Interactions between *Streptomyces scabies*, nonpathogenic streptomycetes and plants

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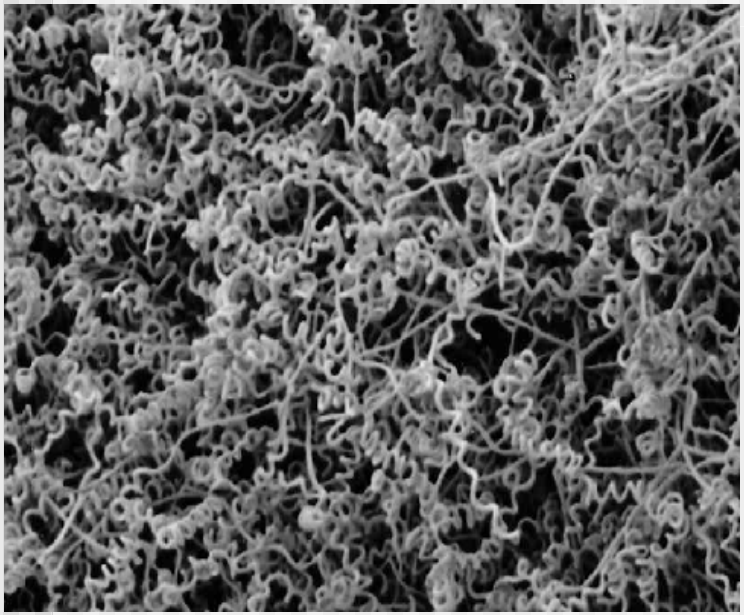
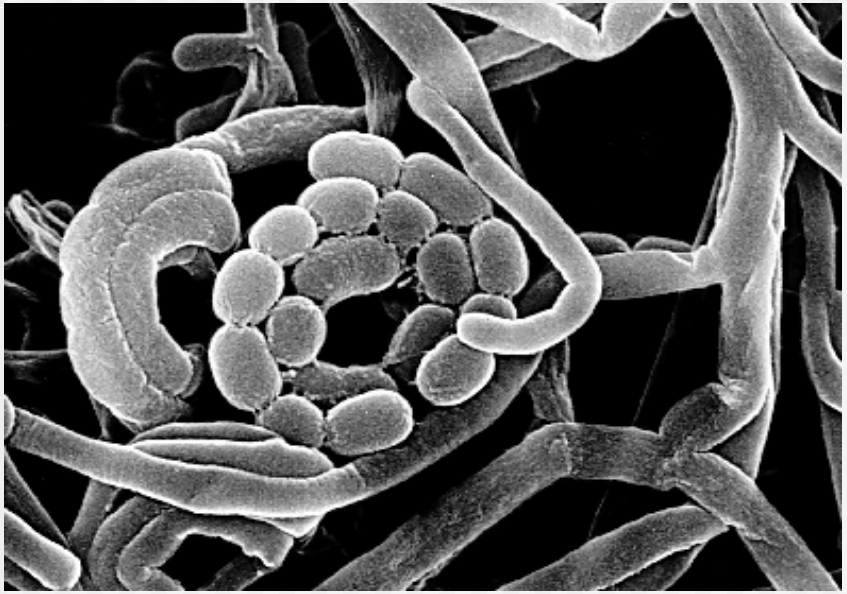
Actinomycetes

