

# COMMUNICATION BETWEEN PLANTS AND *TRICHODERMA*

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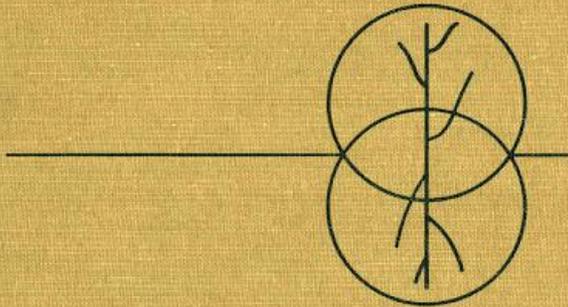
Spin-off

- **Introduction**
  - Cross Protection / Plant Induced Resistance
  - Update on the knowledge of induced plant immunity
- **Communication between plants and Trichoderma**
  - Induced Plant Immunity by *T. asperellum*, strain T34

# INTRODUCTION

## The Nature and Practice of Biological Control of Plant Pathogens

R. James Cook  
Kenneth F. Baker

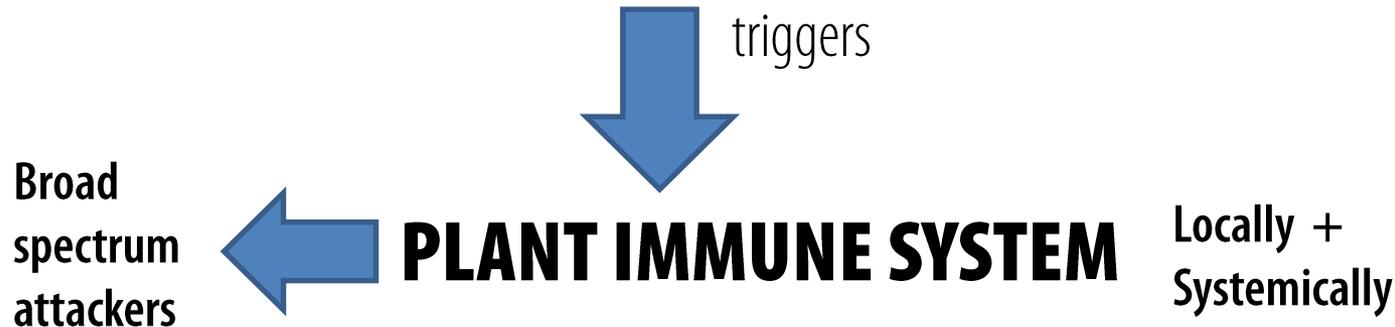


- **1964. Averre and Kelman. Studies on *Pseudomonas* spp. in tobacco:** “Evidence for an active defence mechanism of host stimulated by prior inoculation with an avirulent or non-pathogenic strains”.
- **1967. Phillips *et al.*, 1974 Baker and Cook, 1980 Kúć:** “The effect of prior inoculation of a plant with a non-pathogenic colonist. . . trigger a general state of greater readiness or shorter response time”.

*The ability to wall off a pathogen* by the formation abscission layer, deposit of callose, production of occlusions, protection layers, . . . **Long-distance communication** and *the involvement of plant hormones.*

# INTRODUCTION

- Non-self molecules: pathogens / herbivorous insects
- Own molecules (injured cells)
- Beneficial microorganisms: (PGPR / PGPF)
- Specific chemicals



Plant hormones are central players in plant immunity:

- **SA + JA** : Major defence hormones
- **ET, ABA, Auxins, GAs, CKs, brassinosteroids** :  
Modulators of immune signalling network

# INTRODUCTION

## ISR

triggered by *beneficial root-colonizing microbes*

### SA-independent

- Enhanced sensitivity to **JA and/or ET** signals
- Not associated with accumulation PR
  - **Priming:**
    - JA/ET are induced upon subsequent attack
    - The fitness cost is low
    - Ecological adaptation to reduce damage in an hostile environment

## SAR

triggered by *pathogens*

### SA- dependent

Increase tissue levels **SA, MeSA, Glicerol 3P,...**

Activation proteins with antimicrobial activity: PR

### Successful **PATHOGENS:**

- Minimize host immunity : **Effectors**
- **Prevent detection of PAMPs**

C. M. J. Pieterse, D. Van der Does, C. Zamioudis, A. León-Reyes, S.C.M. Van Wees. **Hormonal Modulation of Plant Immunity.** Annu. Rev. Cell Dev. Biol. **2012.** 28:489-521.

