LABORATORY OF Phytopathology

Gembloux Agro-Bio Tech
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BIOCONTROL OF WHEAT AGAINST SEPTORIA TRITICI BLOTCH: NEW ELICITORS

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OBJECTIVES

Elicitors consist of all signals perceived by plants and inducing a defensive reaction. They are considered as promising **biological control** tools for **Integrated Plant Management (IPM)** strategies. Up to now, few elicitors have been efficiently and specifically designed to protect **wheat** against major diseases threatening both its yield and quality.

This project focuses on the **screening of 9 potential elicitor molecules** of various origins and structures (labelled 'EGL' 1 to 9) to protect winter wheat against *Zymoseptoria tritici*, responsible for Septoria Tritici Blotch (STB). In addition, the direct **biocide activity** of these molecules was evaluated *in vitro* on both spore germination and fungal growth.

MATERIALS AND METHODS

The winter wheat variety 'Avatar' is susceptible to the disease and was grown under greenhouse conditions.

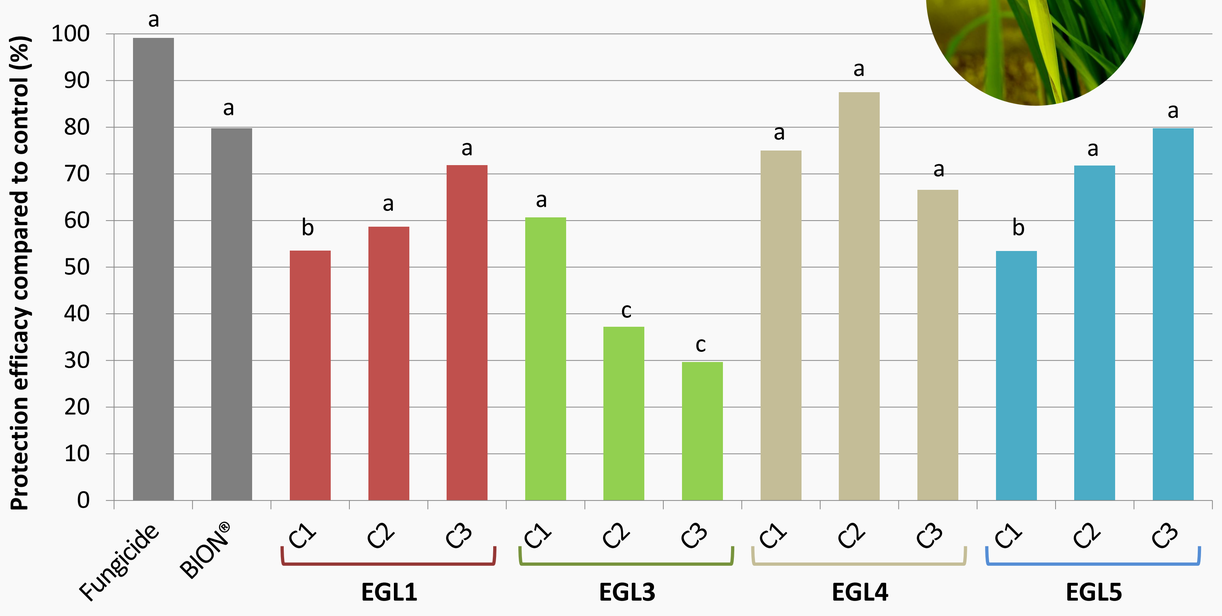
PROTECTION EFFICACY

- **Elicitor treatment**: plants at 3-4 leaf stage were sprayed with 30mL of the various molecules, tested respectively at **3 different concentrations**, C1 being the smallest concentration. Control plants were treated with water only. Control treatments consisted of BION® (Syngenta) and the Epoxiconazole® fungicide (BASF).
- **STB inoculation**: Five days after treatment, all the plants were inoculated with a 30mL spore suspension (10^6spores.mL^{-1}) of the ***Zymoseptoria tritici*** strain 'TO1187'. Controls plants were treated with sterile water amended with 0,05% Tween 20.
- **Disease severity** was scored at 28 days post-inoculation by assessing the percentage of 3rd leaf area covered with lesions (necrosis + chlorosis) as well as pycnidium density within the scored lesions.

