Grower Summary

FV 391

Carrots: Improving the management & control of cavity spot

Annual 2012

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 & STC Research Foundation
Industry Representative:	Keith Mawer, Strawson Ltd
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Previous report/(s):	None
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Project Cost (total project cost):	£ 119,444

Headline

- Neither SL567A nor any of four novel fungicides, Limex or Perlka reduced cavity spot or increased yield in a dry spring.

- Limited evidence was found that metalaxyl-M half-life in soil diminishes with increasing pH.

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 pathogen *Pythium violae* is able to utilise a wide range of crop and weed hosts. Whilst long rotations (e.g. 1 in 6) benefit carrot production by reducing the risk of damage from various pests and pathogens, they are not very effective for 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 explain variation in disease development, weather conditions are outside grower 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 mode of action, the sustainability of this treatment is of major concern. 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*) are candidates for cavity spot control. Screening of new products (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* will be appraised during the growing season using quantitative PCR using methodology developed in FV 353. Measures of pathogen activity in relation to treatments will be undertaken in collaboration with Dr D Barbara 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; 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.

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 1 are:

- Carrot crops already being monitored for cavity spot in project FV 373 will be used to quantify the occurrence enhanced soil degradation.
- Initial screening and optimisation of dose and timing of new products will be investigated.
- The use of calcium applications (as Limex or Perlka) will be investigated top enable rates of application and effects on pH and available calcium on cavity spot to be determined.

Summary of the results and main conclusions

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

Cavity spot levels were low in 2012 because of the dry spring conditions and no significant treatment differences were observed on cavity spot incidence or yield in the two field experiments (Table 1). Neither the standard fungicide metalaxyl-M (SL567A) nor the other treatments decreased cavity spot at the STC, where 9% of carrots were affected in untreated plots. A soil test indicated this site did not give enhanced degradation of the fungicide. The dry season appears to have impaired fungicide activity and treatments probably work best when soils remain moist and *Pythium* spp. are active.

Table 1. Effects of novel fungicides, Limex and Perlka in comparison with SL567A on the incidence of cavity spot and yield -2011

	Timing 1 Pre-drilling	Timing 2 4-6 weeks after drilling	Timing 3 4-6 weeks after Timing 2	% roots with cavity spot		Yield (t/ha)	Yield (kg/ plot 2.7m^2)
				Retford	STC	Retford	STC
1	Untreated	Untreated	Untreated	0.5	9.3	68.6	22.7
2		SL567A (1.3 L/ha)	-	0.0	14.3	64.7	26.4
3		HDC F50	-	2.0	12.3	75.9	21.4
4		HDC F52		1.0	5.8	69.0	23.5
5	HDC F51	-	-	2.0	6.0	73.0	24.1
6		HDC F53		2.8	7.0	69.0	22.8
7		SL567A (0.65 L/ha)	SL567A (0.65 L/ha)	1.5	9.8	65.4	22.9
8		HDC F50	HDC F50	1.5	3.3	78.3	24.3
9		HDC F52	HDC F52	0.8	9.5	82.7	22.6
10	HDC F51	HDC F51		0.5	6.3	61.6	27.0
11		HDC F53	HDC F53	3.3	6.3	63.8	25.6
12	Limex 5 t/ha	-	-	1.3	13.5	74.0	20.7
13	Limex 10 t/ha	-	-	0.5	5.5	78.9	25.5
14	Limex 15 t/ha	-	-	0.3	6.5	85.2	27.2
15	Perlka 250 kg/ha	-	-	0.5	7.0	77.4	19.8

At both sites, the calcium treatments (as Limex) showed trends for decreased cavity spot and higher yields at the higher rates of application (Table 1). There were significant increases in soil pH and extractable calcium in June at the STC site, with the higher rates of Limex. These effects were not significant at the end of the experiment though positive trends remained (Table 2). Low levels of carrot scab were present at the Retford site, but this was unaffected by any of the test treatments including calcium applications.

