Grower Summary

FV 391

Carrots: Improving the management & control of cavity spot

Annual 2013

Disclaimer

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.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Project Number:	FV 391
Project Title:	Carrots: Improving the management & control of cavity spot
Project Leader:	Dr P Gladders
Contractor:	ADAS UK Ltd
Industry Representative:	Mr Keith Mawer, Strawson Ltd,
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Headline

- SL567A (metalaxyl-M) remained the most effective treatment, though cavity spot control was only achieved in one of the two field experiments.
- Limex incorporated before sowing also gave control of cavity spot at one of the sites.
- The novel/experimental fungicide products were not effective at standard 'blight' rates and higher doses will be evaluated in 2013.

Background

Carrot cavity spot remains one of the most important diseases of carrots (Koike *et al.*, 2007), still capable of causing complete loss in parts or even whole crops. Financial losses are particularly high when overwintered crops are lost. Current management of the disease relies on use of partially resistant or tolerant varieties and metalaxyl-M fungicide treatment early in the life of the crop. Recent HDC projects (FV 353, CP 46) have improved understanding of the pathogen and indicate that the main causal organism, *Pythium violae,* is able to utilise a wide range of crop and weed hosts. Whilst long rotations (e.g. one in six) benefit carrot production by reducing the risk of damage from various pests and pathogens, they are not very effective for preventing cavity spot.

Disease development is strongly influenced by rainfall (soil moisture) and some quantitative data based on irrigation experiments is now available from FV 353. Whilst this helps to explain variation in disease development, weather conditions are outside growers' control so fungicide treatment remains the main tool that growers can use to counteract infection triggered by rainfall events. Metalaxyl-M has served the industry well for many years though its efficacy has been affected by enhanced degradation at some sites. As the industry is dependent on a single fungicide with a single site and mode of action, the sustainability of this treatment is a major concern though fortunately, to date, resistance to metalaxyl-M has not been detected in the *P. violae* population. The extent to which fields in carrot production are currently affected by enhanced degradation is unknown. A soil test would be of interest to growers as a chargeable service if enhanced soil degradation can be shown to affect field performance of metalaxyl-M.

New fungicide active ingredients, particularly those used for potato late blight (*Phytophthora infestans*) or downy mildew (e.g. *Plasmopara viticola* in vines) are candidates for cavity spot control. Screening of new products (of mainly strobilurin chemistry) was last reported in 2001 in FV 5f (Pettitt *et al*., 2001). New candidate active ingredients and products are available from Bayer CropScience, BASF and other companies. Treatment impacts on *Pythium violae* were appraised during the growing season using quantitative PCR and methodology developed in FV 353. Measures of pathogen activity in relation to treatments were undertaken in collaboration with Dr D Barbara[1] and colleagues at the University of Warwick.

There are also opportunities to evaluate non-fungicidal treatments including biological control agents (bacterial and fungal products are available), soil amendments and calcium treatments. The latter provided some useful activity in pot and field tests in FV 5f and have been used successfully against clubroot (*Plasmodiophora brassicae*) in vegetable Brassicas (Defra project HH3227TFV); clubroot control using novel and sustainable methods; and HGCA work on oilseed rape (RD-2007-3373). Calcium applications can be made immediately prior to sowing (e.g. as Limex or Perlka). The effects of calcium are complex, extending beyond changes in soil pH to modification of soil microflora and direct effects on the host plant. Previously, Scaife *et al.* (1983) reported decreased incidence of cavity spot when soil exchangeable calcium exceeded 8 milliequivalents per 100 g soil. Also, it is known that *Pythium* spp. in general prefer an acid pH.

The use of varieties with resistance to cavity spot is well established in the industry. Resistance is incomplete and therefore additional control measures, particularly fungicides are still used. Whilst fungicide evaluation will be undertaken on more susceptible varieties, the benefits on the most resistant varieties should also be established. It may be possible, in future, to refine at field level the range of measures that are required to control cavity spot.

The overall aim of this project is to improve the management and control of cavity spot. Specific objectives in Year 2 were:

1. To evaluate new fungicides and biological treatments with potential to control *Pythium* species in soil.
2. To establish optimum application rates and timings for the most promising new products.
3. To determine the contribution of pre-planting calcium applications for cavity spot control.
4. To determine the prevalence of enhanced degradation of metalaxyl-M in carrot growing areas.

