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APRC Project report

Project SP74: Development of self-fertile clones of Queen Cox

Project Staff: Dr. A.D. Webster, Ms Jane Spencer

Date: Report to 30th September, 1994

Performance of self-fertile Queen Cox clones on three grower sites

Monitoring continued on the growth, flowering and cropping of self-fertile Queen Cox clones 18 and 7 on three grower sites. As judged by trunk girth measurements the strongest trees were those planted on the Faversham site and the weakest those planted near Wisbech. Differences in tree size between clones 18 and 7 were small. The numbers/tree of floral buds formed on spurs and terminals were highest on the Faversham site and lowest on the Ledbury site; these differences ranged from 40% for clone 18 and 83% for clone 7. Nevertheless, fruit numbers per tree were very similar on all sites with those at Ledbury marginally the best. Setting efficiency, expressed as final fruit numbers harvested/100 spur and terminal floral buds, was only 58% and 50% at Faversham compared with 121% and 98% at Ledbury for clones 7 and 18 respectively. The high figures at Ledbury were in spite of thinning trees to two fruits/cluster; no thinning was carried out on the other two sites.

Fruit samples were collected in early June from each site and analysed for their mineral content. The smallest fruits at this time were from the Ledbury site and the largest from Faversham, which also had fruits with the lowest percentage dry weight. As might be expected the smaller, less developed fruits from the Ledbury site contained less calcium per fruit but had highest concentrations of calcium.

Fruits have been harvested and placed in CA storage for assessment of storage performance and ex-store quality and size. Samples were also taken at harvest for further mineral analysis. Details of yield and quality will be included in the next report.

Flower and Fruitlet thinning of apple

Carbaryl (Thinsec/Sevin), which is commonly used for fruitlet thinning of Cox's Orange Pippin and its 'sports', is often erratic in its effects. Application of carbaryl at the 12 mm stage also frequently thins too late to provide maximum benefits in increased fruit size and high alcohol insoluble solid content of fruits required for optimum fruit texture. Moreover, carbaryl is not approved for use under several of the European IFP guidelines. Alternative methods of thinning are required which are both environmentally acceptable and reliable.

Several new chemical thinners have recently been tested in the USA and these and other closely related products were tested in spring 1994 as thinners for self-fertile Cox clones grown at East Malling. Each of eight different products was tested at four different concentrations on branch units. Records of floral bud numbers and fruit set were taken. Most of the products tested are blossom thinners and will only be appropriate for use on orchards where cropping is consistent in most seasons. The consistently-cropping self-fertile Cox and Queen Cox clones lend themselves well to use of blossom thinning chemicals. This research is conducted in collaboration with colleagues at Wilheminadorp in the Netherlands.

Records of initial fruit set, taken approximately one month after application of the blossom

thinners, showed that three of these chemicals, Wilthin, Endothallic Acid and Pelargonic Acid all reduced levels of initial set when used at sufficiently high concentrations. Ammonium thiosulphate, oleic acid, oenanthic acid and lauric acid had no effect on initial set.

A fruitlet thinner, Axcel (a formulation of benzyl adenine) which was applied later, after bloom, had no effect on initial set.

Effects on final fruit set, fruit size and skin finish will be assessed when the harvested fruits are removed from cold storage.

Maturity development in clones of Queen Cox

Many problems were experienced with the storage and texture of Queen Cox fruits in the 1993/94 season. These problems have been attributed to climatic factors, incorrect timing of harvest, overcropping trees, modern systems of management and poor storage regimes (Sharples report). Long-term storage is only successful if fruit is picked at an optimal maturity; this maturity may be influenced by site, crop load, tree age, rootstock and the clone of Queen Cox grown.

Three new clones of Queen Cox, Numbers 4, 9 and 74, all of which exhibit improved red colour in comparison with Queen Cox-EMLA, were released by HRI-East Malling several years ago. Maturity development of fruits from these clones was evaluated in 1994 and compared with that of Queen Cox-EMLA planted on the same site at East Malling.

