Grower Summary

CP 124

Managing ornamental plants sustainably (MOPS):

Hot foam treatment for the control of pathogens in debris and on re-used propagation trays

Annual 2014

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Project Number:	CP 124
Project Title:	Managing ornamental plants sustainably (MOPS)
Work package title:	Hot foam treatment for the control of pathogens in debris and on re-used propagation trays
Work package leader:	Erika Wedgwood
Contractor:	ADAS
Report:	Annual report 2014
Publication Date:	30 July 2015
Previous report/(s):	None
Start Date:	11 March 2014
End Date:	31 October 2014
Project Cost:	£241,833

GROWER SUMMARY

Headline

A new technology (Foamstream) showed good efficacy against *Pythium* and *Fusarium* and could be a valuable tool to help maintain clean and healthy plant production sites.

Background and expected deliverables

The need for surface disinfection to reduce inoculum levels of plant pathogens prior to ornamental plant production is critical for sustainable production. Some chemical disinfectants pose a risk of crop damage through vapour spread and so cannot be used when there is a growing crop in the vicinity. A treatment which can be applied close to a growing crop offers advantages in this situation. The Foamstream treatment, developed by Weedingtech as a safe non-toxic treatment for weed control in public spaces, has potential for use in reducing plant pathogen inoculum levels close to a growing crop with little risk of crop damage.

The Foamstream technique of hot foam treatment (See: www.Weedingtech.com), is currently being marketed for weed control in amenity areas. It may allow disinfection without the use of harsh chemicals of the various plant pathogens that are found in used growing media, and root/stem debris and that collects on benches and standing areas, or are spread via re-use of contaminated containers. Foamstream produces wet heat >80°C which is maintained under a natural foam insulation created by palm oils added to the heated water. The process has full organic approval and is non-polluting when used around water courses. Many fungal plant pathogens are killed by temperatures of 50-56°C, dependent on duration of exposure. Development of Foamstream for use in propagation areas and other locations could allow disinfection during the production cycle rather than waiting to the end of production because of the risk of plant susceptibility to vapours which can arise from some disinfectants.

The objectives of this work were:

- To determine if hot foam treatment will kill *Fusarium* and *Pythium* on materials used in horticultural plant production
- To determine if hot foam treatment to root debris with root rot will kill *Phytophthora* and *Pythium*
- To determine the safety of hot foam treatment to materials used in horticultural plant production

Summary of the work and main conclusions

Foamstream equipment delivers a sheet of foam from a 260 mm wide nozzle and is passed over a surface at a speed of one to two seconds. This equipment was used to evaluate the efficacy of the hot foam blanket against two common pathogens found in debris on woven ground cover and other nursery surfaces. Both artificially infested woven ground cover and infested plant roots were treated.

Pythium sp. and *Fusarium* sp. inoculum was cultured on potato dextrose agar (PDA). Plugs cut from the colonies were put on squares of woven ground-cover material, one per 90 mm diameter PDA plate. Cultures were incubated for three weeks until the hyphae had grown across and through the material and resting spores had formed within the mycelium. The infested squares of woven ground cover were doused with the Foamstream treatment for one to two seconds. *Fusarium* was also given a 10 second treatment. Untreated controls involved treating infested squares with cold water instead of the hot foam. Treatments were replicated four times. The squares were dried before plating onto agar to re-isolate.

A second test aimed to investigate whether hot foam could kill *Pythium* and *Phytophthora* spp. in raspberry root debris. The freshly harvested infested roots were scattered onto a tray of woven groundcover and Foamstream was applied for one to two seconds and an experimental time of 10 seconds. This was replicated four times with cold water controls. The roots were then plated onto agar to determine pathogen survival.

Finally, Foamstream was applied to a range of horticultural materials including pots, seed trays, polythene and expanded polystyrene to assess for thermal damage.

Agar plates containing the treated groundcover were assessed for the presence of the target pathogen and/or any other microbial contamination after three and six days incubation. Plates with roots were assessed after eight days.

The results showed the hot foam treatment was successful in killing *Pythium* after 1-2 seconds of treatment. However *Fusarium* appeared to be less susceptible to Foamstream than *Pythium* (Table 1). Foamstream was also successful at controlling *Pythium* and *Phytophthora* spp. infested raspberry roots again at both durations (Table 2).

Table 1. Results of Foamstream against *Pythium* sp. and *Fusarium* sp. on artificially infested woven ground cover

Pathogen tested and treatment given	Duration of treatment	Presence/absence (+/-) of fungal growth	
		3 days after treatment	6 days after treatment
Fusarium sp. cold water control	1-2 seconds	+	+
Pythium sp. cold water control	1-2 seconds	+	+
Fusarium sp. Foamstream	1-2 seconds	_	_
Fusarium sp. Foamstream	10 seconds	_	+
Pythium sp. Foamstream	1-2 seconds	_	_

Table 2. Results of Foamstream against *Pythium* and *Phytophthora* in raspberry roots

Treatment	Duration of treatment	Presence/absence (+/-) of fungal growth 8 days after treatment
Raspberry roots cold control	1-2 seconds	+
Raspberry roots Foamstream	1-2 seconds	_
Raspberry roots Foamstream	10 seconds	_

Foamstream was also found to be safe to use on most horticultural materials tested. However, some damage was observed on tunnel polythene with the plastic becoming slightly warped.

This new technology showed good efficacy against the oomycete root rot pathogen species of *Pythium* and *Phytophthora,* but a reduced level of control of the fungal pathogen *Fusarium oxysporum*. Foamstream treatment, designed to be used as a non-chemical weed control method, could be a valuable tool to help maintain clean and healthy plant production sites.

Action Points

There are no action points at present. The Foamstream equipment will be tested under commercial nursery conditions with natural infestations of plant pathogens and the practicalities of application on a larger scale will be examined.