Grower Summary

HNS 180

Development of fungicide treatments for sustainable control of powdery mildew on rose and herbaceous crops

Annual Report 2011

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

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Further information

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

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Headline

- New fungicides were tested for the control of powdery mildew on *Aquilegia, Aster, Phlox* and rose.

- Cyflamid, Flexity, Fortress, Nativo 75WG, Nimrod, potassium bicarbonate + Silwet L-77, Signum, Switch, Systhane 20EW and Thiovit Jet all gave good control on one or more crops.

Background and expected deliverables

Powdery mildews of rose and herbaceous perennials are widespread, common and potentially very damaging diseases. Whilst fungicides still remain the primary method of control the efficacy of individual fungicides against powdery mildew diseases on different crops is likely to vary.

Work in project HNS 156 identified new fungicides with good activity against powdery mildew on seedling crops of *Crataegus* (*Podosphaera clandestina*) and *Quercus* (*Erysiphe alphitoides*) and devised long-term programmes for their use.

The overall aim of this project was to devise fungicide programmes based on currently available products that provide sustainable, season-long control of powdery mildew on *Rosa* and some susceptible herbaceous crop species.

Summary of the project and main conclusions

Control of overwintered mildew on rose

The efficacy of nine fungicides applied around bud burst were compared for the control of powdery mildew (*Podosphaera pannosa*) on outdoor container-grown rose cv. Ruby Wishes that had not been cut-back from the previous season. Powdery mildew was first observed on 9 June 2010, 8 weeks after the second spray application, when it affected young leaves, buds and stems on a few plants, though none on untreated plants; it was concluded that these differences were due to chance. By 23 June, powdery mildew affected 35-60% of plants and covered 0.6 – 10.3% of the leaf area. None of the treatments reduced the disease compared with untreated plants.

It was concluded that overwintering infection was unlikely to be the primary source of mildew on plants in this experiment, and consequently no conclusions could be drawn on the relative effectiveness of different products in controlling overwintered mildew.

Evaluation of fungicides for control of rose powdery mildew

Twelve fungicide or biofungicide treatments were compared for control of powdery mildew on container-grown rose cv. Ruby Wishes in a shade tunnel on a nursery in Norfolk. Treatments were applied as high volume sprays from 22 April to 6 July 2010 at approximately 14 day intervals.

Powdery mildew was first observed on 9 June, shortly after the third spray application, and increased to affect 23% of leaflets and 2.2% of the leaf area on untreated plants by the end of the experiment. Disease severity was significantly reduced by all treatments with no clear difference between them: Kindred (meptyldinocap), Nativo 75WG, Nimrod (bupirimate), potassium bicarbonate + Silwet L-77, potassium bicarbonate + Serenade ASO (B*acillus subtilis*), Serenade ASO, Signum, Switch, Systhane 20EW (myclobutanil) and three coded experimental products (GF-1985, GF-2190 and GF-1326).

The incidence of affected leaflets on 9 June was reduced by all treatments except for Serenade ASO and potassium bicarbonate + Serenade ASO; the incidence of affected flowers on 6/8 July was reduced by all treatments except for the same two treatments and one coded product (GF-1985). It should be noted, that the advised spray interval for Serenada ASO is 7 days, whereas the spray interval used within this evaluation was 14 days. None of the treatments caused crop damage or left an obvious spray deposit.

Evaluation of fungicides for control of powdery mildew on *Aquilegia* and *Phlox*

Eleven fungicide treatments were compared for the control of powdery mildew (*Erysiphe aquilegiae* and *Podosphaera fusca*) on container-grown *Aquilegia* cv. Red Hobbit and *Phlox* cv. Blue Paradise on a nursery in Norfolk. Five high volume sprays were applied at approximately 14 day intervals from 20 July to 20 September 2010. Powdery mildew was first observed, on both crops, on 25 August, one week after the third spray.

On *Aquilegia* powdery mildew increased to affect 40% of untreated plants and all treatments reduced disease incidence to 10% or less. No powdery mildew was found on plants treated

with Cyflamid, Nativo 75WG, Signum or Thiovit Jet + wetter. Disease severity was low and there were no clear differences between treatments.

