

'94 현장애로 기술개발사업

# 조생온주의 화학적 적과와 품질향상

Fruit Thinning and Improving Fruit Quality  
by Use of Growth Regulators in  
Early Satuma Mandarin

- 1차년도 중간보고서 -

1995 년 12 월

研究機關

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1997 12 29

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I.

**Fruit thinning and improving fruit quality  
by use of growth regulators in early-maturing  
satsuma mandarin**

II.

80%  
가  
가  
가

III.

1 (1994. 12 - 1995. 12).

1. 3,5,6- trichloro- 2- pyridyloxyacetic acid(3,5,6- TPA) 15mg/L

10

4

가 (

).

2. 3,5,6- TPA

가

가

(

).

3. 2

3,5,6- TPA

가

가

(

).

4. 3,5,6- TPA

가

가

5. 가

가

2 (1995. 12 - 1996. 12)

1. , , 3,5,6- TPA 15mg/L 가  
67mg/L 4 5 4 (

2 )

2. 3,5,6- TPA

가

가

3

3. 1 가

2,4- dichlorophenoxy

propionic acid(2,4- DP)

가

4. 가

가

가

가

### 3 ((1996. 12 - 1997. 12))

1. 1996

3,5,6- TPA

, 가

4

2. 1996

3. 1, 2

PDJ

가

4. 가 0 100mg/L 4

0 40mg/L 4

5 ( ), , 3,5,6- TPA

, 가

, 가

, PDJ

6

2

가

6.

PDJ

5

5 10

3

### III.

#### 1.

3,5,6- TPA, 가 , 가  
2,4- DP PDJ 가

#### 2. 3, 5, 6- TPA

3,5,6- TPA 7.5mg/L 가  
30mg/L 가 가 15mg/L가  
3,5,6- TPA  
13.6  
14.1m m 50% 15.3 18.5m m 2  
0 30% . 25 28m m 가  
가 가 가  
3,5,6- TPA 1  
가 가  
가 3,5,6- TPA 가 가

가

가

가

30m g/L

가

### 3. 가

가 67m g/L

가

가

가

가 50m g/L

가

40m g/L

### 4.

가 13

가

30%

14m m

가 13 17

18m m

3,5,6- T P A 15m g/L

가 17

20%

가

가

가  
가 50m g/L 가 20m g/L 가  
가

가



## SUMMARY

Alternate bearing phenomenon is severe in early-maturing satsuma mandarin which represents more than 80% of citrus acreage in Cheju island, Korea. The most reliable method to correct the alternate bearing habit is fruit-thinning which is very laborious. In order to establish the chemical fruit-thinning method, several experiments including demonstration were conducted for three years.

3,5,6-Trichloro-2-pyridyloxyacetic acid(3,5,6-TPA), ethychlozate (figaron), and mixture of figaron and ethephon were selected as chemical fruit-thinning agents. 2,4-Dichloroprop and PDJ(a derivative of jasmonic acid) did not increase fruit drop.

The suitable concentration of 3,5,6-TPA proved to be 15mg/L, because 7.5mg/L showed insufficient fruit-thinning effect while 30mg/L tended to increase leaf drop. Fruit diameter at spray was correlated with the thinning effect which was represented as the percent decrease in the final number of fruits remaining; spray at fruit dia of 13.6-14.1mm resulted in 50% thinning, that of 15.3-18.5mm did 20-30%, and that of 25-28mm showed no thinning effect.

3,5,6-TPA advanced peel colouring by one week with dark orange colour, and increased fruit size. Spray of 3,5,6-TPA resulted in more percent distribution of marketable fruits in

groves producing small fruits because of heavy crop load, while more unmarketable large fruits in groves with light crop. Effect on juice Brix was inconsistent. Rough peel surface with large oil sac of young fruit became as smooth as the peel of control fruit. Few fruits stopped development without abscission. Any damage on tree by 3,5,6-TPA was not observed.

Effect of figaron on fruit drop, peel colouring, and fruit size, juice Brix varied with groves. Ethephon alone increased both fruit and leaf drop. Addition of 50mg/L figaron to ethephon increased ethylene evolution from fruit and fruit drop, while decreased ethylene evolution from leaf and leaf drop caused by ethephon.

It was suggested to spray 15mg/L 3,5,6-TPA at fruit dia of 14mm when the final leaf-fruit ratio is expected to be less than 13 in control, at that of 18mm when the final leaf-fruit ratio to be 13-17, and no spray when the final leaf-fruit ratio to be more than 17. Figaron alone or mixture of figaron and ethephon seemed to be further evaluated for practical use. Because of variability in the response to fruit-thinning agents among groves, small-scale spray are recommended before spray in the whole grove.

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# 1

1

84%

가

가

가

가

가

8

( 1- 1).

1- 1.

Table 1- 1. Citrus production in Cheju for recent eight years

	'89	'90	'91	'92	'93	'94	'95	'96
( )	19,335	19,414	19,605	21,727	21,479	21,448	21,605	25,802
( )	746	493	556	719	619	549	615	480
( )	2,200	3,151	4,251	2,623	3,948	5,521	4,334	6,079

( : ).

가

가

가 가  
가

WTO 가

81 5- chloroindazol- 8-  
acetic acid ethylester(ethychlozate; 가 ; j- 455)가

(鈴  
木 等, 1977, 1982, 1983). 90

3,5,6- trichloro- 2- pyridyloxyacetic acid(3.5.6- T P  
A) 가

가 (Agusti, M.  
, 1994, 1995). (1993) ethephon(

) 가 가

가 가

dichloroprop(2,4- DP; )

가 (Zaragoza

, 1992) PDJ

(竹内 禎,

1997). 가 ,

가

3,5,6- TPA, 가 , ,

가

PDJ

가

2

1. 1 (1994. 12 1995. 12)

3,5,6- TPA , 가

가

2

**3, 5, 6- TPA** : 3,5,6- TPA 15mg/L

10 4

가 (

).

**3, 5, 6- TPA** : 7.5, 15, 30mg/L 3,5,6- TPA  
67mg/L( 2 100mg/L)) 가

2

( ).

:

3,5,6- TPA 15mg/L, 가 50mg/L, 2,4- D 20mg/L 4



0, 10, 20, 40, 80mg/L

.  
: 가 3,5,6- TPA  
15mg/L, 가 100mg/L, 가 100mg/L+ 20mg/L  
가 ( ) ( )

2. 2 (1995. 12 1996. 12)

가  
1 가 2,4- DP  
가 가 가  
가 가

.  
: , , 3,5,6- TPA 15mg/L  
가 67mg/L 4 5 4 ( )  
가 2 ) 3,5,6- TPA  
가 가 3

.  
**2, 4- DP** 가 :  
, 2,4- DP 45mg/L( 17.7m m  
, 2,4- DP 90mg/L( 17.7mm ), 2,4- DP 90mg/L(  
20.2mm ), 3,5,6- TPA 15mg/L( 17.7m m ) 5  
3 .

가 : 가 50mg/L 50mg/L  
1, 2, 3, 4, 6, 9

3. 3 ((1996. 12 1997. 12)  
3 , ,

가 PDJ 가 .  
가

: 1996  
가  
가 , 3,5,6- TPA , 가 3

4 , 3 4  
3 31

: 1996  
5 ( 가), 가

: ( ), , 3,5,6- TPA , 가  
, 가 , PDJ 6  
( ) ( ) 2 .  
가 : ( ), ( ), (

) 3 PDJ  
 5 5-10 8  
 가 11 11  
 ( ) .  
 PDJ : , PDJ 25  
 mg/L( 15.4mm ), PDJ 50mg/L( 15.4mm ),  
 PDJ 100mg/L( 15.4mm ), PDJ 50mg/L( 18.9mm  
 ) 5 .  
 가 : 가 0, 25, 50, 100  
 mg/L 4 ( ) 0, 10, 20, 40 mg/L 4  
 ( ) 4 .

## 2 가

1

Pomeroy Aldich(1943)가 ‘ , ‘ ,  
naphthalene acetic acid(NAA)

三輪

等(1958) 齊藤 等(1959) NAA 가  
가

文(1976)

NAA

1970 1980 鈴木 等(1977, 1983, 1977, 1982)  
10 1981

5- chloroindazol- 8- acetic acid ethylester( 가 ; ethychlozate;  
j- 455)

가 栗山 吉田(1975) 30

100mg/L, 鈴木 廣瀨(1982) 50 100 200mg/L, 眞子  
(1980) 河瀨 等(1981) 40- 50 100 200mg/L

韓 文(1983), 韓(1985) 40

50 100 200mg/L 가

, 가 가 가 .

芮 文(1980) 30 , 45

150mg/L 가 , 金(1982)  
30 60 150mg/L 가  
. 5 20  
40 50 6 7 .  
가  
가  
가 가 가 .  
文 (1993) 6 15 ( 10 16mm) 가 50mg/L  
20 30%  
가 14  
20mg/L ethephon( )  
.  
90  
3,5,6- trichloro- 2- pyridyl- oxyacetic acid(3.5.6- TPA)가  
가 (Agusti ,  
1994). dichloroprop ( ; 2,4- DP)  
가 (Zaragoza , 1992)  
PDJ  
(竹内 禎, 1997).  
가

## 2 3,5,6- TPA

1.

3,5,6- TPA 15mg/L 10

, 5 5 1 1

80m, 3km

18

3 × 3m

5 22

27 6 19 ( 11.4m m), 10 6 29  
( 17.0m m), 7 8 ( 19.3m m), 7 19 ( 24.8m m)

60m, 3km

20 2.7m × 2.7m

5

22 가

, 11.2m m), 6 24 ( 14.7m m), 7 11 ( 22.4  
6 17 ( 26

mm), 7 18 ( 26.3mm) .

50

200 300

4

가

8

가

가

{(100- )-(100- )}/(100- )

( - )/(100- )

- )/(

) (1- / )

9 7

1=

( 50 ), 2= ( 28 50), 3= (

22 28), 4= ( 17 22), 5= (

17 )

2.

3,5,6- TPA

10 20

가

가

( 2-1). 6 19

6 29 7 8

가 2

7 8 7 19

6 19 .

6 19 8 18 6

19 7 8 가 2

7 8 가 7 19

. 가 .

( 2-2) 6 17

가 15.3 24.7 가

. 가 7 11 가 가

7 18 가

2- 1. 3,5,6- TPA 15mg/L 가

(18 , , 1995 )

Table 2- 1. Effect of the date of foliar spray of 15mg/L 3,5,6- TPA on fruit and old leaf drop ratios in 'Okitsu Early' satsuma mandarin(18- years old, Cheju, 1995)

	(mm)		(%)					(%)	(%)
	6. 19		6. 19	6. 29	7. 8	7. 19	6. 19		6. 19
			6. 29	7. 8	7. 19	7. 29	8. 18	(%)	8. 18
	11.4	-	51.6	9.6	26.6	1.4	89.8bz)	-	16.8az)
6 19	11.4	11.4	58.3	28.6	4.7	0.8	92.7ab	28	19.0a
6 29	11.5	17.0	49.5	7.0	34.0	1.6	92.4ab	25	9.6a
7 8	11.1	19.3	58.8	-	30.8	3.6	93.5a	36	6.8a
7 19	11.7	24.8	-	-81.2-	-	1.5	88.2b	-16	11.6a

z)DMRT , 5% .



2-2. 3,5,6-TPA 15mg/L 가 (20 , , 1995 )

Table 2-2. Effect of the date of foliar spray of 15mg/L 3,5,6-TPA on leaf-fruit and old leaf drop ratios in 'Okitsu Early' satsuma mandarin(20-years old, Namwon, 1995)

	(mm)			(%)	(%)
		8	1		6. 17
	11.1(6 17 )	2.6	15.3cz)	-	8. 1
6 17	11.2	2.4	24.7b	38	8.3az)
6 24	14.7	6.3	22.7b	33	9.3a
7 11	22.4	18.6	32.3a	53	11.0a
7 18	26.3	11.2	13.7c	- 12	7.5a
					5.4a

z)DMRT , 5% .

2-3

. 가 1 , 3 , 5  
 가 4.2, 5.0  
 가 6 17 7 11  
 3 가 . 7  
 18 ( ) 19 ( )  
 가  
 .  
 4 ( ) ( )  
 ) 2 7 10  
 가 가 가  
 가 6 7

2- 3. 3,5,6- TPA 15mg/L 가  
(1995)

Table 2- 3. Effect of the date of foliar spray of 15mg/L 3,5,6- TPA on the visually- scored degree of fruit load in 'Okitsu Early' satsuma mandarin(1995)

( 18 )		( 20 )	
	z)		z)
	4.2		5.0
6 19	3.2	6 17	3.8
6 29	3.4	6 24	3.6
7 8	3.4	7 11	3.8
7 19	3.8	7 18	4.2

z) : 1= ( 50 ), 2= ( 28 50), 3= ( 22 28), 4= ( 17 22), 5= ( 17 ).

가 . 가 가 가  
24.8m m  
26.3m m 25m m  
3,5,6- TPA 가

3 1 3,5,6- TPA 가

1.

, 3,5,6- TPA 7.5mg/L , 3,5,6- TPA 15mg/L ,

3,5,6- TPA 30mg/L , 3,5,6- TPA 15mg/L 1 15 20  
 10mg/L 가 , 가 67mg/L 6 1 1  
 5 2  
 .  
 27 6 19 ,  
 26 6 17 1 , 3,5,6- TPA 10mg/L 가  
 7 8 , 7 11  
 . 2 .

2.

2- 4. 1 3,5,6- TPA 가 가  
 (18 ,  
 ,1995 )

Table 2- 4. Effect of foliar spray of 3,5,6- TPA and figaron at the 1st June drop on fruit and old leaf drop ratios in 'Okitsu Early' satsuma mandarin(18- years old, Cheju, 1995)

z)	(%)		(%)		6.19 8. 18	
	(mm)	(6.19 8.18)	(%)	(6.19 8.18)		
3,5,6- TPA 7.5mg/L	11.2	88.3by)	-	8.2ay)	2.7	22.3cy)
3,5,6- TPA 15mg/L		88.6b	3	9.7a	2.7	22.2c
3,5,6- TPA 30mg/L		93.3a	43	10.2a	2.3	31.4b
3,5,6- TPA 15mg/L		93.7a	46	15.1a	2.8	40.6a
+ 10mg/L		92.9a	37	14.3a	2.8	35.5ab
가 67 mg/L		84.4c	- 33	7.0a	2.7	16.4c

z)6 19 ( 27 ) , 2 7 8 가 .  
 y)DMRT , 5% .

3,5,6- TPA 7.5mg/L  
 15mg/L 30mg/L 가 가  
 40% ( 2- 4). 3,5,6- TPA 15mg/L 20  
 10mg/L 가 가 .  
 3,5,6- TPA 7.5mg/L 가  
 15mg/L, 30mg/L, 15mg/L + 10mg/L 가  
 54 71% ( 2- 5). 가  
 67mg/L 가 .

2- 5. 1 3,5,6- TPA 가 가  
 (20 , ,  
 1995 )

Table 2- 5. Effect of foliar spray of 3,5,6- TPA and figaron at the 1st June drop on fruit and old leaf drop ratios in 'Okitsu Early' satsuma mandarin(20- years old, Namwon, 1995)

z)	z)		y)		y)	
	(mm)	(%) (6.19 8.18)	(%) (6.19 8.18)	(%) (6.19 8.18)	6.17	8. 2
	11.1	66.2cy)	-	9.0cy)	4.2	13.1cy)
3,5,6- TPA 7.5mg/L		82.2b	47	9.2c	4.2	26.4b
3,5,6- TPA 15mg/L		86.9ab	61	10.9bc	3.8	26.0b
3,5,6- TPA 30mg/L		84.6ab	54	16.8ab	4.5	24.1b
3,5,6- TPA 15mg/L + 10mg/L		90.2a	71	18.5a	4.1	39.0a
가 67 mg/L		70.0c	11	6.7c	3.7	12.5c

z)6 17 ( 26 ) , 2 7 11 가 .  
 y)DMRT , 5% .

15mg/L	3,5,6- TPA	가
가	가	( 2- 1).
	가 13.1	7.5
30mg/L	3,5,6- TPA	25
15mg/L + 10mg/L 2		39
가 67mg/L		가
2- 6		
	가	4.0
2- 6. 1	3,5,6- TPA	가
		가 (1995 )

Table 2- 6. Effect of foliar spray of 3,5,6- TPA and figaron at the 1st June drop on the visually- scored degree of fruit load in 'Okitsu Early' satsuma mandarin(1995)

z)	y)	
	4.4	4.6
3,5,6- TPA 7.5mg/L	4.2	3.6
3,5,6- TPA 15mg/L	3.0	2.8
3,5,6- TPA 30mg/L	3.0	2.8
3,5,6- TPA 15mg/L + 10mg/L	3.0	2.8
가 67 mg/L	4.4	4.0

z) 2- 4, 5 .

y) 2- 3 .

