

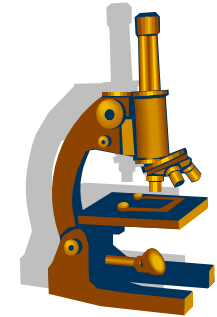


Pour une agriculture propre et innovante





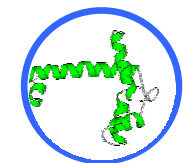
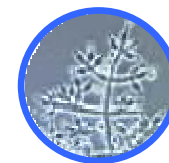
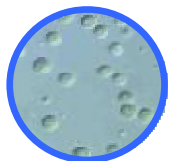
A life sciences company striving for high quality and innovative agriculture



A unique expertise in designing efficient active ingredients and developing cost effective formulations

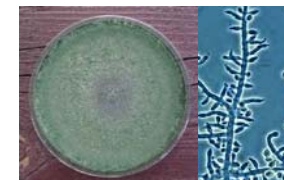
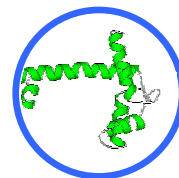
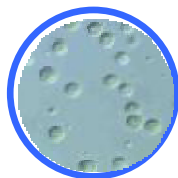


A team of scientists focusing on opportunities for technology transfer and value creation



TRICHODERMA HARZIANUM TECHNOLOGIES

Three generations of products :

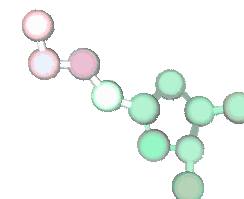


1st generation : Core products:

Concentrated spores of *Trichoderma harzianum*

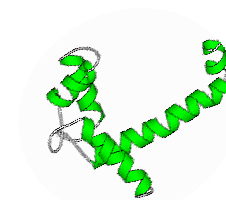
2nd generation : Adjustment products :

Antibiotic extracts of *Trichoderma harzianum* (lactons)



3rd generation : Plant defense elicitors :

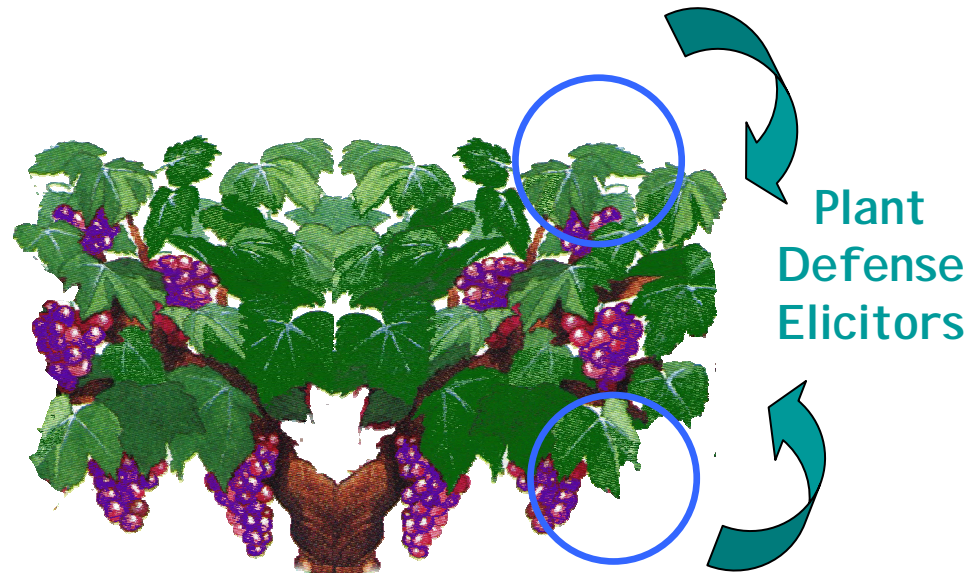
Oligopeptidic extracts of *Trichoderma h.* (peptaibols)





Cellulase, glucanase and xylanase from *Trichoderma* as plant defense elicitor
French Patent N° 99 13483

Curent
patent
portfolio

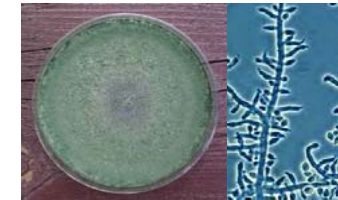
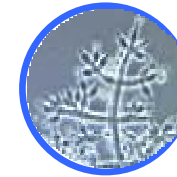
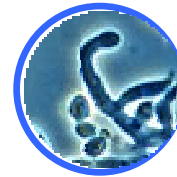
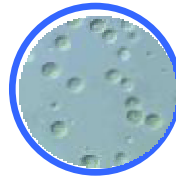


Core
products

New use of *Bacillus thuringiensis*
kurstaki and *israeliensis*
as plant defense stimulators
PCT / FR 2005/003177

Trichoderma clones, isolation,
fermentation and application like plant health product.
French Patent N°04 00076 with world extension

TRICHODERMA HARZIANUM



Biocontrol agent with 3 principal capabilities:

- Organic matter colonizator
- Cell wall destructor with it's enzymes production
 - Volatil antibiotic difusor

