

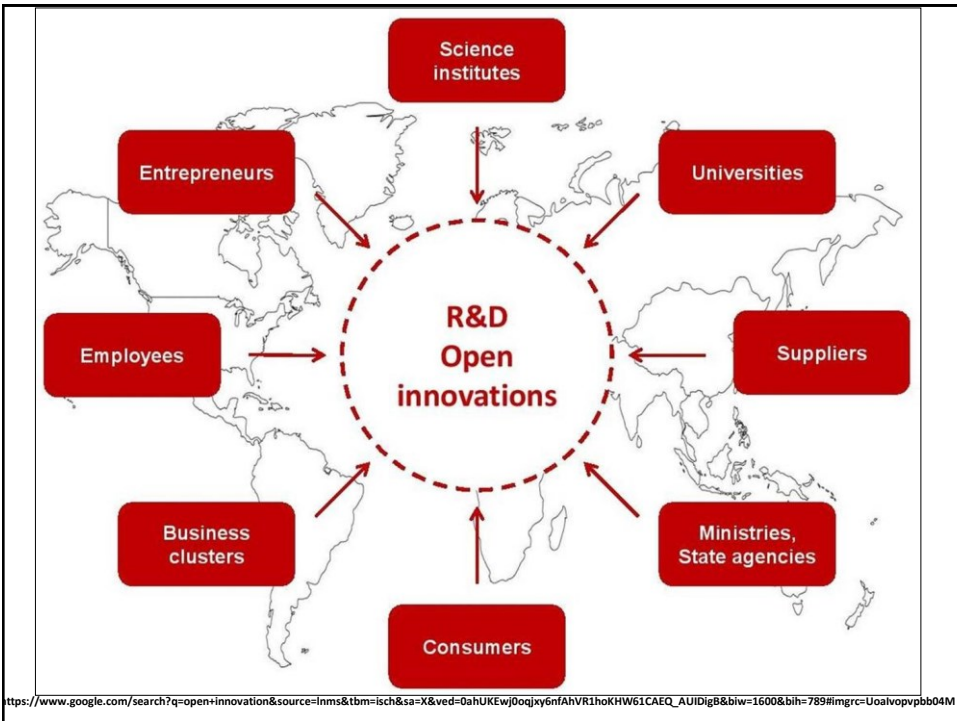


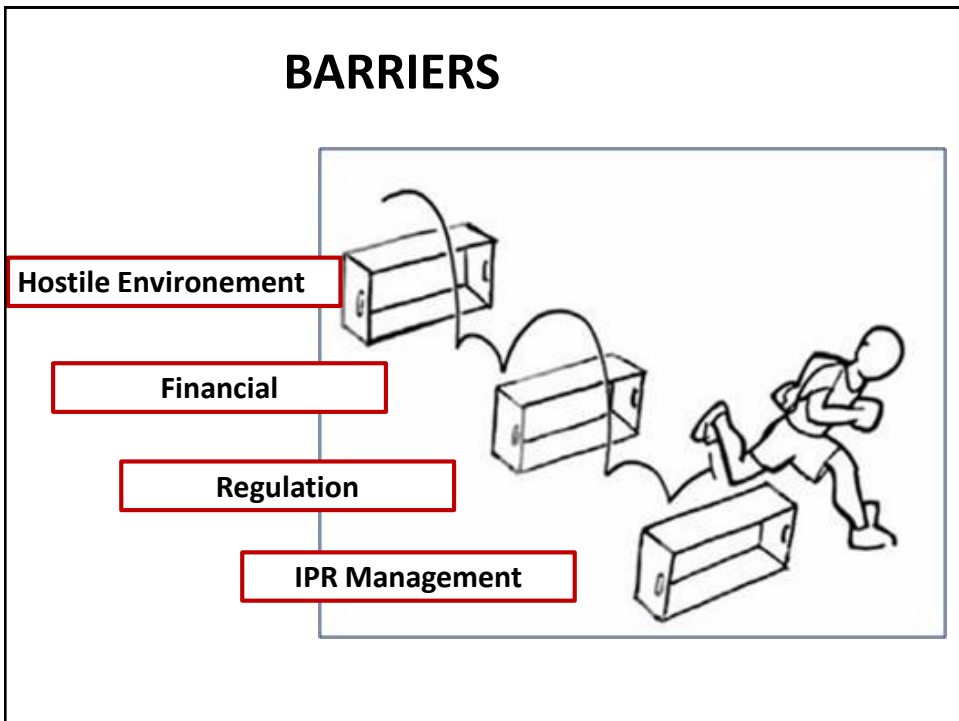
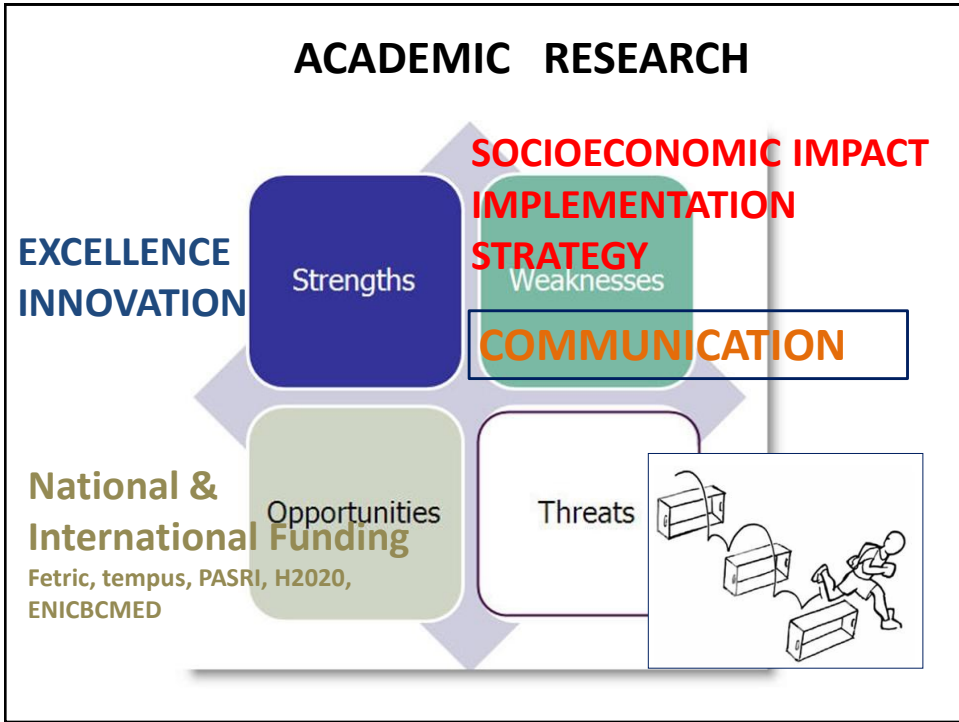
L'Innovation, un des Moteurs de l'Entreprise pour un Développement Durable


