Phytopathologie intégrée et urbaine
Gembloux Agro-Bio Tech
Université de Liège

Elicitor screening to protect winter wheat against *Zymoseptoria tritici*

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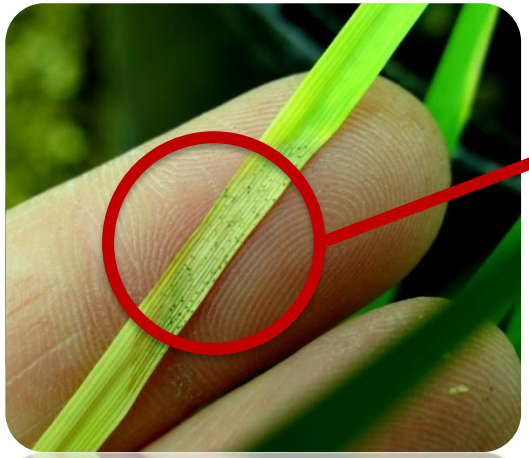
OBJECTIVES

Develop a method based on **Eliciting agents** to **protect wheat** against *Zymoseptoria tritici*

LABORATOIRE DE Phytopathologie

Wheat Pathogen: *Zymoseptoria tritici*

- Hemibiotrophic fungi *Mycosphaerella graminicola*
- **Septoria Tritici Blotch** (STB) foliar disease
- **40% yield loss** in wheat crops



FOLIAR SYMPTOMS
(after 21-28 days after infection)

Elongated, tan lesions containing characteristic black fruiting structures (**asexual pycnidia**)

