FINAL REPORT

Investigation into the use of Ethrel C and its impact on basal branching on a range of nursery stock species

HNS 154

February 2008

Project Title	Investigation into the use of Ethrel C and its impact on basal branching on a range of nursery stock species
Project number:	HNS 154
Project leader:	Mark Huey (replaced by Cathryn Lambourne in June 2007)
Report:	Final report, February 2008
Previous report	None
Key staff:	Mark Huey Stacy Lambourne Cathryn Lambourne Deborah Liddell Iwona Burdon
Location of project:	Stockbridge Technology Centre Ltd. North Yorkshire
Project coordinator:	John Richards
Date project commenced:	March 2007
Date completion due:	November 2007
Key words:	plant growth regulators, PGRs, basal branching, nursery stock, Ethrel C, Gibberellic Acid, spray, drench, phytotoxicity.

The results and conclusions in this report are based on a series of experiments conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Report authorised by:

Cathryn Lambourne
Project Manager
Stockbridge Technology Centre Ltd

Signature ..... Date .....

Dr G M McPherson
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Signature ..... Date .....

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Grower Summary

Headline

- Neither Ethrel C nor Gibberellic Acid provided consistently beneficial results in providing improved basal branching of HONS species.

Background and expected deliverables

Liner producers face a regular challenge to maintain and improve the quality of their products. The 'quality' can be determined by attributes such as leaf colour, plant vigour, root production, compactness and ability to develop into a well-branched final product. This final attribute is heavily influenced by the degree of basal branching that is generated during the growth of the liner.

Basal branching has always been poorer in certain HONS species such as *Photinia, Cornus* and some *Berberis* spp. As a large amount of labour intensive hand pruning is required to produce a high quality product, this can raise the overall production costs considerably.

The use of growth regulators or PGRs offers a potential alternative solution to create a more compact plants through increased branching thereby reducing the labour required. input to HONS species is via the use of growth regulators or PGRs. Previous work carried out on rose scions treated with Ethrel C (2-chloroethylphosphonic acid) showed some promising effects, increasing branching by up to 60% in some cultivars. Further work carried out in the US on HONS species has also indicated that growth regulators may be of some benefit to the UK industry. The choice of suitable products is rather limited in the UK at the present and work is required to try and identify any beneficial effects from products already available to on the UK market. There is also a need to investigate, as well as carrying out investigations on products not currently available, but which may potentially gain approval for use in the near future.

The aim of this project current project therefore was to evaluate the effectiveness of commercially available growth regulators (Ethrel C and Gibberellic Acid) on a broad range of HONS species to see if basal branching could be enhanced relative to untreated (control) plants.

Summary of the project and main conclusions

A range of HONS species (Table 1), which often require or benefite from pruning during production, were chosen for this study. Single applications of either Ethrel C (as a drench or spray) or Gibberellic Acid (as a spray only) were used at a range of application rates. Separate batches of plants were left untreated to act as a 'control' treatment.

Table 1. List of HONS species chosen for the trial

Species	**Species**
Berberis ottawensis 'Purpurea'	*Griselinia littoralis* GA
Camellia Donation	*Lavatera* 'Barnsley' GA
Chamaecyparis '*Ellwoodii'*	*Rosa sp.* (Patio type) 'Sweet Memories'
Choisya ternata	*Photinia* 'Red Robin'
Clematis 'Perle D'Azur'	*Pieris 'Forest Flame'*
Cosmos	*Pittosporum* 'Arundel Green' GA
Erica carnea 'Myretoun Ruby'	*Viburnum tinus* 'French White'
Euphorbia characias	

GA – plants treated with Gibberellic Acid only

The majority of the plants were bought-in as plugs and were potted-on into 9cm pots. The Clematis plants arrived as bare-rooted cuttings and were potted-on into 3 litre pots using suitable compost mixes + CRF for each crop type.

The selected growth regulators were applied to the crops 3-5 weeks following potting-on. Ethrel C was applied at 50%, 25% and 10% of the label rose rate (10L product/1000L water). Gibberellic acid was applied at 100% and 50% of the rate recommended for rhubarb (10 tablets/100L water). A volume of 50ml/plant was applied for the drench applications. Spray applications were made using a Hoselock hand pumped sprayer. Plants were sprayed to run-off.

Observations and assessments were carried out during the trial period to monitor any effects on branching, root development, plant height and overall crop safety. Unfortunately, very little in the way of consistent beneficial effects on these factors was observed with either product over the trial period on any of these factors.

On several of the crops (*Chamaecyparis*, *Choisya*, *Rosa* (Patio), *Berberis, Camellia*, *Clematis* and *Viburnum*), a large number of plants which had received the drench application of Ethrel C appeared to suffer a severe phytotoxic response which resulted in plant death. The effect correlated well with the applied dose rate. However, it is not certain whether the rates chosen for this type of application were entirely appropriate or whether perhaps they should have been reduced compared to the spray application. Alternatively, it is possible that other factors contributed to plant loss including high glasshouse temperatures or host-

specific root pathogens, which may have attacked the plants subsequent to the product application and this may have caused a more severe response. Laboratory checks for the more common root pathogens (e.g. *Phytophthora* spp.) were negative.

From the initial results obtained in this one year study, it is clear that further work on plant growth regulators, including as yet unlicensed products, is required for the industry to confidently rely on their use to aid production of high quality HONS species, and to minimise labour costs.

Financial benefits

- There were no financial benefits arising from this work.

Action points for growers

- Where growth regulators have been used successfully in HONS species and benefits in terms of basal branching have been observed, growers should advise the project team and/or the HDC Technical Manager.

- Until further information can be gathered, growers should avoid spray and drench treatments with Ethrel C as there were strong indications of potential phytotoxicity following the use of Ethrel C (albeit as a drench application), as the product is known to be very volatile. Growers are advised to test treat a small number of plants prior to whole-scale use on HONS species not previously treated.

- From a crop safety perspective the gaseous nature of Ethrel C should also be noted if applying this product under protection.

- Keep abreast of any future developments, including novel PGRs that may become available in the future, and encourage on-going evaluation in HONS.

Science Section

Introduction

Liner producers face a continual challenge to maintain, and improve, the quality of the plants they produce. The quality is determined by a number of attributes such as; leaf colour, plant shape including compactness, and the plant's ability to develop into a well-branched final product. This final attribute is heavily influenced by the amount of basal branching that is generated during early growth of the liner. Yet basal branching has always been poorer with certain HONS species such as *Photinia, Cornus* and some *Berberis* spp., and a significant amount of labour intensive hand-trimming is required to produce a high quality product. This can raise the overall costs of production considerably, thereby eroding profit margins.

The use of growth regulators may provide a potential solution to this problem, by increasing basal branching to create more compact plants prior to sale. Work carried out on roses (HDC 101) showed that applying Ethrel C (2-chlorethylphosphonic acid) to the basal scion sections of roses increased branching by up to 60% in some cultivars. Promising results were also seen following intensive work in the USA using a much larger range of growth regulator products than are currently available in the UK. This initial study focused on PGRs already available for use in the UK e.g. Ethrel C, Gibberellic Acid, to investigate potential benefits for the production of liner nursery stock species.

Materials and Methods

Table 1. The range of nursery stock species chosen for the work.

