

## APRC Project Report

**Project SP105** Evaluation of new thinning chemicals

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**Date:** Report to 31 March 1998

### Apple

Yields and trial results in 1997 were, as reported previously, severely influenced by frost damage in spring 1997. Nevertheless, with the aid of frost protection on one of the trial sites at East Malling frost damage was reduced and some of the thinning tests were undertaken as planned. The post harvest storage results from these trials are presented below.

### Influence of ATS (Thio-sul) sprays $\pm$ rewetting on yields and fruit quality of Royal Gala/M9

Reports from Canada suggest that sprays of ATS may cause more phytotoxicity to spur leaves if conditions at the time of spraying favour slow drying (i.e. high humidity). Controlled environment studies conducted in The Netherlands have recently confirmed this environmental effect on phytotoxicity. Attempts were made to simulate increased humidity by rewetting orchard trees approximately 6 or 24 hours after ATS spray application.

All the ATS treatments thinned Royal Gala and the higher concentration (1.5%) reduced yields more than the lower concentration (1.0%). Rewetting had no effect on the efficacy of thinning in 1997 (Table 1). Yields of fruits > 70 mm or > 65 mm in diameter were increased by all the spray treatments. Although sprays at the higher concentrations increased > 70 mm diameter fruits slightly more than the lower concentration, this was offset by a slight reduction in yields of fruits > 65 mm in diameter. On this evidence in 1997 ATS at 1.0% would appear to be the preferable treatment for Royal Gala.

**Table I.** Yield and grade out of Royal Gala in 1997

Treatment	Rewetting	Total yield kg/tree	Wt. fruit/tree > 70 mm	Class I > 65 mm
Control unsprayed	-	28	2.0	10.9
Thiosul 1.0%	-	20	3.7	11.6
1.5%	-	15	4.6	10.3
1.0%	pm (6 hours)	19	4.8	11.3
1.5%	pm (6 hours)	15	6.0	11.7
1.0%	am (24 hours)	21	4.7	14.2
1.5%	am (24 hours)	16	4.5	11.2

Examination of fruits from the higher concentration spray treatments after harvest but pre-storage, showed that mean fruit size and fruit ripeness (as indicated by higher % soluble solids and reduced starch) were increased by the treatments. No differences in fruit firmness were evident, all fruits measuring approximately 9.0 kg even though samples from the treated trees were larger in size.

Storage until the second week in March 1998 was in air (within a polypropylene cabinet to reduce weight loss) at 2°C. Tests carried out post storage showed almost no change in soluble solids content but pressure of all fruits had reduced to approximately 6.0 kg. Samples kept for a further seven days to simulate shelf life lost a further 0.5 kg in pressure.

**Table 2.** Post harvest assessments of Royal Gala fruits

Treatment	Mean fruit wt of 10 fruit samples (g)	Pressure (kg)		% soluble solids		% starch
		Pre-Storage	Post Storage	Pre-Storage	Post Storage	Pre-storage
Control unsprayed	119	9.9	6.0	11.1	11.3	54
Thiosul (1.5%)						
“ No rewetting	136	9.9	6.3	12.3	12.4	46
“ 6 h rewetting	144	9.7	6.0	12.1	12.0	42
“ 24 h rewetting	138	10.1	6.4	12.2	12.6	52

#### Influence of sprays of ATS (Thio-sul) and AVG (Retain) on yields and grade out of Queen Cox/M9

All of the Thio-sul treatments applied at flowering time in 1997 reduced fruit set on Queen Cox/M9 trees. In most cases, when taking account of the frost damage, this reduced yields more than was desirable. Treatments with either 1.0% or 1.5% Thio-sul reduced the number of fruits removed by hand thinning from 24 to 2 fruits/tree. In years of heavier fruit set and less frost damage it is predicted that this saving in hand thinning should be much greater. Thio-sul at the lower concentration (1.0%) thinned slightly more than hand thinning alone in 1997; whilst the 1.5% concentration sprays reduced fruit set to much less than on the hand thinned trees. Two sprays of Thiosul (1.0%) thinned to similar levels to those achieved with the single 1.5% ATS treatment.

The Thio-sul treatments produced no benefits in terms of improved fruit grade of Queen Cox in 1997; the highest yields of fruits > 65 mm were harvested from the control trees. In hindsight, thinning treatments were not warranted on these frost damaged trees in 1997.

Following the frost damage, several treatments with AVG ('Retain') were applied in an attempt to prevent, rather than increase, fruitlet abscission. These treatments increased the fruit numbers harvested/tree but reduced the mean size of the fruits. Addition of GA<sub>4+7</sub> to the 'Retain' sprays, in an attempt to alleviate the anticipated fruit size reduction by Retain, were not successful. Nevertheless, the results show that treatment with 250 ppm Retain increased total yield by approximately 30% and produced similar quantities of large diameter fruits to the hand-thinned controls.

The Retain-treated fruits had similar percentage of soluble solids and seeds/fruit as fruits from control trees but the samples had reduced average size and were firmer.

#### Influence of ATS sprays on Mondial Gala/M9

Sprays at full bloom of 1.5% but not 1.0% ATS reduced fruit set and harvested fruit numbers/tree on Mondial Gala trees; sprays of ATS at 1.0% were less successful in thinning. Two sprays (at 40% and 90% full bloom) of 1% ATS had similar effects to a single 1.5% spray. None of the ATS treatments thinned as much as hand-thinning, which produced the largest mean fruit size, the best fruit grade out but the lowest total yield/tree. In 1997, the ATS treatments produced no significant improvement in fruit size or grade out from these frost affected trees.

#### Influence of ATS sprays on Jonagold/M9

Results on Jonagold were similar to those on Mondial Gala with severe frost damage again greatly influencing the outcome of the trial. ATS at 0.5% induced no significant thinning, but 1.0% and 1.5% sprays were both effective.

#### Thinning results from elsewhere in Europe

The annual meeting of the EUFRIN Thinning Group was held in Ahrweiler, Germany in February 1998. Although many of the researchers attending had also experienced some frost damage to their trials, only in Italy was this as severe as in the UK.

Results from Poland showed that 1.5% ATS thinned Gala very effectively and increased fruit size compared with unthinned controls. The ATS effect was not, however, significantly better than that achieved with hand thinning. A combination of benzyl adenine (BA) and carbaryl gave the highest weights/tree of fruits > 70 mm in diameter. BA alone at 100 mg l<sup>-1</sup> reduced fruit set on Gala, increased fruit size but reduced total yield/tree slightly.

Tests on Jonagold in Belgium and Poland showed 0.5% ATS to be ineffective, 1.0% ATS to be ideal, but 1.5% ATS to cause phytotoxicity to spur leaves. In Polish trials the highest concentration of ATS also caused some russetting on Jonagold fruits.

Trials using Paturyl (BA) in Spain showed that the treatments increased mean fruit size of the variety Golden Delicious more than was attributable to the spray's effect in reducing crop load. ATS treatments to this variety left too many clusters with two rather than the desired single fruit.

Dutch trials showed that sprays of 2% or 3% ATS produced similar effects to hand thinning on the pear variety Conference. Good thinning results on Conference were also achieved using Pommit, a product of Polish manufacture that contains both NAA and urea. Combination treatments of 3% ATS and Pommit produced the largest increases in fruit size.