



APPENDICES

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

Copyright© by Chiang Mai University

All rights reserved

## APPENDIX A

### Chemical reagents preparation

#### 1. AFLP loading buffer

Bromophenol blue	0.05 g
Xylene cyanol	0.05 g
0.5 M EDTA	1 ml
Formamide	49 ml

The solution was mixed together and adjusted to a final volume of 50 ml by double distilled water (ddH<sub>2</sub>O). The solution was sterilized and kept at room temperature.

#### 2. Bind-silane

Acetic acid	50 $\mu$ l
Ethanol	1 ml
Bind-silane (stock)	1.5 $\mu$ l

The solution was mixed together and kept at room temperature.

#### 3. Developing solution

Sodium carbonate	60 g
37 % formaldehyde	3 ml

Dissolved sodium carbonate in ddH<sub>2</sub>O and then added 37 % formaldehyde.

Adjust to a final volume of 2,000 ml by ddH<sub>2</sub>O.

#### 4. 1 % ethidium bromide

Dissolved 100 mg ethidium bromide in ddH<sub>2</sub>O, and adjusted to a final volume of 10 ml by ddH<sub>2</sub>O. The solution was kept in the dark bottle with aluminum foil at 4°C.

#### 5. Extraction buffer (Doyle and Doyle (1990))

NaCl	28 ml
2 M Tris-HCl pH 8	5 ml
0.5 M EDTA pH 8	4 ml
CTAB	2 %
PVP-40	1 %

The solution was mixed together and adjusted to a final volume of 100 ml by ddH<sub>2</sub>O. The solution was sterilized and kept at room temperature.

#### 6. 0.5 M EDTA (pH 8.0)

Dissolve 9.31 g EDTA in 40 ml ddH<sub>2</sub>O, adjust pH = 8 with 10N NaOH. Adjust to a final volume of 50 ml by ddH<sub>2</sub>O. The solution was sterilized and kept at room temperature.

#### 7. Fix/stop solution (10 % acetic acid)

100 % acetic acid	200 ml
ddH <sub>2</sub> O	1,800 ml

The solution was mixed together and kept at room temperature.

**8. 5 M NaCl**

Dissolve 29.2 g NaCl in 80 ml ddH<sub>2</sub>O. Adjust to a final volume of 100 ml by ddH<sub>2</sub>O. The solution was sterilized and kept at room temperature.

**9. 40 % polyacrylamide (19:1)**

Acrylamide 150 g

Bis-acrylamide 8 g

Dissolved acrylamide in ddH<sub>2</sub>O and then added bis-acrylamide. Adjust to a final volume of 400 ml by ddH<sub>2</sub>O. The solution was kept in the dark bottle with aluminum foil at 4 °C.

**10. 6 % polyacrylamide gel**

Urea 29.4 g

40 % polyacrylamide 10.5 ml

10x TBE buffer 7 ml

10 % APS 400 µl

TEMED 30 µl

Dissolved 29.4 g urea in 15 ml ddH<sub>2</sub>O, and then added 10x TBE buffer, 40 % polyacrylamide and 10 % APS. Adjust to a final volume of 70 ml by ddH<sub>2</sub>O and added TEMED, and then mixed them together.

**11. Staining solution**

Silver nitrate 2 g

37 % formaldehyde 3 ml

Dissolved Silver nitrate in ddH<sub>2</sub>O and then added 37 % formaldehyde. Adjust to a final volume of 2,000 ml by ddH<sub>2</sub>O.

**12. 10x TBE buffer**

Tris base	108 g
-----------	-------

Boric acid	55 g
------------	------

0.5 M EDTA (pH 8)	40 ml
-------------------	-------

Dissolved tris (hydroxyl methyl) aminomethane and boric acid in 800 ml ddH<sub>2</sub>O, and then added 0.5 M EDTA (pH 8). Adjust to a final volume of 1,000 ml by ddH<sub>2</sub>O.

