

# Bioproducts and their potential in protection of *Brassica napus* L. against *Verticillium longisporum*, (C. Stark) Karapapa, Bainbr & Heale

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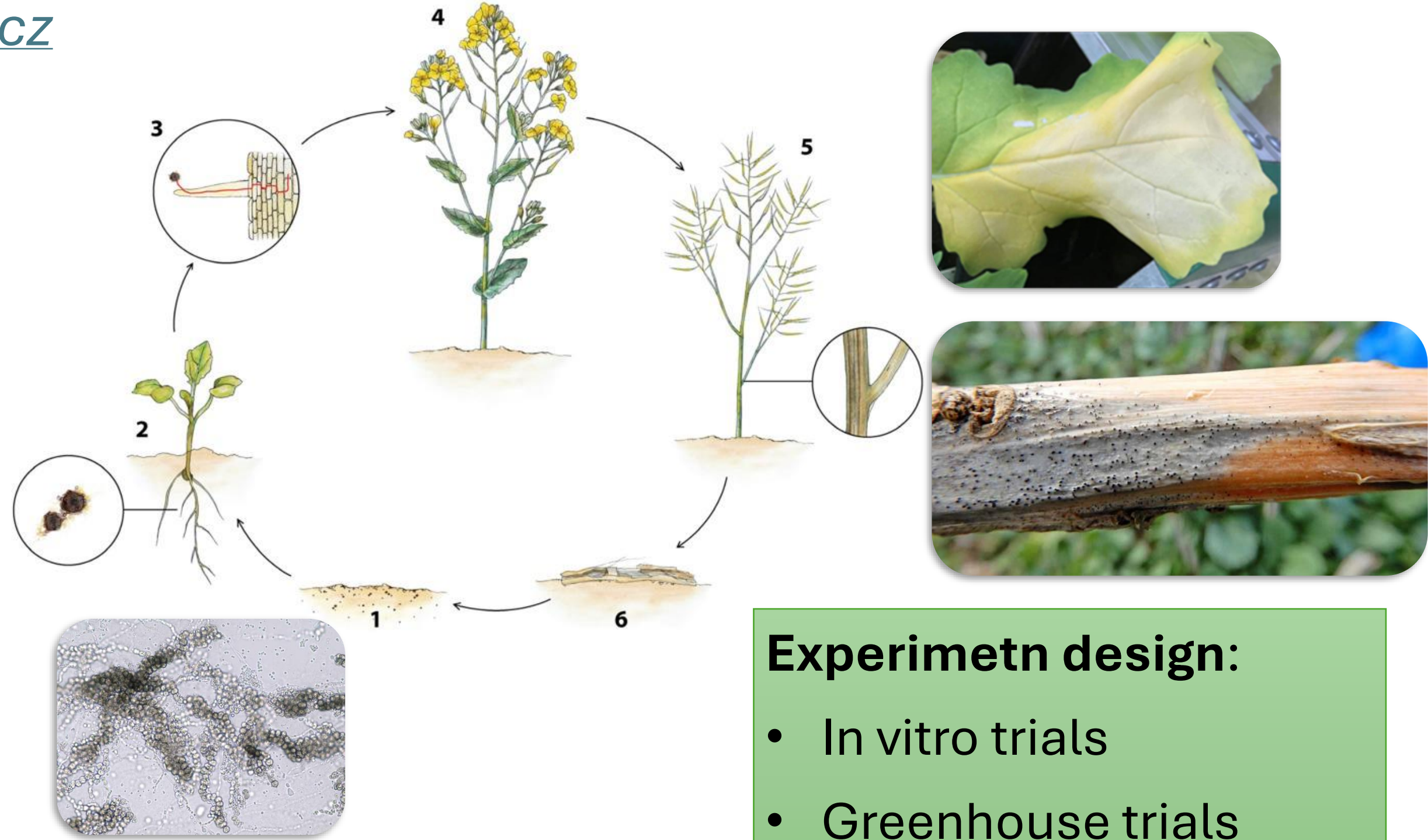


## Objectives:

- Investigate biological protection methods for winter oilseed rape against *V. longisporum*.

## Hypotheses:

- Beneficial microorganisms may inhibit *V. longisporum* growth, offering a potential biological control solution for winter oilseed rape.
- *V. longisporum* could begin attacking the root system of winter oilseed rape as early as autumn, impacting crop health.



