Managing Ornamentals Sustainably (MOPS)

Project Overview

Background

Crop protection is a significant area of research for the HDC. For the ornamentals sector it is especially important as few crop protection products come onto the market with label recommendations for ornamentals. Many widely used conventional chemical pesticides have already or are predicted to become unavailable over the next decade as new European legislation takes effect. Resultant gaps in crop protection have already been experienced by ornamentals growers and the situation will become still more difficult in the future. A further tranche of product withdrawals is likely following implementation of Regulation (EC) (1107/2009) that requires assessment of inherent hazard as well as risk and the definition of many popular products as “endocrine disruptors”.

To help counter this situation and provide new solutions for ornamentals growers the MOPS project has been set up. One of the main objectives of the project is to assess new crop protection products highlighted by the HortLINK SCEPTRE project (Sustainable crop and environment protection – targeted research for edibles). The SCEPTRE project screened around 285 conventional pesticides and biopesticides on a range of edible crops. A number of these products were extremely effective on pest and disease problems similar to those experienced by ornamentals growers were therefore recognised as having potential for use by ornamentals growers.

To be included in the MOPS programme products must fulfil certain criteria; show promise for efficacy against the target pest or disease, have potential for use in an IPM strategy, have the manufacturers’ support for an EAMU on ornamentals and have no adverse effect on growth or quality.

Summary

Over the two years of the MOPS project novel products including 8 conventional fungicides and 5 biofungicides were screened against powdery mildews and rusts, and 5 conventional insecticides and 7 bioinsecticides were screened against aphids, whitefly, western flower thrips, carnation tortix and vine weevil.

An overview of the experiments on pesticides carried out is given in Table 1 showing the test crop, and the number of novel products tested. The leading novel products and the commercial standard treatment used for comparison for each target are shown in Table 2.

Table 1. Overview of pesticide screening experiments

Target	Test crop	Number of novel pesticides tested			
		Conventional		Biopesticides	
		2014	2015	2014	2015
Powdery mildew	Hawthorn	3	3	4	2
Powdery mildew	Aster	5	6	4	3
Powdery mildew	Pansy	5		4	
Rust	Bellis	6	6	3	2
Rust	Antirrhinum	6		3	
Aphid (peach potato)	Pansy	3		3	
Aphid (melon & cotton)	Hebe		3		3
Whitefly (glasshouse)	Verbena	1		5	
Thrips (western flower)	Verbena	3		3	
Tortrix (carnation)	Choisya		3		2
Vine weevil	Fuchsia	1		4*	

*3 nematode products used in addition

Table 2. Leading novel products (code name in numerical order) identified for control of target diseases and pests

Target	Test crop	Commercial standard	Leading 3* novel products	
			Conventional	Biopesticides
Powdery mildew	Hawthorn	Signum	**10**,39,**77**	38,**47**,**105**
Powdery mildew	Aster	Signum	**10**,**25a**,**77**	11,**105**,178
Powdery mildew	Pansy	Signum	**10**,**25a**,**77**	**47**,**105**,178
Rust	Bellis	Signum	**25a**,**77**,177	**47**,**105**,178
Rust	Antirrhinum	Signum	**25a**,**77**,177	**47**,**105**,178
Aphid (peach potato)	Pansy	Movento	**200**,**59**	**62**,**130**,**179**
Aphid (melon & cotton)	Hebe	Movento	**59**	**62**,**130**,**179**
Whitefly (glasshouse)	Verbena	Teppeki**	**59**	**62**,205,208
Thrips (western flower)	Verbena	Actara	48,**200**,207	**179**,201,**130**
Tortrix (carnation)	Choisya	Steward*		
Vine weevil	Fuchsia	Exemptor		**130**,205

*where fewer products were tested or fewer showed promise a smaller selection was made

**similar product Mainman has an EAMU for ornamental plant production and should be used instead of Teppeki.

Three conventional fungicides 10, 25a and 77 were particularly useful, performing well against both powdery mildew and rust diseases. Three biofungicides 47, 105 and 178 had broad spectrum activity against both powdery mildew and rust. Biofungicide 105 performed well in a managed programme for powdery mildew, maintaining control in a low disease situation and delaying the need for a conventional fungicide by two spray rounds.

Conventional insecticides 59 and 200 both had activity against peach potato aphid and in addition 200 had activity against western flower thrips and 59 against melon and cotton aphid and glasshouse whitefly. Conventional insecticide 59 is a neurotoxin and is relatively fast acting, whereas 200 works by ingestion and tends to be slower acting, it has translaminar activity which is useful in situations where spray coverage is difficult.

