CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Results of the study could be summarized as follows:

1. 10 of the collections in germplasm had pedigree records either from garden roses or old varieties of greenhouse cut roses; others had no known parentage.

2. Genetic relationships in rose parent cultivars as measured by randomly amplified polymorphic DNA (RAPD) markers were conducted through HAT-RAPD technique. By using 28 primers to analyze 28 varieties of cut-rose, it was found that the number of bands appearance had a great diversity and a big difference in size range of bands. The relationships between the 28 cultivars based on their genetic distances were clustered in a dendrogram. Cluster analysis based on similarity values classified roses genotype into 4 major groups. Highly polymorphic profiles were obtained with 8 of primers such as OPB-8, OPB-9, OPB-10, OPF-11, OPJ-4, OPN-03, OPAD-01 and OPAU-08. By using 8 primers for the analysis, it was found that the dendrogram had high similarity in genetic relationship and rose genotype was classified into 3 major groups.

3. Pollen germination percentage ranged from 3.3 to 62.1%. 27 varieties were classified into two groups, 14 var. usable and 13 unusable. Only 14 usable pollen parents could be used as male parents.

4. The varieties from collections were hybridized to make several crosses between 14 fixed male parents and 27 female parents: 7,844 flowers were pollinated

from 268 crossing combinations and 196 successful crossings were obtained, 3,299 hips harvested. 47,266 seeds were also harvested from the hips and 39,707 seeds from 193 crosses were sowed. 118 crosses gave 7,132 seedlings. Germination rate was 18% and 6,202 healthy seedlings were selected. The result indicated that successful crosses involved several factors, not only male or female fertility, but also cross-ability level on parent combination which could cause self-incompatibility, cross-compatibility, fruit drop, seed dormancy, embryo abortion, etc.

5. Selection of seedling stage: From the 39,707 seeds sowed, germination rate was 18%. 332 plants with abnormal germination, 336 plants susceptible to diseases and 262 stunted seedlings were eliminated. Selection for this stage could reduce the size of the progeny by 13%. 6,202 plants were selected for evaluation in the next stage.

6. Selection of small plant stage: From the 6,202 selected seedlings, elimination was as follows: 497 plants with short stem plants, 875 plants with small bud size, 210 plants with small flower size and 370 plants with few petals. Selection from this stage could reduce the size of the progeny by 68.5%. The remaining was 4,250 plants.

7. Selection of medium plant stage: From 4,250 selected plants, discards were as follows: 935 plants with short stem length, 250 plants with small flower bud size, 750 plants with poor flower head shape, 270 plants with blooms of split or confused centers, 382 plants with small flower size, 636 plants with few petals. Selection for this stage could reduce the size of progeny by 16.6% and the remaining 1,027 were plants with good traits.

8. Selection of large plant stage: From 1,027 selected plants, discards were as follows: 153 plants with short stem length, 79 plants with small stems, 129 plants with few numbers of strong canes, 27 plants with non cut rose characteristies , 340 plants of poor overall appearances and 91 plants with thin petals. Selection for this stage could reduce the size of progeny by 3.4% and the remaining 208 were plants with good characteristics suitable for cut rose.

9. Selection of first budding stage (6 plants replicates compared with standard check): From 208 selected numbers, discards were as follows: 11 numbers with non-cut rose characteristics, 35 numbers with few flowers per plants, 24 numbers with few strong canes, 20 numbers with small flower bud size, 22 numbers with small flowers, 13 numbers with few petals or excessive petals and 9 numbers with short stem length. Selection for this stage could reduce the size of progeny by 1.2% and the remaining 74 were plants with good characteristics suitable for second budding stage evaluation.

10. Selection of second budding large plant stage (6 plants per replicates, 4 replicates with standard check): From 74 selected numbers, the selection criteria design was based on comparison with the check variety, i.e. strong flower neck, yield and quality, field problems and speed of production. Selection for this stage could reduce the size of progeny by 0.3%, and the remaining 17 codes suitable for yield evaluation and to be compared with commercial varieties were classified into 5 colour groups. Then, the yield production trials of red and pink colour groups were planned for the next evaluation.

11. For the cytological studies, the chromosome number of parents and offspring of different colours was similar with 2n=28 and rose parent and their offspring could not be identified.

12. RAPD fingerprinting for hybrid identification in rose parent and offspring. The results indicated that it could show the genetic relationships in parent rose, but could not identify hybrid of rose offspring.

