



Agriculture & Horticulture  
DEVELOPMENT BOARD



# **Grower Summary**

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## **FV 373a**

Carrots: Incidence of cavity spot  
in commercial crops

Final 2014

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**Project Number:** FV 373a

**Project Title:** Carrots: Incidence of cavity spot in Commercial Crops

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### **Further information**

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# ***GROWER SUMMARY***

## **Headline**

In 2013, there was no correlation between water inputs, soil saturation, soil temperature and other field variables such as soil nutrient levels and the incidence or severity of cavity spot disease.

## **Background**

Cavity spot is a serious and recurring disease of commercial carrots in the UK but its occurrence is largely unpredictable. Current control systems rely on the use of a single soil applied fungicide treatment which is only partially successful and growers need improved methods of control.

Previous survey work in HDC FV373 of the incidence of cavity spot in commercial crops did not lead to significant correlations between any of the variables recorded and disease incidence or severity. The BCGA decided to extend the work for an additional year to determine if the additional data collected would help inform of the factors which lead to disease in carrot crops.

## **Summary**

The workplan in 2013 was a direct replicate of the work undertaken in the three year period 2010 to 2012. Twenty nine commercial carrot production sites provided by members of the BCGA and representative of the main carrot production areas of England and Scotland were monitored for total water input (precipitation and irrigation), soil moisture and soil temperature. In addition one experimental site 'Cottage Field' at HRI Warwick known to be a high risk site was also monitored. At each site the incidence and severity of cavity spot disease was established by sampling prior to harvest and relationships were sought between the recorded site conditions and the development of disease.

At each site an automatic soil moisture station was installed in a representative area of the field. This consisted of a remote transmission unit (RTU) and SIM set up to log all data and communicate via the GPRS network together with an automatic tipping bucket total water input sensor (resolution 0.2mm per tip) and soil moisture (SM) probe. The SM probe

consisted of a sealed tube containing capacitance sensors at 100, 200 and 300mm depths and an integrated temperature sensor at the middle level to record soil temperature values.

The station recorded the total water input (precipitation plus irrigation), soil temperature (degrees C) and soil moisture (% soil moisture at 3 levels).

Data was collected continuously from all of the RTUs from the time of installation (normally at the early establishment stage) to just prior to harvest of the crop or just prior to strawing down for late lifted crops. The resultant data file was converted to hourly values and then to daily summaries for analysis.

Periods when the soil was saturated were calculated and used in the analysis of correlations. The 10mm crown crop stage was also recorded and for those sites where accurate records were not available this crop stage was estimated by using a weather model using local weather data.

2013 started with an exceptionally cold spring which was followed by the warmest summer since 2006. The most notable weather of the summer was a prolonged warm period from 3 to 22 July, when high pressure was established across the UK. Overall for the UK was drier than the long-term with 78% average rainfall and it was the driest summer since 2003. Parts of southern and south-west England and East Anglia received less than half the average rainfall. Nevertheless, there were some notably wet days, particularly in July and August, with localised heavy downpours. The year ended with a stormy outlook and the late autumn and winter proved exceptionally wet for the south and south west of England.

Crops were sampled when mature and before commercial harvesting or strawing. At each site samples were collected and washed to reveal any cavity spot lesions. Each sample was recorded for the incidence of disease lesions (% roots affected) and the severity of the disease (scale 1 to 5)

