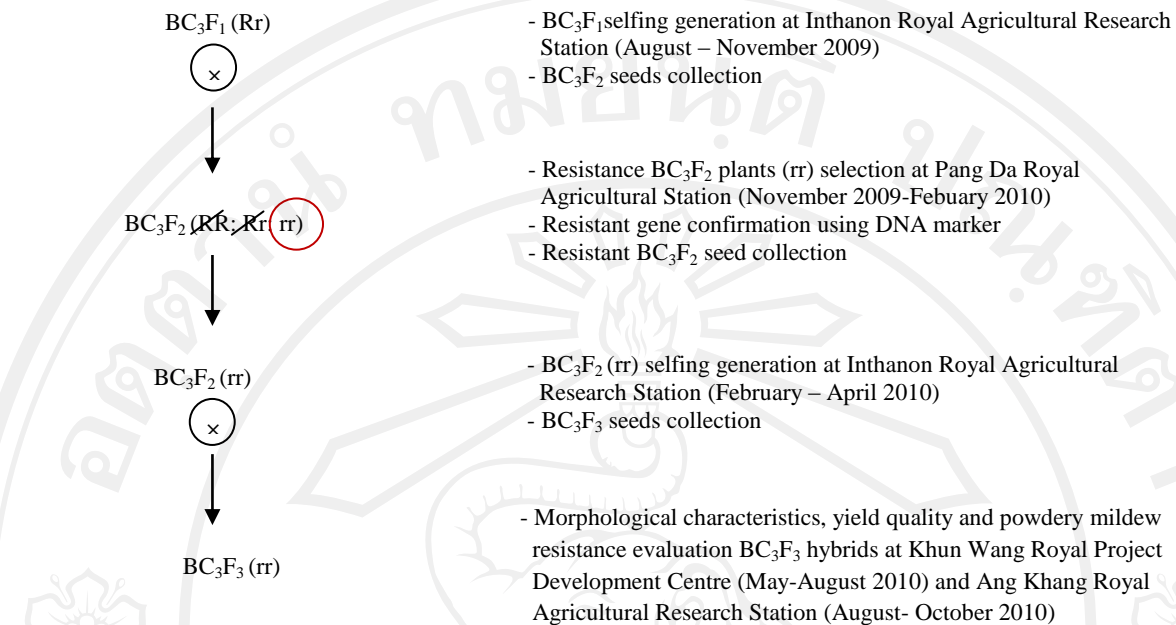


# **APPENDICES**

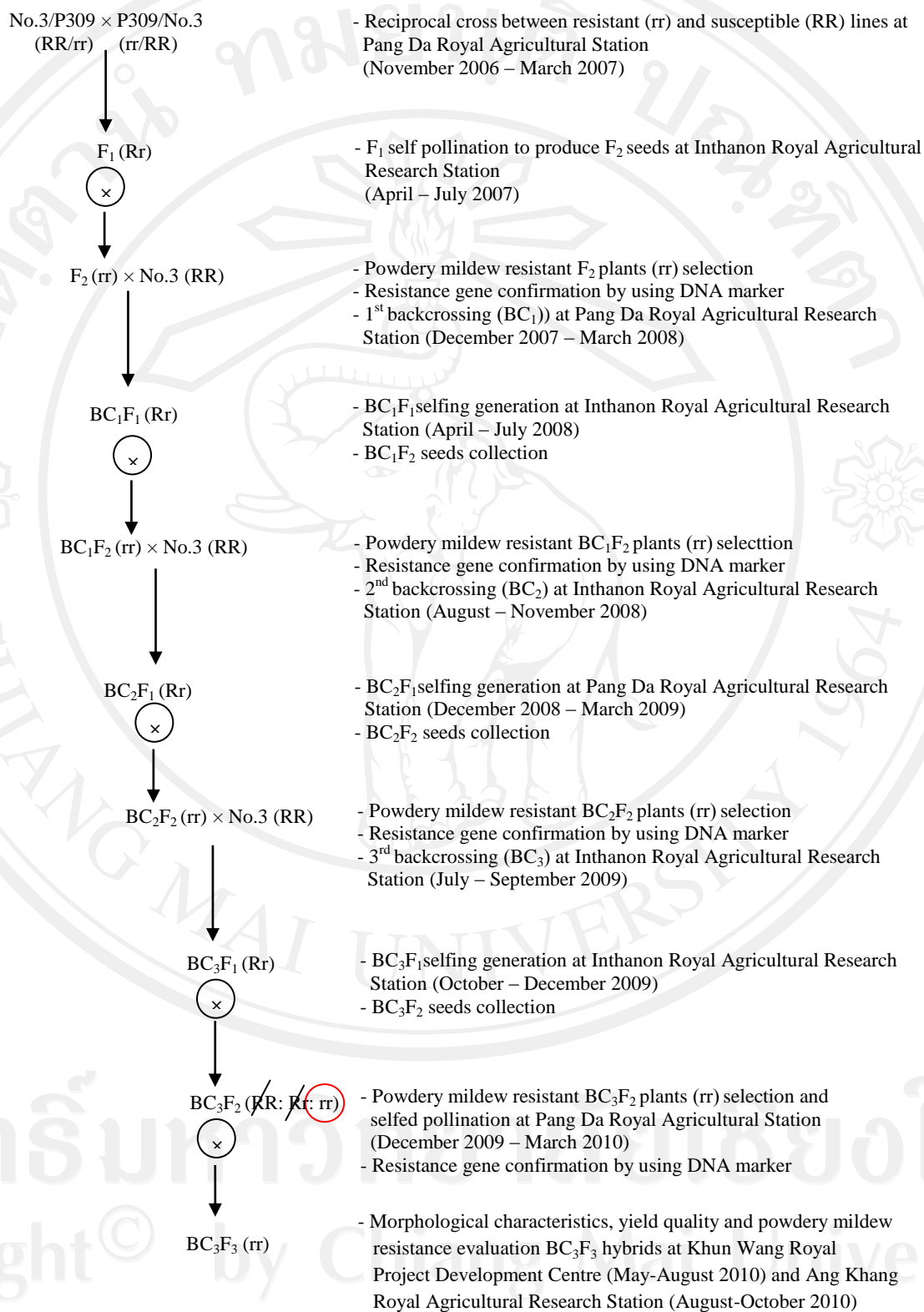
ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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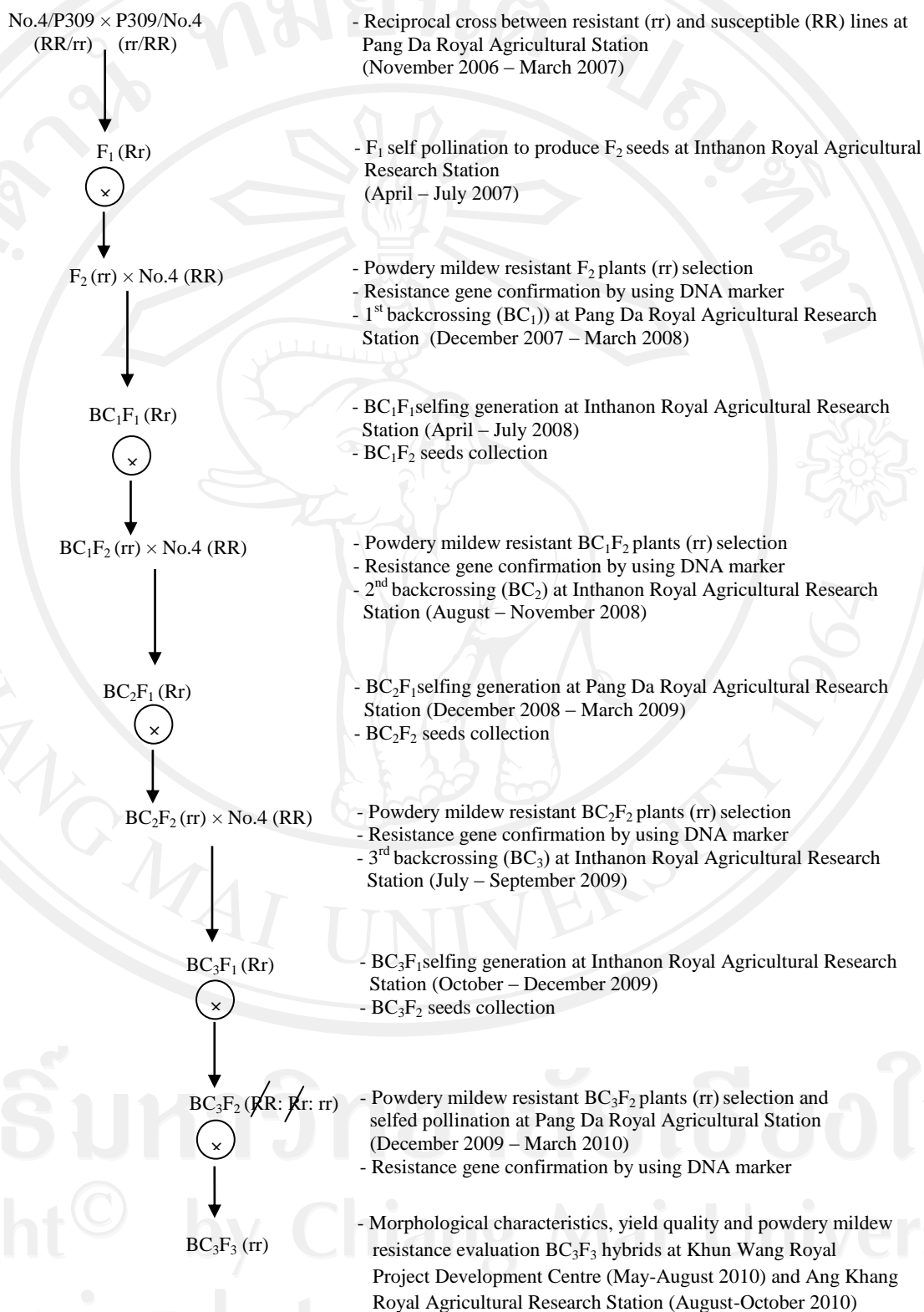