ou

How can technology transfer from Lab to Market push companies for open innovation?

**Pr Souad Rouis, Entrepreneur
Center of Biotechnology of Sfax
Laboratory of Biopesticides**

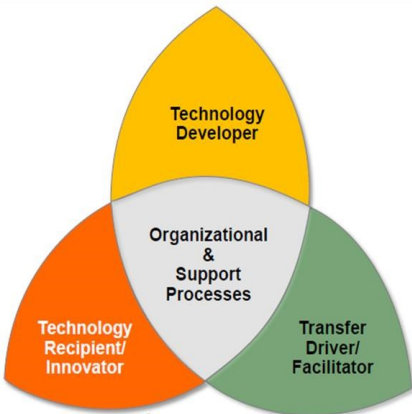




 innoSPICE



innoSPICE® is an instrument to support quality management in the field of innovation, knowledge and technology transfer.

innoSPICE Model



- innoSPICE is an ISO/IEC 15504 conformant process reference & assessment model for knowledge- and technology transfer and innovation activities.
- The level of the transfer and innovation capability of an organization is related to
 - the fulfilment of processes (process dimension „what“?) and
 - the maturity of these processes (maturity dimension „how are they performed“?)
- innoSPICE was evaluated within > 30 assessments in various institutions all over Europe
- innoSPICE Special Interest Group (SIG) is new member of the SPICE User Group and the model is public available.

Source: innoSPICE ISO 15504

4

Organizational Process Category (ORG)

Tendering; Contracting; Technology Transfer Management; Relationship Management; Human Resource Management; Incentive Structure; Decision Making

Technology Developer Process Category (DEV)

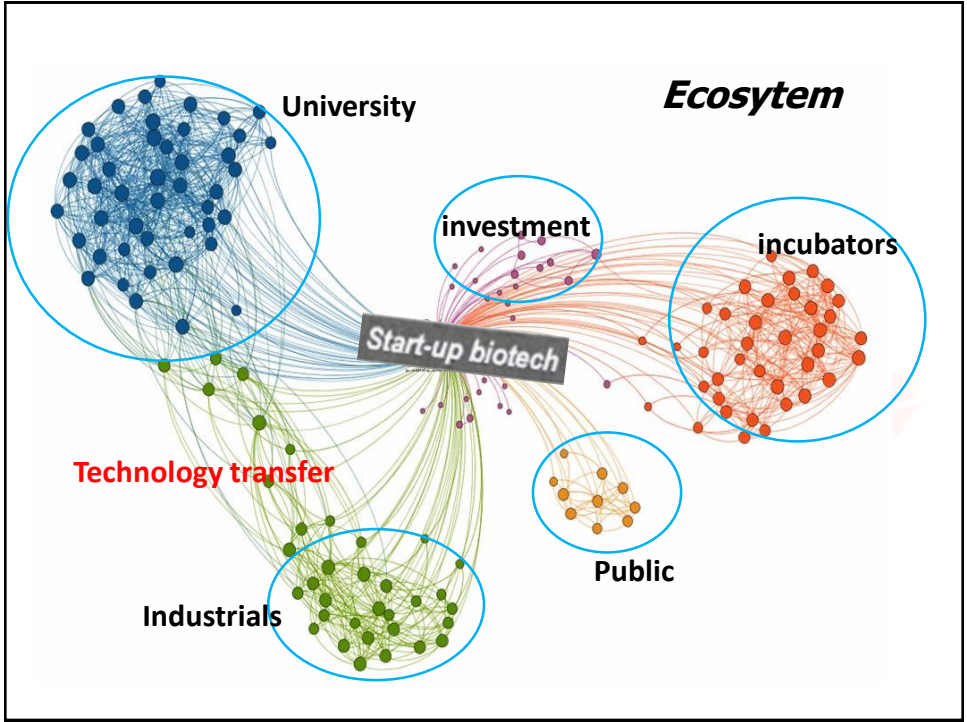
Research and development project proposal preparation, Applied Science Knowledge Creation, Experimental Science Knowledge Creation, Prototype Development, Technology Development, Technology Release