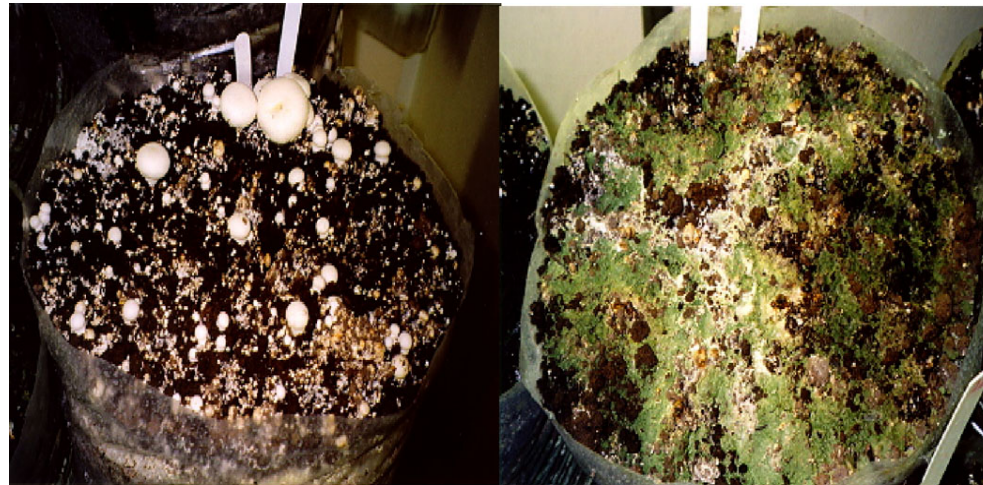
Trichoderma sp sources



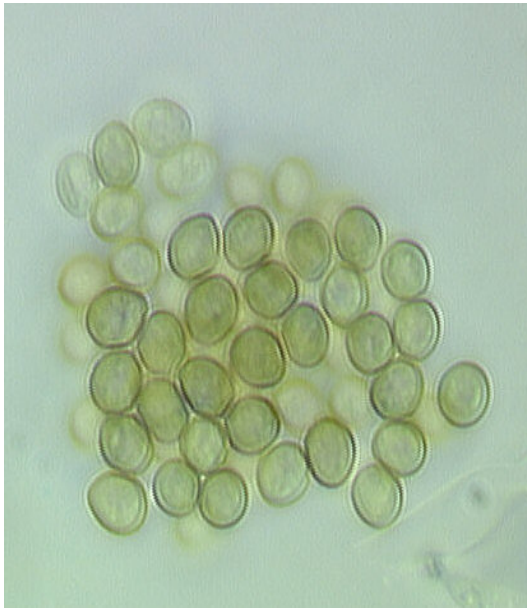
Dead organic matter



Mushroom « of Paris » substrats, composts, etc...



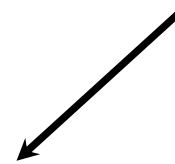
Trichoderma cycle

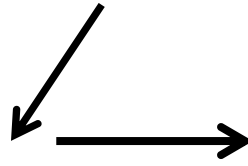


5 h after
cultivation in
growth media :
Germination



48 h :
Mycela growth

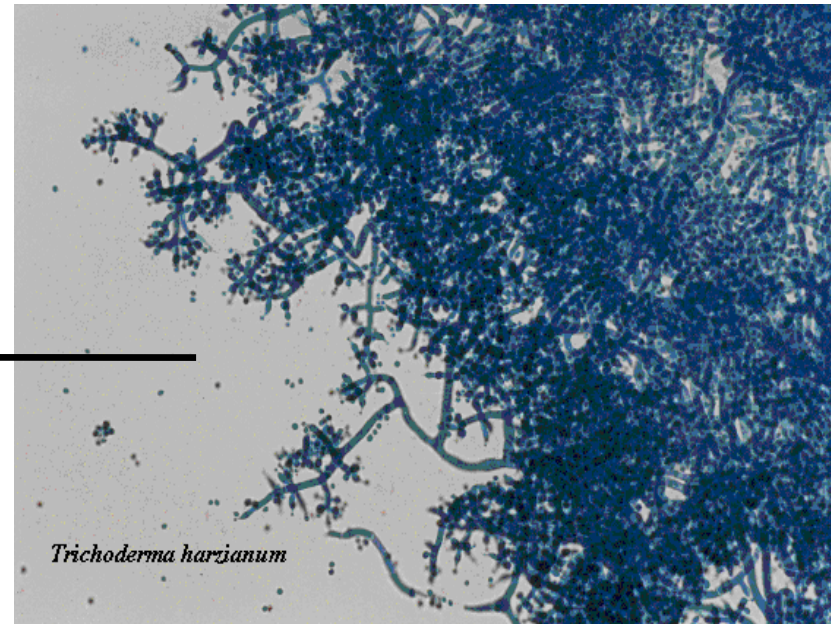




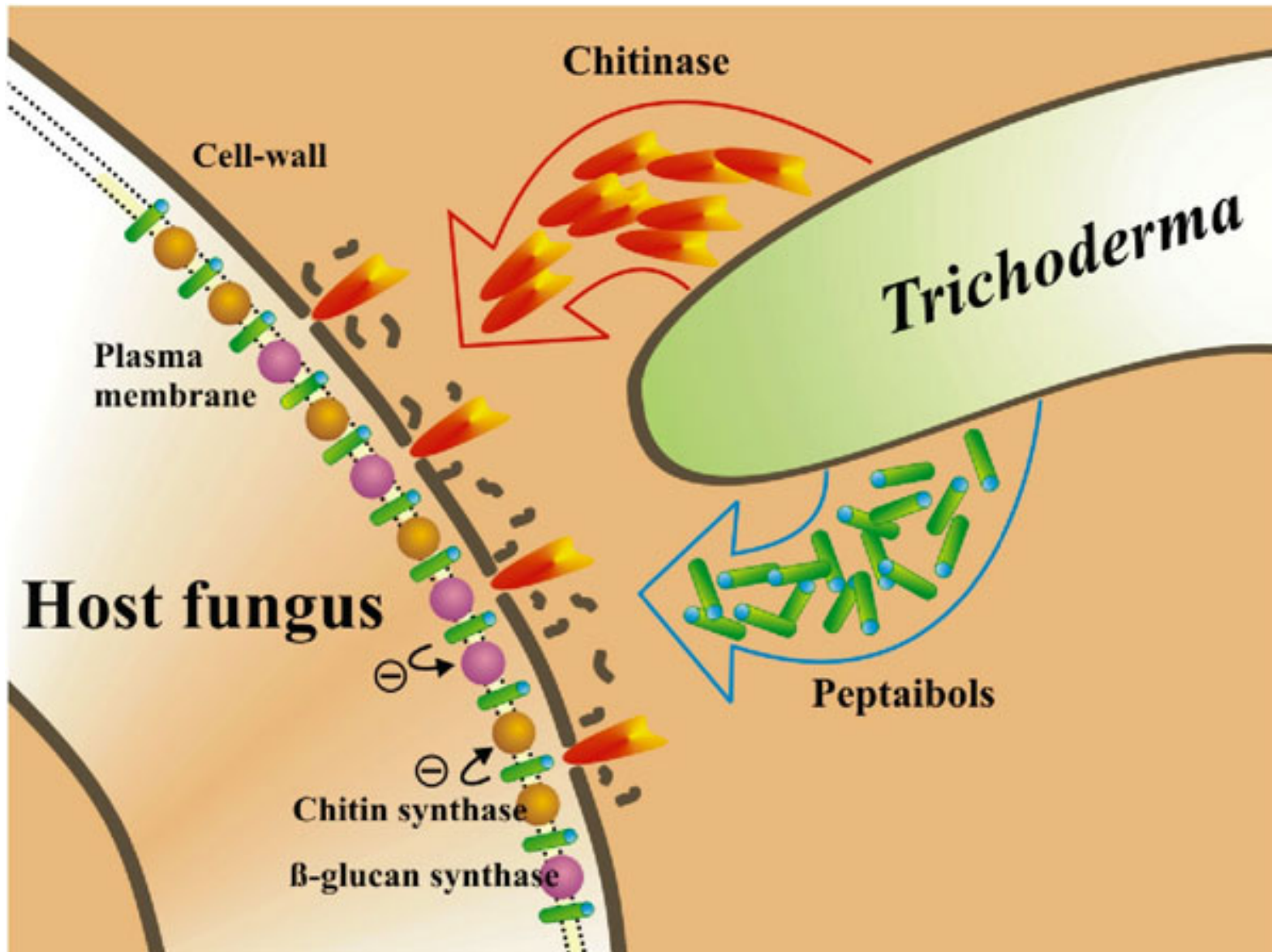
72 h :
Constitution of
reproduction
organs :
Coniophores