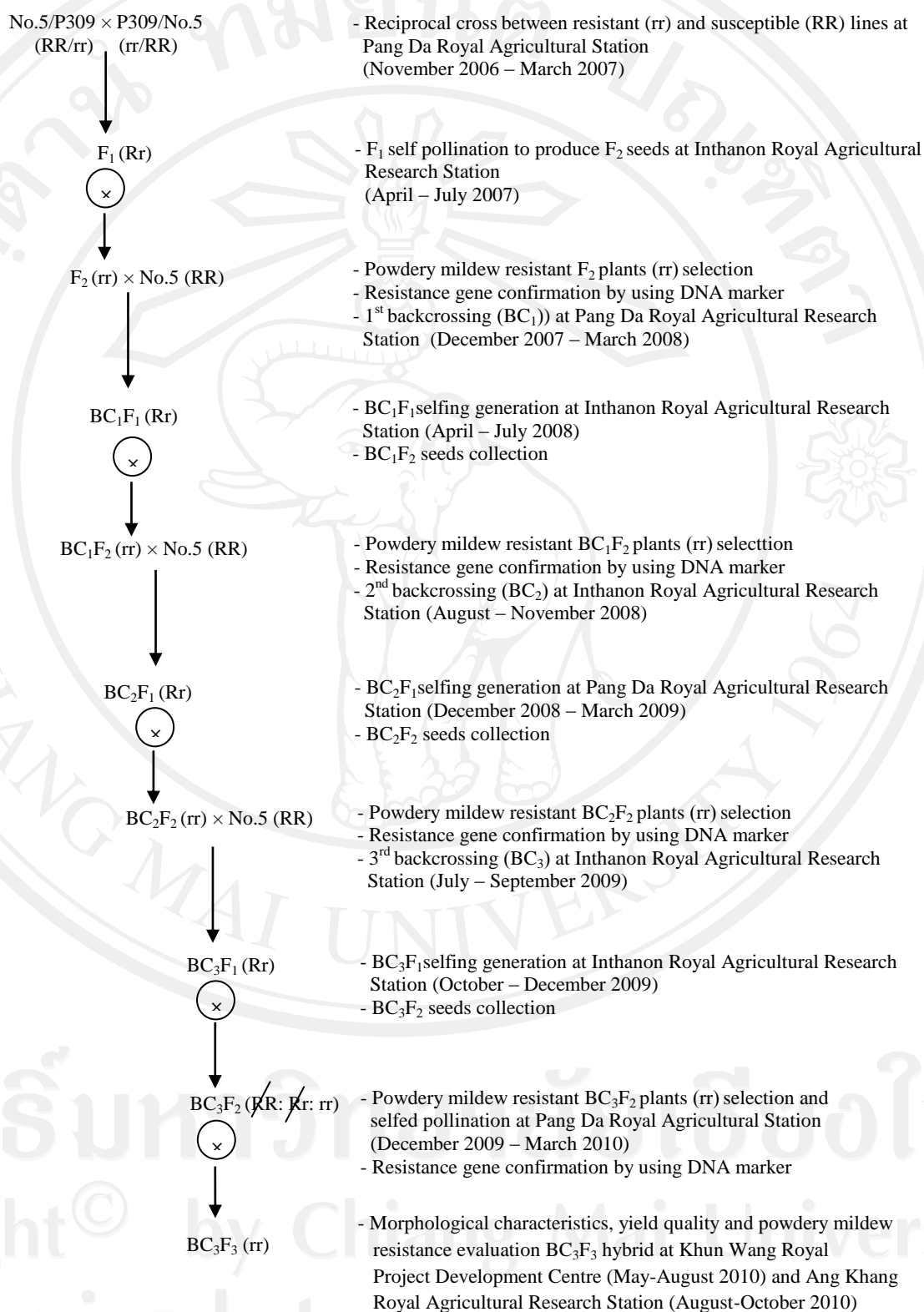
### Pea breeding program for powdery mildew resistance between No.3 × P309



