



Pythium oligandrum

MODES OF ACTION



Pythium oligandrum

- Fungi-like microorganism
- Ubiquitous in soils (in low concentrations)
- Hyperparasite of fungal microorganisms
- Used as an active substance in plant protection (products: Polyversum, Polyversum-BioGarden, Green Doctor)
- Strain M1 included in 1107/2009

TAXONOMIC CLASSIFICATION

Species: *Pythium oligandrum*

Strain: M1

Genus: *Pythium*

Family: *Pythiaceae*

Order: *Pythiales*

Class: *Oomycetes*

Phylum: *Heterokontophyta*

Kingdom: *Chromalveolata*

MODES OF ACTION

1. MYCOPARASITISM
2. INDUCTION OF REZISTANCE
3. GROWTH STIMULATION

MODES OF ACTION

- **MYCOPARASITISM**
 - Direct control of plant pathogenic microorganisms by hyphae, enzymatic degradation

**3D simulation of *Pythium*
oligandrum growth and
presents
mycoparasitism**

BIOPREPÁRÁTÝ

TYPICAL TARGETED HOST MICROORGANISMS MYCOPARASTISM

- *Alternaria spp.*
- *Botrytis cinerea*
- *Fusarium spp.*
- *Gaeumannomyces graminis*
- *Phytophthora cactorum*
- *Sclerotinia sclerotiorum*
- *Verticilium dahliae*

MODES OF ACTION

- **INDUCTION OF RESISTANCE (oligandrin)**
 - Inhibition of growth and development of pathogenic microorganisms by stimulating resistance related genes influencing morphological and biochemical barriers in plant tissues

Biochemical pathways

- **Oligandrin**

- a low molecular mass protein <10 kDa produced by *Pythium oligandrum* (Picard et al., 2000)
- Influencing genes regulating production of defence related enzymes in plant tissues (Lou et al., 2011)

