CHAPTER 5

DISCUSSION AND CONCLUSION

Male sterility is very critical for plant breed improvement program especially for the production of hybrid seeds of chilies (Min *et al*., 2009) as this trait can help save time and labor, hence the production cost, as well as enhance the purity of hybrid seeds (Mulyantoro *et al*., 2009; Yang *et al.*, 2008). Male sterility in chili can be distinguished into three groups : normal male fertile chili (N/S *RfRf*), male sterile chili ; (N *rfrf*) and male fertile chili which has heterozygosis in the genotype of the fertility restoration (N/S *Rfrf*) using fertility scoring for the evaluation of male sterility (Meshram and Narkhede, 1982; Rai *et al.*, 2001; Pakozdi *et al*., 2002; Yoon *et al*., 2006). Normal male fertile chili (N/S *RfRf*) can be used as C line in breeding hybrid chilies as the parent has the homozygous male sterility controlling gene in the nucleus. This occurred in nine varieties. The CA1447 contains total soluble solids and vitamin C and they can be utilized for breeding hybrids with the desirable characteristics. Twenty-two varieties with pollen fertility were obtained. The CA1450 has high total soluble solids and vitamin C, and CA1449 contains high capsaicin. They should be exploited as maintainer or B line in breeding hybrids with these characteristics. The chili varieties with heterozygous male sterility controlling gene may be used as C line in future breed improvement of which accession CA1448 has high content of moisture, total soluble solids and vitamin C. The distribution of the F_1 hybrids in the three male pollen viability groups is supported by the research results of Shifriss (1997) which enabled an understanding of the genetic mechanism in fertility restoration and the use of male sterility trait in hybrid development (Wang *et al*., 2006) It is also found that the fertility scoring method is robust in genetic evaluation for the present purpose (Pakozdi *et al*., 2002).

Evaluation of male sterility of chili based on amplification of CAPS DNA marker was followed the protocol of Kim *et al*., (2006). All chili samples yielded the same size of PCR products (>1,000 bp), however, no pattern of fragmented DNA

could be obtained by *Rsa* I and *Mse* I digestion. This result suggested that these PCR primer set and restriction enzymes was not suitable to evaluate male sterility among chili varieties. Although, Kim *et al*., (2006) and Lee *et al*., (2008) previously reported the success of using this primer set and enzymes to distinguish male sterility in chilies, it is possible that chilies in this experiment contained different nucleotide sequences, as indicated from the larger PCR size and no restriction sites of *Rsa* I and *Mse* I enzymes. As a result, these PCR primer set and restriction enzymes could not be used to determine male sterility of chili varieties in this work. Thus, the researcher proposed for the undertaking of amplified DNA to be sequenced as well as performed DNA digestion by more other restriction enzymes, in order to gain more information on how to distinguish male sterility of our existing chili lines by DNA marker.

The F_1 hybrids CA1450 × CA1448 and CA1450 × CA1447 obtained maximum yield at 6.794 and 5.912 t/rai levels, respectively, higher than the performance of other hybrids, male parent, female parent and commercial varieties at statistically significant different levels. The F_1 hybrid CA1450 × CA1448 showed positive heterosis in terms of fruit weight per plant, the number of fruit per plant, average fruit weight, fruit width, fruit length and pericarp thickness while F_1 hybrid CA1450 × CA1447 expressed positive heterosis in fruit weight per plant, the number of fruits per plant, average fruit weight, fruit length and pericarp thickness. The line × tester F_1 hybrids, CA1445 × CA683, showed significant heterobeltiosis for fruit weight per plant, the number of fruits per plant, average fruit weight, fruit width, fruit length and pericarp thickness, respectively, in consonance with the trials of Geleta and Labuschagne, 2004; Shrestha *et al*., 2011; Sousa and Maluf, 2003; Patel *et al*., 2010, as high heterosis hybrids are associated with parents having good characteristics (Pérez-Grajales *et al*., 2009).

Although there was no parental varieties which showed a good appearance in all but some parents varieties show a high general combining ability value in some characteristics. These are useful in breeding program to improve the fruit yield and qualities of commercial varieties. Zou *et al*., (2007) for example used combining ability concept for the analysis in breed improvement program to obtain high yield chili varieties. The female parent, CA1450 showed positive general combining abilities in fruit weight per plant, yield, average fruit weight, fruit width and pericarp

thickness, while that of CA1447 appeared positive in fruit weight per plant, yield, average fruit weight, fruit width and fruit length. The F_1 hybrid CA1450 × CA1448 showed significant specific combining ability effect for fruit weight per plant, yield, the number of fruits per plant, average fruit weight, fruit width, fruit length and pericarp thickness indicating the relationship with additive and non-additive effect which have influence on the horticultural expression of the hybrids (Rego *et al*., 2009; Haung *et al*., 2009; Zewdie *et al*., 2001; Legesse, 2000).

Genetic evaluation of male sterility trait can be performed through both fertility scoring method and molecular markers of male sterility genes. The difference lies in the matters of time, convenience and expense. The first approach needs planting two crops of chili and thus involves more plant materials, planted area, and time compared to the latter which uses shorter time, fewer plant materials, and small space thus allowing the experiment on many varieties at a time but which involves expensive equipment and high cost for chemicals. Furthermore, there is a need to explore more in the area of molecular technique to fit the varieties of chili under study.

The chili varieties used in the experiment will be good genetic sources for breeding more diverse female parental lines containing sterility trait like CA1450 and male parents which have desirable horticultural characteristics for developing good characteristics and high yielding hybrids like CA1447 and CA 1448. Breed improvement will help reduce the cost of hybrid seeds production and hence the cost of seeds for farm production.