Grower Summary

HNS 187

Evaluating the potential of plant growth regulators to limit growth on tree and hedging species

Annual 2015

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Project title:	Evaluating the potential of plant growth regulators to limit growth on tree and hedging species
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Report:	Final report, April 2015
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Date project completed (or expected completion date):	31 March 2015

GROWER SUMMARY

Headline

- All species tested responded to chlormequat, but leaf yellowing was a problem depending on the rate used.
- All the plant species tested in 2014 responded to at least one of the plant growth regulators used.

Background

The work was undertaken to find alternative ways of reducing the vigour of field-grown tree and hedging crops in nursery production. Undercutting during the growing season is the current method of regulating growth, however this is not effective during wet summers, because undercutting does not provide a sufficient stress response in plants when soils are moist. A planned number of applications of plant growth regulators has the potential to limit the growth of vigorous species, if carefully timed, irrespective of the weather. Plant growth regulators can be applied throughout the growing season giving growers more precise control of crop growth, even in wet summers, helping to ensure that the majority of plants do not exceeded height specifications.

Summary

All of the plant growth regulators used within this trial have the potential to regulate the growth of selected tree and hedging subjects. All the species within the trial responded to at least one plant growth regulator in both 2013 and 2014. Three applications of plant growth regulators were applied at three weekly intervals, commencing in early July. Treatments used in 2014 are shown in Table 1.

Stabilan 750 (75% chlormequat) was used instead of Fargro Chlormequat (46% chlormequat) in 2014 as Fargro Chlormequat became unavailable during the period of the trial, and has a final use date of 31/11/15. Stabilan 750 (75% chlormequat) is a more concentrated product and possesses a label approval for use on ornamentals. Rates of Stabilan 750 were reduced to take account of both the more concentrated product and the fact that rates of Fargro Chlormequat used in 2013 resulted in unacceptable phytotoxicity in several plant species.

Table 1. Growth regulator products used in experimental treatments 2014

Product name	**Active ingredient**	**Rate (l/ha or kg/ha) applied as 1000l water/Hectare**	**Approval status**
Untreated			
Stabilan 750*	750 g/l chlormequat	15.3l/ha (all species excluding *Sorbus)* 7.6l/ha *(Sorbus)*	Label
HDC P003 (foliar spray) *(Prunus* & *Sorbus* only)	Confidential	Confidential	Not authorised
Regalis** *(Prunus* & *Sorbus* only)	10% w/w prohexadione calcium	1 kg on 18/06/13, 1 kg/ha on 10/07/13, and 0.5 kg/ha on 06/08/13	EAMU
HDC P004	Confidential	Confidential	Not authorised
Moddus	250g/l	0.2 l/ha	EAMU

*chlormequat treatment included Activator 90 at 1ml/l of water.
**Regalis treatment included 2.5 ml of X-Charge per litre of water.

Reduced rates of chlormequat in 2014 still resulted in some phytototoxic damage, although less severe than the previous year on most of the test species and was considered commercially acceptable by the industry representatives in mid September.

HDC P003 and Regalis (prohexadione calcium) were only used on *Prunus* and *Sorbus* in 2014 as these were the only two species that responded to these plant growth regulators in 2013. HDC P003, applied only as a foliar treatment via a weed wiper in 2013, did not result in significant reductions in height so this method was not pursued. Moddus (trinexapac-ethyl) and HDC P004 were included in the trials carried out in 2014 to test additional plant growth regulators. Although HDC P004 and Moddus caused slight damage on some of the test species, phytotoxic damage caused by these treatments was considered commercially acceptable throughout the trial.

The treatments that resulted in the greatest mean height reduction by species during 2013 and 2014 are shown in Table 2:

Table 2. Treatments during the trial that resulted in the greatest mean height reduction.