Rainfall favors spores to splash onto upper leaves and heads

No wheat cultivar fully resistant to *Z. tritici*

Disease control relies mainly ON FUNGICIDES

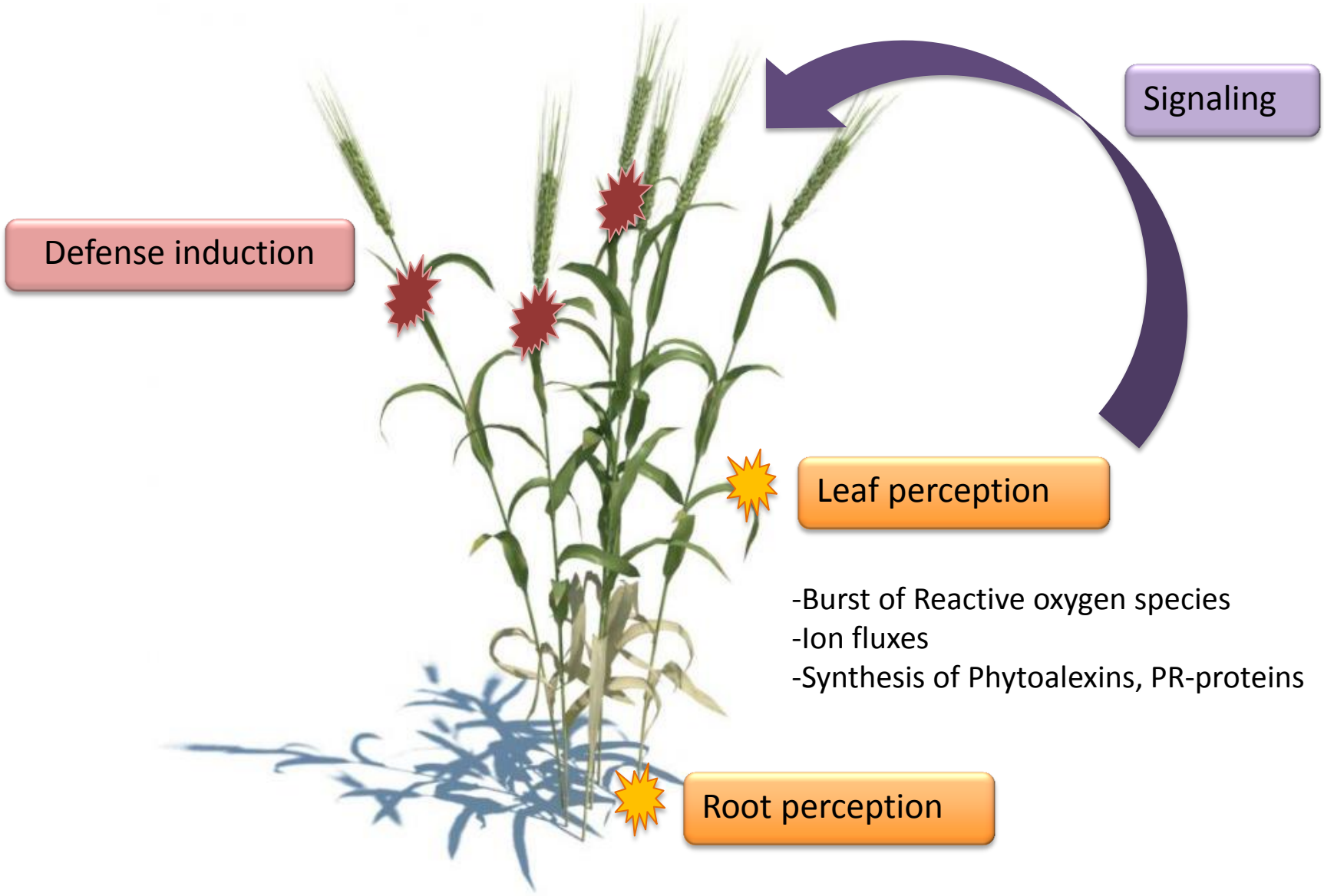
Biocontrol tool: ELICITORS

ELICITOR = all signals perceived by plants and inducing a defensive reaction

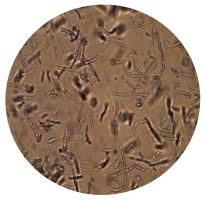
CONCEPT OF INDUCED RESISTANCE

- **For a wide variety of plants**
- **Against a broad-spectrum of diseases (bacteria, virus, fungi)**

Very few elicitors have been identified for wheat


Signaling
Defense induction
Leaf perception
-Burst of Reactive oxygen species
-Ion fluxes
-Synthesis of Phytoalexins, PR-proteins
Root perception

SCREENING METHODOLOGY




ELICITOR SCREENING METHODOLOGY

1

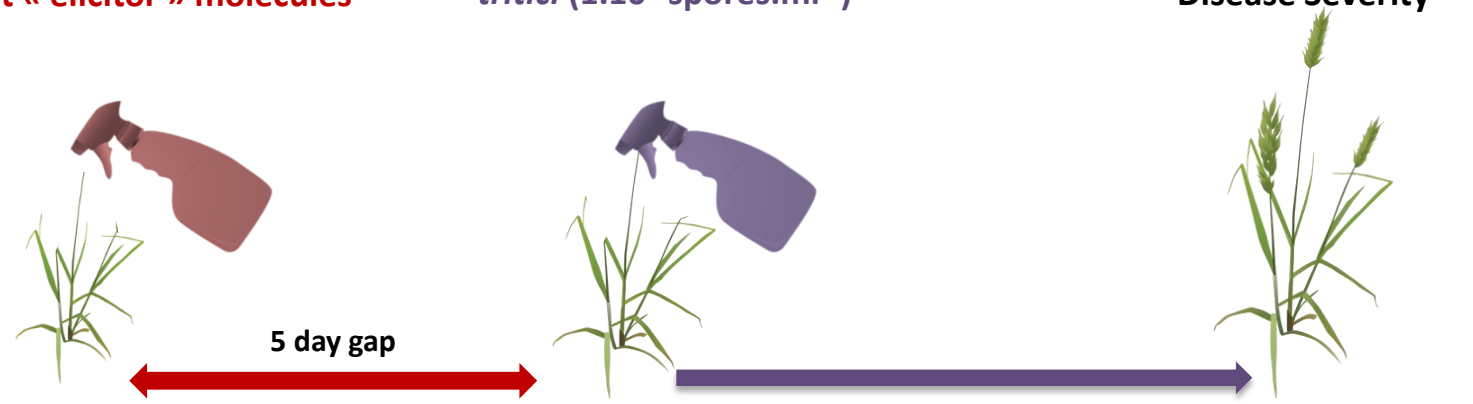
Preventive treatment with 9 different « elicitor » molecules

2

Inoculation with *Zymoseptoria tritici* (1.10^6 spores.ml^{-1})

