Plant & Food RESEARCH
RANGAHAU AHUMĀRA KAI

Bio-Protection
Bioprotection science for New Zealand

β-aminobutyric acid induces resistance in potato to *Spongospora subterranea*

M Loreto Hernandez Maldonado

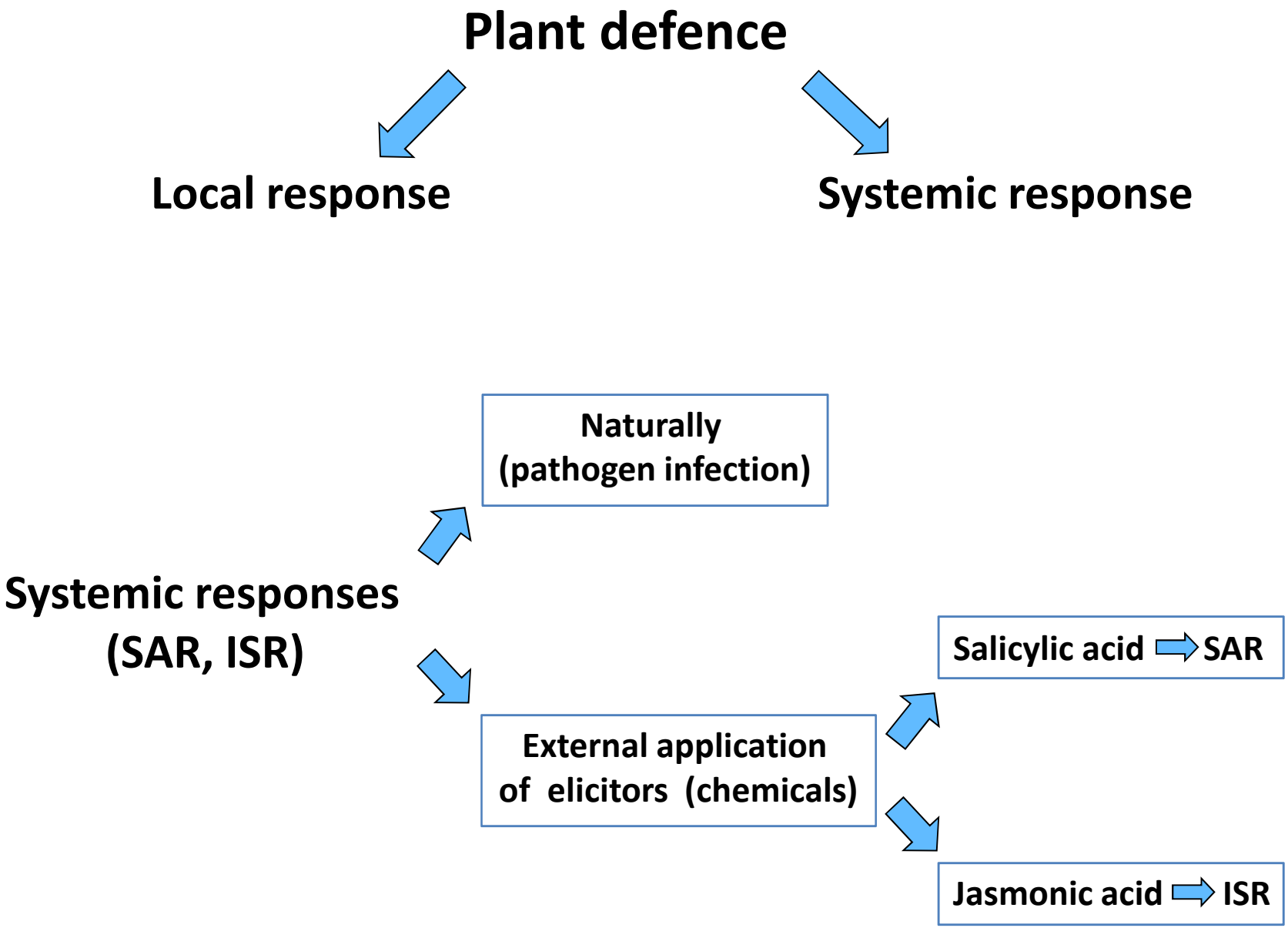
Richard E Falloon, Ruth C Butler, Anthony J Conner & Simon R Bulman

New Zealand Ministry of Business Innovation & Emplo
Horticulture NZ

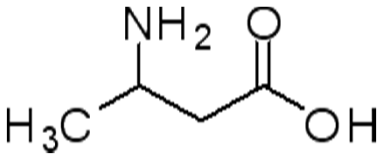
kshop,
2014

Loreto Hernandez

Horticulture NZ


Plant defence
Local response
Systemic response
Systemic responses
(SAR, ISR)
Naturally
(pathogen infection)
External application
of elicitors (chemicals)
Salicylic acid
SAR
Jasmonic acid
ISR

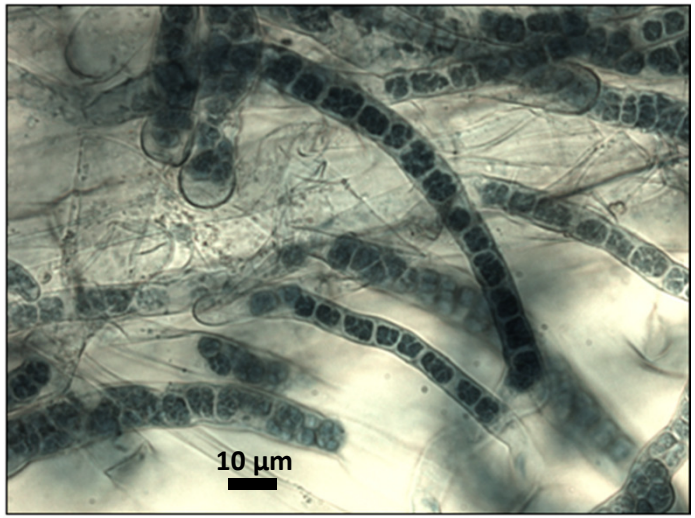
β–aminobutyric acid (BABA)