Species	Species
Berberis ottawensis 'Purpurea'	*Griselinia littoralis* GA
Camellia 'Donation'	*Lavatera* 'Barnsley' GA
Chamaecyparis '*Ellwoodii'*	*Rosa sp.* (Patio type) 'Sweet Memories'
Choisya ternata	*Photinia* 'Red Robin'
Clematis 'Perle D'Azur'	*Pieris* 'Forest Flame
Cosmos	*Pittosporum* ' Arundel Green' GA
Erica carnea 'Myretoun Ruby'	*Viburnum tinus* 'French White'
Euphorbia characias	

GA – plants treated with Gibberellic Acid only

The range of HONS species used and the decisions regarding which of the two PGR products to apply to which plants in this trial were chosen after consultation with a number of growers. The species chosen for the trial had specific growth habits that made them good candidates for PGR treatments. The majority of the plants were bought-in as plugs and potted-on into 9cm pots using composts appropriate to the species. The Clematis were

bought as bare rooted cuttings and potted-on into 3 litre pots. Potting-mixes suitable for the crop types were used throughout.

Treatments

For the initial study commercially available PGRs were evaluated alongside an untreated control at different rates of application either as a HV spray or drench application to a range of HONS species. The various treatments are presented in Table 2 below.

Table 2. Details of the treatments applied to the HONS species chosen for the study

Plant species	Untreated	Ethrel C						Gibberellic Acid		
		HV Spray			Drench			HV Spray		Drench
		10%	25%	50%	10%	25%	50%	50%	100%	
Berberis ottawensis 'Purpurea'	✓	✓	✓	✓	✓	✓	✓	X	X	-
Camellia 'Donation'	✓	✓	✓	✓	✓	✓	✓	X	X	-
Chamaecyparis '*Ellwoodii'*	✓	✓	✓	✓	✓	✓	✓	X	X	-
Choisya ternata	✓	✓	✓	✓	✓	✓	✓	X	X	-
Clematis 'Perle D'Azur'	✓	✓	✓	✓	✓	✓	✓	X	X	-
Cosmos	✓	✓	✓	✓	✓	✓	✓	X	X	-
Erica carnea 'Myretoun Ruby'	✓	✓	✓	✓	✓	✓	✓	X	X	-
Euphorbia characias	✓	✓	✓	✓	✓	✓	✓	X	X	-
Griselinia littoralis	✓	X	X	X	X	X	X	✓	✓	-
Lavatera 'Barnsley'	✓	X	X	X	X	X	X	✓	✓	-
Rosa sp. (Patio type) 'Sweet Memories'	✓	✓	✓	✓	✓	✓	✓	X	X	-
Photinia 'Red Robin'	✓	✓	✓	✓	✓	✓	✓	X	X	-
Pieris 'Forest Flame	✓	✓	✓	✓	✓	✓	✓	X	X	-
Pittosporum ' Arundel Green'	✓	X	X	X	X	X	X	✓	✓	-
Viburnum tinus 'French White'	✓	✓	✓	✓	✓	✓	✓	X	X	-

The Ethrel C treatments were applied to batches of 27 plants at 3 rates: 50%, 25% and 10% of the product label rate (for roses) 10 ml product/1 litre water. They were applied either as drenches (50ml/pot) or as foliar sprays to run-off. An equivalent batch of plants remained untreated to act as a 'control' for comparison purposes.

A Gibberellic acid treatment was also applied to 3 HONS species (as indicated in Table 2) as a foliar spray at a 1N and 0.5N rate based on the product label rate (for rhubarb) of 1 tablet/10 litres water.

Foliar spray treatments were applied to run-off with a Hozelock hand-pumped sprayer.

As the various plant species did not all arrive at the same time the 1st batch of plants (*Viburnum, Camellia, Rosa sp., Clematis, Photinia, Choisya, Berberis* and *Pieris*) received the Ethrel C application (spray or drench) in advance of the remaining species (*Erica*, *Cosmos*, *Chamaecyparis* and *Euphorbia*). The Gibberellic acid treatments were also applied to the *Lavatera, Griselinia* and *Pittosporum* plants at this later date.

Crop Diary

23.3.07	HONS species potted: Viburnum, Camellia, Pittosporum, Patio Rose, Clematis, Photinia, Choisya, Berberis, Griselinia, Lavatera, Pieris.
13.4.07	Ethrel C sprays and drench treatments applied to Viburnum, Camellia, Patio Rose, Clematis, Photinia, Choisya, Berberis and Pieris.
11.5.07	*Chamaecyparis* potted-up.
31.5.07	Cosmos and Euphorbia potted-up.
20.6.07	Photinia, Choisya, Pieris, Viburnum and Patio Rose species assessed.
4.7.07	Application of Subdue to *Chamaecyparis*, Choisya and Viburnum species
10.7.07	Application of Ethrel C spray and drench treatments to *Chamaecyparis*, Erica, Cosmos and Euphorbia. Gibberellic acid application to Griselinia, Lavatera and Pittosporum.
19.7.07	Assessed Camellia plants
24.7.07	Grower visit to assess plant quality for an independent commercial perspective.
10.8.07	Visual assessment of plants
10.9.07	Full assessment of all species.

Agronomic Assessments

The various species were assessed by measuring plant height, counting the number of branches (where possible) and assessing the quantity of roots present using the following scale:

0 – No roots
1 – Few roots visible
2 – Roots visible around perimeter of pot base
3 – Some roots growing up sides of pot, but no firm root ball
4 – More extensive roots but root ball not fully held together
5 – Good root system, root ball held together.

A record of any plants which had died (potentially as a result of phytotoxicity to the treatments) was also made.

The trial was also visited by a commercial HONS grower to independently assess the quality of the various plants from a commercial view point.

Results and Discussion

Following potting-on the various species established well and were judged to be suitable for PGR treatment to compare their potential for increased basal branching.

Following application of the PGRs it became evident that some of the plants were not progressing well, especially where drench applications of Ethrel C had been applied.

A visit from a commercial HONS grower on the 24th July 2007 was very useful. He was able to provide a commercial perspective on the quality of the plants. His comments are summarised in tables 3 and 4 overleaf.

Ethrel C

A full assessment of all the crops was carried out on the 4th September. The results have been presented as bar charts on pages 12-14.

Basal Branching (charts 1-7)

In the selected crops where it was possible to count the basal branching the results were quite variable across the crops. In many crops e.g. *Berberis, Choisya, Viburnum* and *Pieris* no positive measurable effect was seen on the number of branches formed following the application of Ethrel C, relative to the untreated control plants. Indeed, on average, more branches were recorded in the untreated plants. In the *Photinia* and *Camellia* crops a slight increase in branching was observed on the treated plants particularly with the highest rate drench application. The *Photinia* plants only branched slightly more than the untreated plants at the two lower rates of the drench application, and otherwise showed reduced branching.

In some crops it proved impossible to count and record basal branching for a variety of reasons associated with the plants natural growth habit. The crops of *Erica, Cosmos*, *Clematis* and *Chamaecyparis* do not produce branches in the true sense, whilst the small *Rosa* (Patio) crop produced so many branches and shoots that it was impossible to count them and only as such an overall impression of the plant's 'bushiness' could be formed.

Overall the results proved to be inconsistent with no clear patterns being seen across the range of crops. The spray and drench at the highest rate (50%) proved to be detrimental in

many cases, not only reducing branching, but also proving to be highly phytotoxic (see Phytotoxicity section).

No obvious differences in the number of 'branches' was observed in the remaining crops.

Plant Height (charts 8-18)

Overall, there was little in the way of significant changes to the height of plants following spray application of Ethrel C at the various rates of application. Drench treatments on several species e.g. *Choisya, Berberis, Camellia*, *Chamaecyparis*, *Viburnum* and *Euphorbia* had a significant detrimental effect on plant height and reduced it by >50% in many cases. Unfortunately the reduction in height did not appear to be associated with an increase in basal branching.