15 30mg/L TPA 1 15mg/L + 10mg/L 2

3.0 2.8 .

( 2-4) 가 22

가 15mg/L 3,5,6- TPA 30

15mg/L TPA 가 .

가

가

4 2 3,5,6- TPA 가

1.

, 3,5,6- TPA 7.5mg/L , 3,5,6- TPA 15mg/L ,  
3,5,6- TPA 30mg/L , 3,5,6- TPA 15mg/L 15 20  
10mg/L 가 , 가 100mg/L , 가 100mg/L  
15 20 67mg/L 가 7 1 1 5

2

36 7 8 ,

50 7 11 1 3,5,6- TPA 10mg/L

가 67mg/L 가 7 29 ,

8 2 . 2

2.

( 2- 7) 20m m 3,5,6-TPA 가 가 가 5%

2- 7. 2 3,5,6- TPA 가 가 (18 , ,1995 )

Table 2- 7. Effect of foliar spray of 3,5,6- TPA and figaron at the 2nd June drop on fruit and old leaf drop ratios in 'Okitsu Early' satsuma mandarin(18- years old, Cheju, 1995)

z)	(%)		(%)		7.8 8. 18	
	(mm)	(7.8 8.18)	(%)	(7.8 8.18)	7.8	8. 18
	20.7	71.3	-	5.2	5.3	18.7
3,5,6- TPA 7.5mg/L	19.3	80.3	31	4.4	6.2	27.0
3,5,6- TPA 15mg/L	20.6	75.7	15	2.3	5.1	20.5
3,5,6- TPA 30mg/L	20.6	74.5	11	2.4	5.4	21.4
3,5,6- TPA 15mg/L + 10mg/L	20.2	83.6	43	7.5	5.0	28.5
가 100mg/L	19.3	83.7	43	7.5	4.7	26.3
가 100mg/L + 67mg/L	20.6	83.9	44	0.5	6.1	33.8

z)7 8 ( 36 ) , 2 7 29 가 .

( 2- 8) 23m m 3,5,6- TPA 가

2- 8. 2 3,5,6- TPA 가 가  
(20 ,  
, 1995 )

Table 2- 8. Effect of foliar spray of 3,5,6- TPA and figaron at the 2nd June drop on fruit and old leaf drop ratios in 'Okitsu Early' satsuma mandarin(18- years old, Namwon, 1995)

z)	(mm)	(% )		(% )		7.11	8. 18
		(7.11 8.18)	(%)	(7.11 8.18)	(%)		
	23.1	36.3cy)	-	16.7ay)		12.7ay)	19.1aby)
3,5,6- TPA 7.5mg/L	22.3	40.2bc	6	9.9b		10.3a	17.9b
3,5,6- TPA 15mg/L	23.6	50.4ab	22	7.2b		11.1a	32.3ab
3,5,6- TPA 30mg/L	23.0	45.7ab	15	8.8b		11.4a	21.2ab
3,5,6- TPA 15mg/L + 10mg/L	22.6	40.5bc	7	8.7b		10.7a	21.5ab
가 100mg/L	22.8	55.9a	31	5.7b		9.4a	27.0ab
가 100mg/L + 67mg/L	23.6	58.2a	58	9.4b		12.3a	36.6a

z)7 11 ( 50 ) , 2 8 2 가 .  
y)DMRT , 5% .

가 3,5,6- TPA .

2- 9

3,5,6- TPA  
가 (3.0) 가 가  
가 .



2-9. 2 3,5,6- TPA 가 가 (1995 )

Table 2-9. Effect of foliar spray of 3,5,6- TPA and figaron at the 2nd June drop on the visually- scored degree of fruit load in 'Okitsu Early' satsuma mandarin(1995)

z)	y)	
	4.0	3.4
3,5,6- TPA 7.5mg/L	3.3	3.2
3,5,6- TPA 15mg/L	3.6	3.3
3,5,6- TPA 30mg/L	4.0	3.4
3,5,6- TPA 15mg/L + 10mg/L	3.6	3.0
가 100mg/L	2.0	3.0
가 100mg/L + 67mg/L	3.0	3.0

z) 2- 7, 8 .

y) 2- 3 .

5

1.

( 70m, 2km) 20 .  
1995 5 20 . ,  
가 50mg/L, 3,5,6- TPA 15mg/L 2,4- D 20mg/L 4  
( ) 0, 10, 20, 40, 80mg/L 5

( ) 5 .  
 53 7 12 가 7  
 30 .  
 3 ( ) , 3,5,6- TPA 15mg/L 1  
 , 가 1 1  
 20mg/L 가 1  
 .  
 가 가 가  
 가 가  
 ( ) 15  
 1996 7 15 가 0, 50mg/L  
 0, 50mg/L 3  
 . 1, 2, 3, 4, 6,  
 9 가 , (1995  
 ) 20 5 .  
 (1995) 1  
 30 3  
 가

(PYE UNICAM series 304 Chromatograph FID, 2m alumina column, 130 oven temp., 120 inj. temp., 180 det. temp., 30ml/min flow rate, N2 carrier gas)

100 .

가

1995

1997 6 9 ( 14.5mm) 가

0, 25, 50, 100 mg/L 4 ( )

0, 10, 20, 40 mg/L 4 ( )

4 1

2.

2- 10 가

50mg/L 가 가

가 3,5,6- TPA 15mg/L 가

가 . 2,4- D 20mg/L

가 가

2- 10. 가 (%)

(20 , , 1995 )

Table 2- 10. Effect of foliar spray of auxins with ethephon on fruit drop ratio(%) in 'Miyagawa Early' satsuma mandarin(20- years old, Seogwipo, 1995)

(mg/L)	0	10	20	40	80
가 50mg/L	12.5	14.9	19.5	35.4	87.6
3,5,6- TPA 15mg/L	8.9	28.5	27.5	49.7	62.6
가 50mg/L	13.0	15.5	12.8	19.3	13.4
2,4- D 20 mg/L	8.9	12.6	17.9	20.4	34.7

7 12 ( 53 , 23.6m m) .

가 가 가  
 가 50mg/L  
 40mg/L 가가 가 80mg/L  
 가 80mg/L  
 ( 5-2). 3,5,6- TPA 15mg/L  
 20mg/L 가가 가  
 40mg/L  
 2,4- D 20mg/L 40mg/L  
 80mg/L 가  
 80mg/L

2- 11. 가 (%)  
 (20 , , 1995 )

Table 2- 11. Effect of foliar spray of auxins with ethephon on leaf drop ratio(%) in 'Miyagawa Early' satsuma mandarin(20- years old, Seogwipo, 1995)

(mg/L)	0	10	20	40	80
가 50mg/L	10.4	11.8	19.9	14.1	36.5
3,5,6- TPA 15mg/L	7.0	11.0	11.0	7.0	28.0
2,4- D 20mg/L	10.1	10.4	9.9	14.6	33.2
	0.0	7.8	6.4	8.4	35.9

7 12 ( 53 , 23.6m m) .

가 가  
 가 50mg/L 10 40mg/L  
 3,5,6- TPA 15mg/L 가 67mg/L 20mg/L 가

2- 12 .

3,5,6- TPA 가 가 가  
 가 3,5,6- TPA 가  
 가 가

2- 12. 3,5,6- TPA 가 가  
 (20 , , 1995 )

Table 2- 12. Effect of foliar spray of 3,5,6- TPA and figaron with or without ethephon on fruit and leaf drop ratio(%) in 'Okitsu Early' satsuma mandarin(20- years old, Namwon, 1995)

		(%)	(%)
0	0	68.1cz)	11.5bz)
3,5,6- TPA 15m g/L	20	79.2bc	13.8ab
	0	86.1ab	14.3ab
가 67m g/L	20	94.0a	21.6a
	0	72.0c	9.3b
	20	78.0bc	10.7b

z)DMRT , 5% .  
 6 17 ( 26 , 11m m) .

1996 가 가  
 가 가 ,  
 가 ( 2- 13).  
 ( 2- 14) 가 가  
 ( 2- 15) 가

2- 13. 가 가  
(15 , , 1996 )

Table 2- 13. Effect of figaron and ethephon on fruit and leaf drop ratio in 'Miyagwa Early' satsuma mandarin (15-years old, Cheju, 1996)

	(%)	(%)
	6.8	55.8
50m g/L	24.4	81.9
가 50m g/L	9.5	50.5
E + F z)	12.9	85.9

z) 50mg/L + 가 50mg/L.  
7 15 ( 44 , 20.7mm ) .

2- 14. 가 가  
(15 , , 1996 )

Table 2- 14. Effect of figaron and ethephon on changes in ethylene evolution of leaf in 'Miyagwa Early' satsuma mandarin(15- years old, Cheju, 1996)

	1	2	3	4	6	9
	100 y)	100	100	100	100	100
50mg/l	289	86	1,027	918	1,639	689
가 50mg/l	90	51	160	114	326	61
E + F z)	247	99	492	875	1,199	99

z) 50mg/L + 가 50mg/L.  
y) 100 .

2- 15. 가 가  
(15 , , 1996 )

Table 2- 15. Effect of figaron and ethephon on changes in ethylene evolution of fruit in 'Miyagwa Early' satsuma mandarin(15- years old, Cheju, 1996)

	1	2	3	4	6	9
	100y)	100	100	100	100	100
50mg/l	67	65	143	1,356	1,152	130
가 50mg/l	40	35	98	264	135	120
E + Fz)	103	69	223	1,428	706	153

z), y) 2- 14 .

가 0 100mg/L 0 40mg/L  
20mg/L 가 가

2- 16. 가 가  
(%) (22 , 1997 )

Table 2- 16. Effect of figaron and ethephon on fruit drop ratio(%) in 'Miyagawa Early' satsuma mandarin (22- years old, Seogwipo, 1997)

가 (mg/L)	(mg/L)			
	0	10	20	40
0	65.9	77.0	79.8	90.8
25	78.4	86.1	78.4	79.1
50	66.1	82.2	84.2	76.6
100	79.3	74.2	84.3	84.1

6 9 ( 14.5mm) .

가 ( 2-16) 40mg/L 가 0  
 mg/L 가 가가 가  
 . ( 2-17) 가 0mg/L  
 가 가 가 가 가가  
 .  
 1  
 가 가 25mg/L  
 가 .

2-17. 가 가

(%) (22 , , 1997 )

Table 2-17. Effect of figaron and ethephon on old-leaf drop ratio(%) in 'Miyagawa Early' satsuma mandarin (22-years old, Seogwipo, 1997)

가 (mg/L)	(mg/L)			
	0	10	20	40
0	6.6	16.3	9.6	12.4
25	8.6	7.4	2.6	7.5
50	4.6	11.0	9.5	6.3
100	8.2	4.0	5.3	5.3

6 9 ( 14.5mm) .

## 6 2,4- DP PDJ

1.

2,4-dichlorophenoxy propionic acid(2,4- DP) 가

가 1996



, 2,4- DP 45mg/L( 17.7m m ), 2,4- DP 90mg/L( 17.7m m ), 2,4- DP 90mg/L( 20.2m m ) 4 3 5 26 17.7m m 7 1 20.2m m 7 5 1 7 1 27 PDJ 가 가 1997 , PDJ 25mg/L, PDJ 50mg/L, PDJ 100m g/L 3 17.7m m PDJ 50m g/L 20.2m m 5 2,4- DP 6 9 16 .

2.

2- 18. 2,4- DP가 (20 , , 1996)

Table 2- 18. Effect of foliar spray of 2,4- DP on fruit and leaf drop ratio in 'Okisu Early' satsuma mandarin(20- years old, Cheju, 1996)

	(% )	(% )		
	6.5	44.2.	8.8	16.5
2,4- DP 45mg/L ( 17.7mm)	9.5	52.0	7.6	19.8
2,4- DP 90mg/L ( 17.7mm)	4.1	39.2	10.7	19.2
2,4- DP 90mg/L ( 20.2mm)	29.5	36.5	9.2	9.8

5%

2,4- DP 45mg/L 가 90mg/L  
 2,4- DP 가 ( 2- 18).  
 50mg/L PDJ 가 ( 2- 19)  
 가 .

2- 19. PDJ 가 (22 , , 1997 )

Table. 2- 19. Effect of foliar spray of PDJ on fruit drop in 'Miyagawa Early' satsuma mandarin(22- years old, Seogwipo, 1977)

(mm)	(6 6 -8 12 )
PDJ 25mg/L, 6 9 , 15.4	81.1
PDJ 50mg/L, 6 9 , 15.4	77.5
PDJ 100mg/L, 6 9 , 15.4	83.5
PDJ 50mg/L, 6 16 , 18.9	85.7
	88.4

5%

7 가

1.

1996 ( ),  
 (7 8 ), 3,5,6- TPA 15mg/L  
 , 가 67mg/L 4 5

2

2-20

2-20. 1996

Table 2-20. Location, cultivar, full-bloom date, date of application and fruit diameter at application in the fruit-thinning experiments in 1996

	(m)				(mm)
	160		5 31	6 28	17.2
	80		5 27	6 21	14.1
	60		5 23	6 18	15.3
	50		5 23	6 18	15.5

2

2

4

가

1997

( )

(7 8 ), 3,5,6- TPA 15mg/L

, 가 67mg/L , 가 50 mg/L + 20mg/L

, PDJ 50mg/L 6 5

26 6 11 ( 13.8mm ),

27 6

12 ( 13.8mm ) . 1996

가 가

1995 2 , 1996 1997 3

2- 21 .

2- 21. 가 ,

Table 2-21. Treatments, location and cultivar used, and date of application in the fruit-thinning experiments for demonstration

	z)			( )	(mm)
1995	3,5,6- TPA 15mg/L			6 20 (33)	-
	가 100mg/L			6 27 (35)	-
	가 +				
1996	3,5,6- TPA 15mg/L			6 28 (31)	18.5
	가 67mg/L			7 20 (59)	27.7
				7 18 (57)	25.7
1997	3,5,6- TPA 15mg/L			6 11 (26)	13.6
	가 67mg/L			6 12 (27)	14.0
	가 +			6 12 (27)	13.7

z) 가 가 + 가 50  
mg/L 20mg/L .

2.

1996 3,5,6- TPA 15mg/L

4 가 가

( 2- 22)

19% , ( 2- 23) 44% ,

( 2- 24) ( 2- 25) 28% .  
 가 67mg/L 8 25% .

2- 22. 3,5,6- TPA 가 가  
 (15 , , 1996)

Table 2- 22. Effect of 3,5,6- TPA and figaron on fruit and leaf drop ratios in 'Miyagawa Early' satsuma mandarin (15-years old, Cheju, 1996)

z)	(%)	(%)	(%)		
3,5,6- TPA 15mg/L	34.6 by)	-	9.2 ay)	9.3	12.8 by)
가 67mg/L	47.2 a	19	10.4 a	9.2	15.6 ab
가 67mg/L	43.0 ab	13	8.7 a	12.6	20.3 a

z) 2- 20 .  
 y)DMRT , 5% .

2- 23. 3,5,6- TPA 가 가  
 (19 , , 1996 )

Table 2- 23. Effect of 3,5,6- TPA and figaron on fruit and leaf drop ratios in 'Okitsu Early' satsuma mandarin(19-years old, Cheju, 1996)

z)	(%)	(%)	(%)		
3,5,6- TPA 15mg/L	32.8 by)	-	8.2 ay)	9.6	13.1 ay)
가 67mg/L	62.4 a	44	5.6 a	6.8	18.6 a
가 67mg/L	49.9 ab	25	6.7 a	7.5	14.2 a

z) 2- 20 .  
 y)DMRT , 5% .

2- 24. 3,5,6- TPA 가 가 (21 , , 1996 )

Table 2- 24. Effect of 3,5,6- TPA and figaron on fruit and leaf drop ratios in 'Okitsu Early' satsuma mandarin (21- years old, Namwon, 1996)

z)	(%)	(%)	(%)		
3,5,6- TPA 15m g/L	35.0 by)	-	7.0a.y)	9.6	14.2 by)
가 67m g/L	52.9 a	28	8.1a	11.2	26.1 a
	40.4 b	8	7.9a	10.8	18.3 ab

z) 2- 20 .

y)DMRT , 5% .

2- 25. 3,5,6- TPA 가 가 (15 , , 1996 )

Table 2- 25. Effect of 3,5,6- TPA and figaron on fruit and leaf drop ratios in 'Miyagawa Early' satsuma mandarin (15- years old, Namwon, 1996)

z)	(%)	(%)	(%)		
3,5,6- TPA 15m g/L	35.0 by)	-	6.5a.y)	10.1	14.8 ay)
가 67m g/L	52.9 a	28	6.1a	9.9	21.9 a
	45.1 a	16	7.3a	10.9	19.6 a

z) 2- 20 .

y)DMRT , 5% .