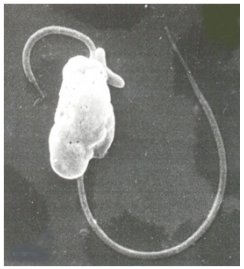
- **One of the most successful elicitors of induced resistance**
- **Very successful against several potato diseases**
- **The mechanism of BABA-IR is not completely understood**

SAR/ISR | **Unknown pathway** | **Priming**

Spongospora subterranea has two life cycle stages



Zoosporangia in roots



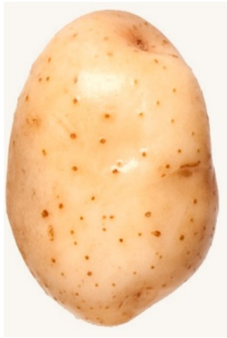
Ueli Merz

Sporosori in root galls and tuber lesions

Methods for powdery scab management

Crop rotations

Disease-free seed tubers & seed tuber treatments

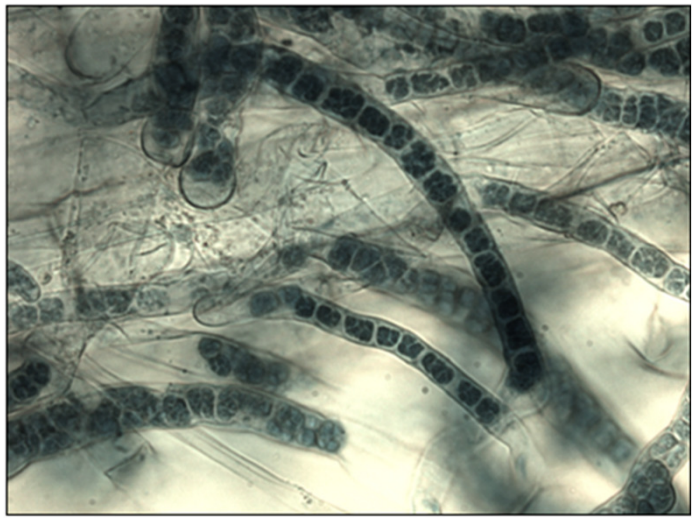


Soil treatments

Resistant cultivars

Overall objectives

- **Test the effectiveness of BABA against *Spongospora subterranea***
- **Develop understanding of the mechanism(s) involved**

