Leptosphaeria biglobosa inhibits the production of sirodesmin PL by *L. maculans*

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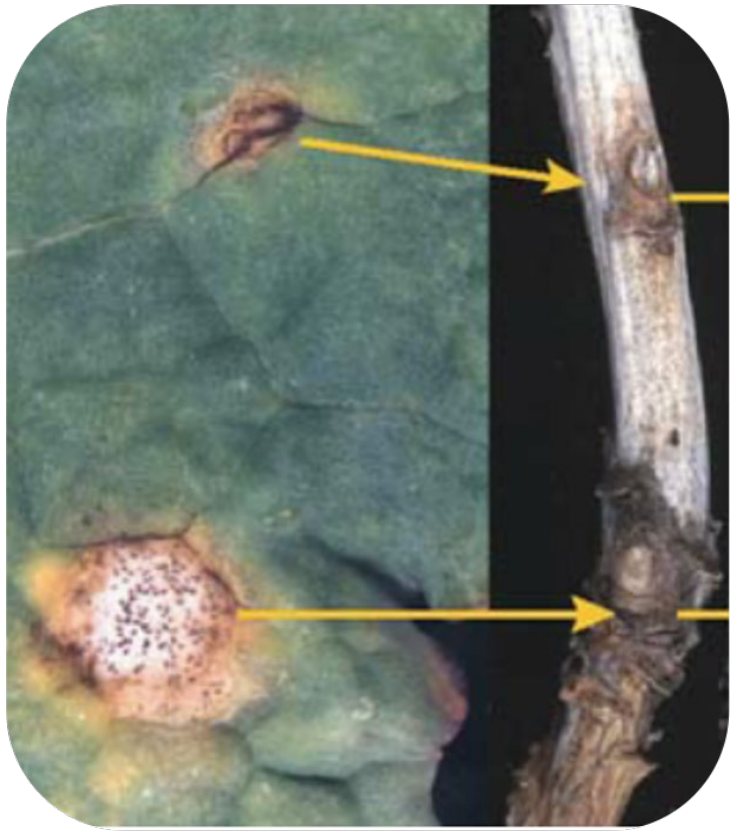
Phoma stem canker

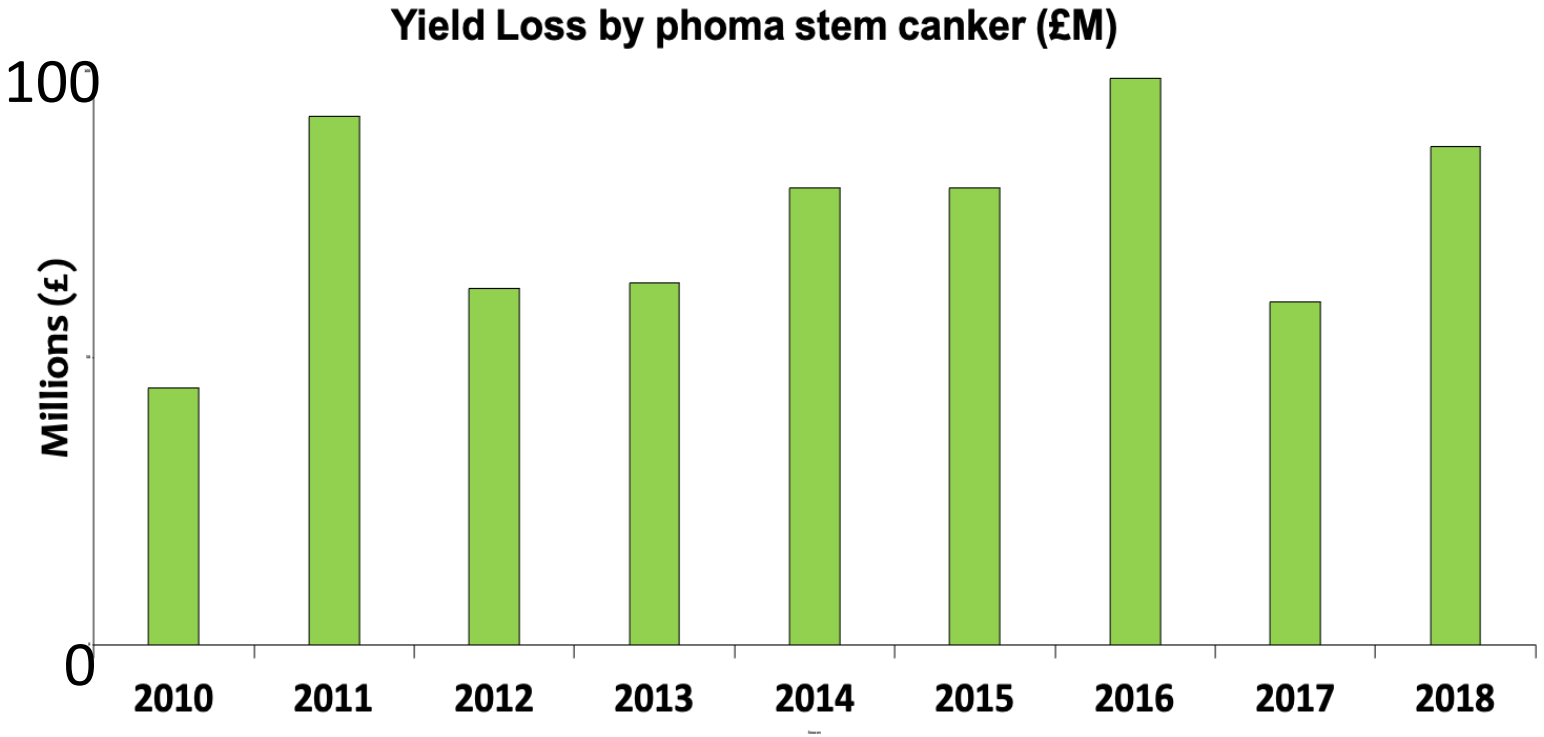
- Phoma stem canker is caused by two similar co-existing pathogens - *Leptosphaeria maculans* and *L. biglobosa*
- The difference in stem location has been suggested to be due to the differences in ascospore maturation
- However, this may be changing!!!
- *L. maculans* and *L. biglobosa* can be found in stem basal lesions