Species	2013	2014
Alnus	Fargro Chlormequat	HDC P004
Betula	Fargro Chlormequat	Moddus
Populus	Fargro Chlormequat	Stabilan 750
Prunus	P003 (foliar spray)	HDC P004
Sorbus	Fargro Chlormequat	HDC P004

It should be noted that whilst Fargro Chlomequat gave the greatest height reduction for four species at the full rate used in 2013 it also caused leaf yellowing. Stabilan 750 (chlormequat) had the most effect on the height of *Populus* resulting in a significant reduction in height compared to untreated controls. Stabilan 750 (chlormequat) and PO004 also resulted in the most significant reduction in mean height of *Prunus.* Although Stabilan 750 (chlormequat) resulted in a greater height reduction in *Prunus* than HDC PO004, the latter which was less damaging, appeared to result in a more even crop, so may be a better commercial treatment if an EAMU is granted. All treatments other than Moddus resulted in a significant reduction in the mean height of *Sorbus.*

The best potential treatments can be summarised for each species:

Chlormequat is likely to be the most effective growth regulator on *Populus* to prevent excessive growth. HDC PO004 was the most effective treatment on *Sorbus,* HDC PO004 was considered the most useful treatment on *Alnus.* Moddus appeared visually the most useful on *Betula* however this result should be treated with caution as differences were not statistically significant. It should also be noted that 2014 was the first year that Moddus had been used in these trials.

HDC P003 and P004 were used in these trials under an experimental permit. HDC P004 performed well on *Sorbus* and resulted in similar growth regulation as HDC P003 in the case of *Prunus,* therefore an application for an EAMU to permit the use of HDC P004 in ornamental plant production and forest nurseries will be sought.

Not all the plant species responded to the different growth regulators in the same way. Therefore in the third year of trials under HNS 187a, treatments will be refined further in an attempt to optimise growth control for specific species.

Financial Benefits

For species where there is no need for a central leader, crops can be mechanically topped at a cost of £150/ha. However, for many crops this is not an option as it would have a detrimental impact on subsequent growth following planting out.

The forestry sector is one of the key market outlets for two year old field-grown tree species, however plants over 90 cm have reduced marketability. The landscape sector tends to specify one and two year old tree and hedging plants at 80 – 100 cm in height. Plants over 100 cm can normally be substituted for 80 – 100 cm crops to landscapers providing that they are sold at the same price. Although this is a way of clearing some taller stock, extra height variation within crops adds about 5% to the grading cost which typically equates to an additional labour cost of £105 per hectare.

Despite growers using cultural techniques such as undercutting to limit the growth of certain species (e.g. *Alnus incana, Alnus glutinosa, Betula pendula, Prunus avium, Sorbus aucuparia* and *Tillia platyphyllos)* in the second year of production, approximately 50 percent of the stock can reach over 100 cm tall in the second year of field production. Within the trial the following percentages of untreated crops exceeded the 90 m height specification: *Alnus glutinosa* (82.5%)*, Betula pendula* (92.5%)*, Populus x canadensis* 'Robusta' (80%)*, Prunus avium* (12.5%) and *Sorbus aucuparia* (67.5%)*.*

Based on an average of 300,000 plants to the hectare on a typical bed-based system, and an average price per plant of £0.30, and with a worst case scenario that up to half of the aforementioned species would be unmarketable in some years, this equates to a loss of up to £45,000 per hectare.

To summarise:

Limiting height variability speeds up grading, saving £105 per hectare in labour.

Minimising the percentage of crops 90cm or over could also potentially result in up to £45,000 worth of additional marketable crops per hectare.

Action Points

- Plan to trial the use of plant growth regulators as part of the production schedule (always leave some untreated as a comparioson) suitable products include Regalis and plant growth regulators (with appropriate authorisation) containing chlormequat at appropriate rates. Test plant growth regulators on vigorous species or cultivars to determine plant response.
- There is a need to 'read' a crop's growth in line with the season to determine when best to commence applications of plant growth regulators. Ensure that plants have put on sufficient extension growth to take up plant growth regulators prior to commencing applications. Field grown transplants are typically at the optimum growth stage to commence plant growth regulaton application between mid June and early July depending on the season.Be aware that some fungicides e.g. triazoles such as Folicur, Nativo 75WG* and Topas can have a growth regulatory effect (see HNS 156) which needs to be taken account of, particularly if used in conjunction with plant growth regulators.
- Monitor crops after treatment with plant growth regulators and aim to reapply plant growth regulators when extension growth starts again. For the species tested this is typically three weeks after the previos application.
- Very vigerous species such as *Betula* may respond to more frequent lower rates of plant growth regulators.
- Allow sufficient time for plant growth regulators to be taken up by treated plants prior to the application of irrigation, take account of the weather and irrigation schedules before application.