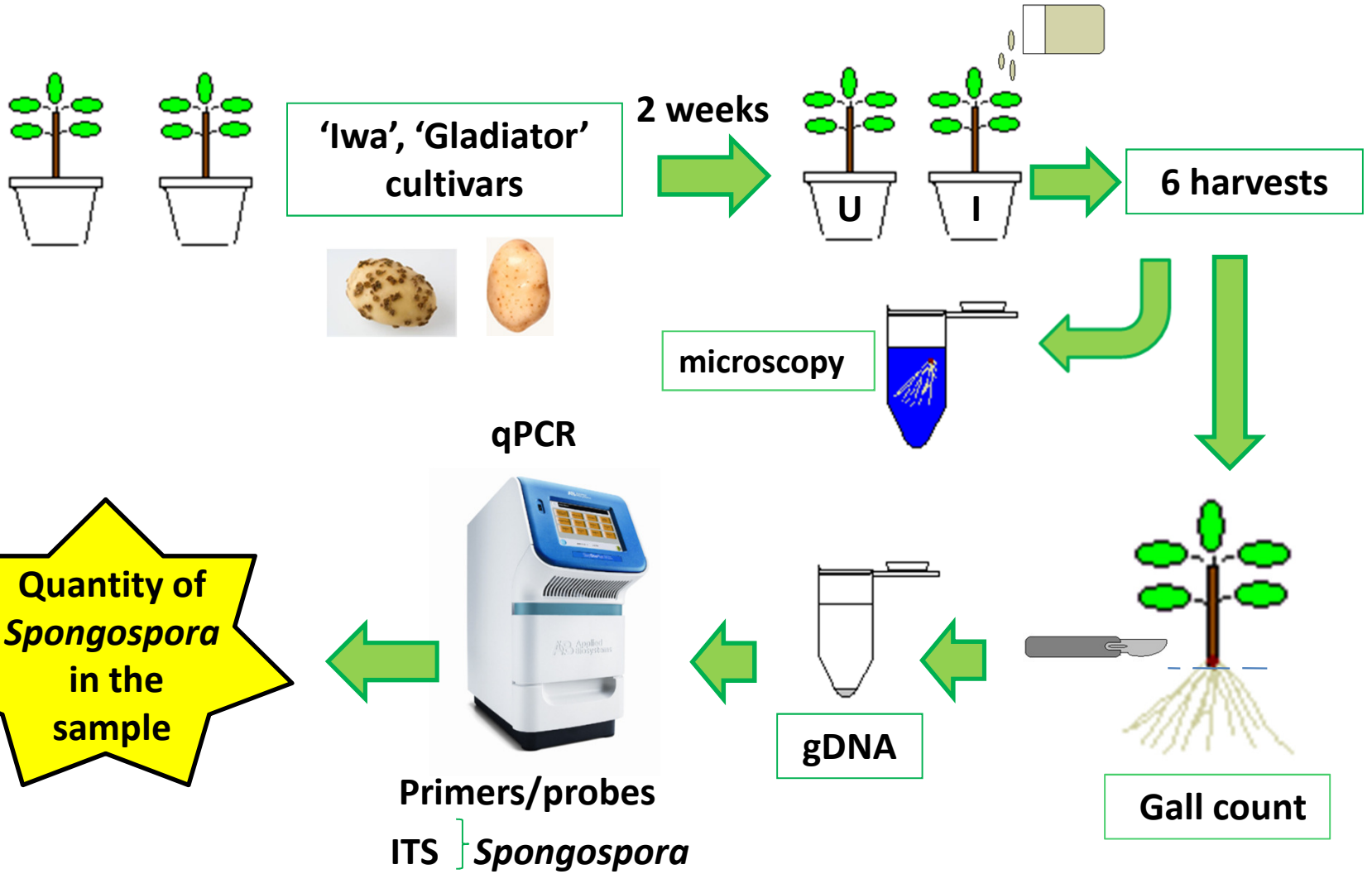


Aims

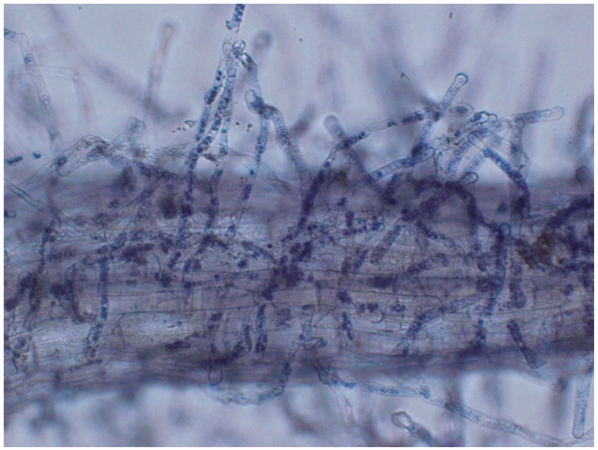
- **Develop methods for measuring *S. subterranea* using qPCR**
- **Test if resistance can be induced against *S. subterranea* in potato using BABA**
- **Determine if chemical elicitors have potential for control of *S. subterranea***