- Gram-positive bacteria
- Main genus: *Streptomyces*





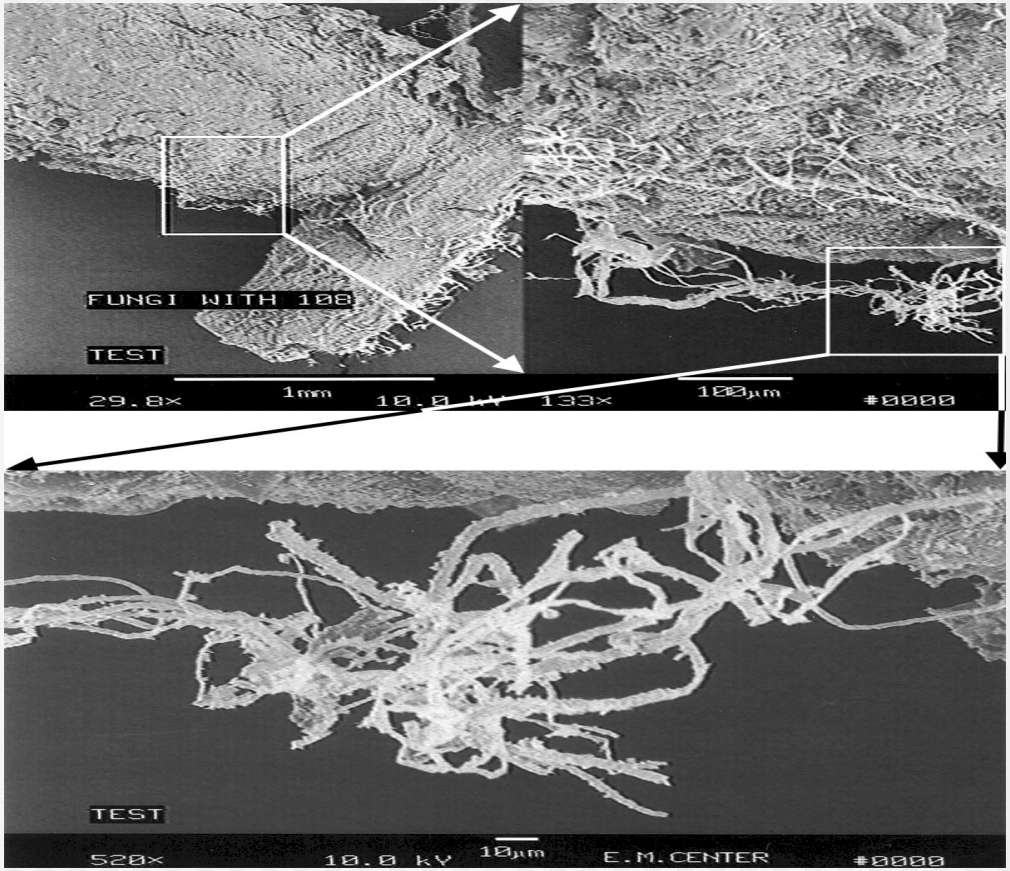
Streptomyces species

- Abondance in soil and rhizosphere

Habitat	Plante	Bactérie (X 10^8 ufc/g)	Streptomycète (X 10^6 ufc/g)	Streptomycète (%)
Aride				
(Marrakech)	*P. dactylifera*	**21**	**64**	**3,0**
Semi-aride				
(Essaouira)	*A. spinosa*	**2,3**	**20**	**8,7**
Humide				
(Haut Atlas)	*A. spinoum*	**11**	**11**	**1,0**
	A. pungens	**53**	**27**	**0,5**
	A. ibrahimianus	**28**	**18**	**0,6**
	B. spinosum	**17**	**16**	**0,9**
	C. balansae	**44**	**44**	**1,0**
	O. scariosa	**20**	**25**	**1,3**

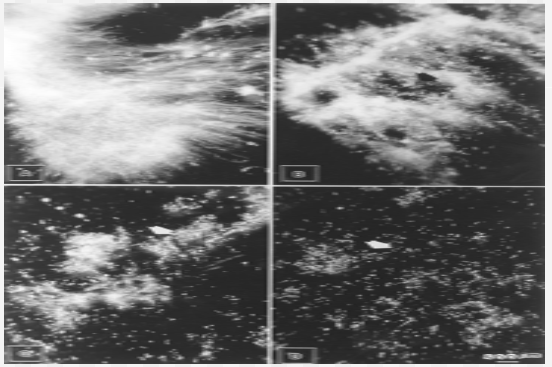
Streptomyces species

- Root colonizers

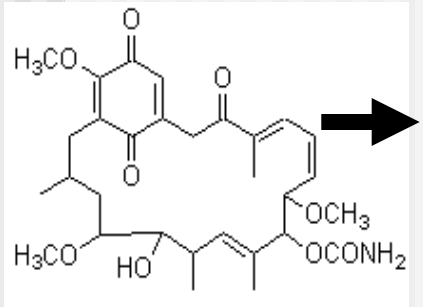


Streptomyces species

- Degradation of organic matter (complex polymers : lignin, suberin, cutin, chitin, etc.)