1997 3,5,6- TPA  
 ( 2- 26), ( 2- 27))  
 가 51 53% , 가 40



2- 27. 가  
(15 , , , 1997 )

Table 2- 27. Effect of fruit-thinning agents on fruit and old leaf drop ratios in 'Miyagawa Early' satsuma mandarin (15-years old, Namwon, 1997)

z)	(%)	(%)	(%)		
	71.9	-	7.1		32.7
3,5,6-TPA 15mg/L	86.3	51	11.2		48.4
가 67mg/L	79.9	29	8.3		34.9
가 +	75.3	12	6.9		41.1
PDJ 50mg/L	73.7	6	7.5		27.9

z)6 12 ( 27 ) , 가 + 가 67mg/L  
20mg/L .  
y)DMRT , 5% .

1995 12  
가 가  
가 가 ( 2- 28).  
7 가  
가  
2  
가  
(3,5,6- TPA 15mg/L ) 가 .  
( 2- 28) 20 4.8 가  
3,5,6- TPA 15mg/L 가 100mg/L  
3.6, 3.8 가 100  
mg/L + 20mg/L 5 4 가  
1 2.8 .



2- 28. 가 z) (1995)  
 Table 2- 28. Effect of fruit-thinning agents on the visually-scored degree(z) of fruit load in two groves(1995)

	y)	x)
	2.4	4.8
3,5,6- TPA 15m g/L	3.0	3.6
가 100m g/L	2.8	3.8
가 100m g/L+Ethephon 20m g/L	2.8	2.8

z) 2- 3 .  
 y)12 , 35 .  
 x)20 , 33 .

1996

3 .  
 가 ( 2- 29).

2- 29. 가 z) (1996)  
 Table 2- 29. Effect of fruit-thinning agents on the visually-scored degree(z) of fruit load in three groves(1996)

	y)	x)	w)
	2.7	3.9	3.8
3,5,6- TPA 15m g/L	1.8	3.6	3.4
가 67m g/L	2.0	3.3	3.0

z) 2- 3 .  
 y)20 , 31 .  
 x)13 , 59 .  
 w)15 , 57 .

2- 30 1997

가 5.0 가  
 3,5,6- TPA 가  
 가 4.3 3,5,6- TPA 가  
 3.0 3.2  
 가 가  
 3,5,6- TPA 가  
 가

2- 30. 가 z) (1997)  
 Table 2- 30. Effect of fruit-thinning agents on the visually-  
 scored degreez) of fruit load in three groves(1997)

	y)	x)	w)
3,5,6- TPA 15m g/L	5.0	4.3	3.8
가 67m g/L	2.7	3.0	1.8
가 50m g/L+ 20m g/L	4.3	4.0	3.6
	5.0	3.2	4.0

z) 2- 3

y)20 , 26 .  
 x)22 , 27 .  
 w)14 , 27 .

### 3

1

1

가

. 1996

1997

가

2

1996

가 13

가

3,5,6- TPA 가

가 42, 20%

가 13

3,5,6-

TPA 가

가 23, 9%

. 1997

10

가

10

7

1

8

가

8

1

3

1996 가 13 10a  
 20 3,5,6- TPA 가  
 17, 13 ,  
 11, 10 ( 3- 1).

3- 1. 3,5,6- TPA 15mg/L 가 67mg/L 가 10a  
 ( , 1996 )

Table 3- 1. Effect of folioar spray of 3,5,6- TPA 15mg/L and figaron 67mg/L on the labour(hours) of fruit- thing in Early- maturing satsuma mandarin(Cheju, 1996)

	z)	y)
	20.2h	19.7 h
3,5,6- TPA 15mg/L	3.3	8.5
가 67mg/L	7.0	9.1

z) 2- 23 .

y) 2- 22 .

1997 가 4.3  
 7 35 (10 )가 3,5,6-  
 TPA 20 , 가 1 43 , 가  
 48  
 ( 3- 2). 3,5,6- TPA 가 +

0.8 4.3

3- 2. 가  
(22 , , 1997 )

Table 3-2. Effect of fruit-thinning agents on the number of fruits to be thinned and labour(hour) of fruit-thinning in 'Okitsu Early' satsuma mandarin(22- years old, Namwon, 1997)

z)	10a		
		( ' “)	(h)y)
	251	7' 35"	19.0
3,5,6- TPA 15mg/L	7	0' 20"	0.8
가 67mg/L	49	1' 43"	4.3
가 50mg/L + 20mg/L	26	0' 48"	2.0

z) 2- 27 .

y)10a × 150(10a )

4

1

가 가 .  
 , 가  
 가  
 가 . 1  
 가  
 , , ,  
 1996

2

0,  
 100 가  
 90 가 20  
 (Color eye 2145,  
 Macbeth) a\*

( )

가 .

200

. 1997

2

, ( )

Brix

0.1 N NaOH

. 1997

酸糖同時分析機(NH- 1000, 日園蓮 Horiba)

1996

가

가 . (

), 3,5,6- TPA , 가 3

4 , 3 4

) 100 3

HPLC

1. 3,5,6- TPA

1995 3,5,6- TPA 15mg/L  
 가 4- 1  
 가 1  
 7 19 3,5,6- TPA  
 a\* 가 가 3,5,6- TPA

4- 1. 3,5,6- TPA 15mg/L 가

(18 , , 1995 )

Table 4- 1. Effect of the date of foliar spray of 15mg/L 3,5,6- TPA on fruit peel colouring in 'Okitsu Early' satsuma mandarin(18- years old, Cheju, 1995)

	( . )				
	10. 7z)	10. 14z)	10. 21z)	10. 29z)	11. 3y)
	6	16	22	54	14.97cx)
6 19	16	26	46	78	21.52a
6 29	16	22	34	70	19.88ab
7 8	12	26	46	84	20.58ab
7 19	10	22	34	76	18.37bc

z)0= , 100=

y) a\* ( 가 가 ).

x)DMRT , 5% .



4- 2. 3,5,6- TPA 15mg/L 가 (20 , , 1995 )

Table 4- 2. Effect of the date of foliar spray of 15mg/L 3,5,6- TPA on fruit peel colouring in 'Okitsu Early' satsuma mandarin(20- years old, Namwon, 1995)

	( . )			
	10. 20z)	10. 27z)	11. 3z)	11. 13y)
	38.3	44.0	50.8	3.6bx)
6 17	53.3	60.0	65.6	5.6a
6 24	52.0	63.3	64.7	5.9a
7 11	49.0	54.2	57.8	5.5a
7 18	40.0	49.2	51.6	4.3b

z)0= , 100= .  
y) 가 : 1= , 9= .  
x)DMRT , 5% .

3,5,6- TPA 15m g/L

( 4- 2). 25m m 가  
가

2. 1 3,5,6- TPA 가  
 ( 4- 3) 3,5,6-  
 TPA 1  
 가 50 5 . a\*  
 3,5,6- TPA . 3,5,6- TPA  
 ( 4- 4) . 가  
 3,5,6- TPA  
 3,5,6- TPA .

4- 3. 1 3,5,6- TPA 가 가  
 (18 , , 1995 )

Table 4- 3. Effect of foliar spray of 3,5,6- TPA and figaron at the 1st June drop on fruit peel colouring in 'Okitsu Early' satsuma mandarion(18- years old, Cheju, 1995)

z)	( . )				
	10. 7	10. 14y)	10. 21y)	10. 29y)	11. 3x)
	8	12	28	50	22.52
3,5,6- TPA 7.5mg/L	12	24	33	74	25.85
3,5,6- TPA 15mg/L	12	22	46	68	26.63
3,5,6- TPA 30mg/L	18	24	40	72	26.92
3,5,6- TPA 15mg/L + 10mg/L	14	24	42	72	25.92
가 67 mg/L	8	18	32	70	25.97

z) 2- 4 .

y), x) 4- 1 .

4- 4. 1 3,5,6- TPA 가 가  
( 20 , ,1995 )

Table 4- 4. Effect of foliar spray of 3,5,6- TPA and figaron at the 1st June drop on fruit peel colouring in 'Okitsu Early' satsuma mandarion(20- years old, Namwon, 1995)

z)	( . )			
	10. 20y)	10. 27y)	11. 3y)	11. 13x)
	40.3	56.7	60.8	4.3cw)
3,5,6- TPA 7.5mg/L	59.3	58.0	60.0	5.0bc
3,5,6- TPA 15mg/L	60.0	60.7	65.9	5.0bc
3,5,6- TPA 30mg/L	64.3	67.7	66.7	5.3ab
3,5,6- TPA 15mg/L + 10mg/L	64.3	66.7	72.5	5.9a
가 67 mg/L	50.0	52.7	58.4	4.7bc

z) 2- 5 .

y), x), w) 4- 2 .

3. 2 3,5,6- TPA 가  
( 4- 5) ( 4- 6)

3,5,6- TPA

. 가 100m g/L 1

가

3,5,6- TPA

100m g/L +

67m g/L 2

1

가 .

4- 5. 2 3,5,6- TPA 가 가  
(18 , , 1995 )

Table 4- 5. Effect of foliar spray of 3,5,6- TPA and figaron at the 2nd June drop on fruit peel colouring in 'Okitsu Early' satsuma mandarion(18- years old, Cheju, 1995)

z)	( . )			
	10. 7y)	10. 14y)	10. 21y)	10. 29y)
	8	14	20	44
3,5,6- TPA 7.5mg/L	16	24	34	64
3,5,6- TPA 15mg/L	14	28	38	72
3,5,6- TPA 30mg/L	14	24	36	66
3,5,6- TPA 15mg/L + 10mg/L	14	20	34	76
가 100mg/L	10	18	24	46
가 100mg/L + 67mg/L	14	20	34	64

z) 2- 7 .

y) 4- 1 .

4- 6. 2 3,5,6- TPA 가 가  
(20 , , 1995 )

Table 4- 6. Effect of foliar spray of 3,5,6- TPA and figaron at the 2nd June drop on fruit peel colouring in 'Okitsu Early' satsuma mandarion(20- years old, Namwon, 1995)

z)	( . )			
	10. 20y)	10. 27y)	11. 3y)	11. 13x)
	38.3	42.0	46.7	4.4
3,5,6- TPA 7.5mg/L	51.7	54.0	59.3	4.9
3,5,6- TPA 15mg/L	42.1	45.3	50.0	4.4
3,5,6- TPA 30mg/L	44.0	46.7	53.3	4.3
3,5,6- TPA 15mg/L + 10mg/L	40.7	42.7	46.0	4.6
가 100mg/L	47.3	55.3	59.3	5.0
가 100mg/L + 67mg/L	58.3	60.0	64.7	4.9

z) 2- 8 .

y), x) 4- 2 .

4.

가. 1996

7 ( ) 5 3,5,6- TPA  
 a\* 가 ( 4- 7 11).  
 가 ( ) ( )  
 ), a\* 가  
 5 가 .

4- 7. (15 ,  
 , 1996 )

Table 4- 7. Effect of fruit- thinning methods on fruit peel coloring in 'Miyagawa Early' satsuma mandarin(15- years old, Cheju, 1996)

z)	( . )					
	10. 6y)	10. 13y)	10. 20y)	10. 28y)	11. 3y)	11. 3x)
3,5,6- TPA 15mg/L 가 67mg/L	10	18	40	66	80	18.99cw)
	9	19	35	64	74	20.15bc
	22	35	64	83	94	25.74a
	11	19	39	66	82	22.54b

z) 2- 20 .

y), x), w) 4- 1 .

4- 8.

(19 ,

, 1996 )

Table 4- 8. Effect of fruit- thinning methods on fruit peel coloring in 'Okitsu Early' satsuma mandarin(19- years old, Cheju, 1996)

z)	( . )					
	10. 6y)	10. 13y)	10. 20y)	10. 28y)	11. 3y)	11. 3x)
3,5,6- TPA 15mg/L 가 67mg/L	4	10	29	58	77	19.85bw)
	4	8	24	57	76	19.81b
	9	22	45	72	87	22.33a
	6	11	29	65	83	20.46ab

z) 2- 20 .

y), x), w) 4- 1 .

4- 9.

(21 ,

, 1996 )

Table 4- 9. Effect of fruit- thinning methods on fruit peel coloring in 'Okitsu Early' satsuma mandarin(21- years old, Namwon, 1996)

z)	( . )			
	10. 11y)	10. 28y)	11. 3y)	11. 15x)
3,5,6- TPA 15mg/L 가 67mg/L	13	57	68	22.2bw)
	11	53	60	22.9b
	19	63	78	26.9a
	14	61	68	25.5a

z) 2- 20 .

y), x), w) 4- 1 .

4- 10.

(15 ,

, 1996 )

Table 4- 10. Effect of fruit- thinning methods on fruit peel coloring in 'Miyagawa Early' satsuma mandarin (15- years old, Namwon, 1996)

z)	( . )		
	10. 11y)	10. 28y)	11. 3y)
3,5,6- TPA 15mg/L 가 67mg/L	9	45	50
	10	54	58
	12	57	56
	14	49	52

z) 2- 20 .

y) 4- 1 .

4- 11. 가

(1996 )

Table 4- 11. Effect of fruit- thinning agents on fruit peel colour at harvest in early- maturing satsuma mandarin in three groves(1996)

z)	(11 3 )		(11 19 )		(11 8 )	
	y) a*x)		y) a*x)		y) a*x)	
3,5,6- TPA 15mg/L 가 67mg/L	66	17.9bw)	66	23.9aw)	80	24.8cw)
	91	22.4a	65	25.9a	88	27.5a
	77	17.5b	64	24.7a	84	26.1c

z) 2- 21 .

y), x), w) 4- 1 .

. 1997  
 5 4- 12  
 15 . 3.5.6.  
 - TPA 1  
 가  
 가 . PDJ ( 4- 12)  
 ( 4- 15)

a\*

4- 12. (20

, 1997 )

Table 4- 12. Effect of fruit- thinning methods on fruit peel colouring in 'Okitsu Early' satsuma mandarin(20- years old, Cheju, 1997)

z)	( . )				
	9. 28y)	10. 5y)	10. 13y)	10. 19y)	11. 5x)
	6	14	34	44	21.8aw)
	9	16	34	42	22.6a
3,5,6- TPA 15m g/L	12	30	52	76	25.5a
가 67m g/L	5	9	32	38	24.3a
가 +	6	11	30	44	23.0a
PDJ 50mg/L	5	9	30	40	21.6a

z) 2- 26 .

y), x), w) 4- 1 .



4- 13.

(20 ,

, 1997 )

Table 4- 13. Effect of fruit- thinning methods on fruit peel colouring in 'Miyagawa Early' satsuma mandarin(20- years old, Cheju, 1997)

z)	( . )				
	9. 28y)	10. 5y)	10. 13y)	10. 19y)	11. 5x)
	6	11	26	42	22.9bcw)
	6	11	24	42	24.6b
3,5,6- TPA 15m g/L	11	22	40	70	26.8a
가 67m g/L	7	16	30	50	22.5c
가 +	6	10	24	46	23.1bc

z) 2- 21 .

y), x), w) 4- 1 .

4- 14.

(14 ,

, 1997 )

Table 4- 14. Effect of fruit- thinning methods on fruit peel colouring in 'Okitsu Early' satsuma mandarin(14- years old, Chochun, 1997)

z)	( . )					
	9. 28y)	10. 5y)	10. 12y)	10. 19y)	10.26y)	11. 5x)
	16	24	34	50	66	24.9bw)
	14	24	34	50	68	24.9b
3,5,6- TPA 15m g/L	36	48	58	74	87	30.2a
가 67m g/L	14	22	32	48	64	24.3b
가 +	18	28	38	54	72	25.7b

z) 2- 21 .

y), x), w) 4- 1 .

4- 15.

(1997 )

Table 4- 15. Effect of fruit- thinning methods on fruit peel colouring of early- maturing satsuma mandarin in Namwon groves(1997)

( )	( )		( )
( . )	10. 21y)	11 .5x)	10. 21y)
z)			
	48	22.2bcw)	33
	50	20.9cd	53
3,5,6- TPA 15m g/L	56	25.3a	70
가 67m g/L	54	24.0ab	49
가 +	56	21.7bcd	51
PDJ 50mg/L	52	19.6d	-

z) 2- 27, 2- 21 .

y), x), w) 4- 1 .

3 가

3.5.6- TPA 15mg/L 21 17 1

가 .

가 4 3 25m m

1

가 가

20m m 3.5.6- TPA 15mg/L .