Figure 1. Comparison of treated and untreated Euphorbia plants

Table 3. Commercial evaluation of PGR (Ethrel C) treated HONS plants – Grower comments - 24th July 2007

Crop	Branching effects	Plant Heights	Rooting	Phytotoxicity
Clematis	No obvious additional branching seen cf control	All treatments reducing plant heights	not able to assess (insufficient root in all treatments including control to turn pots out)	Many plants dead in drench treatments. Less severe effects from sprays, but all poorer than control plants
Cosmos	No obvious additional branching seen cf control	Plant heights reduced in higher rate spray and drench applications	not assessed	Narrow strap like leaves at highest drench and spray rate. Also slower to flower.
Chamaecyparis	No branching seen in any plants incl. control	no differences	poor throughout, but reduced by treatments.	Many plants dead at 50 and 25% spray and drench
Choisya ternata	No obvious additional branching seen cf control	Plant heights reduced in higher rate spray and drench applications	Big impact on rooting with all treatments. Reduction and damage to roots seen.	Many plants dead at higher rate drench treatments. All treated plants poorer visually than controls
Erica	No differences seen	No differences seen	No differences seen	None
Euphorbia	No obvious additional branching seen cf control	Plant heights reduced at higher drench and spray treatments	Big impact on rooting with all treatments. Reduction and damage to roots seen.	None obvious, except plant height and root damage
Pieris	Slightly more branching in 50 and 25% drench	Slightly shorter with treatments, not significant	Rooting poorer in all treatments cf control	None obvious, except plant height and root damage
Patio Rose	Some response to treatments, slightly more at 50% spray	Similar throughout	Some slight reduction in roots with all treatments	Many plants dead at higher rate drench treatments.
Viburnum	No obvious additional branching seen cf control, short internodes at 50 and 25% spray	Plant heights reduced at higher drench and spray treatments	Reduced rooting throughout treatments	Many plants dead at higher rate sprays and drench treatments.
Berberis	No obvious additional branching seen cf control	Similar throughout	Some damage and reduction to roots at higher drench rates	Many plants dead at higher rate drench treatments.
Photinia	Possibly slightly more branching at 50% spray rate, less effects at lower rates, no effect with drenches. Plants good overall, may be worth pursuing.	Similar throughout	No effects, similar to control	Some slight distortion, but not too bad.
Camellia donation	Very variable, no consistent response	Reduced by highest rates of drench and spray	Roots affected at highest rates of drench and spray	Heights and roots affected, no scorch or plant death.

Charts 1-7 Effects of Ethrel C applied as either a foliar spray or a drench application on basal branching in HONS species.

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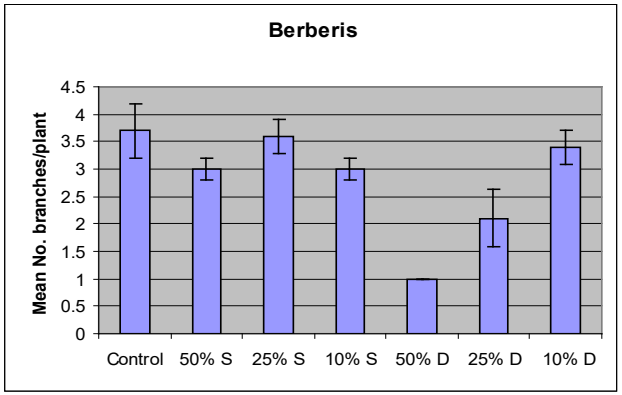

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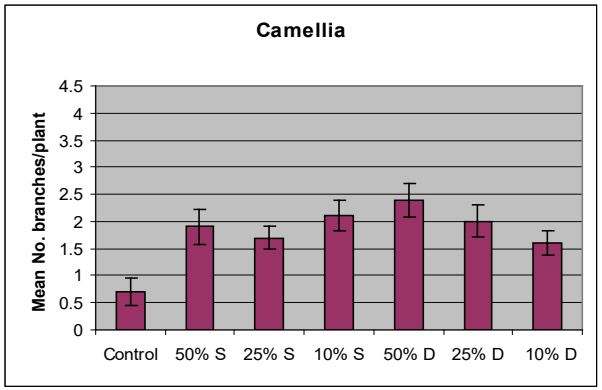

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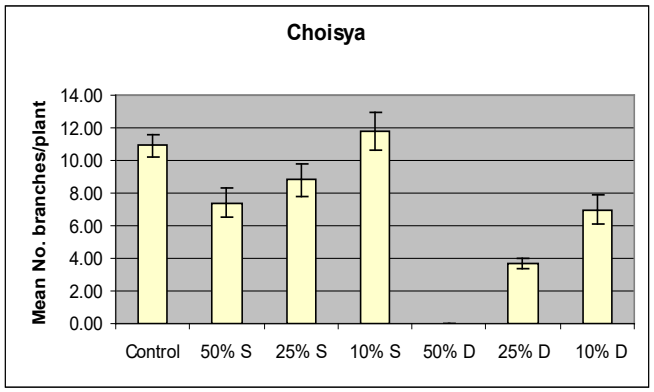

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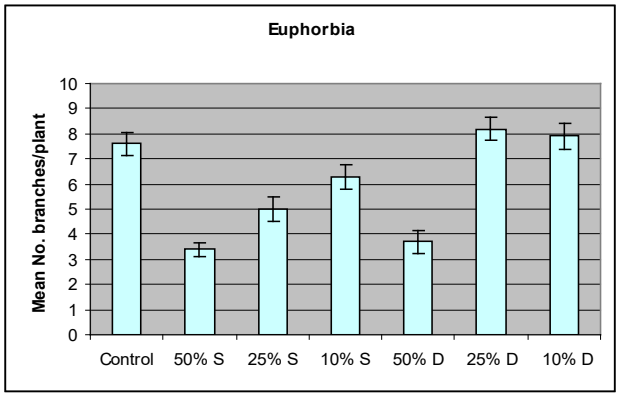

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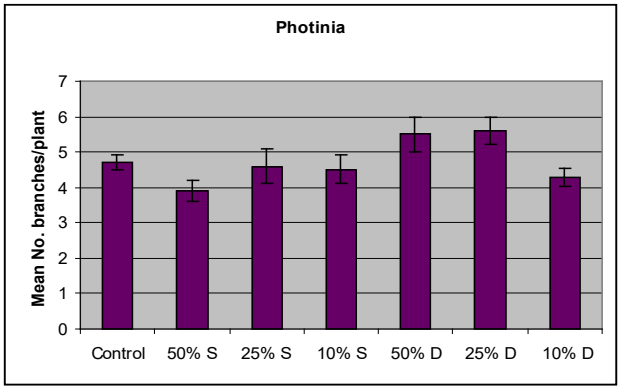

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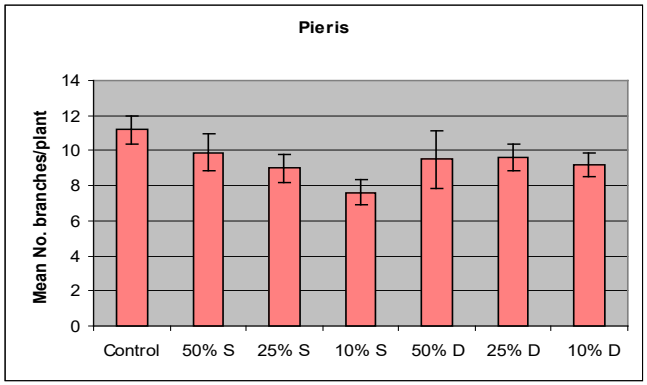