Summary of the project and main conclusions

[1] Unfortunately, Dr Dez Barbara passed away during 2012 and he will be sadly missed by both the research community and the horticultural industry.

The second year of this project comprised two replicated field experiments (Retford, Notts, cv. Chantenay and STC, Cawood, Yorks, cv. Nantes type). The aim was to evaluate new fungicides and biological products and the testing of soils from carrot crops for enhanced degradation of metalaxyl-M. In addition, the effects of pre-sowing calcium treatments (such as Limex or Perlka) were investigated (Table 1).

In Year 1, cavity spot levels were low because of the dry spring conditions and no significant treatment differences in cavity spot incidence or yield were observed in the two field experiments. However, in 2012, in excess of 55% of roots were affected by disease at Retford and 64% at STC, which provided a severe test of the products.

The standard fungicide metalaxyl-M (SL567A) was the most effective fungicide at the Retford site where it gave 64% control. Disappointingly, none of the experimental fungicides applied at standard rates of application (for foliar disease) decreased soil-borne cavity spot incidence.

Table 1: Effects of novel fungicides, Limex and Perlka in comparison with SL567A on the incidence of cavity spot in 2012

	Timing 1	**Timing 2**	**Timing 3**	**Cavity spot incidence (%)**	
	Pre-drilling	**4–6 weeks after drilling**	**4–6 weeks after Timing 2**	**Retford**	**STC**
1	Untreated	Untreated	Untreated	55	65
	Standard	SL567A (1.3 L/ha)	-		
2				20	55
3		HDC F50	-	51	65
4		HDC F52		55	78
5	HDC F51	-	-	40	68
6		HDC F53		47	55
7		SL567A (0.65 L/ha)	SL567A (0.65 L/ha)	19	60
8		HDC F50	HDC F50	53	63
9		HDC F52	HDC F52	49	69
10	HDC F51	HDC F51		43	62
11		HDC F53	HDC F53	42	62
12	Limex 5 t/ha	-	-	48	68
13	Limex 10 t/ha	-	-	37	60
14	Limex 15 t/ha	-	-	34	60
15	Perlka 400 kg/ha	-	-	74	60
16	HDC F125	HDC F125	HDC F125 2	51	49
Fpr	-	-	-	<0.001	0.349
SED	-	-	-	9.5	9.28
LSD	-	-	-	19	18.64

At both sites, the calcium treatments (as Limex) showed trends for decreased cavity spot at the higher rates of application. At the Retford site, 15 t/ha of Limex was more effective than most of the foliar treatments apart from the SL567A control (Table 1). There were also significant effects on pH in the Limex treatments at the later assessments in both the STC and the Retford experiments, with a clearer rate effect at the later assessment. The higher Limex applications also increased available calcium. Perlka resulted in significantly higher cavity spot incidence than the untreated control at the Retford site.