***IN VITRO* BIOCIDE ACTIVITY**

- **Fungal spotting tests**: Fungal aliquots of 5µL (5.10^5 spores.mL^{-1}) were spotted on PDA plates amended with various concentrations of the elicitor molecules, D1 being the smallest. After incubation for 10 days at 18°C, the colony diameters were measured for each spot (3 plates with 5 spots/plate as replicates).
- **Spore germination tests:** Fungal aliquots of 0,6mL (10^4 spores.mL^{-1}) were sprayed on elicitor amended PDA plates (3 plates as replicates). The percentage of germinated spores was scored after 2 days.

The best elicitors were chosen, based on their protection efficacy, and biocide activites, along with other criteria listed in Table 1.



Bars tagged with the same letter are not significantly different using the Tukey test at *P*=0.05

Figure 1. Example of a screening test of elicitors EGL1, EGL3, EGL4 and EGL 5 Control plants showed 35% mean infection on 3rd leaf surface

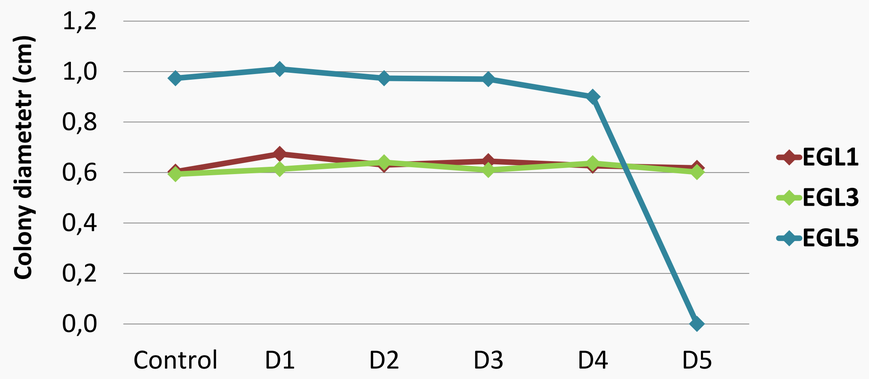


Figure 2. In vitro biocide effect of elicitors EGL1, EGL3 and EGL 5 on *Zymoseptoria tritici* fungal growth on PDA medium

Table 1. Selection criteria of the 3 best elicitors

	Concentration	Protection efficacy	Biocide activity	Easy Formulation	Originality	Market availability
EGL1	C1	++	No	✓	✓	✓
	C2	+++				
	C3	+++				
EGL2	C1	+++	No	✗	✓	✗
	C2	++				
	C3	+++				
EGL3	C1	++	No	✓	✓	✗
	C2	++				
	C3	++				
EGL4	C1	++	No	✓	✓	✓
	C2	+++				
	C3	++				
EGL5	C1	++	Yes at C3	✓	✓	✓
	C2	++				
	C3	++				
EGL6	C1	++	Yes at C3	✓	✗	✓
	C2	++				
	C3	+++				
EGL7	C1	+++	No	✓	✓	✓
	C2	++				
	C3	+				
EGL8	C1	NA	Yes at C3	✗	✓	✓
	C2	NA				
	C3	NA				
EGL9	C1	++	No data	✗	✓	✗
	C2	+++				
	C3	+++				

Protection efficacy cotations: 0% '0'; 1-9% '+/-'; 10-39% '+'; 40-59% '++'; 60-79% '+++'; 80-100% '++++'

CONCLUSION & PERSPECTIVES

- EGL7 did not show a reliable effect stability throughout several screening tests
- EGL5 showed a biocidal effect *in vitro* on fungal growth at the highest concentration

The 3 best elicitors chosen for further studies are: EGL1 at the highest concentration C3, and **EGL4** and **EGL5** at the mid-concentration C2.
Next experiments will investigate the triggered signalling pathways in the plant (RT-qPCR and spectrophotometry measurements)

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