



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

HNS 164

Improving basal breaking of
field-grown roses using
ethylene releasing agents

Final Report 2010

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Further information

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Headline

- Cerone improved basal breaking and grade-out of some 'shy' breaking Hybrid Tea cultivars tested in field trials at Paul Chessum Roses. However, there was no improvement in the Floribunda cultivars tested.
- The overall quality of Cerone-treated Class 1 plants was similar to, or better than, that of the untreated controls.

Background and expected deliverables

The accepted standard for Class 1 rose bushes requires a minimum of three strong shoots (basal breaks) originating from just above the graft union. However, at present only 60% of the 12 million bushes propagated annually make this grade. Some so-called 'shy' breaking cultivars produce only one or two breaks despite repeat pruning during production to try to stimulate branching. These roses often have other very desirable attributes such as large blooms or fragrance. Improving the Class 1 grade-out of 'shy' cultivars would help to increase the profitability of the industry and reduce wastage during production.

Although Ethrel C (2-chloroethylphosphonic acid), an ethylene releasing agent, is a very powerful defoliant, work over three seasons in a previous Defra-funded project has shown that low concentration, low volume sprays have the potential to increase basal breaking in 'shy' cultivars by up to 66%, if applied at the optimum time during the production cycle. Furthermore, one spray at the critical time during development was more effective than three separate pruning treatments in triggering basal breaking in some 'shy' breaking cultivars.

To determine whether this approach would be successful in commercial rose production, field trials were carried out at Paul Chessum Roses during 2008, 2009 and 2010. An alternative ethylene releasing agent was needed for the project since at the beginning of the trial Ethrel C was due to be withdrawn from use and therefore Cerone (2-chloroethylphosphonic acid or Ethephon) was selected as a direct replacement.

The overall aim of this project was to improve product quality and Class 1 grade-out in commercial containerised rose production by increasing the number of basal breaks using an ethylene releasing agent applied once during the production cycle. In addition to improvements in product quality, it was envisaged that the project would also help to deliver the potential to reduce waste at grade-out and reduce labour costs associated with pruning and grading.

Summary of the project and main conclusions

Application of the ethylene releasing agent

'Shy' breaking rose cultivars were selected for the trial by Mr Clive Faulder (David Austin Roses, formerly of Paul Chessum Roses) and Mr Paul Chessum (Paul Chessum Roses).

Hybrid Tea cultivars

'Alec's Red', 'Just Joey', 'Renaissance' and 'Wendy Cussons'.

Floribunda cultivars

'Margaret Merrill', 'Mountbatten', 'Burgundy Ice', 'Champagne Moment' and 'Pure Abundance'.

Scions were budded on to *Rosa laxa* rootstocks in single rows at two field sites at Paul Chessum Roses, Great West at Upper Caldecote and Montilliers, Everton (Figure GS1). Experimental blocks, each consisting of seven budded rootstocks, were staked out in April 2008 and in June 2009.



Figure GS1. One of the field sites at Paul Chessum Roses used to test the effectiveness of Cerone sprays on basal breaking in 2008. Photo taken on 15 April 2008.

As it was known that Ethrel C was to be withdrawn from use, Cerone, was used as an alternative product as it has the same active ingredient. Following action by the HDC, an updated SOLA (Table GS1) was secured for the use of Cerone in ornamental plant production. (The maximum rate according to the current SOLA is 1 litre of product per hectare applied in a minimum of 125 litres of water per hectare, i.e. up to 0.8%v/v).

Two concentrations of Cerone (0.25 or 0.5% v/v, 2.5 ml or 5ml in 1000ml) solutions were prepared with a wetting agent (0.1% v/v Activator 90, 1ml in 1000ml). A water solution containing a wetting agent (0.1% v/v Activator 90, 1ml in 1000ml) served as a control treatment (0%).

Table GS1. Current approval status for Cerone (as at 25 October 2010)

Product	MAPP number	Active ingredient	Use	Crop	Approval status
Cerone	15087	480g/l 2-chloroethylphosphonic acid (Ethephon)	Plant growth control	Ornamental plant production	SOLA, extension of use number 2743 of 2010

Spray applications (0%, 0.25% and 0.5% Cerone) were applied to 'maiden' bushes at the beginning of the first growth flush ('shot' bud stage) in 2008 and to the following year's crop at the end of the first growth flush in 2009 to determine whether effects on the propensity for basal breaking depended upon the timing of the treatments (see Table GS2).