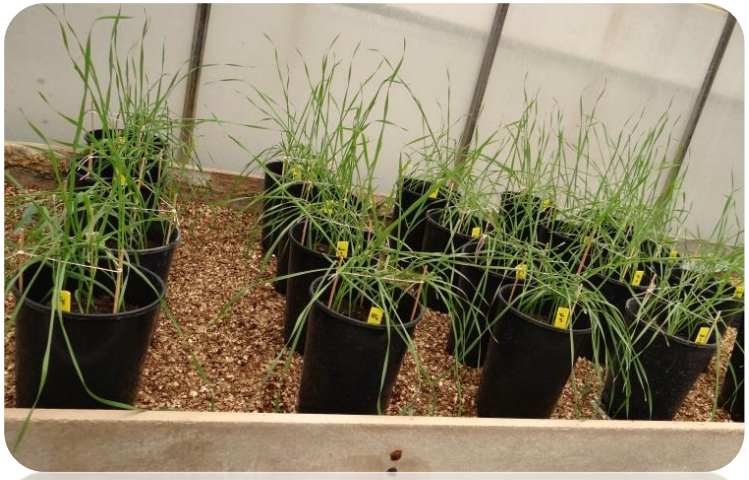
3

Measurement of Disease Severity



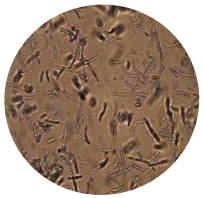
PREVENTIVE TREATMENT WITH 9 DIFFERENT « ELICITORS »

	EGL1	EGL2	EGL3	EGL4	EGL5	EGL6	EGL7	EGL8	EGL9
C1 (mg/ml)	0.1	0.001	$9{,}5.10^{-5}$	0.3	0.006	0.006	0.12	Dil.x2000	0.002
C2 (mg/ml)	1	0.01	$9{,}5.10^{-4}$	3	0.06	0.06	1.2	Dil.x200	0.008
C3 (mg/ml)	5	0.1	0.0095	30	0.625	0.625	12	Dil.20	0.03