**13. TE buffer**

2 M Tris-HCl (pH 8)	500 $\mu$ l (10 mM)
---------------------	---------------------

0.5 M EDTA (pH 8)	200 $\mu$ l (1 mM)
-------------------	--------------------

The solution was mixed together and adjusted to a final volume of 100 ml by ddH<sub>2</sub>O. The solution was sterilized and kept at room temperature.

**14. 2 M Tris-HCl (pH 8)**

Dissolve 242.8 g tris (hydroxyl methyl) aminomethane in 800 ml ddH<sub>2</sub>O, adjust pH = 8 with 10N NaOH. Adjust to a final volume of 1,000 ml by ddH<sub>2</sub>O. The solution was sterilized and kept at room temperature.

**15. Wash buffer**

Ammonium acetate	10 mM
------------------	-------

Ethanol	75 %
---------	------

The solution was mixed together and kept at room temperature.

## APPENDIX B

## Data matrices of present (1) and absent (0) DNA band

## Appendix B-1 Data matrices of present (1) and absent (0) DNA band of PH01 - PH18

generated by OPAK 10 primer.

DNA band size (bp)	Code																	
	PH 01	PH 02	PH 03	PH 04	PH 05	PH 06	PH 07	PH 08	PH 09	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18
1,686	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
1,550	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
1,421	0	0	1	0	0	1	1	0	1	1	1	0	0	1	1	1	1	1
1,140	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1
1,010	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1
893	0	1	0	0	1	0	1	0	0	0	1	1	1	1	1	1	1	0
875	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
677	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1
574	1	1	0	1	1	0	1	1	0	0	0	1	0	1	0	1	1	1
544	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1
456	0	1	0	0	1	0	1	1	0	1	1	1	1	1	0	0	0	0
408	1	1	1	1	0	0	0	0	1	0	0	1	0	1	0	1	1	1
324	1	0	0	0	0	0	0	1	1	0	1	1	1	1	1	0	0	1
276	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
253	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0
223	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

**Appendix B-2** Data matrices of present (1) and absent (0) DNA band of PH19 - D03

generated by OPAK 10 primer.

DNA band size (bp)	Code																	
	PH 19	PH 20	PH 21	PH 22	PH 23	PH 24	PH 25	PH 26	PH 27	PH 28	PH 29	K 01	K 02	K 03	K 04	D 01	D 02	D 03
1,686	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
1,550	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
1,421	1	1	0	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1
1,140	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0
1,010	1	1	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1	1
893	0	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1
875	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
677	1	1	0	1	0	1	1	1	1	1	1	1	0	1	0	0	1	1
574	0	0	1	0	1	1	0	0	0	1	0	0	0	1	1	1	1	1
544	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1
456	1	0	0	0	0	0	1	1	0	1	1	0	1	1	1	1	1	1
408	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0
324	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	1
276	1	1	1	1	1	0	0	0	0	1	0	1	0	0	1	0	0	0
253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
223	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1

**Appendix B-3** Data matrices of present (1) and absent (0) DNA band of PH01 - PH18  
generated by OPD 03 primer.

DNA band size (bp)	Code																	
	PH 01	PH 02	PH 03	PH 04	PH 05	PH 06	PH 07	PH 08	PH 09	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18
1,644	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
1,500	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	1	1	1
1,376	1	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0
1,185	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0
1,032	1	1	0	1	0	1	1	1	1	1	0	1	1	0	0	0	1	1
927	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0
850	0	0	0	1	1	0	0	0	0	0	1	1	0	1	1	1	0	0
763	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
646	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	1	0
539	1	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	1
477	0	0	0	0	1	1	1	1	1	1	1	0	1	1	0	1	1	0
437	1	0	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0
378	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0



**Appendix B-4** Data matrices of present (1) and absent (0) DNA band of PH19 - D03

generated by OPD 03 primer.