This preliminary work has revealed differences between Queen Cox clones in their fruit maturity development. Although not funded by APRC this work is of relevance to previous APRC-funded research on Cox clones and will be reported fully in a subsequent report.

APRC Project Report

Project SP.74 (11) Development of self-fertile clones of Queen Cox and alternative methods of fruit thinning.

Project Staff: Dr A.D. Webster Ms Jane Spencer

Date: Report to 30th March 1995

Performance of self-fertile Queen Cox Clones on grower sites

Fruit from sites at Ledbury, Faversham and Wisbech were CA stored at East Malling until mid-March. The fruits were held at 3.5°C, 1¼% O_2 and < 1% CO_2. Half the fruits from each clone were tested for their shelf life post storage by holding them at 18°C for seven days. The results are shown in Tables 1 and 2.

Examination of fruit samples of SF Queen Cox Clone 18 immediately post storage showed almost no rotting but there was slight storage breakdown in fruits from the Faversham site. SF Queen Cox Clone 7 showed slight rotting. Re-examination of samples after simulated shelf life tests showed development of slight bitter pit, corky core and senescent breakdown in Clone 18 samples from the Faversham site, slight rotting and breakdown in the Ledbury fruit but no problems with Wisbech fruits. Fruits of clone 7 showed rather more breakdown than fruits of Clone 18; a small amount of bitter pit was noted on Clone 7 fruits from the Wisbech site.

Table 1
Queen Cox (SF) stored at 3.5°C, 1¼% O_2 and < 1% CO_2.
Half the fruit from each clone tested for shelf life at 18°C for seven days.

Clone	Mean fruit wt (g)	% Red colouration	Pressure Tests		Soluble Solids		No. of Seeds (Full)
			Post Storage Force at 8 mm	Post Shelf Life Force at 8 mm	Post Storage % Sugar	Post Shelf Life % Sugar	
Faversham Site							
7	146	58	68.1	55.5	13.7	14.0	3.2
18	165	49	67.9	61.5	13.8	14.1	2.0
Ledbury Site							
7	126	64	73.2	59.2	13.9	14.6	4.9
18	137	55	74.3	64.4	12.6	13.2	3.3
Wisbech Site							
7	122	43	64.2	57.2	14.0	14.1	4.2
18	123	43	58.6	54.3	12.9	13.0	2.8

Table 2
Fruit Mineral Analyses

	Milligrams per 100 gms Fresh Weight					
	N	P	K	Ca	Mg	% Dry Weight
Faversham Site						
7	75.0	16.7	176.8	4.8	6.4	16.5
18	57.8	15.8	174.4	4.6	6.6	17.1
Ledbury Site						
7	48.2	15.4	167.9	5.3	7.0	17.3
18	46.7	14.7	166.3	5.4	6.6	15.9
Wisbech Site						
7	65.1	14.0	165.7	5.4	7.1	17.6
18	68.5	12.9	144.3	5.2	6.5	15.7

Flower and Fruitlet Thinning of apple

The results of a preliminary trial, testing 4 new potential blossom thinning and one new fruitlet thinning chemical, are shown in the attached Table 3. The most effective thinning chemical was Endothallic acid which reduced initial and final fruit set at all concentrations tested. Wilthin and Pelargonic acid also reduced final set at the highest concentrations tested. Ammonium thiosulphate, which had only a small and statistically non-significant influence on initial set did reduce final set by up to 35%. None of the fruits from treated trees showed any increase in russeting or other symptoms of chemical phytotoxicity. Effects on fruit size were not statistically significant. This is explained by the fact that only branches, rather than whole trees were treated.

Sprays of Paturyl (containing benzyl adenine; similar to Axcel) at the 12 mm fruitlet stage had no effect on initial or final set. Sprays of Paturyl to varieties other than Cox in Dutch trials have proved more promising.