C. M. J. Pieterse, C. Zamioudis, R.L. Berendsen, D.M.Weller, S.C.M. Van Wees, P.A.H.M. Bakker. **Induced Systemic Resistance by Beneficial Microbes.** Annu. Rev. Phytopathol. **2014.** 52:347-375.

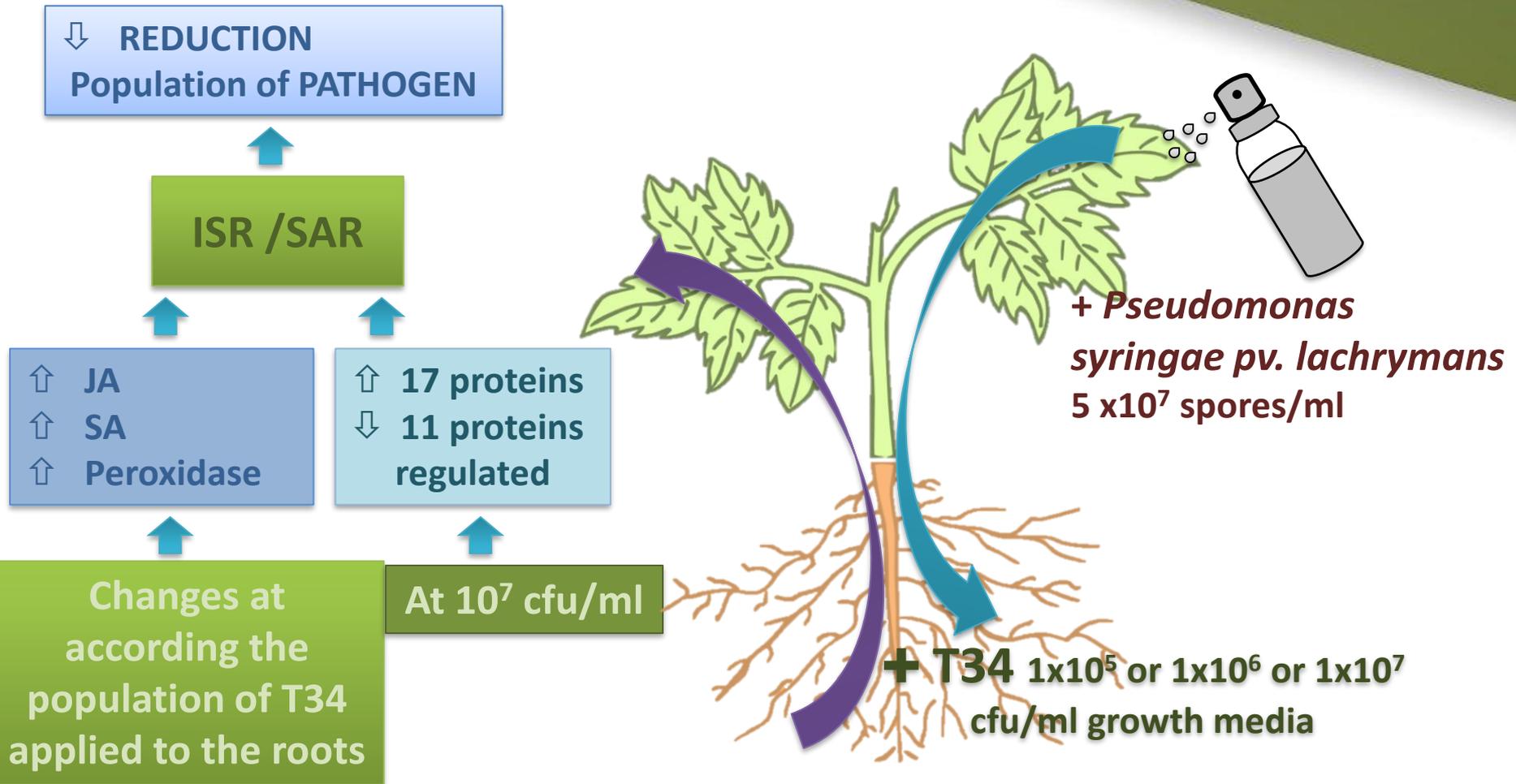
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***Trichoderma***, filamentous Ascomycete  
(Hypocrea) 105 species