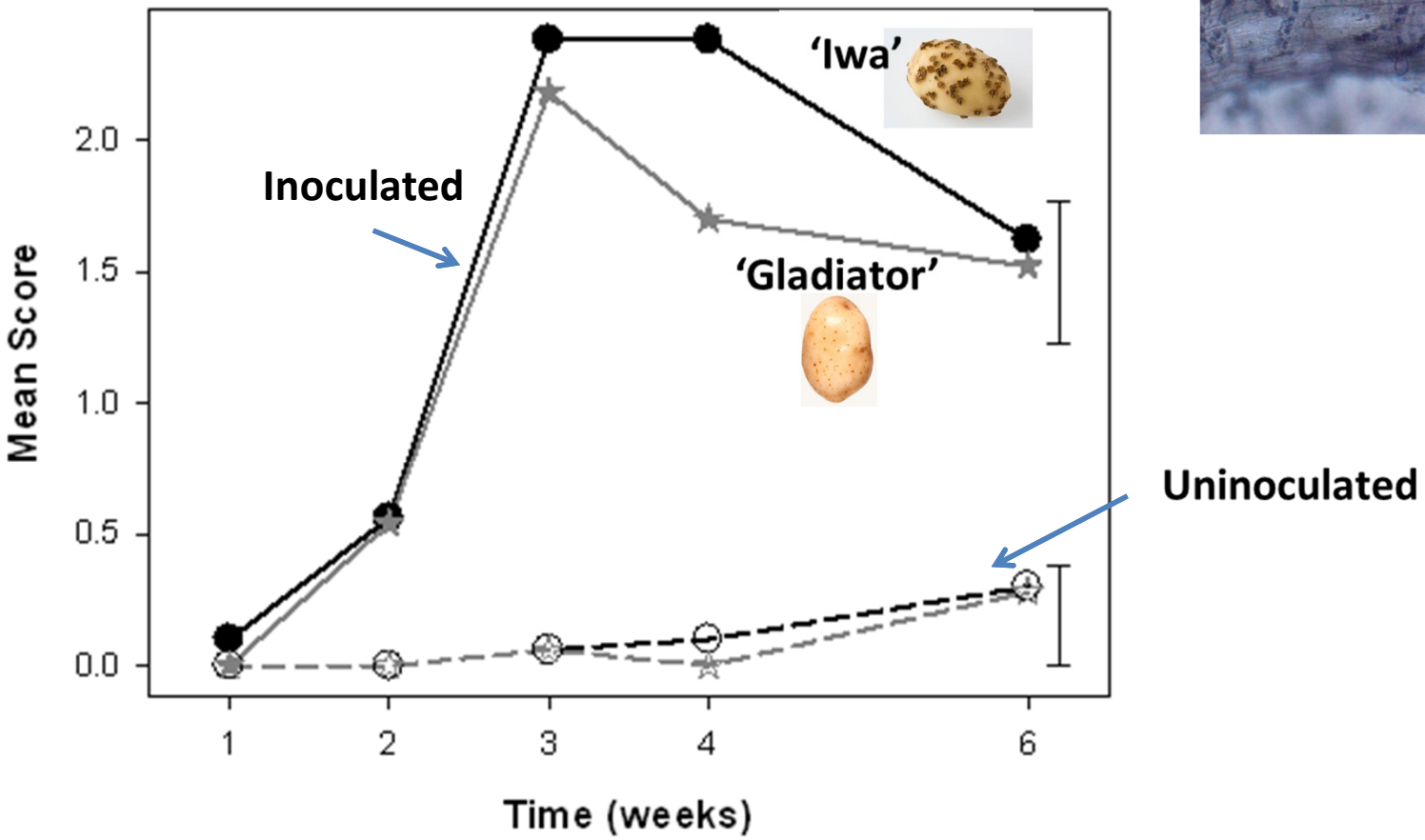
Plant growth system

Quantitative PCR for detection of *Spongospora subterranea*

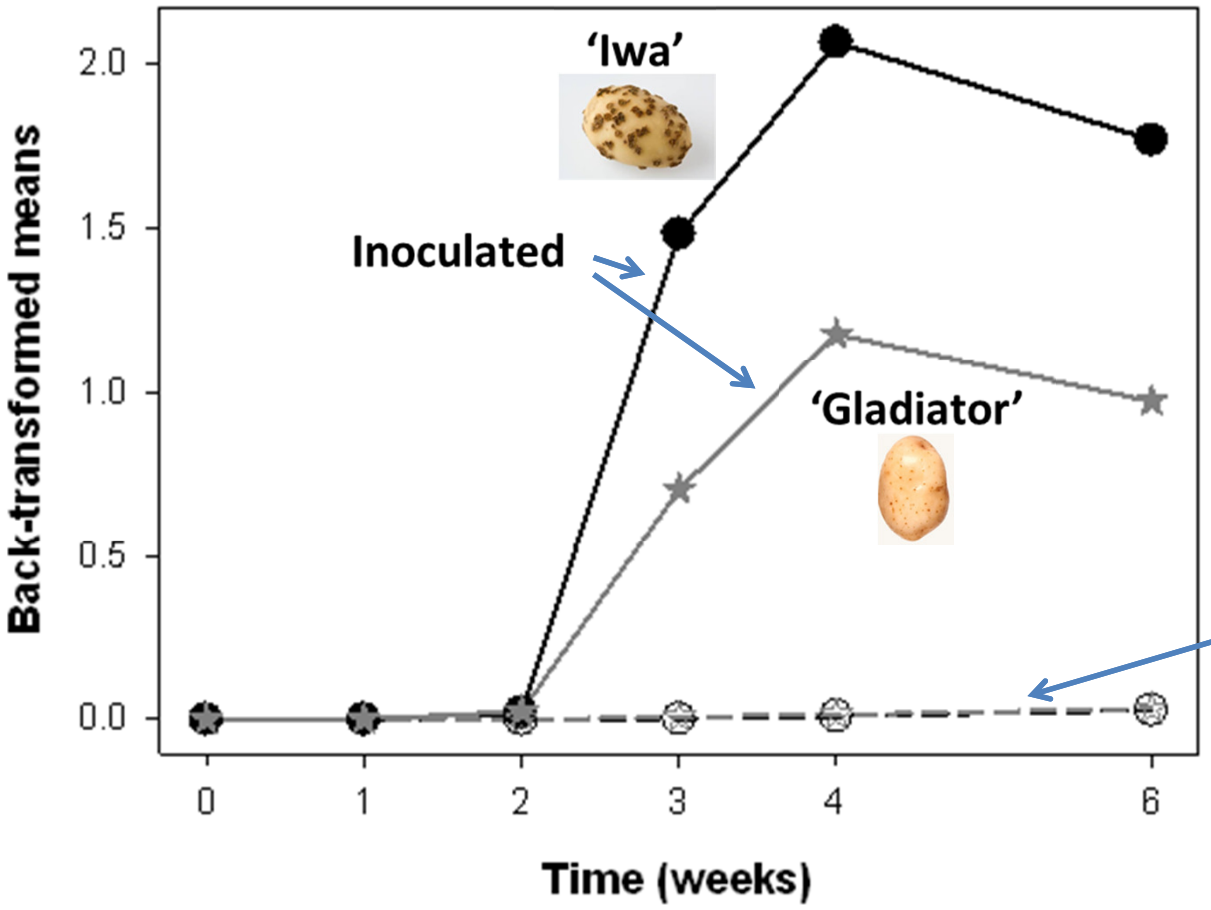


Zoosporangium severity score scores

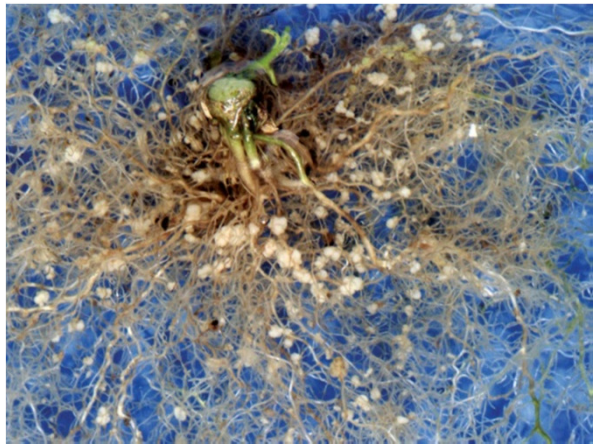


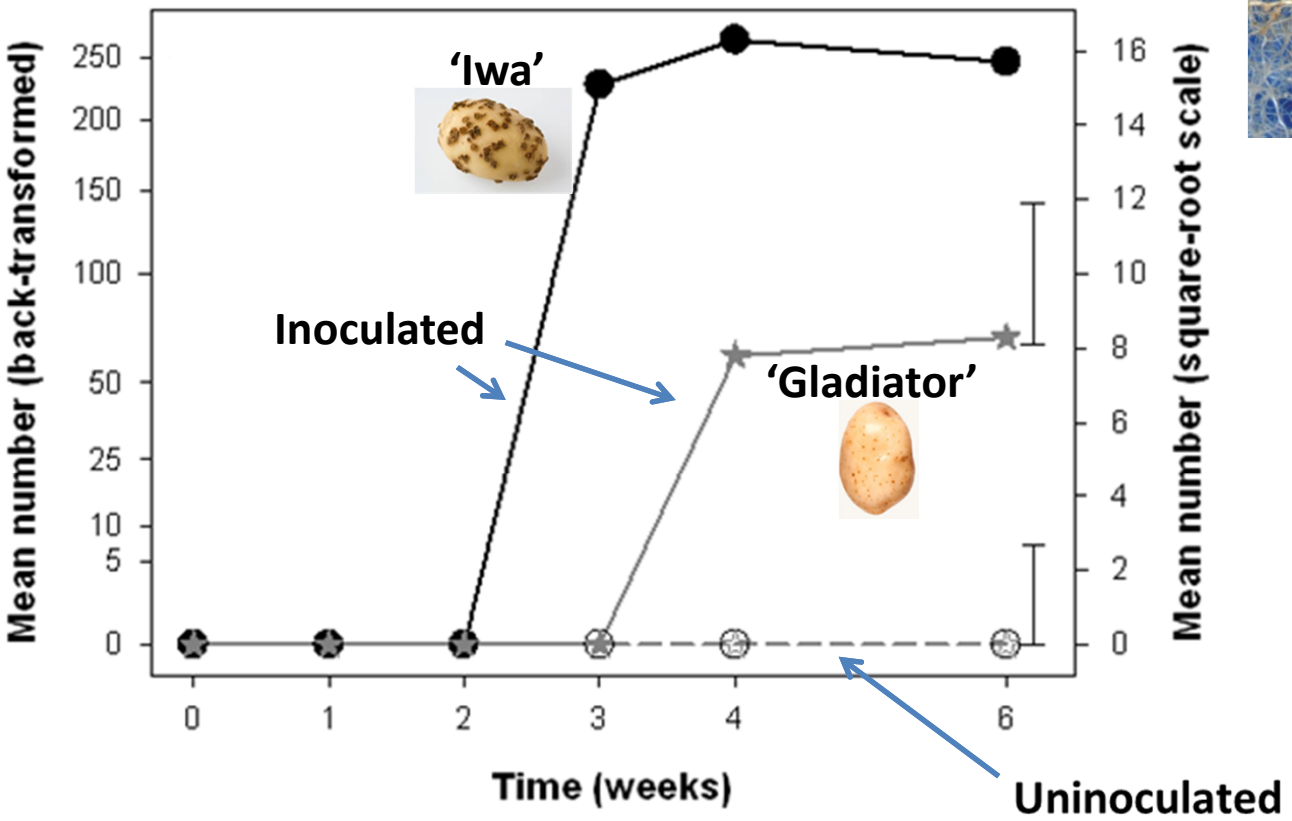


Amount of *Spongospora* DNA (ng µl^{-1})