Table 3
Chemical Thinning

Scion: Self-fertile Cox clone 8

Product	Concentration	Timing	Set/100 S + T+ floral buds	
			Initial	Final
Endothallic Acid	Nil (Control)	Full bloom	210.8	86.0
	25 ppm	Full bloom	131.8 **	71.2 *
	50 ppm	Full bloom	107.7 ***	54.4 ***
	100 ppm	Full bloom	75.9 ***	34.7 ***
SED			21.41	6.91
Pelargonic Acid	Nil (Control)	Full bloom	143.7	116.1
	750 ppm	Full bloom	168.6	114.2
	1500 ppm	Full bloom	109.6	90.7 *
	3000 ppm	Full bloom	79.2 *	65.0 ***
SED			18.55	10.06

+S + T = spur and terminal floral buds
* = significantly different from the control
*** = very highly significantly different
SED = standard error of difference

Table 3 (continued)

Product	Concentration	Timing	Set/100 S + T floral buds	
			Initial	Final
Wilthin'	Nil Control	Full bloom	198.9	92.4
	1000 ppm	Full bloom	183.1	91.6
	2000 ppm	Full bloom	155.7 *	86.2
	4000 ppm	Full bloom	124.4 ***	60.8 ***
SED			13.92	7.26
Scion: Self-fertile Cox Clone 9				
Ammonium thiosulphate	Nil (Control)	Full bloom	160.7	100.7
	0.5%	Full bloom	140.4	78.9 **
	1.0%	Full bloom	127.3	75.3 **
	1.5%	Full bloom	125.4	65.0 ***
SED			NS(14.44)	6.95
Cox Clone 9				
Paturyl	Nil (Clone)	12 mm fruitlet	165.0	82.4
	50 ppm	"	150.7	78.6
	100 ppm	"	165.7	81.4
	200 ppm	"	164.3	78.6
SED				NS(8.41)

NS = no significant differences

APRC Project Report

Project SP. 74 (11) — Development of self-fertile clones of Queen Cox and alternative methods of fruit thinning

Project Staff: Dr. A.D. Webster Ms. Jane Spencer

Date: Report to 30th September 1995

Self-fertile Queen Cox clones

Recording of growth and cropping of two self-fertile clones, numbers 18 and 7, has continued on three commercial grower sites, located at Faversham, Ledbury and Wisbech. Samples were collected from each site at harvest and placed into cold store after making preliminary quality assessments. These samples will be evaluated for colour, firmness, soluble solids, mineral content and incidence of storage breakdown in the winter, after completion of storage. Yields of the self-fertile clones on each site will be estimated by the owners and sent to HRI.

A monoculture orchard of Queen Cox Clone 18, planted on a site isolated from other apples at East Malling in spring 1994, is making good growth and produced its first small crop this year.

Self-fertile Queen Cox Clone 18 is now being marketed through NSA Tree fruits. Preliminary results of tests of this and other HRI Cox and Queen Cox selections at Wilhelminadorp in Holland have been sent to HRI.

Flower and fruitlet thinning of apple

Following the promising results achieved last year in a preliminary trial testing several new chemical thinners on branch units of self-fertile Cox clones, the work was extended in 1995. The chemical treatments showing most promise in the 1994 trial were tested again in 1995 but this year on whole trees of Queen Cox and Royal Gala on M.9 rootstock. These trees, which in previous years had cropped abundantly, were 5-years-old and trained as slender spindles planted in single rows. Although the frost close to full bloom in May 1995 appeared to have caused much damage to blossoms of both varieties, it was decided to continue with the trial and the treatment sprays were applied as planned.

Four blossom thinning chemicals were compared: ammonium thiosulphate (ATS), endothallic acid (TD), pelargonic acid (Thinex) and monocarbamide dihydrogensulphate (Wilthin). A new fruitlet thinner based on benzyl adenine (Paturyl) was compared with the industry standard carbaryl (Thinsec). Two experimental controls were (a) no thinning or (b) hand thinning to two fruits/cluster when the fruitlets were 12mm in diameter.

The orchard is not routinely irrigated but during the severe drought in August trickle irrigation (a single 2-litre emitter/tree) was applied for approximately 24 hours on each of 4 occasions.

The numbers of floral clusters were counted on each tree and initial and final fruit set recorded well before 'June Drop' and just prior to harvest respectively. The trees selected were very uniform at the beginning of the experiment; each Queen Cox treatment/tree having between 169 and 175 floral buds and each Royal Gala between 93 and 99 floral buds.

