

Developing new solutions for *Hylobius* control – a nursery perspective

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Back in 2009, cypermethrin was the standard *Hylobius* weevil control product in forestry. In 2014 FSC granted a derogation for the use of cypermethrin, with an initial expiration date of 2014, thus alerting the industry to the urgent requirement for an effective alternative. The *Hylobius* Plant Protection Group (HPPG) was set up, consisting of various organisations including Forest Research, forest management companies and nurseries. The aim of the group was to identify and trial safer, more environmentally friendly weevil control options through trialling a range of conventional pesticides, physical barriers, bio controls, repellents, and the use of population prediction models.

Since 2010, the HPPG's field trials have been established annually, on sites provided by Tihill Forestry and Scottish Woodlands. The creation of randomised site layout plans has been overseen by Forest Research and more recently universities, ensuring a robust experimental design capable of producing reliable data. Trial results have been presented to and shared with industry representatives, such as Confor.

Pesticides

The HPPG's first field trials were planted in 2010, with tree supply and treatment application carried out by the nursery. From the range of products tested, results of these initial sites identified neonicotinoid insecticides as effective. We were aware of the use of imidacloprid against weevil in Europe, but also knew that similar active ingredients with better ecotoxicology profiles were available. For this reason, acetamiprid had been included in the trials, and results between the two insecticides were comparable. With 500 times lower toxicity to aquatic organisms than cypermethrin (Willoughby et al., 2017), acetamiprid (Gazelle) was selected as a potential alternative. The supply of Gazelle treated trees to forest sites began in 2012. Uptake of Gazelle by the forest industry represented a big step forward in terms of environmental sustainability, demonstrating a desire for change and improvement in the sector's approach to pest control. The HPPG's trials are also indicating that there are other products with better ecotoxicity profiles than acetamiprid which may be viable alternatives.

Physical barriers

We have endeavoured to test all physical-barrier

products available, some of them incorporating bio-repellents. A flexible sand-based coating used in Sweden was included in the first round of HPPG trials. Performance on the UK trial sites was poor, so the treatment was not selected for further testing. Plastic tree nets were also tried. Results were variable, with good performance on some sites but significant damage on others regardless of weevil population; additionally, the use of non-biodegradable plastics in our forests is not environmentally sustainable. A wax coating application machine was hired and shipped across from Sweden to Maelor specifically for the trials. When first tested in 2013, it was observed that the wax quickly started to crack and fall from the trees. Results showed that rates of weevil damage were high, but despite the initial failure we persevered. Wax was tried again for three successive years, with the same outcome each time. There has been some success though. We have been



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trialling waxed paper tree sleeves since 2013, producing efficacy data on a range of site types and for varying weevil populations. The sleeves are biodegradable and therefore represent an environmentally sustainable option. On very exposed sites, or with high weevil populations, the sleeves do not generally provide an adequate level of protection. But on more sheltered sites and with low to medium weevil pressure we have seen the sleeves perform well. So, combined with weevil population prediction and proper site assessment the sleeves fit well into an Integrated Pest Management programme. Recently the HPPG has been working with a partner company in the development of a new polymer treatment. Applied to the tree stem as a liquid, it sets to form a strong and flexible barrier. We have tested the polymer for three years running, during which time both the formula and the application technique have been improved. The nursery has bought a small application machine for the product: along with the trial work we aim to send out polymer treated trees to customers this season for evaluation and feedback.





Bio-controls

A range of bio controls have been trialed, so far these have proved to be ineffective or impractical for individual plant protection. There could be a role for such products in reducing population levels. The HPPG members have been involved in work with BIOPROTECT, and later BIPESCO (Swansea University). Research is ongoing in this area and we hope to see developments soon.

Where to?

To date 17 unique chemical treatments, eight unique biological treatments and eight unique physical barrier treatments have been tested in our trials. With varying rates, product combinations and replications that comes to over 200 separate treatments on over 70,000 trees. The HPPG's investment in the search for alternative weevil control strategies totals several hundred thousand pounds. Research and development of alternative solutions which provide improvements to environmental sustainability takes time and patience. Attempting to bring new products to the market prematurely risks not only catastrophic weevil damage on planting sites, but also loss of user confidence.

The HPPG is committed to continuing its work into alternative hylobius controls and are currently planning for a 2019 trials programme. The HPPG is now working within the framework of the Hylobius Industry Research Programme (HIRP). HIRP are currently raising funds to fully analyse and publish the HPPG's trial work together with work by the FC's Hylobius Working Group.

As an industry we have a long way to go before we will be able to rely on exclusively chemical free solutions for Hylobius. Having proved that we can work together with a common purpose, we are confident that it is only a matter of time before we get there. The recent announcement of an innovation grant funded by Forest Enterprise Scotland is a significant milestone. We look forward to finding out which novel and pioneering approaches are selected.

Any suggestions for new products to try will be gratefully received.

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