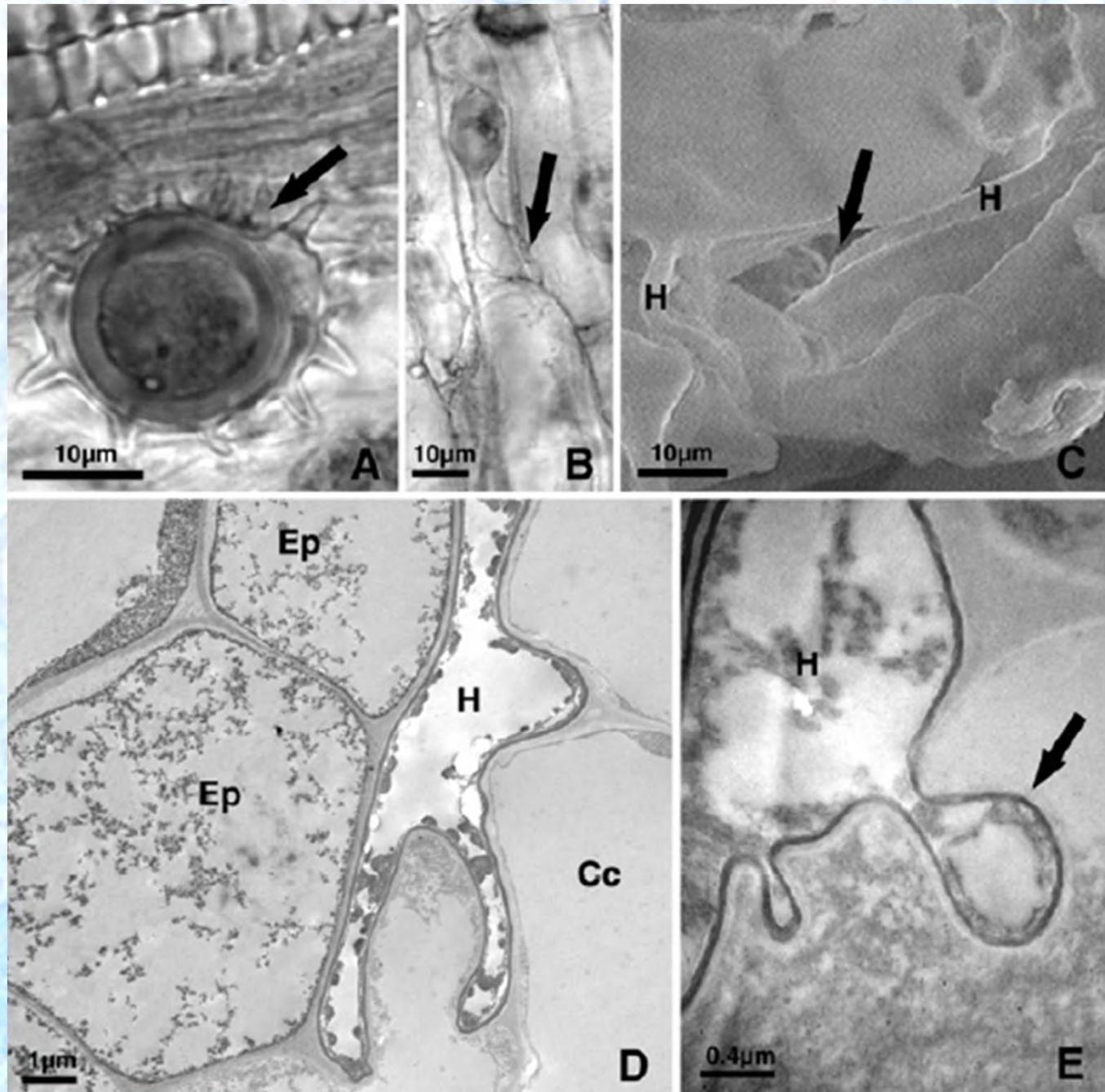
- **Cell wall protein fractions**

- Two glycoproteins (POD-1 and POD-2) (Takenaka et al., 2006)
- Elicitors that trigger induced resistance against bacterial and fungal diseases

TYPICAL TARGETED HOST MICROORGANISMS INDUCTION OF RESISTANCE

- *Leptosphaeria maculans*
- *Pseudoperonospora cubensis*
- *Puccinia spp.*
- *Ralstonia solanacearum*
- *Tilletia caries*

(Mohamed et al., 2007)



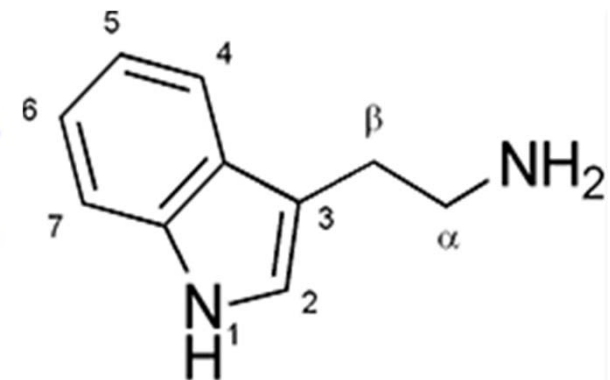
Pythium oligandrum colonization of grapevine (Pinot noir) roots 14 days after inoculation. **A and B**, Light microscope observations of grapevine roots stained with lactophenol-trypan blue. **A**, Oogonium (arrow) and **B**, germinated zoospore with germ tube forming appressorium structures (arrow) visualized on the root surface. **C**, Scanning electron microscopy: presence of hyphae (H) on the grapevine root surface and evidence of penetration through intercellular spaces (arrow). **D and E**, Transmission electron micrographs of transverse section of a tertiary root. **D**, Hypha (H) in intercellular space between epidermis (Ep) and the first cortical cell (Cc) layer of the roots exhibiting high vacuolation and altered cytoplasmic content. **E**, Failure of host cell penetration attempts by *P. oligandrum* hypha (H) and plant cell wall folding without disruption (arrow)