The effects of the treatments on initial and final fruit set are shown in Table 1 below:

Table 1: The effects of sprays of blossom and fruitlet thinning chemicals on the initial and final fruit sets of Queen Cox and Royal Gala in 1995

Treatment	Spray concentration	Queen Cox		Royal Gala	
		Initial set/ 100 floral buds	Final set/ 100 floral buds	Initial set/ 100 floral buds	Final set/ 100 floral buds
Control		232	107	584	374
Hand Thin		160	110	232	232
ATS	0.5%	130	80	330	265
	1.0%	124	63	333	294
	1.5%	136	54	199	158
TD	25 mg l^{-1}	175	95	354	254
	50 mg l^{-1}	99	66	287	230
	100 mg l^{-1}	78	47	233	171
Wilthin	1000 mg l^{-1}	187	106	509	
	2000 mg l^{-1}	198	92	452	
	4000 mg l^{-1}	147	67	335	
Thinex	750 mg l^{-1}	196	114	459	
	1500 mg l^{-1}	218	109	481	
	3000 mg l^{-1}	163	96	467	
Carbaryl	750 mg l^{-1}	203	52	402	215
Paturyl	50 mg l^{-1}	196	68	411	275
	100 mg l^{-1}	199	66	461	267
	200 mg l^{-1}	227	60	503	283

all treatments caused some reduction in final set values; the severity of response increased with increasing concentrations of each chemical.

Table 2
The effects of sprays of ATS and TD at blossom time on the initial and final fruit set of Conference pear trees

Treatment	Spray concentration	Initial set/100 floral buds	Final fruit set/100 floral buds
Unthinned control	-	123	46
ATS	0.5%	112	34
ATS	1.0%	117	25
ATS	1.5%	81	20
TD	25 mg l^{-1}	74	30
TD	50 mg l^{-1}	33	18
TD	100 mg l^{-1}	33	16

APRC Project Report

Project SP74: Development of self-fertile clones of Queen Cox and alternative methods of fruit thinning

Project Staff: A.D. Webster and J.E. Spencer

Date: Report to 31st March, 1996

Self-fertile clones of Queen Cox

Evaluation of two self-fertile clones of Queen Cox, numbers 7 and 18, has continued on three grower sites located at Faversham, Ledbury and Wisbech. Fruits collected from the three sites were placed in controlled atmosphere storage and removed in the second week of March, when post storage fruit quality assessments were conducted. The shelf life of fruit samples was also compared by keeping fruits at 18°C for seven days after storage, prior to assessment.

The average fruit weights, post storage, were similar for the self-fertile clones 7 and 18 and the self-sterile EMLA clone fruits collected from the Faversham site (Table 1). Fruits of clone 7 collected from the Ledbury and Wisbech sites were, by contrast, smaller than fruits of clone 18.

Pressure tests showed that fruits of clone 7 were softer than those of clone 18 at all three sites. Faversham site fruits were softer than desirable immediately post storage whereas fruits from the Ledbury site exhibited ideal pressure values. Pressure values declined, as expected, after seven days shelf life at 18°C but fruits from the Ledbury site maintained very acceptable values.

Fruits collected at the Ledbury and Wisbech sites from clone 7 trees had slightly higher percentage soluble solids than fruits from clone 18 trees. Fruits from the Faversham site were lower in soluble solids than those from the other two sites.

On the evidence of these tests and those conducted in previous years, fruits of self-fertile Queen Cox clone 18 store as well as those of the EMLA Queen Cox clone. Fruits of self-fertile clone 7 appear to ripen earlier and are sometimes softer than desirable if picked at the same time as the other clones.

Flower and fruitlet thinning

Apple

Studies investigating the efficacy of blossom or fruitlet thinning chemicals have indicated that several new products may have considerable promise for use on Royal Gala and Queen Cox apple cultivars. Three concentrations of four blossom thinning chemicals, ammonium thiosulphate (ATS), endothallic acid (TD), monocarbamide dihydrogensulphate (Wilthin) and perlargonic acid (Thinex) and a fruitlet thinning chemical, benzyl adenine (Paturyl) were compared with the industry standard carbaryl (Thinsec). Additional experimental controls were trees which were hand thinned to two fruits per cluster (at the 12 mm diameter stage) and unthinned trees.