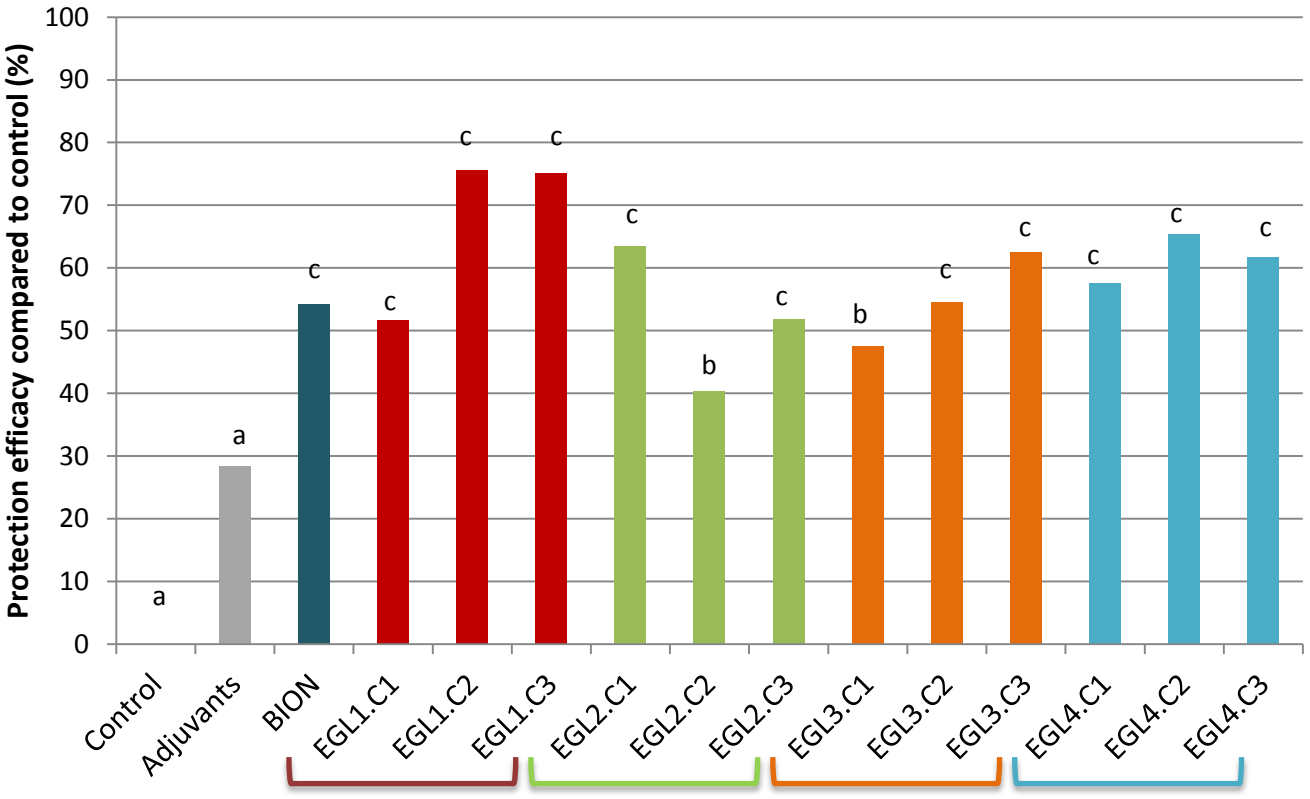


Control 1: water
Control 2: water + adjuvants
Control 3: BION®, Syngenta Europe (0,6mg/ml)

SCREENING RESULTS




RESULTS for EGL1-EGL2-EGL3-EGL4



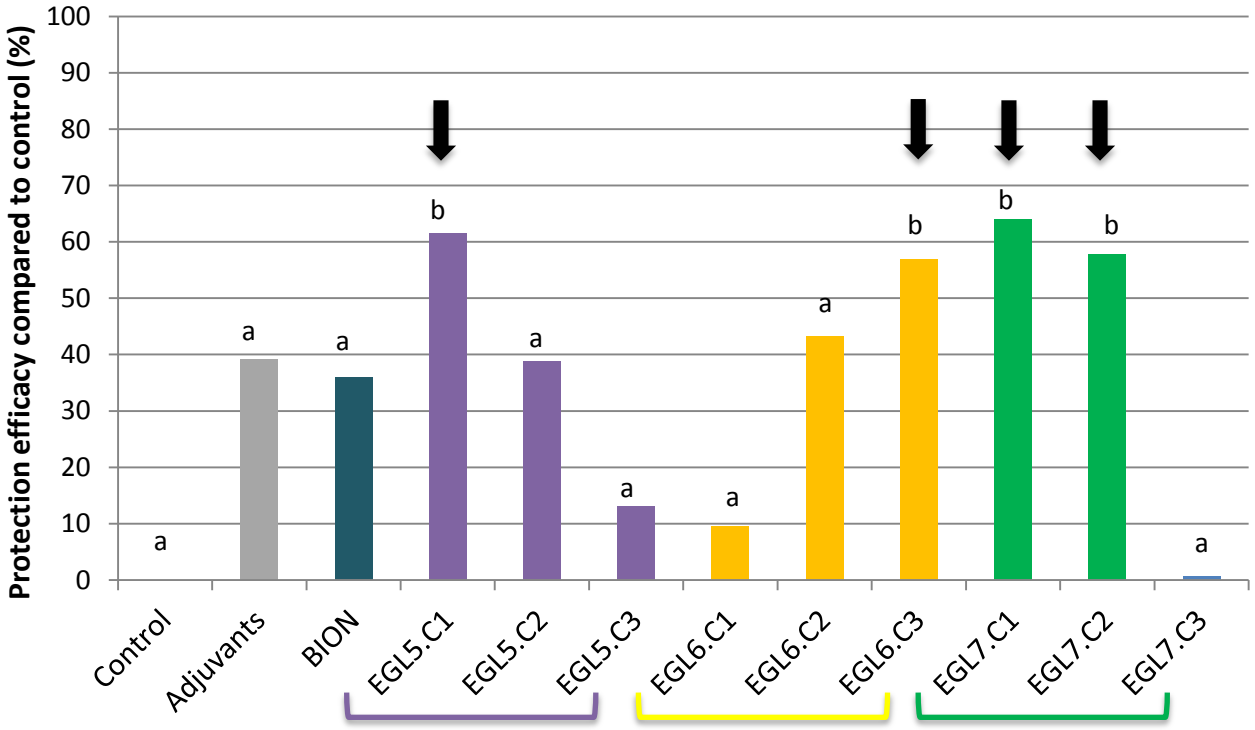
	Doses (mg/ml)			
	EGL1	EGL2	EGL3	EGL4
C1	0.1	0.001	$9{,}5.10^{-5}$	0.3
C2	1	0.01	$9{,}5.10^{-4}$	3
C3	5	0.1	0.0095	30