The bioinsecticides 62, 130 and 179 are of particular interest, having useful activity against peach potato aphid and melon and cotton aphid and in addition some activity against whitefly (62), western flower thrips (130, 179) or vine weevil (130). All are contact acting so would require good spray coverage to achieve the best results.

The products shown in bold were carried forward for extended phytotoxicity testing on a range of protected ornamentals and HNS. Note that a few leading treatments were not be taken forward for further phytotoxicity testing either because the nature of the product means that there is little risk of phytotoxicity or because there is already sufficient information known.

All treatments used in the vine weevil control experiment were effective in reducing numbers of vine weevil larvae apart from 179. The most effective treatments were Exemptor incorporated and drenches of Calypso, 205 and three nematode products; Nemasys L, Larvanem and SuperNemos.

A molecular diagnostic technique was validated for detection and identification of leaf and bud nematodes (*Aphelenchoides* spp) as there are now very few nematologists in the UK who are able to confirm *Aphelenchoides* spp. by microscopy. A LAMP (loop-mediated isothermal amplification) technique has been developed using specific primers designed by the ADAS biotechnology group based at the University of Nottingham to identify samples containing *A. fragariae*. The method has proved to be accurate enough to identify a single nematode following extraction from leaf material.

In further work on nematodes a range of disinfectants were tested for efficacy when used on areas, such as sand beds, where leaf and bud nematodes can remain viable within infested leaf debris. There were seven disinfectant treatments applied at the maximum rates specified on the label. Following treatment, the numbers of live leaf and bud nematodes per gram of leaf and in the sand were determined. Anigene (a medical disinfectant) was the most effective but still killed only 9% in the infested leaf material. Menno Florades, Hortisept Pro, Unifect G and Anigene reduced nematode survival in the sand but did not eradicate them. These results indicate that disinfectants cannot be used as a quick method of cleaning up infested leaf material. However if sand beds are thoroughly cleared of all infested leaf debris following an infested crop, a horticultural disinfectant such as Menno Florades, Hortisept Pro or Unifect G could reduce the numbers of nematodes surviving in the sand. An interval of at least four weeks should still be left before using the beds to grow any fresh plants susceptible to leaf and bud nematodes

A further area of work focused on disinfectants and soil and surface sterilisation. Nine disinfectants were screened against Fusarium and Pythium on surfaces, a biological anaerobic soil disinfection technique was tested against Fusarium in soils and a heat treatment was evaluated for control of Fusarium, Pythium and Phytophthora on nursery materials and debris.

Three disinfectants; Disolite, Unifect G and Domestos, were noted as particularly effective against Fusarium and Pythium on different surfaces. Disolite and Unifect G were used as capillary matting disinfectants on a nursery with known Fusarium infection and pot grown Easter Cacti placed on the matting had improved vigour compared with the untreated. Choice of disinfectant will depend on the target disease, the surface to be treated and the odour corrosiveness and biodegradability of the product.

A recent development in soil sterilisation has been the biological system of anaerobic soil disinfection using organic by-products as soil amendments. These products encourage specific anaerobic soil bacteria build-up and production of fungitoxic chemicals. A number of proprietary products (sold as “Herbie”) have been developed in the Netherlands for soil disinfection. These were tested for the first time against Fusarium, a common soil-borne disease in cut flower crops. One particular Herbie product (14.3) halved the level of infestation when used with a starter culture, however the disease was not eliminated. A further trial, this time at winter temperatures, using Herbie 14.3 at a higher rate however did not give significant control.

The Foamstream system designed for weed control on hard surfaces consists of a lance which delivers water at 90ºC with additives that create a heat-retaining foam. It has potential for sterilisation so in this experiment it was tested for efficacy against matting inoculated with Pythium and Fusarium and roots with a natural Pythium and Phytophthora infection. It effectively killed Pythium and Phytophthora and checked Fusarium. A subsequent trial on Fusarium infected matting confirmed that mycelium was killed initially but the infection returned probably following germination of resting spores. It is proposed that a two treatment approach could be particularly efficacious for Fusarium control, with an initial Foamstream treatment followed by a disinfectant or a further Foamstream treatment. Tests on different plastics and capillary matting commonly used on nurseries did not show any damage from a two second exposure.

Work planned for 2016

The work planned for 2016 is summarised in Table 3. It should be noted that these will not be straight pesticide screening trial but will use the novel pesticides in programmes or integrated with biological control agents.

Table 3. Overview of experiments

Target	**Test crop**
Powdery mildew	Aster (Ampelomyces study)
Powdery mildew	Aster
Aphid (melon and cotton)	Hebe
Western Flower Thrips	Verbena

The future after MOPS

It is important that work to develop new pesticides for ornamental plant production continues after the MOPS project is completed and that no momentum is lost. At present it is planned that work on ornamentals will be included in Crop Protection programmes.