96 h:
Conidiogénèse



Trichoderma sp way of action



Sticking

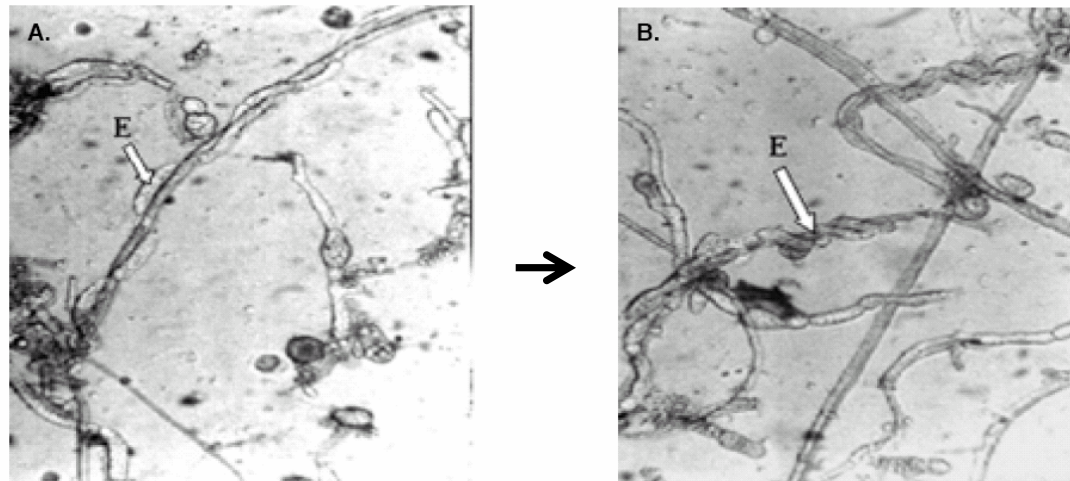


Figure 5. A. Début d'enroulement du mycélium du *T. harzianum* sur celui du *F. oxysporum* f. sp. *radicis-lycopersici* ($\times 400$) — Beginning of rolling up of *T. harzianum* mycelium on that of *F. oxysporum* f. sp. *radicis-lycopersici* ($\times 400$). B. Enroulement du mycélium du *T. harzianum* sur celui du *F. oxysporum* f. sp. *radicis-lycopersici* ($\times 400$) — Rolling up of *T. harzianum* mycelium on that of *F. oxysporum* f. sp. *radicis-lycopersici* ($\times 400$).