(Fitt et al. 2006)

Just a few phoma spots?

- Since the 2009/10 growing season, phoma stem canker has caused annual yield losses worth more than £74m on average in England and Wales

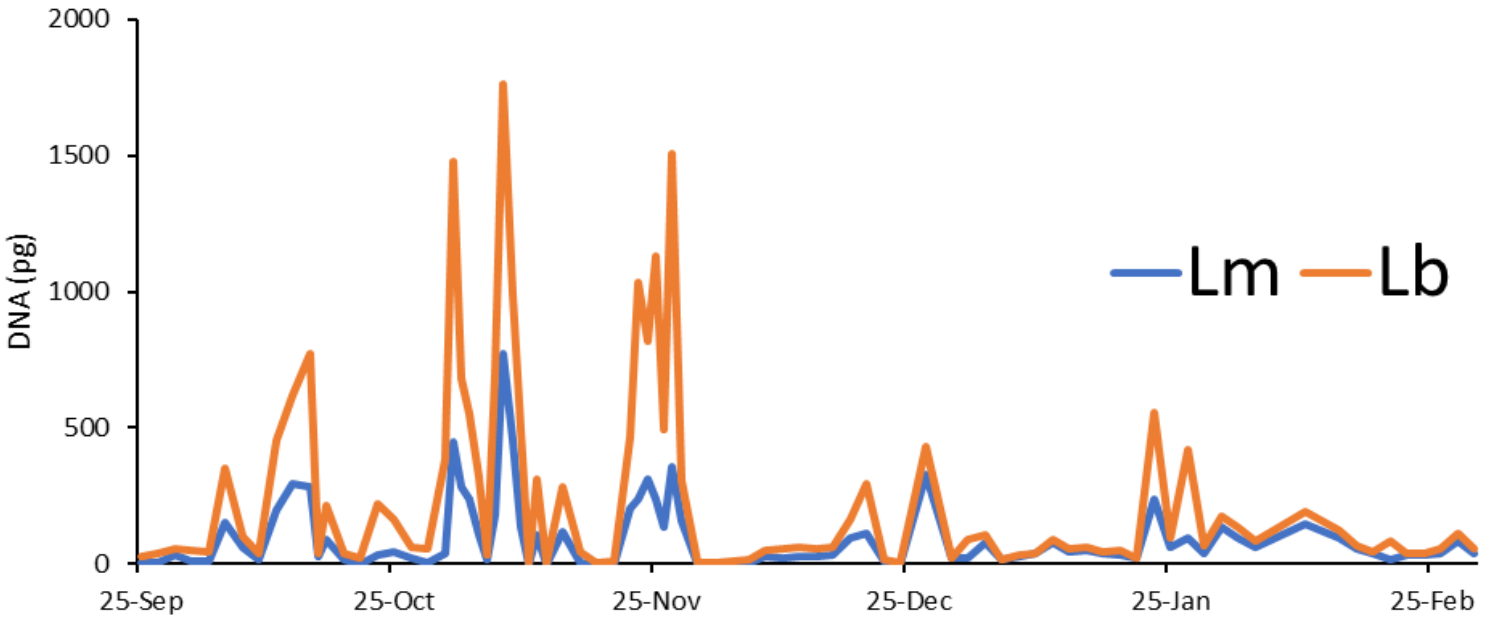


(CropMonitor, 2019)

- Despite growers using resistant cultivars and effective fungicides

Shifting of spores?