Queen Cox

Treatment effects on both initial and final fruit set per tree are presented in Table 2. All three

concentrations of ATS and TD significantly reduced the initial fruit set per 100 floral buds. The highest Wilthin concentration also reduced initial set, as did the highest concentration of Thinex. The fruitlet thinners, Paturyl and Thinsec were not applied until just before initial set was counted and, therefore, had no effect on initial set. The hand thinning resulted in a 31% reduction in fruit numbers at initial set.

The final fruit numbers, counted at harvest and expressed per 100 floral buds (Table 2), indicated that natural fruitlet abscission was much more severe on the unthinned control trees than on the hand thinned trees, such that both control and hand thinned trees had similar final fruit numbers. Although all the ATS and TD treatments appeared to reduce final fruit numbers per 100 floral buds, the effect was only statistically significant for the medium and high spray concentrations. Only the high concentration of Wilthin reduced final set significantly and none of the Thinex treatments had any statistically significant effect on final fruit numbers. All three Paturyl treatments reduced final fruit set but not as severely as the treatment with Thinsec.

Table 3 shows the treatment effects on total yield (kg/tree), total fruit numbers and mean individual fruit size in 1995. Surprisingly, the yields, fruit numbers and mean fruit sizes were very similar on both control and hand thinned trees. The high and medium concentrations of either ATS or TD treatments reduced yields and fruit numbers harvested and also increased mean fruit size by approximately 25%. The highest concentration sprays of Wilthin had a similar effect and this treatment resulted in fruits with the largest mean size. None of the Thinex treatments had any significant effect upon yields or fruit sizes. Paturyl sprays produced significant reductions in fruit numbers but small and usually non significant reductions in yields (kg/tree). These Paturyl treatments also increased mean fruit size by approximately 25%. The Thinsec treatment reduced yield and harvested fruit numbers slightly more than the Paturyl treatments. Mean fruit size was similar for the Thinsec and the high concentration Paturyl treatments.

The Queen Cox fruits were graded at East Malling in the commercial fruit packhouse. The percentages of the total yield in each of the size categories are presented in Table 4. The percentages of fruits >70 mm Class I were very variable and not appropriate for ANOVA analysis. Nevertheless, the highest concentrations of ATS and TD and also the Thinsec sprays produced approximately 20% of their yield in this size category and the highest rates of Wilthin and Paturyl both resulted in >30% of fruit yields in this >70 mm Class I category. In comparison with the unthinned controls, the medium and high concentration ATS, TD and Paturyl and the high concentration Wilthin sprays increased significantly the percentages of fruits in the >65 mm Class I category. The highest proportions of fruits in the 65 mm to 70 mm category were harvested from the Thinsec sprayed trees.

Fruit samples collected from several of the treatments at harvest and placed in CA storage (3.5°C <1% CO_2 1.25% O_2) until mid March showed that the firmest fruits were harvested from the ATS-sprayed treatment and the softest from the untreated controls and the hand thinned trees (Table 5). Percentage soluble solids were higher in fruits from all the chemically thinned trees in comparison with controls or hand thinned trees.

Royal Gala

Despite apparent severe frost damage, the Royal Gala trees still overset in 1995. Hand thinning of the trees to two fruits per cluster removed more than half of the fruit numbers initially set (Table 6). All the ATS and TD spray treatments also reduced initial set percentages but only the highest spray concentrations of each product matched the hand thinning in terms of degree of initial thinning. Although both Wilthin and Thinex also reduced initial set percentages, their effects were in most instances less than those achieved with ATS and TD. Very few fruits abscinded from the

hand thinned trees between the times of recording initial and final fruit sets, whereas approximately 37% of fruitlets set initially on the unthinned controls abscinded in this period. Final fruit set percentages were similar for the hand thinned, the low and medium concentrations of ATS or TD, the high concentration of Wilthin, all the Paturyl concentration sprays as well as for the Thinsec treatment. The high concentration sprays of ATS and TD produced more severe reductions in final set.

