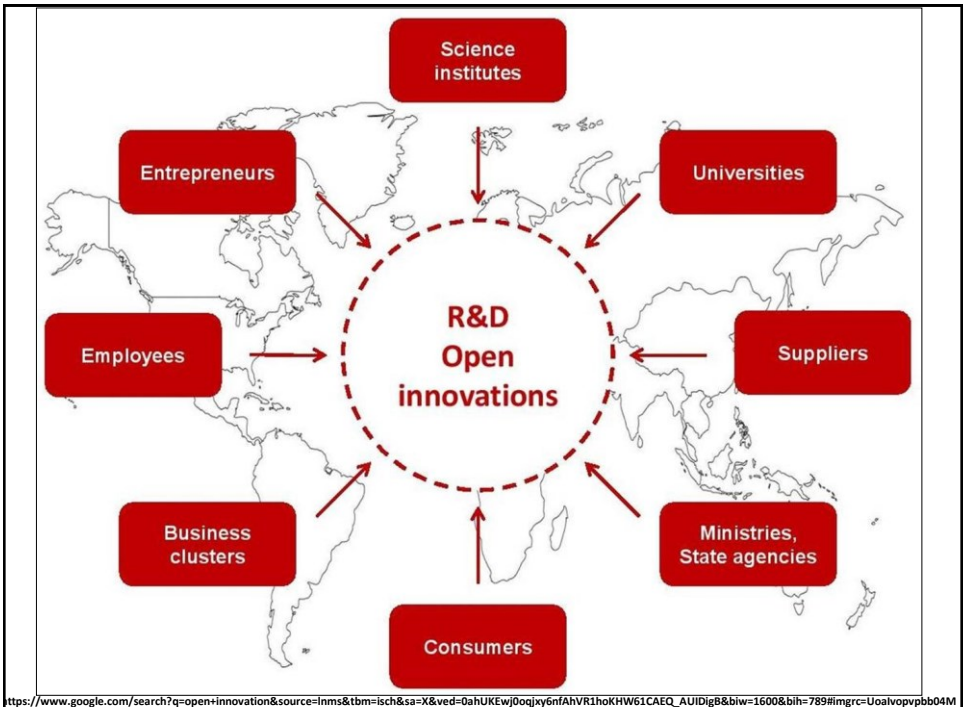
L'Innovation, un des Moteurs de l'Entreprise pour un Développement Durable

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



https://www.google.com/search?q=open+innovation&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj0oqjxy6nfAhVR1hoKHW61CAEQ_AUIDigB&biw=1600&bih=789#imgrc=UoaIvopvpbb04M

ACADEMIC RESEARCH

EXCELLENCE
INNOVATION

Strengths

Weaknesses

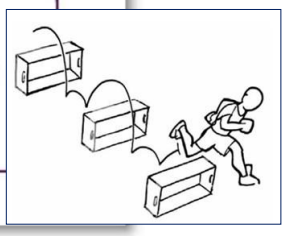
SOCIOECONOMIC IMPACT
IMPLEMENTATION
STRATEGY

COMMUNICATION

Opportunities

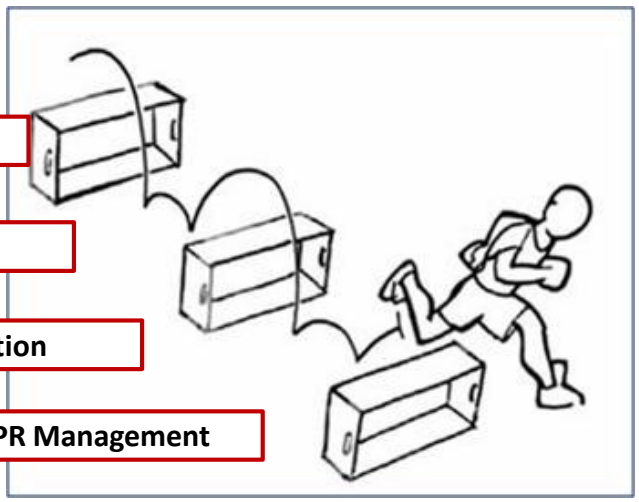
National & International Funding
Fetric, tempus, PASRI, H2020, ENICBCMED