## Experiment design:

- In vitro trials
- Greenhouse trials
- Field trials

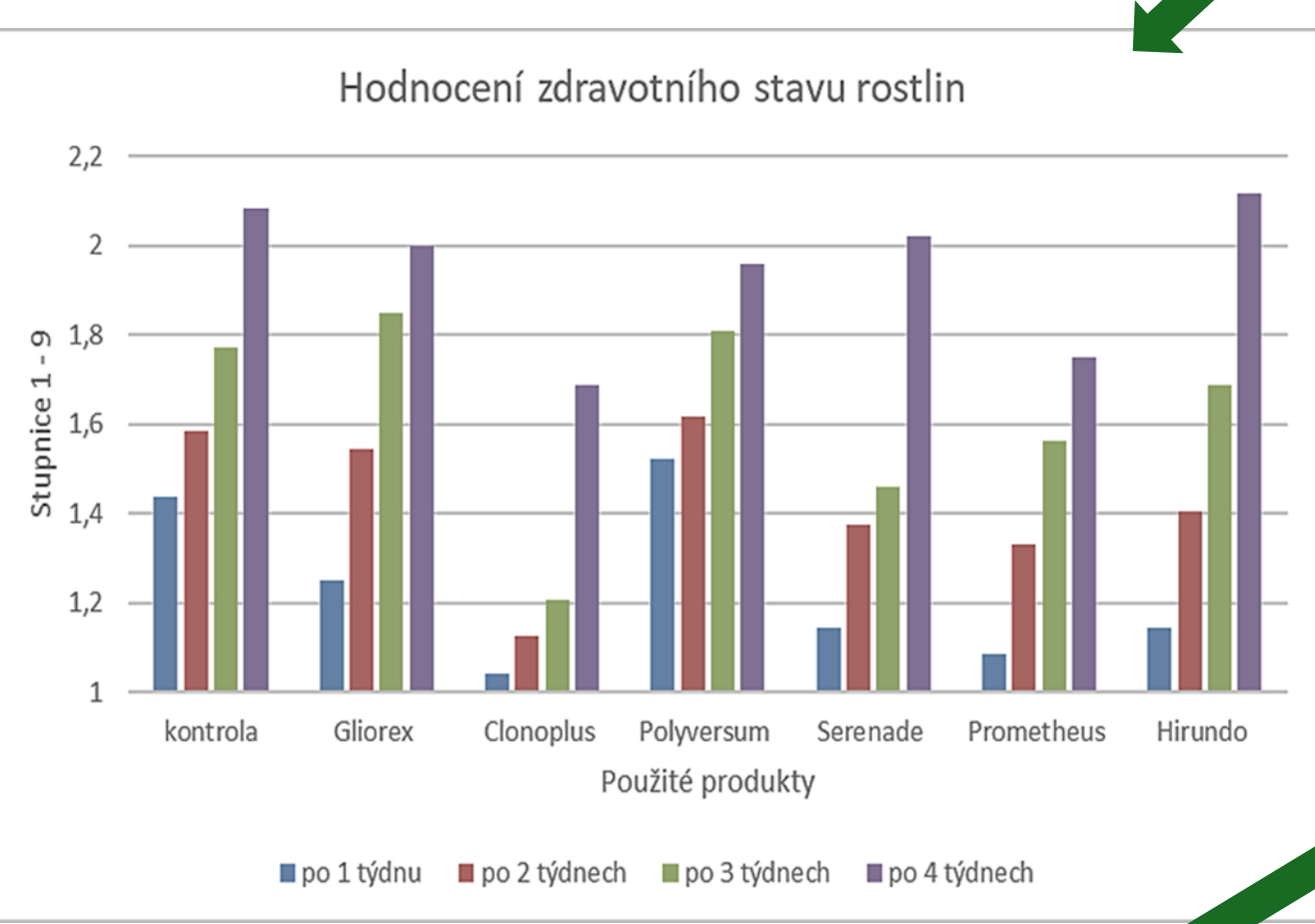
Bioproduct	Active substance	Producer
Hirundo	<i>Bacillus amyloliquefaciens</i> FV08-10	Monas Technology
Prometheus	<i>Pseudomonas veronii</i> CCM 9674	Biopreparáty
Polyversum	<i>Pythium oligandrum</i> M1	Kwizda Agro
Xilon	<i>Trichoderma asperellum</i> T34	AgroProtec
Contans	<i>Coniothyrium minitans</i> NOC/M/91-08	