DNA band size (bp)	Code																	
	PH 19	PH 20	PH 21	PH 22	PH 23	PH 24	PH 25	PH 26	PH 27	PH 28	PH 29	K 01	K 02	K 03	K 04	D 01	D 02	D 03
1,644	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
1,500	0	0	1	0	0	1	0	0	0	1	0	0	1	1	0	0	0	0
1,376	0	1	0	0	1	0	1	1	1	0	1	0	1	0	0	0	0	0
1,185	1	1	0	1	1	1	0	0	0	1	1	0	0	1	1	1	1	1
1,032	1	1	1	0	1	1	0	1	1	0	0	1	0	0	0	0	1	1
927	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1
850	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
763	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1
646	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
539	1	0	0	0	0	1	1	1	1	0	1	0	1	1	0	1	1	1
477	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
437	0	0	0	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0
378	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0

**Appendix B-5** Data matrices of present (1) and absent (0) DNA band of PH01 - PH18

generated by OPF 01 primer.

DNA band size (bp)	Code																	
	PH 01	PH 02	PH 03	PH 04	PH 05	PH 06	PH 07	PH 08	PH 09	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18
2,300	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0
1,480	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,250	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0
1,192	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0
1,050	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1
977	1	1	1	1	0	1	1	0	1	0	0	1	1	1	0	0	1	0
855	1	1	0	1	1	1	1	0	0	1	0	0	1	1	1	1	1	0
744	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	0
634	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0
560	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
450	1	1	1	1	1	0	0	0	0	1	0	0	1	1	0	1	1	1
421	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
300	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0

**Appendix B-6** Data matrices of present (1) and absent (0) DNA band of PH19 - D03

generated by OPF 01 primer.

DNA band size (bp)	Code																	
	PH 19	PH 20	PH 21	PH 22	PH 23	PH 24	PH 25	PH 26	PH 27	PH 28	PH 29	K 01	K 02	K 03	K 04	D 01	D 02	D 03
2,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,480	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0
1,250	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
1,192	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1,050	0	1	1	0	0	1	1	1	1	1	0	1	0	0	1	1	1	1
977	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0
855	1	1	0	0	0	1	1	1	0	0	1	0	1	1	0	1	1	1
744	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	1	1
634	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
560	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
450	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1
421	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	1	1	1
350	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
300	0	0	1	0	1	0	1	1	1	0	1	1	0	0	0	0	0	0

**Appendix B-7** Data matrices of present (1) and absent (0) DNA band of PH01 - PH18 generated by OPF 02 primer.

DNA band size (bp)	Code																	
	PH 01	PH 02	PH 03	PH 04	PH 05	PH 06	PH 07	PH 08	PH 09	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18
1,500	1	1	0	1	0	0	0	0	0	0	0	1	1	1	0	1	0	0
1,224	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
1,118	1	1	0	1	1	0	1	1	1	0	1	0	0	0	0	1	1	1
879	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1
820	1	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0
700	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
655	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0
587	1	1	1	1	0	0	0	0	0	1	0	0	1	1	1	1	0	0
539	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	1	1	1
475	1	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	1
428	1	0	0	0	0	1	0	0	1	1	0	1	0	1	0	1	0	1
375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

**Appendix B-8** Data matrices of present (1) and absent (0) DNA band of PH19 - D03 generated by OPF 02 primer.

DNA band size (bp)	Code																	
	PH 19	PH 20	PH 21	PH 22	PH 23	PH 24	PH 25	PH 26	PH 27	PH 28	PH 29	K 01	K 02	K 03	K 04	D 01	D 02	D 03
1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,224	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	0	0
1,118	0	0	1	0	1	1	1	0	0	1	1	1	1	1	1	0	0	1
879	1	0	1	1	1	1	0	1	0	1	0	1	0	0	1	1	0	0
820	1	1	0	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1
700	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
655	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1
587	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
539	0	0	1	1	1	0	1	1	1	0	0	0	1	0	0	1	0	1
475	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
428	0	0	0	0	1	0	0	1	0	0	1	1	1	1	0	1	0	0
374	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