- Antibiosis



60% of known antibiotics are produced by streptomycetes

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Streptomyces and plants

- Plant pathogens
  - *Streptomyces scabies*
- Saprophytic organisms
- PGPR
  - *S. violaceusniger* YCED9 (increase dry weight of radish by 20%)
- Biocontrol agents
  - Mycostop
  - Arzent

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Streptomyces scabies

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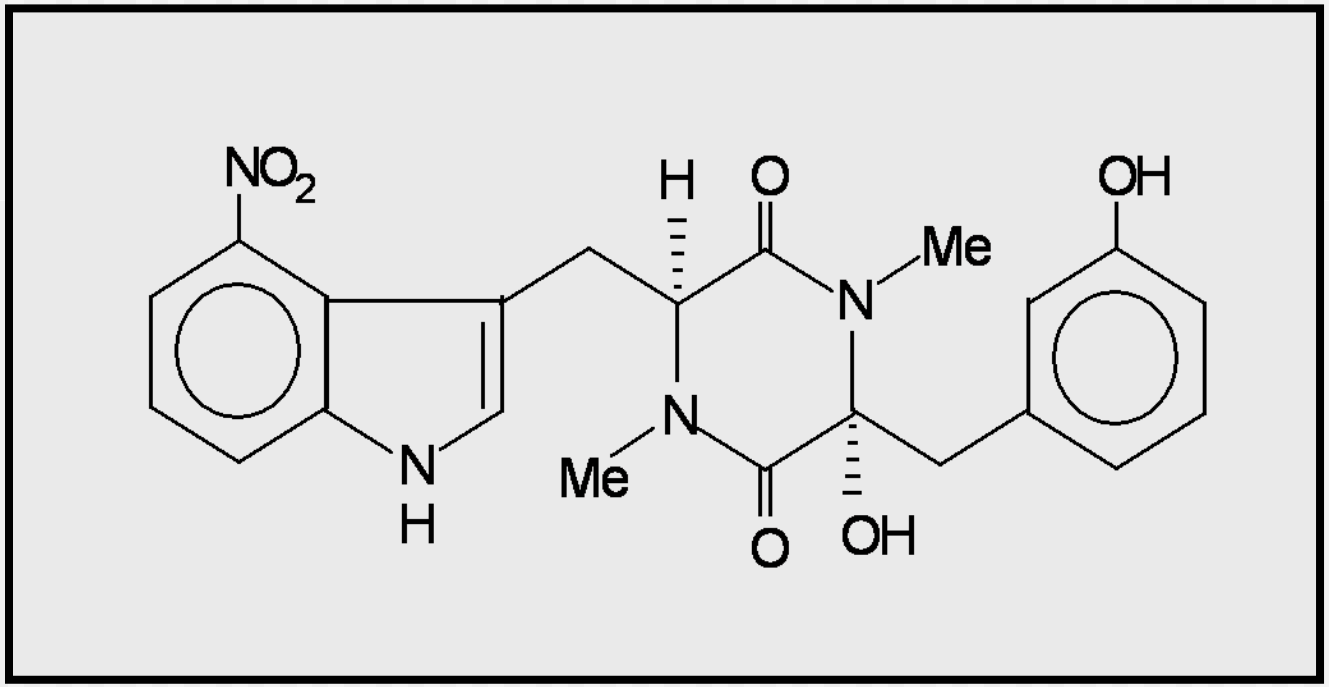
Thaxtomin