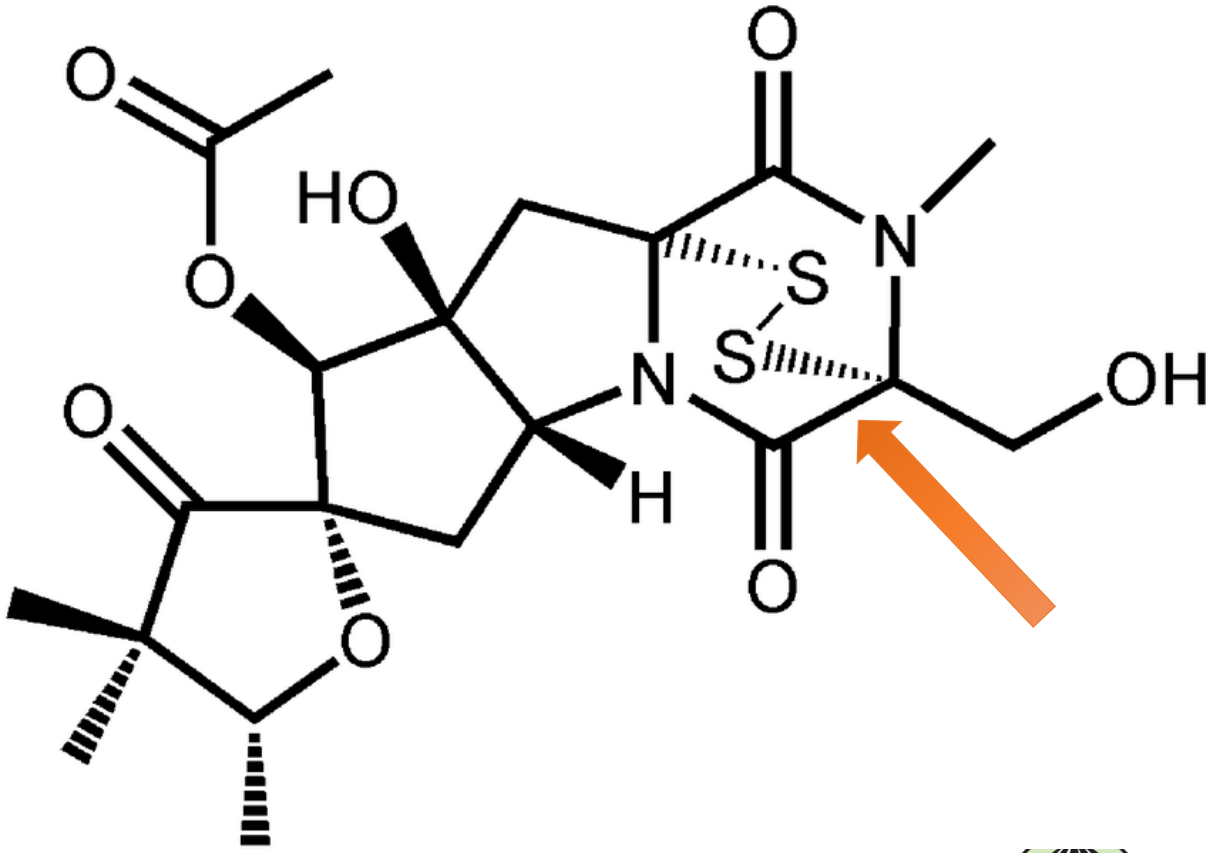
- Studies have shown that *L. biglobosa* ascospores were released later than *L. maculans*



- Recent studies using qPCR shown that ascospores of both species are can be released at similar times

Sirodesmin PL

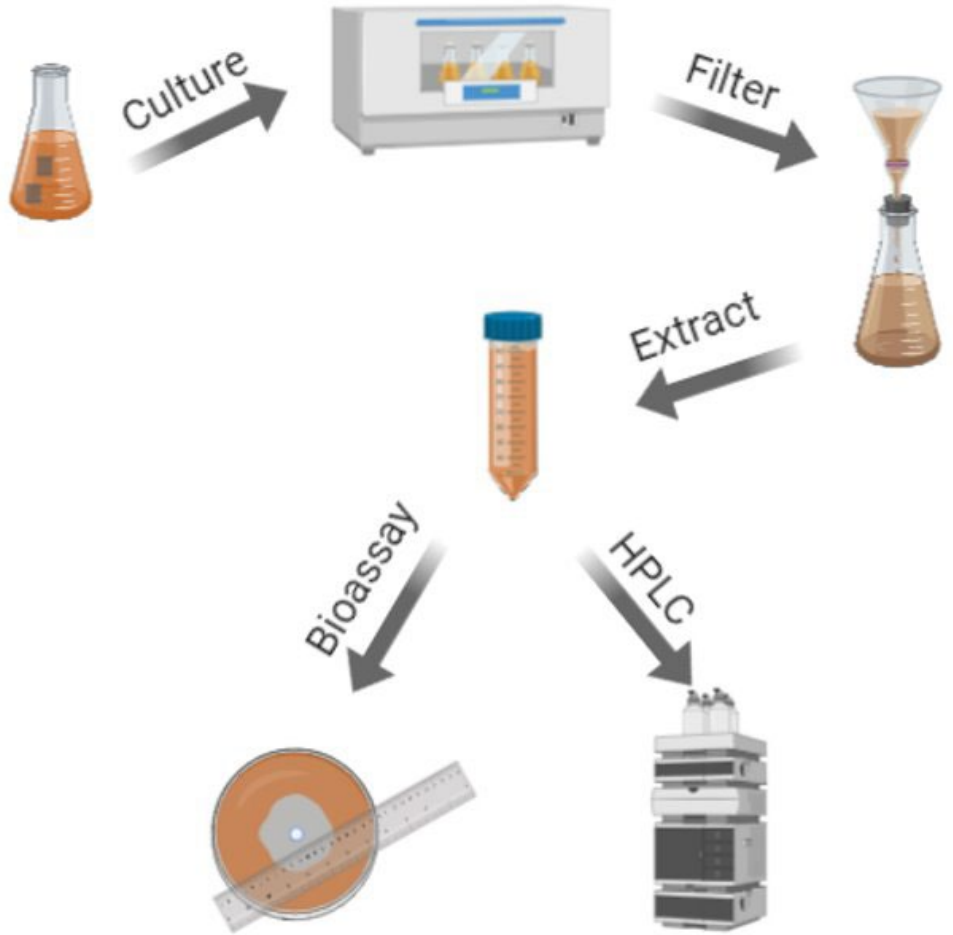
- *L. maculans* produces a non-host selective epipolythiodioxopiperazine (ETP) called Sirodesmin PL
- *L. biglobosa* does not
- Sirodesmin has an inhibitory effect on *L. biglobosa*



