Grower Summary

HNS 175

Liverwort control using novel techniques

Annual Report 2010

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The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

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

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Headline

- Addition of seed meals *Sinapis alba*, *Brassica napus* '00' and *Camelina sativa* can significantly reduce liverwort establishment.
- Growing media amendment with Sylvafibre® and sterilised loam can significantly reduce liverwort establishment.

Background and expected deliverables

Liverwort growing on the surface of growing media is a major problem to the horticulture industry, affecting both protected and outdoor grown hardy nursery stock; the cost of hand removal of moss, liverwort and weeds at dispatch has been estimated at 4% of total annual production costs, equating to £1,763 per hectare based on 2008-9 figures. Zero tolerance of liverwort in certification schemes and a lack of approved chemical products also make its control a technical priority for growers.

The aim of this project is to build on work completed in HDC projects HNS 126 and HNS 93c by investigating further the herbicidal effect of glucosinolate (GSL) hydrolysis products found in oilseeds on liverwort, and the suppression of liverwort growth by unknown biological or physical factors within certain growing media components.

GSLs and their hydrolysis products (isothiocyanates, ITCs) are responsible for the distinctive pungent smell and hot taste of cabbages, mustards and other brassicas and are known to have toxic effects against plants, root knot nematodes and fungal species; brassicas are also successfully used in the bio-fumigation of soils against weeds and diseases.

ITCs are the most bioactive products of GSL hydrolysis and have been shown to exhibit a herbicidal effect on liverwort; ITCs adversely affect liverwort gemmae (vegetative propagules produced by gemma cups on the liverwort surface) comparable to commercially used herbicides (lenacil and metazachlor) when tested under laboratory conditions (HDC project HNS 126). *Limnanthes alba* seed meal provided short-term liverwort control when incorporated into growing media (HDC project HNC 93c), and *Sinapis alba* 'IdaGold' applied as a mulch has been found to control established liverwort.

Observations made by ADAS consultants during project HNS 93c suggested a suppressive effect on liverwort growth where the growing media was amended with loam or Sylvafibre®,

possibly indicating natural microbial suppression in addition to any physical effect. Work carried out under the auspices of the Peatering Out project similarly suggested a suppressive effect of green compost on liverwort growth. Suppression of liverworts through microbial activity from growing media amendments has not been investigated but represents an opportunity to improve control if a better understanding of the effects can be obtained.

The expected deliverables from this work include the development of an effective novel control for liverwort infestation based on:

- Growing media amendment with seed meal or a combination of seed meals to reduce liverwort establishment.
- Growing media amendment with materials to provide natural microbial suppression of liverwort in addition to any physical effect.

Summary of the project and main conclusions

Two trials were carried out during 2009/10, investigating seed meal and growing media suppressive effects on liverwort establishment and growth. Both trials were carried out under protection.

Seed meal suppressive effect

Five oil seeds (*Brassica carinata, Sinapis alba, Camelina sativa* and two different *Brassica napus* (oilseed rape samples) were selected for inclusion in this trial, aiming to include products grown as commercial crops in the UK, where the seed meal was a waste product, and which would provide a range of glucosinolates to test.

The seed meals were processed to a fine meal and analysed for glucosinolate content. Each was applied both as a mulch and incorporated into the growing media at a rate of 3% to investigate the effect of application method. A pot of established liverwort was placed within each plot to provide liverwort inoculum.

Liverwort establishment was least in the *Sinapis alba* (incorporated), *Camelina sativa* (mulch) and *Brassica napus* '00' treatments after 19 weeks (Figure 1). Of these, the results for *Sinapis alba* were most consistent, with least variability in the amount of liverwort

established. During the winter period the trial became excessively dry as automatic irrigation was not used. In addition to this, a fungal infestation which had been noted previously, spread throughout the liverwort in the trial. The combination of these two factors adversely affected liverwort development at the end of the trial. (It is possible that the fungal infestation was opportunistic as the liverwort was under stress or it could have been a primary pathogen of liverwort, which would warrant further investigation). Data collected after 30 weeks reflected these events and any effects of the seed meal were not clear.