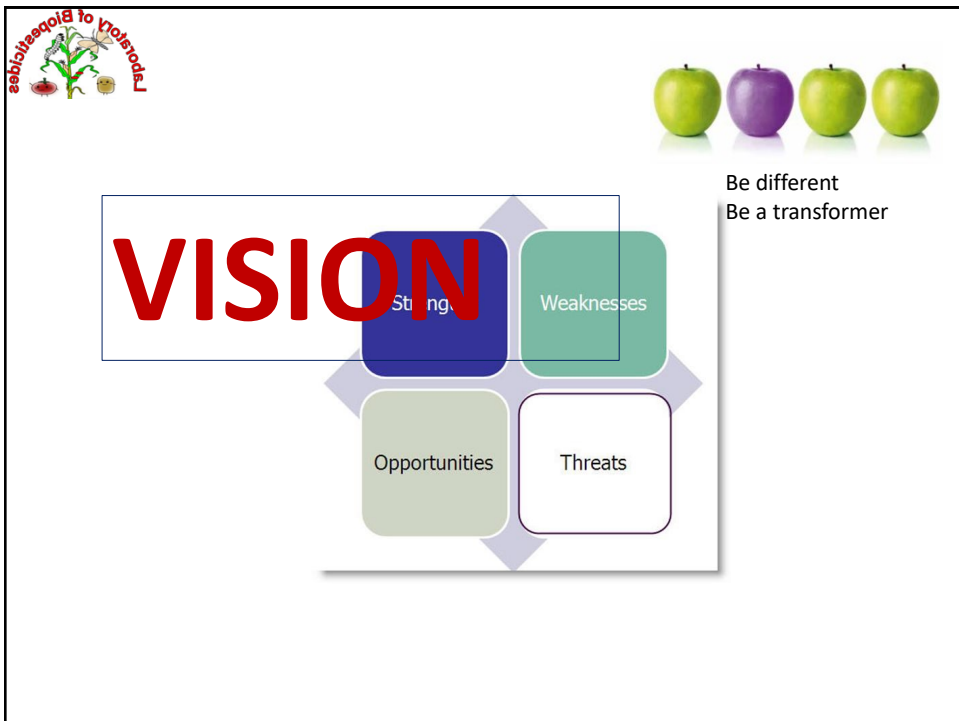
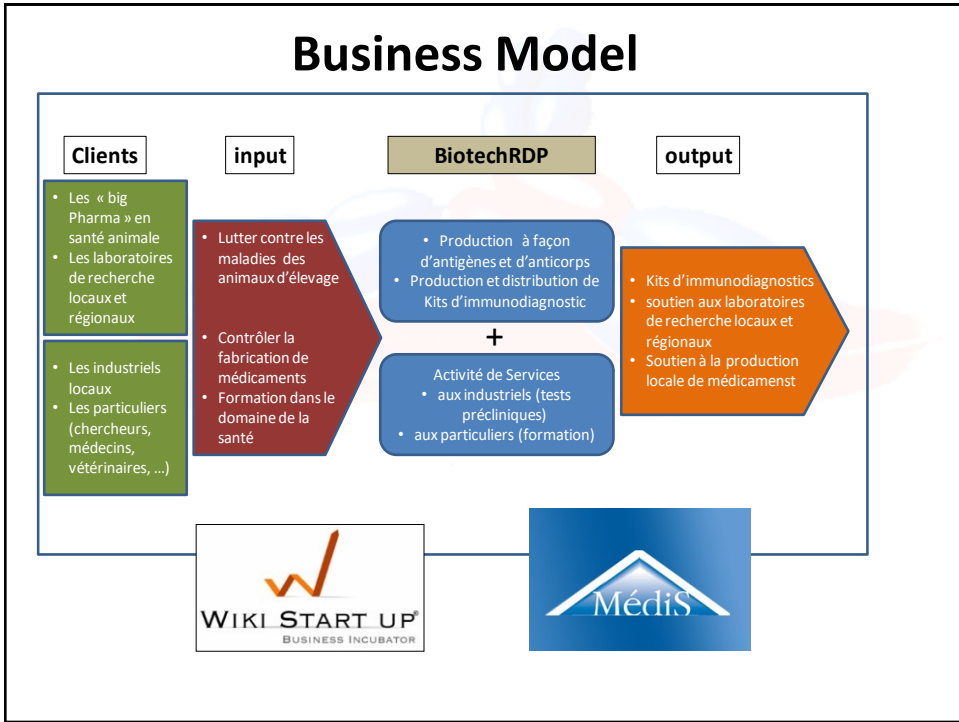
Technology Transfer Driver Process Category (TTD)

Technology Transfer Concept; Technology Evaluation; Intellectual Property Protection Determination ; Initial Market Assessment; Technical Analysis; Market and Competitive Analysis; Technology Value Evaluation; Go to Market Estimation; Commercial/Social-economic Interest Confirmation; Business Case Establishment; Financing Sources Raising

Supporting Process Category (SUP)

Contacts and Collaboration Development; Communication; Joint Review; Information Management; Training; Work Environment







Strategy/General Objectif

Establish and maintain consultation and collaboration between the different structures operating in the sphere of research, innovation and development

Create an environment encouraging to the exploitation of results by acting both on the demand and the supply of the results of research and innovations and by facilitating the Research-Development interface.



