15th International Rapeseed Congress

Course of colonization and potential for seed transmission of *Verticillium longisporum* in winter and spring-type oilseed rape (*Brassica napus*)

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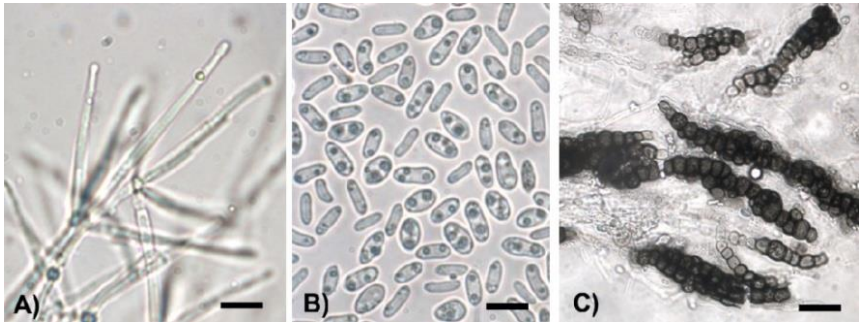
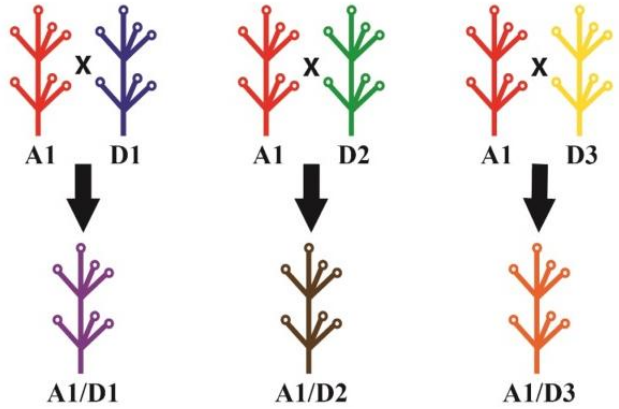
Verticillium longisporum

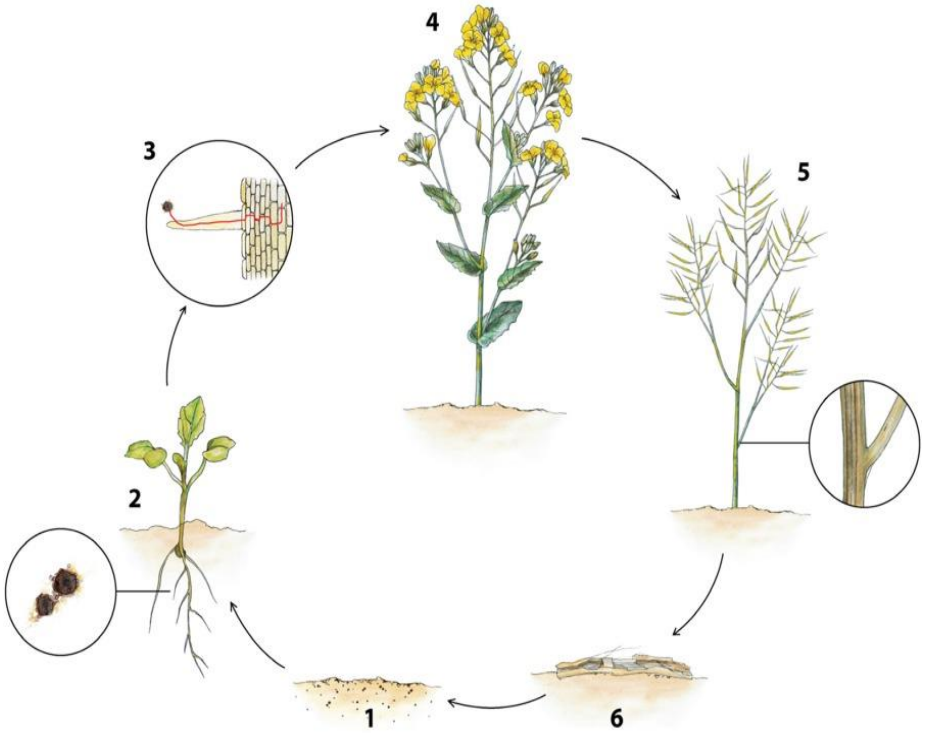
- Soilborne vascular pathogen
- Specific to Brassicaceae
- Most aggressive to oilseed rape
- A1/D1, A1/D2, A1/D3 lineages
  - ➢ A1/D1 is the dominant lineage in Europe and Canada
- 10-50% yield reduction on oilseed rape
- No effective fungicide available