On *Phlox* powdery mildew was severe and by 7 October affected 70% of the leaf area of untreated plants. The best treatments were Cyflamid, Nativo 75WG, potassium bicarbonate + Silwet L-77, Signum and Thiovit Jet + wetter, all of which reduced the disease to less than 7% leaf area affected. The biofungicide Serenade ASO reduced mildew severity by 50% and treatment may have been more effective if applied weekly. Potassium bicarbonate was significantly more effective when used with a silicon based wetter (1% leaf area affected) than with Serenade ASO (8%).

No leaf scorch or other obvious adverse effects were observed immediately after treatments. However, after five sprays had been applied, the mean height of *Phlox* plants was reduced from 29 cm to 25-26 cm by Fortress, Nativo 75WG and both of the potassium bicarbonate treatments. Thiovit Jet + wetter left an obvious pale brown spray deposit on both *Aquilegia* and *Phlox*.

Evaluation of fungicides for control of established powdery mildew on *Aster*

Nine fungicide treatments were compared for control of established powdery mildew (*Golvinomyces cichoracearum*) on container-grown *Aster* at ADAS Boxworth. Each treatment was applied twice as high volume sprays at a 7 day interval in October 2010. Seven days after the second treatment the leaf area affected by powdery mildew was greatest on untreated plants (37%) and was significantly reduced by all treatments (Cyflamid, Flexity, Fortress, Nativo 75WG, potassium bicarbonate + Silwet L-77, Systhane 20EW, Signum, Swift SC and Switch). Potassium bicarbonate + Silwet L-77 was the most effective, reducing powdery mildew (11%).

Summary of results obtained in 2010

The relative efficacy of products examined in the three experiments done in 2010 is summarised in Table 1. Details of products used and their approval status are given in Table 2.

Table 1. Summary of fungicide and biofungicide efficacy against powdery mildew diseases on *Aquilegia, Phlox* and *Rosa* – 2010

Product	Fungicide group codes	Level of powdery mildew control[a] on:		
		Aquilegia	*Phlox*	*Rosa*
Cyflamid	U6	*****	*****	-
Flexity	U8	****	*****	-
Fortress	13	****	*****	-
Kindred	29	-	-	****
Nativo 75WG	3+11	*****	*****	*****
Nimrod		-	-	*****
Potassium bicarbonate + Silwet L-77	NC	*****	*****	*****
Potassium bicarbonate + Serenade ASO	NC	*****	**	***
Serenade ASO	NC	*****	**	****
Signum	7+11	*****	*****	*****
Switch	9+12	***	****	****
Systhane 20EW	3	*****	****	*****
Thiovit Jet + wetter	M2	*****	*****	-
Disease level on untreated		40% plants affected (all at low level)	70% leaf area affected	21% leaflets affected (all at low level)

[a] Disease reduced by: *, 1-20%; **, 21-40%, ***, 41-60%, ****, 61-80%; *******,** 81-100%, - not tested.

Products were applied as protectant sprays approximately every 14 days.

Fungicide group codes are taken from the Fungicide Resistance Action Committee code list. Numbers and letters are used to distinguish fungicide groups according to their cross-resistance behaviour; products with the same number are at high risk of cross-resistance. U =unknown mode of action; m=multisite inhibitor (low risk of resistance); NC = not classified.

Table 2. Details of fungicide and biofungicide products used in this work and their approval status