Numbers of galls per g^{-1} root dry weight





Conclusions

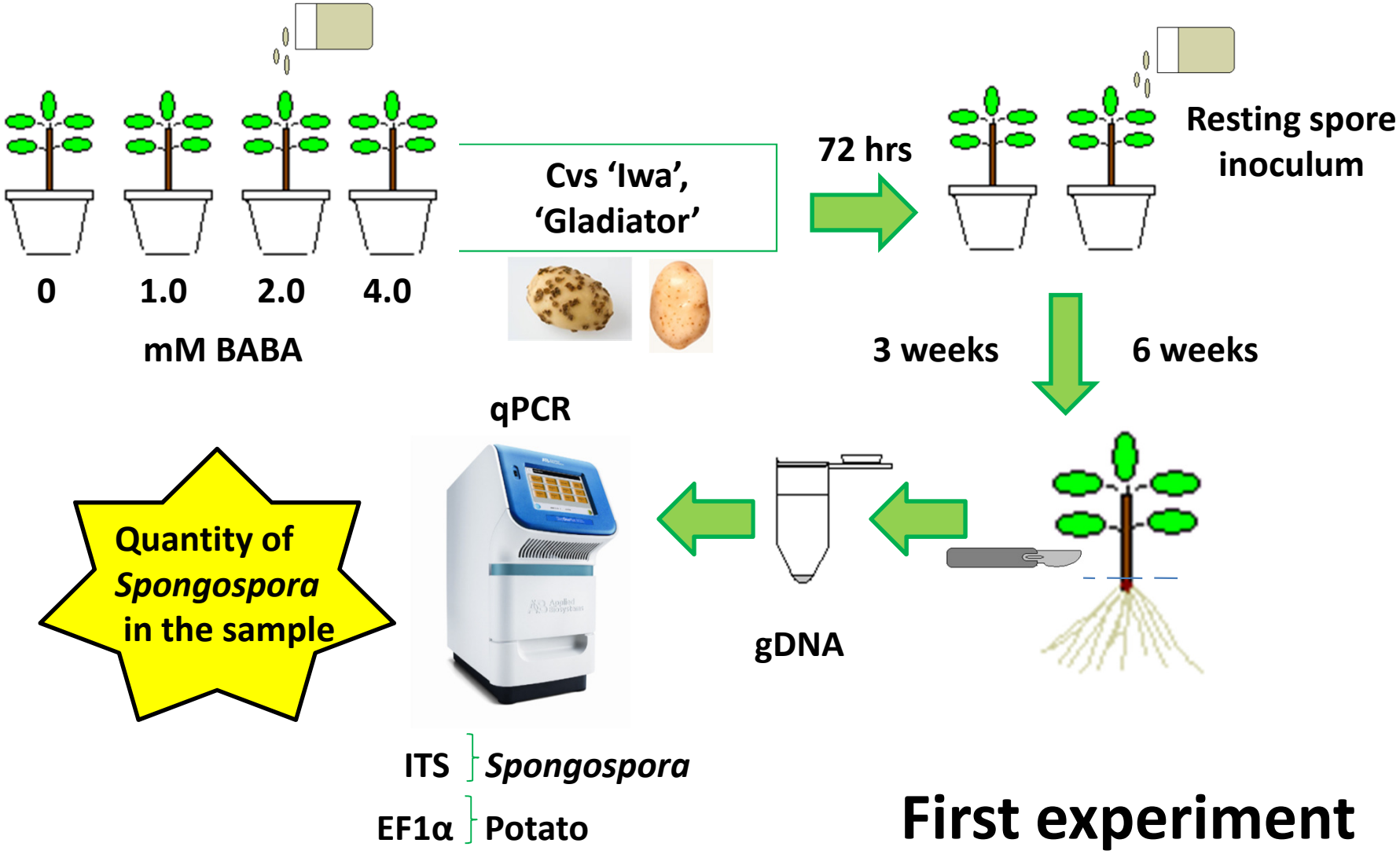
- **qPCR provided highly sensitive detection of *Spongospora subterranea* infection**
- **The pathogen reached maximum infection at 3 to 4 weeks post-inoculation**
- **Pattern of pathogen development in roots was similar in two cultivars with different tuber susceptibilities**

