

# Grower Summary

---

**FV 446**

**Leeks: White tip control  
(Phytophthora porri)**

Annual report 2017

**Project title:** Leeks: White tip control (Phytophthora porri)

**Project number:** FV 446

**Project leader:** Erika F. Wedgwood, RSK ADAS Ltd.

**Report:** Annual report, March 2017

**Previous report:** None

**Key staff:** Angela Huckle, RSK ADAS  
Vasiliki Tzortzi, RSK ADAS  
ADAS Gleadthorpe scientific support

**Location of project:** ADAS Boxworth and field site (Notts)

**Industry Representative:** Charles Lightbown, Really Welsh Trading Company Ltd.  
Deeside Farm,  
Deeside Lane, Sealand,  
Flintshire,  
CH1 6BP

**Date project commenced:** 1 April 2016

**Date project completed** 31 May 2018  
**(or expected completion date):**

## DISCLAIMER

*While the Agriculture and Horticulture Development Board seeks to ensure that the information contained within this document is accurate at the time of printing, no warranty is given in respect thereof and, to the maximum extent permitted by law the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.*

*© Agriculture and Horticulture Development Board 2017. No part of this publication may be reproduced in any material form (including by photocopy or storage in any medium by electronic mean) or any copy or adaptation stored, published or distributed (by physical, electronic or other means) without prior permission in writing of the Agriculture and Horticulture Development Board, other than by reproduction in an unmodified form for the sole purpose of use as an information resource when the Agriculture and Horticulture Development Board or AHDB Horticulture is clearly acknowledged as the source, or in accordance with the provisions of the Copyright, Designs and Patents Act 1988. All rights reserved.*

*All other trademarks, logos and brand names contained in this publication are the trademarks of their respective holders. No rights are granted without the prior written permission of the relevant owners.*

*The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations*

## **GROWER SUMMARY**

### **Headline**

Varieties, soil treatments and a wide range of foliar fungicides were examined for their effect on White Tip control. At this stage, no treatment combinations were observed that could be used for effective disease management in the field.

### **Background**

Fungicide control of White Tip in leeks is limited by the number of approved foliar fungicide products and the number of applications permitted for each. Fungicide products for other oomycetes such as various downy mildews and potato blight could have potential for the treatment of *Phytophthora porri* on leeks and so require efficacy testing in order to increase the range of modes of action available to growers. Better targeting of the few applications permitted would be beneficial to the control of White Tip, as it is for potato blight, with published research indicating a link between heavy rainfall and the appearance of White Tip. Examination of weather data, and assessment of selected conditions which are correlated with leek infection is required to better understand disease incidence and the development of effective control methods.

Primary infection of the leek crop is through the splashing of *P. porri* resting spores (oospores) onto the leaves and in particular into the leaf sheaths which can remain moist for some time and therefore creating extended periods for white tip development. Oospores are released from infested plant debris, but although growers are aware of the need for crop rotation this is not always possible and so a method of soil treatment, pre-planting, would be beneficial. Chemical soil treatment options are very limited and expensive, but work elsewhere has shown reduction of oomycete activity following incorporation, separately, of two inexpensive waste products, Limex and Gypsum. Limex is already used by some growers to provide phosphate, magnesium and sulphur, while Gypsum (calcium sulphate dehydrate) has been applied in selected experiments for the reduction of *Phytophthora* root rots. Whether or not these products might be effective against *P. porri* oospores is not known.

There are indications that some leek varieties are more susceptible than others to White Tip, however comparison is needed of these alongside each other with a similar level of inoculum. Variety resistance is unlikely to give total disease control, however it is possible that the use of either a biostimulant, or a biofungicide with a mode of action including the stimulation of plant defence responses, could improve control.

It is likely that a combination of cultural and chemical measures will continue to be required by growers to reduce the incidence and severity of White Tip.

## Summary

In WP 1, to determine by inoculated test if there are differences in leek cultivar susceptibility to infection by *P. porri*, ten varieties were sown into modules in June 2016. Inoculation tests with breeding lines have shown physiological resistance exists in leeks whereby a hypersensitive response by the plant stops lesion development, and that infection “escape mechanisms” related to shank height may not be as relevant. The varieties were from five different breeding companies and included Triton and Lexton, selected because of known susceptibility to White Tip. Cultivars that have been reported by growers to appear to have a lower susceptibility to White Tip, Pluston and Lancaster, were chosen for the experimental work. Other commonly grown varieties (Mancurian, Curling, O96, Belton, Krypton and Longton) with unknown susceptibility were included following grower consultation. Plots of 10 plants were arranged in a randomised block design outdoors under overhead irrigation at ADAS Boxworth. They were inoculated in a leaf sheath with a suspension of *P. porri* zoospores in September and November 2016. The experiment was still running at the time of this report, but up until the end of January 2017 no statistically significant differences in either incidence (mean 10% of plants with White Tip) or severity (1% of leaf area, principally at the tips) had been seen, although it was noted that no leeks of cv. Mancurian had exhibited symptoms.