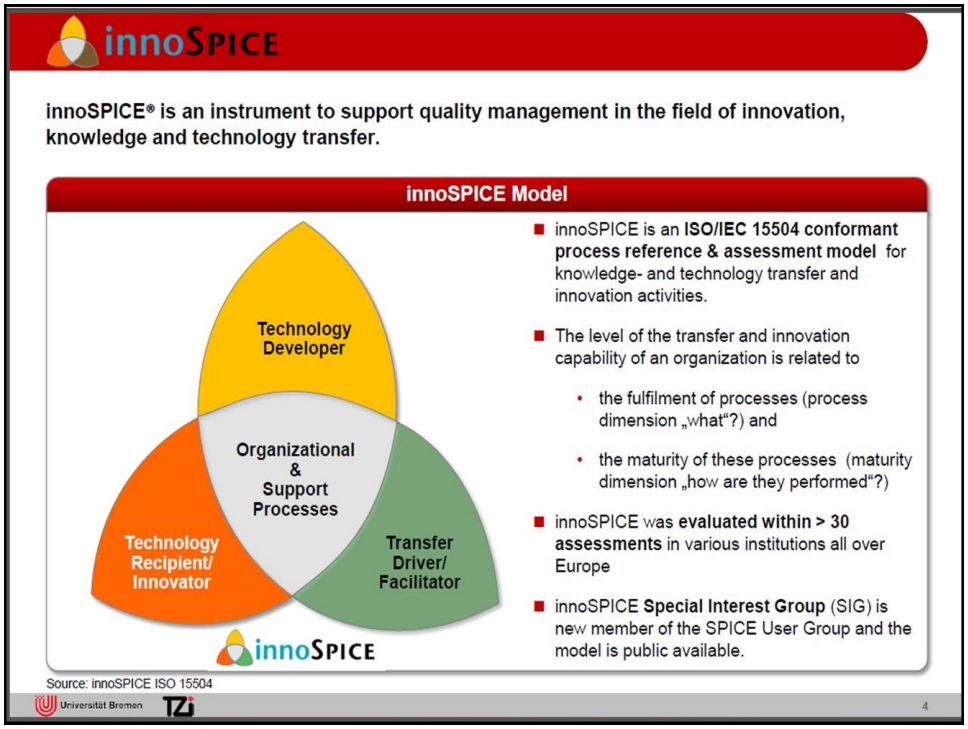
Threats



BARRIERS

- Hostile Environement
- Financial
- Regulation
- IPR Management





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

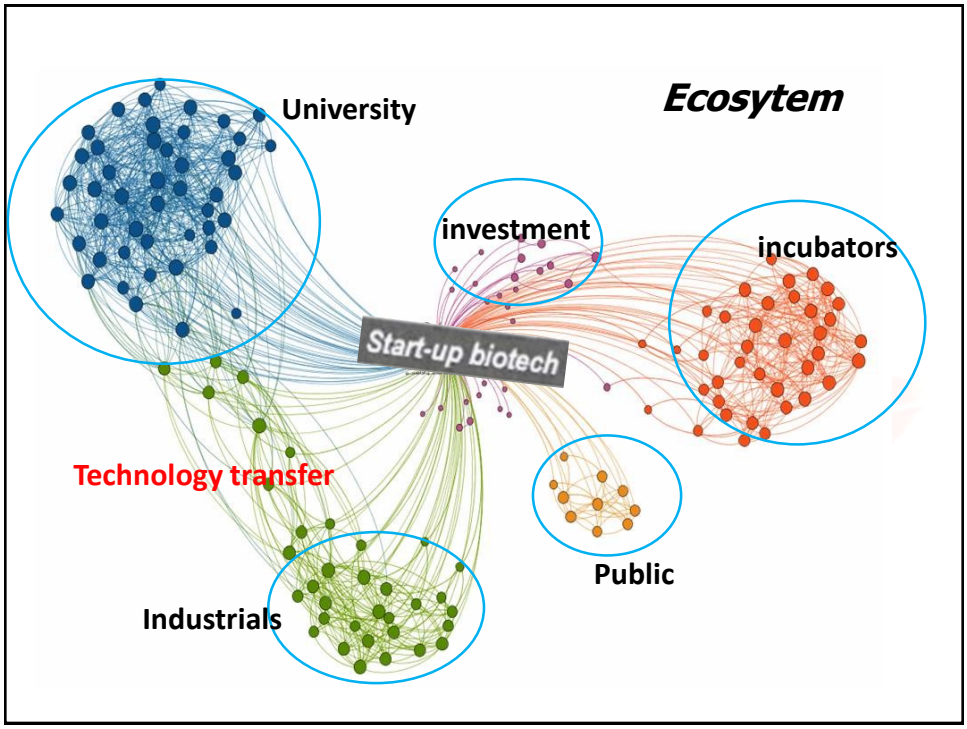
Technology Transfer Driver Process Category (TTD)