Conclusions

- **Amounts of pathogen DNA in 'Iwa' roots were greater than in 'Gladiator'**
- **Difference of infection between cultivars may occur at later stages of root infection**
- **qPCR useful for studying epidemiology of diseases caused by *Spongospora subterranea***

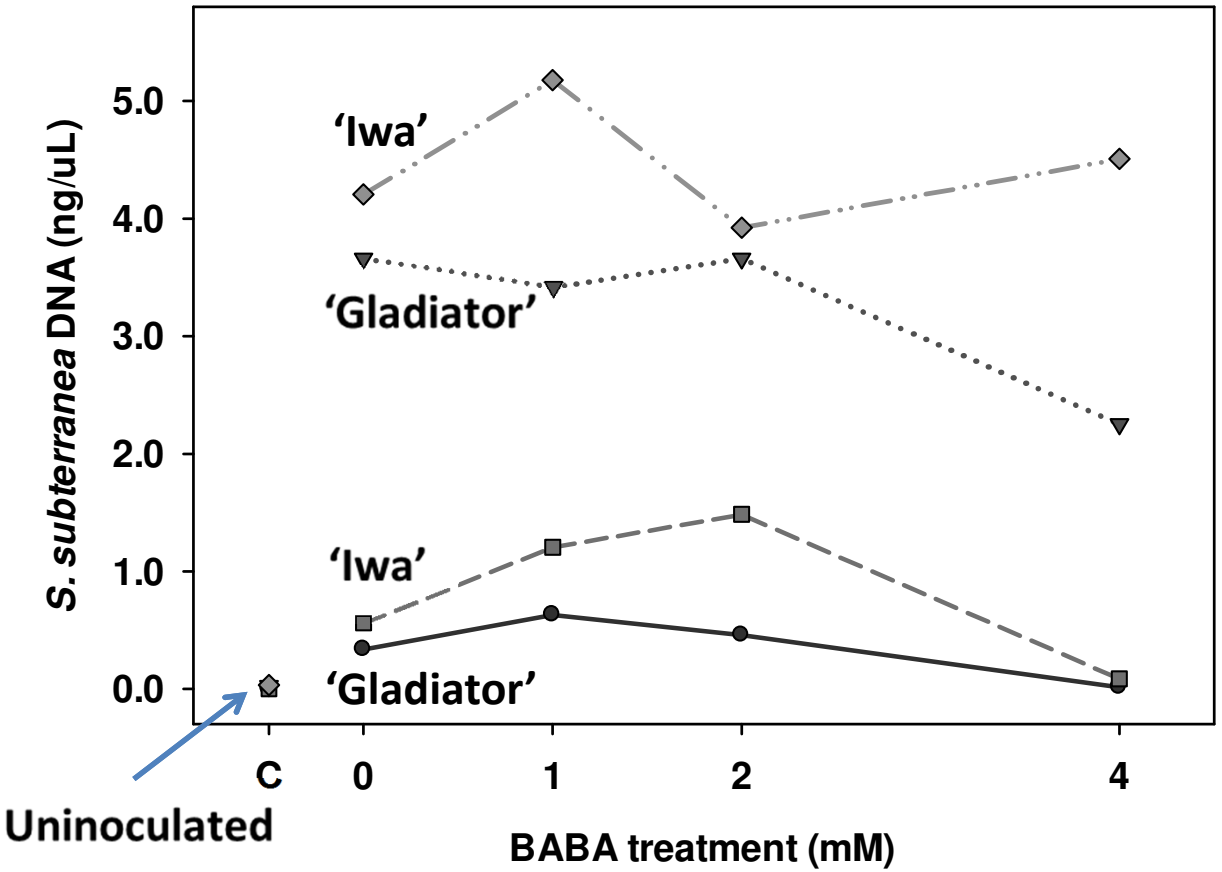
Hernandez Maldonado *et al.* (2013). *Plant Pathology* 62: 1089-1096