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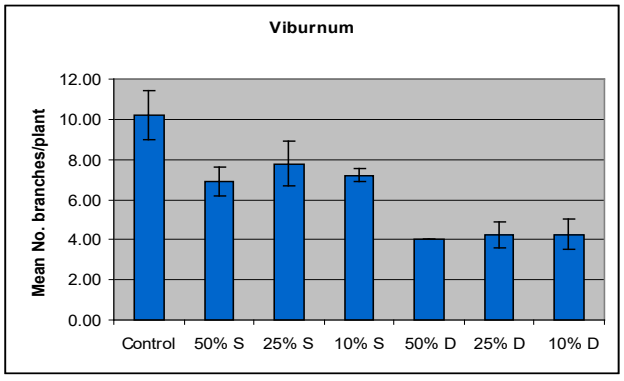
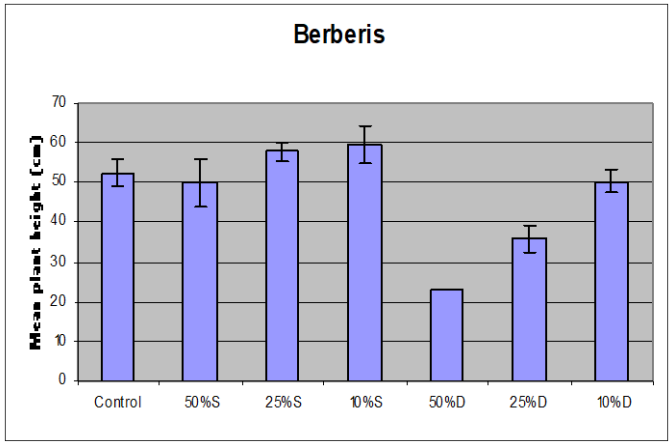


'Empty' bars in charts signify that all plants had died.

It was not possible to count the branching on the Patio Rose, Cosmos, Erica, Clematis and *Chamaecyparis* crops.

Charts 8-13: Effects of Ethrel C applied as either a foliar spray or a drench application on plant height in HONS species.



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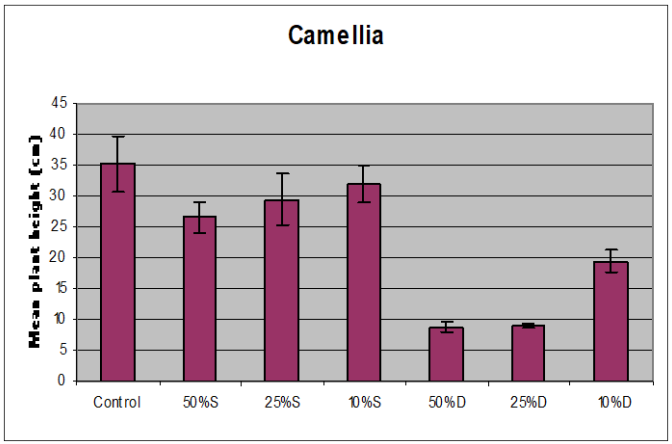

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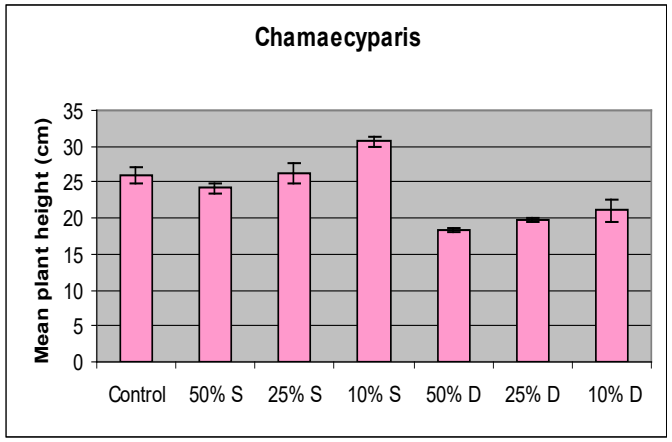

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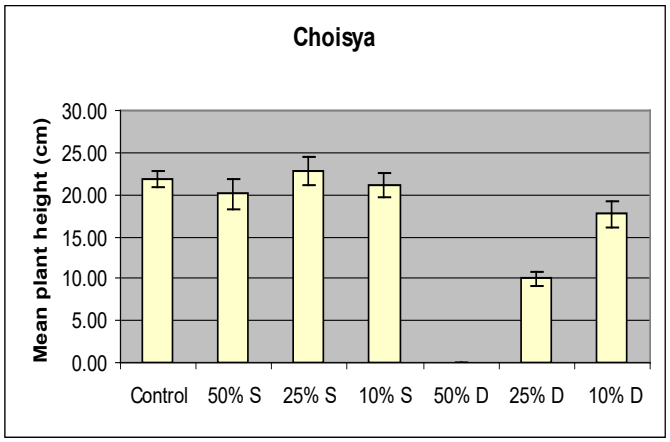

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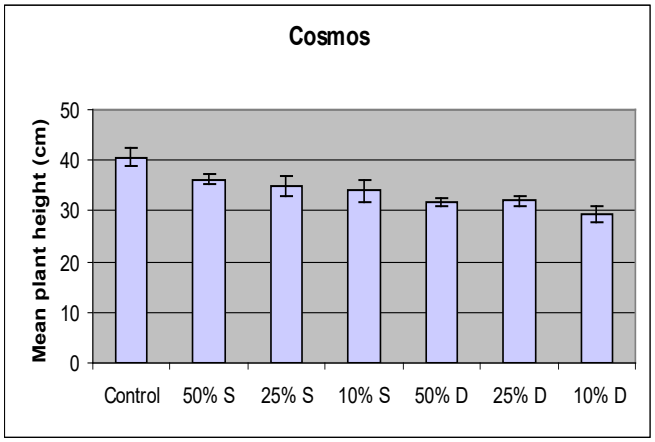

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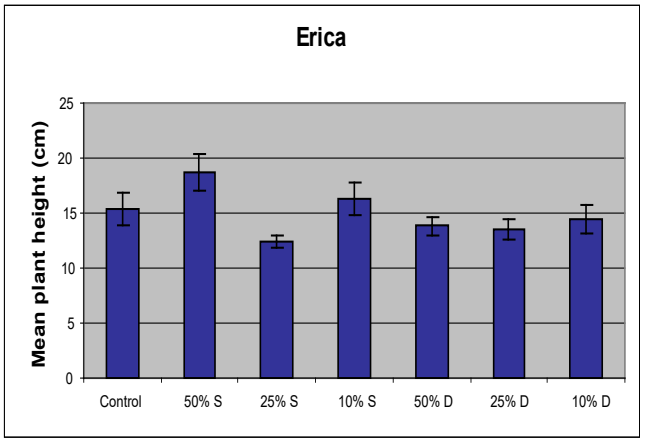

‘Empty’ bars in charts signify that all plants had died.

It was not possible to record the plant height on the Clematis crop.

Charts 14-18 (cont'd) Effects of Ethrel C as either a foliar spray or a drench application on plant height in HONS species

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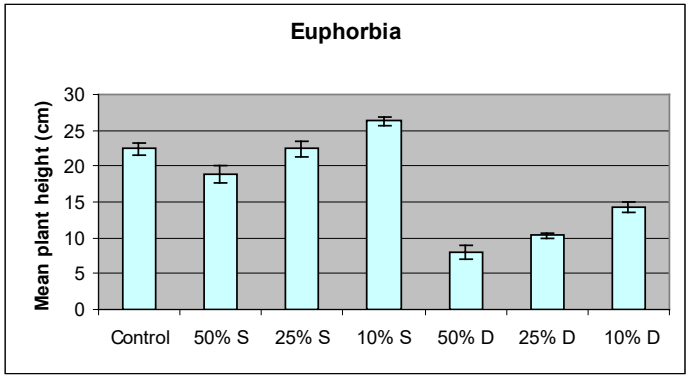