Thaxtomin: essential pathogenicity factor

EF-35

M13

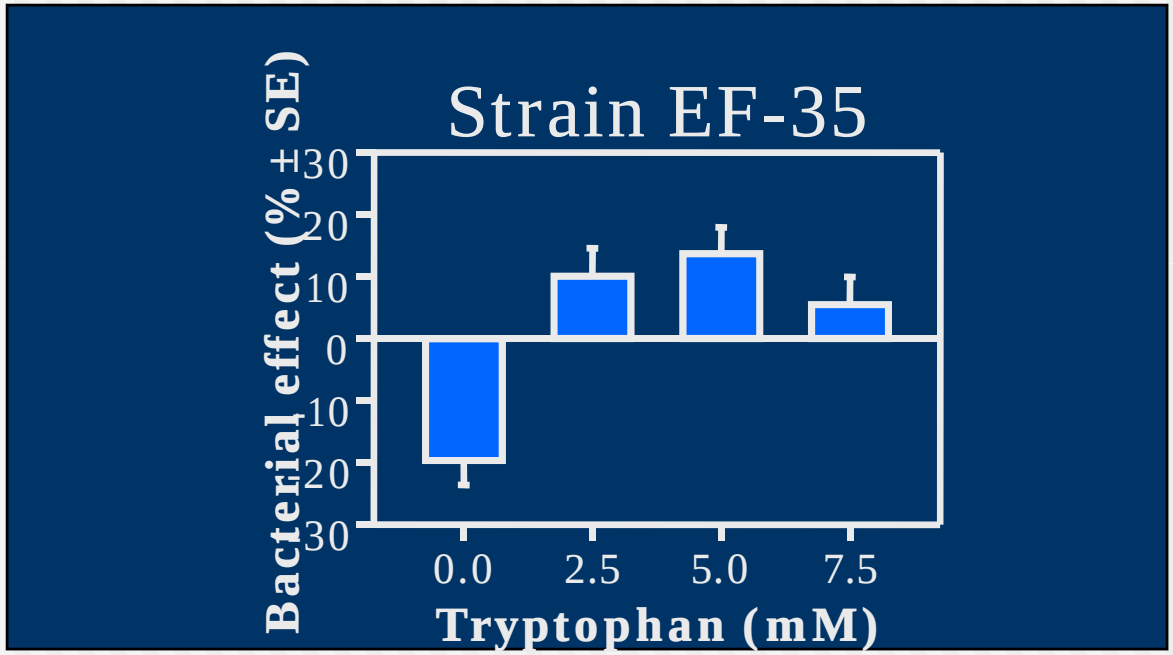
S. scabies, strictly pathogen?

Radish seedlings were grown on agar supplemented with various elements (amino acids, mineral nitrogen, auxin, etc.)