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)

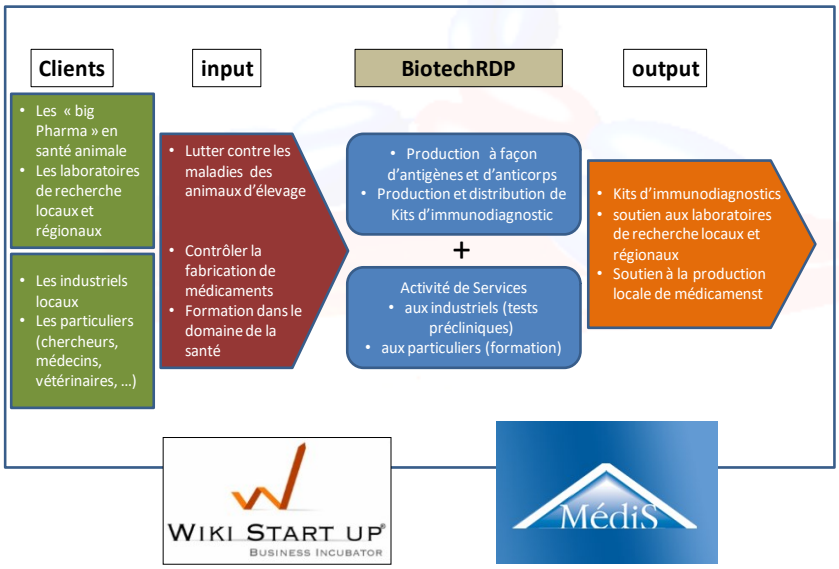
Contacts and Collaboration Development; Communication; Joint Review; Information Management; Training; Work Environment

.


Ecosytem
University
investment
incubators
Start-up biotech
Technology transfer
Public
Industrials


BiotechRDP

Business Model



Be different
Be a transformer

VISION

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)

IPM-4-CITRUS

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

Laboratory of Biopesticides

BUSINESS CASE

Bt based Biopesticide Valorisation: « From Lab to Market »

National Ecosystem support

VRR

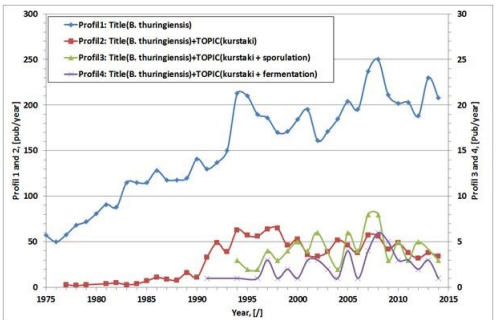
regional Innovation Award

Spinoff

PIRD, PNRI

Centre Technique des Agrumes

Biopesticide:Scientific Excellence



Profile 3			Profile 4		
Country	Paper	Rate [%]	Country	Paper	Rate [%]
USA	19	23.1	CANADA	24	46.1
CANADA	16	19.5	USA	15	28.8
MEXICO	14	17.0	TUNISIA	5	9.6
CHINA	12	14.6	BRAZIL	4	7.6
TUNISIA	9	10.9	INDIA	4	7.6
BRAZIL	8	9.7	MEXICO	3	5.7
INDIA	5	6.0	CHINA	3	5.7
ENGLAND	3	3.6	QATAR	2	3.8
FRANCE	3	3.6	TAIWAN	2	3.8
QATAR	3	3.6	ARGENTINA	1	1.9