## In vitro:

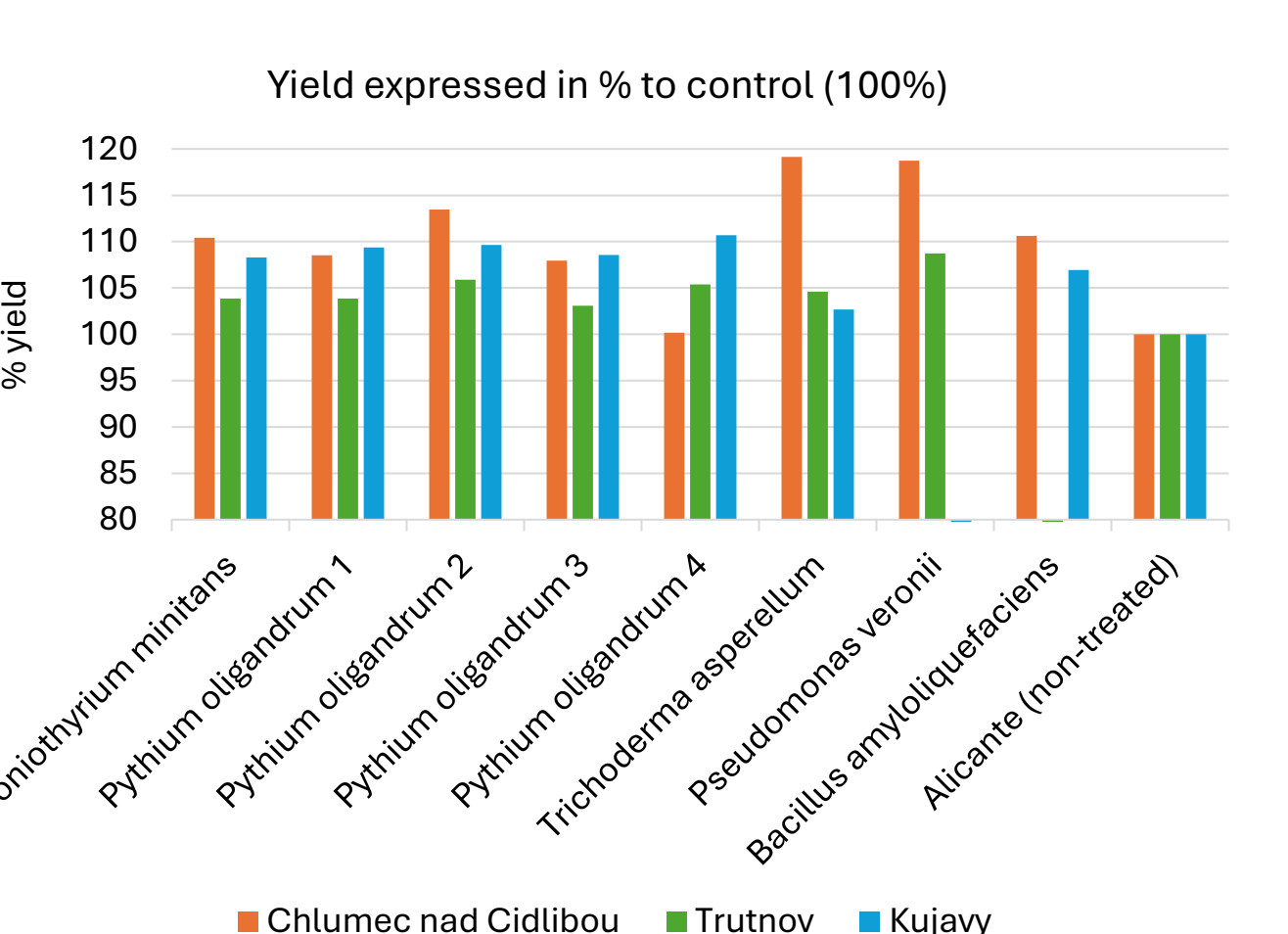
- *V. longisporum* VL43, isolated from *B. napus* (Uni. of Göttingen collection), PDA substrate
- Mycelial measured 45 days after the application of the bioproduct (every 15 days) and pathogen growth inhibition (%) calculated