Total yields per tree (kg) were similar on the unthinned and hand thinned controls, the low and medium concentration ATS spray treatments, the low concentration TD treatment and all three concentration treatments of Wilthin, Thinex and Paturyl (Table 7). Yields were reduced significantly by the medium and high concentration sprays of TD, the high concentration ATS treatment and the Thinsec sprays. Hand thinning increased mean fruit size significantly, by approximately 40% in comparison with unthinned controls. Only the highest concentration ATS sprays and the carbaryl treatment produced a response of similar magnitude. Nevertheless, the medium concentration ATS and the medium and high concentrations of TD also produced statistically significant increases in mean fruit size. The treatment differences in percentages of fruits in the various size categories were so extreme that ANOVA analysis was considered unsuitable and largely unnecessary. Table 8 shows that only three treatments, hand thinning, the high concentration of ATS and Thinsec, produced more than 20% of the total fruit yield in the 65 mm to 70 mm Class I category. The highest proportion of fruits Class I >65 mm grades was produced by the high concentration ATS spray. The medium concentration of ATS and the medium and high concentrations of TD all produced >10% of their fruits in the >65 mm Class I grades. The medium and high concentration sprays of Wilthin and Paturyl induced only a small increase in the proportions of fruits in these desirable size grades.

Pear

Despite severe frost damage the Conference pear trees set high numbers of fruitlets. Table 9 shows that the medium and high concentrations of TD both reduced initial fruit set per 100 floral buds significantly. A slight (but non statistically significant) reduction was also induced by the lowest concentration spray of TD and the highest concentration spray of ATS. All the treatments, except the lowest concentration of ATS reduced the final set per 100 floral buds. The most severe thinning was induced by the medium and high TD concentrations and the high concentration spray of ATS and these same treatments also reduced the total yield per tree (Table 10). Although several of the treatments increased slightly the mean fruit size, none of these treatment differences were statistically significant.

Technology Transfer

Thinning of Royal Gala and Queen Cox featured as an exhibit and grower talk at the Fruit Focus Exhibition held at HRI-East Malling in the summer of 1995.

A lecture, featuring the results of the 1995 trials, was presented at a meeting of European fruit thinning research specialists, held in Stuttgart, Germany in November, 1995.

Flower and fruitlet thinning was the basis of a lecture given to ADAS advisors as part of a Study Day held at HRI-East Malling.

Table 1

Post storage and shelf-life results 1995/6 of self-fertile Queen Cox clones grown at Faversham, Ledbury and Wisbech

	Average ft wt gms	Force at 8 mm (Newtons)	% soluble solids	No. of seeds/fruit		
				Full	1/2	Empty
Post storage (Fruits were CA stored at 3.5°C, 1.25% 0_2 <1% $C0_2$ until mid March						
Faversham						
Control -EMLA	153.1	56.5	15.2	2.9	0.2	0.9
SF clone 7	154.4	54.3	15.2	4.0	0	0.5
SF clone 18	158.9	57.2	15.3	2.3	0.1	0.9
Ledbury						
Clone 7	129.4	63.7	18.1	4.3	0.1	0.1
Clone 18	144.5	72.2	17.3	2.5	0.4	0.5
Wisbech						
Clone 7	117.0	57.7	17.5	3.8	0.2	0.2
Clone 18	144.0	67.2	16.9	2.1	0.1	0.9
Post shelf-life (Fruits kept at 18°C for 7 days after removal from storage)						
Faversham						
Control	154.4	49.5	14.9			
Clone 7	155.2	50.9	15.7			
Clone 18	161.6	50.7	15.0			
Ledbury						
Clone 7	132.2	58.8	17.6			
Clone 18	143.3	58.1	16.6			
Wisbech						
Clone 7	116.4	51.0	18.1			
Clone 18	157.4	53.5	16.6			