Depotter et al. 2016, Molecular Plant Pathology

Disease cycle



Depotter et al. 2016, *Molecular Plant Pathology*

Symptoms in field

Depotter et al. 2016, *Molecular Plant Pathology*

Symptoms in greenhouse

- Foliage discoloration

Mork VL

- Vascular browning

VL Mock

- Stunting

Arne Weiberg, DFG FOR 546, 2004-2010

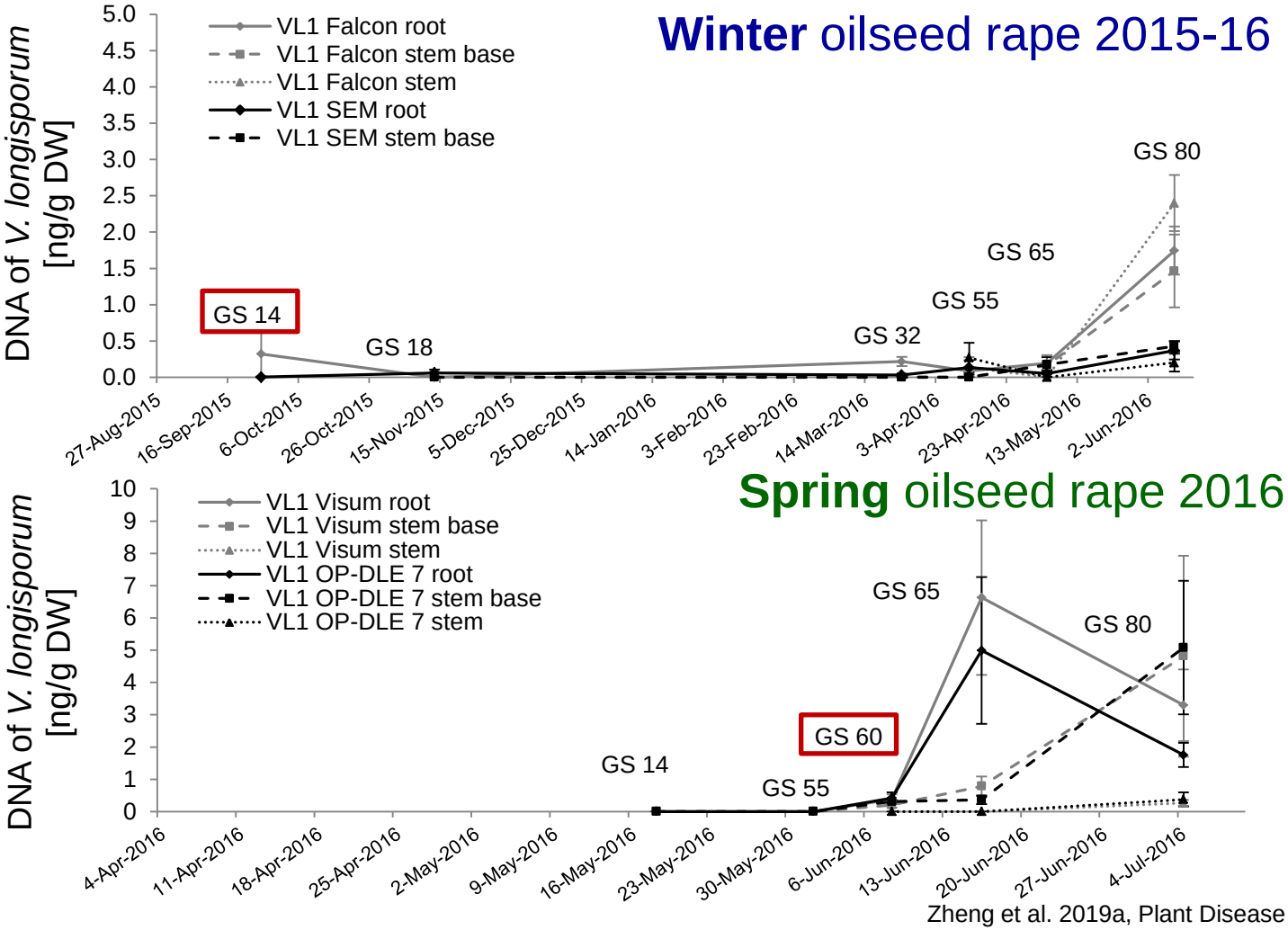
- Biomass reduction
- Flowering delay

Part I

Colonization patterns of *V. longisporum* in field

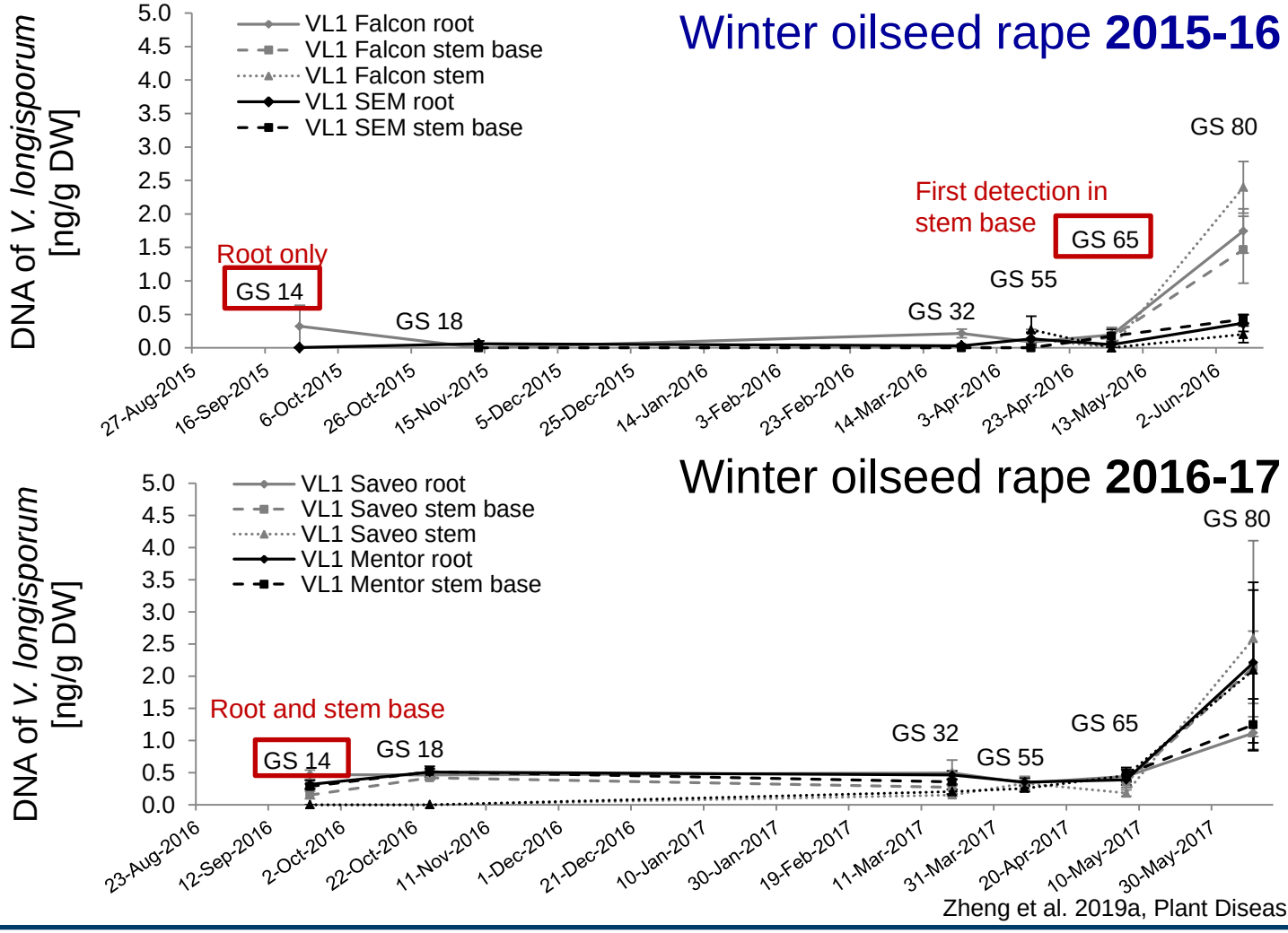
- Samples from whole season
- Quantification with real-time PCR