MODES OF ACTION

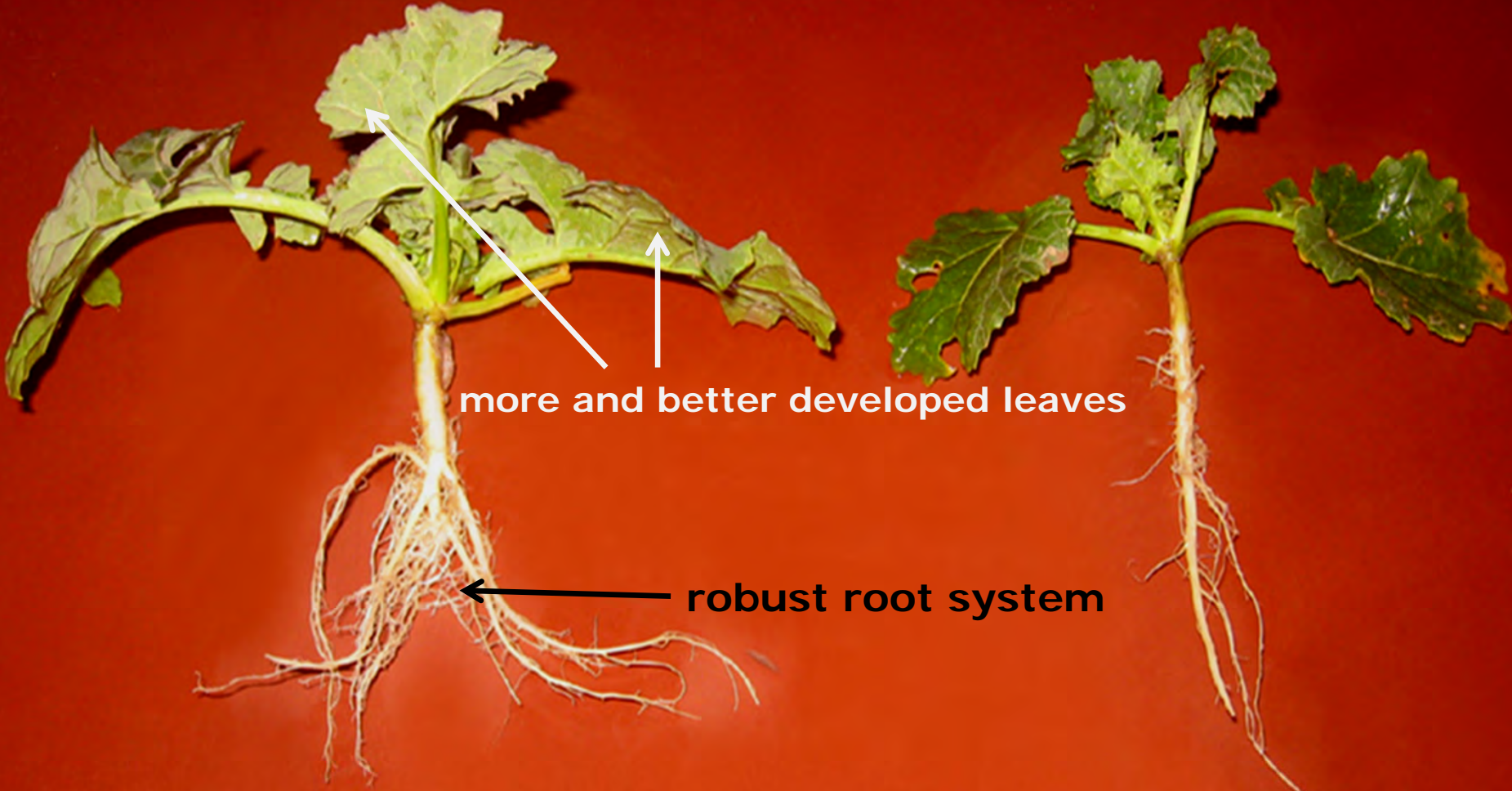
- **GROWTH STIMULATION**
 - Induces production of growth stimulating phytohormone– enhances uptake of phosphorus and micronutrients

Tryptamine

- Tryptamine, a precursor of IAA (Indole-3-acetic acid) is produced by *Pythium oligandrum* (Le Floch et al., 2003)
- IAA is a phytohormone inducing the plant growth and development (Winter, 1966)



EXAMPLE OF GROWTH STIMULATION - WOSR



A (treated)

B (untreated)



POLYVERSUM[®] autumn: 3 weeks after application

REFERENCES

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- Winter, A. 1966. A Hypotetical Route for the Biogenesis of IAA. *Planta* (Berlin), Volume 79, pp. 229-239

POLYVERSUM

- Formulation: Wettable powder
- Active substance: *Pythium oligandrum* M1
- > 1.000.000 oospores per gram
- Inert carrier: Silicon Dioxide
- Storability: 2 years
- Wide scale of efficiency
- No risk of overdosing
- Suitable to combine with other PPP



REGISTRATION OF POLYVERSUM

Country

Crop

CZECH REPUBLIC

Oilseed rape, sunflower, mustard, poppyseed, strawberry, cucumber, tomato, vegetables, brassica vegetables, hop, grape wine, pepper, forest and ornamental nurseries, golf courses and ornamental lawns, organic grown wheat, barley, rye and triticale

POLAND

Strawberry, ornamental plants, cucumber, tomato, lettuce, pepper

SLOVAKIA

Oil seed rape, sunflower, forest nurseries, barley, wheat, grape wine, tomato, cucumber

HUNGARY

Oil seed rape, oil radish, mustard, cucumber

GERMANY

All crops – growth stimulation

AUSTRIA

All crops – growth stimulation

USA

All crops

CHINA

Tomatoes

COSTA RICA

All crops – growth stimulation

PANAMA

All crops – growth stimulation

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COMPANY PROFILE

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Since 1997

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