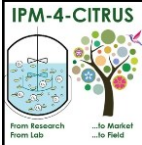
Specific Objectives

1/ Establishment of a strategic partnership with an industrialist interested in plant health for the transfer of biopesticide production technology and their commercialization

2 / Accompanying this Public-Private Partnership in the process of legal and economic maturation

3 / Realization of a proof of concept for a license and a business creation (spinoff / startup)

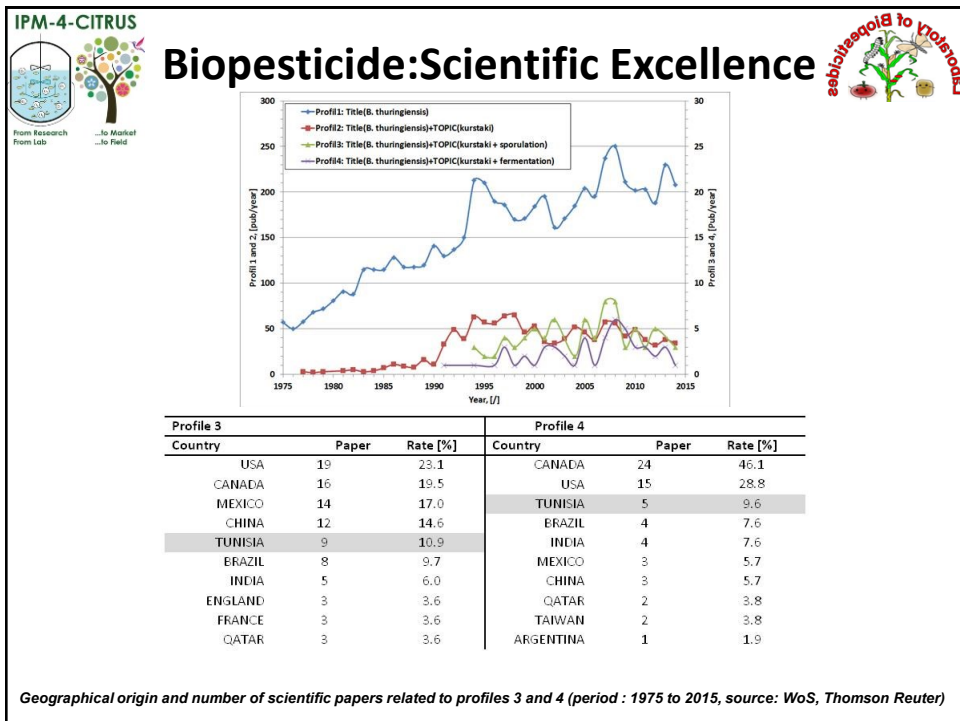
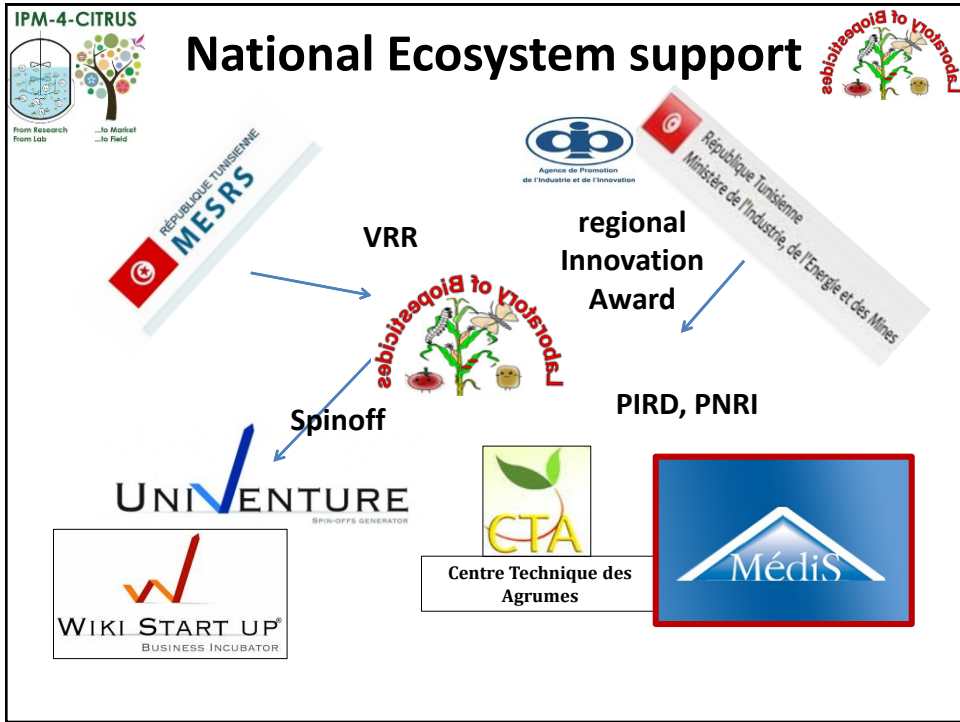
4 / Reinforcing the rapprochement Research-Enterprise by initiating a dialogue between all the stakeholders for the creation of a chain of plus value (cluster)

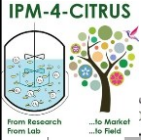


BUSINESS CASE

***Bt* based Biopesticide Valorisation: « From Lab to Market »**








From Research
From Lab

...to Market
...to Field

INNOVATION/ VALORISATION

EN MICROBIOLOGIE
N° 10.1007/s00203-009-0458-y

ORIGINAL PAPER



A new Tunisian strain of *Bacillus thuringiensis kurstaki* having high insecticidal activity and δ -endotoxin yield