1. 3,5,6- TPA

1995 6 19 7 8  
 3,5,6- TPA , , , 가  
 가 ( 4- 16). 7 19  
 3,5,6- TPA 가  
 가  
 가  
 가 ( 4- 17).  
 7 18

4- 16. 3,5,6- TPA 15mg/L 가  
 (18 , , 1995 )

Table 4- 16. Effect of the date of foliar spray of 15mg/L 3,5,6- TPA on fruit growth in 'Okitsu Early' satsuma mandarin(18- years old, Cheju, 1995)

	(mm)	(mm)	(mm)	(g)	(g)
	46.5c	56.3c	121	2.0c	71.1c
6 19	53.2a	64.3a	121	2.2a	90.1a
6 29	50.2b	62.0b	124	2.0c	79.9b
7 8	50.6b	61.6b	122	2.2a	86.0a
7 19	46.9c	57.0c	122	2.1b	73.6c

4- 17. 3,5,6- TPA 15mg/L 가 (20 , , 1995 )

Table 4- 17. Effect of the date of foliar spray of 15mg/L 3,5,6- TPA on fruit growth in 'Okitsu Early' satsuma mandarin(20- years old, Namwon, 1995)

	(mm)	(mm)	(mm)	(g)	(g)
	47.5	60.7	128	2.2c	91.7
6 17	50.6	61.7	122	2.2bc	99.9
6 24	50.9	61.8	121	2.4ab	97.5
7 11	51.7	62.0	120	2.5a	100.3
7 18	49.3	61.2	124	2.3bc	97.1

2. 1 3,5,6- TPA 가  
 3,5,6- TPA 가 가  
 가가 가  
 ( 4- 18). 3,5,6- TPA 가 15mg/L  
 가 가 30mg/L 15mg/L 가  
 가 . 15mg/L 10mg/L  
 가 가  
 3,5,6- TPA 가 . 가  
 . 3,5,6- TPA 30mg/L  
 가 67mg/L .  
 3,5,6- TPA  
 ( 4- 19). 3,5,6- TPA  
 30mg/L 가 15mg/L 가 3,5,6-  
 TPA 가 가 .

4- 18. 1 3,5,6- TPA 가 가  
(18 , , 1995 )

Table 4- 18. Effect of foliar spray of 3,5,6- TPA and figaron at the 1st June drop on fruit growth in 'Okitsu Early' satsuma mandarion(18- years old, Cheju, 1995)

z)	(mm)	(mm)	(mm)	(g)	(g)	
	46.3dy)	56.5c	122ab	2.0b	93.5c	73.3c
3,5,6- TPA 7.5mg/L	48.1c	58.5b	122ab	2.1b	102.0b	78.7b
3,5,6- TPA 15mg/L	53.7b	64.6a	120ab	2.1b	120.0a	93.3a
3,5,6- TPA 30mg/L	56.7a	66.3a	117b	2.2a	124.0a	98.0a
3,5,6- TPA 15mg/L + 10mg/L	54.8b	65.7a	119ab	2.1b	124.1a	98.6a
가 67 mg/L	45.3d	56.4c	125a	1.8c	91.7c	72.8c

z) 2- 4 .  
y) 4- 1 .

4- 19. 1 3,5,6- TPA 가 가  
(20 , , 1995 )

Table 4- 19. Effect of foliar spray of 3,5,6- TPA and figaron at the 1st June drop on fruit growth in 'Okitsu Early' satsuma mandarion(20- years old, Namwon, 1995)

z)	(mm)	(mm)	(mm)	(g)	(g)	
	45.9	56.2	122	2.0b	90.6	73.6
3,5,6- TPA 7.5mg/L	51.7	61.6	119	2.5a	94.1	76.1
3,5,6- TPA 15mg/L	50.8	58.8	118	2.6a	101.0	82.5
3,5,6- TPA 30mg/L	50.6	60.2	119	2.6a	98.5	79.4
3,5,6- TPA 15mg/L + 10mg/L	49.3	58.1	118	2.5a	104.4	82.9
가 67 mg/L	45.5	56.4	124	2.1b	87.5	70.7

z) 2- 5 .  
y) 4- 1 .

3. 2 3,5,6- TPA 가  
 3,5,6- TPA 15 30mg/L  
 가 100mg/L 가  
 3,5,6- TPA 가가 가  
 ( 4- 20). 3,5,6- TPA  
 가 가 . 3,5,6- TPA  
 가 가 가  
 가 가 가 가  
 가 가 가 ( 4- 21).

4- 20. 2 3,5,6- TPA 가 가  
 (18 , , 1995 )  
 Table 4- 20. Effect of foliar spray of 3,5,6- TPA and figaron at  
 the 2nd June drop on fruit growth in 'Okitsu Early'  
 satsuma mandarion(18- years old, Cheju, 1995)

z)	(mm)	(mm)	(mm)	(g)	(g)	
	44.8	55.5	124	2.2	85.0	68.1
3,5,6- TPA 7.5mg/L	48.8	58.6	120	2.2	91.4	71.4
3,5,6- TPA 15mg/L	48.0	57.5	120	2.2	93.6	72.7
3,5,6- TPA 30mg/L	48.3	57.6	119	2.3	96.7	75.4
3,5,6- TPA 15mg/L + 10mg/L	50.7	50.7	122	2.2	95.2	74.0
가 100mg/L	47.3	58.7	124	2.0	91.5	74.1
가 100mg/L + 67mg/L	52.7	62.7	119	2.0	108.1	85.2

z) 2-7 .

4- 21. 2 3,5,6- TPA 가 가  
(20 , ,  
1995 )

Table 4- 21. Effect of foliar spray of 3,5,6- TPA and figaron at the 2nd June drop on fruit growth in 'Okitsu Early' satsuma mandarin(20- years old, Namwon, 1995)

z)	(mm)	(mm)	(mm)	(g)	(g)	(%)
	50.1	61.0	122	2.6	100.0	81.2
3,5,6- TPA 7.5mg/L	52.3	63.3	121	2.7	106.8	82.3
3,5,6- TPA 15mg/L	53.3	62.9	118	2.6	112.2	79.7
3,5,6- TPA 30mg/L	51.7	61.0	118	2.6	103.3	80.2
3,5,6- TPA 15mg/L + 10mg/L	53.5	63.3	118	2.9	113.6	79.0
가 100mg/L	52.3	62.6	120	2.6	107.2	80.5
가 100mg/L + 67mg/L	51.3	62.7	122	2.5	106.3	79.8

z) 2- 8 .

4.

1996

가

4- 1

A2- 1 .

0 ( 46mm )

8.9%

3,5,6- TPA 15m g/L

1.8%

1 ( 46 51mm)

29.5, 8.1 % 0

1 ( ) 38.4% 3,5,6-  
 TPA 9.9% 10 ( )  
 77mm ) 3,5,6- TPA  
 0.1% 9 ( 70 77mm) 0.1, 1.8% 9 10  
 ( ) 0.1% , 3,5,6- TPA  
 1.9% . ( 51 56mm), ( 62 70mm),  
 ( 62 70mm) 33.7, 21.2, 6.6%  
 3,5,6- TPA 26.4, 42.2, 19.6% . ,  
 , 61.5% 3,5,6-  
 TPA 88.2% . 가 67mg/L  
 33.8%  
 .  
 1997 1996  
 68.8% 31.2%  
 3,5,6- TPA 15mg/L 80.1%  
 ( 4- 2, A2- 2). 가 67mg/L  
 , 가 50mg/L + 20mg/L  
 , PDJ 50mg/L  
 50%  
 .  
 36.6% 63.2% 3,5,6- TPA 15mg/L  
 가 24.4% ( 0.2% )  
 73.8%  
 ( 4- 3, A2- 3).



71.3% , 3,5,6- TPA 67.6% . , 가  
67mg/L , 가 50mg/L + 20mg/L

77.6, 69.1, 69.6%

4- 4( A2- 4)

80.9%

3,5,6- TPA 15mg/L

67mg/L

+ 20mg/L

가

가 +

70 75kg

가 65kg

3,5,6- TPA

45kg

68%

( 4- 5, A2- 5),

가 +

4.3%

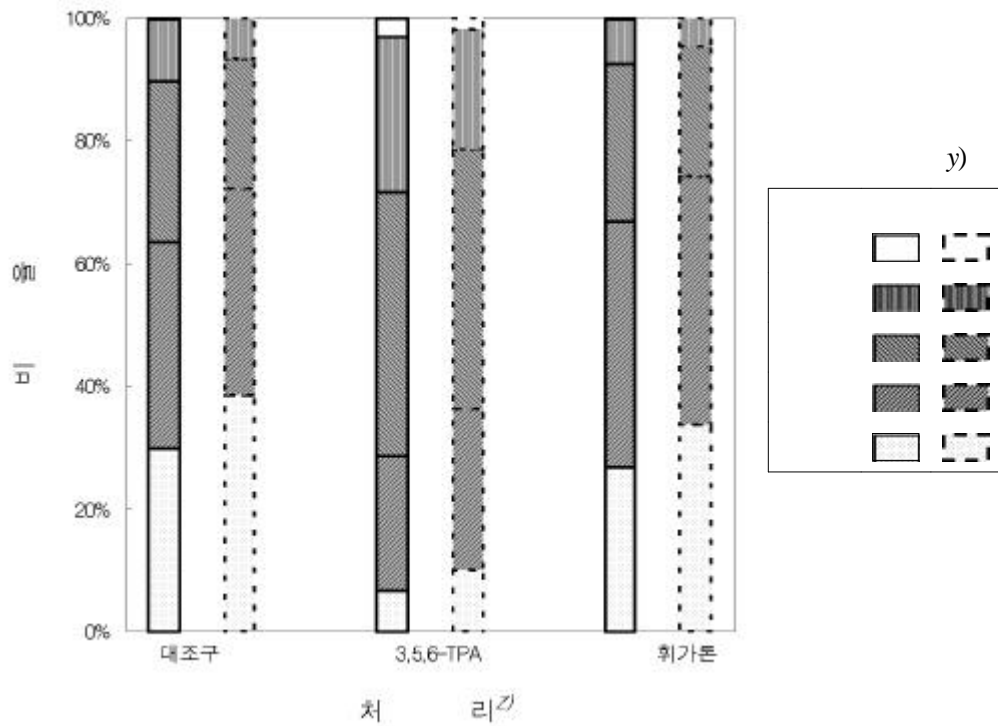
6.6%

3,5,6- TPA 15mg/L

가

(

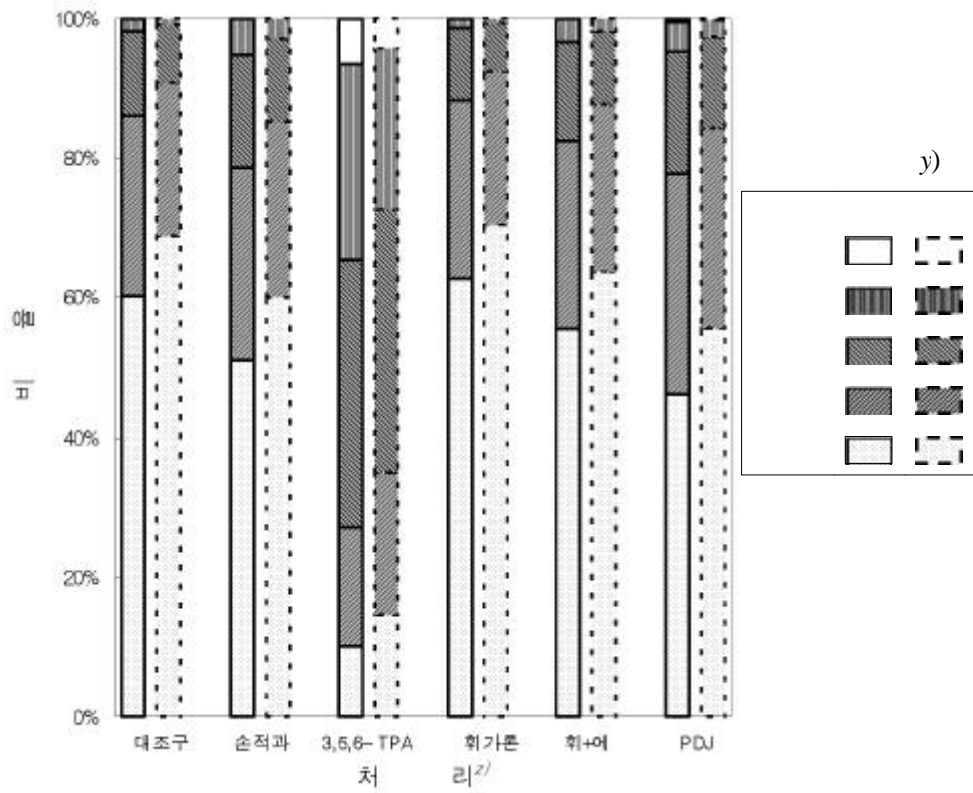
4- 6, A2- 6), 가



4- 1. (1996), (1996).

Figure 4- 1. Percent distribution of fruit by weight(and diameter) as affected by fruit-thinning methods in 'Okitsu Early' satsuma mandarin(19- years old, Cheju, 1996).

- z) 2- 20, 2- 23 .
- y) = 9, 10 ( 70mm ),
- = 7, 8 ( 62 70mm),
- = 4, 5, 6 ( 56 62mm ),
- = 2, 3 ( 51 56mm),
- = 0, 1 ( 51mm ).

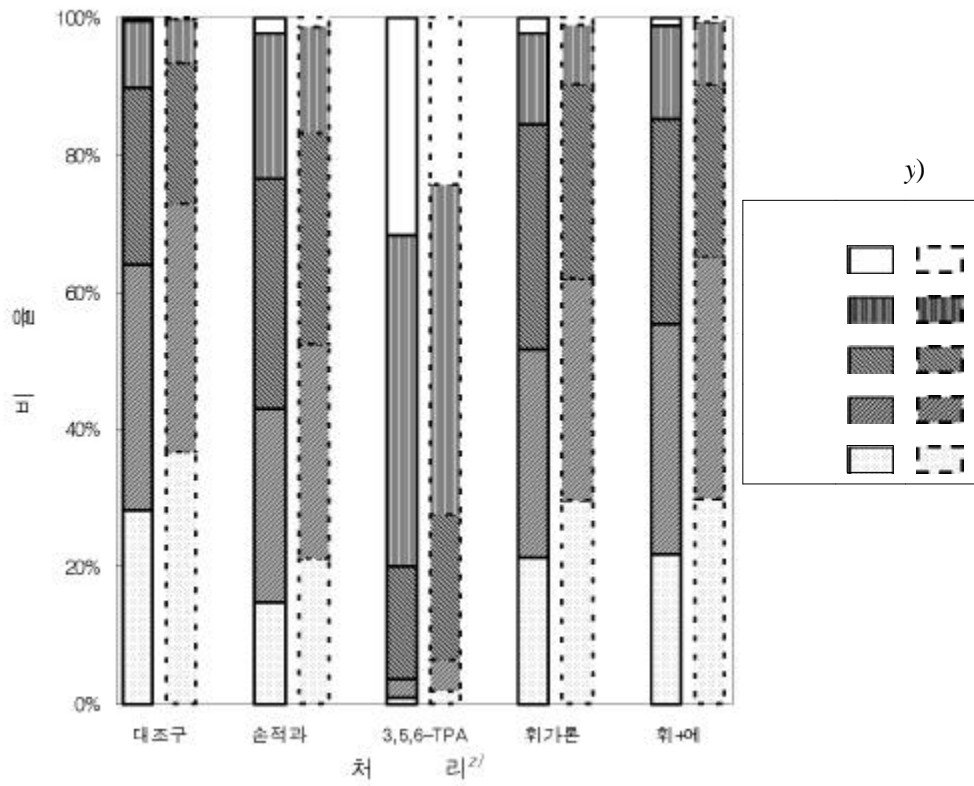


4- 2. (20 , , 1997 ).

Figure 4- 2. Percent distribution of fruit by weight(and diameter) as affected by fruit- thinning methods in 'Okitsu Early' satsuma mandarin(20- years old, Cheju, 1997).

z) 2- 26 .

y) 4- 1 .



4- 3.