Table 2. Soil pH and extractable calcium levels in relation to Limex treatments at STC - 2011

	Timing 1 Pre-drilling	Mean pH		Extractable Calcium (mg/L)		
		21 June	2 November	10 May	21 June	2 November
1	Untreated	6.2	7.0	1486	1778	1911
12	Limex 5 t/ha	6.5	7.3	1499	2009	2153
13	Limex 10 t/ha	6.8	7.5	1478	2301	2091
14	Limex 15 t/ha	6.9	7.2	1429	2323	2431

Tests for enhanced degradation of metalaxyl-M

Soil from 32 fields (including the two fungicide trial sites) was assessed for the persistence of metalaxyl-M in 2011. In 15 soils the half-life was less than the 10 days previously associated with control failure in 15 soils and in 12 soils was greater than 20 days. The remaining 5 soils fell between 10 and 20 days. Examples of fast and slow degrading soils are shown in Figure 1 and Figure 2 (respectively). More detailed results of soil tests will be presented in the HDC Cavity spot study project FV 373.

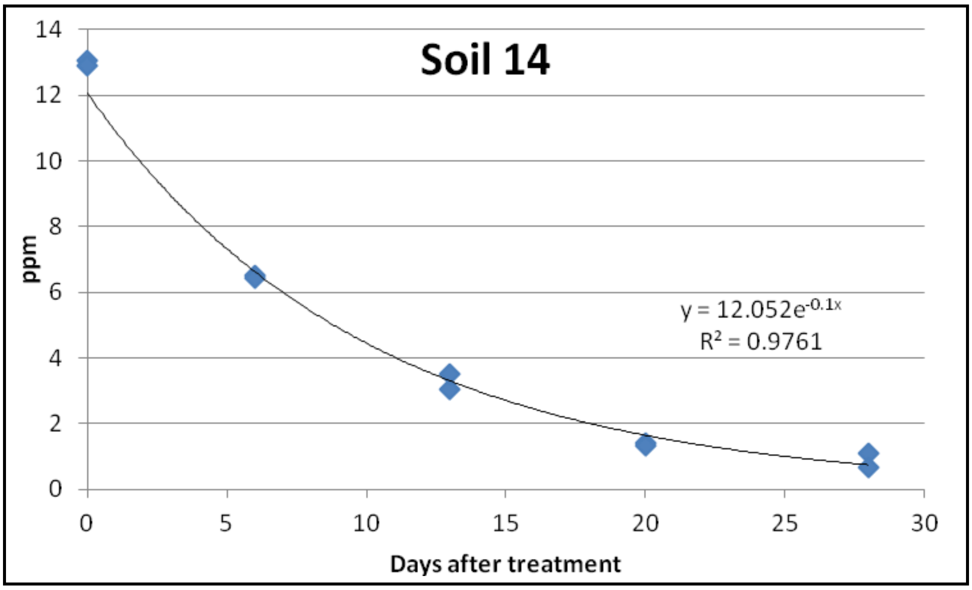

Figure 1. Example of plot of 'fast' degrading soil.

