Grower Summary

HNS 187a

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

Final 2016

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Further information

If you would like a copy of the full report, please email the AHDB Horticulture office (hort.info.@ahdb.org.uk), quoting your AHDB Horticulture number, alternatively contact AHDB Horticulture at the address below.

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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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Project leader:	David Talbot, ADAS UK Ltd.
Report:	Final report, April 2016
Previous report:	HNS 187 Annual report, April 2015
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Date project commenced:	01 March 2013
Date project completed (or expected completion date):	02 April 2016

GROWER SUMMARY

Headline

- *Populus* responded to chlormequat, reducing the rate and number of applications reduced damage to an acceptable level.
- Confidential product HDC POO4 proved effective on *Sorbus* and an EAMU has been applied for.

Background and expected deliverables

The forestry sector is one of the key market outlets for two year old field-grown tree species, however plants over the 90 cm specification mark 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 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 to the total cost.

The work undertaken in this project builds on research from project HNS 187; to find alternative ways of reducing the vigour of field-grown tree and hedging crops in nursery production to meet specifications. Undercutting during the growing season is the current method of regulating growth, however, this is not effective during wet summers, because it does not provide a sufficient stress response in plants when soils are moist. A planned number of applications of chemical plant growth regulators has the potential to limit the growth of vigorous species, irrespective of the weather, if carefully timed and managed. Chemical plant growth regulators can be applied throughout the growing season (as long as label or EAMU restrictions covering rates and application number are observed) giving growers more precise control of crop growth, even in wet summers, helping to ensure that the majority of plants do not exceed the height specifications set for crops.

Summary of the work and main conclusions

All of the plant growth regulators used within this trial have the potential to regulate the growth of selected tree and hedging species. All the species within the trial responded to at least one plant growth regulator in both 2013 and 2014 (a number of active ingredients were examined). Trials carried out in 2015 were designed to build upon the results obtained previously; the application rates and timings of plant growth regulators were adjusted in line with the growth and expected response of the test plant species. Treatments used in 2015 are shown in Table 1.

Within this project the following percentages of untreated crops in 2014 exceeded the 90 cm height specification: *Alnus glutinosa* (82.5%)*, Betula pendula* (92.5%)*, Populus x canadensis* 'Robusta' (80%)*, Prunus avium* (12.5%) and *Sorbus aucuparia* (67.5%)*.* The weather (a cold spring resulting in a three week delay to the start of the growing season, followed by a cool summer with low night time temperatures often in single figures) during 2015 resulted in a poor growing season, therefore the percentages of untreated crops exceeding 90cm was much lower relative to 2014. The following percentages of untreated crops exceeded 90 cm in 2015: *Alnus glutinosa* (17.5%)*, Betula pendula* (72.5%)*, Populus x canadensis* 'Robusta' (7.5%)*,* and *Sorbus aucuparia* (0%)

Rates of Stabilan 750 (75% chlormequat) applied to *Populus* were reduced from the rates used in 2014 in order to minimise plant phytotoxicity sysmptoms. The number of treatments of Stabilan 750 applied to *Populus* was also reduced in some instances to determine if this still resulted in useful growth regulation while minimsining the level of phytotoxicity. Confidential product HDC POO4 was applied with a shorter spray interval than in 2014 to *Alnus* to establish whether this would result in a better level of growth regulation.

Table 1. Growth regulator products used in experimental treatments 2015

Product name	**Active ingredient**	**Rate (l/ha or kg/ha) applied with 1000 l water/hectare**	**Authorisation status**
Untreated			
Stabilan 750 + Activator 90 (0.1%)	750 g/l chlormequat	15.3 l/ha 12.2 l/ha	Label
HDC POO4*	Confidential	Confidential	Not approved (used under experimental permit)
Stabilan 750 + Activator 90 (0.1%) + HDC POO4*	750 g/l chlormequat + confidential	15.3 l/ha + confidential	Label + not approved (used under experimental permit)

* No Foam (anti foaming product; a polydimethyl silicone emulsion) was added at at 1 drop per litre of spray solution.