### Pea breeding program for powdery mildew resistance between P309 × No.4



### Pea breeding program for powdery mildew resistance between No.5 × P309



## APPENDIX B

**Table 1** Analysis of variance of number of days to first flowering of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
Rep	2	0.53	0.26		
Tre	6	365.04	60.84	1935.82	0.00
Error	12	0.38	0.03		
Total	20	365.95			

CV=0.49

**Table 2** Analysis of variance of number of days to first blooming of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
Rep	2	0.80	0.40		
Tre	6	430.37	71.73	1807.55	0.00
Error	12	0.48	0.04		
Total	20	431.65			

CV=0.51

**Table 3** Analysis of variance of number of days to first pod setting of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
Rep	2	0.22	0.11		
Tre	6	805.20	134.20	711.67	0.00
Error	12	2.26	0.19		
Total	20	807.68			

CV=0.98

**Table 4** Analysis of variance of number of days to first flowering node of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
Rep	2	0.59	0.30		
Tre	6	336.32	56.05	651.54	0.00
Error	12	1.03	0.09		
Total	20	337.94			

CV=1.59

**Table 5** Analysis of variance of height of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
rep	2	1029.10	514.60		
var	6	65344.80	10890.80	498.03	0.00
Error	12	262.40	21.90		
Total	20	66636.40			

CV=3.55

**Table 6** Analysis of variance of number of nodes of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
rep	2	19.93	9.96		
var	6	709.71	118.29	55.55	0.00
Error	12	25.55	2.13		
Total	20	755.19			

CV=6.66



**Table 7** Analysis of variance of number of branches of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
rep	2	1.52	0.76		
var	6	94.43	15.74	52.85	0.00
Error	12	3.57	0.30		
Total	20	99.52			

CV=11.61

**Table 8** Analysis of variance of fresh pod length of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
rep	3	0.08	0.03		
var	7	72.62	10.37	36.58	0.00
Error	21	5.95	0.28		
Total	31	78.65			

CV=5.94

**Table 9** Analysis of variance of dry pod length of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
rep	3	0.99	0.33		
var	7	72.39	10.34	38.30	0.00
Error	21	5.67	0.27		
Total	31	79.05			

CV=5.99

**Table 10** Analysis of variance of fresh pod width of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
rep	3	0.02	0.01		
var	7	7.21	1.03	205.12	0.00
Error	21	0.11	0.01		
Total	31	7.34			

CV=3.26

**Table 11** Analysis of variance of dry pod width of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
rep	3	0.02	0.01		
var	7	6.61	0.94	109.69	0.00
Error	21	0.18	0.01		
Total	31	6.81			

CV=5.17

**Table 12** Analysis of variance of seeds per pod of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to February 2007

Source	DF	SS	MS	F	P
rep	3	0.34	0.11		
var	7	26.18	3.74	12.47	0.00
Error	21	6.30	0.30		
Total	31	32.81			

CV=8.98

**Table 13** Analysis of variance of powdery mildew infection percentage on leaf surface at the 4<sup>th</sup> leaf nodes of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to March 2007

Source	DF	SS	MS	F	P
Rep	2	4804.80	2402.39		
Tr	6	33826.70	5637.78	9.48	0.00
Error	12	7140.00	595.00		
Total	20	45771.40			

CV=53.61

**Table 14** Analysis of variance of powdery mildew infection percentage on leaf surface at the 7<sup>th</sup> leaf nodes of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to March 2007

Source	DF	SS	MS	F	P
Rep	2	352.10	176.07		
Tr	6	14418.30	2403.04	6.16	0.00
Error	12	4682.30	390.19		
Total	20	19452.70			

CV=83.21

**Table 15** Analysis of variance of powdery mildew infection percentage on leaf surface at the 11<sup>th</sup> leaf nodes of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to March 2007

Source	DF	SS	MS	F	P
Rep	2	2167.70	1083.85		
Tr	6	20371.50	3395.25	8.71	0.00
Error	12	4678.70	389.89		
Total	20	27217.90			

CV=54.47

**Table 16** Analysis of variance of powdery mildew infection percentage of a whole plant of 7 snow pea lines/cultivar at Pang Da Royal Agricultural Station during November 2006 to March 2007

Source	DF	SS	MS	F	P
Rep	2	1839.10	919.55		
Tr	6	21191.80	3531.97	11.87	0.00
Error	12	3571.20	297.60		
Total	20	26602.20			

CV=49.05

**Table 17** Analysis of variance of powdery mildew infection percentage on leaf surface at the 7<sup>th</sup> leaf nodes of 7 snow pea lines/cultivar at Inthanon Royal Agricultural Research Station during July to October 2007

Source	DF	SS	MS	F	P
Rep	3	92.12	30.71		
Tr	6	413.38	68.90	1.31	0.30
Error	18	944.15	52.45		
Total	27	1449.66			

CV=106.91

**Table 18** Analysis of variance of powdery mildew infection percentage on leaf surface at the 11<sup>th</sup> leaf nodes of 7 snow pea lines/cultivar at Inthanon Royal Agricultural Research Station during July to October 2007

Source	DF	SS	MS	F	P
Rep	3	47.18	15.73		
Tr	6	333.85	55.64	0.49	0.81
Error	18	2034.53	113.03		
Total	27	2415.55			

CV=90.63

**Table 19** Analysis of variance of powdery mildew infection percentage of a whole plant of 7 snow pea lines/cultivar at Inthanon Royal Agricultural Research Station during July to October 2007

Source	DF	SS	MS	F	P
Rep	3	61.34	20.45		
Tr	6	2321.36	386.89	3.50	0.02
Error	18	1988.56	110.48		
Total	27	4371.26			