Aims of this study:

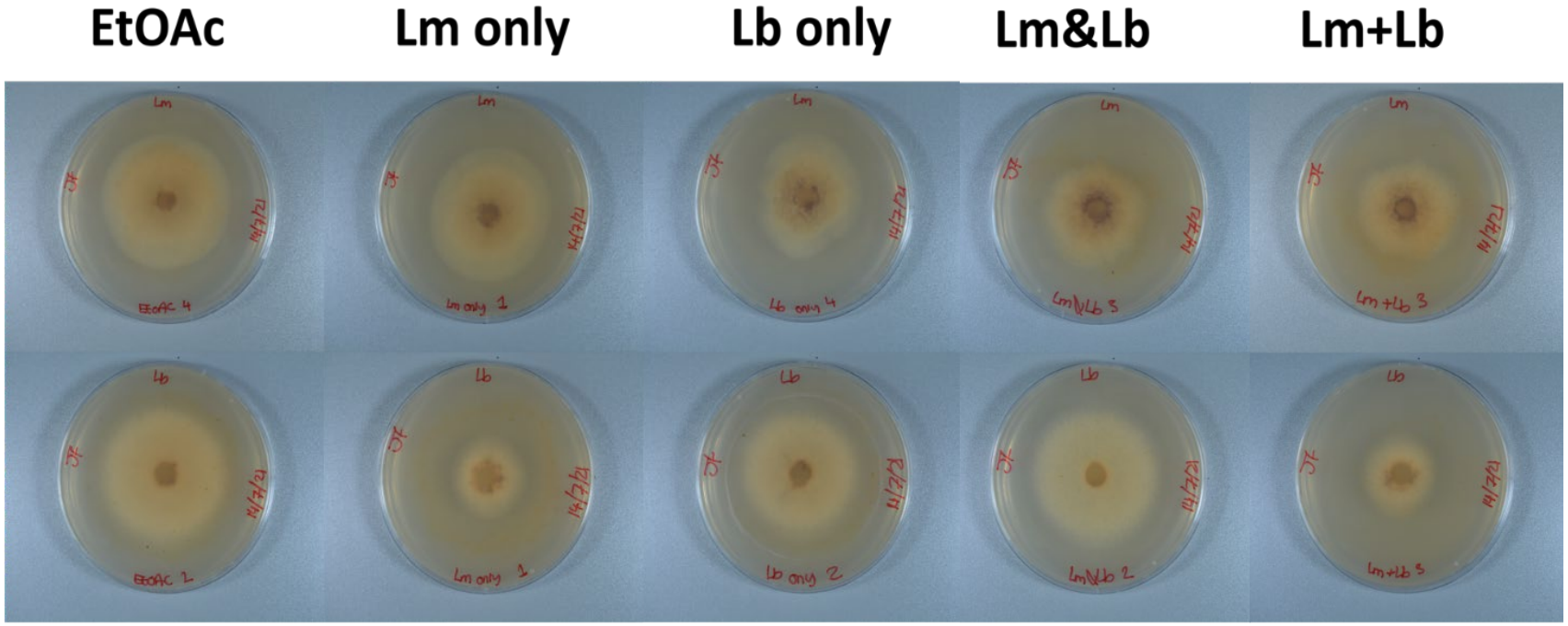
- Interactions between *L. maculans* and *L. biglobosa*
- Changes in phytotoxin production as a result of increased interspecific competition