Product	Active ingredient(s)	Rate used	Approval status on ornamentals:		Maximum number sprays or total dose
			Outdoor	Protected	
Cyflamid	cyflufenamid	0.5 L/ha	SOLA 0512/07	Not approved	2
Flexity	metrafenone	0.5 L/ha	SOLA 2850/08	Not approved	0.5 L/ha
Fortress	quinoxyfen	0.25 L/ha	SOLA 2852/08	SOLA 2852/08	2
Kindred	meptyldinocap	0.6 ml/L	Not approved	Not approved	Not applicable
Nativo 75WG	tebuconazole + trifloxystrobin	0.4 g/L	LTAEU	Not approved	2
Nimrod	bupirimate	0.38 ml/L	Label (rose) and LTAEU	Label (rose) and LTAEU	none
Potassium bicarbonate + Silwet L-77	$KHCO_3$ + wetter	10 g/L + 0.025%	Commodity substance	Commodity substance	60 kg/ha
Potassium bicarbonate + Serenade ASO	$KHCO_3$ + *B. subtilis*	10 g/L +	Commodity substance + 0246/09	Commodity substance + 0246/09	60 kg/ha + 7
Potassium bicarbonate + Systhane 20EW	$KHCO_3$ + myclobutanil	10 g/L + 0.3 ml/L	Commodity substance + label	Commodity substance +label	60 kg/ha + none stated
Serenade ASO	*Bacillus subtilis*	10 ml/L	SOLA 0246/09	SOLA 0246/09	7
Signum	boscalid + pyraclostrobin	1.35 g/L	SOLA 1842/09	SOLA 1842/09	2
Swift SC	trifloxystrobin	0.5 ml/L	2882/08	Not approved	2
Switch	cyprodinil + fludioxonil	1 g/L	Label	Label	3
Systhane 20EW	myclobutanil	0.3 ml/L	Label	Label	None stated
Thiovit Jet + non-ionic wetter	sulphur	10 kg/ha	LTAEU	LTAEU	None stated

Treatments not approved were used under an Experimental Permit; many of the products have a maximum number of applications per crop; where we used a greater number this was done under an Experimental Permit.

Treatments rates are based on a spray volume of 1,000 L/ha.

LTAEU - Long Term Arrangements for Extension of Use. Nimrod is currently permitted on ornamentals other than rose under the LTAEU.

Where a product is used under the LTAEU or a SOLA, growers should read and observe all the restrictions; use under a SOLA or the LTAEU is at the grower's own risk.

Financial benefits

Each year powdery mildews affect many species of hardy nursery stock and herbaceous perennials. The diseases they cause may be slight or, in some situations, if left untreated, may cause severe economic losses. They impair photosynthesis, stunt growth and can cause premature leaf fall. They generally do not kill their hosts but extensive white fungal growth on leaf, stem and flower surfaces make plants unsightly, and thus either unsaleable or of reduced quality. Severe damage can cause death of leaves and shoots. Although numerous fungicides are available for powdery mildew control, weekly applications may be needed to maintain adequate control. The potential financial benefits to growers from this project are more reliable control of powdery mildew with reduced risk of fungicide resistance, and reduced losses and down-grading of crops due to powdery mildew.

Action points for growers

- Powdery mildew are 'high risk pathogens' with regard to resistance management. Therefore, use fungicides from a range of different fungicide groups when devising a spray programme for control of powdery mildew (see Table 1).

- Seek to include in the spray programme one or more fungicides which are at low risk of selecting resistant strains; such products include potassium bicarbonate mixed with a silicon-based wetter and Thiovit Jet mixed with a wetter.

- A wide range of fungicides were found to provide good control of powdery mildew on rose and are currently permitted for use on the outdoor crop: Nativo 75WG, Nimrod, Potassium bicarbonate + Silwet L-77, Signum, Switch and Systhane 20EW; the biofungicide Serenade ASO also gave control.

- A wide range of fungicides were found to provide good control of powdery mildew on *Aquilegia* and *Phlox* and are currently permitted for use on outdoor ornamental crops: Cyflamid, Flexity, Fortress, Nativo 75WG, potassium bicarbonate + Silwet L-77, Signum, Switch, Systhane 20EW, Thiovit Jet + wetter; the biofungicide Serenade ASO gave good control on *Aquilegia* and moderate control on *Phlox* where the disease was more severe.

- When using potassium bicarbonate to control powdery mildew, mixing it with a silicon based wetter is likely to improve control.

- The biofungicide Serenade ASO applied every 14 days can give some control of powdery mildew, though generally it is less effective than conventional mildew fungicides applied at the same spray interval.

- Note that Fortress at 0.25 L/ha, Nativo 75WG at 0.4 kg/ha and potassium bicarbonate at 10 g/L can reduce plant height. This effect is most likely to occur when these products are used on young plants and after several applications.