CV=13.14

**Table 20** Analysis of variance of number of days to first flowering of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	113.02	56.51		
Tr	8	285.49	35.69	1.43	0.26
Error	16	399.12	24.94		
Total	26	797.62			

CV=13.12

**Table 21** Analysis of variance of number of days to first blooming of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	117.36	58.68		
Tr	8	245.44	30.68	2.51	0.06
Error	16	195.20	12.20		
Total	26	558.00			

CV=8.21

**Table 22** Analysis of variance of number of days to first pod setting of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	47.08	23.54		
Tr	8	478.59	59.82	2.66	0.05
Error	16	359.56	22.47		
Total	26	885.23			

CV=9.98

**Table 23** Analysis of variance of snow pea vines height at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	215.50	107.74		
Tr	8	60206.30	7525.79	36.98	0.00
Error	16	3256.20	203.51		
Total	26	63678.00			

CV=8.37

**Table 24** Analysis of variance of first flowering node of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	8.37	4.19		
Tr	8	296.02	37.00	38.51	0.00
Error	16	15.37	0.96		
Total	26	319.77			

CV=5.81

**Table 25** Analysis of variance of flower number per inflorescence of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	0.24	0.12		
Tr	8	6.58	0.82	3.22	0.02
Error	16	4.08	0.26		
Total	26	10.90			

CV=28.21

**Table 26** Analysis of variance of first node to pod setting of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	3.87	1.93		
Tr	8	251.38	31.42	22.45	0.00
Error	16	22.40	1.40		
Total	26	277.65			

CV=6.76

**Table 27** Analysis of variance of pod per bunch of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	0.01	0.01		
Tr	8	0.33	0.04	6.09	0.00
Error	16	0.11	0.01		
Total	26	0.45			

CV=7.46

**Table 28** Analysis of variance of node to first branch of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	37.83	18.92		
Tr	8	275.65	34.46	7.10	0.00
Error	16	77.59	4.85		
Total	26	391.07			

CV=43.5

**Table 29** Analysis of variance of branch number per plant of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	0.52	0.26		
Tr	8	175.15	21.89	22.85	0.00
Error	16	15.33	0.96		
Total	26	191.00			

CV=30.01

**Table 30** Analysis of variance of snow pea internodes length at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	4.33	2.17		
Tr	8	172.22	21.53	34.88	0.00
Error	16	9.87	0.62		
Total	26	186.42			

CV=9.98



**Table 31** Analysis of variance of node number per plant of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	2.34	1.17		
Tr	8	312.97	39.12	43.24	0.00
Error	16	14.48	0.90		
Total	26	329.79			

CV=3.92

**Table 32** Analysis of variance of first harvesting date of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	65.85	32.93		
Tr	8	2586.74	323.34	10.21	0.00
Error	16	506.81	31.68		
Total	26	3159.41			

CV=9.52

**Table 33** Analysis of variance of number of day to harvest of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	844.74	422.37		
Tr	8	3978.74	497.34	4.12	0.01
Error	16	1931.26	120.70		
Total	26	6754.74			

CV=48.79

**Table 34** Analysis of variance of snow pea pod length at Khun Wang Royal Project  
Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	3.99	1.99		
Tr	8	21.89	2.74	3.21	0.02
Error	16	13.63	0.85		
Total	26	39.51			

CV=12.37

**Table 35** Analysis of variance of snow pea pod width at Khun Wang Royal Project  
Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	0.01	0.00		
Tr	8	2.68	0.33	5.63	0.00
Error	16	0.95	0.06		
Total	26	3.63			

CV=10.08

**Table 36** Analysis of variance of seed per pod of snow pea at Khun Wang Royal  
Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	3.40	1.70		
Tr	8	21.61	2.70	2.49	0.06
Error	16	17.33	1.08		
Total	26	42.33			

CV=27.24

**Table 37** Analysis of variance of weight per pod of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	1.28	0.64		
Tr	8	82.77	10.35	9.64	0.00
Error	16	17.18	1.07		
Total	26	101.23			

CV=16.87

**Table 38** Analysis of variance of pod number per plant of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	24.82	12.41		
Tr	8	303.10	37.89	13.59	0.00
Error	16	44.61	2.79		
Total	26	372.53			

CV=24.37

**Table 39** Analysis of variance of total pod weight per plant of snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
rep	2	1403.50	701.74		
tr	8	26245.70	3280.71	18.99	0.00
Error	16	2763.90	172.74		
Total	26	30413.10			

CV=26.42

**Table 40** Analysis of variance of number of days to first flowering of snow pea node at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	2.21	0.74		
Tr	8	1174.02	146.75	108.32	0.00
Error	24	32.51	1.36		
Total	35	1208.74			

CV=3.63

**Table 41** Analysis of variance of number of days to first blooming of snow pea node at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	5.51	1.84		
Tr	8	1022.53	127.82	38.76	0.00
Error	24	79.15	3.30		
Total	35	1107.19			

CV=5.37

**Table 42** Analysis of variance of number of days to first pod setting of snow pea node at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	1.11	0.37		
Tr	8	1624.89	203.11	119.22	0.00
Error	24	40.89	1.70		
Total	35	1666.89			

CV=2.63

**Table 43** Analysis of variance of vines height of snow pea at Ang Khang Royal

Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	616.80	205.60		
Tr	8	82227.20	10278.40	102.14	0.00
Error	24	2415.10	100.60		
Total	35	85259.10			

CV=5.68

**Table 44** Analysis of variance of snow pea first flowering node at Ang Khang Royal

Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	1.83	0.61		
Tr	8	226.81	28.35	52.52	0.00
Error	24	12.96	0.54		
Total	35	241.60			

CV=4.64

**Table 45** Analysis of variance of flower number per inflorescence of snow pea at

Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	0.00	0.00		
Tr	8	2.05	0.26	41.70	0.00
Error	24	0.15	0.01		
Total	35	2.20			

CV=6.57

**Table 46** Analysis of variance of first node to pod setting of snow pea at Ang Khang  
Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	1.57	0.52		
Tr	8	259.63	32.45	40.39	0.00
Error	24	19.29	0.80		
Total	35	280.48			

CV=5.54

**Table 47** Analysis of variance of pod per inflorescence of snow pea at Ang Khang  
Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	0.01	0.00		
Tr	8	1.37	0.17	32.98	0.00
Error	24	0.12	0.01		
Total	35	1.50			

CV=6.40

**Table 48** Analysis of variance of node to first branch of snow pea at Ang Khang  
Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	16.85	5.62		
Tr	8	547.66	68.46	27.42	0.00
Error	24	59.91	2.50		
Total	35	624.42			