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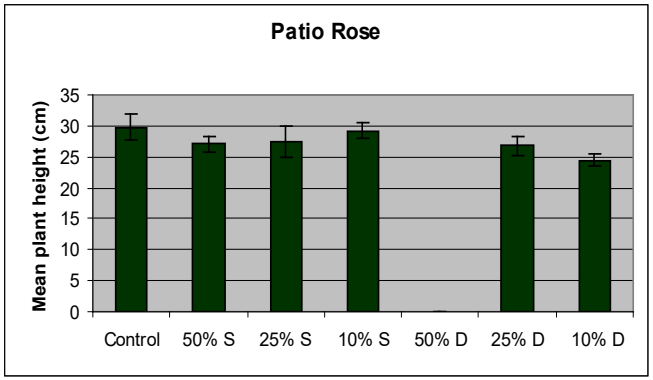

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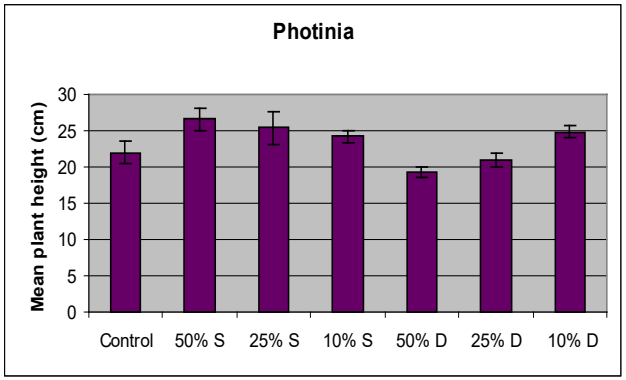

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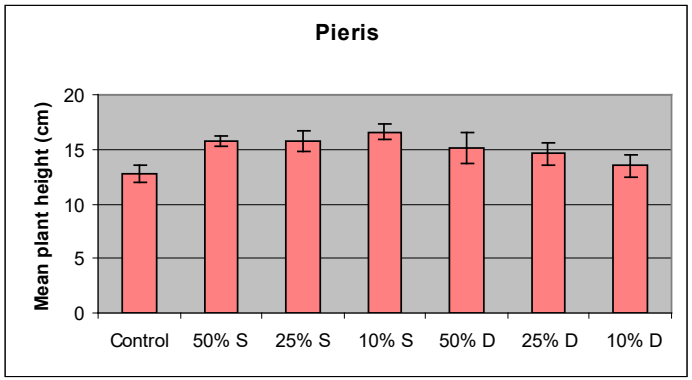

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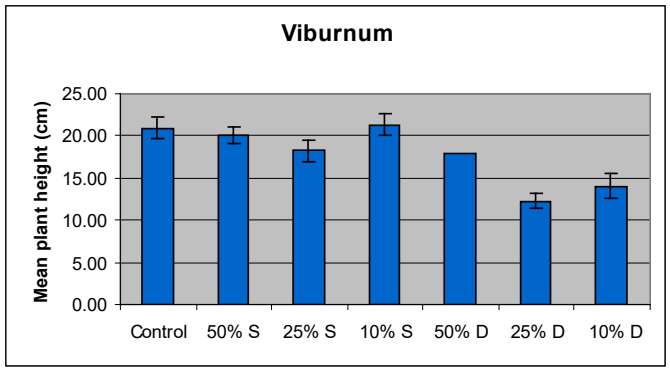
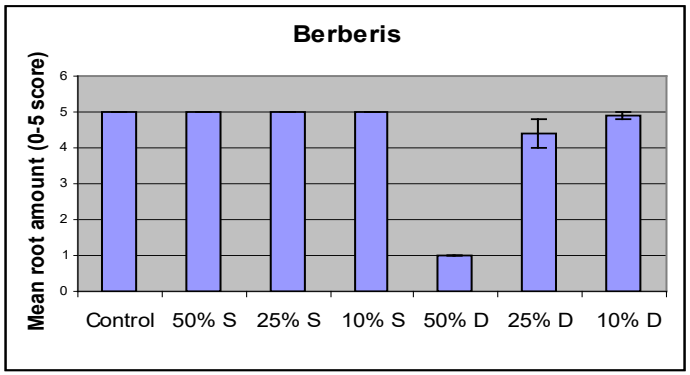


'Empty' bars in charts signify that all plants had died.

It was not possible to record the plant height on the Clematis crop.

Charts 19-23 Effects of Ethrel C applied as either a foliar spray or a drench application on root development



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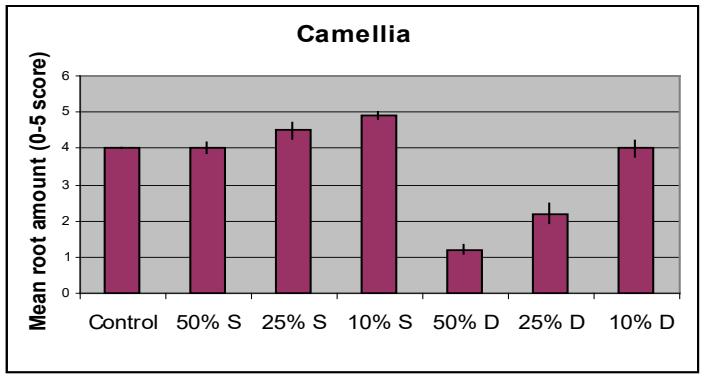

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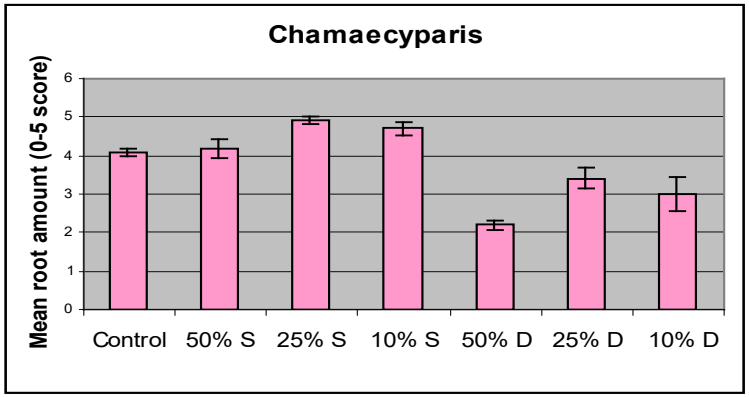
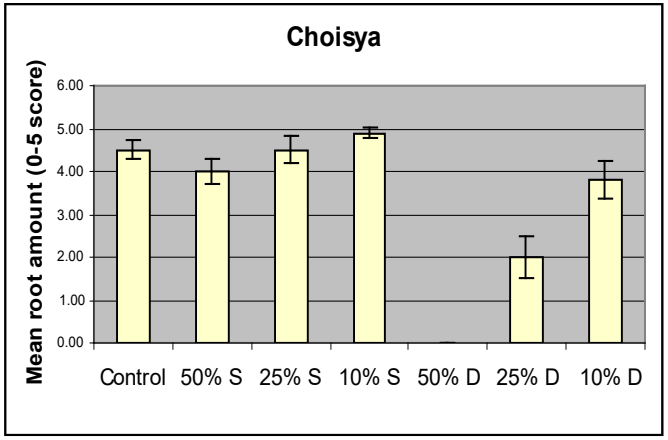


21

'Empty' bars in charts indicate all plants dead.

It was not possible to assess the roots on the Cosmos and Clematis crops.