Penetration



Degradation

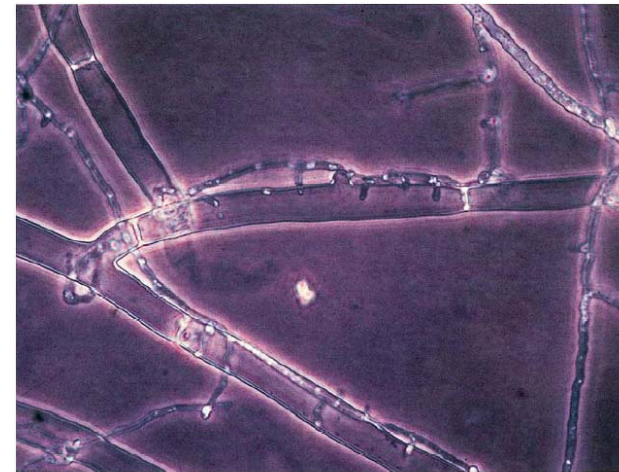
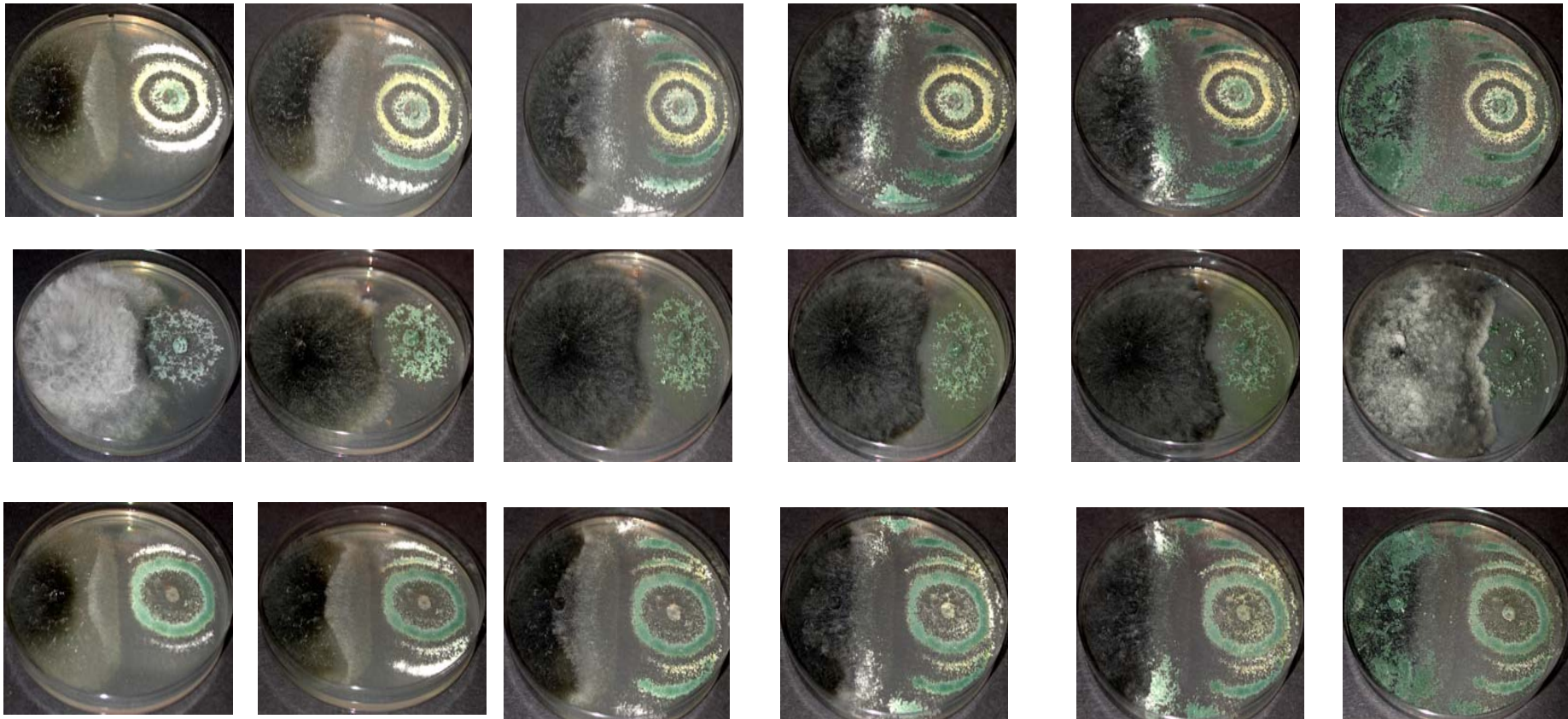
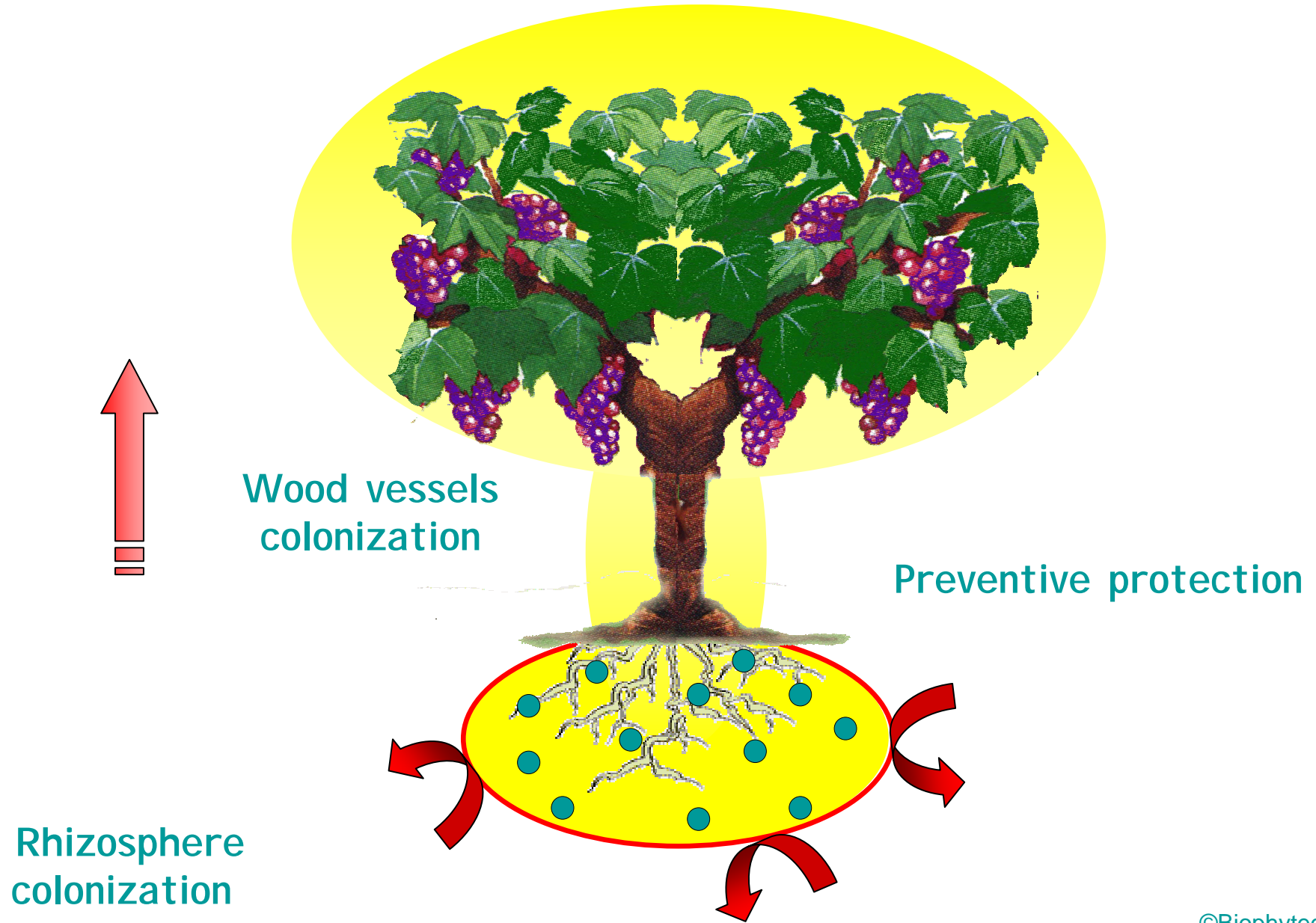


Fig. 1. Penetration and haustoria formation within the large hyphae of *Rhizoctonia solani* by the smaller hyphae of *Trichoderma virens*.