Table 2

Chemical thinning trial 1995; Initial and final set of Queen Cox

Treatments	Floral bud nos./tree	Initial set/100 floral buds	Final fruit number/100 floral buds
Control	170	232	105
Hand thinned	173	160	109
ATS			
0.5%	175	130	80
1.0%	171	131	63
1.5%	172	136	54
TD			
25 ppm	173	175	90
50 ppm	179	99	67
100 ppm	174	78	48
Wilthin			
1000 ppm	169	187	106
2000 ppm	175	198	92
4000 ppm	169	147	67
Thinex			
750 ppm	171	196	114
1500 ppm	172	218	109
3000 ppm	173	163	96
Paturyl			
50 ppm	170	193	75
100 ppm	175	199	66
200 ppm	172	227	68
Thinsec			
750 ppm	173	203	54
SED	4.9	23.9	13.0

Table 3

Chemical thinning trial 1995; Yields and average fruit weight of Queen Cox

Treatments	Total yield kg/tree	Total fruit no./tree	Mean fruit weight (g)
Control	13	163	84
Hand thinned	14	172	82
ATS			
0.5%	12	125	101
1.0%	11	103	109
1.5%	9	81	119
TD			
25 ppm	12	136	95
50 ppm	10	101	105
100 ppm	8.4	80	111
Wilthin			
1000 ppm	14	154	91
2000 ppm	13	141	89
4000 ppm	11	100	131
Thinex			
750 ppm	15	169	88
1500 ppm	14	166	88
3000 ppm	12	146	85
Paturyl			
50 ppm	12	113	105
100 ppm	12	105	108
200 ppm	11	99	116
Thinsec			
750 ppm	10	83	118
SED	1.5	19.7	10.8

Table 4

Chemical thinning trial 1995; Size and quality of harvested Queen Cox fruits

Treatments	% wt. fruit Class I > 70 mm	% wt. fruit Class I 65-70 mm	% wt. fruit Class I > 65 mm	% total wt. fruit Class I	% total wt. fruit Class II
Control	9.6	12.5	22.1	79.3	15.2
Hand thinned	2.3	9.8	12.1	74.4	16.9
ATS					
0.5%	10.1	32.2	42.3	73.3	13.1
1.0%	12.4	37.5	49.8	83.0	9.3
1.5%	19.4	39.4	58.9	78.3	15.3
TD					
25 ppm	10.6	17.7	28.4	74.5	13.0
50 ppm	10.7	35.8	46.5	74.4	11.9
100 ppm	19.3	25.0	44.4	65.0	23.1
Wilthin					
1000 ppm	0.4	16.1	16.4	80.0	13.8
2000 ppm	1.9	23.6	25.5	72.9	12.9
4000 ppm	34.6	17.0	51.6	72.9	20.0
Thinex					
750 ppm	0.8	15.0	15.8	81.2	8.5
1500 ppm	1.3	18.6	19.9	78.5	14.2
3000 ppm	4.0	13.9	17.9	70.4	17.3
Paturyl					
50 ppm	17.0	25.3	42.3	74.1	15.2
100 ppm	13.6	37.1	50.7	78.6	10.6
200 ppm	38.3	29.9	68.1	76.8	14.1
Thinsec					
750 ppm	20.1	52.0	72.0	87.0	7.8
SED		8.79	12.21	5.71	3.17

Table 5

Queen Cox thinning trials 1995; Post storage results (March)

	Concentration	Average fruit wt. gms	Force at 8 mm (Newtons)	% soluble solids
Control		78.1	40.4	11.6
Hand thinned		92.9	43.6	13.4
Thinsec	750 ppm	118.2	50.6	15.2
ATS	1.5%	114.2	54.9	15.4
TD	100 ppm	89.1	50.2	15.2
Paturyl	200 ppm	133.9	46.9	15.2