Imen Saadaoui · Souad Rouis · Samir Jaoua

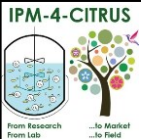
PATENT

Received: 13 November 2008 / Revised: 16 January 2009 / Accepted: 16 January 2009
© Springer-Verlag 2009

Abstract BLB1 is a new *Bacillus thuringiensis kurstaki* strain, isolated from a Tunisian soil sample. Assay of toxicity of BLB1 crystal proteins resulted in an LC50 of 70.32 ng of toxin per mg of flour against third instar *Ephesia kuehniella* with confidence limits of (31.6–109.04 ng). This LC50 is less than that of the commercial strains HD1 used as a reference. The characterization of this strain by scanning transmission electron microscopy, analysis of its *cry* genes content by PCR-sequencing, and analysis of its δ -endotoxin patterns demonstrate that it belongs to the same subgroup than HD1, but ruled out the involvement of *cry*


during sporulation (Bechtel and Bulla 1976). These proteins are specifically toxic to insect larvae and are widely used as bioinsecticides against lepidopteran, dipteran, and coleopteran pests. Crystal proteins from numerous strains have been classified according to the similarity of their amino acid sequences and their insecticidal specificity (Höfte and Whiteley 1989).

In general, most Lepidopteron-specific *B. thuringiensis* toxins are known to be synthesized as a protein crystals composed of protoxin molecules of 130–140 kDa which, upon ingestion by larvae of a susceptible species, are dis-




From Research
From Lab


...to Market
...to Field




CENTRE DE BIOTECHNOLOGIE DE Sfax
LABORATOIRE DES BIOPESTICIDES




FACULTE DES SCIENCES DE Sfax
DEPARTEMENT SCIENCES DE LA VIE



LABORATOIRES PHARMACEUTIQUES MEDIS



ANPR
Agence Nationale de la Recherche
de la Biotechnologie, de la Santé et de l'Environnement



République Tunisienne
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
Université de Sfax

THESE

En vue de l'obtention du
Doctorat en Sciences Biologiques

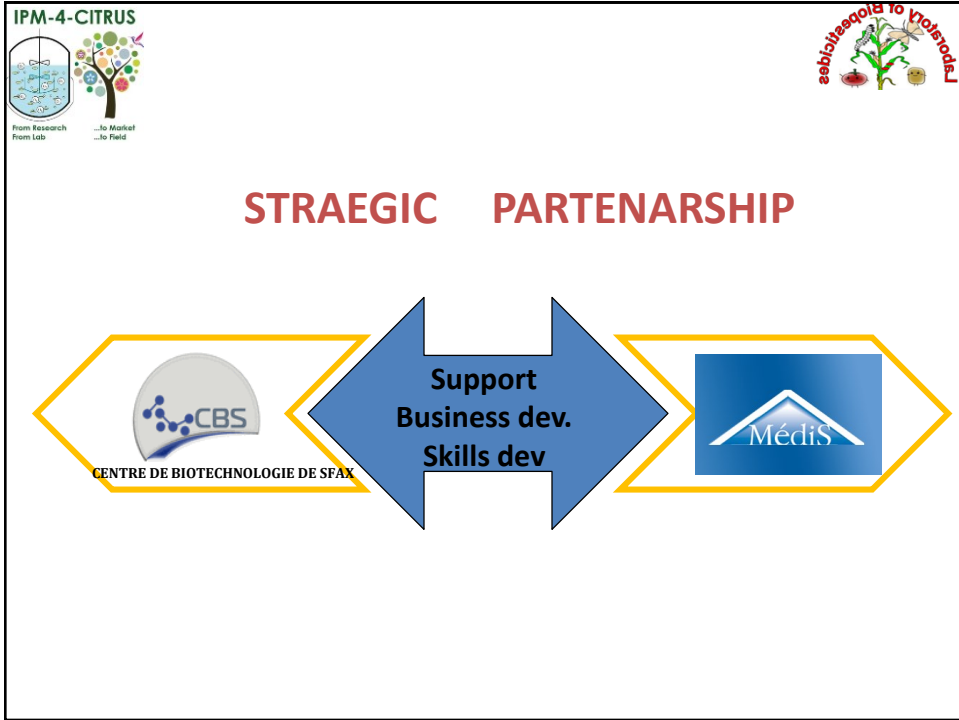
Présentée par
Nouha ABDELMALEK

Recherche et caractérisation de nouvelles souches de *Bacillus thuringiensis* et leur application pour la lutte biologique.

Soutenu le 19/12/ 2010 devant le jury composé de :

Mr. Ali GARGOURI	Professeur, CBS	Président
Mme. Alya SELLAMI-KAMOUN	Maitre de conférences, FSS	Rapporteur
Mr. Luc FILLAUDEAU	Directeur de Recherche à l'INRA, Toulouse	Rapporteur
Mr. Hichem CHOUAYEKH	Professeur, CBS	Examinateur
Mr. Slim TOUNSI	Professeur, CBS	Membre Invité
Mme. Nadia BEN SAID	Pharmacien Responsable Biotechnologies, MEDIS	Membre invité
Mme. Souad ROUIS	Maitre de conférences, CBS	Directrice de thèse