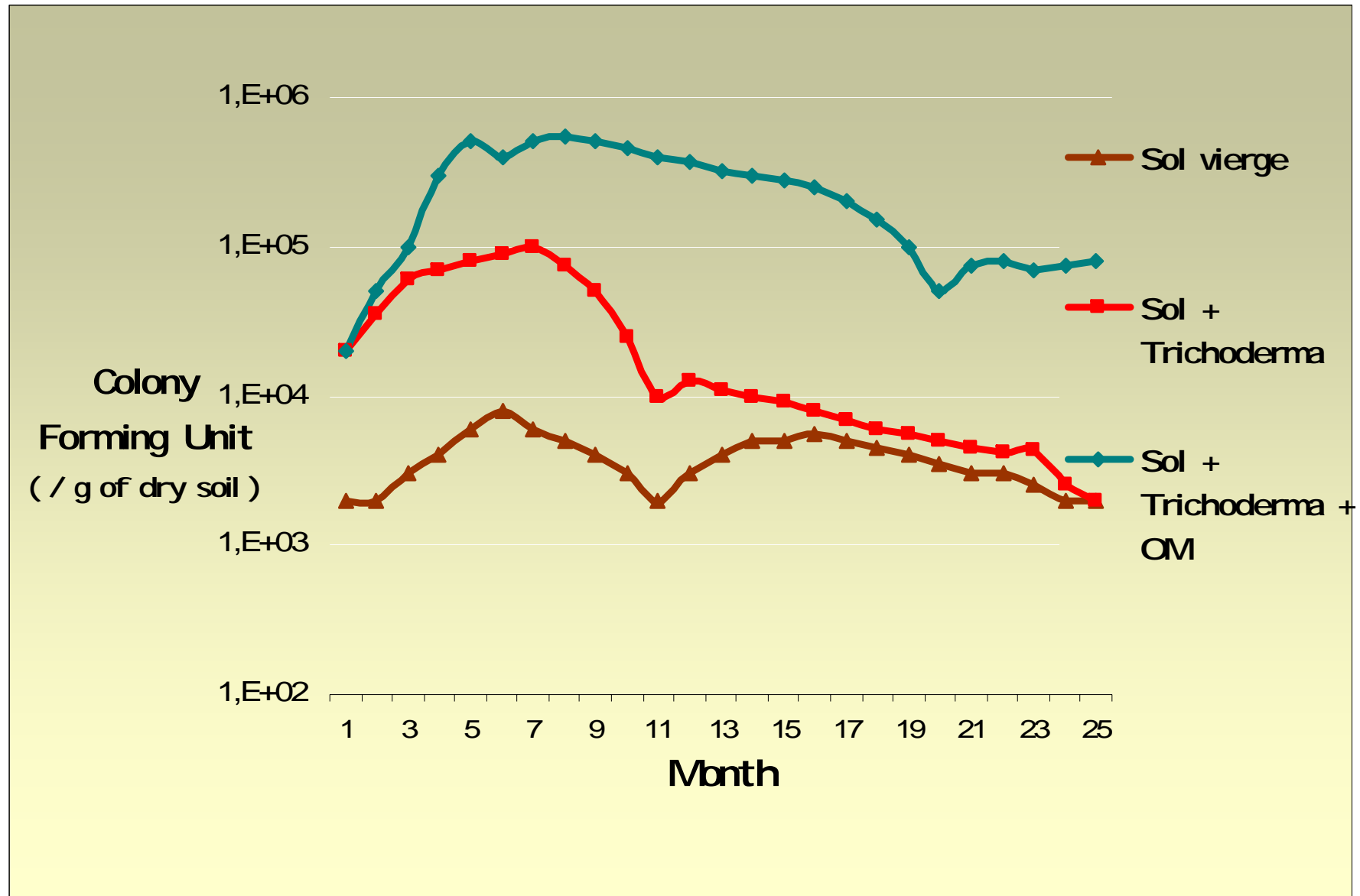
Laboratory screening of the
best *Trichoderma* isolate
on Petri dishes
against pathogens (ex: *Phomopsis viticola*)