Low volume sprays of Cerone were applied to the new shoots (approximately 5 cm long) and around the bud shield on April 16 2008 and to the lower 15 cm of stem on the following year's crop on 24 June 2009 using handheld sprayers. An additional treatment was also included in 2009 where stems were cut back to 45 cm at the end of the first growth flush to mimic commercial practice carried out at Paul Chessum Roses. The number and diameter of basal breaks, stem height and the number of flower buds in response to each treatment were recorded at intervals over each growing season.

All the experimental roses were lifted in autumn 2008 and 2009 and graded by nursery staff. The number of Class 1 roses for each cultivar was counted; these plants were then pruned and placed into cold store. All bare-rooted bushes were potted into 4 L pots and moved onto holding beds the following spring. Overall plant quality for each cultivar was scored by 'grower experts' from Paul Chessum Roses at the half-growth and full-growth stages (Figure GS2) to determine whether the Cerone sprays applied in the previous year affected plant architecture, flower number or form.



Figure GS2. Experimental plants on the container nursery at Paul Chessum Roses. Overall plant quality for each cultivar and each treatment was scored by grower experts. Photo taken on 16 June 2010.

Table GS2. Rose production timescale

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Year 1		Root-stocks planted				Root-stocks budded			
Year 2	Root-stocks headed back		First flush of growth*		Second flush of growth^			Rose bushes lifted and placed into cold store	
Year 3	Grade-out and containerisation		Holding beds	Retail half growth stage	Retail full growth stage				

*Cerone treatment in 2008; ^Cerone and 'tipping back' treatments in 2009.

Effects of Cerone on shoot morphology during the maiden year

2008: Stem height was reduced significantly by the Cerone sprays to the Hybrid Tea cultivars 'Alec's Red' and 'Just Joey' at the beginning of the first growth stage but was not consistently affected in the Floribunda cultivars. Compared to the control treatment, the number of basal breaks was increased by both Cerone concentrations in 'Alec's Red' and 'Just Joey'. Cerone sprays did not improve basal breaking in the Floribunda cultivars 'Margaret Merrill' or 'Mountbatten'. (The 'tipping back' treatment practised at the nursery on commercial crops increased basal breaks in 'Just Joey' and 'Margaret Merrill'). The diameter of the basal breaks was not greatly affected by the Cerone sprays. The numbers of flower buds were reduced in most cultivars, but only by one or two buds per plant.

2009: When measured eight weeks after the application of the treatments, the number of basal breaks in Cerone-treated plants was increased by up to 50% in all cultivars except 'Renaissance' and 'Champagne Moment'. The diameter of the breaks was reduced by 1-2 mm in some Cerone-treated plants compared to the control treatment and tipping back treatments but overall, diameters averaged between 8 to 10 mm. In these trials, the Cerone sprays did not trigger the production of weak shoots as has been found previously with other ethylene releasing agents.

Effects of Cerone on percentage grade-out

2009: The final grade-out of plants lifted in 2008 was carried out on 16 March 2009. The percentage grade-out was improved from 60% in the untreated control to over 90% in 'Alec's

Red' sprayed with 0.5% Cerone spray. Grade-out was not affected by Cerone sprays in 'Margaret Merril' and 'Mountbatten'. The grade-out of 'Just Joey' could not be determined since some experimental bushes were lifted with the commercial crop and the labels removed. However, earlier measurements of basal breaks and shoot diameters indicated that the Cerone treatment would also have increased grade-out of this 'shy' cultivar.

2010: Percentage grade-out from plants lifted in 2009 was increased from 40% to 75% in 'Alec's Red' and from 48% to 80% in 'Wendy Cussons' by the 0.5% and the 0.25% Cerone sprays, respectively (Figure GS3); percentage grade-out of 'Renaissance' and the three Floribunda cultivars was not improved by the Cerone sprays. In the Class 1 plants, the mean number of basal breaks was significantly improved by both Cerone sprays in 'Wendy Cussons', compared to the untreated control and plants that were 'cut back'. Effects of Cerone on basal breaking in the Floribunda cultivars were not statistically significant.