Growth types comparison



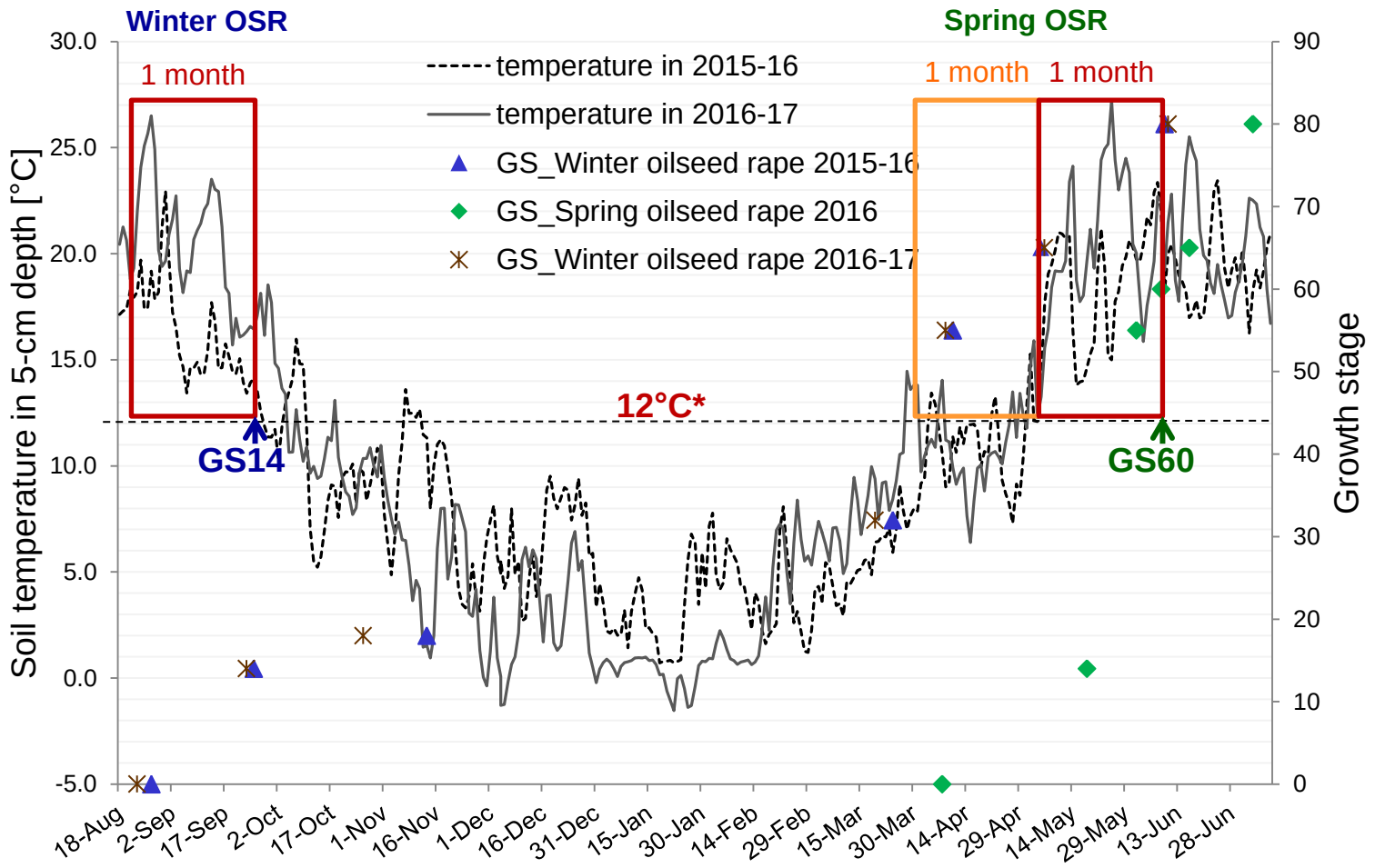
Zheng et al. 2019a, Plant Disease

Years comparison



Zheng et al. 2019a, Plant Disease

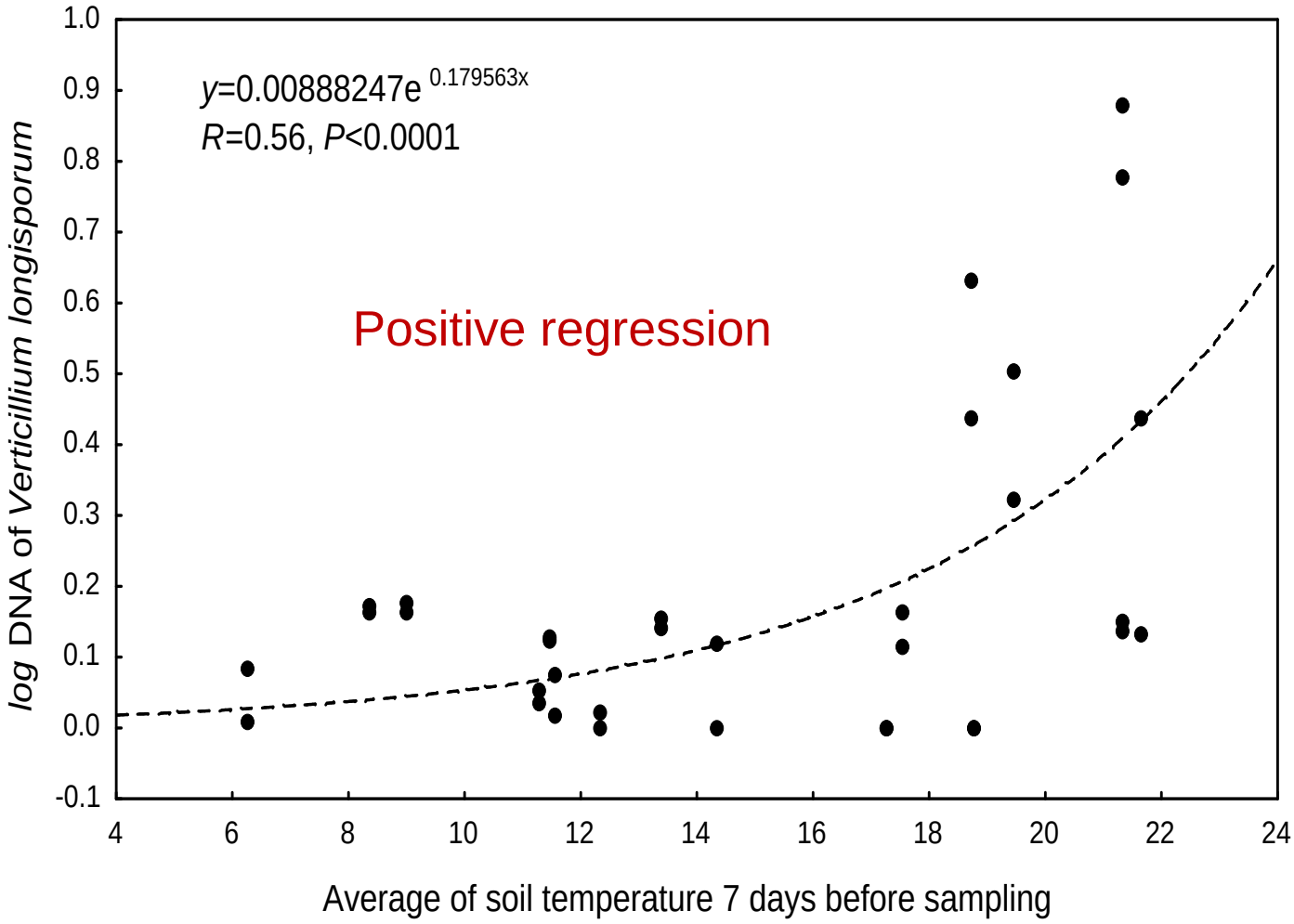
Results-soil temperature



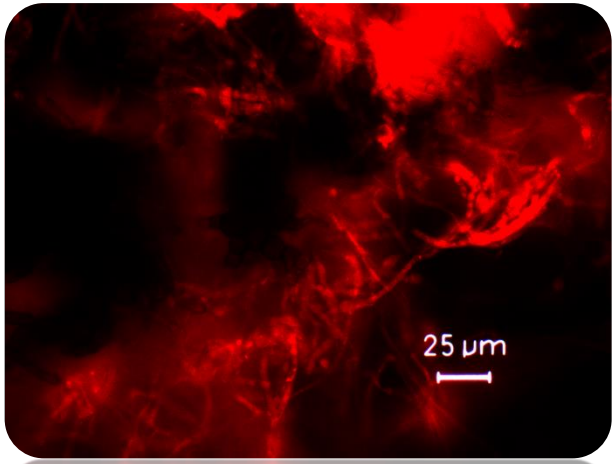