13. The female heritability from sib analysis gave high value on traits of number of petals, flower bud size, and peduncle length, while from parent-offspring regression analysis it gave high value on traits of number of petals. This indicated that female effects might occur with cytoplasmic inheritance. The male heritability from sib analysis gave high value on traits of stem length and flower diameter, while from parent-offspring regression analysis it gave high value on traits of peduncle length. It indicated that male effect might occur with nucleus inheritance.

14. Selection of yield production trial (3 replicates with 90 plants per replicates evaluated for colour standard check): For 6 selected numbers in each colour (red and pink colour), the selection criteria design was based on comparison with the check variety regarding their plant characters, pest resistance, problems on field, overall flower characters and productivity trends. Selection for this stage could reduce the size of progeny by 0.06%, and the remaining 2, best offspring in each colour, were selected for the market response study.

15. Selection for market response (2 best numbers in each colour compared with colour standard check): 6 selected numbers in each colour (red and pink colour) were evaluated by customer survey from interviews and questionnaires. Data were collected from 2 consumer groups i.e. 45 persons from general public and 7 florists from flower shops. The results showed that '04-301' and '04-116' were suitable to be released as new red and pink rose varieties. Selection for this stage could reduce the size of progeny by 0.03% and the remaining was 1 best offspring of each colour. The

selection criteria were formulated from information and response from the customer surveys.

16. The description of the new varieties is given in Figure 6.1.

Paka Sweet

Type	medium
Size of flower	2.5
Diameter (cm)	9.5-11.0
Bud size (cm)	3.5-4.5
Stem length (cm)	60-80
Number of petals	20-28
Number of thorns	moderate
Number of side shoots	1-4
Resistance to powdery mildew	moderate
Resistance to black spot	high
Resistance to downy mildew	moderate
Cut stage	2
Vase life (days)	12-14
Vase life after 3 days of transport	8-9
Production/m^2/year	280-300
Flush to flush	50
Toughness of petals	high
Fragrance	absent

Lanna Beauty

Type	large
Size of flower	2.5-4.2
Diameter (cm)	9.5-11.0
Bud size (cm)	4.5-5.0
Stem length (cm)	80-95
Number of petals	55-75
Number of thorns	high
Number of side shoots	3-4
Resistance to powdery mildew	moderate
Resistance to black spot	low
Resistance to downy mildew	moderate
Cut stage	2
Vase life (days)	15-18
Vase life after 3 days of transport	11-12
Production/m^2/year	220-240
Flush to flush	50
Toughness of petals	moderate
Fragrance	absent