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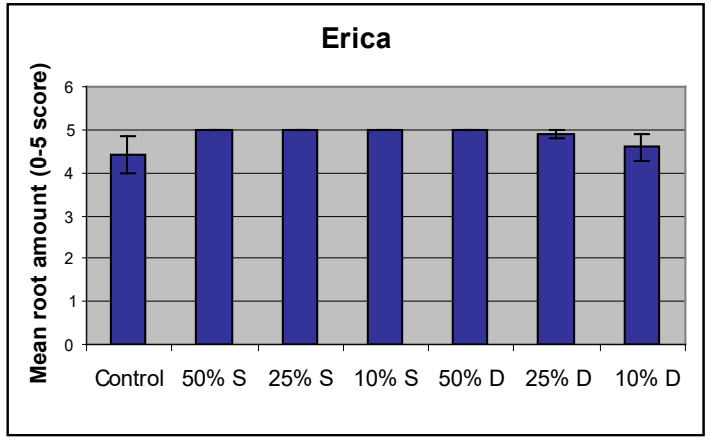
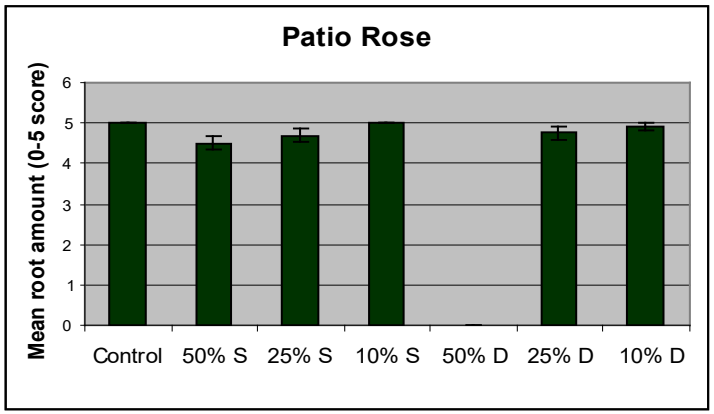


23

Charts 24-28 (cont'd) Effects of Ethrel C applied as either a foliar spray or a drench application on root development



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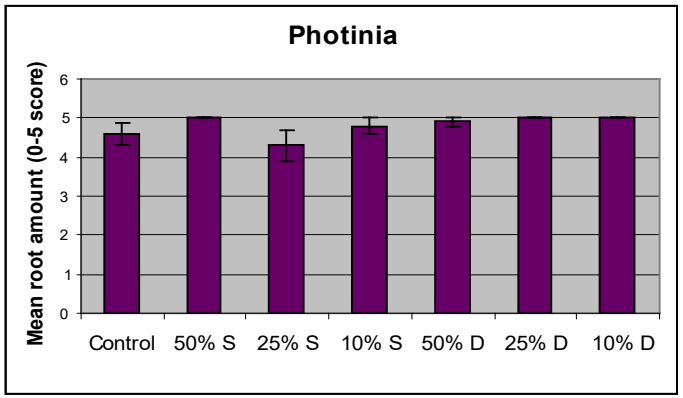

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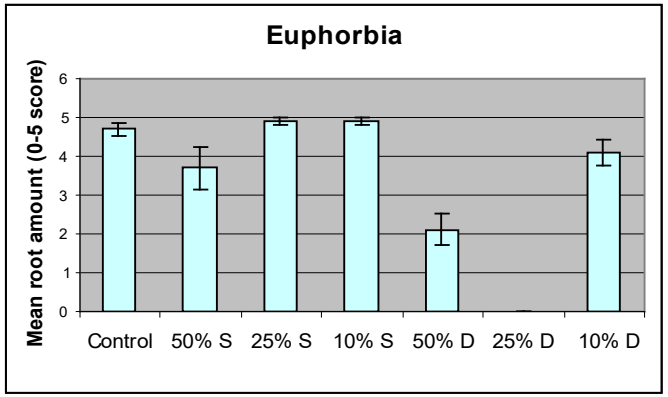

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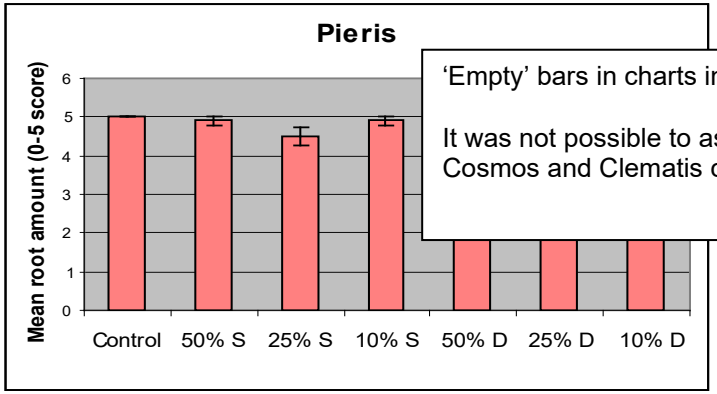
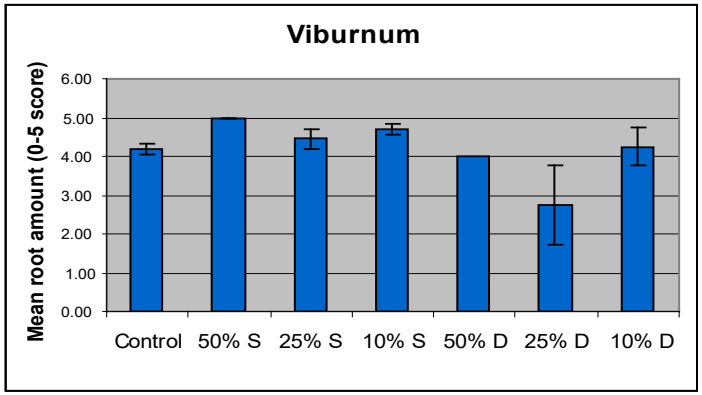


27

'Empty' bars in charts indicate all plants dead.

It was not possible to assess the roots on the Cosmos and Clematis crops.



28

Root Development (charts 19-28)

The roots were assessed using the 0-5 scale detailed in the Materials and Methods section. This provided a visual quantitative assessment of root development, but did not determine root quality as such. In the majority of the crops the amount of root was unaffected by the spray application of Ethrel C. However, the drench treatments had a large impact on the root development in *Berberis, Camellia, Chamaecyparis, Choisya, Euphorbia, Rosa, Pieris* and *Viburnum* and, in the absence of other causes, appeared to be responsible for the death of many plants (see Phytotoxicity section).

Phytotoxicity

Approximately 5 weeks following the application of Ethrel C many of the crops showed evidence of a severe phytotoxicity effect ultimately leading to root and plant death. The most seriously affected plants were seen on those plants which had received the drench application suggesting that the product caused a deleterious effect on root tissues. Crops which were most severely affected were; *Choisya, Viburnum, Rosa (*Patio type*), Clematis* and *Berberis*. The total mortality of the crops following treatment with Ethrel C is presented in Chart 29 (the data is presented as the percentage of plants dead from the total number of plant/treatment).