***Threshold temperature for a successful infection, based on climate chamber experiment.**

Zheng et al. 2019a, Plant Disease

Results-relationship between soil temperature and fungal amounts



Zheng et al. 2019a, Plant Disease



Part II

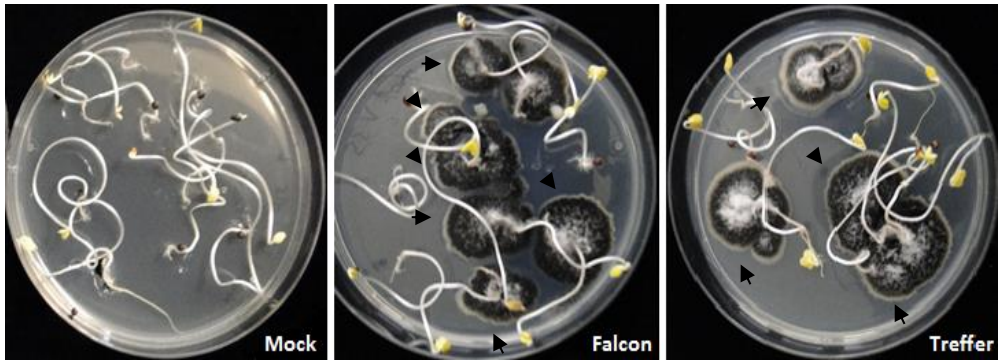
Seed transmission

- Greenhouse & field trial
- *dsRed*-transformant
- Offspring test

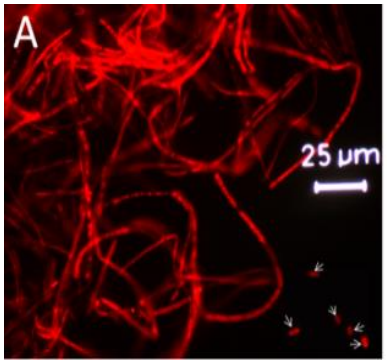
Seed infection in greenhouse

Cultivar		Seed infection frequency [%]		
		Mock	VL43	DsRed VL43
Winter type	Falcon	0.00 c	13.33±3.00 a	10.50±3.86 a
	Treffer	0.00 c	0.08±0.08 bc	5.50±2.22 ab
Spring type	OP-DLE7	0.00 c	1.46±0.55 abc	-
	Visum	0.00 c	6.25±0.63 ab	-