CV=31.07

**Table 49** Analysis of variance of number of branch per plant of snow pea at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	1.51	0.50		
Tr	8	40.61	5.08	20.42	0.00
Error	24	5.97	0.25		
Total	35	48.09			

CV=19.17

**Table 50** Analysis of variance of snow pea internodes length at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	4.50	1.50		
Tr	8	139.59	17.45	101.01	0.00
Error	24	4.15	0.17		
Total	35	148.23			

CV=7.63

**Table 51** Analysis of variance of first harvesting date of snow pea at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	29.86	9.95		
Tr	8	1542.22	192.78	35.35	0.00
Error	24	130.89	5.45		
Total	35	1702.97			

CV=3.86

**Table 52** Analysis of variance of number of day to harvest of snow pea at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	292.78	97.59		
Tr	8	710.50	88.81	3.47	0.01
Error	24	613.72	25.57		
Total	35	1617.00			

CV=15.10

**Table 53** Analysis of variance of pod length of snow pea at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
rep	3	0.31	0.10		
Tr	8	18.71	2.34	9.20	0.00
Error	24	6.10	0.25		
Total	35	25.12			

CV=5.92

**Table 54** Analysis of variance of pod width of snow pea at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
rep	3	0.03	0.01		
Tr	8	3.20	0.40	7.12	0.00
Error	24	1.35	0.06		
Total	35	4.57			

CV=9.50



**Table 55** Analysis of variance of seed per pod of snow pea at Ang Khang Royal

Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
rep	3	0.14	0.05		
Tr	8	27.58	3.45	18.52	0.00
Error	24	4.47	0.19		
Total	35	32.19			

CV=10.74

**Table 56** Analysis of variance of weight per pod of snow pea at Ang Khang Royal

Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
rep	3	4.92	1.64		
Tr	8	129.67	16.21	5.74	0.00
Error	24	67.72	2.82		
Total	35	202.31			

CV=22.19

**Table 57** Analysis of variance of pod number per plant of snow pea at Ang Khang

Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	9.36	3.12		
Tr	8	574.28	71.78	12.66	0.00
Error	24	136.13	5.67		
Total	35	719.77			

CV=16.44

**Table 58** Analysis of variance of total pod weight per plant of snow pea at Ang Khang Royal Agricultural Station during August to October 2011

Source	DF	SS	MS	F	P
Rep	3	1626.60	542.20		
Tr	8	14636.80	1829.60	2.32	0.05
Error	24	18959.90	789.99		
Total	35	35223.20			

CV=28.46

**Table 59** Analysis of variance of powdery mildew infection percentage on leaf surface at the 7<sup>th</sup> leaf nodes at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	97.20	48.58		
Tr	8	23688.30	2961.03	34.01	0.00
Error	16	1393.00	87.06		
Total	26	25178.40			

CV= 33.36

**Table 60** Analysis of variance of powdery mildew infection percentage on leaf surface at the 11<sup>th</sup> leaf nodes at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Rep	2	128.30	64.15		
Tr	8	53993.50	6749.19	198.31	0.00
Error	16	544.50	34.03		
Total	26	54666.30			

CV=12.08

**Table 61** Analysis of variance of powdery mildew infection percentage on leaf surface at the 7<sup>th</sup> leaf nodes at Ang Khang Royal Agricultural Station during August to October 2010

Source	DF	SS	MS	F	P
rep	3	16.03	5.34		
Tr	8	33.05	4.13	1.82	0.12
Error	24	54.37	2.27		
Total	35	103.45			

CV=126.25

**Table 62** Analysis of variance of powdery mildew infection percentage on leaf surface at the 11<sup>th</sup> leaf nodes at Ang Khang Royal Agricultural Station during August to October 2010

Source	DF	SS	MS	F	P
rep	3	4900.30	1633.43		
Tr	8	1828.00	228.50	1.43	0.24
Error	24	3842.00	160.08		
Total	35	10570.30			

CV=19.02

**Table 63** Analysis of variance of consumer preference to characteristics of tested of pod size snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Tr	5	39.01	7.80	7.32	0.00
Error	168	179.10	1.07		
Total	173	218.12			

CV=36.22

**Table 64** Analysis of variance of consumer preference to characteristics of tested of shape snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Tr	5	48.33	9.67	11.70	0.00
Error	168	138.41	0.82		
Total	173	186.74			

CV=32.30

**Table 65** Analysis of variance of consumer preference to characteristics of tested of crispness snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Tr	5	30.10	6.02	5.09	0.00
Error	168	198.83	1.18		
Total	173	228.93			

CV=37.63

**Table 66** Analysis of variance of consumer preference to characteristics of tested of sweetness snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Tr	5	6.05	1.21	0.95	0.45
Error	168	213.66	1.27		
Total	173	219.70			

CV=40.54

**Table 67** Analysis of variance of consumer preference to characteristics of tested of color snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Tr	5	71.91	14.38	18.70	0.00
Error	168	128.90	0.77		
Total	173	200.81			

CV=31.62

**Table 68** Analysis of variance of consumer preference to characteristics of tested of scent snow pea at Khun Wang Royal Project Development Centre during May to August 2010

Source	DF	SS	MS	F	P
Tr	5	6.10	1.22	1.13	0.35
Error	168	181.24	1.08		
Total	173	187.34			

CV=37.57

**Table 69** Analysis of variance of consumer preference to characteristics of tested of pod size snow pea at Ang Khang Royal Agricultural Station during August to October 2010

Source	DF	SS	MS	F	P
Tr	8	6.43	0.80	0.68	0.70
Error	117	137.29	1.17		
Total	125	143.71			

CV=35.54

**Table 70** Analysis of variance of consumer preference to characteristics of tested of shape snow pea at Ang Khang Royal Agricultural Station during August to October 2010

Source	DF	SS	MS	F	P
Tr	8	8.59	1.07	0.99	0.45
Error	117	127.29	1.09		
Total	125	135.87			

CV=35.14

**Table 71** Analysis of variance of consumer preference to characteristics of tested of crispness snow pea at Ang Khang Royal Agricultural Station during August to October 2010

Source	DF	SS	MS	F	P
Tr	8	4.71	0.59	0.78	0.62
Error	117	88.21	0.75		
Total	125	92.93			

CV=25.86

**Table 72** Analysis of variance of consumer preference to characteristics of tested of sweetness snow pea at Ang Khang Royal Agricultural Station during August to October 2010

Source	DF	SS	MS	F	P
Tr	8	5.44	0.68	0.66	0.72
Error	117	120.21	1.03		
Total	125	125.66			

CV=25.86

**Table 73** Analysis of variance of consumer preference to characteristics of tested of color snow pea at Ang Khang Royal Agricultural Station during August to October 2010