Reduced rates of chlormequat applied in 2015 still resulted in slight phytototoxic damage, although damage was less severe than in the previous year and was considered commercially acceptable by the industry representatives when assessed during mid-September.

Although HDC POO4 caused slight damage to *Alnus* and *Sorbus*, any phytotoxic damage caused by this treatment was considered commercially acceptable throughout the trial.

The treatments that resulted in the greatest mean height reduction by species during 2013, 2014 and 2015 are shown in Table 2.

It should be noted that whilst high rates of chlomequat (as Fargro Chlormequat) gave the greatest height reduction for four plant species (at the full rate used in 2013), it also caused extensive leaf yellowing. This product has since been revoked from use.

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

Species	**2013**	**2014**	**2015**
Alnus	Fargro Chlormequat	HDC POO4	None*
Betula	Fargro Chlormequat	Moddus	None*
Populus	Fargro Chlormequat	Stabilan 750	Stabilan 750
Prunus	POO3 (foliar spray)	HDC POO4	Species not included in 2015
Sorbus	Fargro Chlormequat	HDC POO4	HDC POO4

* Untreated controls had the shortest plants relative to plots treated with plant growth regulators.

Stabilan 750 (chlormequat) significantly reduced the height of *Populus* in 2014, compared to untreated controls. Therefore chlormequat was the only growth regulator tested on *Populus* in 2015. Based on these findings, chlormequat is likely to be the most effective growth regulator for use on *Populus* to manage growth.

Some adjuvants are claimed to enable rates of chlormequat to be reduced, while maintaining efficacy, potentially reducing the level of any phytotoxic damage. More frequent, less damaging and potentially more effective, lower rate applications could commence earlier in the growing season. There still may need to be a compromise between slight phytotoxic damage and effective growth regulation with chlormequat on some species, unless a safer solution can be found.

HDC POO4 was the most effective treatment on *Sorbus* and *Prunus*, and also the most useful treatment on *Alnus.* From observations, Moddus appeared to be the most useful on *Betula,* however this result should be treated with caution as the differences in plant height between treatments were not statistically significant.

HDC POO4 was used in these trials under an experimental permit. As HDC POO4 performed well on *Sorbus,* an application for an EAMU to permit its use in ornamental plant production and forest nurseries has been applied for by AHDB.

Financial benefits

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

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% of the stock can often reach over 100 cm in height in the second year of field production.

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 species could be unmarketable in some years, this equates to a potential loss of up to £45,000 per hectare.

Limiting height variability within crop species also speeds up the grading process saving £105 per hectare in labour.

Action points for growers

- Plan to trial the use of plant growth regulators as part of the production schedule (always leave some untreated as a comparison). Suitable products include plant growth regulators (with appropriate authorisation) containing chlormequat at appropriate rates and HDC POO4 (if an EAMU can be obtained). Test plant growth regulators on vigorous species or cultivars to determine plant response.
- There is a need to appreciate a crop's growth in line with the prevailing weather to determine when best to commence applications of plant growth regulators. Ensure that plants have put on sufficient 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. There may be a need to reduce rates or delay the first application if crop growth is poor.
- Be aware that some fungicides e.g. triazoles such as Folicur and Topas can have a growth regulatory effect (see HNS 156) which needs to be taken into account, particularly when these products are used in conjunction with plant growth regulators.
- Monitor crops after treatment and aim to reapply plant growth regulators when extension growth commences again. For the species tested, this is typically three weeks after the previous application.

- Very vigorous species such as *Betula* may respond to more frequent lower rate applications of plant growth regulators.
- Allow sufficient time for plant growth regulators to be thoroughly absorbed by treated plants - take account of weather forecasts and avoid the application of overhead irrigation immediately after treatment.
- HDC POO4 has potential for use as a growth regulator on *Alnus*, *Prunus* and *Sorbus* provided an EAMU can be obtained for use in ornamental plant production.