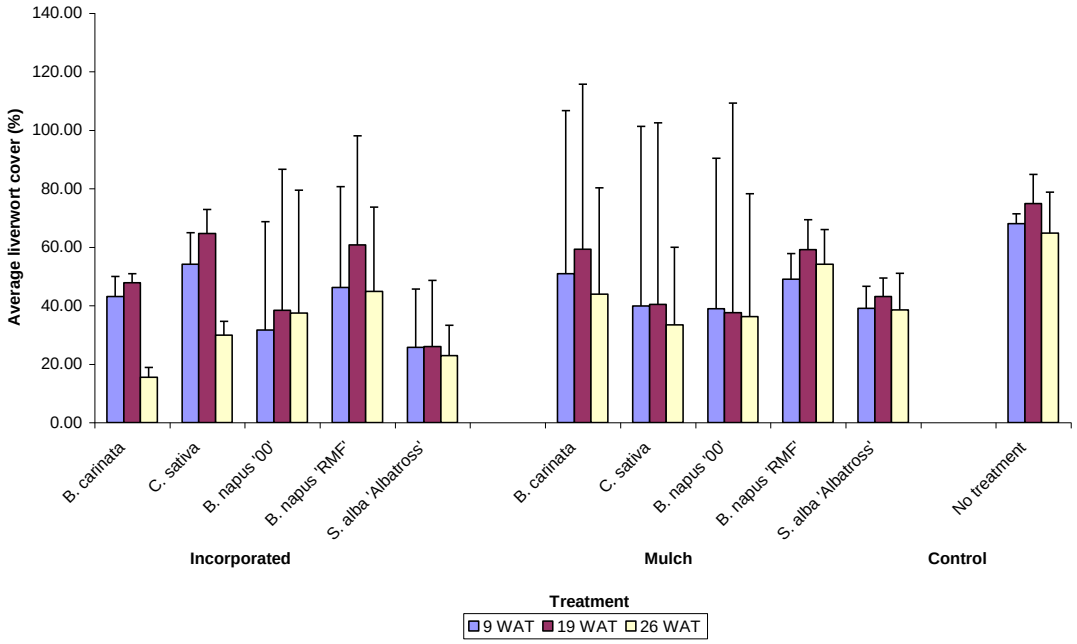

Figure 1: Seed meal suppressive effect (WAT = weeks after treatment)

Future research could investigate optimum application rates and combining seed meals to provide higher levels of liverwort control, along with examining any potential phytotoxic effects against crop plants.

Growing media suppressive effect

Five products were included in the trial (Melcourt Sylvafibre®, Melcourt Growbark®, Perlite, Vital Earth Green Compost and sterilised loam), with Sinclair Professional Peat used as a base. Treatments were incorporated into the peat at a standard rate of 50%, except for the sterilised loam (20%); 50% loam would not be used commercially by growers due to the increased weight of the media. Treatments were watered by hand in addition to overhead irrigation to maintain high water levels and exclude any physical effects due to improved

drainage. This also served to increase liverwort pressure. Trays were placed on a mypex-covered bed topped with gravel. Again, a pot of established liverwort was placed within each plot to provide liverwort inoculum.