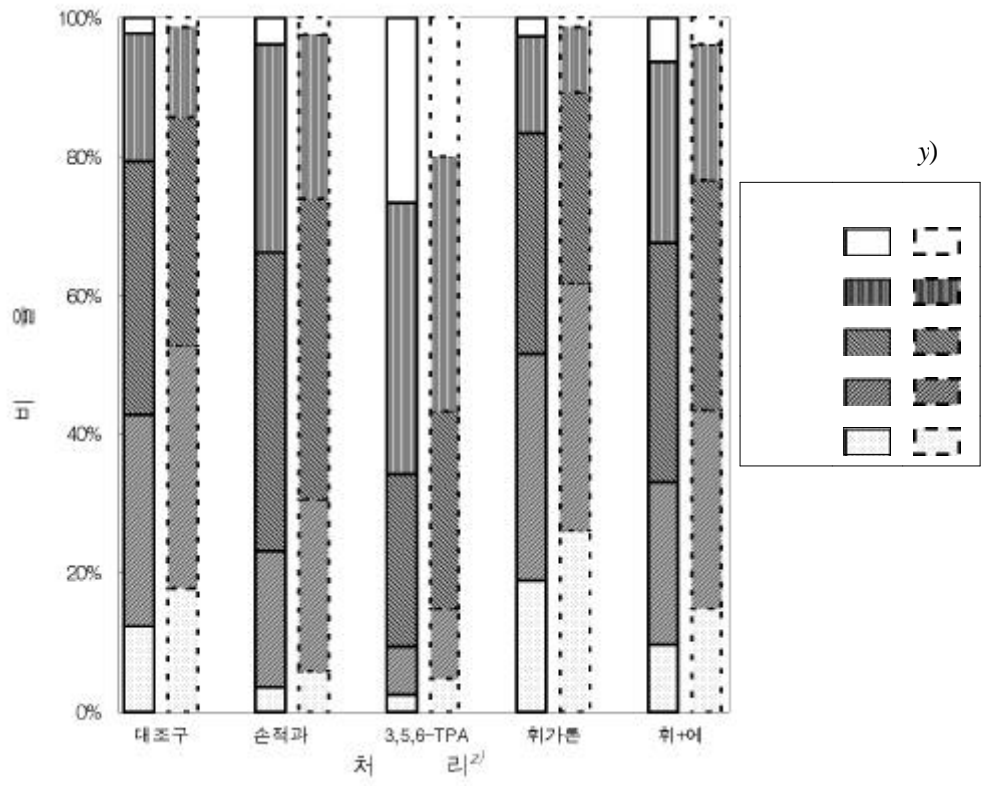
(13 ,

, 1997 ).

Figure 4- 3. Percent distribution of fruit by weight (and diameter) as affected by fruit-thinning methods in 'Okitsu Early' satsuma mandarin (13- years old, Chochun, 1997).

z) 2- 30 .

y) 4- 1 .

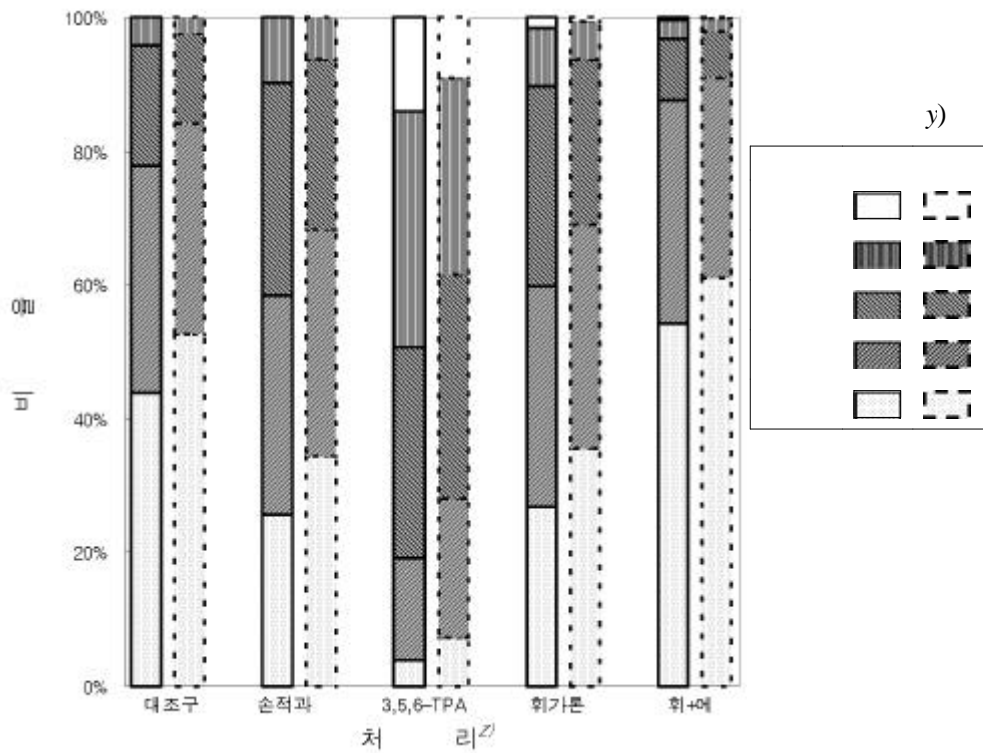


4- 4. (22- years old, , 1997 ).

Figure 4- 4. Percent distribution of fruit by weight (and diameter) as affected by fruit- thinning methods in 'Okitsu Early' satsuma mandarin (22- years old, Namwon, 1997).

z) 2- 30 .

y) 4- 1 .

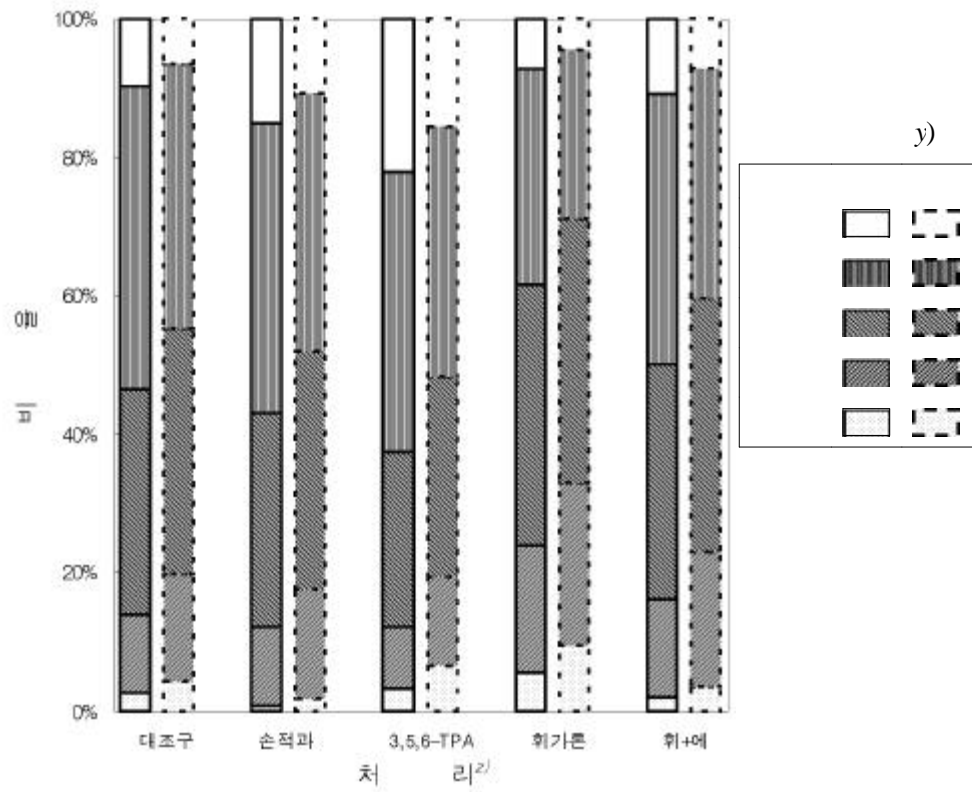


4-5. (20 , , 1997 ).

Figure 4-5. Percent distribution of fruit by weight (and diameter) as affected by fruit-thinning methods in 'Miyagawa Early' satsuma mandarin (20-years old, Cheju, 1997).

z) 2-30 .

y) 4-1 .



4- 6. (15 , , 1997 ).

Figure 4- 6. Percent distribution of fruit by weight(and diameter) as affected by fruit-thinning methods in 'Miyagawa Early' satsuma mandarin(15- years old, Namwon, 1997).

z) 2- 27 .

y) 4- 1 .

1. 3,5,6- TPA

4- 22, 23		3,5,6- TPA		가	
가		가		3,5,6- TPA	
		6	17	7	11
가		0.6		가	7
19			가		
			가		0.15

4- 22. 3,5,6- TPA 15mg/L 가  
(18 , , 1995 )

Table 4- 22. Effect of the date of foliar spray of 15mg/L 3,5,6- TPA on fruit quality in 'Okitsu Early' satsuma mandarin(18- years old, Cheju, 1995)

	(g)	(%)	(o Bx)		(%)
	89.4d <sub>z</sub> )	79.5	9.8a	1.13ab	8.7
6 19	114.4a	78.7	10.2a	1.03b	9.9
6 29	100.6c	79.3	9.8a	1.10ab	8.9
7 8	108.2b	79.4	10.2a	1.18a	8.6
7 19	92.6d	79.6	10.4a	1.15a	9.0

z)DMRT , 5% .



4- 23. 3,5,6- TPA 15mg/L 가  
(20 , , 1995 )

Table 4- 23. Effect of the date of foliar spray of 15mg/L 3,5,6- TPA on fruit quality in 'Okitsu Early' satsuma mandarin(20- years old, Namwon, 1995)

	(g)	(%)	( Bx)		(%)
	91.7	80.5	9.4bz)	1.27ab	7.4
6 17	99.9	81.1	10.0a	1.31a	7.6
6 24	97.5	79.8	10.3a	1.16b	8.9
7 11	100.3	79.4	10.0a	1.22ab	8.2
7 18	97.1	80.2	9.8ab	1.28ab	7.7

z) 4- 22 .  
j) 4- 22 .

2. 1 3,5,6- TPA 가  
가 가 3,5,6- TPA  
가 . 가  
3,5,6- TPA  
30mg/L 가 67mg/L .  
3,5,6- TPA

3,5,6- TPA 15mg/L  
가 0.9 1.5 가  
( 4- 25).

가  
 가 3,5,6- TPA 30mg/L  
 15mg/L + 10mg/L 2  
 가 .

4- 24. 1 3,5,6- TPA 가 가  
 (18 , , 1995 )  
 Table 4- 24. Effect of foliar spray of 3,5,6- TPA and figaron at  
 the 1st June drop on fruit quality in 'Okitsu Early'  
 satsuma mandarion(18- years old, Cheju, 1995)

지)	(g)	(%)	가		
			(. Bx)	(%)	(%)
	93.5c)	77.6	10.0	1.11	9.1
3,5,6- TPA 7.5mg/L	102.0b	77.8	10.1	1.05	9.7
3,5,6- TPA 15mg/L	120.0a	78.2	10.0	1.04	9.7
3,5,6- TPA 30mg/L	124.0a	79.3	10.1	1.12	9.0
3,5,6- TPA 15mg/L + 10mg/L	124.1a	79.5	10.2	1.07	9.8
가 67 mg/L	91.7c	79.7	10.4	1.08	9.5

지) 2- 4 .

가) 4- 22 .

4- 25. 1 3,5,6- TPA 가 가  
(20 , ,  
1995 ).

Table 4- 25. Effect of foliar spray of 3,5,6- TPA and figaron at the 1st June drop on fruit quality in 'Okitsu Early' satsuma mandarion(20- years old, Namwon, 1995)

z)	(g)	(% )	j)		
			(. Bx)	(%)	
	90.6	81.1	9.4cj)	1.24b	7.6
3,5,6- TPA 7.5mg/L	94.1	80.8	9.8bc	1.21b	8.1
3,5,6- TPA 15mg/L	101.0	81.6	10.3ab	1.28b	8.0
3,5,6- TPA 30mg/L	98.5	80.7	10.9a	1.34ab	8.1
3,5,6- TPA 15mg/L + 10mg/L	104.4	79.4	10.7a	1.46a	7.3
가 67 mg/L	87.5	80.8	9.7c	1.20b	8.1

z) 2- 25 .

j) 4- 22 .

3. 2 3,5,6- TPA 가  
4- 26  
가  
가 가  
가 5% .  
3,5,6- TPA 30m g/L 1 15m g/L 10m g/L  
가 .  
3,5,6- TPA 15m g/L 10m g/L 가 7.6 가

가 100mg/L 67mg/L 가

9.3 가

8.1 8.9 .

3,5,6- TPA 가 가

가 ( 19 25). 가

가 가 .

4- 26. 2 3,5,6- TPA 가 가  
(18 , , 1995 )

Table 4- 26. Effect of foliar spray of 3,5,6- TPA and figaron at the 2nd June drop on fruit quality in 'Okitsu Early' satsuma mandarion(18- years old, Cheju, 1995)

이)	(g)	(%)	가		가
			(. Bx)	(%)	
	85.0	80.2	10.0	1.21ab)	8.3
3,5,6- TPA 7.5mg/L	91.4	78.3	9.7	1.11b	8.8
3,5,6- TPA 15mg/L	93.6	77.7	10.1	1.19b	8.5
3,5,6- TPA 30mg/L	96.7	78.0	10.1	1.25ab	8.1
3,5,6- TPA 15mg/L + 10mg/L	95.2	77.7	10.1	1.34a	7.6
가 100mg/L	91.5	81.1	9.6	1.18b	8.2
가 100mg/L + 67mg/L	108.1	79.0	9.7	1.13b	8.6

이) 2- 7 .

가) 4- 22 .

4- 27. 2 3,5,6- TPA 가 가  
(20 , ,  
1995 )

Table 4- 27. Effect of foliar spray of 3,5,6- TPA and figaron at the 2nd June drop on fruit quality in 'Okitsu Early' satsuma mandarion(20-years old, Namwon, 1995)

z)	(g)	(%)	-----		
			(. Bx)	(%)	
	100.0	81.2	9.7b <sub>y</sub> )	1.16	8.4
3,5,6- TPA 7.5mg/L	106.8	82.3	10.1ab	1.13	8.9
3,5,6- TPA 15mg/L	112.2	79.7	9.8b	1.21	8.1
3,5,6- TPA 30mg/L	103.3	80.2	10.2ab	1.25	8.2
3,5,6- TPA 15mg/L + 10mg/L	113.6	79.0	10.2ab	1.20	8.5
가 100mg/L	107.2	80.5	10.6a	1.25	8.5
가 100mg/L + 67mg/L	106.3	79.8	10.6a	1.14	9.3

z) 2- 8 .

y) 4- 22 .

4.

가. 1996

4- 28 34

( 4- 31)

3,5,6- TPA 15mg/L 가

가 .

32), ( 4- 29, 31, 32) ( 4- 28, 30,

3,5,6- TPA 15mg/L 가 67mg/L  
 ( 4- 28)  
 ( 4- 34)

4- 28. (15 , , 1996 )

Table 4- 28. Effect of fruit- thinning methods on fruit quality in 'Miyagawa Early' satsuma mandarin(15- years old, Cheju, 1996)

z)	(g)	(% )			
			(. Bx)	(%)	
3,5,6- TPA 15mg/L 가 67mg/L	99.5	78.5	10.9by)	1.36	8.0b
	101.1	79.2	11.6a	1.33	8.8ab
	109.4	78.4	12.1a	1.34	9.0a
	104.0	79.3	11.8a	1.43	8.3ab

z) 2- 20 .

y) 4- 22 .

4- 29.

(19 ,

, 1996 )

Table 4- 29. Effect of fruit- thinning methods on fruit quality in 'Okitsu Early' satsuma mandarin(19- years old, Cheju, 1996)

z)	(g)	(% )			
			(. Bx)	(%)	
	89.9b <sub>y</sub> )	79.5a	12.1	1.40	8.7
	88.4b	78.9a	12.2	1.45	8.5
3,5,6- TPA 15mg/L	115.4a	77.8b	12.8	1.49	8 . 6
가 67mg/L	91.7b	79.7a	12.8	1.39	9.3

z) 2- 20 .

y) 4- 22 .

4- 30.

(21 ,

, 1996 )

Table 4- 30. Effect of fruit- thinning methods on fruit quality in 'Okitsu Early' satsuma mandarin (21- years old, Namwon, 1996)

z)	(g)	(% )			
			(. Bx)	(%)	
	92.8b <sub>y</sub> )	72.9	10.4	1.00	10.4
	95.3b	78.5	10.7	1.06	10.1
3,5,6- TPA 15mg/L	115.0a	77.2	1 1 . 1	1.05	10.6
가 67mg/L	108.8a	77.4	11.2	1.03	10.9

z) 2- 20 .

y), v) 4- 22 .

4- 31.

(15 ,

, 1996 )

Table 4- 31. Effect of fruit-thinning methods on fruit quality in 'Miyagawa Early' satsuma mandarin(15- years old, Namwon, 1996)

이)	(g)	(%)			
			(. Bx)	(%)	
3,5,6- TPA 15mg/L 가 67mg/L	76.2	79.3	9.9	0.86b)	11.5b
	78.1	79.1	10.4	0.94a	11.2b
	76.2	78.0	10.3	0.77c	13.4a
	76.3	78.8	10.6	0.81bc	13.3a

이) 2- 20 .

가) 4- 22 .

4- 32.