**Appendix B-9** Data matrices of present (1) and absent (0) DNA band of PH01 - PH18 generated by OPF 09 primer.

DNA band size (bp)	Code																	
	PH 01	PH 02	PH 03	PH 04	PH 05	PH 06	PH 07	PH 08	PH 09	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18
1,550	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
1,250	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
1,106	0	0	0	1	0	1	0	1	0	0	0	1	1	1	1	1	1	1
979	1	1	1	1	0	1	0	0	0	1	0	1	0	1	1	0	0	1
858	1	1	1	0	1	0	1	0	1	1	0	0	1	1	1	1	1	1
752	1	1	1	1	0	1	0	1	1	0	1	1	0	0	0	0	1	1
667	0	1	0	0	0	1	0	1	0	1	0	1	1	1	0	0	1	0
600	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0
464	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
418	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
375	0	1	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0
325	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0

**Appendix B-10** Data matrices of present (1) and absent (0) DNA band of PH19 - D03 generated by OPF 09 primer.

DNA band size (bp)	Code																	
	PH 19	PH 20	PH 21	PH 22	PH 23	PH 24	PH 25	PH 26	PH 27	PH 28	PH 29	K 01	K 02	K 03	K 04	D 01	D 02	D 03
1,550	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,250	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0
1,106	0	0	0	0	0	1	1	0	1	1	0	1	1	0	1	1	0	1
979	1	0	1	1	1	0	0	0	1	1	1	0	0	1	1	1	1	1
858	0	1	0	0	1	0	1	1	0	0	1	0	0	1	1	0	0	0
752	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0
667	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
600	1	1	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0
464	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
418	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
375	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
325	0	0	0	1	1	1	0	1	0	1	1	0	0	0	0	0	0	0

**Appendix B-11** Data matrices of present (1) and absent (0) DNA band of PH01 - PH18

generated by OPF 14 primer.

DNA band size (bp)	Code																	
	PH 01	PH 02	PH 03	PH 04	PH 05	PH 06	PH 07	PH 08	PH 09	PH 10	PH 11	PH 12	PH 13	PH 14	PH 15	PH 16	PH 17	PH 18
2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,602	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
1,550	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
1,369	0	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	0
1,210	0	0	0	0	1	0	1	1	0	0	1	1	1	1	0	0	0	0
1,112	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	1	1	1
1,000	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1
931	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
840	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1
759	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0
692	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	1	1	0
580	0	0	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1
556	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	1	1
492	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
392	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	1
355	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0
262	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**Appendix B-12** Data matrices of present (1) and absent (0) DNA band of PH19 - D03  
generated by OPF 14 primer.

DNA band size (bp)	Code																	
	PH 19	PH 20	PH 21	PH 22	PH 23	PH 24	PH 25	PH 26	PH 27	PH 28	PH 29	K 01	K 02	K 03	K 04	D 01	D 02	D 03
2,000	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
1,602	1	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
1,550	0	0	1	0	1	1	1	1	1	0	0	1	1	0	1	1	1	1
1,369	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
1,210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
1,112	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	1	1	0
1,000	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0
931	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
840	1	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1
759	1	0	0	0	0	0	1	1	1	0	0	1	1	1	0	0	0	0
692	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1
580	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0
556	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1
492	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0
392	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
355	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
262	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0