In vitro methods



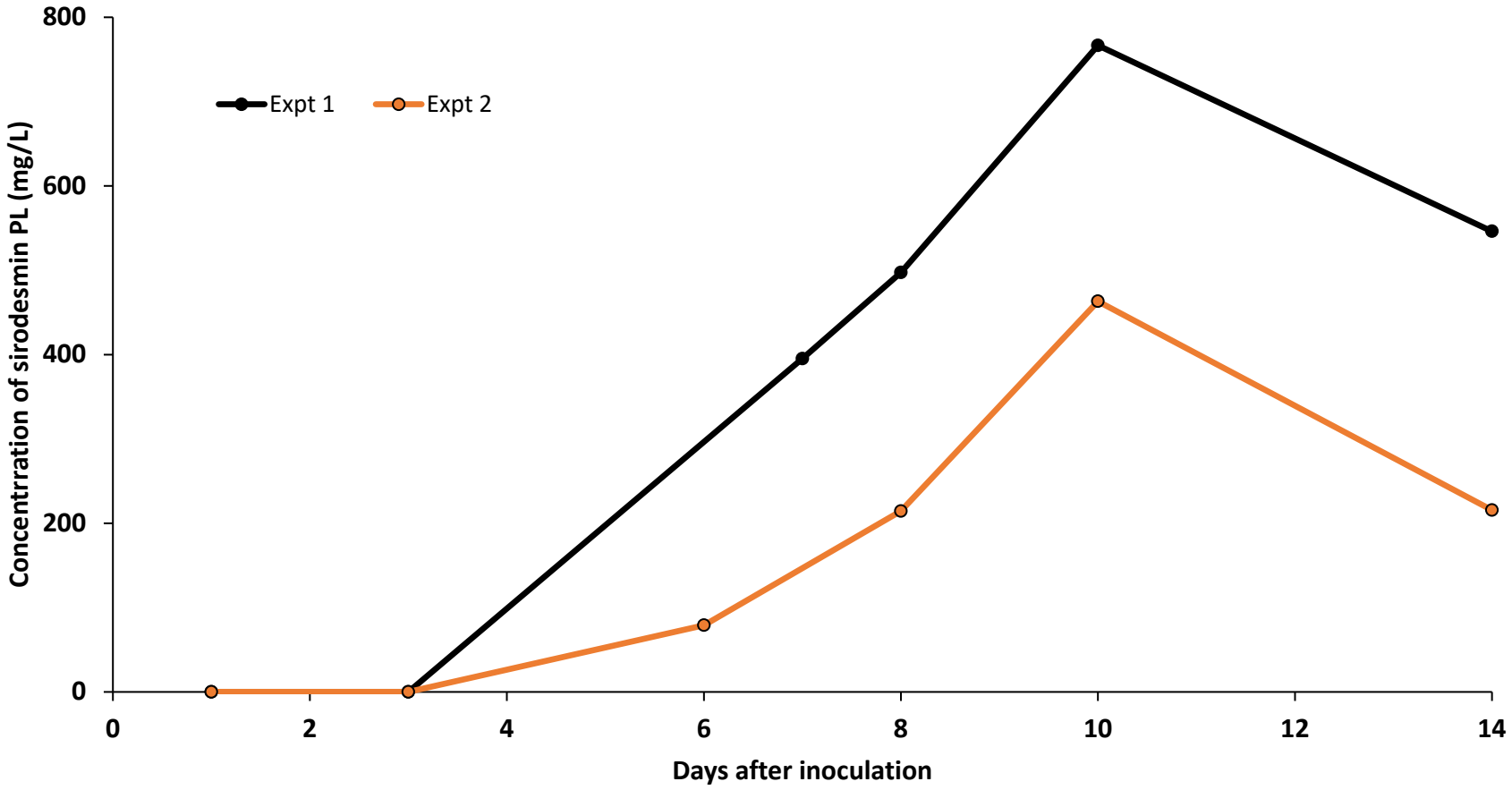
(Biorender 2021)

Effect of secondary metabolites on colony area

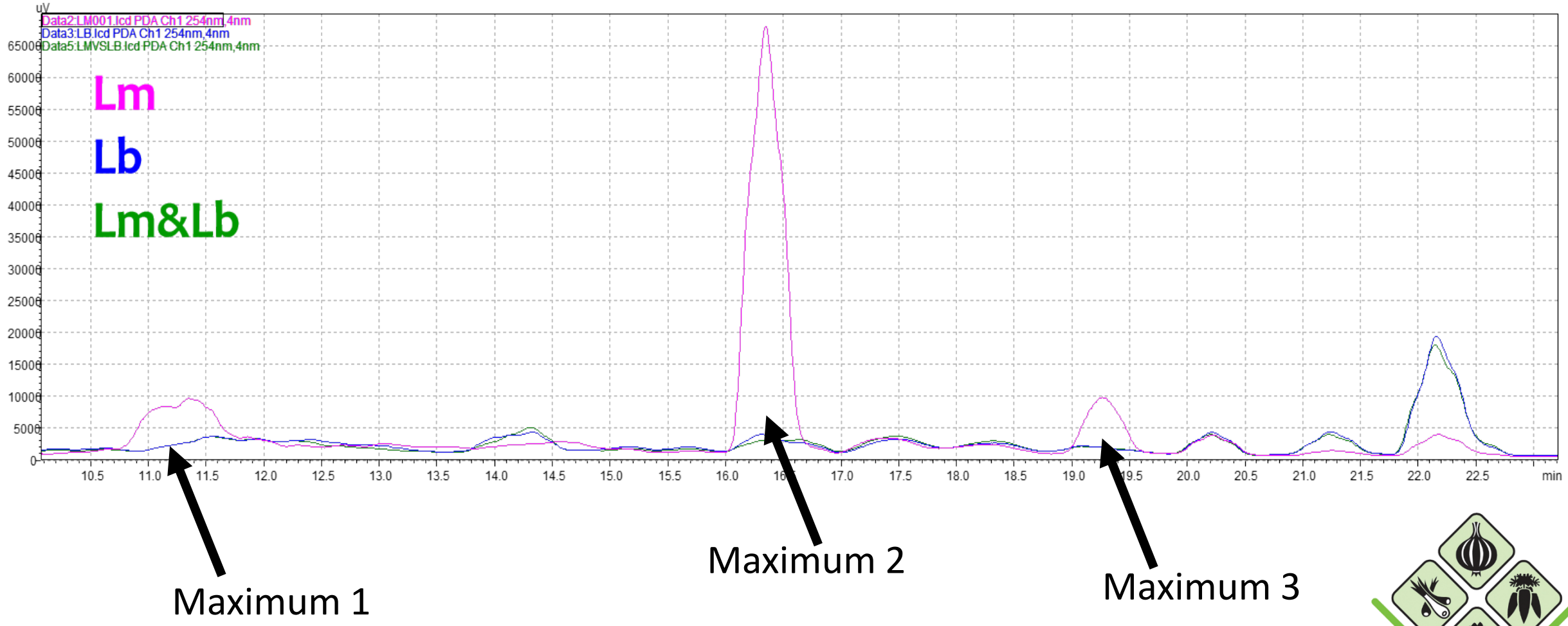


- The secondary metabolites produced by *L. maculans* inhibit *L. biglobosa* colony growth.
- This inhibition is not observed when *L. maculans* and *L. biglobosa* are co-inoculated.
- The inhibition was observed when *L. biglobosa* was sequentially inoculated with *L. maculans*