How does it work



Population dynamic of *Trichoderma sp* in different type of soil



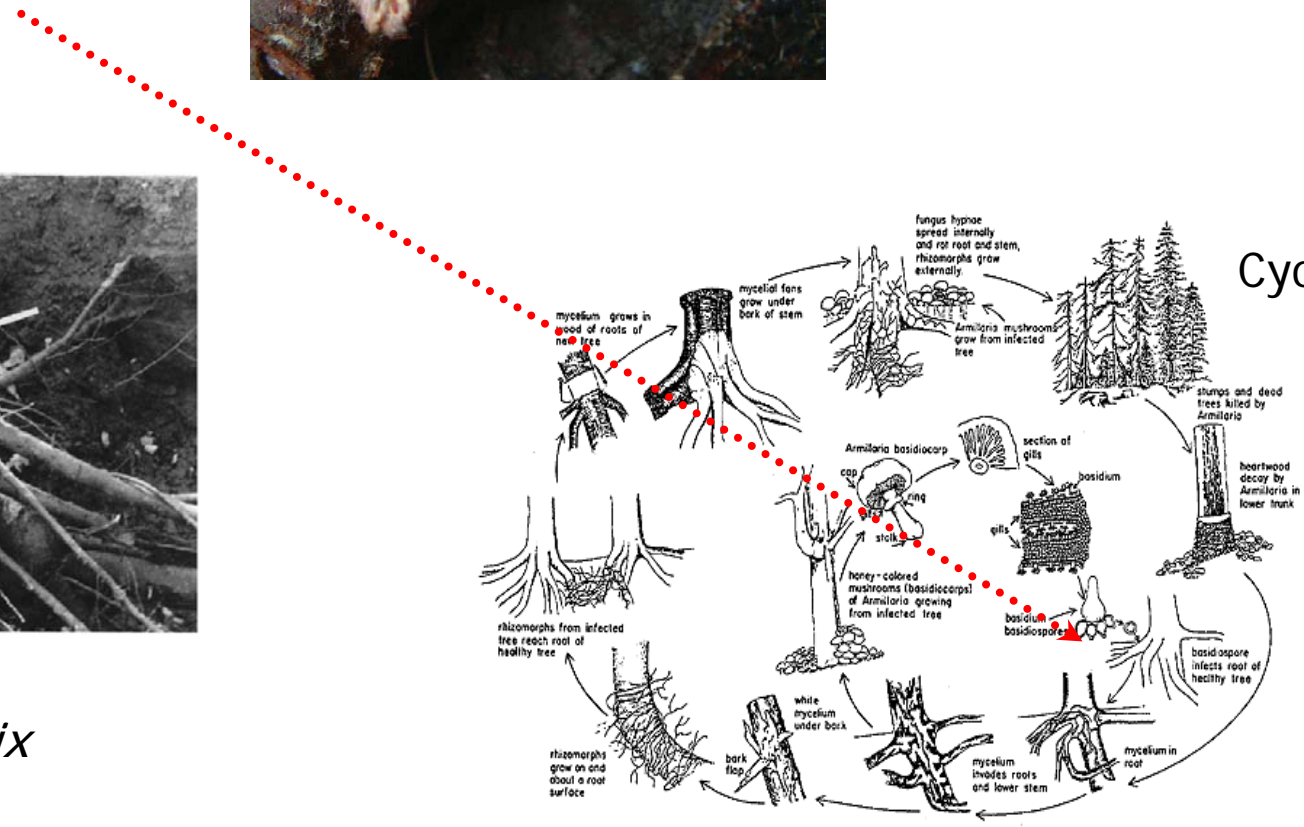
Trichoderma in the root colonization



*Armillaria
melea
or ostea*

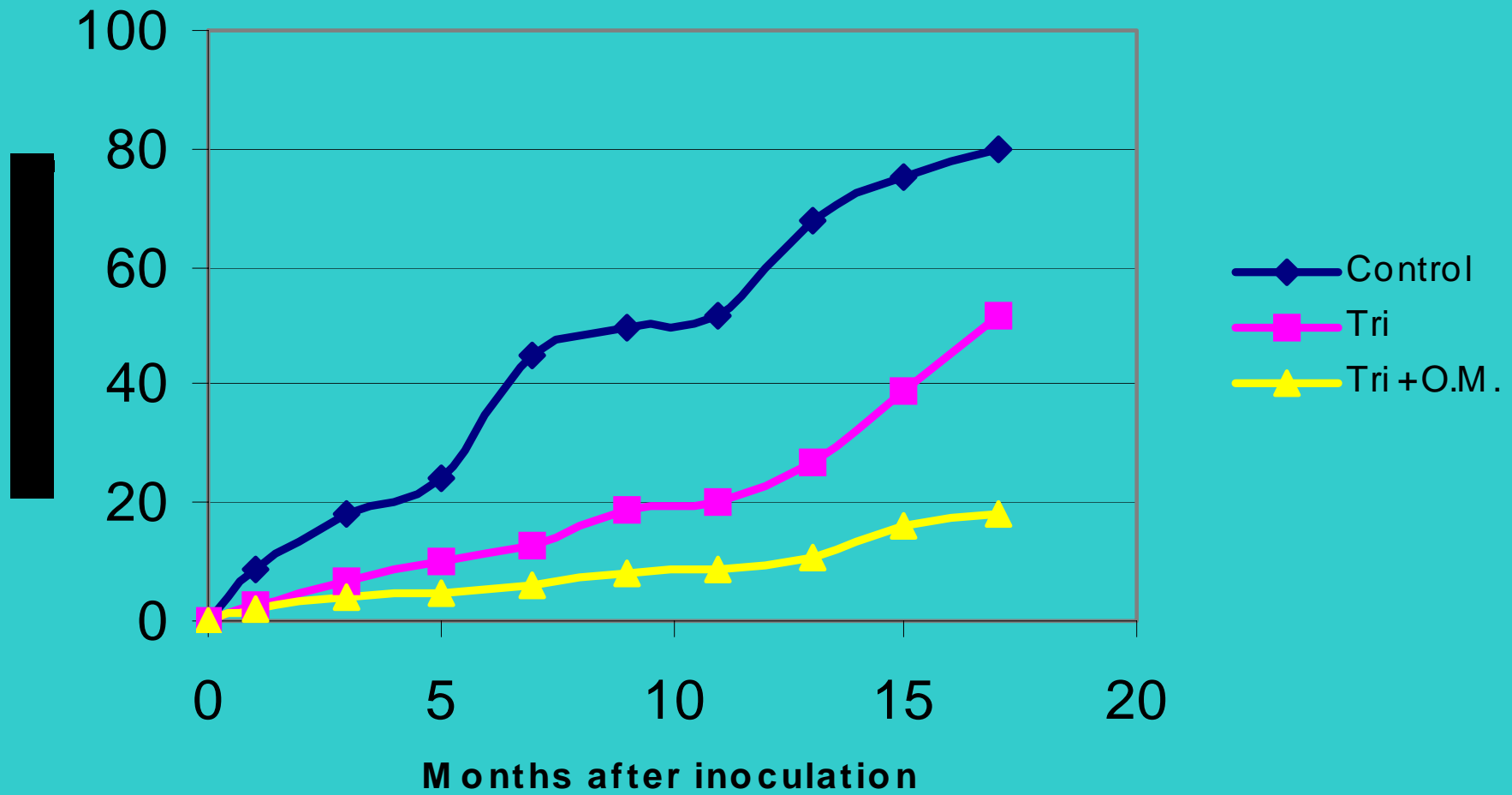


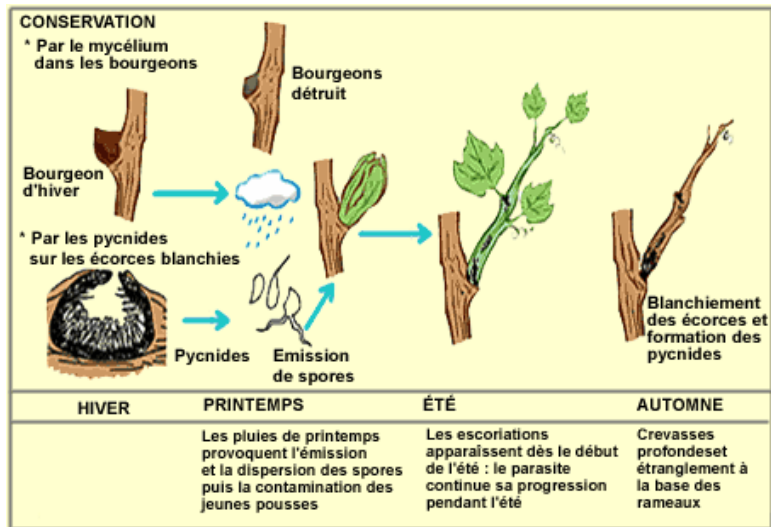
Rosellinia necatrix



Cycle

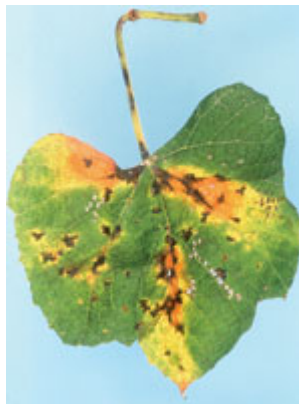
Evolution of Armillaria mortality after treatment of Trichoderma