(20 ,

, 1996 )

Table 4- 32. Effect of fruit-thinning methods on fruit quality in 'Miyagawa Early' satsuma mandarin(20- years old, Cheju, 1996)

이)	(g)	(%)			
			(. Bx)	(%)	
3,5,6- TPA 15mg/L 가 67mg/L	111.7	75.6	11.7	1.42b)	8.3
	139.4	78.9	11.8	1.55a	7.6
	121.1	72.7	11.3	1.42b	8.0

이) 2- 21 .

가) 4- 22 .



4- 33.

(13 ,

, 1996 )

Table 4- 33. Effect of fruit-thinning methods on fruit quality in 'Okitsu Early' satsuma mandarin (13- years old, Chochun, 1996)

z)	(g)	(% )			
			(. Bx)	(%)	
	95.9	78.4a)	10.2	1.03	9.9
3,5,6- TPA 15mg/L	99.6	76.9b	10.2	1.00	10.2
가 67mg/L	97.6	77.8ab	10.7	0.93	11.6

z) 2- 21 .

) 4- 22 .

4- 34.

(15 ,

, 1996 )

Table 4- 34. Effect of fruit-thinning methods on fruit quality in 'Miyagawa Early' satsuma mandarin(15- years old, Namwon, 1996)

z)	(g)	(% )			
			(. Bx)	(%)	
	85.6b)	77.3	10.2b	1.12a	9.1b
3,5,6- TPA 15mg/L	105.4a	76.7	10.7ab	1.09a	9.8b
가 67mg/L	96.6ab	78.9	10.9a	0.97b	11.2a

z) 2- 21 .

) 4- 22 .

. 1997

1997 4- 35 38

1996 가 3,5,6- TPA 15m g/L  
 가 . 1996  
 ( 4- 37)

( 4- 30) 3,5,6- TPA 가 .  
 가 67m g/L 가

3,5,6- TPA 15m g/L

1996 . 1997

PDJ 50m g/L ,

가 .

4- 35. (20 ,

, 1997 )

Table 4- 35. Effect of fruit-thinning methods on fruit quality in 'Miyagawa Early' satsuma mandarin(20- years old, Cheju, 1997)

z)	(g)	(%)	. Bx		
			(. Bx)	(%)	(%)
3,5,6- TPA 15m g/L 가 67m g/L 가 +	71.9c <sub>j</sub> )	78.4	11.5ab	1.26a	9.14
	84.6b	79.3	10.6c	1.07b	9.93
	115.3a	78.4	11.7a	1.21ab	9.74
	77.0bc	80.0	10.8bc	1.08b	10.06
	69.3c	76.9	11.1abc	1.10b	10.22

z) 2- 21 .

j) 4- 22 .

4- 36.

(20 ,

, 1997 )

Table 4- 36. Effect of fruit- thinning methods on fruit quality in 'Okitsu Early' satsuma mandarin(20- years old, Cheju, 1997)

z)	(g)	(% )	. Bx)		
			(. Bx)	(%)	(%)
3,5,6- TPA 15m g/L 가 67m g/L 가 + PDJ 50mg/L	72.2b <sub>y</sub> )	77.9a	11.8a	1.24a	9.62a
	73.6b	79.3a	12.0a	1.22a	9.85a
	91.8a	79.1a	12.4a	1.21a	10.30a
	72.4b	79.1a	12.3a	1.19a	10.39a
	74.1b	78.5a	12.1a	1.18a	10.33a
	73.2b	78.3a	11.6a	1.23a	9.50a

z) 2- 26 .

y) 4- 22 .

4- 37.

(15 ,

, 1997 )

Table 4- 37. Effect of fruit- thinning methods oan fruit quality in 'Miyagawa Early' satsuma mandarin(15- years old Namwon, 1997)

z)	(g)	(% )	. Bx)		
			(. Bx)	(%)	(%)
3,5,6- TPA 15m g/L 가 67m g/L 가 + PDJ 50mg/L	104.5b <sub>y</sub> )	80.1ab	9.5c	1.13	8.50
	105.1b	80.0ab	9.5c	1.24	7.74
	130.5a	75.8c	10.6a	1.12	9.61
	103.3b	79.4b	10.0b	1.12	8.95
	98.1b	81.1a	10.2ab	1.12	9.11
	103.8b	80.3ab	9.5c	1.09	8.84

z) 2- 27 .

y) 4- 22 .

4- 38.

(14 ,

, 1997 )

Table 4- 38. Effect of fruit- thinning methods on fruit quality in 'Okitsu Early' satsuma mandarin(14- years old Chochun, 1997)

z)	(g)	(% )			
			(. Bx)	(% )	
	75.2b2)	78.6a	10.4ab	1.09b	9.65ab
	88.3b	80.8a	9.7b	1.03b	9.37ab
3,5,6- TPA 15m g/L	152.9a	75.4b	11.0a	1.06b	10.38a
가 67m g/L	89.3b	79.5a	9.9ab	1.32a	7.58c
가 +	81.8b	79.7a	10.1ab	1.17b	8.65bc

z) 2- 21 .

y) 4- 22 .

6

가

( 4- 39 42),

( 4- 43),

( 4- 44)

가

4- 39. 가

Table 4- 39. Effect of fruit-thinning agents on fruit weight loss during cold storage in early-maturing satsuma mandarin

: %

		'96		'97	
		12. 24	1. 21	2. 26	3. 31
		2.9	5.6	18.2	33.8
	가 67mg/L	2.9	5.2	9.4	28.4
	3,5,6- TPA 15mg/L	2.9	6.4	18.0	37.2
		2.5	4.6	12.9	31.1
	가 67mg/L	2.5	4.7	9.2	22.6
	3,5,6- TPA 15mg/L	2.5	4.7	12.5	31.5

4- 40. 가

Table 4- 40. Effect of fruit-thinning agents on fruit weight loss during storage at ambient temperature in early-maturing satsuma mandarin

: %

		'96		'97	
		12. 24	1. 21	2. 26	3. 31
		3.7	6.1	13.7	52.8
	가 67mg/L	4.0	9.7	16.0	54.3
	3,5,6- TPA 15mg/L	4.1	7.4	15.5	45.5
		3.6	5.5	12.7	50.2
	가 67mg/L	5.1	8.8	14.8	48.2
	3,5,6- TPA 15mg/L	1.9	4.6	7.3	38.5

4- 41. 가

Table 4- 41. Effect of fruit-thinning agents on percent decay of fruit during cold storage in early-maturing satsuma mandarin

: %

		'96	'97		
		12. 24	1. 21	2. 26	3. 31
		0	0.75	4.75	8.25
	가 67mg/L	0	0.25	1.75	13
	3,5,6- TPA 15mg/L	0	2.25	4.5	7.25
		0	0.3	6	5
	가 67mg/L	0	0.7	3	5
	3,5,6- TPA 15mg/L	0	0.7	4	10

4- 42. 가

Table 4- 42. Effect of fruit-thinning agents on percent decay of fruit during storage at ambient temperature in early-maturing satsuma mandarin

: %

		'96	'97		
		12. 24	1. 21	2. 26	3. 31
		0	0.8	8.0	6.3
	가 67mg/L	0	5.3	5.5	13.0
	3,5,6- TPA 15mg/L	0	2.0	4.7	8.0
		0	0.3	3.7	9.7
	가 67mg/L	0	1.7	4.0	8.7
	3,5,6- TPA 15mg/L	0	2.3	1.7	10.7

4- 43. 가

Table 4- 43. Effect of fruit- thinng agents on sugar contents in juice after cold storage in early- maturing satsuma mandarin

: %

		1.06	1.42	4.52	7.00
	가 67mg/L	1.21	1.66	5.13	7.99
	3,5,6- TPA 15mg/L	1.11	1.71	4.66	7.23
		0.83	1.09	3.68	5.61
	가 67mg/L	1.01	1.39	4.25	6.66
	3,5,6- TPA 15mg/L	0.96	1.33	4.36	6.65

4- 44. 가

Table 4- 44. Effect of fruit- thinng agents on sugar contents in juice after storage at ambient temperature in early- maturing satsuma mandarin

: %

		1.99	1.98	6.18	9.90
	가 67mg/L	1.40	1.53	5.19	8.12
	3,5,6- TPA 15mg/L	1.27	1.53	5.66	8.46
		1.36	1.99	6.32	9.67
	가 67mg/L	1.45	1.76	6.43	9.64
	3,5,6- TPA 15mg/L	1.30	1.87	6.22	9.39

5

1

가

가

1996

1996

1997

가

1

2

3,5,6- TPA

30m g/L

2

가

( 2- 5)

15m g/L

가

가

3,5,6- TPA

가

,

가

(不知火)

가

3,5,6- TPA



가 . 가

가

가 가 50mg/L  
40mg/L 가

3

1996

가

3,5,6- TPA 가

( 5- 1). ( )

가

가

( 5- 2)

가

5- 1. 3,5,6- TPA 가 가  
(1996 )

Table 5- 1. Effect of 3,5,6- TPA and figaron on sugar contents in leaf at fruit harvest in early- maturing satsuma mandarin (1996)

지)	( )	( )	( )	( )	
	14.2	13.0	10.1	7.6	11.2
3,5,6- TPA 15m g/L	16.5	10.8	15.4	12.9	13.9
가 67m g/L	13.8	11.6	11.1	12.0	12.1

지) 2- 20 .

5- 2. 3,5,6- TPA 가 가  
(1996 )

Table 5- 2. Effect of 3,5,6- TPA and figaron on sugar contents in root at fruit harvest in early- maturing satsuma mandarin (1996)

지)	( )	( )	( )	( )	
	6.2	9.4	6.9	9.1	7.9
3,5,6- TPA 15m g/L	6.6	11.6	7.4	10.7	9.1
가 67m g/L	4.2	13.6	6.6	9.2	8.4

지) 2- 20 .

4

5- 3 1995 3,5,6- TPA 가  
 1996 .  
 1995 가  
 1996 가 가  
 0 가 . 가 40% 1  
 3,5,6- TPA 15mg/L 2 가 100mg/L  
 가  
 0.4 1/10 .  
 1996 1997  
 가 0.24 가  
 0.5 0.4  
 3,5,6- TPA 0.3  
 ( 5- 4). 가  
 .  
 가 1 .  
 가

5- 3. 3,5,6- TPA 가 가  
(18 , , 1995- 1996 )

Table 5- 3. Effect of foliar spray of 3,5,6- TPA and figaron on number of flowers per leaf in 'Okitsu Early' satsuma mandarion(18- years old, Chjeu, 1995- 1996)

1		2	
z)		y)	
			0.003
	0.003	3,5,6- TPA 7.5mg/L	0.005
3,5,6- TPA 7.5mg/L	0.002	3,5,6- TPA 15mg/L	0.002
3,5,6- TPA 15mg/L	0.014	3,5,6- TPA 30mg/L	0.005
3,5,6- TPA 30mg/L	0.014	3,5,6- TPA 15mg/L + 10mg/L	0.006
3,5,6- TPA 15mg/L + 10mg/L	0.027	가 100mg/L	0.052
가 67 mg/L	0.005	가 100mg/L + 67mg/L	0.042

z) 2- 4 .

y) 2- 7 .

5- 4. 가  
(1996- 19967 )

Table 5- 4. Effect of fruit-thinning agents on number of flowers per leaf in 'Okitsu Early' satsum mandarin(1996- 1997)

z)		
	0.24	1.39
	0.52	-
3,5,6- TPA 15mg/L	0.30	1.17
가 67mg/L	0.46	1.62

z) 2- 20 .

# 6

25 30

가

20 25

가 ( )

가

가

10%

20%

가

11%

80%

90%

50% 가

{(100-

)-(100-

)} / (100-

) (

-

) / (100-

)

(

-

) / (

) (1-

/

)

3,5,6- TPA, 가 , 가

가

3

1. 3,5,6- TPA

3,5,6- TPA

7.5mg/L

가

30mg/L

가

가

15mg/L가

( 2-4 8). 6 17 ( 11m m)

7 11 ( 23m m)

15m g/L

가 25 53%

1

가

7 18 ( 25m m)

6- 1

14

3,5,6- TPA 가 ,

3,5,6- TPA

13.6 14.1m m

7

가

50%

15.3 18.5m m

4

가 20 30%

25 28m m

2

가

가

3,5,6- TPA

가

1995

가

7

가

가

11 22m m

가 25 53%

( 2- 1,2)

3,5,6- TPA

6- 1. 3,5,6- TPA 가

Table 6- 1. Summary of effects of 3,5,6- TPA and figaron in early- maturing satsuma mandarin

	( . )	(mm)	( )	( )	(%)	(%)				가	가
1995	6.20	-	21.1	2.4		- )	+++	++			
	6.27	-	21.6	4.8		+++	+++	+++			
1996	6.28	17.2	24.7	4.2	19	++	+++	+	+++	++	
					13	++	+	+	++	+	
	6.21	14.1	23.0	4.2	44	+++	+++	+++	+	-	
					25	+	+	-	+	+	
	6.18	15.3	21.5	3.4	28	++	++	+++	+	-	
					8	+	+	++	+	+	
	6.18	15.5	21.5	2.6	28	++	++	+	+	++	
					16	++	-	-	+	++	
	6.28	18.5	24.7	2.7		++	+++	-	-	-	
						+	-	+	-	-	
	7.20	27.7	28.7	3.9		+	++	-	-	-	
						++	+	-	+	+	
	7.18	25.7	27.4	3.8		+	-	++	+	+	
						++	-	+	++	++	
1997	6.11	13.8	22.5	4.0	53	+++	+++	++	+	+	
					-	-	-	-	+	+	
	6.11	13.6	22.5	5.0		+++	+++	+++	+	+	
						+	+	+	-	+	
	6.12	14.0	22.5	4.3		+++	+++	+++			
						+	++	-			
	6.12	13.8	22.5	3.0	51	+++	+	++	++	+	
					29	+	+	-	++	+	
	6.12	13.7	22.6	3.8		+++	+++	+++	+	+	
						+	-	+	-	-	

ㄱ) 가 , 2-3 .  
 ㄴ) 3,5,6- TPA 15mg/L, 가 67mg/L; -, ;  
 +, ; ++, ; +++, .

1995) 가 (Augusti ,

가 .

2

1

. 가 1996

가 가 가

1997 가 가

.

가 가

. 가 3,5,6- TPA 가  
가 가

2. 가

가 67mg/L

가

가

, ,

가

가 50mg/L

가

40mg/L

( 2- 10, 11).