## Greenhouse – symptoms evaluation:

- *V. longisporum* spore suspension:  $8 \times 10^3$  spores per mL
- Five days after sowing - 1 mL of the microsclerotia suspension added to pot (1 cm deep)
- Next day bio product solution applied – the same spot
- Solution: according to the manufacturer's guidelines for a 9 x 9 cm pot, using the max. recom. amount.
- Duration 6 weeks, starting from the bioproduct application, Health assessing: 1-9 scale



- 3 localities, 3 rep. in each variant
- each repetition approximately 15 m<sup>2</sup>
- 9 samples per bioproduct available for evaluation



In vitro test – inhibition of mycelia growth for 5 bioproduct over 45 day period. Trends of the growth with average and st. deviation

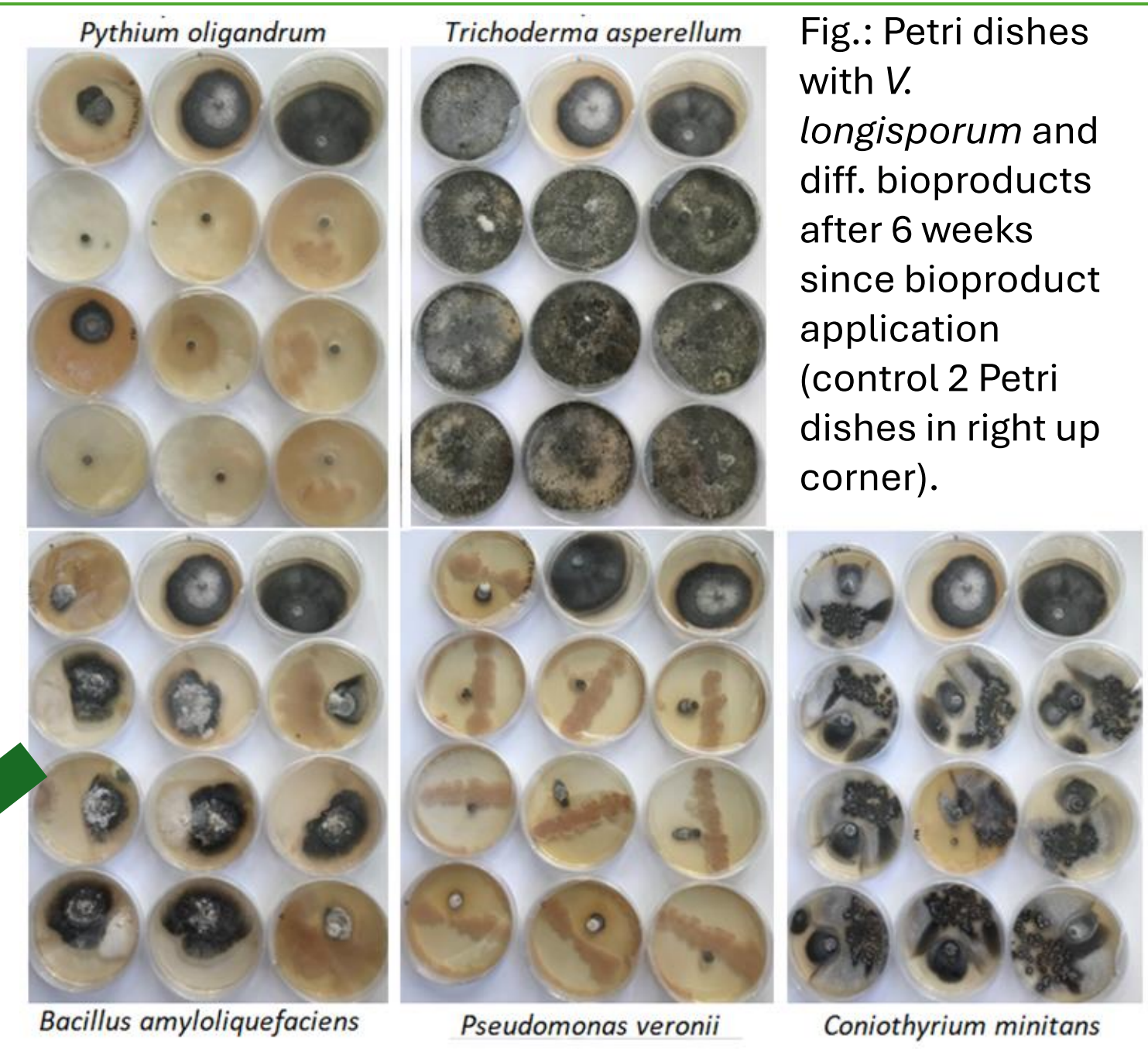
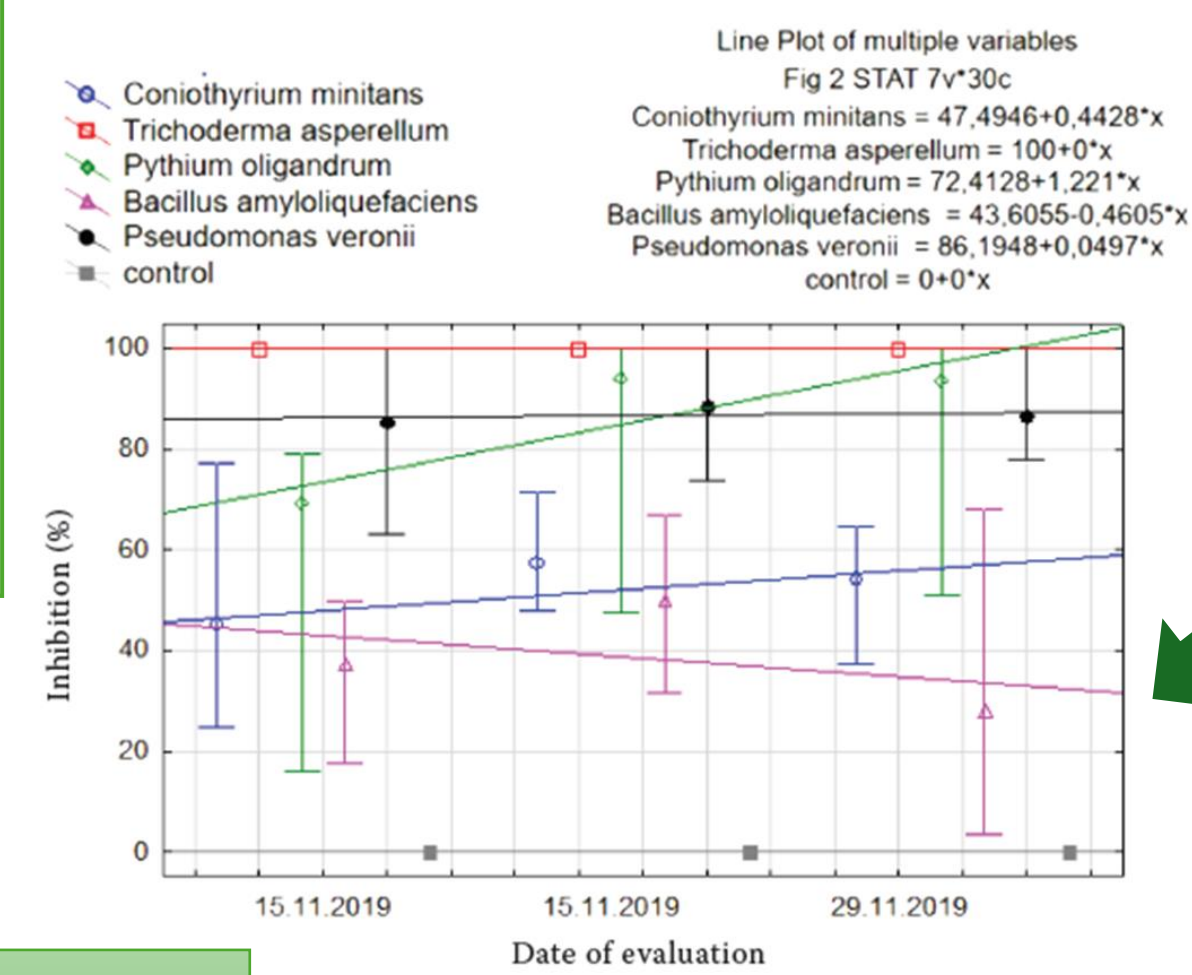
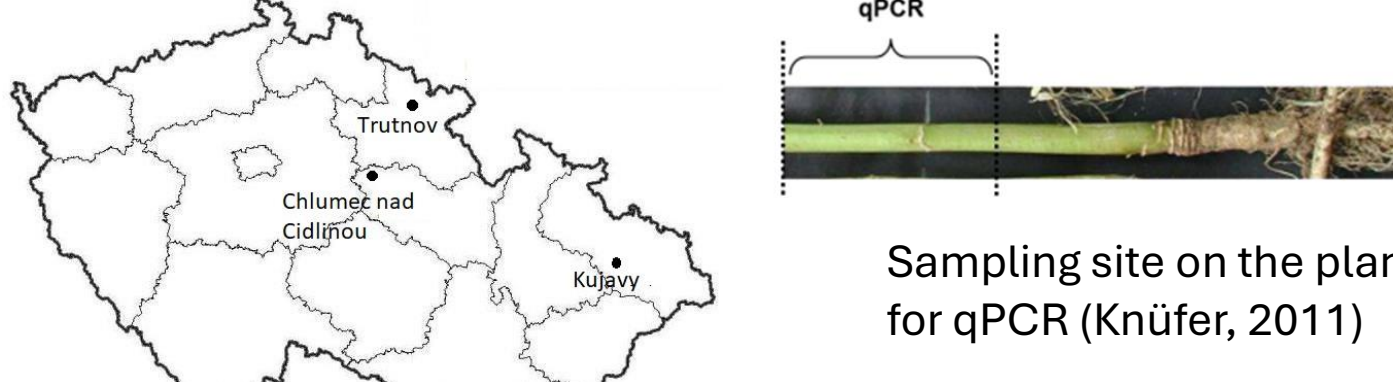