Wood pycnids

Phomopsis viticola

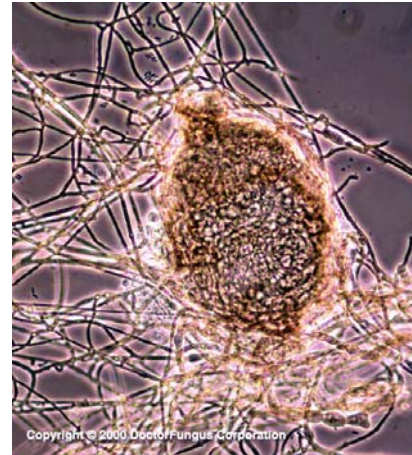


Leaf conidia

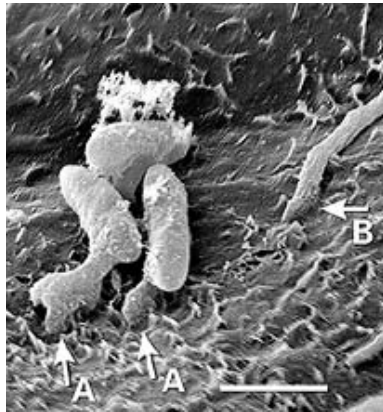


Sclerotes

Trichoderma on wood



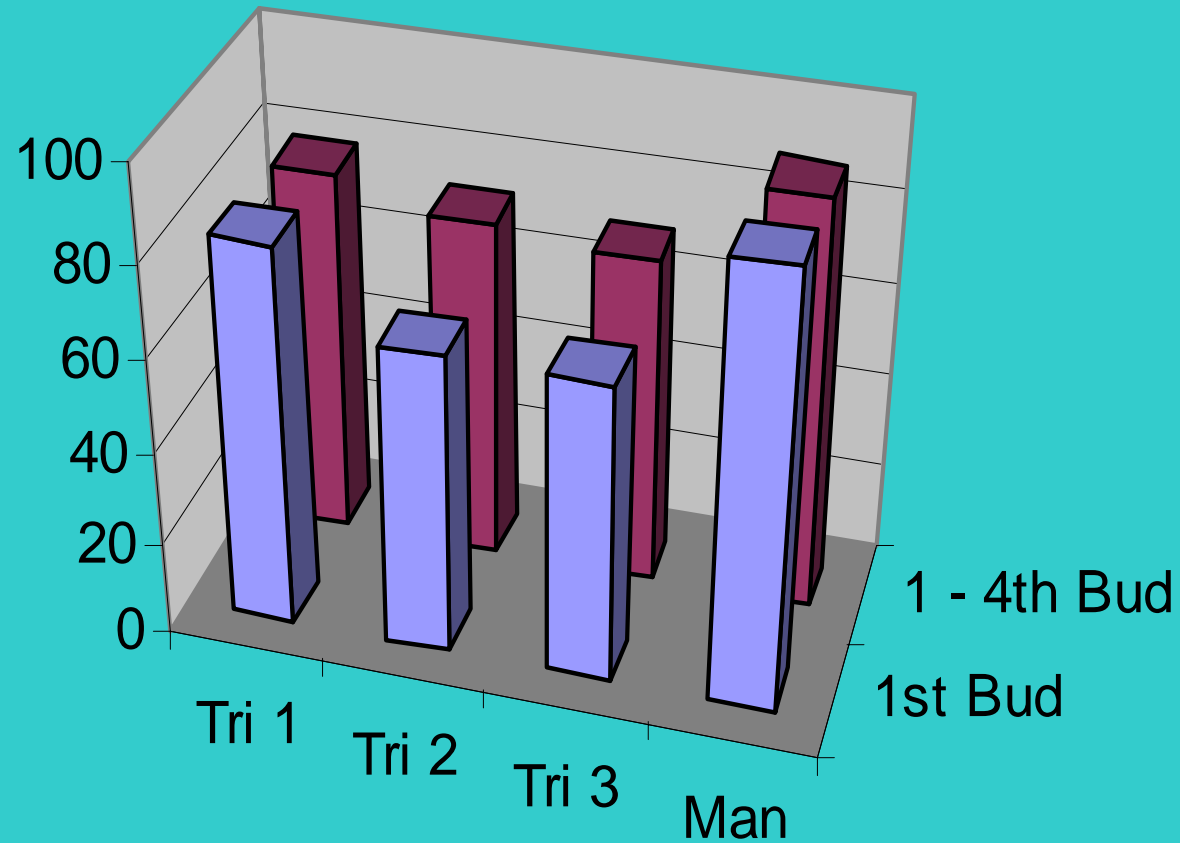
Against pycnidids during winter



and mycelia during spring

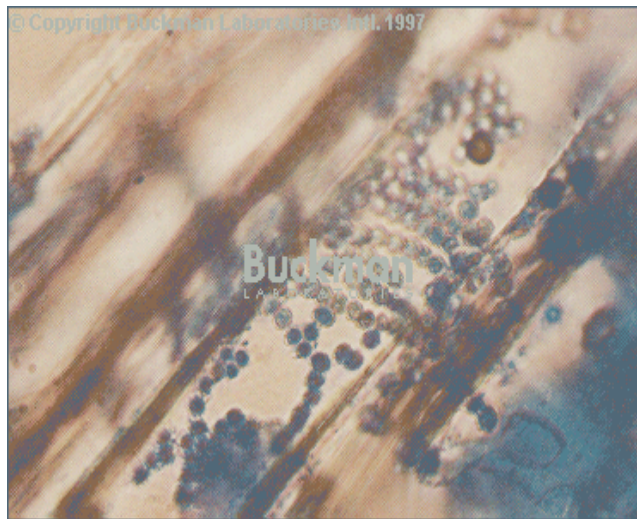
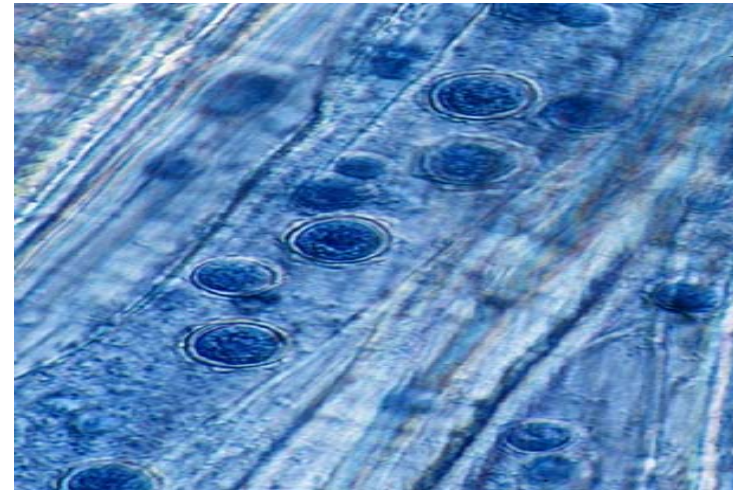
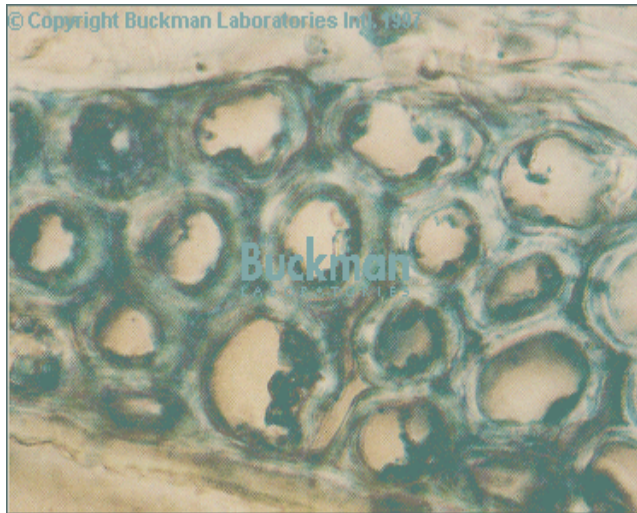