(文, 1993). 1997 가  
50mg /L 50mg/L 5 ( 2- 26, 27, 30)  
. 가  
가 20  
. 1 22.5  
14mm 4 가  
.  
3.  
가 13  
가 30%  
14mm 가 13 17  
18mm 3,5,6- TPA 15  
mg/L  
가 17 20%  
가 가  
.  
가

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A1- 1. ( , 1995 6 )

Table A1- 1. Meteorological data during this experiment (Cheju, June 1995)

	( )			(%)		(mm)	(h)
1	20.7	27.9	15.5	57	30		11.1
2	21.3	25.1	16.8	68	47	10.5	8.7
3	20.1	24.1	16.3	95	86	24.3	0.0
4	17.3	19.7	15.7	87	73		8.7
5	18.0	20.2	15.9	85	73		10.3
6	19.1	21.4	14.8	79	63		8.8
7	21.3	26.1	17	67	40		9.2
8	19.5	21.3	17.4	88	76		10.2
9	17.4	18.6	16.5	95	92	5.5	0.0
10	18.3	20.1	16.7	92	81	0.1	0.0
11	18.4	19.7	17.3	88	82	0.0	0.0
12	17.4	18.1	16.4	95	88	26.0	0.0
13	17.4	19.2	16.4	95	86	10.4	0.0
14	19.2	21.3	17.3	89	78		3.5
15	19.5	22.1	16.7	86	70		8.5
16	19.9	22.6	16.9	87	78		8.6
17	22.0	25.5	18.0	64	37	0.1	0.0
18	21.3	24.8	17.8	86	69	1.1	3.4
19	24.2	26.1	21.1	79	63		7.8
20	22.6	26.1	17.8	82	58		9.0
21	21.9	23.2	19.6	87	75	14.0	1.2
22	19.1	21.1	18.6	90	73	0.2	0.0
23	20.0	23.2	18.1	86	63	0.0	7.3
24	21.2	23.8	18.8	89	81		8.5
25	21.5	26.7	19.3	93	69	0.4	1.8
26	21.6	23.8	20.2	85	70		8.8
27	22.0	25.0	19.7	82	58		7.2
28	22.1	24.8	18.9	81	46		10.8
29	21.9	24.2	18.6	85	78		11.0
30	21.5	24.1	19.7	92	84	8.3	0.0

A1-2. ( , 1995 6 )

Table A1-2. Meteorological data during this experiment  
(Seogwipo, June 1995)

	( )			(%)		(mm)	(h)
1	20.5	24.8	16.8	36	15		11.2
2	21.2	22.9	18.3	70	30	5.7	1.4
3	20.2	24.1	18.9	91	70	61.9	7.2
4	19.7	23.4	17.2	78	53		10.3
5	19.5	23.3	16.4	71	48		12.2
6	20.2	23.2	15.6	59	49		10.8
7	21.2	24.7	17.5	60	42		8.3
8	20.7	23.9	18.9	74	55		11.3
9	19.1	21.9	17.7	85	67	0.0	0.6
10	19.3	21.8	17.5	79	67	0.5	3.0
11	19.1	20.9	18.2	80	70		0.0
12	17.8	18.8	17.1	92	83	35.8	0.0
13	18.2	19.7	16.9	87	69	6.1	0.0
14	19.5	23.8	17.2	85	61		4.7
15	19.7	23.0	17.1	84	62		8.5
16	20.2	23.3	16.2	74	55		11.6
17	20.5	23.5	17.4	69	50	3.6	0.3
18	20.8	23.9	17.4	85	66	0.2	4.8
19	24.4	28.8	19.5	62	25		10.4
20	22.4	26.7	18.8	79	40		9.5
21	20.6	23.0	19.2	89	73	23.9	0.0
22	19.6	21.9	18.6	79	65	0.0	0.8
23	21.1	25.8	18.7	75	51		8.6
24	21.2	23.4	18.5	81	69		10.3
25	21.9	24.0	20.8	91	81	1.1	0.3
26	22.6	25.5	20.1	66	42		7.0
27	21.1	24.0	18.5	81	70		8.2
28	21.3	24.3	18.0	78	63		11.9
29	21.7	25.0	17.5	75	56		10.6
30	21.0	22.4	20.3	89	70	64.3	0.0

A1- 3. ( , 1995 7 )

Table A1- 3. Meteorological data during this experiment(Cheju, July 1995)

	( )			(%)		(mm)		(h)
1	22.7	24.9	20.4	92	86	5.7	4.5	
2	21.3	22.6	19.3	95	94	118.0	0.0	
3	22.3	25.5	21.1	94	82	1.3	0.0	
4	21.2	23.3	20.5	94	87	1.4	0.0	
5	20.1	21.8	19.2	95	85	30.3	0.0	
6	20.6	22.4	19.0	92	86	16.9	0.0	
7	24.1	28.6	20.3	91	74	71.5	0.0	
8	25.9	29.1	21.9	87	70		11.8	
9	28.5	32.2	24.4	71	55		12.5	
10	28.3	31.8	25.5	77	60	0.0	6.1	
11	27.9	33.3	25.2	84	55	0.0	11.6	
12	29.0	32.6	26.1	69	52		11.3	
13	30.0	33.2	28.1	57	51		12.2	
14	28.9	33.6	26.2	69	47		12.6	
15	29.2	33.6	26.1	75	55		10.4	
16	28.8	34.5	24.8	84	60	0.0	10.8	
17	24.9	28.5	23.3	82	49		8.2	
18	24.8	27.6	20.7	78	61		12.1	
19	26.8	34.4	22.6	77	59	0.0	5.9	
20	26.2	29.2	24.9	92	87	0.0	0.2	
21	26.5	32.4	24.9	89	61	0.2	4.1	
22	26.5	29.3	23.1	87	74	120.9	5.2	
23	23.3	26.1	21.3	92	77	45.8	0.0	
24	27.0	28.5	24.9	85	68	0.9	4.5	
25	27.2	30.4	25.0	87	61	0.0	10.8	
26	27.3	30.0	25.7	84	72		12.8	
27	27.3	31.1	24.0	79	50		11.8	
28	25.3	27.9	22.6	85	75		11.3	
29	25.9	28.6	22.3	84	69		12.3	
30	27.7	31.0	24.3	80	51	0.3	10.7	
31	28.6	31.6	25.4	79	67		11.2	

A1- 4. ( , 1995 7 )

Table A1- 4. Meteorological data during this experiment  
(Seogwipo, July 1995)

	( )			(%)		(mm)	(h)
1	22.5	24.1	20.4	92	84	25.2	2.0
2	21.9	22.6	21.3	94	94	365.2	0.0
3	22.0	24.3	21.0	94	85	5.8	0.0
4	21.5	22.8	20.8	93	84	2.7	0.0
5	19.8	21.7	18.6	92	84	34.7	0.0
6	20.1	21.4	19.2	91	86	41.0	0.0
7	23.0	23.5	21.2	95	94	226.8	0.0
8	24.3	26.3	23.2	94	91	0.4	0.0
9	24.6	27.4	23.5	93	84	0.1	1.1
10	24.2	26.0	23.2	94	88	0.0	0.0
11	25.2	27.5	24.2	91	84		0.7
12	25.4	27.6	24.3	91	83		0.8
13	26.2	28.6	24.2	86	74		6.1
14	26.5	29.1	25.2	87	76		6.3
15	25.9	27.9	25.5	92	88	0.0	0.0
16	26.7	29.2	25.1	87	80		10.4
17	25.1	27.3	23.7	80	66		3.7
18	24.9	27.5	22.4	78	73		6.6
19	25.4	27.4	23.3	89	80		0.0
20	27.3	29.9	25.8	89	78	0.0	5.1
21	27.7	29.2	26.5	88	76	0.0	2.2
22	27.9	30.4	23.5	86	81	14.7	5.8
23	23.4	26.6	22.2	90	72	52.1	0.0
24	25.0	26.9	24.2	91	79	9.4	0.6
25	25.7	27.2	24.8	93	85	0.0	0.0
26	26.1	28.3	25.1	91	81		5.1
27	25.9	27.8	23.5	84	75		11.6
28	25.7	28.6	22.5	80	68		12.1
29	26.3	29.0	22.6	82	75		11.7
30	27.6	30.0	25.3	86	71	8.6	7.3
31	28.6	30.9	26.4	85	71	3.3	9.6



A1- 5. ( , 1996 6 )

Table A1- 5. Meteorological data during this experiment(Cheju, June 1996)

	( )			(%)		(mm)	(h)
1	21.8	26.2	17.6	81	61		11.0
2	20.5	23.9	18.7	86	73		7.8
3	22.0	24.6	19.3	85	75	2.5	1.3
4	20.5	22.9	18.6	86	74	3.5	9.5
5	20.5	23.0	18.7	81	61		7.1
6	24.1	29.0	18.9	67	42		12.3
7	20.7	24.2	18.6	89	61	1.8	0.0
8	21.3	25.9	19.0	90	74	0.2	3.3
9	21.3	24.7	19.9	88	74	0.0	0.9
10	23.3	30.1	20.2	87	67	2.9	4.4
11	21.0	24.9	19.6	89	68	0.0	0.0
12	22.7	26.6	19.7	83	69		3.0
13	22.4	25.1	19.2	80	68		6.6
14	21.7	26.2	20.2	91	74	6.6	1.9
15	21.9	26.1	18.3	88	78		4.0
16	24.5	29.8	20.5	85	65	4.4	7.0
17	25.1	31.0	22.4	85	58	9.2	0.0
18	21.9	24.2	19.9	78	58	0.0	11.1
19	19.9	24.1	17.3	78	64	47.1	0.0
20	24.2	27.1	20.0	79	55	20.2	0.7
21	24.1	28.2	21.3	62	43	0.4	2.8
22	24.0	26.5	21.1	68	48		7.6
23	22.7	26.4	19.3	79	57	22.1	9.9
24	23.6	29.1	17.9	80	64	13.7	0.0
25	22.1	26.3	19.5	87	84	40.6	0.0
26	20.3	22.5	19.3	83	72	0.0	0.0
27	24.4	30.5	19.7	77	60	36.7	7.2
28	25.7	29.5	22.5	81	66	8.7	2.9
29	26.9	30.4	21.5	67	55	3.1	10.5
30	23.7	27.8	20.1	72	60		4.7

A1- 6. ( , 1996 6 )

Table A1- 6. Meteorological data during this experiment  
(Seogwipo, June 1996)

	( )			(%)		(mm)	(h)
1	21.7	24.6	19.3	76	63		11.6
2	21.7	24.3	18.1	75	66		9.1
3	21.6	22.3	21.2	89	85	43.6	0.0
4	22.1	23.7	20.7	79	60		9.6
5	22.0	24.9	20.2	63	53		5.7
6	23.1	25.7	19.7	67	54	0.0	9.0
7	20.2	21.7	18.7	90	77	42.4	0.0
8	20.8	22.9	20.2	87	75	0.0	2.3
9	21.0	22.7	19.8	85	74	0.3	0.8
10	22.1	23.6	20.6	87	80	2.0	2.2
11	20.8	22.3	20.1	89	82	0.0	0.0
12	22.0	24.8	20.1	78	49		3.4
13	21.4	24.2	19.2	81	64		4.8
14	22.3	24.7	20.7	88	80	3.9	2.1
15	23.5	25.5	21.7	87	76	0.1	1.0
16	23.7	26.2	23.0	87	76	0.3	1.9
17	22.5	24.1	20.8	90	84	30.5	0.0
18	22.8	29.1	19.8	62	29		10.3
19	19.9	23.0	17.9	79	65	46.1	1.2
20	21.7	24.1	19.5	88	71	39.2	0.0
21	21.0	21.6	20.5	81	71	1.8	0.0
22	21.8	24.2	20.1	84	62	0.0	5.1
23	21.3	24.3	19.8	86	73	32.8	4.7
24	21.9	23.6	19.3	90	85	15.7	0.0
25	21.2	23.0	19.3	90	87	103.0	0.0
26	20.3	22.1	18.9	84	72		2.6
27	21.8	23.7	20.3	90	83	27.3	0.0
28	23.3	25.7	21.9	92	87	11.7	4.6
29	23.3	24.9	20.9	93	89	0.7	0.0
30	21.6	22.6	20.0	93	79	0.5	2.1

A1- 7. ( , 1996 7 )

Table A1- 7. Meteorological data during this experiment(Cheju, July 1996)

	( )			(%)		(mm)	(h)
1	23.8	27.0	21.1	77	65		7.7
2	23.9	28.4	20.6	81	65	2.5	10.0
3	24.0	26.6	21.7	83	76	4.8	0.2
4	24.9	29.0	21.8	81	69	1.0	0.9
5	22.2	27.0	20.1	84	69	1.4	10.2
6	22.3	26.4	20.1	80	65	0.0	6.6
7	19.6	21.3	18.4	81	68	0.4	0.0
8	19.3	23.5	17.7	69	51		2.0
9	19.1	21.1	18.1	78	69	0.0	0.0
10	18.2	19.7	17.2	87	83	1.6	0.0
11	18.5	19.9	17.6	88	86	27.5	0.0
12	21.8	24.6	19.8	84	75	0.2	7.2
13	22.6	24.3	21.6	85	77	5.9	0.0
14	22.5	25.4	21.0	84	79	1.3	0.0
15	27.7	33.5	22.5	63	35	0.1	9.3
16	24.3	27.9	22.2	80	65	2.0	0.0
17	26.2	30.4	22.0	75	60		12.8
18	26.7	30.8	22.9	74	56		10.8
19	26.6	29.2	23.8	80	67		11.4
20	28.0	33.4	24.6	74	53		11.9
21	29.0	33.6	25.4	69	50	0.0	5.8
22	29.4	32.4	28.1	73	52	0.0	6.8
23	29.1	33.8	26.5	74	52		13.0
24	28.1	31.2	24.9	74	58		12.4
25	28.1	30.8	24.8	74	60		11.6
26	28.9	32.2	26.3	73	62		12.0
27	28.5	31.3	25.8	76	64		11.4
28	29.2	34.2	26.7	72	52	0.0	6.7
29	29.2	32.4	27.0	75	62		12.1
30	29.1	32.9	26.3	70	49		11.8
31	28.1	33.7	26.1	78	45		10.6

A1- 8. ( , 1996 7 )

Table A1- 8. Meteorological data during this experiment  
(Seogwipo, July 1996)

	( )			(%)		(mm)	(h)
1	23.1	24.8	21.2	82	72		6.3
2	23.4	26.1	21.7	90	78	0.0	3.6
3	23.6	27.3	22.4	94	74	4.8	2.1
4	23.4	24.2	22.5	96	94	9.0	0.0
5	23.6	27.3	20.4	82	62	1.8	11.1
6	21.4	23.2	20.5	93	85	2.8	0.1
7	20.1	21.4	18.3	82	71		1.2
8	19.7	22.0	17.8	72	61		4.3
9	19.5	21.3	18.0	80	72		1.8
10	19.1	20.8	18.1	89	81		0.0
11	19.1	20.0	18.3	95	91	47.0	0.0
12	22.5	24.8	19.9	93	89	5.3	0.0
13	24.3	27.1	21.7	92	72	6.6	7.7
14	23.3	24.7	21.6	93	88	3.0	0.0
15	25.3	27.0	24.1	95	90		0.3
16	24.0	25.3	23.2	96	90	0.7	0.0
17	27.3	30.0	24.3	88	76		10.3
18	27.4	29.8	24.4	77	67		10.4
19	27.0	29.5	24.2	89	81		11.0
20	27.8	30.3	26.4	92	82		8.5
21	27.5	28.8	26.8	95	91	0.0	0.0
22	26.7	28.9	25.5	95	88		0.0
23	27.1	29.6	25.8	93	82		4.2
24	28.2	30.4	25.8	87	67		11.6
25	28.6	31.0	26.6	82	70		12.0
26	29.1	31.0	27.3	84	74	0.0	10.6
27	28.6	30.8	27.3	83	69		5.5
28	28.8	30.7	27.5	89	78		0.7
29	29.4	31.5	27.4	84	70	0.0	9.5
30	29.3	31.3	26.8	68	55		11.6
31	29.8	32.5	27.0	67	53		10.9

A1- 9. ( , 1997 6 )

Table A1- 9. Meteorological data during this experiment(Cheju, June 1997)

	( )			(%)		mm	(h)
1	24.1	27.6	19.7	59	35	2.1	0.0
2	20.6	24.6	17.9	56	32	0.0	11.2
3	20.5	23.2	16.0	56	38		10.2
4	21.0	25.4	17.4	57	40		9.5
5	22.8	26.2	17.9	79	63		11.1
6	21.4	24.4	19.5	88	77	0.0	3.7
7	23.3	27.1	19.6	81	61		9.6
8	21.6	24.1	19.7	91	91	19.8	0.0
9	20.6	25.2	17.0	71	29		9.0
10	21.2	23.8	19.5	64	42	0.0	0.9
11	21.8	25.4	18.9	73	56	0.0	11.6
12	22.2	24.4	19.1	79	59		10.6
13	21.8	24.7	18.4	67	46		11.4
14	21.7	24.2	18.3	71	50		10.2
15	22.6	26.0	20.2	68	52		9.3
16	22.4	25.8	18.0	73	46		10.9
17	24.1	26.5	20.1	58	40		11.1
18	23.4	26.1	20.6	80	42		8.2
19	23.2	25.3	20.7	83	47		8.0
20	23.7	26.3	21.1	78	57	0.2	8.0
21	23.3	25.2	21.3	87	75		2.9
22	22.8	25.0	20.9	87	77		3.4
23	23.6	26.2	20.6	80	69		11.0
24	23.8	28.5	20.5	83	60	4.6	6.8
25	25.6	29.3	22.2	84	57	20.8	0.0
26	26.4	30.0	23.5	84	63	4.0	6.9
27	24.5	26.2	22.2	91	90	20.1	0.0
28	23.4	26.6	21.4	87	75	5.1	6.3
29	23.9	26.6	21.2	88	78		8.9
30	25.2	29.1	21.4	78	53	2.5	2.6

A1- 10. ( , 1997 6 )

Table A1- 10. Meteorological data during this experiment  
(Seogwipo, June 1997)

	( )			(%)		(mm)	(h)
1	21.5	23.7	18.8	81	71	10.9	0.0
2	21.1	23.4	18.6	65	53		10.8
3	20.9	24.9	16.1	54	45		11.6
4	21.3	24.3	17.4	60	47		10.4
5	21.9	23.6	19.8	82	74		0.0
6	21.7	24.3	19.4	82	67	0.5	1.2
7	21.7	23.5	19.3	82	70	2.4	0.0
8	22.1	23.1	20.8	88	86	46.0	0.0
9	23.6	27.6	20.9	62	38		10.5
10	22.4	26.1	19.7	61	49		0.7
11	21.0	24.8	17.2	74	60		12.5
12	22.0	24.8	18.8	78	68		7.2
13	22.2	25.5	18.5	69	57		11.3
14	22.1	25.9	18.9	63	48		9.8
15	22.3	25.8	19.2	67	57		9.4
16	22.1	25.3	18.7	66	56		10.6
17	23.3	27.4	19.8	67	55		11.8
18	23.3	27.0	19.5	69	54		8.1
19	24.7	28.7	22.0	70	58		4.9
20	24.3	26.4	22.6	80	70		8.9
21	23.1	25.7	21.0	79	66	0.0	4.1
22	22.9	25.1	21.2	80	71		2.7
23	23.4	26.9	19.0	75	67		12.0
24	23.7	26.7	20.8	80	66	4.0	3.4
25	24.1	24.8	22.6	88	77	43.2	0.0
26	24.3	25.0	23.5	87	86	0.7	0.0
27	24.0	25.3	23.1	86	82	15.7	0.0
28	26.1	29.7	22.0	69	54	11.8	7.2
29	24.5	26.9	22.4	76	67		10.0
30	23.6	25.1	21.4	83	70	0.9	0.6