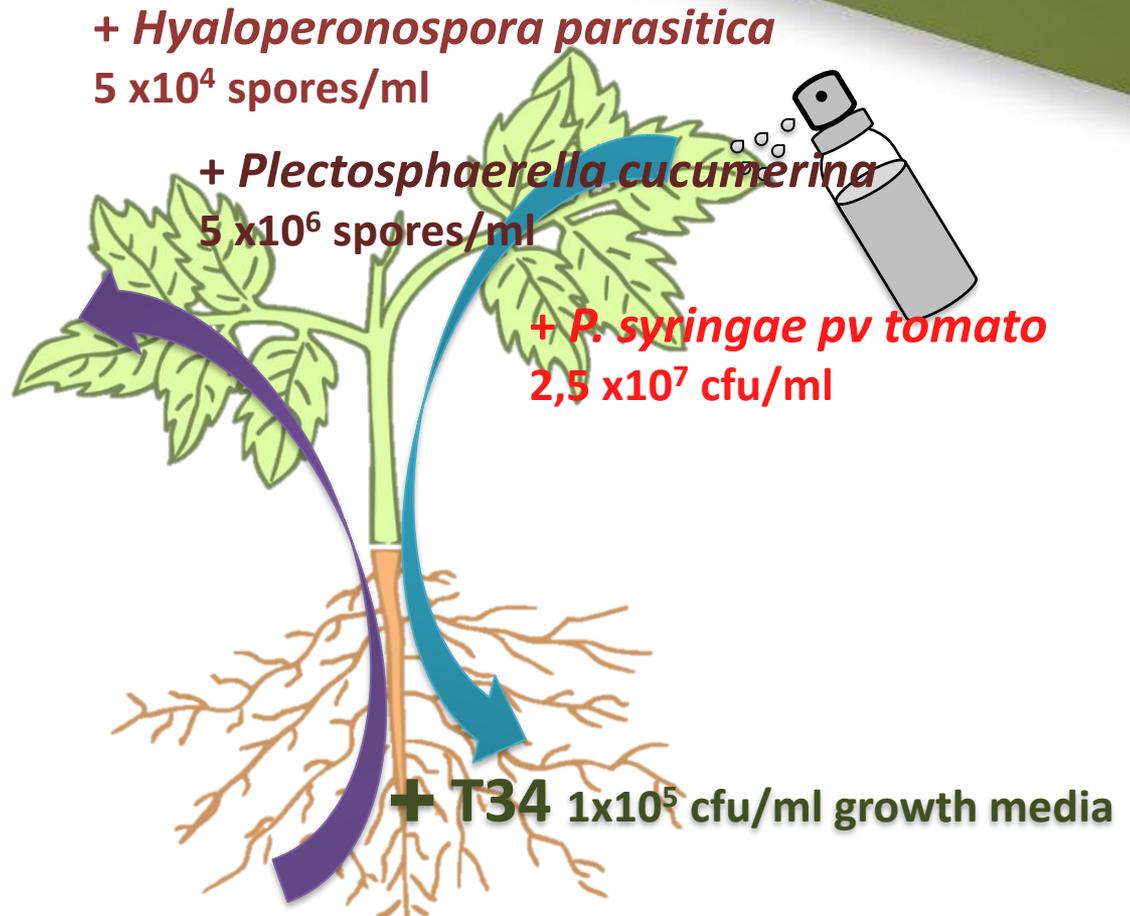
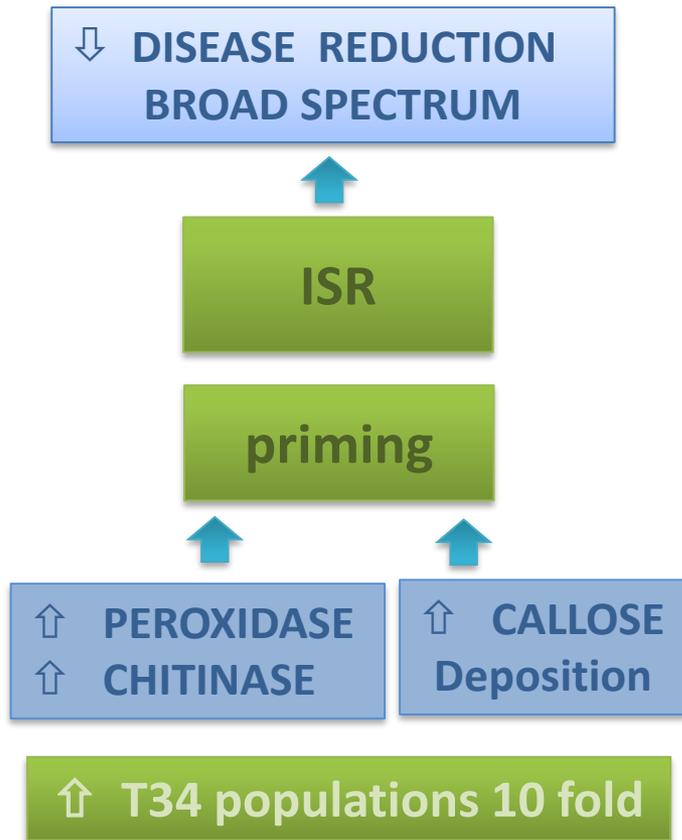
- Saprotrophic fungi.
- Frequently found in soil, wood, bark, other fungi and innumerable other substrates.
- *Trichoderma* strains are among the most studied and used **plant protection products**, because:
  - ✓ Competition
  - ✓ Antibiosis
  - ✓ Parasitism
  - ✓ **Induction of Resistance**
  - ✓ Plant Growth Promotion