Source	DF	SS	MS	F	P
Tr	8	57.49	7.19	8.55	0.00
Error	117	98.29	0.84		
Total	125	155.78			

CV=34.99

**Table 74** Analysis of variance of consumer preference to characteristics of tested of scent snow pea at Ang Khang Royal Agricultural Station during August to October 2010

Source	DF	SS	MS	F	P
Tr	8	4.78	0.60	0.66	0.73
Error	117	106.21	0.91		
Total	125	110.99			

CV=33.00

## APPENDIX C

**Table 1** Test of consumer satisfaction on pod size of snow pea hybrids and their parents from Khun Wang Royal Project Development

Centre	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	4	13.79	3	10.34	9	31.03	5	17.24	8	27.59	3.34	1.37	Like moderately
No.5	5	17.24	6	20.69	12	41.38	6	20.69	0	0.00	2.66	1.01	Like slightly
Fang No.7	11	37.93	9	31.03	8	27.59	1	3.45	0	0.00	1.97	0.91	Dislike
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	0	0.00	5	17.24	11	37.93	13	44.83	0	0.00	3.28	0.75	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	1	3.45	7	24.14	10	34.48	9	31.03	2	6.90	3.14	0.99	Like moderately
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	4	13.79	8	27.59	10	34.48	6	20.69	1	3.45	2.72	1.07	Like slightly

N = 29



**Table 2** Test of consumer satisfaction on pod shape of snow pea hybrids and their parents from Khun Wang Royal Project Development

Centre	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	1	3.45	4	13.79	9	31.03	8	27.59	7	24.14	3.55	1.12	Like moderately
No.5	4	13.79	10	34.48	12	41.38	3	10.34	0	0	2.48	0.87	Like slightly
Fang No.7	10	34.48	11	37.93	6	20.69	2	6.9	0	0	2	0.93	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	0	0	5	17.24	12	41.38	11	37.93	1	3.45	3.28	0.8	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	0	0	8	27.59	15	51.72	3	10.34	3	10.34	3.03	0.91	Like moderately
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	3	10.34	10	34.48	14	48.28	2	6.9	0	0	2.52	0.78	Like slightly

N = 29

**Table 3** Test of consumer satisfaction on pod crispness of snow pea hybrids and their parents from Khun Wang Royal Project

Development Centre	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	8	27.59	3	10.34	9	31.03	7	24.14	2	6.9	2.72	1.31	Like slightly
No.5	2	6.9	6	20.69	11	37.93	6	20.69	4	13.79	3.14	1.13	Like moderately
Fang No.7	2	6.9	8	27.59	15	51.72	4	13.79	0	0	2.72	0.8	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	12	41.38	7	24.14	5	17.24	4	13.79	1	3.45	2.14	1.22	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	0	0	6	20.69	12	41.38	6	20.69	5	17.24	3.34	1.01	Like moderately
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	0	0	7	24.14	11	37.93	7	24.14	4	13.79	3.28	1	Like moderately

N = 29

**Table 4** Test of consumer satisfaction on sweetness of snow pea hybrids and their parents from Khun Wang Royal Project Development

Centre	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	4	13.79	8	27.59	10	34.48	4	13.79	3	10.34	2.79	1.18	Like slightly
No.5	2	6.9	12	41.38	8	27.59	5	17.24	2	6.9	2.76	1.06	Like slightly
Fang No.7	5	17.24	8	27.59	11	37.93	4	13.79	1	3.45	2.59	1.05	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	5	17.24	13	44.83	4	13.79	4	13.79	3	10.34	2.55	1.24	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	3	10.34	10	34.48	6	20.69	7	24.14	3	10.34	2.9	1.21	Like slightly
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	1	3.45	7	24.14	12	41.38	6	20.69	3	10.34	3.1	1.01	Like moderately

N = 29

**Table 5** Test of consumer satisfaction on sweetness of snow pea hybrids and their parents from Khun Wang Royal Project Development

Centre	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	0	0	3	10.34	11	37.93	12	41.38	3	10.34	3.52	0.83	Like moderately
No.5	3	10.34	13	44.83	10	34.48	2	6.9	1	3.45	2.48	0.91	Like slightly
Fang No.7	13	44.83	14	48.28	2	6.9	0	0	0	0	1.62	0.62	Dislike
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	0	0	5	17.24	13	44.83	8	27.59	3	10.34	3.31	0.89	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	1	3.45	4	13.79	15	51.72	7	24.14	2	6.9	3.17	0.89	Like moderately
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	5	17.24	9	31.03	12	41.38	1	3.45	2	6.9	2.52	1.06	Like slightly

N = 29

**Table 6** Test of consumer satisfaction on scent of snow pea hybrids and their parents at Khun Wang Royal Project Development Centre

Line/cultivar	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	4	13.79	5	17.24	14	48.28	3	10.34	3	10.34	2.86	1.13	Like slightly
No.5	3	10.34	9	31.03	12	41.38	3	10.34	2	6.9	2.72	1.03	Like slightly
Fang No.7	8	27.59	7	24.14	10	34.48	3	10.34	1	3.45	2.38	1.12	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	2	6.9	8	27.59	13	44.83	4	13.79	2	6.9	2.86	0.99	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	3	10.34	8	27.59	11	37.93	6	20.69	1	3.45	2.79	1.01	Like slightly
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	1	3.45	8	27.59	13	44.83	5	17.24	2	6.9	2.97	0.94	Like slightly

N = 29

**Table 7** Test of consumer satisfaction on pod size of snow pea hybrids and their parents at Ang Khang Royal Agricultural Station

Line/cultivar	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	0	0	3	14.3	3	21.43	6	42.86	2	14.29	3.5	1.02	Like moderately
No.3	2	14.29	2	14.29	6	42.86	4	28.57	0	0	2.86	1.03	Like slightly
No.4	1	7.14	3	21.43	8	57.14	2	14.29	0	0	2.79	0.8	Like slightly
No.5	3	21.43	1	7.14	4	28.57	5	35.71	1	7.14	3	1.3	Like moderately
Fang No.7	0	0	3	21.43	6	42.86	4	28.57	1	7.14	3.21	0.89	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	0	0	4	28.57	9	64.29	1	7.14	0	0	2.79	0.58	Like slightly
BC <sub>3</sub> F <sub>3</sub> (P309 × No.4)	0	0	2	14.29	7	50	5	35.71	0	0	3.21	0.7	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	4	28.57	1	7.14	3	21.43	4	28.57	2	14.29	2.93	1.49	Like slightly
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	3	21.43	2	14.29	2	14.29	4	28.57	3	21.43	3.14	1.51	Like moderately