Année Universitaire : 2015-2016



IPM-4-CITRUS
From Research From Lab ...to Market ...to Field

Université de Toulouse
Le laboratoire de Biotechnologie

IPM-4-Citrus

**CALL: H2020-MSCA-RISE-2016
NUMBER: 734921**

DURATION: 48 MONTHS / START: 01 APR 2017

PROJECT COST: 801,000.00 €

CONTACT (PO): TIPHANIE SPANIER, REA

INSA TOULOUSE

CBS

JKI
Julius Kühn-Institut

BIYANS

twb
White Biotechnology
center of excellence

MédiS
Au service de la santé

LISBP

UJ

IPT
مركز البحوث والتقنية في تونس
Tunis Center for Research and Technology

CTA

BIOINDUSTRY PARK
SILVANO FUMERO

WIKI START UP
BUSINESS INCUBATOR

IPM-4-CITRUS


IPM aims...
<http://www.ipm-4-citrus.insa-toulouse.fr/>

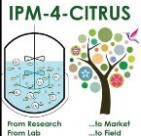
IPM-4-CITRUS aims to strengthen collaborations between academic and non-academic partners based in 3 European Member States (France, Germany and Italy), 2 Associated Countries (Turkey and Tunisia) and 1 Third Country (Lebanon), to develop two new bio-pesticides active against citrus pests and scale them up from lab to market.



Bacillus thuringiensis


The project's research and innovation activities are based on a multidisciplinary approach, which aims at understanding and sensitising stakeholders about the health risk factors related to citrus pests and developing an alternative **Integrated Pest Management (IPM)** approach based on biological control. In conjunction with validation through field tests, the project will pave the way for future commercial exploitation of these new biopesticide products by drawing up a feasibility study for future spin-off activities and/or new production lines in partner SMEs.

Staff secondments and inter-sector and international mobilities between complementary partners will represent a unique opportunity to optimise bioproduction processes and obtain high added-value bioproducts, while building up the partners' skills and reinforcing the training of early-stage researchers through knowledge sharing and networking. The project will also adopt a concrete RRI approach by favouring public engagement and informal education through the different outreach activities aimed at a variety of target groups.

IPM-4-CITRUS


HORIZON 2020 FUNDED
 Marie Skłodowska Curie Action
 Research & Innovation Staff Exchange

INTEGRATED PEST MANAGEMENT
 Understanding & sensitising stakeholders about the health risks related to citrus pests
 Developing an alternative IPM approach based on biological control

IPM-4-CITRUS


11 PARTNERS
6 COUNTRIES
4 YEARS DURATION


Partners: INSA TOULOUSE, LISBP, CBS, Médiis Au service de la santé, CTA, IPT, WIKI START UP, BIOWORKS ASSOCIATION, twb White Biotechnology center of excellence, BIYANS, JKI Atlas Niles Institute, BIOINDUSTRY PARK


STRAIN USED:
Bacillus thuringiensis kurstaki BLB1 and LIP

TARGETED PEST:
 insect larvae
Phyllocnistis citrella & *Prays citri*

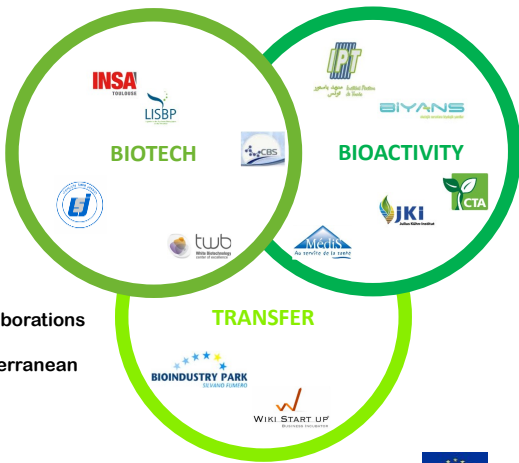
Citrus

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement N° 734921



IPM-4-CITRUS


**Interdisciplinary
 Intersectoral
 International**




GOAL :

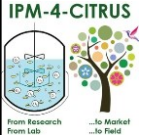
- Strengthening Academia & Industrial collaborations
- Optimising bioproduction processes
- Developing new biopesticides in the Mediterranean region

HOW :

- Feasibility study for future spin-off activities and new production lines,
- Benchmarking the opportunities & obstacles related to bringing innovative ideas to the market.

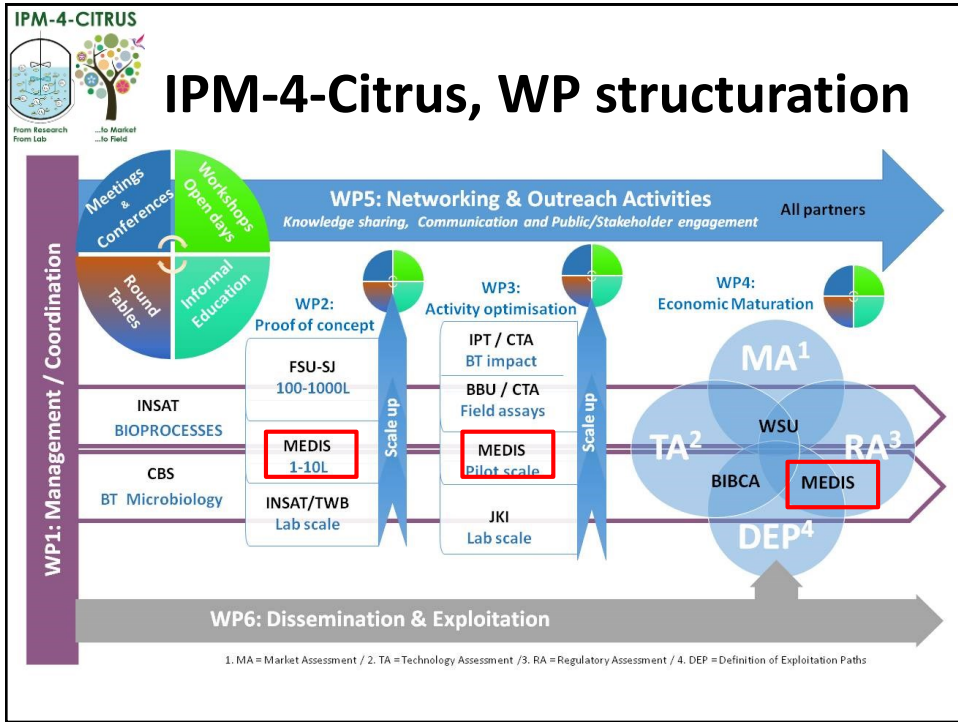
This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement N° 734921