Fig.: Petri dishes with *V. longisporum* and diff. bioproducts after 6 weeks since bioproduct application (control 2 Petri dishes in right up corner).

## Field trials:

Variant	<i>Coniothyrium minitans</i> - Contans	<i>Pythium oligandrum</i> - Polyversum	<i>Trichoderma asperellum</i> - Xilon	<i>Pseudomonas veronii</i> - Prometheus	<i>Bacillus amyloliquefaciens</i> - Hirundo	Control - Alicante
35 week 2019						
Before sowing	2 kg/ha	x x x x	x	x	x	x
Pickling	x	5 g/kg 5 g/kg	x x	x	x	x
During sowing	x	x x x 100 g/ha	10 kg/ha	x	x	x
42 week 2019						
BBCH 14-16	x	x 100 g/ha 100 g/ha	x	1 L/ha	1 L/ha	x
11-14 week 2020	x	x x x 32	x	1 L/ha	1 L/ha	x
17-18 week 2020	x	x x x x	x	1 L/ha	1 L/ha	x
BBCH 65	x	x x x x	x	1 L/ha	1 L/ha	x



No differences between treatments ( $P = 0.861$ ) without regard for locality. Even with no statistical differences, differences in yield are useful in practice

- Chlumec nad Cidlibou, the highest yield achieved by the variant *Trichoderma asperellum* T34 (Xilon); the difference between the lowest and highest yield - 19.1%
- Trutnov, the highest yield from *Pseudomonas veronii* CCM 9674 (Prometheus), 8.7% higher than the control (lowest yield)
- Kujavy, the highest yield by *Pythium oligandrum* 4 (Polyversum – bioproduct application during sowing), 9.6% higher than the control (lowest yield)
- Differences such as 19% are promising for use in practice

qPCR detection: Amounts of *V. longisporum* ( $\mu\text{g}$  in 0.1 g of plant material) on 3 localities (each repetition), x – no pathogen presence detected

locality	Chlumec nad Cidlinou		Trutnov		Kujavy	
	amount of pathogen	amount of pathogen	amount of pathogen	amount of pathogen	amount of pathogen	amount of pathogen
<i>Coniothyrium minitans</i>	x 0,94 3	x 9,87	756	x	x	x
<i>Pythium oligandrum 1</i>	x 93,8	867	x	x	x	x
<i>Pythium oligandrum 2</i>	x 0,90 4	x 0,94 1	x 0,93 7	x	x	x
<i>Pythium oligandrum 3</i>	x	x 0,95 9	x	x	x	x
<i>Pythium oligandrum 4</i>	0,88 9	92,3	x 9,51	0,98	x	x
<i>Trichoderma asperellum</i>	9,04	x	x 9,59	x	x	x
<i>Pseudomonas veronii</i>	x	x 840	x	x	-	-
<i>Bacillus amyloliquefaciens</i>	0,92 9	x	-	-	-	0,90 4
Alicante (non-treated)	0,89 2	x	x 86,7	x	x	x

Mixed sample from 5 plant  
Differences in the amount of pathogen between variants and localities with magnitudes of 1–10e3 even though no statistically significant differences ( $P = 0.205$ ) exist between treatments