Radish seedlings were inoculated or not with *S. scabies*

Growth of inoculated and non inoculated plants was compared

S. scabies, strictly pathogen?



Expression of results: **bacterial effect**

[(FW bacterial treat. – FW control treat.) ÷ FWcontrol treat.] × 100

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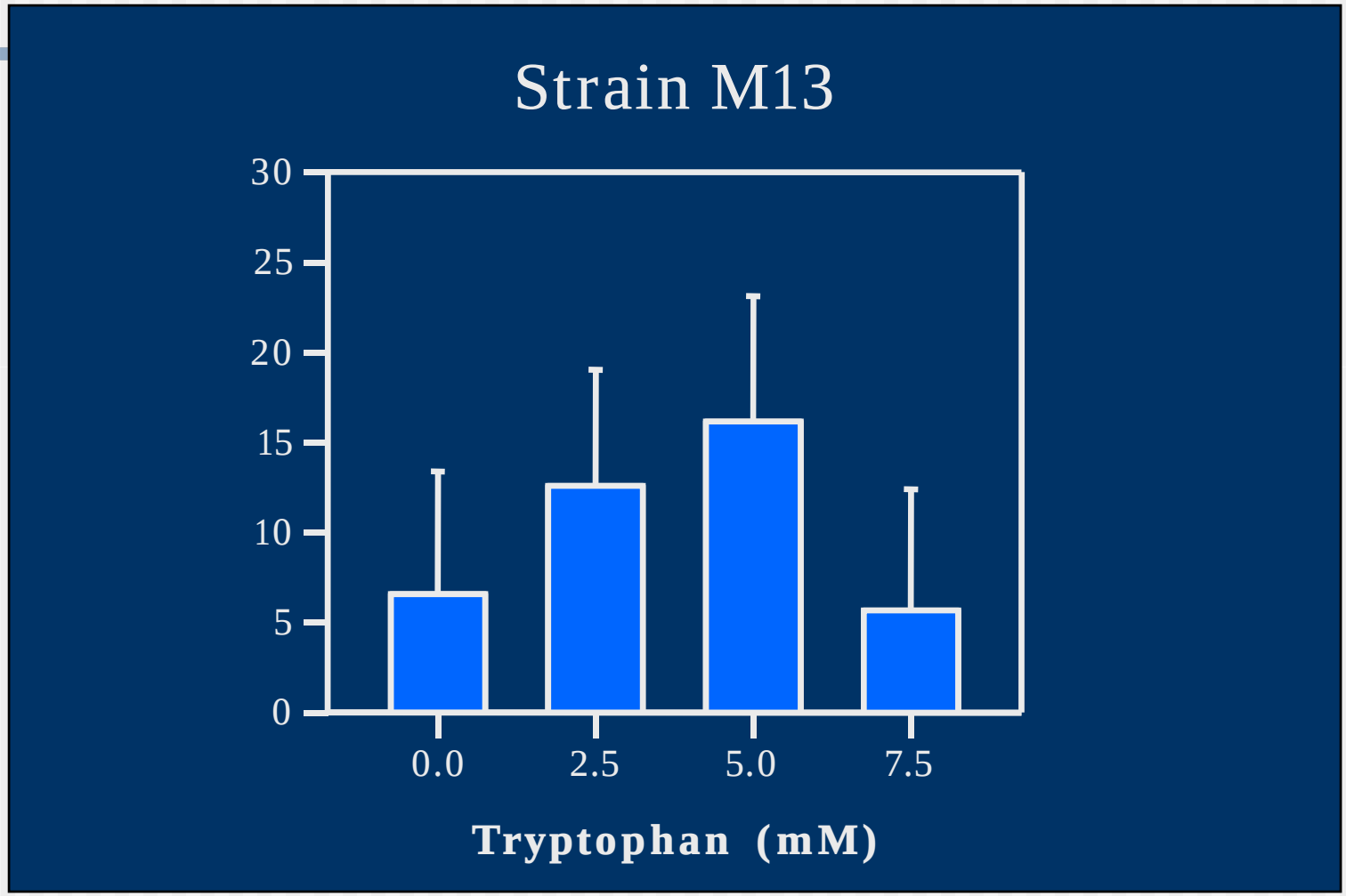
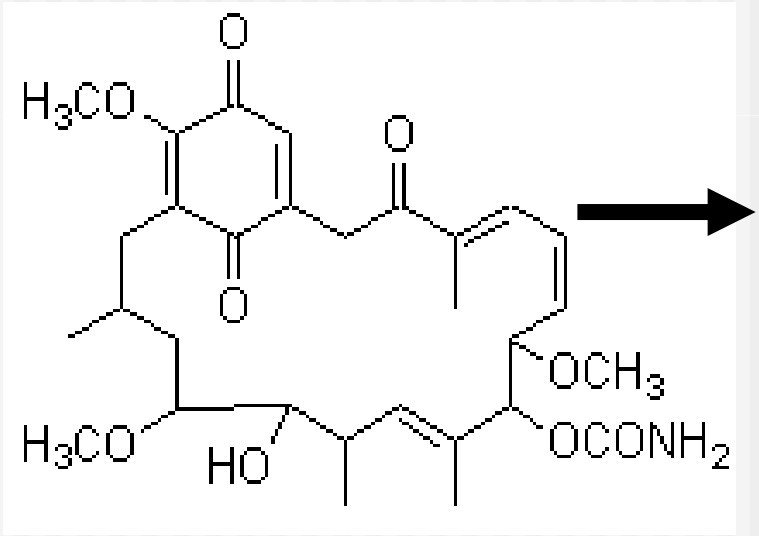