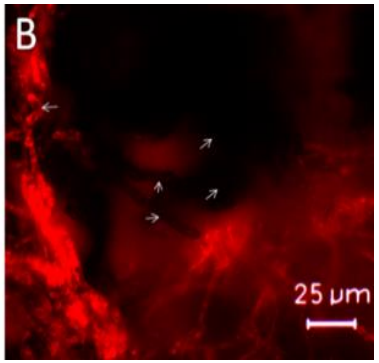
Number of tested seeds:
Winter type: 150 x 3 seeds per treatment, 1,800 seeds in total
Spring type: 160 x 3 seeds per treatment, 1,920 seeds in total



VL43



Hyphae



Microsclerotia

dsRed-VL43

Zheng et al. 2019b, Plant Disease

Seed infection in field

Field season	Crop type	Number of seeds analyzed	Seed infection frequency [%]	DNA of *Verticillium longisporum* in seeds [ng/g DW]
2016	Spring oilseed rape (cv. 'Visum')	2,880	3.2±0.46	1.1±0.39 a
2015/16	Winter oilseed rape (cv. 'Falcon')	2,160	no detection	not determined
2016/17	Winter oilseed rape (cv. 'Aristoteles')	2,240	no detection	0.3±0.04 b

Experimental field of spring oilseed rape inoculated with *V. longisporum* in Göttingen in 2016

Zheng et al. 2019b, Plant Disease

Offspring test

Seeds from greenhouse

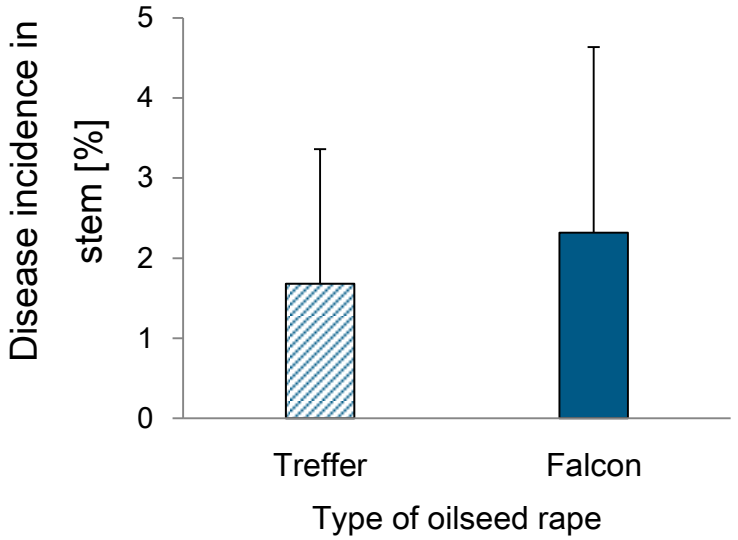
- 120 seeds from 8 plants x 3 replicates
- 720 seeds were tested in total

Seeds from field

- 60 seeds from each field-grown diseased plant, 8 replicates + control
- 540 seeds were tested in total

- Surfaced sterilized with 3% sodium hypochlorite for 2 min

Seeds from greenhouse



None of offspring grown from seeds collected from field-grown diseased plant showed disease symptoms

Zheng et al. 2019b, Plant Disease

Summary

Patterns of plant colonization in spring and winter type plants in the field differed and correlated with soil temperature.

- ❖ Winter oilseed rape plants displayed earlier root colonization but a strongly delayed and discontinuous colonization pattern.
- ❖ Spring oilseed rape plants displayed later root colonization but followed by continuous shoot colonization.
- ❖ 12°C is a threshold soil temperature for a successful root colonization.

In the greenhouse, *V. longisporum* can infect the seed and transmit the disease to the offspring. In the field, no seed transmission was found in winter oilseed rape, whereas low level transmission was found in spring oilseed rape.

- ❖ Warmer regions and spring-type oilseed rape might bear a potential risk of seed transmission of *V. longisporum.*
- ❖ In winter-type oilseed rape, seed transmission of the pathogen and/or the disease was not found and appears not likely to occur under field conditions.