BABA effects on *S. subterranea* root infection



First experiment

Amount of *Spongospora* DNA



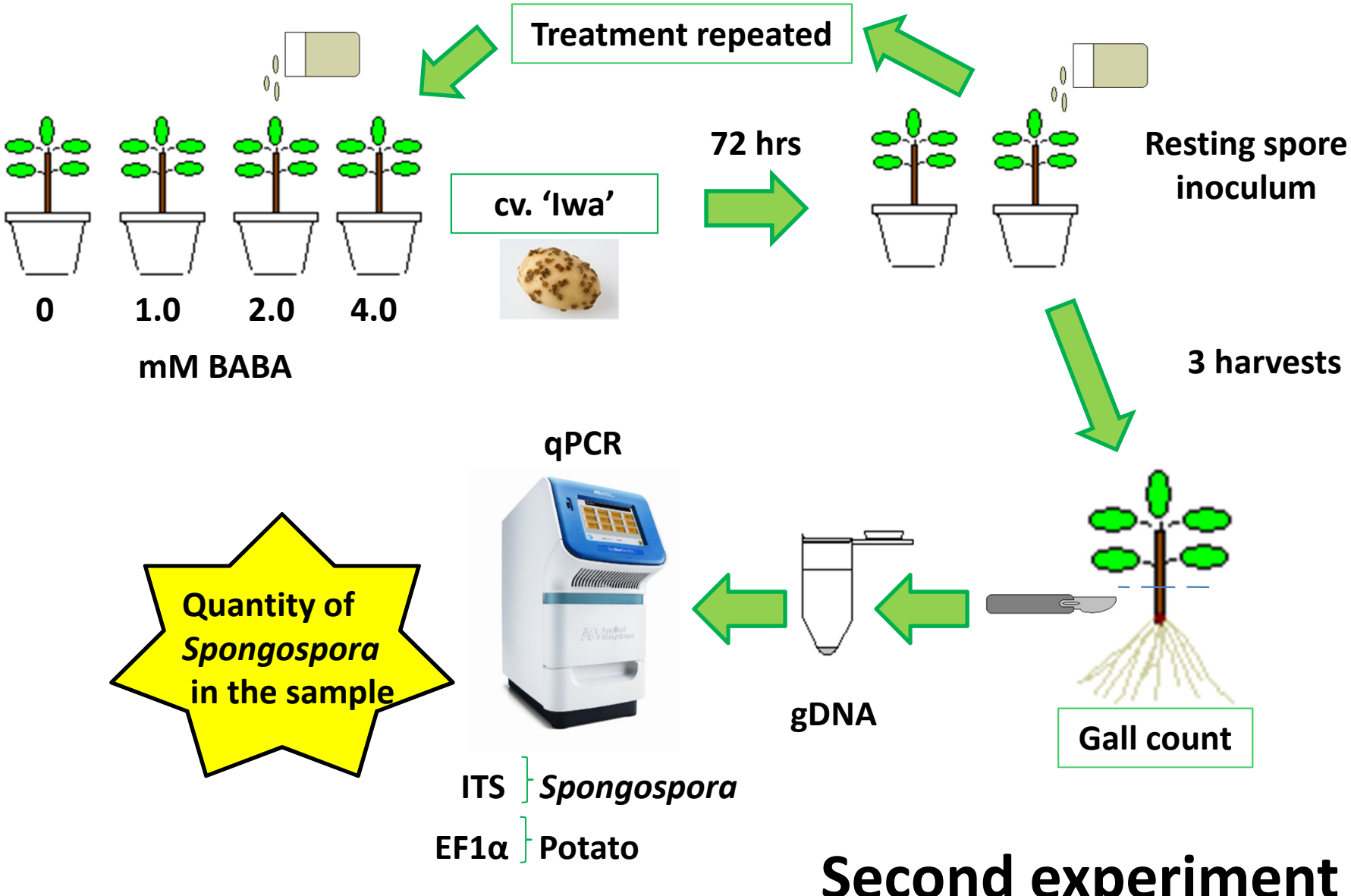
6 weeks p. inoc^{n}

3 weeks p. inoc^{n}

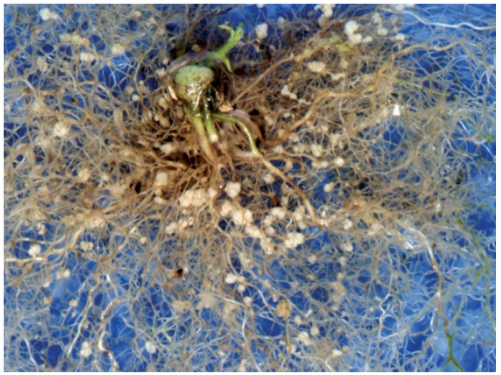
Delay in plant growth observed in plants

‘Gladiator’

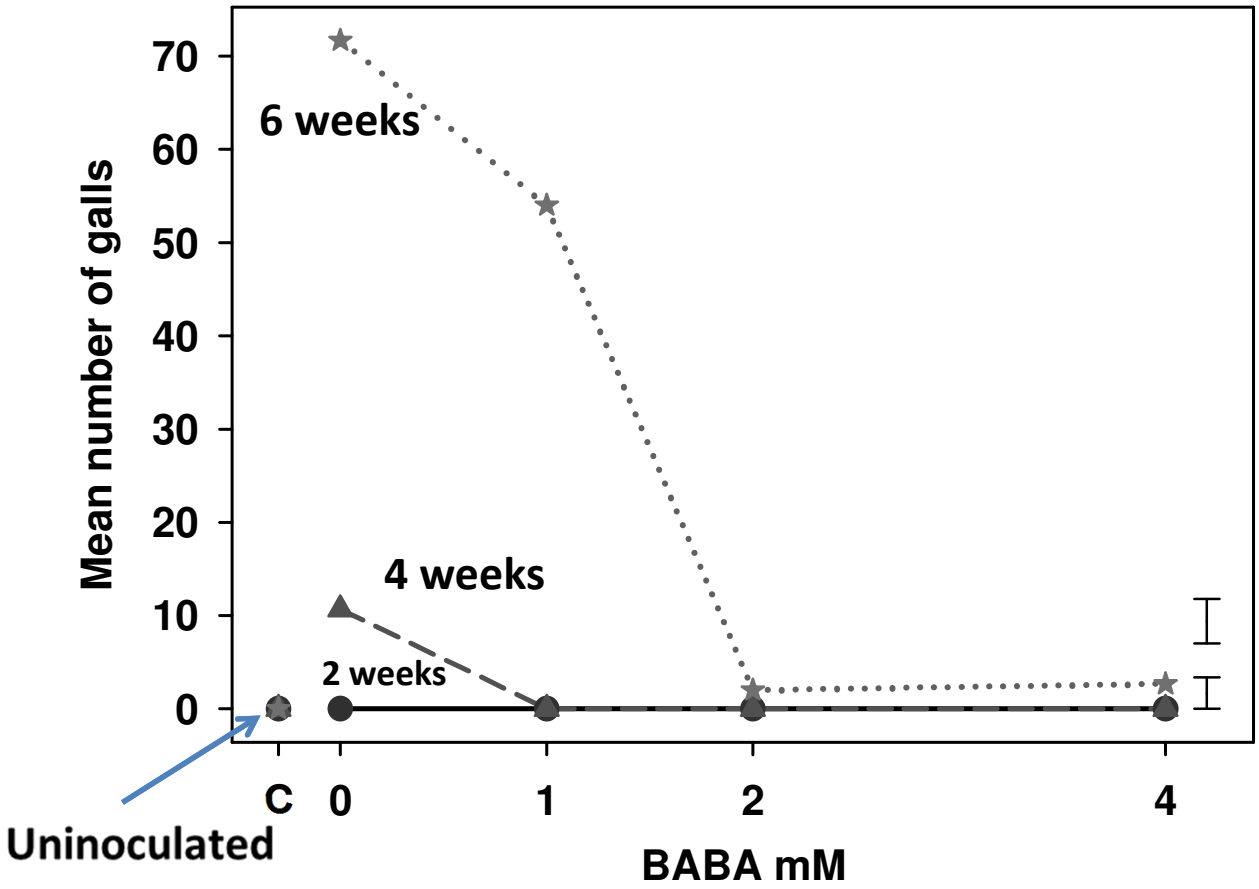
BABA effects on *S. subterranea* root infection