**Appendix B-15** Data matrices of present (1) and absent (0) DNA band of *P. schilleriana* (FP), *P. cornu-cervi* (MP) and their ten progenies (H1 - H10) generated by OPF 01 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
1,500	1	0	1	1	0	1	1	1	1	0	0	0
1,463	0	1	0	0	0	0	0	0	0	1	1	1
1,361	1	0	1	1	1	1	1	1	1	0	0	0
1,236	1	0	0	0	0	0	1	1	1	1	1	1
1,222	0	1	1	1	1	1	1	1	1	1	1	1
1,034	1	0	1	1	1	1	1	1	1	1	1	1
966	1	1	1	1	1	1	0	1	1	0	0	0
624	0	1	0	0	0	0	0	0	0	0	0	0
545	1	1	1	1	1	1	1	1	1	1	1	1
451	1	1	1	1	1	1	1	1	1	1	1	1
394	0	1	1	1	1	1	1	1	1	0	1	1

**Appendix B-16** Data matrices of present (1) and absent (0) DNA band of *P. schilleriana* (FP), *P. cornu-cervi* (MP) and their ten progenies (H1 - H10) generated by OPF 02 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
2,364	1	0	0	1	1	0	0	0	0	0	0	0
1,787	1	0	1	1	0	0	0	0	0	0	0	0
1,500	1	0	1	1	1	1	1	1	1	1	1	1
1,111	0	1	1	1	1	1	1	1	1	0	1	1
874	1	1	1	1	1	1	1	1	1	1	1	1
818	1	0	0	0	0	0	0	0	0	0	1	0
731	1	0	1	1	1	1	1	1	1	1	1	1
589	1	0	1	1	1	1	1	1	1	1	1	1
527	0	1	1	0	0	0	0	1	0	0	1	1
424	0	0	0	0	0	0	0	1	0	0	1	0
358	0	0	0	1	0	1	0	0	0	0	1	0

**Appendix B-17** Data matrices of present (1) and absent (0) DNA band of *P. schilleriana* (FP), *P. cornu-cervi* (MP) and their ten progenies (H1 - H10) generated by OPF 09 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
1,411	1	0	0	1	1	1	1	1	1	1	1	1
1,262	0	1	1	1	1	1	1	1	1	1	1	1
981	1	0	1	0	0	0	1	1	0	0	1	1
893	0	1	0	0	0	0	0	0	0	0	0	0
852	1	0	1	1	1	1	1	1	1	1	1	1
740	1	0	1	1	1	1	1	1	1	1	1	1
667	0	1	1	1	0	1	1	1	1	0	0	1
589	0	1	1	1	1	0	1	0	0	1	0	0
545	1	0	0	0	0	0	0	0	0	0	0	0
468	1	1	1	1	1	1	1	1	1	1	1	1
404	1	0	0	0	0	0	0	0	1	0	0	1
395	0	1	1	1	1	1	1	1	1	1	1	0
310	1	0	1	0	1	1	1	1	1	1	1	1

**Appendix B-18** Data matrices of present (1) and absent (0) DNA band of *P. schilleriana* (FP), *P. cornu-cervi* (MP) and their ten progenies (H1 - H10) generated by OPF 14 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
1,582	0	1	1	1	1	1	1	1	1	1	1	1
990	1	1	1	1	1	1	1	1	1	1	1	1
848	0	1	0	1	1	1	1	1	1	1	0	0
748	1	0	1	1	1	1	1	1	1	1	1	1
679	1	0	0	1	1	1	0	1	1	0	0	1
591	0	1	1	1	1	1	1	1	1	1	1	1
429	1	0	1	1	1	1	1	1	1	0	1	1
373	1	0	1	0	1	1	0	1	1	1	0	1

**Appendix B-19** Data matrices of present (1) and absent (0) DNA band of *D. pulcherrima*‘dwarf’ (FP), *P. equestris* (MP) and their ten progenies (H1 - H10)

generated by OPAK 10 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
425	1	0	0	0	1	0	1	0	1	1	0	0
350	1	0	1	0	1	1	1	1	1	1	1	1
262	0	1	1	0	1	1	1	1	1	1	1	1