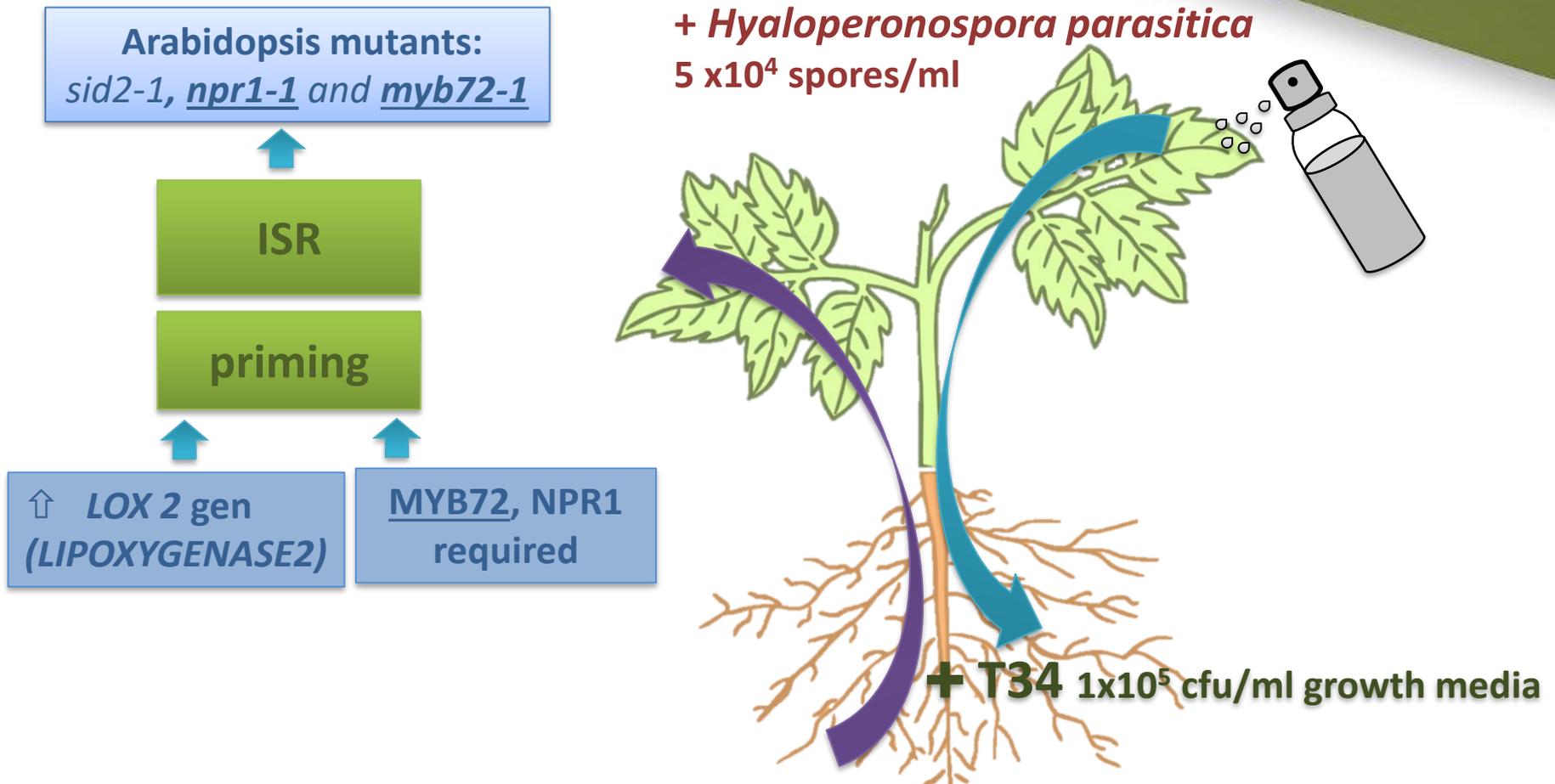
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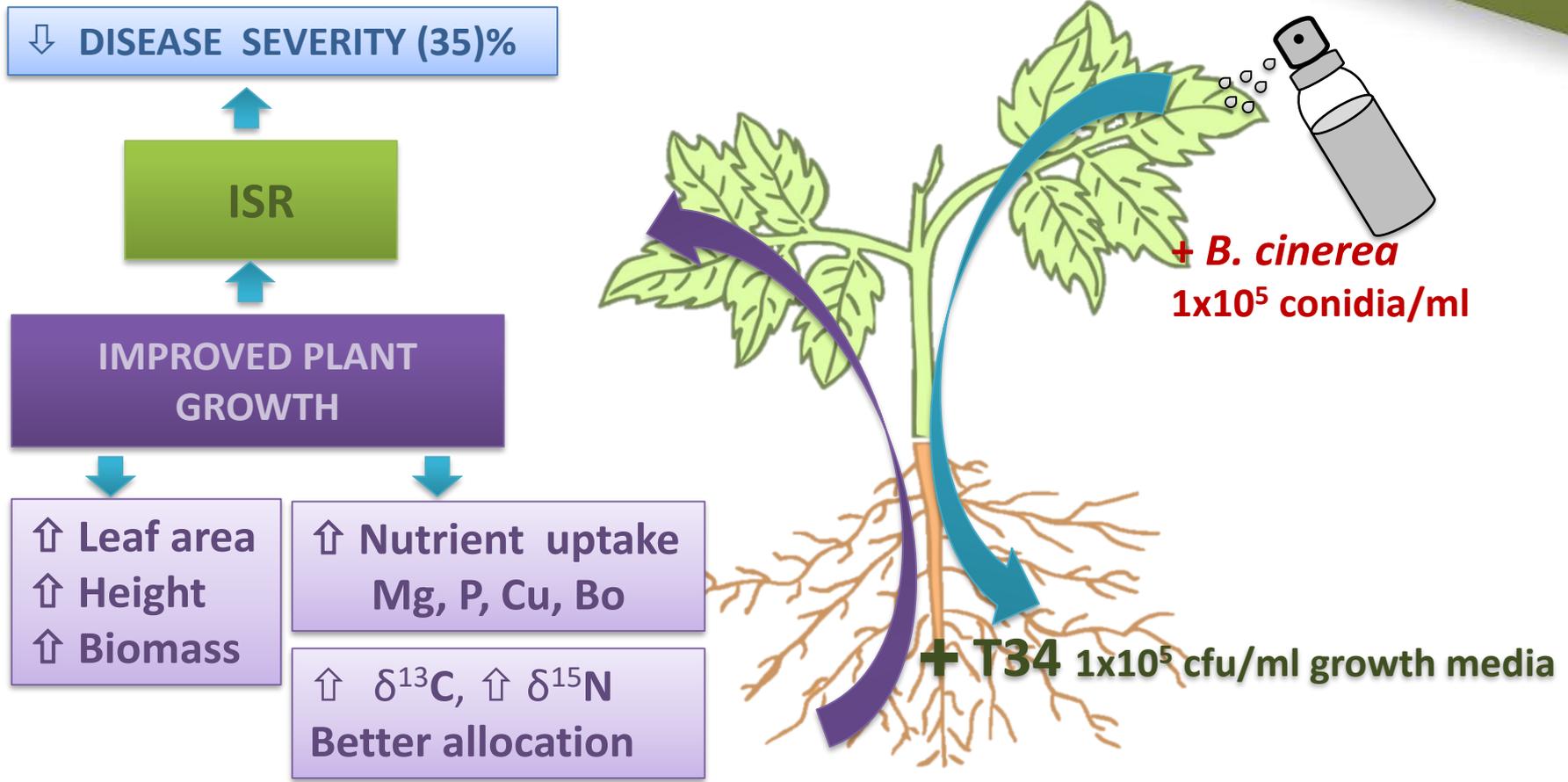
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