IPM-4-CITRUS


A pool of competency... with human resource

		MM												Budget		
Total		178												801 €		
Nb participants :		36														
			BBU	BIPCA	CBS	CTA	FSU	INSAT	IPT	JKI	MEDIS	TWB	WSU	MM	Total k€	
F	WP1 Secondments													0	0	
	MM (No permanent)															
M	WP2 Secondments			17		19	31				21			88	396	
	MM (No permanent)			12		16	24			12						
EN	WP3 Secondments	9	1	6	5	11		9	16	14				71	319,5	
	MM (No permanent)	9	0	0	1	10		6	2	12						
B	WP4 Secondments		3	1		2	2		2			1		11	49,5	
	MM (No permanent)		0	0		0										
	WP5 Secondments			3		3	1						1	8	36	
	MM (No permanent)			0												
Total k€			9	4	27	5	35	34	9	18	35	1	1	178	801	
Participants (secondement)			2	2	5	2	6	6	2	3	4	1	1	34		



IPM-4-CITRUS
From Research From Lab ...to Market ...to Field

Progress Meeting -JKI-26 &27 September 2019

T2.3: Bioprocess transposition (scale up 1-10L bioreactor scale)

knowledge sharing

TWB → **CBS /USJ**

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IPM-4-CITRUS

From Research From Lab ...to Market ...to Field

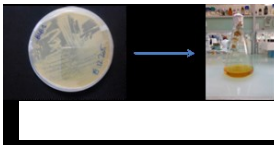



Progress Meeting -JKI-26 &27 September 2019

T2.4: Production protocol for demonstration scale (Pre-industrial)

Task to be initiated

An *innovative*, tested methodology which will be applied and adapted to the pre- industrial scale towards exploitation by the industrial partner

↓

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From Research From Lab ...to Market ...to Field

BIOACTIVITY

The whiteboard contains the following information:

- Process Flow:** A schematic diagram showing the flow from raw materials through various stages (e.g., extraction, filtration, concentration) to the final product.
- Parameters:** Lists various parameters such as temperature (T₁, T₂), pH, and concentrations.
- Bioactivity Tests:**
 - Antimicrobial:** Tests using agar diffusion and MIC (Minimum Inhibitory Concentration).
 - Antifungal:** Tests using agar diffusion and MIC.
 - Antibacterial:** Tests using agar diffusion and MIC.
 - Antiparasitic:** Tests using agar diffusion and MIC.
 - Antiviral:** Tests using agar diffusion and MIC.
- Results Table:** A table summarizing the results of the bioactivity tests.

IPM-4-CITRUS

TRANSFER

Grant Management

734921 (IPM-4-Citrus) - MCA-RES

Call: HORIZON-MCA-RES-2018

Topic: MCA-RES-2018

Unit: REACT

Project Continuous Report

Summary for publication	Deliverables (DMP, Ethics, Reports)	Meetings	Critical Risks	Publications	Dissemination	Patents (IP)	S&E Impact	Open Data	Gender	Researcher	ABS Regulation
✓	i	i	✓	✓	✓	✓	i	✓	✓	✓	i

Deliverables, Ethics, DMP, Other Reports

For each Deliverable, a single file (max 5MB) can be uploaded.

Download here the template for the Progress Report. [Download template](#)

View Files [View Files](#)