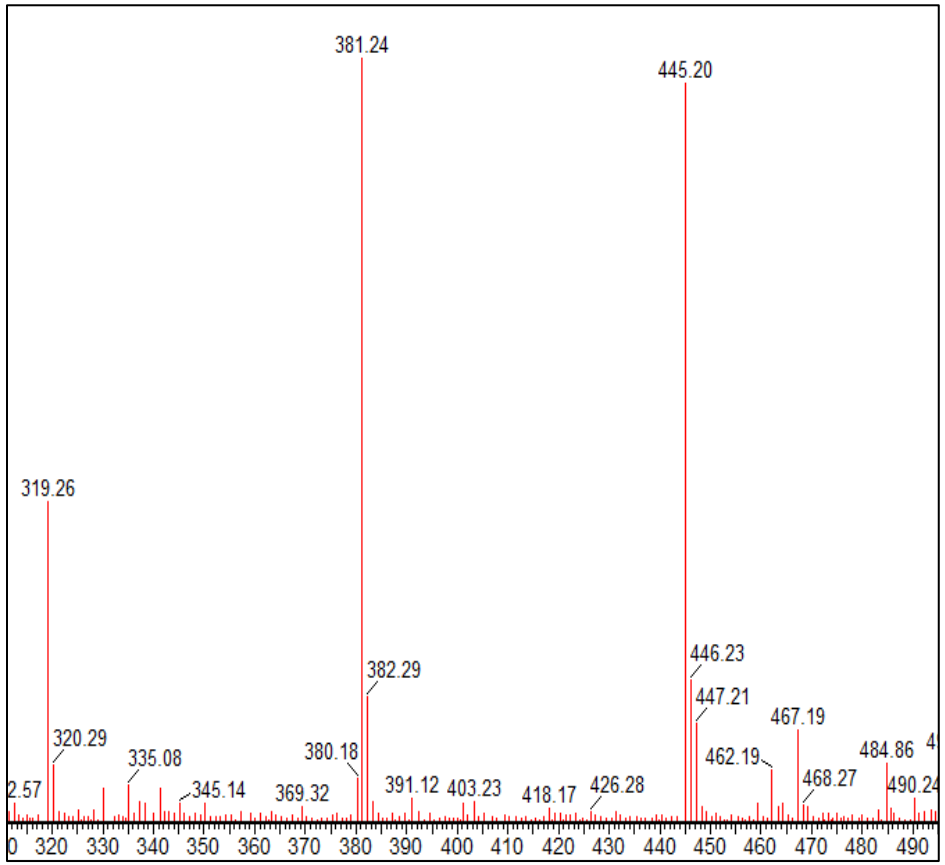
Effect of simultaneous vs sequential inoculation



Identification of unique maxima *in vitro*

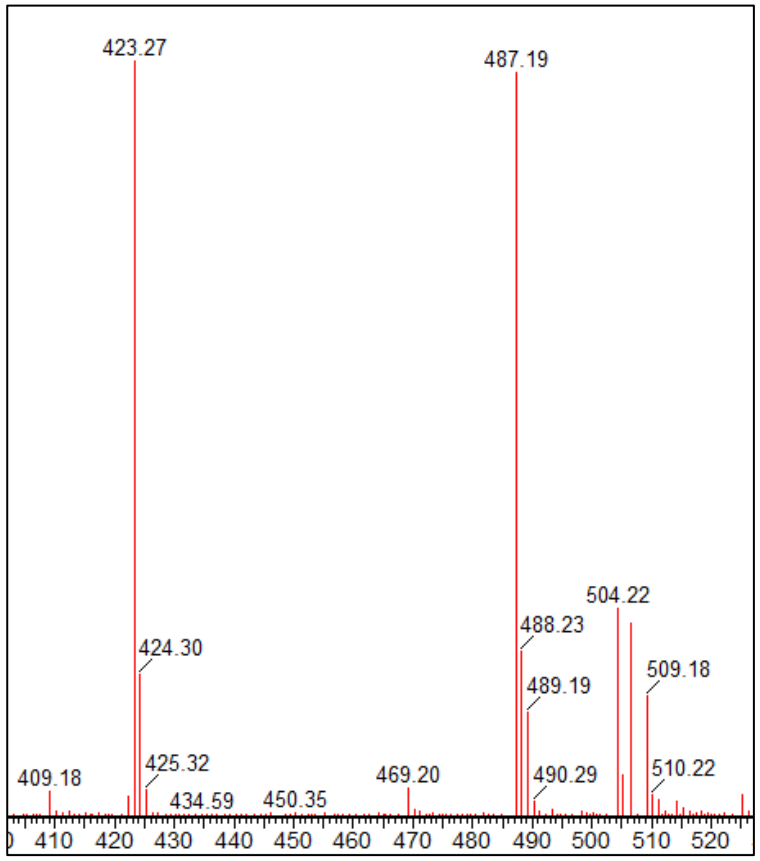


Identification of unique maxima *in vitro*



Deacetyl-sirodesmin PL = 444.5 Da.