Table 6
Chemical thinning trial 1995; Initial and final fruit set of Royal Gala

Treatments	Floral bud nos./tree	Initial set/100 floral buds	Final fruit number/100 floral buds
Control	93	584	370
Hand thinned	94	232	243
ATS			
0.5%	97	330	284
1.0%	96	333	276
1.5%	96	199	165
TD			
25 ppm	99	354	283
50 ppm	97	287	234
100 ppm	94	233	175
Wilthin			
1000 ppm	94	511	343
2000 ppm	97	452	331
4000 ppm	94	335	261
Thinex			
750 ppm	94	459	336
1500 ppm	95	480	372
3000 ppm	88	467	333
Paturyl			
50 ppm	99	411	280
100 ppm	93	461	269
200 ppm	96	501	285
Thinsec			
750 ppm	93	402	218
SED	4.2	39.4	23.6

Table 7

Chemical thinning trial 1995; Yields and average fruit size of Royal Gala

Treatments	Total yield kg/tree	Total fruit no./tree	Mean fruit wt (g)
Control	22	334	68
Hand thinned	20	216	95
ATS			
0.5%	20	262	76
1.0%	19	245	84
1.5%	14	149	103
TD			
25 ppm	21	265	77
50 ppm	17	203	88
100 ppm	12	147	88
Wilthin			
1000 ppm	20	286	76
2000 ppm	23	307	72
4000 ppm	19	234	81
Thinex			
750 ppm	22	308	66
1500 ppm	23	331	71
3000 ppm	21	292	69
Paturyl			
50 ppm	21	271	77
100 ppm	19	244	77
200 ppm	19	252	77
Thinsec			
750 ppm	17	190	94
SED	1.3	20.5	6.1

Table 8
Chemical thinning trial 1995; Size and quality of harvested Royal Gala fruits

Treatments	% wt. fruit Class I 65-70 mm	% wt. fruit Class I 60-65 mm	% wt. fruit Class I >65 mm	% total wt. fruit Class I	% total wt. fruit Class II
Control	1.7	3.6	1.7	89.5	7.9
Hand thinned	25.6	21.0	30.8	89.5	5.9
ATS					
0.5%	6.2	13.8	6.4	90.2	6.2
1.0%	11.9	15.3	12.2	82.0	12.4
1.5%	24.6	12.7	35.5	86.7	7.9
TD					
25 ppm	3.6	12.7	4.1	88.6	6.7
50 ppm	16.7	17.8	18.0	90.8	4.5
100 ppm	14.6	32.4	16.3	91.6	5.0
Wilthin					
1000 ppm	3.1	8.4	3.1	84.8	9.3
2000 ppm	5.4	2.5	5.4	83.8	10.7
4000 ppm	7.1	21.0	8.2	87.7	8.1
Thinex					
750 ppm	2.8	6.0	2.8	88.4	7.7
1500 ppm	0.2	5.0	0.2	88.8	7.0
3000 ppm	0.1	5.0	0.1	83.5	10.3
Paturyl					
50 ppm	5.4	11.4	5.4	85.4	8.3
100 ppm	8.8	11.0	8.8	85.2	11.7
200 ppm	6.9	14.5	7.7	86.6	9.1
Thinsec					
750 ppm	20.5	29.1	24.2	93.0	4.1
SED	-*	-*	-*	2.94	-*

* ANOVA not appropriate

Table 9
Conference - Chemical thinning trial 1995

Treatments	Floral bud nos. per tree	Initial set per 100 floral buds	Final fruit number per 100 floral buds
Control	193.8	123.1	46.3
ATS			
0.5%	190.0	112.0	34.1
1.0%	192.1	116.8	24.8
1.5%	183.6	80.9	19.9
TD			
25 ppm	205.8	72.4	30.1
50 ppm	194.8	33.0	17.8
100 ppm	195.6	32.6	15.6
SED		25.7	7.6

Table 10
Conference - Chemical thinning trial 1995

Treatments	Total yield kg/tree	Total fruit no./tree	Mean fruit weight (g)
Control	10.6	82.6	126.2
ATS			
0.5%	9.2	62.9	146.8
1.0%	7.0	47.0	145.2
1.5%	5.5	36.8	150.3
TD			
25 ppm	7.5	54.9	133.7
50 ppm	4.7	34.4	129.0
100 ppm	4.3	29.8	141.2
SED	1.95	12.97	NS(11.96)