Control showed 14.7% of leaf surface with symptomatic lesions

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

- **Molecules EGL 1, 2, 3 and 4** contributed to reduce *Zymoseptoria tritici* symptoms by at least 40%
- For each molecule, all concentrations were efficient
- Adjuvants added to treatment did not have an impact on disease infection

RESULTS for EGL5-EGL6-EGL7



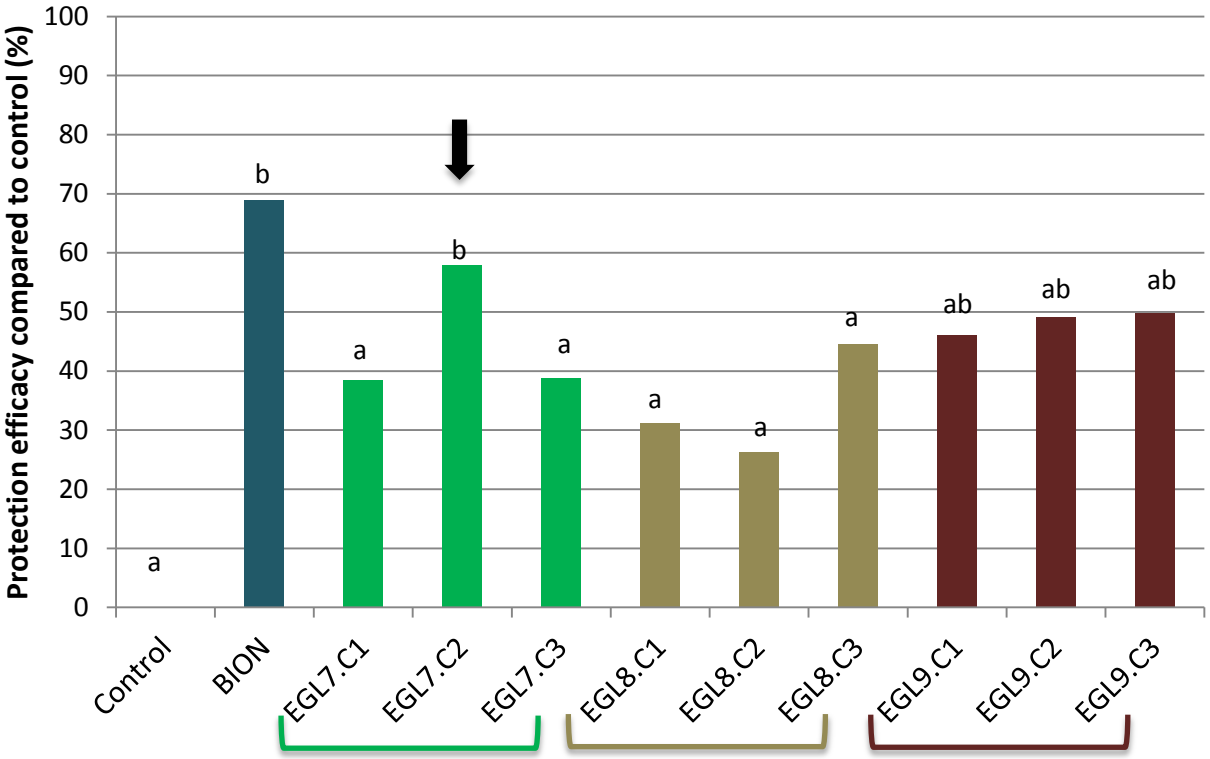
Bars tagged with the same letter are not significantly different using the Tukey test at *P*=0.05

	Doses (mg/ml)		
	EGL5	EGL6	EGL7
C1	0.006	0.006	0.12
C2	0.06	0.06	1.2
C3	0.625	0.625	12

Control showed 12.3% of leaf surface with symptomatic lesions

- **EGL 5, 6 and 7** contributed to reduce *Zymoseptoria tritici* symptoms at various concentrations

RESULTS for EGL7-EGL8-EGL9



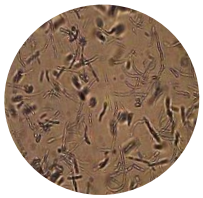
Bars tagged with the same letter are not significantly different using the Tukey test at *P*=0.05