N = 14

**Table 8** Test of consumer satisfaction on pod shape of snow pea hybrids and their parents from Ang Khang Royal Agricultural Station

Line/cultivar	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	0	0	3	21.43	5	35.71	3	21.43	3	21.43	3.43	1.09	Like moderately
No.3	3	21.43	2	14.29	6	42.86	3	21.43	0	0	2.64	1.08	Like slightly
No.4	2	14.29	4	28.57	3	21.43	5	35.71	0	0	2.79	1.12	Like slightly
No.5	2	14.29	3	21.43	6	42.86	3	21.43	0	0	2.71	0.99	Like slightly
Fang No.7	1	7.14	3	21.43	6	42.86	3	21.43	1	7.14	3	1.04	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	1	7.14	4	28.57	7	50	2	14.29	0	0	2.71	0.83	Like slightly
BC <sub>3</sub> F <sub>3</sub> (P309 × No.4)	0	0	0	0	10	71.43	4	28.57	0	0	3.29	0.47	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	2	14.29	3	21.43	2	14.29	7	50	0	0	3	1.18	Like moderately
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	2	14.29	3	21.43	2	14.29	5	35.71	2	14.29	3.14	1.35	Like moderately

N = 14

**Table 9** Test of consumer satisfaction on pod crispness of snow pea hybrids and their parents from Ang Khang Royal Agricultural

Station	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	1	7.14	0	0	6	42.86	5	35.71	2	14.29	3.5	1.02	Like moderately
No.3	1	7.14	0	0	7	50	5	35.71	1	7.14	3.36	0.93	Like moderately
No.4	0	0	0	0	9	64.29	4	28.57	1	7.14	3.43	0.65	Like moderately
No.5	1	7.14	3	21.43	5	35.71	3	21.43	2	14.29	3.14	0.17	Like moderately
Fang No.7	0	0	0	0	8	57.14	4	28.57	2	12.29	3.57	0.76	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	0	0	0	0	6	42.86	7	50	1	7.14	3.64	0.63	Like moderately
BC <sub>3</sub> F <sub>3</sub> (P309 × No.4)	0	0	0	0	10	71.43	4	28.57	0	0	3.29	0.47	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	1	7.14	2	14.29	5	35.71	4	28.57	2	14.29	3.29	1.14	Like moderately
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	1	7.14	1	7.14	9	64.29	3	21.43	0	0	3	0.78	Like moderately

N = 14



**Table 10** Test of consumer satisfaction on pod sweetness of snow pea hybrids and their parents from Ang Khang Royal Agricultural

Station	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	3	21.43	2	14.29	5	35.71	4	28.57	0	0	2.71	1.14	Like slightly
No.3	0	0	2	14.29	7	50	5	35.71	0	0	3.21	0.7	Like moderately
No.4	1	7.14	6	42.86	5	35.71	1	7.14	1	7.14	2.64	1.01	Like slightly
No.5	1	7.14	5	35.71	4	28.57	4	28.57	0	0	2.79	0.98	Like slightly
Fang No.7	1	7.14	2	14.29	5	35.71	5	35.71	1	7.14	3.21	1.05	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	1	7.14	7	50	1	7.14	5	35.71	0	0	2.71	1.07	Like slightly
BC <sub>3</sub> F <sub>3</sub> (P309 × No.4)	1	7.14	5	35.71	5	35.71	2	14.29	1	7.14	2.79	1.05	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	0	0	5	35.71	4	28.57	4	28.57	1	7.14	3.07	1	Like moderately
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	2	14.29	2	14.29	5	35.71	5	35.71	0	0	2.93	1.07	Like slightly

N = 14

**Table 11** Test of consumer satisfaction on pod color of snow pea hybrids and their parents from Ang Khang Royal Agricultural Station

Line/cultivar	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	0	0	1	7.14	3	21.43	6	42.86	4	28.57	3.93	0.92	Like moderately
No.3	1	7.14	4	28.57	8	57.14	1	7.14	0	0	2.64	0.74	Like slightly
No.4	0	0	1	7.14	4	28.57	8	57.14	1	7.14	3.64	0.74	Like moderately
No.5	3	21.43	2	14.29	6	42.86	3	21.43	0	0	2.64	1.08	Like slightly
Fang No.7	4	28.57	6	42.86	3	21.43	1	7.14	0	0	2.07	0.92	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	1	7.14	2	14.29	9	64.29	2	14.29	0	0	2.86	0.77	Like slightly
BC <sub>3</sub> F <sub>3</sub> (P309 × No.4)	0	0	2	14.29	7	50	5	35.71	0	0	3.31	0.63	Like moderately
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	4	28.57	5	35.71	4	28.57	0	0	1	7.14	2.21	1.12	Like slightly
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	8	57.14	3	21.43	1	7.14	2	14.29	0	0	1.79	1.12	Dislike

N = 14

**Table 12** Test of consumer satisfaction on pod scent of snow pea hybrids and their parents from Ang Khang Royal Agricultural Station

Line/cultivar	Opinions of the consumers										Mean	SD	Interpretation
	Dislike		Like slightly		Like moderately		Like very much		Like extremely				
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent			
P309	4	28.57	3	21.43	5	35.71	2	14.29	0	0	2.36	1.08	Like slightly
No.3	0	0	5	35.71	6	42.86	3	21.43	0	0	2.86	0.77	Like slightly
No.4	3	21.43	4	28.57	2	14.29	5	35.71	0	0	2.64	1.22	Like slightly
No.5	2	14.29	4	28.57	6	42.86	2	14.29	0	0	2.57	0.94	Like slightly
Fang No.7	1	7.14	5	35.71	7	50	1	7.14	0	0	2.57	0.76	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.3 × P309)	0	0	6	42.86	6	42.86	2	14.29	0	0	2.71	0.73	Like slightly
BC <sub>3</sub> F <sub>3</sub> (P309 × No.4)	2	14.29	4	28.57	6	42.86	2	14.29	0	0	2.57	0.94	Like slightly
BC <sub>3</sub> F <sub>3</sub> (No.5 × P309)	1	7.14	6	42.86	5	35.71	1	7.14	1	7.14	2.64	1.01	Like slightly
BC <sub>3</sub> F <sub>3</sub> (Fang No.7 × P309)	5	35.71	3	21.43	5	35.71	1	7.14	0	0	2.14	1.03	Like slightly