Acknowledgements

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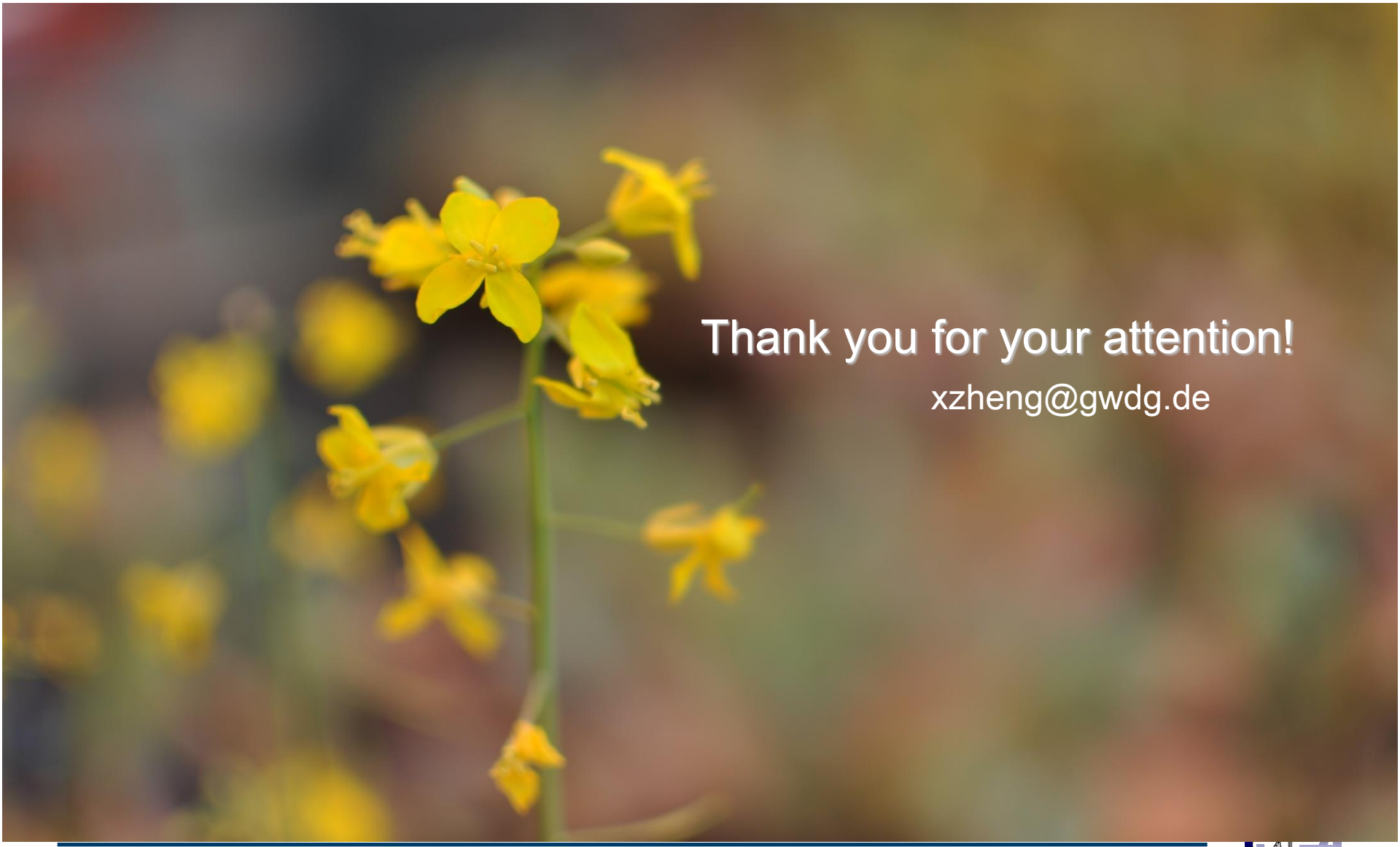
Thank you for your attention!
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