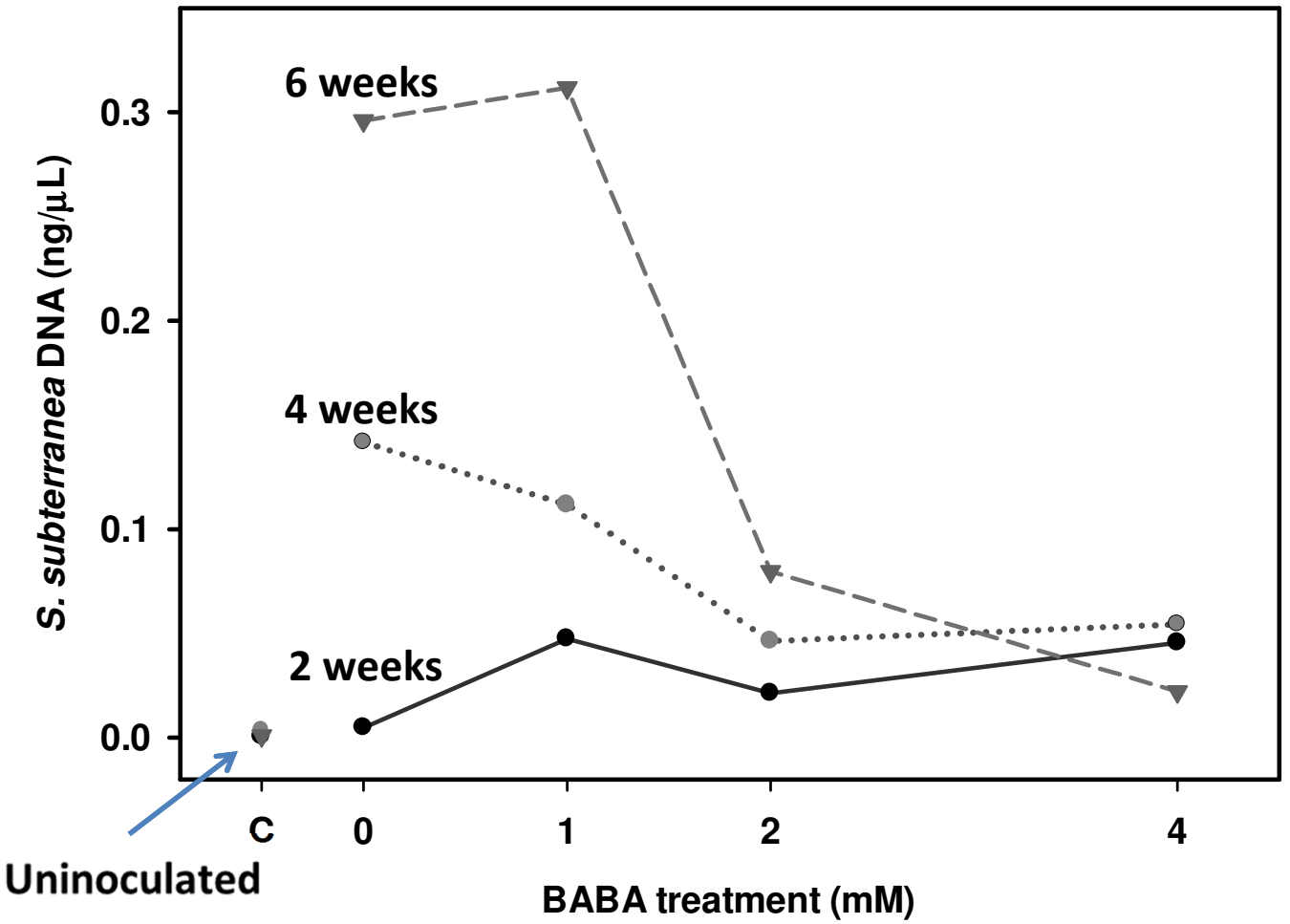
Second experiment



Numbers of galls



Amount of *Spongospora* DNA



Conclusions

- **BABA applied to young plants reduced growth**
- **Repeated treatments (2 weeks) provided good defence against *S. subterranea* root infection, a single treatment did not (long pathogen cycle)**
- **Marked reduction of infection was achieved with BABA at 2 or 4 mM**
- **Chemically-induced resistance could be effective for reducing plasmodiophorid diseases**