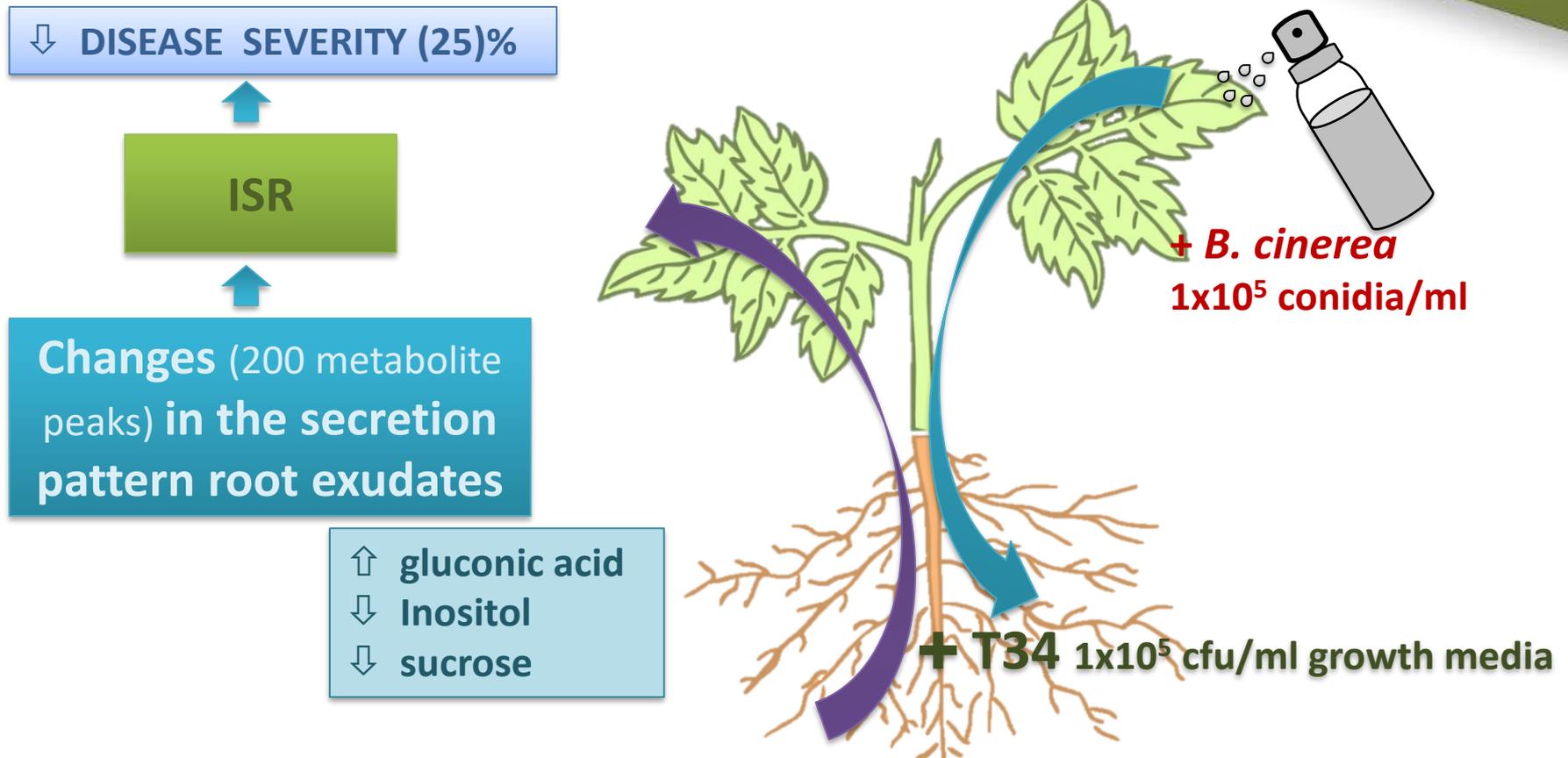


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E. Fernández, G. Segarra and M.I. Trillas. **Physiological effects of the induction of resistance by compost or *Trichoderma asperellum* strain T34 against *Botrytis cinerea* in tomato.** 2014. *Biological Control* 78:77-85.

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