A1- 11. ( , 1997 6 )

Table A1- 11. Meteorological data during this experiment(Cheju, June 1997)

	( )			(%)	(mm)	(h)
1	27.6	29.7	23.1	70	0.7	1.1
2	28.4	33.0	26.4	80		8.2
3	29.5	32.5	25.5	71		12.1
4	29.3	31.9	26.2	63		12.1
5	28.7	31.5	26.2	75	0.4	6.9
6	24.8	28.3	20.8	85	18.7	0.0
7	23.2	25.9	20.6	81		7.7
8	21.8	23.1	20.4	90	20.4	0.0
9	21.8	23.4	20.5	90	0.7	0.0
10	22.1	22.8	21.4	91	8.7	0.0
11	23.3	28.9	21.9	83	51.5	1.4
12	23.9	26.7	22.1	81	0.0	1.4
13	23.0	28.0	22.2	77		6.1
14	25.7	27.5	23.1	84	0.0	2.2
15	29.2	32.5	28.8	66	0.0	9.0
16	27.6	30.7	26.0	85	3.3	2.2
17	25.7	26.8	24.2	88	3.9	1.0
18	27.0	30.3	23.7	79		4.7
19	28.2	33.9	24.2	74		9.5
20	28.1	30.8	25.2	79		12.1
21	27.9	30.9	25.7	82		10.5
22	27.9	29.9	24.7	81		11.0
23	27.6	30.3	24.9	81		11.2
24	26.9	28.8	25.2	83		11.2
25	27.4	29.9	25.0	74		9.7
26	27.4	29.9	25.0	82		9.6
27	28.4	31.6	26.6	82		8.9
28	28.5	31.6	26.6	84		9.7
29	28.8	30.7	27.2	84		9.3
30	28.6	31.1	26.6	82		5.3
31	28.0	30.6	26.1	78		9.5

A1- 12. ( , 1997 7 )

Table A1- 12. Meteorological data during this experiment  
(Seogwipo, July 1997)

	( )			(%)	(mm)		(h)
1	23.8	24.4	23.0	86	2.1	0	
2	23.9	25.3	23.3	87	1.1	0	
3	24.5	26.1	23.3	87	0.2	0	
4	24.4	25.1	24.1	87		0	
5	24.6	26.4	23.5	87		0	
6	22.9	23.9	21.3	88	20.8	0	
7	22.5	25.3	20.8	81	2.2	7.1	
8	20.4	22.5	19.7	90	196.5	0	
9	22.2	25.0	20.4	87	2.2	0	
10	22.8	25.0	21.4	92	20.0	0	
11	23.3	24.4	21.8	96	54.4	0	
12	22.8	25.0	21.6	87	1.4	0	
13	23.6	26.3	21.0	89		5.5	
14	25.0	27.3	22.8	91	0	0	
15	25.6	27.3	24.9	94	0	11.1	
16	24.7	26.2	23.9	97	17.0	0	
17	24.3	26.2	23.6	95	7.2	0.7	
18	24.7	27.4	22.8	94		3.4	
19	25.7	28.1	24.0	94	0.0	2.6	
20	27.0	29.8	24.7	90		10.8	
21	27.2	30.0	25.4	83		10.4	
22	26.4	28.7	23.6	74		10.9	
23	27.2	29.9	24.0	70		11.4	
24	27.5	30.6	24.6	66		10.9	
25	29.3	32.9	25.2	56		11.6	
26	29.9	32.7	25.8	61		6.1	
27	29.5	34.7	25.0	60		6.0	
28	28.7	33.3	24.4	65		6.5	
29	28.6	32.1	25.6	73		7.3	
30	22.6	29.7	25.6	66		6.6	
31	27.1	29.5	25.4	72		7.2	



A2- 1. ( ) (19 , , 1996 )  
 Table A2- 1. Effect of fruit- thinning methods on percent distribution by weight(and diameter) in 'Okitsu Early' satsuma mandarin(19- years old, Cheju, 1996)

( , mm)	z)		
		3,5,6- TPA	가
0(< 46)	5.4ab)(8.9ab)	0.9b(1.8c)	3.2ab(5.2abc)
1(46 51)	24.5a(29.5a)	5.7b(8.1b)	23.6a(28.6a)
2(51 54)	20.5a(21.4a)	9.9b(12.6b)	23.4a(24.9a)
3(54 56)	13.0ab(12.3a)	12.2ab(13.8a)	16.6a(15.5a)
4(56 58)	12.1a(10.2ab)	14.8a(15.3a)	13.7a(11.7ab)
5(58 60)	8.5b(6.7b)	16.1a(15.9a)	8.0b(6.3b)
6(60 62)	5.8b(4.3b)	12.2a(11.2a)	4.3b(3.2b)
7(62 66)	7.9b(5.4c)	16.8a(13.7b)	5.7b(3.7c)
8(66 70)	2.0c(1.2c)	8.4b(5.9b)	1.4c(0.8c)
9(70 77)	0.2b(0.1b)	2.9b(1.8b)	0.2b(0.1b)
10(> 77)	0.0a(0.0a)	0.2a(0.1a)	0.0a(0.0a)

z) 2- 20, 2- 23 .

y)DMRT , 5% .

A 2- 2.

(

) (20 , , 1997 )

Table A2- 2. Effect of fruit- thinning methods on percent distribution by weight(and diameter) in 'Okitsu Early' satsuma mandarin(20- years old, Cheju, 1997)

( , mm)	Z)					
	3,5,6- TPA	가	+	PDJ		
0( <46)	18.3a)(25.5a)	13.8ab(19.7ab)	1.6b(3.1b)	23.0a(30.8a)	18.5a(25.1a)	12.0ab(18.1ab)
1(46 51)	42.2a(43.3a)	37.4a(40.4a)	8.4b(11.5b)	39.7a(39.6a)	37.2a(38.5a)	34.1a(37.4a)
2(51 54)	18.7a(16.6a)	17.6a(16.7a)	10.4b(12.9a)	18.4a(16.3a)	18.9a(17.6a)	20.3a(19.4a)
3(54 56)	7.0a(5.5a)	9.8a(8.4a)	6.7a(7.5a)	7.2a(5.6a)	7.9a(6.5a)	11.3a(9.5a)
4(56 58)	5.8b(4.1b)	6.6ab(5.0b)	12.7a(13.0a)	5.5b(3.9b)	7.7ab(5.8b)	7.3ab(5.7b)
5(58 60)	4.1b(2.7b)	5.6b(4.1b)	12.1a(11.9a)	3.2b(2.1b)	3.8b(2.7b)	6.7b(4.8b)
6(60 62)	2.2b(1.4b)	4.1b(2.7b)	13.4a(12.8a)	1.6b(1.0b)	2.7b(1.9b)	3.6b(2.4b)
7(62 66)	1.3b(0.7b)	4.4b(2.6b)	17.2a(15.0a)	1.3b(0.7b)	2.4b(1.4b)	4.2b(2.5b)
8(66 70)	0.4b(0.2b)	0.8b(0.4b)	10.7a(8.0a)	0.0b(0.0b)	1.0b(0.5b)	0.0b(0.0b)
9(70 77)	0.0b(0.0b)	0.0b(0.0b)	6.1a(4.0a)	0.0b(0.0b)	0.0b(0.0b)	0.5b(0.2b)
10( >77)	0.0b(0.0b)	0.0b(0.0b)	0.5a(0.3a)	0.0b(0.0b)	0.0b(0.0b)	0.0b(0.0b)

z) 2- 20, 2- 23 .

y)DMRT , 5% .

A2-3.

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Table A2-3. Effect of fruit-thinning methods on percent distribution by weight (and diameter) in 'Okitsu Early' satsuma mandarin (13-years old, Chochun, 1997)

( , mm)	z)				
	3,5,6- TPA	가†	+		
0 (< 46)	4.2a)(7.1a)	2.4a(4.3ab)	0.2a(0.6b)	4.2a(7.4a)	3.8a(6.6ab)
1(46 - 51)	24.1a(29.5a)	12.5b(16.8b)	0.6c(1.2c)	17.3ab(22.3ab)	18.1ab(23.2ab)
2(51 - 54)	23.4a(24.8a)	15.2b(17.8b)	1.4c(2.5c)	17.0b(19.3ab)	20.2ab(22.3ab)
3(54 - 56)	12.4a(11.6a)	13.0a(13.6a)	1.4b(2.1b)	13.0a(12.9a)	13.1a(13.0a)
4(56 - 58)	11.9a(10.1a)	12.0a(11.4a)	3.7b(5.1b)	13.8a(12.5a)	12.3a(10.9a)
5(58 - 60)	7.2ab(5.6a)	10.4a(9.4a)	5.4b(7.0a)	11.4a(9.7a)	10.5a(8.7a)
6(60 - 62)	6.5a(4.8b)	11.2a(9.8a)	7.5a(9.0ab)	7.8a(6.1ab)	7.0a(5.4ab)
7(62 - 66)	7.0b(4.6b)	13.0b(10.1b)	23.4a(25.0a)	9.0b(6.2b)	10.0b(7.0b)
8(66 - 70)	3.0c(1.7b)	8.2b(5.5b)	24.8a(23.1a)	4.1bc(2.4b)	3.8bc(2.3b)
9(70 - 77)	0.4b(0.2b)	2.0b(1.2b)	24.3a(19.5a)	2.1b(1.1b)	1.1b(0.6b)
10(> 77)	0.0b(0.0b)	0.2b(0.1b)	7.3a(4.9a)	0.2b(0.1b)	0.0b(0.0b)

z) 2- 20, 2- 23 .

y)DMRT , 5% .

A2-4.

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) (22 , , 1997 )

Table A2-4. Effect of fruit-thinning methods on percent distribution by weight (and diameter) in 'Okitsu Early' satsuma mandarin (22- years old, Namwon, 1997)

( , mm)	z)				
	3,5,6- TPA	가	+		
0 (< 46)	0.8b(1.6b)	0.2c(0.4c)	0.5bc(1.4bc)	1.8a(3.3a)	0.7bc(1.5bc)
1(46 - 51)	11.5ab(16.2ab)	3.5cd(5.5c)	1.8d(3.3c)	17.2a(22.9a)	8.9bc(13.3b)
2(51 - 54)	16.0ab(19.4a)	9.1c(12.3b)	3.0d(4.6c)	18.4a(21.1a)	12.1bc(15.6ab)
3(54 - 56)	14.6a(15.5a)	10.3b(12.3a)	4.1c(5.6b)	14.4a(14.5a)	11.5ab(13.1a)
4(56 - 58)	13.5a(13.0a)	13.2a(14.3a)	5.4b(6.7b)	12.0a(11.0a)	11.5a(11.9a)
5(58 - 60)	12.8ab(11.4ab)	16.1a(16.1a)	8.8b(10.1b)	11.3ab(9.6b)	12.9ab(12.3ab)
6(60 - 62)	10.1ab(8.5bc)	13.9a(13.1a)	10.5ab(11.6ab)	8.5b(6.8c)	9.9ab(8.9abc)
7(62 - 66)	12.9bc(9.5cd)	20.2a(16.8ab)	21.5a(21.2a)	9.7c(6.9d)	16.9ab(13.4bc)
8(66 - 70)	5.7c(3.6bc)	9.5b(6.8b)	17.9a(15.5a)	4.3c(2.6c)	9.2b(6.3bc)
9(70 - 77)	2.2b(1.2b)	3.9b(2.4b)	18.7a(14.7a)	2.4b(1.3b)	5.6b(3.3b)
10 (> 77)	0.1b(0.1a)	0.0b(0.0a)	7.8a(5.3a)	0.2b(0.1a)	0.8ab(0.4a)
Kg/	75.8ay)	42.5c	61.8b	69.2ab	73.8ab
Kg/	64.8a	43.8c	45.0bc	54.3abc	62.0ab

z) 2- 20, 2- 23 .

y)DMRT , 5% .

A2-5.

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) (20 , , 1997 )

Table A2-5. Effect of fruit-thinning methods on percent distribution by weight (and diameter) in 'Miyagawa Early' satsuma mandarin (22-years old, Namwon, 1997)

( , mm)	z)				
	3,5,6- TPA	가	+		
0 (< 46)	12.7a <sub>y</sub> (18.2a)	4.8ab(8.2ab)	0.8b(1.8b)	6.1ab(10.0ab)	12.9a(18.0a)
1(46 - 51)	31.3ab(34.4ab)	20.9b(26.2b)	3.1c(5.4c)	20.8b(25.4b)	41.4a(43.0a)
2(51 - 54)	20.1a(19.6a)	19.8a(21.4a)	7.9b(11.4b)	19.1a(20.6a)	22.5a(20.6a)
3(54 - 56)	13.7a(11.8a)	13.0a(12.4a)	7.4a(9.4a)	13.7a(13.0a)	10.9a(9.4a)
4(56 - 58)	9.1ab(7.2ab)	11.3a(9.8a)	9.5ab(10.8a)	13.0a(11.4a)	4.4b(3.4b)
5(58 - 60)	5.7bc(4.0bc)	12.6a(10.0a)	11.8a(12.4a)	9.9ab(8.0ab)	3.0c(2.2c)
6(60 - 62)	3.2bc(2.2b)	7.7ab(5.8b)	10.2a(10.2a)	7.1ab(5.4b)	1.9c(1.4b)
7(62 - 66)	2.8b(1.8b)	5.7b(3.8b)	20.8a(18.2a)	5.4b(3.6b)	1.5b(1.0b)
8(66 - 70)	1.4b(0.8b)	4.2b(2.4b)	14.7a(11.2a)	3.2b(1.8b)	1.4b(0.8b)
9(70 - 77)	0.0b(0.0b)	0.0b(0.0b)	11.1a(7.6a)	1.3b(0.6b)	0.4b(0.2b)
10 (> 77)	0.0b(0.0b)	0.0b(0.0b)	2.9a(1.6a)	0.5b(0.2b)	0.0b(0.0b)

z) 2- 20, 2- 23 .

y)DMRT , 5% .

A2- 6.

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(15 ,

, 1997 )

Table A2- 6. Effect of fruit- thinning methods on percent distribution by weight(and diameter) in 'Miyagawa Early' satsuma mandarin(15- years old, Namwon, 1997)

( , mm)	Z)				
	3,5,6- TPA	가	+		
0( < 46)	0.1b)(0.2c)	0.1b(0.2c)	0.7a(1.9a)	0.6a(1.3ab)	0.1b(0.3bc)
1(46 51)	2.6ab(4.1ab)	0.9b(1.5b)	2.6ab(4.7ab)	5.1a(8.1a)	2.0b(3.3b)
2(51 54)	5.5ab(8.0a)	5.6ab(8.3a)	4.4b(6.8a)	9.5a(13.0a)	7.5ab(10.8a)
3(54 56)	5.9ab(7.6ab)	5.7ab(7.6ab)	4.5b(6.1b)	8.8a(10.6a)	6.7ab(8.6ab)
4(56 58)	9.2ab(10.8ab)	8.4ab(10.0ab)	6.4b(7.9b)	12.7a(13.8a)	10.1ab(11.8ab)
5(58 60)	10.6a(11.6a)	12.5a(13.7a)	8.9a(10.3a)	11.8a(11.9a)	11.3a(12.2a)
6(60 62)	12.7a(13.0a)	10.1a(10.6a)	10.0a(10.7a)	13.2a(12.5a)	12.4a(12.5a)
7(62 66)	27.1a(24.8a)	21.7b(20.5b)	19.6b(18.7bc)	18.0b(15.0c)	21.8b(19.6b)
8(66 70)	16.6a(13.3a)	19.9a(16.7a)	20.8a(17.4a)	13.0a(9.3a)	17.3a(13.6a)
9(70 77)	8.3bc(5.8b)	13.6ab(9.9ab)	16.9a(12.2a)	6.9c(4.3b)	10.0bc(6.8ab)
10( > 77)	1.4b(0.8b)	1.7b(1.0b)	5.3a(3.3a)	0.4b(0.2b)	0.9b(0.5b)

z) 2- 20, 2- 23 .

y)DMRT , 5% .