Geographical origin and number of scientific papers related to profiles 3 and 4 (period : 1975 to 2015, source: WoS, Thomson Reuter)

IPM-4-CITRUS

INNOVATION/ VALORISATION

cn Microbiol
DI 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

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 *Ephestia 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-

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CENTRE DE BIOTECHNOLOGIE DE SFAX
LABORATOIRE DES BIOPESTICIDES

FACULTE DES SCIENCES DE SFAX
DEPARTEMENT SCIENCES DE LA VIE

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

LABORATOIRES PHARMACEUTIQUES MEDIS

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/ 2016 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, MédiS	Membre invité
Mme.	Souad ROUIS	Maitre de conférences, CBS	Directrice de thèse

Année Universitaire : 2015-2016

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

Laboratory of Biopesticides

STRAEGIC PARTENARSHIP

CBS

CENTRE DE BIOTECHNOLOGIE DE SFAX

Support
Business dev.
Skills dev

MédiS

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

Laboratory of Biopesticides

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 · IPT · 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 Slodowska Curie Action

Research & Innovation Staff Exchange

IPM-4-CITRUS

From Research From Lab … to Market … to Field

INTEGRATED PEST MANAGEMENT

Understanding & sensitising stakeholders about the health risks related to citrus pests

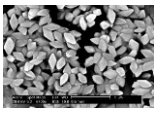
Developing an alternative IPM approach based on biological control

11 PARTNERS

6 COUNTRIES

4 YEARS DURATION

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



STRAIN USED:
Bacillus thuringiensis kurstaki BLB1 and LIP

Citrus

TARGETED PEST:
insect larvae Phyllocnistis citrella & Prays citri

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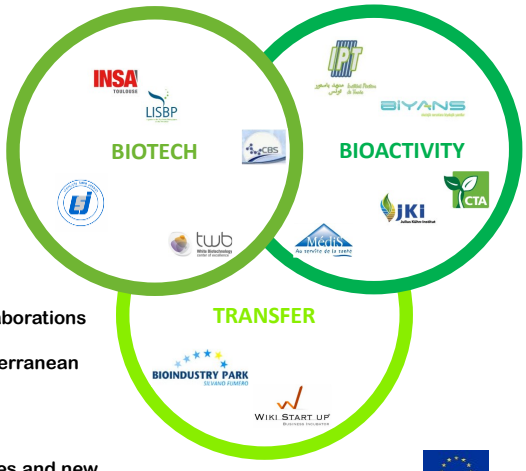
From Research From Lab ...to Market ...to Field

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

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

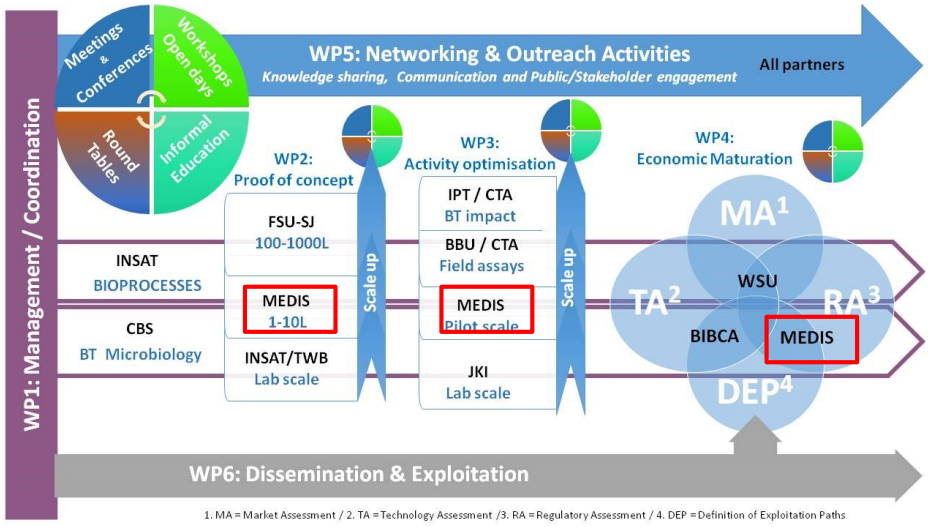
A pool of competency… with human resource