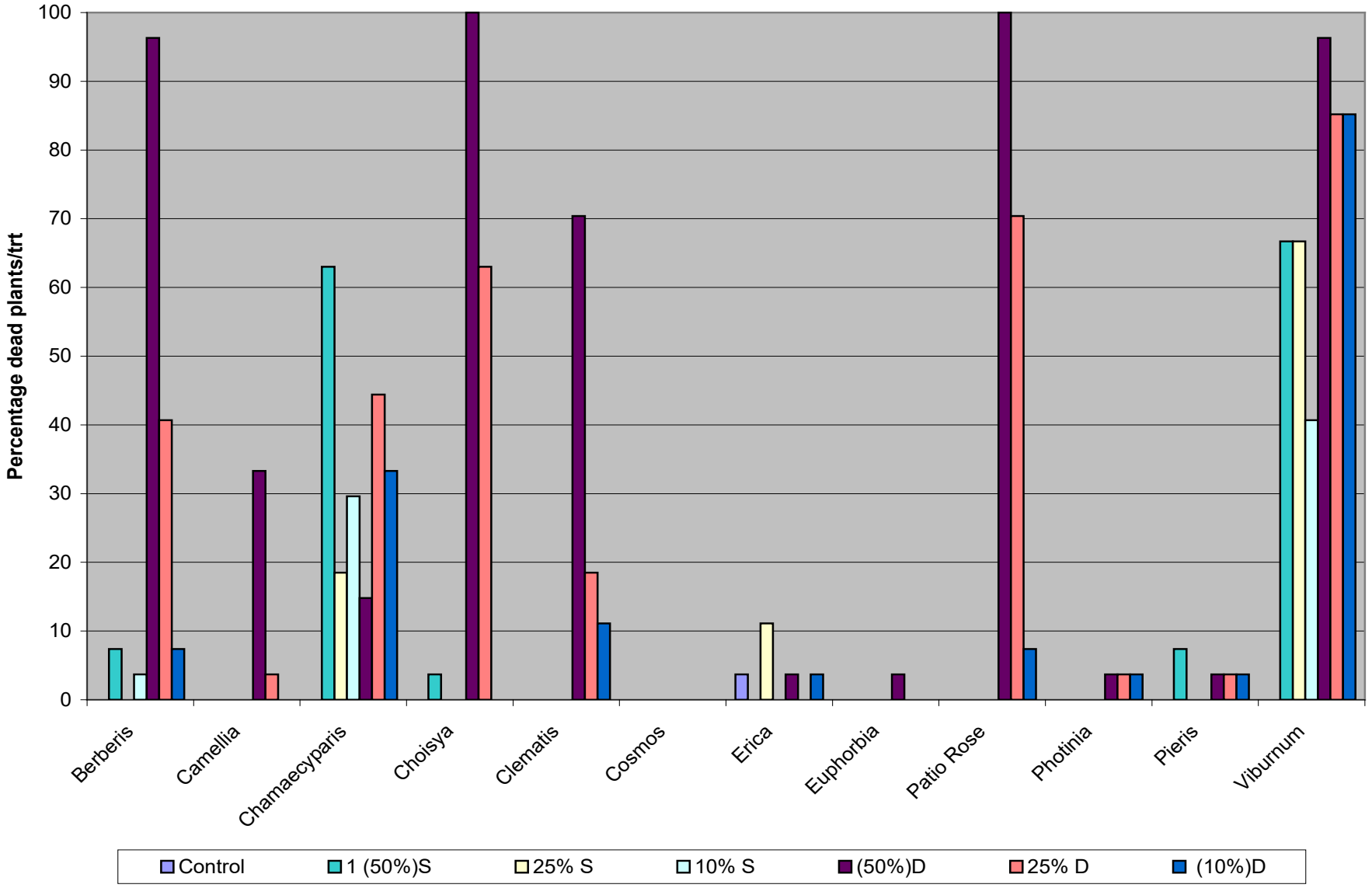
Figure 2. Symptoms of phytotoxicity on Choisya following application of the 50% rate drench of Ethrel C

High numbers of *Chamaecyparis* and *Viburnum* plants died following spray and drench applications. However it was possible that a number of these had succumbed to a root infection e.g. *Phytophthora* spp. though laboratory tests were unable to confirm this. As no untreated plants died it has been assumed that the primary cause of plant death was phytotoxicity from the Ethrel C treatment itself, though we cannot entirely rule out the possibility of a secondary infection with specific root pathogens.

A significant reduction in plant height was observed in several crops e.g. *Chamaecyparis*, *Camellia, Berberis, Choisya* and *Euphorbia* which had received drench applications. As a corresponding height reduction was not observed in the plants receiving spray applications at the same product rate, the effect was deemed to be a phytotoxic response rather than a product effect.

Finally some reduction in flowering was observed following application of Ethrel C at the highest rate (spray and drench) in species such as *Clematis* and *Cosmos* although no quantitative measurement of this effect was recorded. Information from the grower co-ordinators involved in the project support the project findings regarding phytotoxicity effects observed following the use of Ethrel C, and also suggest that the product is very volatile following application and has been observed to cause phytotoxicity effects on neighbouring plants.

Chart 29. Percentage mortality of plants in a range of HONS species during the trial period



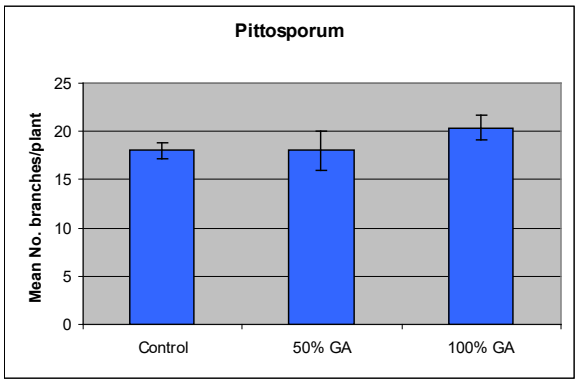
Gibberellic Acid

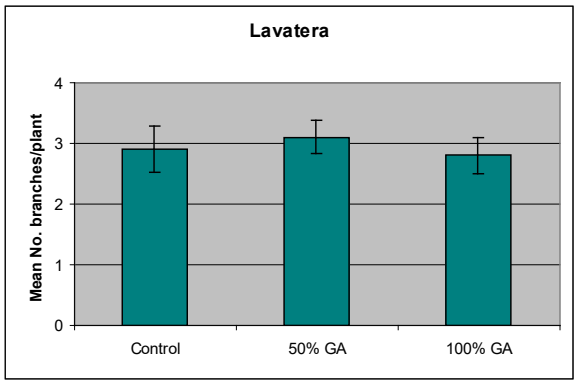
Gibberellic acid was applied to only 3 crop types in this trial, *Pittosporum, Griselinia* and *Lavatera.*

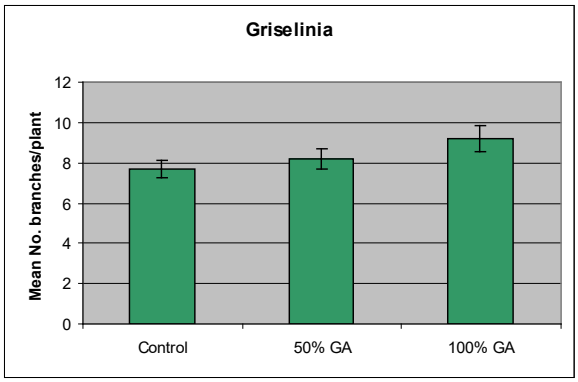
As with the Ethrel C treated plants, the plants treated with GA were inspected by a commercial grower on the 24th July 2007. His comments are shown in Table 4 overleaf.

A full assessment of the treated crops relative to equivalent untreated plants was carried out on the 4th September 2007.

Basal Branching







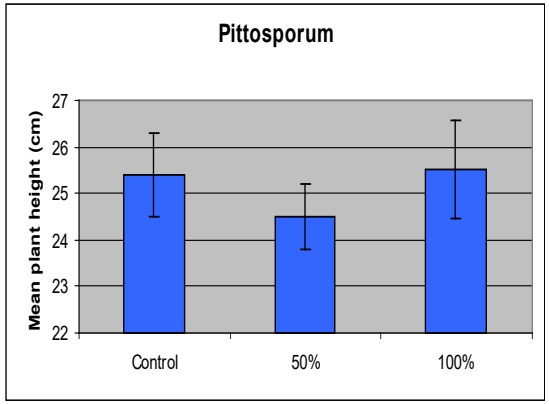
None of the crops which were treated with the spray application of Gibberellic acid showed any significant increase in basal branching compared to the control (untreated plants).