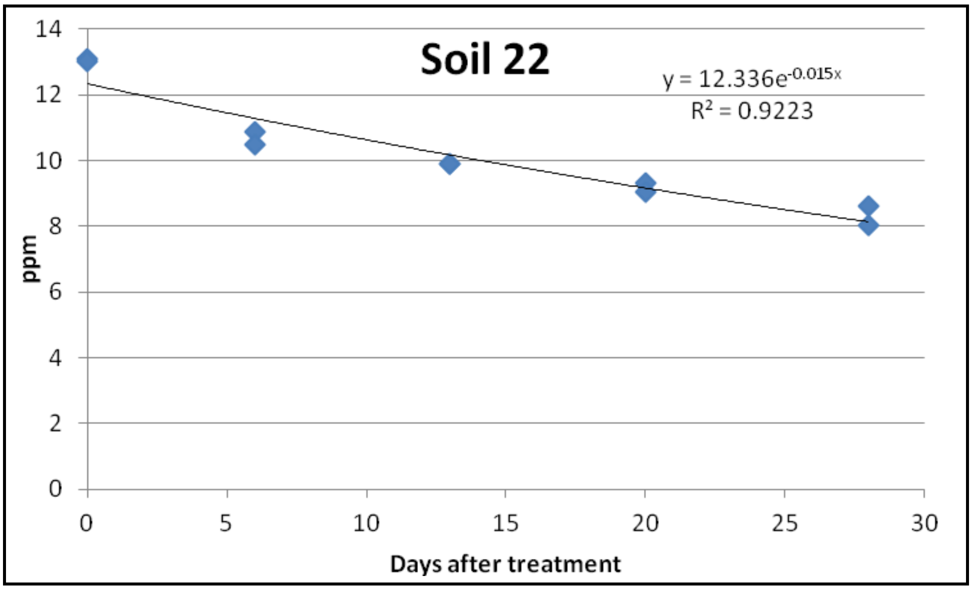

Figure 2. Example of plot of 'slow' degrading soil.

Half-lives of metalaxyl-M degradation were plotted against the measured soil pH (Figure 3) and also against soil organic content values. There was some evidence of correlation between half-life and pH with half-life appearing to diminish with increasing pH. The effect of organic matter was weak. Further examination of these relationships is required so that previous cropping, metalaxyl-M usage histories and weather factors can be taken into account.

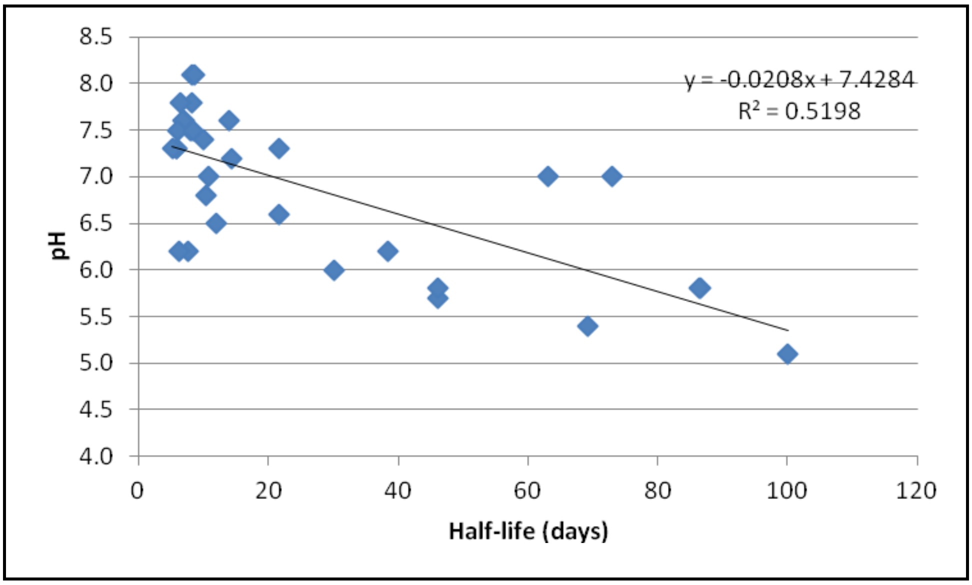

Figure 3. Relationship between Soil pH and metalaxyl-M half-life.

Financial benefits

There are no alternatives to SL567A as chemical control for carrot cavity spot. The financial benefits are likely to be greatest where the fungicide application timing is optimised. This should be post-emergence to moist soil no later than 6 weeks after sowing.

Action points for growers

- Growers need to interpret disease control with SL567A cautiously as poor control may be due to other factors (e.g. low rainfall) than enhanced degradation.

- Consider testing calcium treatments (e.g. Limex) for effect on cavity spot and yield; there were trends in this project for beneficial effects at higher rates of use.