WP No.	Del Ref.	Del No.	Title	Description	IP	Report	Confide	Start	End	Status	
WP1	D1.1	D1	Project Management Plan (PMP)	DI.1 - Project Management Plan (PMP) This report...	IP1	Report	Confide	31 Mar 20		Submitted	
WP1	D1.2	D4	Progress report M12	Delivery DI.2: Progress report M12. This report...	IP1	Report	Confide	31 Mar 20		Submitted	
WP1	D1.3	D5	M12 term meeting M12	DI.1.3: Mid term meeting M12. This delivery will...	IP1	Report	Confide	31 Mar 20		Submitted	
WP1	D1.4	D9	Progress report M36	Delivery DI.4: Progress report M36. This report...	IP1	Report	Confide	31 Mar 20		Submitted	
WP1	D1.5	D11	Project synthesis (M48)	DI.1.5: Project synthesis (T0-48months) This report...	IP1	Report	Confide	31 Mar 20		Submitted	
WP2	D2.1	D3	Scientific & technical report	DI.1: Scientific & technical report for WP2 (IP2)...	IP2	Report	Confide	31 Mar 20		Submitted	
WP3	D3.1	D6	Scientific & technical report	DI.2: Scientific & technical report for WP3 (IP3)...	IP3	Report	Confide	31 Mar 20		Submitted	
WP3	D3.2	D8	Scientific & technical report	DI.2: Progress report (T0-48months) From scie...	IP3	Report	Confide	31 Mar 20		Submitted	
WP4	D4.1	D10	Scientific & technical report	D4.1: Progress report (T0-48months) From scie...	IP4	Report	Confide	30 Sep 20		Draft	
WP5	D5.1	D7	Communication & networks	While networking will be focused on intra-cons...	IP5	Report	Public	31 Mar 20	07 May 20	11 Jun 2019	Approved
WP6	D6.1	D2	Data management plan (DMP)	A data Management Plan (DMP) will be develop...	IP6	Report	Confide	30 Sep 20	07 May 20		Submitted
WP7	D7.1	D12	EPG - Requirement No. 5	The environmental safety of the new strains (B...	IP7	Ethics	Confide	30 Apr 20	01 Sep 20	18 Sep 2017	Approved
WP7	D7.2	D11	EPG - Requirement No. 6	Documentation demonstrating compliance with the...	IP7	Ethics	Confide	30 Apr 20	01 Sep 20	18 Sep 2017	Approved
WP7	D7.3	D14	HEC - Requirement No. 7	4.3.b. Copies of import/report licences for all...	IP7	Ethics	Confide	30 Apr 20	01 Sep 20	18 Sep 2017	Approved
WP7	D7.4	D15	Authorizations for the supply	The beneficiary should obtain/ keep on file and...	IP7	Ethics	Confide	30 Sep 20	17 Dec 20		Submitted

IPM-4-CITRUS

IPM-4-CITRUS

Welcome on the European scientific project website: IPM-4-Citrus

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 734921

Home
Presentation
News & events
Partners
Planning
Resources
Contact
Workspace
EC Portal

News

Tours
Citrus news
Event
Round table
Training

ESOF Toulouse, conference Session Biopesticides . July 2018

ESOF (Evolutionary Open Forum), Toulouse, July 2018 Conference Open Innovation for biopesticides: a new paradigm™. Place : Mercure Hotel - Conques-Cordes

Although traditional innovation used to be a vertical process within companies, a new open innovation paradigm has emerged with a triple-helix model involving interactions between policymakers, academia and

Continue reading

Training IP2

INDUSTRIAL MICROBIOLOGY, FERMENTATION AND SCALE-UP - CELL CULTIVATION IN BIOREACTORS (M14 AND M17)

Training IP2 is dedicated to "industrial microbiology, fermentation and scale-up" associated with a Demo Day on "Scale up (from Erlenmeyer to bioreactor) and product recovery". The consortium has opted to reduce it of CBS (at valorisation unit, ...

Continue reading

Training IP1

(20th April 2018, CBS, Max): "Socially improvement & bioreactor cultivation from basic concept up to intensified bioproduction" PM1 was associated with 2 satellites events (IP1 and RT1). Training IP1 is briefly described hereafter. Recommendations have been planned in relation to each partner's skills and expertise and the most relevant meeting ...

Continue reading

Roundtable RT1

PM1 was associated with 2 satellites events (IP1 and RT1). Round Table RT1 is briefly described hereafter. RT1 was initially scheduled on 05-02 in Ms. Due to delay in the project, this RT was realized at CBS in association with PM1 (M12). A world café is an innovative method of ...

Continue reading

Live plus

TRAININGS...

BEIRUT Training TP2 training @ USJ, Industrial microbiology, fermentation and scale-up - Cell cultivation in bioreactors

SFAX Training TP2 training @ CBS, Industrial microbiology, fermentation and scale-up - Cell cultivation in bioreactors


NETWORKING ACTIVITIES... ROUND TABLES

TUNIS Rencontre5plus5-IPM-4-Citrus-, 7April2017 (Tunis, Tunisie) managed by IPT

ANKARA Biyans-seminar, April2018 (Ankara, Turkey)


BEIRUT Foire des sciences, Bierut-LEB, March2018 (USJ, Lebanon)

TOULOUSE European Science Open Forum, July 2018.

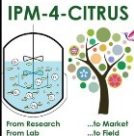
IPM-4-CITRUS

 From Research From Lab ...to Market ...to Field

NETWORKING ACTIVITIES... ROUND TABLES

BEIRUT ROUND TABLE: STATE-OF-THE-ART OF BT CULTURE; COMPARING & SHARING EXPERIENCES – March 2019



TAANAYEL Visit of Biopesticide Start-up (Lebanon) – April 2019

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 From Research From Lab ...to Market ...to Field

INNOVATION & TRANSFER

4 DIMENSIONS OF INNOVATION INTO IPM-4-CITRUS:

1. **Robust fermentation process** with low cost raw material + 2 endemic *Bt kurstaki* strains
2. **Alternative instrumentation** for real time process monitoring (objective : process monitoring and control)
3. **Standards & norms** for Bt production process for the MENA & Sub-Sahara African countries
4. **Innovative application strategy** for controlling leaf miner insects through epiderm (formulation)

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From Research From Lab ...to Market ...to Field

FROM LAB TO MARKET...

Market	API	For	Cond	Market
Human		X	X	X
Animal		X	X	X
Plant	IPM	IPM		

1 production site (Nabeul)
Tunisian and African markets
1 endemic strain (Btk BLB1)

For MEDIS :
1 Manager
1 Bioprocess engineer
1 Formulation engineer

35

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From Research From Lab ...to Market ...to Field

Thank you

CONTACT

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24755116
souadrouis4@gmail.com
Souad.rouis@cbs.rnrt.tn

Tunisian Biotechnologies