Phomamide = 318.4 Da.



Sirodesmin PL = 486.6 Da.

[M – S_2 – H] = 423.3 Da.

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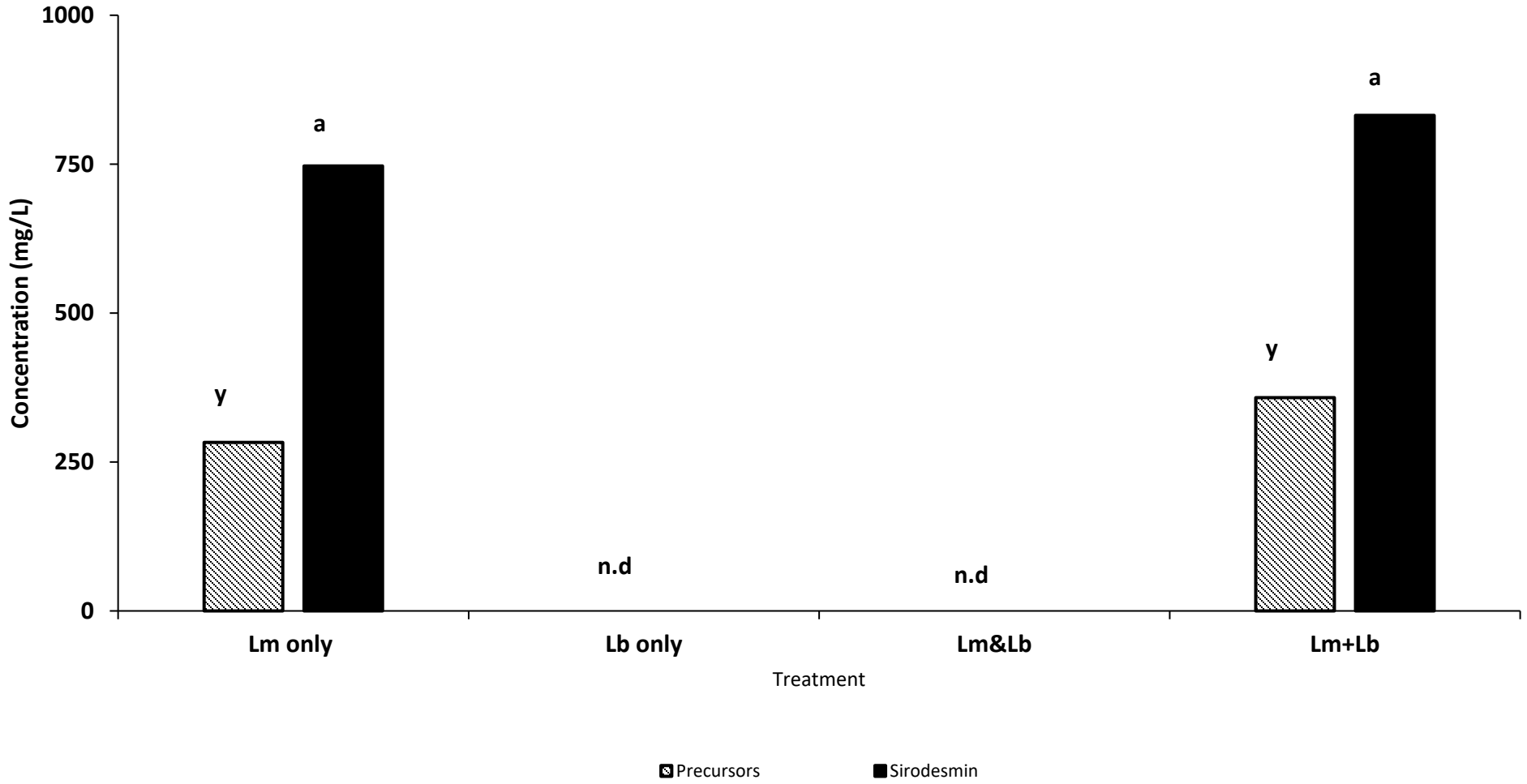
Quantification of unique maxima *in vitro*