**Appendix B-20** Data matrices of present (1) and absent (0) DNA band of *D. pulcherrima*‘dwarf’ (FP), *P. equestris* (MP) and their ten progenies (H1 - H10)

generated by OPF 01 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
574	0	0	1	0	0	0	1	0	0	0	1	1
500	0	0	1	0	0	1	1	1	1	1	1	1
475	0	0	1	0	0	1	1	1	1	1	1	1
420	0	0	0	0	1	0	1	1	0	0	1	0
372	0	0	0	1	0	1	0	1	1	1	1	0
348	1	1	1	0	1	1	1	1	1	1	1	1
279	1	1	1	0	1	1	1	1	1	1	1	1
235	1	1	0	0	1	1	1	1	1	1	1	1
176	1	1	1	0	1	1	1	1	1	1	1	1
149	0	1	1	0	0	1	1	1	1	1	1	1
100	0	1	1	0	0	0	1	1	1	1	1	1



**Appendix B-23** Data matrices of present (1) and absent (0) DNA band of *D. pulcherrima* ‘dwarf’ (FP), *K. minus* (MP) and their ten progenies (H1 - H10) generated by OPAK 10 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
1,200	1	0	0	1	0	1	0	0	0	0	0	1
1,123	0	1	1	1	1	1	1	1	1	1	1	1
1,000	0	1	1	0	0	0	0	1	0	0	0	0
727	1	1	1	1	1	1	1	1	1	1	1	1
530	1	1	1	1	1	1	1	1	1	1	1	1
428	0	1	1	0	0	0	0	1	1	1	0	0
295	0	1	1	1	1	1	1	1	1	1	1	1
210	1	0	0	0	0	0	0	1	0	0	0	0

**Appendix B-24** Data matrices of present (1) and absent (0) DNA band of *D. pulcherrima* ‘dwarf’ (FP), *K. minus* (MP) and their ten progenies (H1 - H10) generated by OPD 03 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
1,362	1	1	1	1	1	1	1	1	1	1	1	1
1,123	0	1	1	1	1	1	1	1	1	1	1	1
915	1	1	1	1	1	1	1	1	1	1	1	1
693	1	1	1	1	1	1	1	1	1	1	1	1
591	0	1	1	1	1	1	1	1	0	1	1	1
421	0	1	1	1	1	1	0	0	1	1	1	0
394	1	1	1	1	1	1	1	1	1	1	1	1
310	1	0	1	1	1	0	1	0	0	0	1	1



**Appendix B-27** Data matrices of present (1) and absent (0) DNA band of *D. pulcherrima*‘dwarf’ (FP), *K. minus* (MP) and their ten progenies (H1 - H10)

generated by OPF 14 primer.

DNA band size (bp)	FP	MP	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
1,579	0	1	1	1	1	0	1	1	1	1	1	1
1,210	1	0	1	1	1	1	1	1	1	1	1	1
1,009	0	1	1	1	1	1	1	1	1	1	1	1
850	0	1	1	1	1	0	1	1	1	1	1	0
700	1	0	1	1	1	1	1	1	1	1	1	1
623	0	1	1	1	1	1	1	1	1	1	1	1

## CURRICULUM VITAE

**Name** Mr. Pratchya Taywiya

**Date of birth** October 3, 1978

### Education background

1996-1999 B.S. (Agriculture), Maejo University, Chiangmai, Thailand

2000-2003 M.S. (Agriculture), Kasetsart University, Bangkok, Thailand

### Scholarships

- Center for Agricultural Biotechnology, Postgraduate Education and Research Development Office, Commission on Higher Education, Ministry of Education, Faculty of Agriculture, Chiang Mai University, Chiangmai, Thailand.
- The Development of Economic Flower Crop: Orchid (DEFECO) Project, Faculty of Agriculture, Chiang Mai University, Chiangmai, Thailand.
- The Staff Development Project, Commission on Higher Education, Ministry of Education, Faculty of Science, Mahidol University, Bangkok, Thailand.