Efficiency against *Phomopsis viticola*



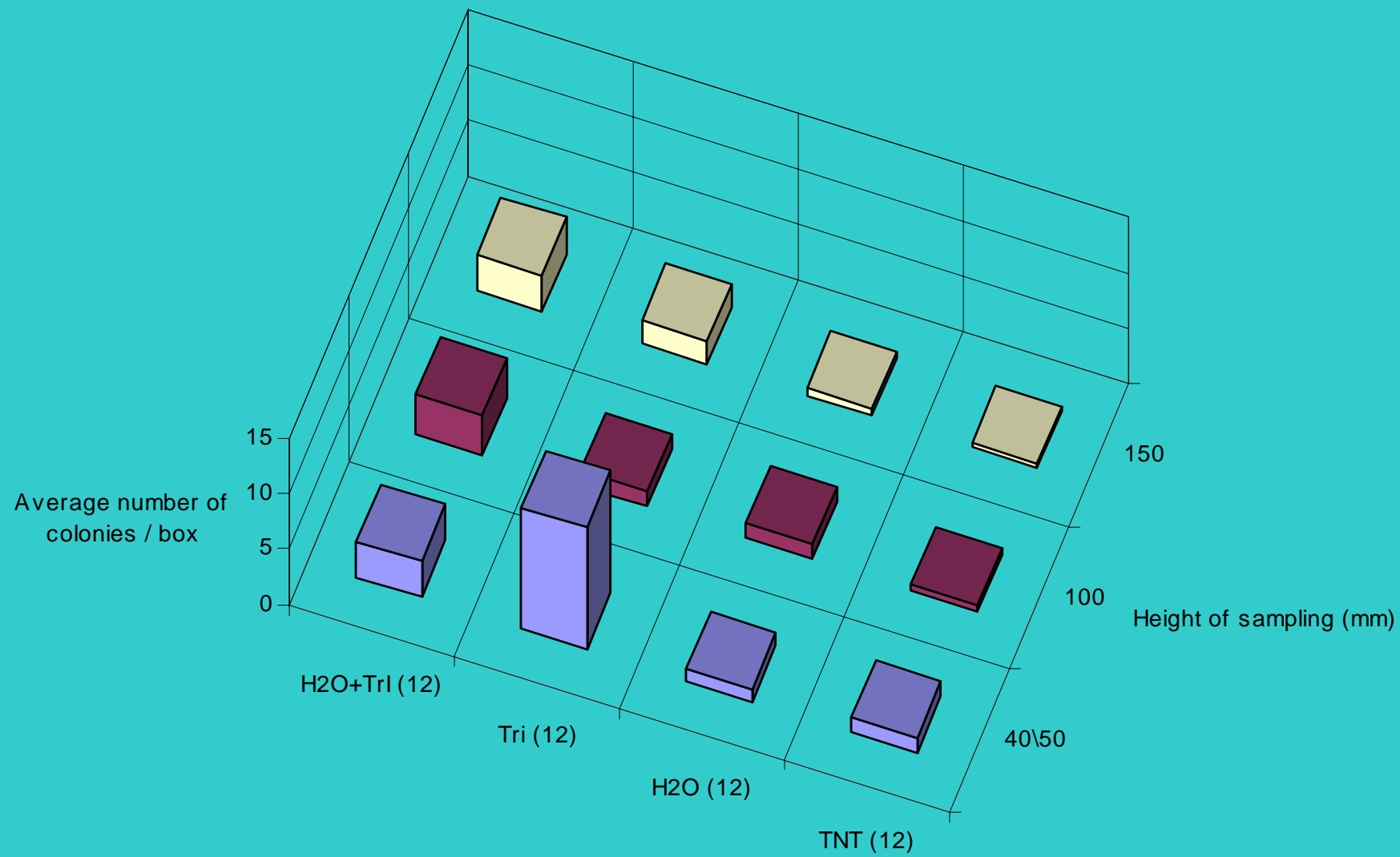
	Tri 1	Tri 2	Tri 3	Man
1st Bud	82	64,9	64,7	93,7
1 - 4th Bud	79,1	73,5	70,8	89,1

Trichoderma in the vessels



Vaccination against Esca, Eutypa

Density of Trichoderma in Carignan's cuttings woods at 12 weeks



Solid state fermentation of *Trichoderma* and formulation



I solate

+

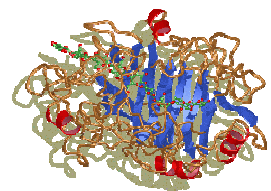


Sugar beet

=



Steril fermentation



F
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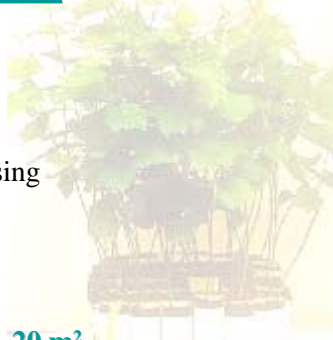
Filtration & Extraction



RESEARCH & DEVELOPMENT PLATFORM

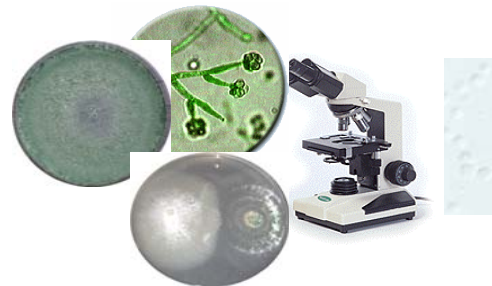
I. PLANT BIOCHEMISTRY LABORATORY – 20 m²

- ↪ Scales
- ↪ PH – meter
- ↪ 2 spectrophotometer UV / Visible
- ↪ Devices for extraction and sample processing
- ↪ Thermocycler
- ↪ Electrophoretic apparatus
- ↪ Ventilated hood



II. MICROBIOLOGY LABORATORY – 20 m²

- ↪ 2 laminary flood hood (*pathogen, antagonists*)
- ↪ Stérilizers
- ↪ Microscopes
- ↪ cultur media apparatus and small scale fermentors
- ↪ water treatment unity



III. EXPERIMENTATION OFFICE- 30 m²

- ↪ Plant and substrats preparation office
- ↪ 2 **phytotrons** (with regulating system of light, temperature and humidity)
- ↪ Growing chamber



IV. ANALYTICAL CHEMISTRY & FORMULATION LABORATORY - 20 m²

- ↪ Chromatography : TLC, HPLC, GC-MS
- ↪ Physical measur apparatus for **formulations**
- ↪ Solubilizer, , wetter, acutenner....



V. EXPERIMENTATION FIELD TRIALS

- ↪ **In open field** – 1000 m²
- ↪ Under plastic tunnels – 300 m²






The Team

General Manager : Olivier BESNARD

Formulation and Technology intelligence
1 PhD in Chemistry ★



Physio-Phytopathology / Publications
1 PhD in Biochemistry ★

RESEARCH & DEVELOPPEMENT / INTELLECTUAL PROPERTY

Marketing and sales
1 Technician



Field trials / Registration
1 Agricultural engineer ★



Trade development

Distributor technical support



Thank you for your attention

More details and informations about our
research with this technologies ?
See our posters in room upstairs

Or
Our website : www.biophytech.fr