Effects of co-inoculation *in planta*

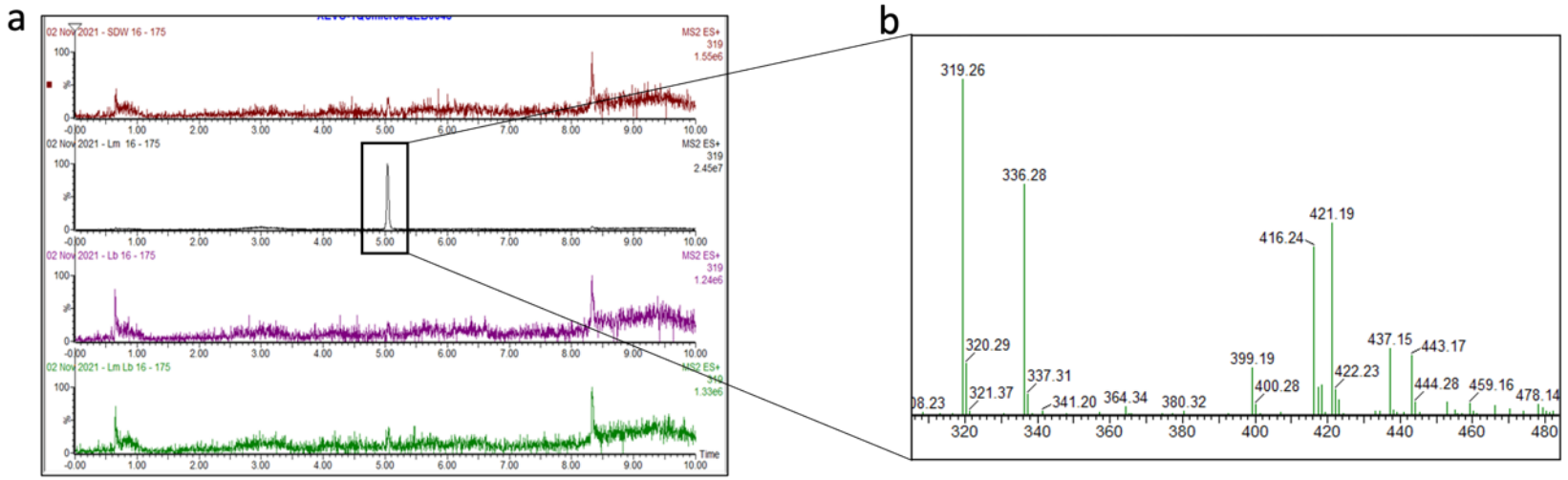
SDW

Lm only

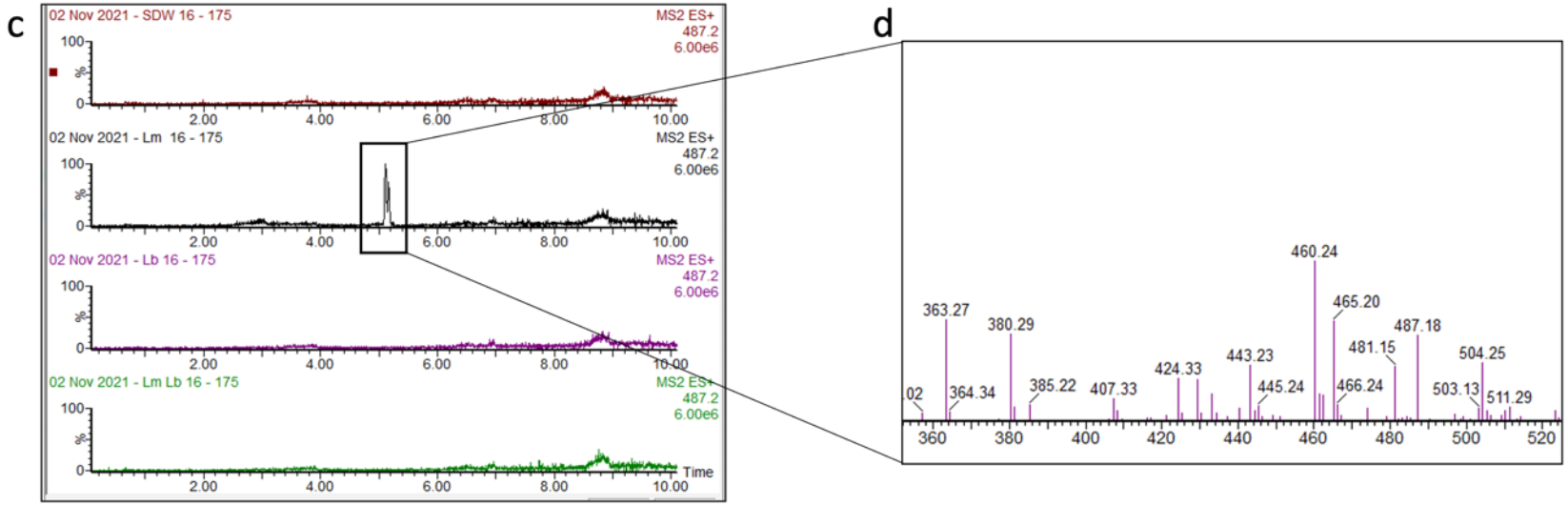
Lb only

Lm&Lb

Quantification of unique maxima



- Phomamide = 318.4 Da.



- Sirodesmin PL = 486.6 Da.
- Deacetylsirodesmin PL = 444.5
- Other adducts were identified

Summary

- The secondary metabolites (Sirodesmin and its precursors) produced by *L. maculans* inhibit *L. biglobosa* colony growth.
- There were 3 unique maxima (Sirodesmin precursors, Sirodesmin PL, and an unknown) to the secondary metabolites from *L. maculans* only.
- When *L. maculans* and *L. biglobosa* are co-inoculated simultaneously Sirodesmin and its precursors are not produced.
- Current UK guidance for application of fungicide (azole) is usually when there is 10-20% crop incidence of *L. maculans* leaf spots.
- If *L. maculans* and *L. biglobosa* ascospores are released at the same time, phoma leaf spot lesions may appear later or be smaller, resulting in a later application of fungicide.
- *L. biglobosa* increasing in importance to UK growers?

Thank you !

Any questions?

Hertfordshire Local Enterprise Partnership

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