a joint yield-protein selection index, and the development of inbred backcross lines. Those three methods were used for increasing seed yield and protein traits in common bean (*Phaseolus vulgaris* L.) (Bliss, 2003). Furthermore, genetic engineering techniques may be a way out to bring in directional changes in both quantity and quality of proteins in this plant. For example, using genetic engineering techniques for increasing the glutenin protein content in wheat that leaded into increasing in the total protein (Patnaik and Khurana, 2001). Likewise, there were attempts to make protein quality by mobilizing storage protein genes from Amaranthus into potato (APCTT, 2003) and also mobilized storage protein genes from Amaranthus into rice (Pental, 1998). This storage protein from Amaranthus had higher levels of some essential amino acids than those recommended by World Health Organization (Paroda, 1999).