S. scabies and other streptomycetes

Geldanamycin



Streptomyces melanosporofaciens EF-76

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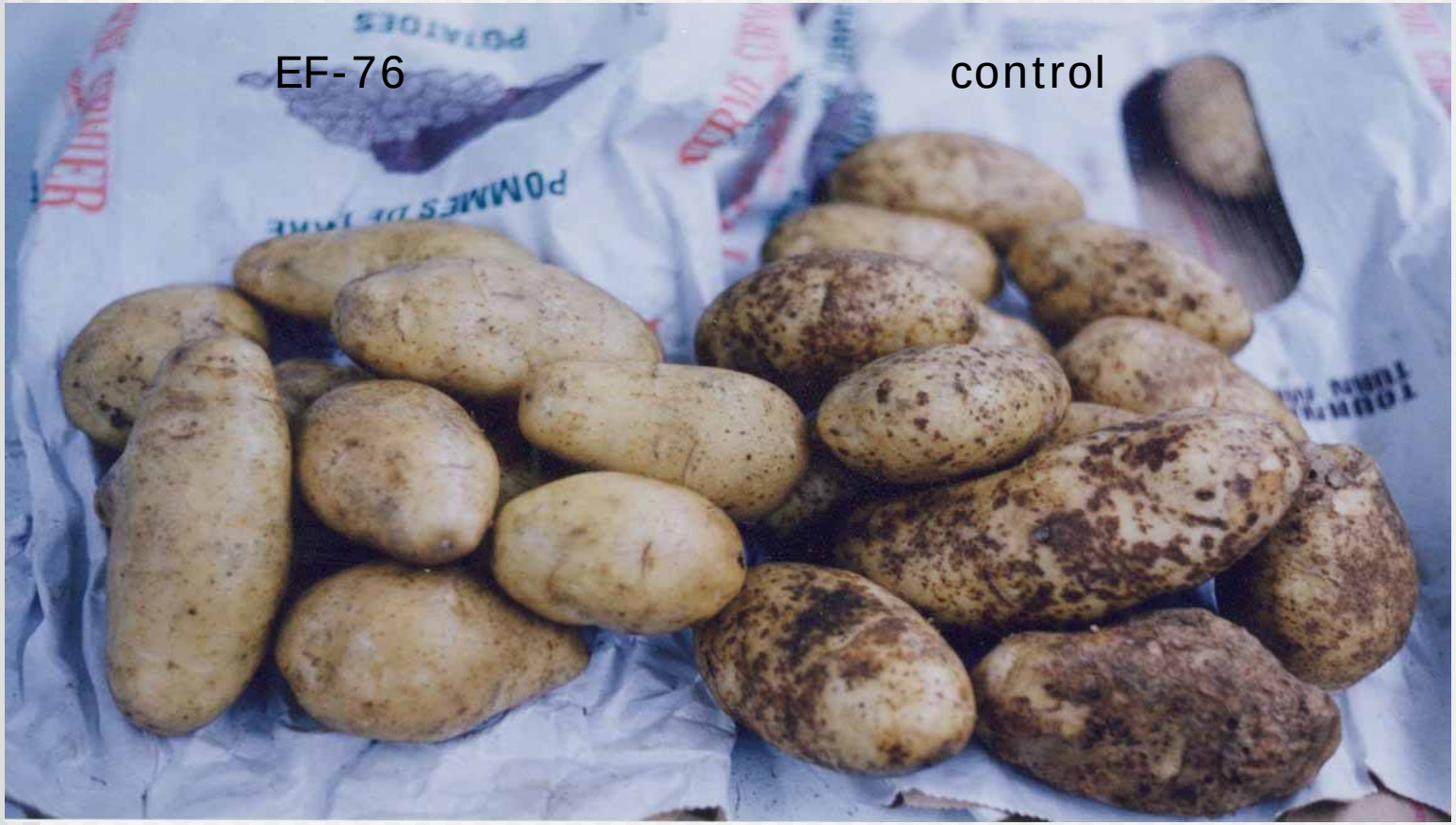
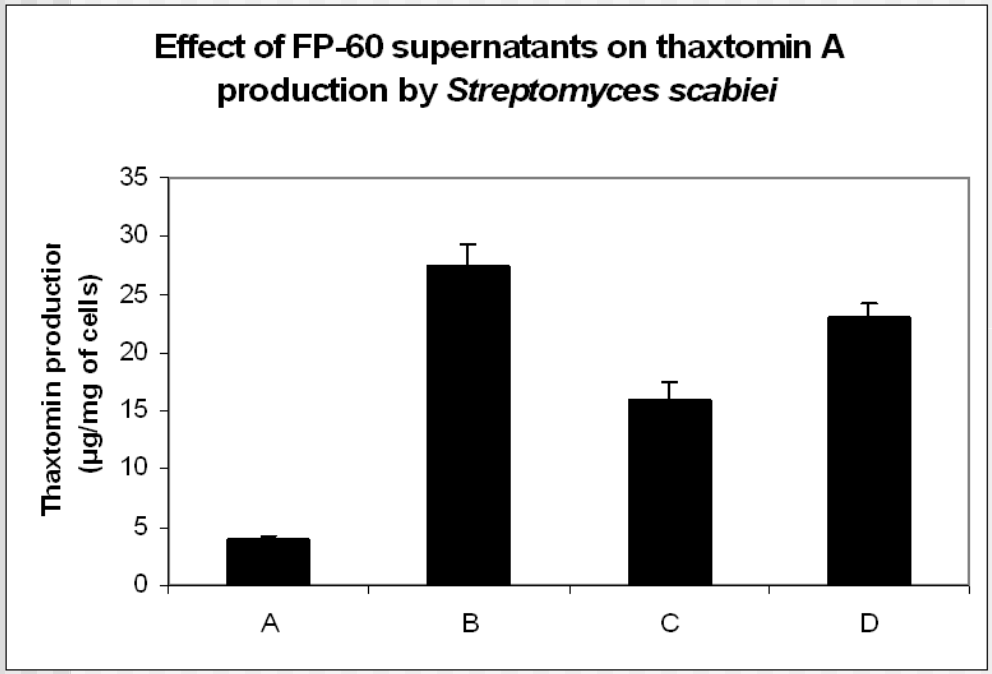
EF-76 : a promising biocontrol tool