	Doses (mg/ml)		
	EGL7	EGL8	EGL9
C1	0.12	Dil.x2000	0.002
C2	1.2	Dil.x200	0.008
C3	12	Dil.x20	0.03

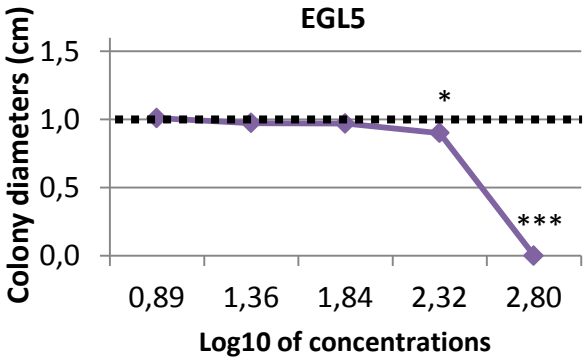
Control showed 15.5% of leaf surface with symptomatic lesions

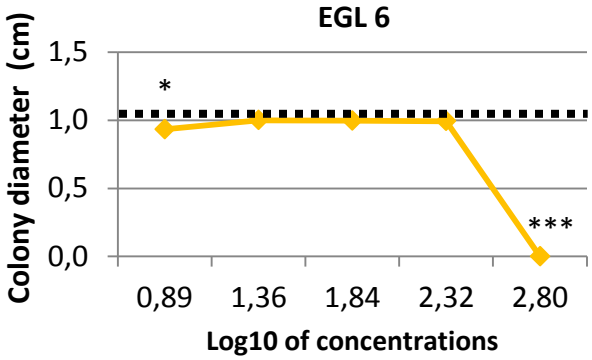
- **EGL 7** showed once more an impact, but just at concentration C2 (1.2mg/ml)

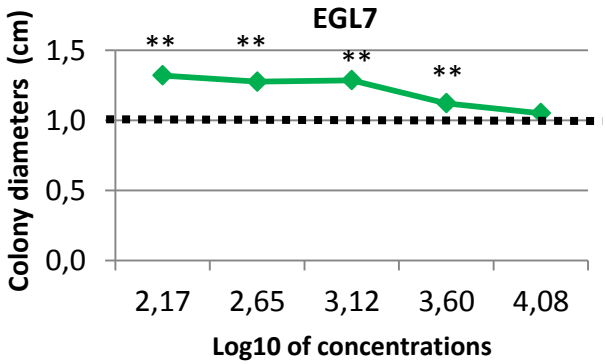
BIOCIDE ACTIVITY (*in vitro*)

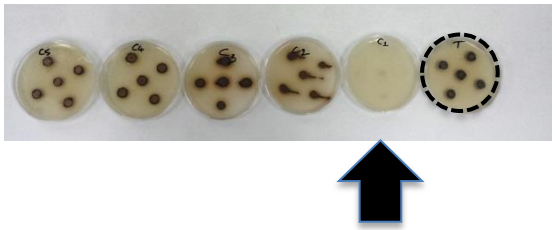


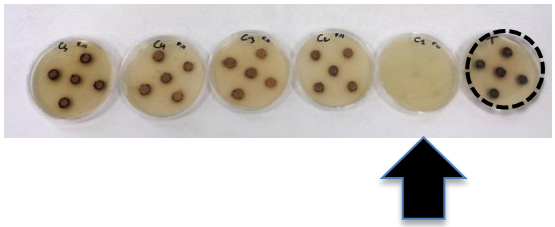

Dose-response curve of *Zymoseptoria tritici* growth on PDA medium with different elicitor concentrations











Ongoing experiment with the other EGLs

Control: .....

CONCLUSIONS

- **Several molecules** contributed to reduce STB foliar infection on wheat (algae extracts, peptide, alcaloïde and oligosaccharide).

- In the three screening tests, disease pressure on control was low (**12% to 15% of leaf surface covered with symptomatic lesions)**. Yet, statistical analysis showed that several molecules were efficient.

  Testing these molecules further, under field conditions, is therefore interesting and legitimate according to C.Maumené (Arvalis Institut du Végétal, France).

- **Biocide tests *in vitro* and *in planta*** are also carried out to ensure the observation of an « elicitor effect »

NEXT STEP

Choosing the 2 best elicitor molecules

Study plant enzymatic activity and defense gene expression

Field trials

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THANK YOU FOR YOUR ATTENTION!