	MM	Budget
Total	178	801 €
Nb participants :		36

		BBU	BIPCA	CBS	CTA	FSU	INSAT	IPT	JKI	MEDIS	TWB	WSU	MM	Total k€
WP1	Secondments												0	0
	MM (No permanent)													
WP2	Secondments			17		19	31			21			88	396
	MM (No permanent)			12		16	24			12				
WP3	Secondments	9	1	6	5	11		9	16	14			71	319,5
	MM (No permanent)	9	0	0	1	10		6	2	12				
WP4	Secondments		3	1		2	2		2		1		11	49,5
	MM (No permanent)		0	0										
WP5	Secondments			3		3	1					1	8	36
	MM (No permanent)			0										
		9	4	27	5	35	34	9	18	35	1	1	178	801
	Total k€	40,5	18	122	22,5	158	153	41	81	157,5	4,5	4,5	801	
	Participants (secondement	2	2	5	2	6	6	2	3	4	1	1	34	

IPM-4-CITRUS

IPM-4-Citrus, WP structuration



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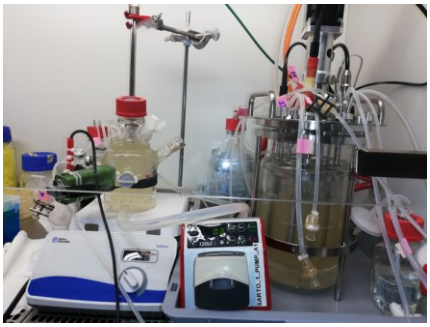
Progress Meeting -JKI-26 &27 September 2019

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

knowledge sharing

TWB → CBS /USJ



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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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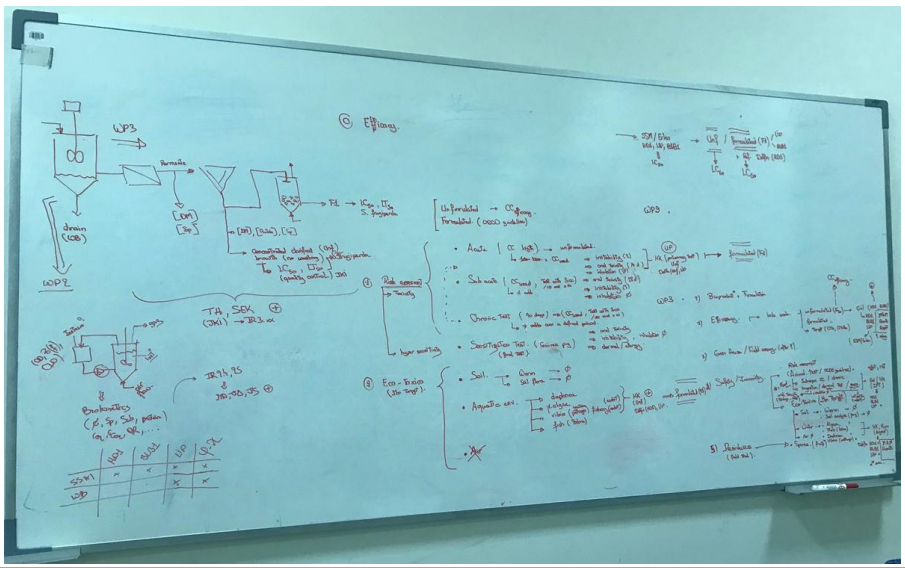
BIOACTIVITY