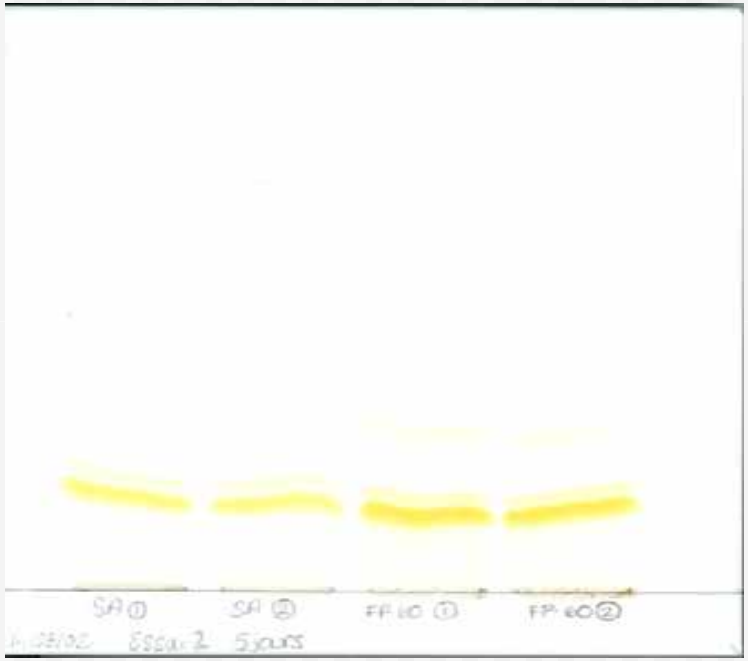


EF-76, always efficient ?

Traitment	Disease index	Disease incidence
Control	2,83 b	72 b
EF-76	2,49 a	70 b
FP-60	3,33 c	83 c

FP-60 induces thaxtomin A production





A) Control
B) Filter sterilized FP-60 supernatant
C) FP-60 supernatant was heated at 100°C for 10 min
D) FP-60 supernatant was filtered to remove proteins

Interspecific molecular signalling modulates thaxtomin A biosynthesis in *Streptomyces scabiei*

Bacterial source of supernatant[1]	Thaxtomin production[2,3](%)	*S. scabiei* biomass[2,4] (%)	Thaxtomin A production per biomass[2,3] (%)
EF-2	106	90	112
EF-3	94	95	99
EF-7	68	82	80
EF-9	152*[5]	132*	115
EF-11	94	93	101
EF-13	202*	92	219*
EF-22	93	92	96
EF-25	98	91	108
EF-34	127	142*	89
EF-56	131*	152*	86
TK24	149*	117	128
FP60	223*	115	194*

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Question

- Some nonpathogenic streptomycetes produce small extracellular compounds promoting thaxtomin biosynthesis in *S. scabies*...
- Do other nonpathogenic streptomycetes produce molecules impeding thaxtomin biosynthesis ?

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Final comments

- Pathogenic streptomycetes could have detrimental, neutral or beneficial effects on plants depending on environmental conditions
- Interactions between rhizospheric streptomycetes involved complex mechanisms (antibiosis, molecular signalling, etc.)

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Thanks to

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