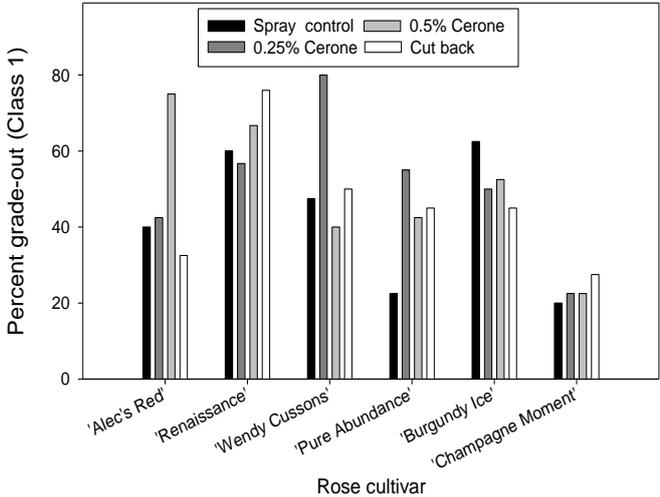


Figure GS3. Effect of Cerone sprays on grade-out of Hybrid Tea and Floribunda roses measured in February 2010 by nursery staff.

Effects of Cerone on plant quality at the half- and full-growth stages

In 2009, the 'expert grower' scores awarded at the half and full-growth stages were generally similar, irrespective of treatment. The exception was 'Margaret Merril' at the half-growth stage when the experts awarded higher scores to plants from the untreated control; at the full-growth stage, plants from all treatments were given similar scores. In 2010, no treatment differences in overall quality were detected at the half-growth stage. At the full-growth stage, the experts preferred the Cerone-treated (Figure GS4) and the cut back 'Burgundy Ice' (these plants were shorter and more compact). Quality



Figure GS4. Cerone-treated (0.5%) 'Burgundy Ice' at full-growth stage. Photo taken on 16 June 2010.

scores given to the other cultivars were similar, irrespective of treatment.

These data suggest that the overall quality of the Class 1 bushes was not adversely affected by Cerone sprays applied during the maiden year. In other words, there were no residual treatment effects on bud number or quality of the flowers.

Financial benefits

Improving basal breaking in 'shy' cultivars using Cerone has the potential to improve plant quality and grade-out in many Hybrid Tea roses, and reduce waste during production. Using a low volume, low concentration Cerone spray is likely to be very cost effective. Over 1,000,000 plants could be treated with just one 5 L container of Cerone costing £108.30, this equates to a chemical cost of 0.01 p per plant. Costs of application would vary depending on the grower's usual practice but increasing the grade-out of some cultivars by 30-35% would result in similar increases in wholesale value.

Action points for growers

- A low volume, targeted spray of Cerone at the SOLA rate of 1 litre per hectare in a minimum water volume of 125 litres plus wetting agent, applied at the 'shot' bud stage or at the end of the first growth flush could improve basal breaking and percentage grade-out in certain 'shy' Hybrid Tea cultivars (Table GS3).
- 'Tipping back' will help to improve the number of basal breaks produced, and therefore, the grade-out of some 'shy' breaking rose cultivars.

Table GS3. Summary of the effects of Cerone on grade-out in the rose cultivars examined

Cultivar	Class 1 grade-out improved	
	0.25%	0.5%
	Cerone	Cerone
'Alec's Red' [*]	No	Yes
'Just Joey' [*]	NA	NA
'Wendy Cussons' [*]	Yes	No
'Renaissance' [*]	No	No
'Margaret Merril' ^{**}	No	No
'Mountbatten' ^{**}	No	No
'Champagne Moment' ^{**}	No	No
'Burgundy Ice' ^{***}	No	No
'Pure Abundance' ^{***}	No	No

^{*}Hybrid Tea cultivars

^{**}Floribunda cultivars

NA = not assessed, although earlier measurements of basal breaks and shoot diameters indicated that Cerone treatment would also have improved grade-out.

Glossary

Blow out – breaking of the scion shoot from the bud union, caused by high winds in the maiden year.

Cutting back – removing mature stems in the first and second growth stages to stimulate basal breaking and reduce 'blow out'

Ethylene releasing agent (ERA) – a chemical that when sprayed on to plants, readily enters plant tissues and breaks down to form the natural gaseous plant hormone ethylene. Endogenous ethylene production is stimulated further by ERAs.

Tipping back – pruning the first flush of shoot growth from the scion bud to stimulate basal breaking and reduce 'blow out'