Figure 6.1 New rose of this study

17. The summary of design for rose breeding program actual is given in Figure 6.2

Suggested blueprint for rose breeding in Thailand

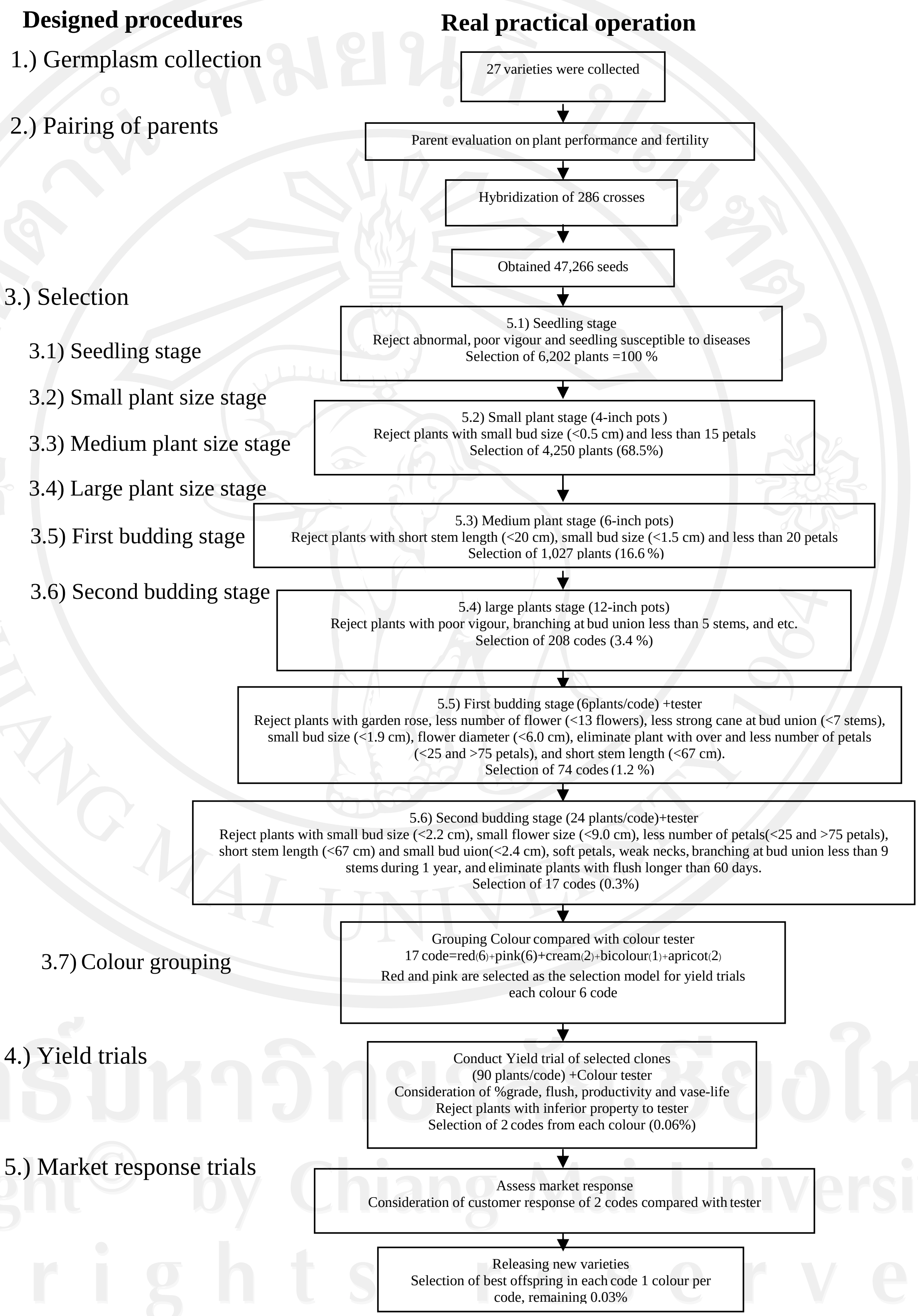

Figure 6.2 Suggested blueprint for rose breeding in Thailand

6.2 Recommendations:

Results of the study gave some useful recommendations to the research works:

1. General, hybridizers are interested only in the characteristics of the parents plants and pay no regard to their transmitting ability. This brings about various problems in hybridizing. Therefore evaluation of parent varieties prior to the hybridizing and ranking superiority according to breeding value will benefit the matching programmes and the preservation of pollen for the next cycle of hybridizing.

2. Careful choice of parents is a very important step to reduce risk. Keeping record of the necessary information ready for the decision on next year's crosses, usually adding two or three new females and one or two new males to replace the previous year‘s worst performers. In case a parentage record is not available, hybridizing can still be carried out and records of the offspring can be used to compare with their parents' characteristics.

3. A genetic analysis will always be a first necessary step which will lead to new sight in rose biology. The knowledge about the inheritance of important rose characters is still limited, compared with other crops. Information on the inheritance of key characters will be a prerequisite for the development of more advanced breeding strategies.

4. Molecular marker alone for selection will generally be less effective than phenotypic selection.

5. Saving the cost and labor by not growing too many seedlings during a given season because they will be eliminated sooner or later by juvenile screening or by cutting a year or more off the breeding programme due to lack of fund.

6. Although a variety may have definitive characteristics such as colour, opening behavior, size and production advantage, these qualities differ considerably when produced in different climatic regions and from grower to grower. Trading practices too have a considerable influence on quality, depending on how the blooms are transported, sorted and handled. After trading it is the florist who uses the flowers in bouquets and arrangements or the flower shop which makes the presentation. Finally the consumer's own handling of the blooms may affect the lasting quality. Every one in the chain influences the value of the product, to a more or lesser degree, and indirectly influences the price the producer finally receives.

7. It is time Thailand should be thinking of having locally-hybridized roses for use within the country and recruiting our own rose hybridizers in order to realize this goal. Registration of new variety of rose should be introduced in this country to protect rose-breeder's right, similar to breeder's right of orchids and some other flowers. The common practice of propagating roses for business purpose without paying royalties should be stopped. At the same time support should be given to Thai hybridizers to give incentives for their work in order that one day new roses created by Thai hybridizers can compete in the world market.