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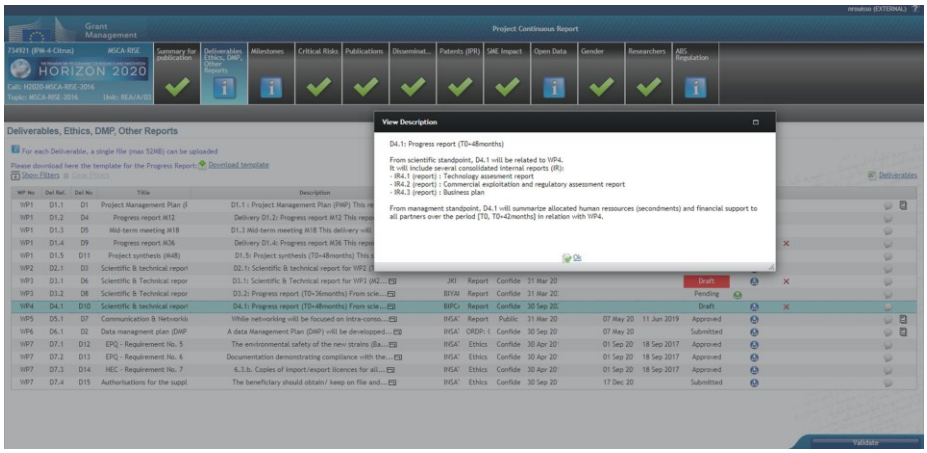
From Research From Lab ...to Market ...to Field

TRANSFER



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

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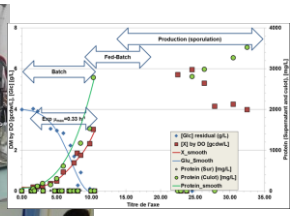
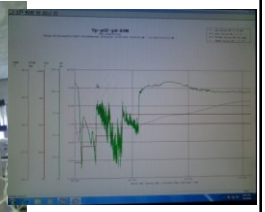
From Research From Lab ...to Market ...to Field

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

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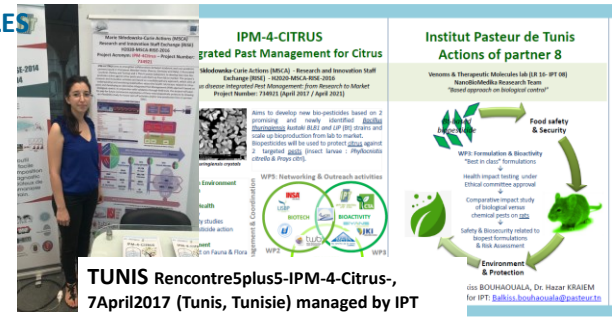
From Research From Lab ...to Market ...to Field

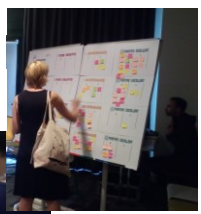
NETWORKING ACTIVITIES…

ROUND TABLES



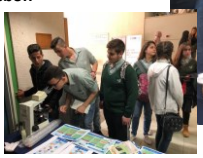
TUNIS Rencontre5plus5-IPM-4-Citrus-, 7April2017 (Tunis, Tunisie) managed by IPT

ANKARA Biyans-seminar, April2018 (Ankara, Turkey)



TOULOUSE European Science Open Forum, July 2018.

BEIRUT Foire des sciences, Bierut-LEB, March2018 (USJ, Lebon



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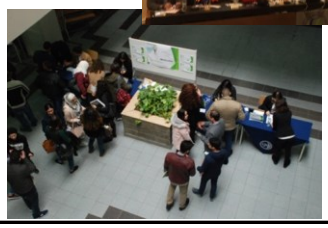
NETWORKING ACTIVITIES…
ROUND TABLES

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

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



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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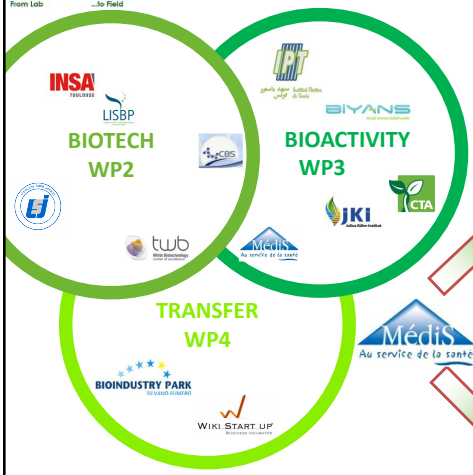
FROM LAB TO MARKET…



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

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Laboratory of Biopesticides

Thank you

CONTACT

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24755116

souadrouis4@gmail.com

Souad.rouis@cbs.rnrt.tn