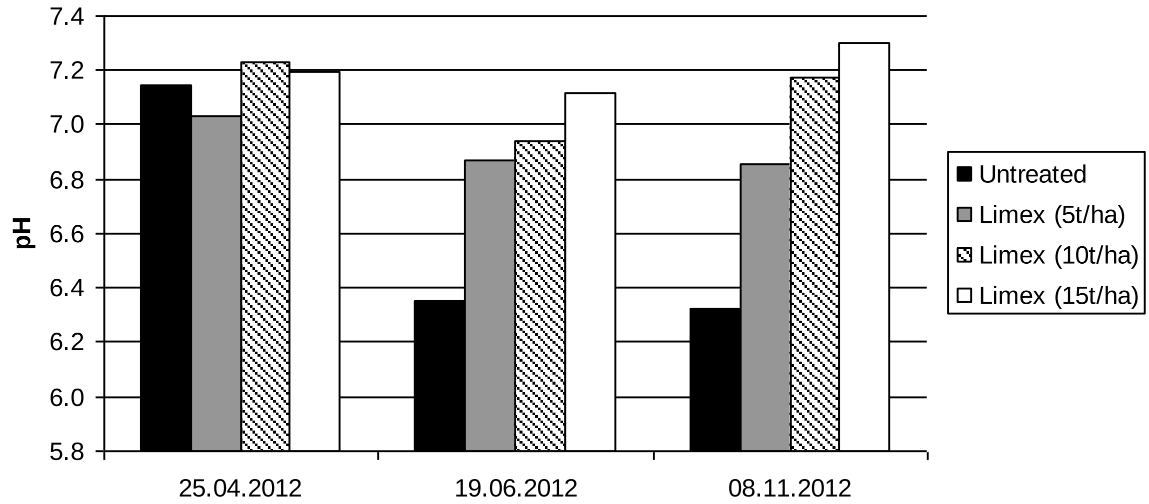

Figure 1: pH differences between treatments at the STC trial
25.04.2012: Fpr. 0.013; SED: 0.06; LSD: 0.12
19.06.2012: Fpr. 0.005; SED: 0.16; LSD: 0.09
08.11.2012: Fpr. <0.001; SED: 0.36; LSD: 0.20

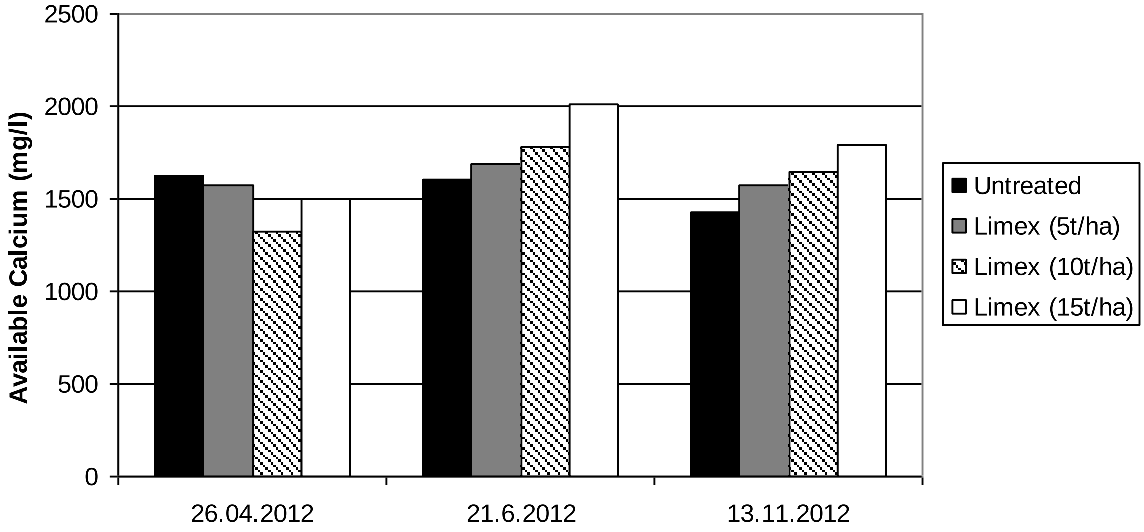

Figure 2: Available calcium at the STC site, in the untreated and Limex treatments
21.06.2012: Fpr: 0.541, SED: 208.4, LSD: 471.4
21.06.2012: Fpr: 0.005, SED: 86.3, LSD: 195.3
13.11.2012: Fpr: 0.243, SED: 165.8, LSD: 375.1

Tests for enhanced degradation of metalaxyl-M

Soils from 25 commercial carrot crops and the two fungicide experiments were tested for enhanced degradation of metalaxyl-M. In 2012, none of the soils sampled showed very rapid degradation (half-life less than ten days) compared with 50% of samples from different fields in 2011. A total of nine soils had half-life values of between ten and thirteen days, and eleven soils had a half-life greater than 20 days. Metalaxyl-M treatments are likely to be more effective in soils with slower rates of degradation. The slower rates of degradation in 2012 may be due to effects on soil microbial populations in dry conditions that were evident up to the end of March 2012. The lack of cavity spot control at STC may be due to very wet conditions increasing the likelihood that the metalaxyl-M was washed out of the soil profile due to its high water solubility.

Financial benefits

There are currently no alternatives to SL567A as chemical control for carrot cavity spot. The financial benefits are likely to be greatest where the timing of fungicide application is optimised. This should be post-emergence to moist soil no later than six weeks after sowing.