In work package (WP) 2 novel conventional fungicides, biological control products and elicitors which may be of benefit against *P. porri* were reviewed. A number of the fungicides reviewed which had potential for off-label approval for foliar application to leeks were put into the WP5 field trial, as AHDB coded products, and others will be included for use at propagation [WP3]. Information was included on the potential for fungicide resistance and biostimulant effect of products used in this project, whereby host defence mechanisms may be elicited.

In WP4, to determine by inoculated tests whether treatments applied to soil may lead to subsequent reduction in White Tip on the plants, treatments of Limex (a by-product of sugar beet processing, containing mainly phosphate, magnesium and sulphur) and Gypsum (calcium sulphate) were incorporated into containers of soil-based growing-media. A measure of control of other soil-borne oomycetes (*Pythium* sp. and *Phytophthora* spp., respectively) had been reported by these products. In June 2016, oospores of *P. porri* were artificially produced and inoculated onto growing-media that had been treated with the equivalent of 5 kg/ha of either product three days earlier. Ten 6 to 7 leaf (three month old) module-grown leek plants were transplanted into each container two days after inoculation. The potentially susceptible variety Triton was planted in half the containers and cv. Pandora in the other untreated, Limex and Gypsum treatments. The containers were arranged outdoors in

randomised blocks at ADAS Boxworth and subject to heavy droplets of irrigation twice daily in order to mimic the splashing of spores from the soil by rain up into the leaf sheaths as naturally would cause White Tip in crops. By September 2016, a mean 30% of the plants had developed White Tip with no significant difference following either the Limex or the Gypsum treatment. Triton and Pandora were also equally affected by the disease, with only a minimal (0.3%) leaf area affected per plant by September, and no further symptom development by mid-October.

In WP 6, a field trial was carried out in the east of the UK (Nottinghamshire) to evaluate foliar applied plant protection products against *P. porri*. A randomised block experiment was set up in a commercial crop of cv. Pluston sown on land with a recent history of White Tip. Products either in use, or pending registration, against *Phytophthora* spp. or downy mildews on other crops, and with potential for off-label registration on leeks, were selected. There were eight experimental products and two products approved on leeks; Invader (mancozeb + dimethomorph) and Infinito (fluopicolide + propamocarb). Two treatments remained untreated to give a total of 12 treatments with four replications. Each product was applied experimentally thrice in succession at timings when the weather was forecast to become wet and so favourable to White Tip infestation of plants by soil-splash of soil-borne spores. Applications were made using an Oxford precision knapsack sprayer at 400 L/ha on 7 September, 9 November 2016 and 6 February 2017 to the four-row beds, with 5 m plot lengths for assessment. First symptoms were seen in August 2016, but did not progress until January 2017. By 1 February virtually all the leeks had White Tip, with a mean 7.2% of leaf area affected per plant in the untreated plots, rising to 13.6% by 1 March 2017. No significant differences were found in the incidence or severity of White Tip between the untreated and treated plots, indicating that none of the products had protected the crop from infection. Weather data including rainfall were recorded using a station in the nearby field margin which relayed readings back to the researchers. These readings will be examined in WP 7 together with recordings to be produced in 2017/18 in order to explore the potential for weather-based disease forecasting to assist spray application timings.

Further work packages of assessing the use of products in propagation against White Tip (WP 3), and a second year of evaluating foliar fungicides (WP 5) but located in the west of England will be carried out in 2017/2018.

## Financial Benefits

Although leek white tip is a sporadic disease of mainly late crop leeks, when active it can cause very serious losses. Given a yield loss estimate of 7.5% this would equate to a financial ingress of £2.25 million annually for leeks were current fungicide control measures not able to be used. In a wetter than average winter the severe losses experienced late in the season can give losses of £3,250/ha when 50% of a crop is affected, (based on typical costs of production of such a crop of at least £6,500/ha).

## Action Points

- Be aware of any history of White Tip in fields being considered for leek planting
- If possible leave at least three years between leek crops
- Removal of infested leek debris/trimmings from fields should reduce the amount of resting spores which will be deposited in the soil from leaf lesions
- Although not proven in the current work, the selection of certain varieties has the possibility of reducing the level of White Tip infection in a crop
- Target foliar fungicide application to periods of forecast heavy rain as this is when infection is most likely to take place
- Be aware that because fungicide applications against White Tip infection can be months apart protection can be lost before an infection event, and so inspection for symptom development will still be needed
- Consider precision spray application onto patches of plants with White Tip
- Be aware that irrigation that splashes soil onto the crop is more likely to encourage White Tip development than lighter droplets, particularly if the leaves then remain wet for a prolonged period in which *P. porri* spores can penetrate the tissue
- Be aware that White Tip lesions are enlarged by secondary invasion of fungi and so consider fungicide application against them as well
- Be aware that there are other causes of white tipping on leeks - various stresses such as drought and scorching by wind, frost or chemicals, but that fresh *P. porri* lesions tend to be a brighter white, often with a wetter/softer appearance (which can cause leaf tip dangling) and tending to have a sharp boundary with green tissue rather than a progression of yellowing
- It may be prudent to lift leek crops with White Tip earlier than intended to reduce the need for trimming and also to curtail disease development and oospore production.