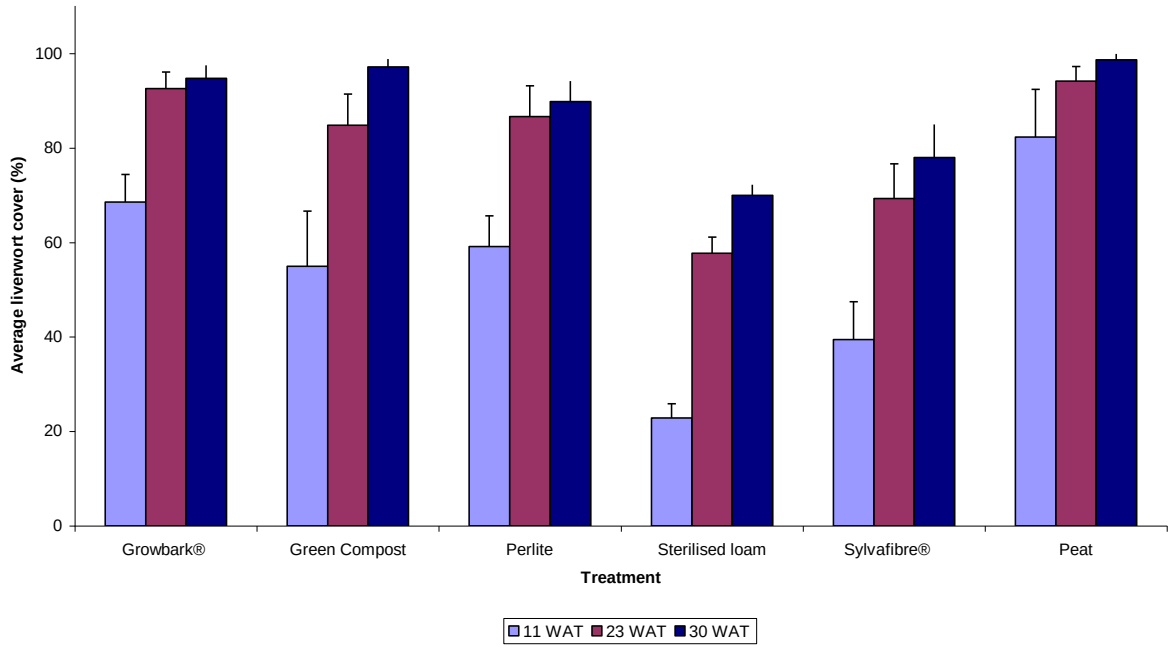

Figure 2: Growing media suppressive effect (WAT = weeks after treatment)

Peat treatments (Figure 2) had a high level of liverwort infestation from early in the trial, with 99% coverage after 30 weeks. Liverwort was slow to establish in the green compost treatment, but after 30 weeks liverwort cover was comparable to that seen in the peat treatments. The Growbark® and perlite treatments also had a high level of liverwort throughout the trial. It is normally expected that the increased drainage provided by these products leads to reduced liverwort cover due to the drier growing media surface, but as high moisture levels were maintained by additional hand watering this effect was eliminated from the trial.

Both Sylvafibre® and sterilised loam had a significant effect, with less liverwort cover in these treatments. Liverwort was slow to establish in the Sylvafibre® treatments although 78% liverwort cover was recorded after 30 weeks. The beneficial effect of Sylvafibre® had previously been attributed to the improved drainage imparted on growing media, but these results suggest that other factors may also be implicated.

Throughout the trial the sterilised loam showed least liverwort establishment compared to all other treatments. Whilst this may show promise in reducing liverwort infestation, the weight and cost of loam may restrict the proportion that could be included in commercial growing media. Future work could investigate the combined effect of these treatments and irrigation levels.

Financial benefits

- The growing media amendment treatments could reduce the need for hand cleaning pots at dispatch. The cost of moss, liverwort and weed removal by hand at dispatch is estimated to be 4% of the total annual production costs, equating to £1,763 per hectare based on 2008-9 production figures.
- The treatments could reduce the need for specific herbicidal liverwort treatments during production. For example, Venzar Flowable costs £105 per hectare or Clayton Lenacil costs £140 per hectare (these figures are in addition to the cost of liverwort removal at dispatch).
- High levels of control would mean that plants free from liverwort infestation could be offered to customers.

Action points for growers

- Growers could consider including a proportion of Sylvafibre® or sterilised loam into potting mixes to aid liverwort reduction, particularly in the case of shorter term crops.
- Further investigations of the effects of seed meal on both liverwort and crop plants are required before any specific recommendations can be made to growers.