Development of methodological tools to better understand biocontrol products

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Context : ABA PIC project **:** **A**cceleration of **B**iocontrol and **A**gricultural equipment for **I**ntegrated **C**rop **P**rotection

19 months
2021-2022

2 Millions €

15 partners

coordinator

A methodological project with 4 objectives

1. Develop and test tools for monitoring biocontrol organisms and substances in the agrosystem: focus on microorganisms and VOCs
2. Develop and test methods for studying the factors that condition the success of the use of biocontrol
3. Improve experimental capacities on the methods of application of biocontrol products
4. Develop biocontrol positioning know-how on the basis of diagnosis, monitoring and anticipation of the dynamics of pests, diseases and crop auxiliaries

Main methodological tools developped by Vegenov and associated results

1

Monitoring of microorganisms by qPCR: Pathogenic and BCA

- Detection and quantification of ***Trichoderma atroviride, T. viride, Bacillus velezensis*** **QST713**

➔ Vegenov can now monitor more than 50 microorganisms species

- Distinction of viable and non-viable microorganisms (PMAxx™) : encouraging results that need to be validated

2

Factor that may condition the efficacy of BCA

After different abiotic stresses

Temperature impact: Optimal = 18/20°C N/D; Decrease = 10/12°C N/D; Increase = 30/32°C N/D

pH impact: Optimal = 6-7; Decrease = 5; Increase = 8

Humidity impact: Optimal = 70-75%; Decrease = 50 and 60%; Increase = 100%

Leaching impact: Optimal = 0 mm; Rain 1 = 20 mm; Rain 2 = 100 mm

	control	10-12°C	30-32°C	pH 5	pH 8	Humidity 50%	Humidity 60%	Humidity 75%	Humidity 100%	Leaching 20 mm	Leaching 100 mm
Chemical control	100.0	100.0	100.0	100.0	100.0	97.7	100.0	98.4	100.0	99.2	83.4
Bacillus 3	96.8	99.2	95.7	92.5	97.0	93.6	99.0	59.2	87.2	13.3	-1.1
Trichoderma 2	98.6	73.0	100.0	89.1	91.1	87.8	74.9	79.2	98.3	98.3	98.3

Protection efficacy: 100% – 0%

When combined with other phytosanitary : conventionnal (C) or biopesticide (B)

		Sulfur (B)	Sulfur (B)	Fatty acid (B)	COS-OGA (B)	Essential oil (B)	Potassium hydrogen carbonate (B)	Cyazofamide (C)	Bupirimate (C)
	Alone	**0**	**0**	**0**	**8**	**52**	**24**	**0**	**26**
***Bacillus* 1**	**97**	50	38	76	100	62	74	83	57
***Bacillus* 2**	**14**	9	18	33	26	76	44	-7	5
***Bacillus* 3**	**100**	94	90	4	98	28	92	93	73
***Trichoderma* 1**	**40**	38	63	24	33	72	42	61	28
***Trichoderma* 2**	**82**	87	82	93	79	88	56	88	94
***Trichoderma* 3**	**76**	85	85	67	78	84	62	76	88

Protection efficacy when combined:

High decrase

Moderate decrease

No evolution

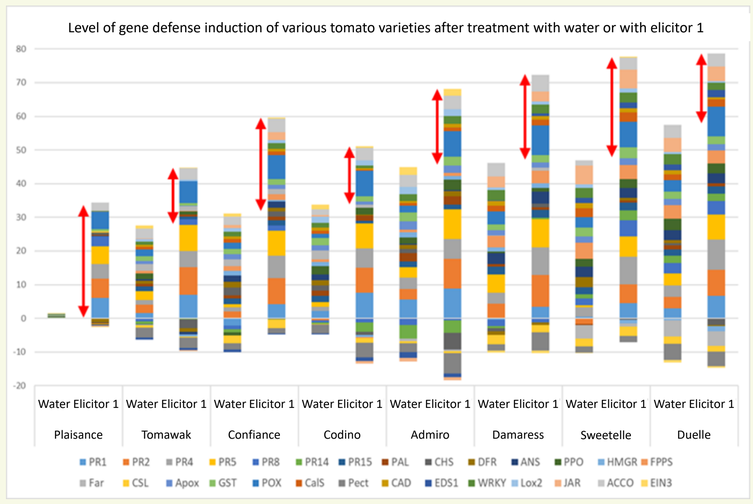
Increase

Ability to stimulate plant defense

Does the tomato variety impact plant defense induction?

	ToMV	ToTV	TSWV	*Passalora fulva*	*Fusarium oxysporum f. sp. lycopersici*	*Fusarium oxysporum f. sp. radicis-lycopersici*	*Verticillium albo-atrum*	*Verticillium dahliae*	*Meloidogyne arenaria, Meloidogyne incognita, Meloidogyne javanica*
Admiro	0-2			A-E	0,1		x	x	
Codino	0-2		x	A-E	0,1	x	x	x	
Confiance	0-2	x	x	A-E	0,1		x	x	
Plaisance	0-2			A-E	0,1	x			
Tomawak	0-2				0	x	x	x	
Damaress	0-2		x	A-E	0,1	x	x	x	
Duelle	0-2			A-E					x
Sweetelle	0-2			A-E	0				x

- **Very contrasting constitutive defense level**
- All varieties respond to elicitor 1, but with variability
- Plaisance variety presented the highest level of induction

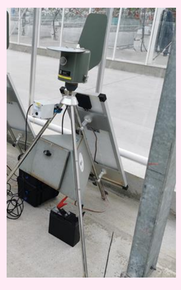


4

Comparison of spore trappers tools for air sampling and spore monitoring in greenhouses and field conditions

Example: *Peronospora destructor* (Allium downy mildew)

Burkhard



- **Early detection ++ (5 days before symptoms)**
- Higher frequency of sampling (automatically) : of interest for appreciating the dynamics of contamination
- Expensive system but energy self sufficiant

Rotorod

- **No early detection (0 day before symptoms)**
- Very low concentration of spores during sampling & manual sampling frequency
- Intermediate cost and not energy self-sufficiant (battery replacement every 4-5 days)

Spornado

- **Early detection +++ (10 days before symptoms)**
- Manual sampling frequency
- Low cost and passive (no energy requirement)

Conclusions

Methodology acquired and/or improved by the various partners

- Available for future private or public projects

Webinars organized early 2023

- Replay available on the Acta website (in French)

Presentations available in the news of Vegenov's website

Let's meet us!

At ABIM 2023 : Stand 064

In our laboratories : Saint Pol de Léon (29),France

Contact by email : crenn@vegenov.com