**Table 1** Summary of Incidence % and Severity (1 to 5) of Cavity Spot disease in the 2013 BCGA field study.

ID	Site 2013	date sown	date 10mm crown	% Incidence	1 to 5 Severity
1	HRIW Cottage CS Trial	03/06/2013	20/08/2013	0.5	0.5
2	SF Old School House	20/03/2013	16/06/2013	3.3	1.0
3	TBG Foxhall	28/05/2013	10/08/2013	0.0	0.0
4	TBG Kenny Hill	05/06/2013	20/08/2013	0.0	0.0
5	HPF Holme	22/04/2013	12/07/2013	0.7	1.0
6	HPF Waplinton	30/05/2013	14/08/2013	0.0	0.0
7	HG Barnby Moor	05/05/2013	23/07/2013	1.3	0.8
8	HG Apley Head	11/06/2013	29/08/2013	0.0	0.0
9	TP Thoresby	22/04/2013	12/07/2013	0.7	0.7
10	KPL Ladybank	27/04/2013	14/07/2013	3.0	1.0
11	KPL Kirkforthar	28/04/2013	15/07/2013	2.0	0.3
12	KPL Edenwood	26/04/2013	13/07/2013	5.0	1.0
13	SL Holton	12/05/2013	29/07/2013	3.7	1.7
14	SL Blyth	22/05/2013	06/08/2013	0.0	0.0
15	SL Walesby	01/05/2013	18/07/2013	0.3	0.3
16	MHP Kellington	29/04/2013	17/07/2013	40.7	4.3
17	FG Haywood Oaks	21/05/2013	05/08/2013	0.0	0.0
18	FG Bilsthorpe	05/05/2013	23/07/2013	6.3	1.2
19	HF Cockey Hill	17/04/2013	07/07/2013	14.0	3.0
20	Mols New Cut Lane	23/04/2013	04/07/2013	16.0	4.0
21	Mols Carr Moss Lane	03/05/2013	10/07/2013	28.7	4.5
22	Wils Knowsley	03/06/2013	06/08/2013	0.0	0.0
23	AB Red Lodge	13/05/2013	28/07/2013	1.0	1.3
24	AB Burnham Deepdale	22/05/2013	03/08/2013	0.0	0.0
25	VCS Fos Ufford	22/04/2013	08/07/2013	0.0	0.0
26	VCS Gr Hilborough	14/05/2013	29/07/2013	0.0	0.0
27	VCS Gr Gooderstone	07/05/2013	22/07/2013	0.0	0.0
28	VCS Elveden	08/05/2013	23/07/2013	0.7	1.3
29	VCS PF Wormegay	18/05/2013	01/08/2013	0.7	0.3
30	VCS Caple St Andrew	01/05/2013	16/07/2013	4.0	2.7

The data in Table 1 shows a range of disease levels with occasional very high values of over 40% affected to more typical lower levels.

It might have been expected to have been a year of lower than average cavity spot due to dry summer conditions and this was certainly the case for the early part of the autumn when levels were low in studied crops and this was also the normal position in other commercial

crops. In 2013 the incidence of disease was around average for the study as a whole with 62% of crops affected but the severity of the infections was generally low. In other commercial crops growers reported some severe infections during the later autumn and winter periods especially in the midlands growing areas.

The results for all four years studies have shown the following:

1. In 2010 the data showed 53% sites with affected roots and an average severity score of 2.0
2. In 2011, cavity spot disease was recorded in 67% of sites. Of those sites which were affected the average score for disease severity was 1.1.
3. In 2012 cavity spot disease was recorded in 64% of sites. Of those sites which were affected the average score for disease severity was 1.2.
4. In 2013 cavity spot disease was recorded in 62% of sites. Of those sites which were affected the average score for disease severity was 1.0.

The tentative relationship which appeared in the first two years between the incidence of cavity spot and the total water inputs in July/August for maincrop carrots was not repeated in 2012 or in 2013. Although the correlation between total water inputs (precipitation plus irrigation) in August and disease remained positive in 2012 it dropped below a significant level and there were many anomalies.

It has not therefore been possible to conclude with any certainty that excessive water particularly in July/August accounts for the development of cavity spot in maincrop carrots.

There was no correlation between soil temperature and disease in any year.

Overall during the project span of 3 years we have found the following:

- There are indications that disease is related to water input and there may be a susceptible crop stage. Early water seems to suppress disease and later water increases it. However this apparent relationship does not occur with certainty and we have observed many anomalies throughout the study.

- We introduced a crop stage marker which is the 10mm crown stage and have used this crop stage to see if we could confirm that this represents the onset of any susceptibility to disease. We have been unable to confirm if this is the case.
- We have looked at degree of soil saturation and soil temperature with respect to disease and have not found any relationships.
- Factors of variety, pH, major soil nutrients, cropping history, and use of SL567A have not shown a consistent influence on the level of cavity spot disease in this study.

## **Financial Benefits**

It is not possible from this study to provide a series of firm guidelines for growers which will lead to defined financial benefits.

Indications of a sensitive period when excessive water inputs could lead to disease have been observed and growers have been urged to manage their irrigation with care during this period in an attempt to reduce the susceptibility of their crops to cavity spot disease. However we can conclude that this sensitivity exists only in certain seasons and our current knowledge does not allow us to predict which seasonal characteristics are involved.

## **Action Points**

Growers are urged to review their knowledge of cavity spot disease (see HDC Research update as Factsheet 06/13) and implement the main recommendations which are as follows:

- apply fungicides early in the season while ensuring total water input is greater than 15mm per week.
- for maincrop carrots, minimise total water input in August.