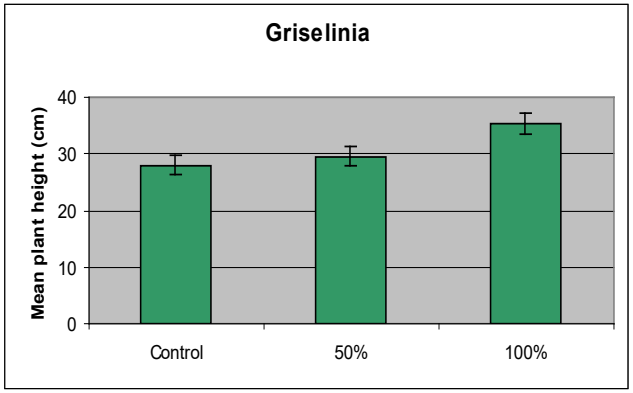
Table 4 : Commercial evaluation of PGR (Gibberellic Acid) treated HONS plants – Grower Comments on 24th July 2007

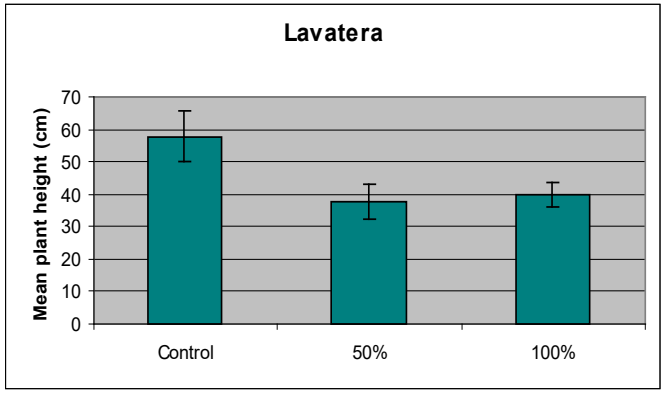
Crop	Branching effects	Plant Heights	Rooting	Phytotoxicity
Lavatera	Very slightly more branching at both rates than untreated plants.	No differences	No differences	None seen
Griselinia	Similar to controls – no differences	Similar to controls – no differences	Similar to controls – no differences	None seen
Pittosporum	Similar to controls – no differences	Similar to controls – no differences	Similar to controls – no differences	None seen

Plant Height

Measurements of plant heights have resulted in some variable results between the crop types. No significant effect on height was observed in the *Pittosporum* plants following application of GA. A slight increase in height following application of GA at the highest rate was observed in the *Griselinia*. However, in the *Lavatera* crop the GA treatments significantly reduced plant compared to the untreated plants.

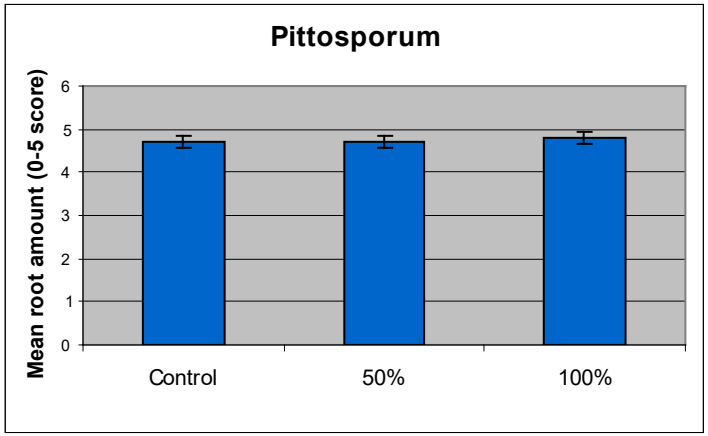


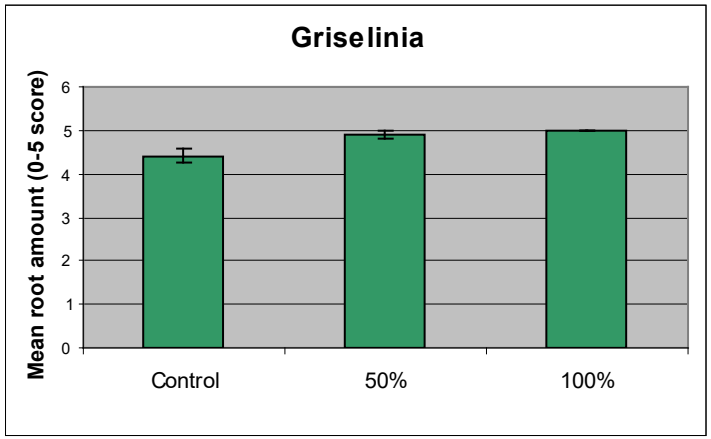


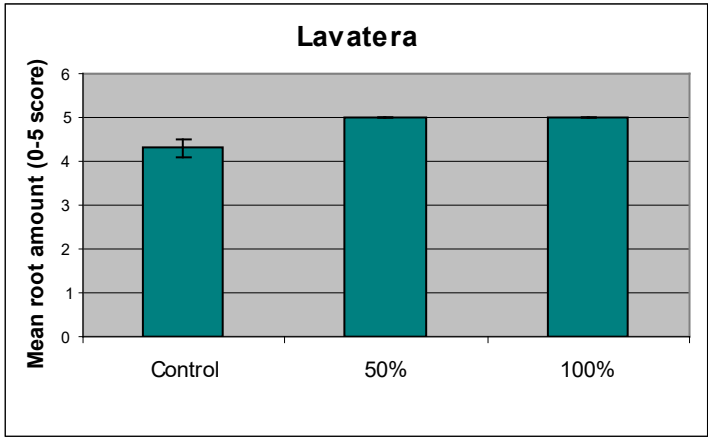


Root Development

In general all the plants treated with GA at the 2 rates showed good root development compared to the control (untreated) plants. In each of the crops a slight increase in the amount of root produced was observed following treatment application.







Phytotoxicity

No symptoms consistent with a phytotoxic effect were seen following the application of GA at either rate. No leaf scorch, stunting, twisting or root effects were observed. Flowering in the Lavatera crop was observed to be similar in the control (untreated) plants to those plants which had received the GA spray application.

Figure 3. Comparison of Griselinia plants treated with GA to control (untreated) plants

Conclusions

The data collected during the first year of this study has not been promising. The results of the trial suggest that Ethrel C when applied as a drench can have some severe phytotoxic effects, causing severe root damage leading to plant death in some crop types. Spray applications of this product at the same rates appeared to be far less toxic. However, this product has an extremely gaseous nature and damage to other plants in the vicinity has been observed following its use (pers. Comm.)

Very little evidence of increased branching was observed in the crops following treatment application. Increased branching, compared to the control, was seen in the *Camellia* plants, and this was linked to a significant reduction in height. There was some suggestion of increased branching in *Rosa* (Patio type) and *Photinia* following application of Ethrel C at the 50% spray rate (grower comments).

Unfortunately the plant to plant variation, irrespective of the applied treatment made it difficult to get a clear impression of the true effects, of the PGR applications in relation to basal branch development.

The spray treatments of Gibberellic Acid seemed to have little effect on the crops chosen for the study. No consistent additional branching or plant height differences were seen, although a slight increase in root development across the species was observed which would be beneficial to treated crops. However, this product did not result any observed phytotoxic effects on the crops, and higher rates of application may have been more effective.

Technology transfer

The initial results from this study have not demonstrated any beneficial effects in terms of increasing basal branching or in reducing labour time and costs from pruning. This may have been due to selection of inappropriate species, unsuitable application methods or rates of application or a number of other potential factors. Clearly further work on these products or other, as yet, unlicensed products would be required to provide a feasible solution to this commercial problem.

Acknowledgement

STC would like to extend their thanks to the growers and consultants involved who provided much valued knowledge, expertise and materials in this trial.