N = 14

## APPENDIX D

### Study of powdery mildew resistant linkage DNA marker by PCR technique in snow pea

#### Materials for PCR technique

##### Equipments

1. Autoclave
2. Adjustable volume micropipette P2, P10, P20, P100, P200, P1000 (Discovery Labmate plus, Pacific Science Co., Ltd.)
3. BIO DOC-It™ M-20 System (Gibthai Co., Ltd.)
4. Blue tip for adjustable volume micropipette P1000 (Neptune Technology and Bioresources Inc., Canada)
5. Electrophoresis apparatus (Gibthai Co., Ltd.)
6. -20 °C freezer
7. Microcentrifuge (Gibthai Co., Ltd.)
8. 1.5 ml microcentrifuge tube (Neptune Technology and Bioresources Inc., Canada)
9. Microtip for adjustable volume micropipette P2 and P10 (Bio Basic Inc., Canada)
10. Microwave oven
11. Mortar
12. 0.2 ml PCR tube (Pacific Science Co., Ltd.)
13. Thermal Cycler (Perkin Elmer Gene Amp PCR System 2400, Perkin-Elmer Cetus Co., Norwalk, Connecticut, USA)
14. Vortex mixer (Gibthai Co., Ltd.)
15. Water bath
16. Yellow tip for adjustable volume micropipette P20, P100 and P200 (Bio Basic Inc., Canada)

Chemical reagents

1. Agarose I<sup>™</sup> (Amresco Inc.)
2. 6× loading buffer (BioExcellent Co., Ltd.)
3. Chloroform (Labscan Asia Co., Ltd.)
4. Deoxyribonucleoside triphosphates (dNTPs) (iNtRON Biotechnology, Inc.)
5. 100 bp + 1.5 Kb DNA ladder (Pacific Science Co., Ltd.)
6. Ethidium bromide (BioExcellent Co., Ltd.)
7. Ethyl alcohol (BioExcellent Co., Ltd.)
8. 100 bp Sharp DNA Ladder Marker (RBC Bioscience Inc., Taiwan)
9. PCR reaction buffer with magnesium chloride (iNtRON Biotechnology, Inc.)
10. Plant DNAZOL<sup>®</sup> Reagent (Invitrogen Co., Ltd.)
11. Primer (Operon Technologies Inc., Alameda, California, USA)
12. *i-Taq*<sup>™</sup> DNA polymerase (iNtRON Biotechnology, Inc.)
13. 10× TBE buffer (Pacific Science Co., Ltd.)
14. TE buffer (BioExcellent Co., Ltd.)

## APPENDIX E

### Snow pea line “Royal project 1”

#### Source and History

Snow pea line “Royal project 1” which is the hybrid derived from cultivar Fang No.7, commercial cultivar which is widely used in Thailand, were crossed with line P309 powdery mildew resistant line from Department of Agriculture. Those of them were bred and tested at four locations where belong to The Royal Project Foundation in Chiang Mai, Pang Da Royal Agricultural Station, Ang Khang Royal Agricultural Station, Inthanon Royal Agricultural Research Station and Khun Wang Royal Project Development Centre. Backcrossing method was used as three times. Then two times of self-pollination were conducted. The duration of this breeding program was 5 years during 2008-2011. This research was supported by the the Royal Project Foundation.

#### The Characteristics of line

##### Specie/variety

Edible fresh pea pod

Scientific name: *Pisum sativum* family *Leguminosae*

##### Stems

The vine height is about 180-250 cm and 1-8 branches per each.

##### Leaves

Compound leaf, at the leaf basal had purple color ring

##### Flowers / flower cluster

Flower color is purple; one cluster had one flower, the first blooming and day to 50 percent of flowering were 39-41 and 42-44 days, respectively. (the number of days from seed sowing)

**Pods and seeds**

One cluster had one pod. First node to pod setting was on the 7<sup>th</sup> leaf node at 43-45 days. They could start to harvest at 50-53 days after seed sowing, .The number of pod per plant was 10-20 pods. The average of pod weight was 9 grams. Pod length and width and wing pod width were 8, 3 and 2 cm, respectively. The skin of seeds had the yellow and green and also had purple spots around the seed. The number of seed per pod was five seeds.

**Other characteristics**

-


**Special characteristic**

Resistance to powdery mildew disease



**Figure 1** Characteristics of snow pea line “Royal project 1”





ร.พ. ๒

**หนังสือรับรองพันธุ์พืชขึ้นทะเบียน  
ตามพระราชบัญญัติพันธุ์พืช พ.ศ. ๒๕๑๘**

เลขที่ ..... ๐๒๖/๒๕๕๔ ..... กรมวิชาการเกษตร

หนังสือรับรองฉบับนี้ให้ไว้แก่ ..... มุลนิธิโครงการหลวง .....

โดยมี ..... องค์ประธานมูลนิธิโครงการหลวง ..... เป็นผู้ดำเนินการ

ตั้งอยู่เลขที่ ๖๕ หมู่ที่ ..... ตรอก/ซอย ..... - ถนน ..... สุขเทพ .....

ตำบล/แขวง ..... - อำเภอ/เขต ..... เมือง ..... จังหวัด ..... เชียงใหม่ .....


เพื่อรับรองว่า


ชนิดพืช ..... ถั่วลิสงเตา

ชื่อพันธุ์/สายพันธุ์ ..... โครงการหลวง 1

เป็นพันธุ์พืชขึ้นทะเบียน ตามมาตรา ๒๘ แห่งพระราชบัญญัติพันธุ์พืช พ.ศ. ๒๕๑๘ ซึ่งแก้ไขเพิ่มเติม  
โดย พระราชบัญญัติพันธุ์พืช (ฉบับที่ ๒) พ.ศ. ๒๕๓๕

ให้ไว้ ณ วันที่ ๕ เมษายน ๒๕๕๔



  
(นายจิรากร ไก่ยเสรี)  
อธิบดีกรมวิชาการเกษตร

**Figure 2** The registration certificate of plant varieties from Department of Agriculture.

## Curriculum Vitae

**Name** Mrs. Anchan Chompupoung

**Date of Birth** April 15, 1971

### Education Background

1993 B.S.C. (Plant Pathology), Chiang Mai University, Thailand

2001 M.S.C. (Plant Biotechnology), Chiang Mai University,  
Thailand

2011 Ph.D. (Horticulture), Chiang Mai University, Thailand

### Work Experience

1993 Research assistant, Research division, Royal Project  
Foundation, Chiang Mai, Thailand

1994 Researcher (vegetable), Research division, Royal Project  
Foundation, Chiang Mai, Thailand

2000 Researcher (vegetable), Development division, Royal Project  
Foundation, Chiang Mai, Thailand

2007-present Vegetable Development and Extension Coordinator,  
Development division, Royal Project Foundation, Chiang Mai,  
Thailand