



# Development of a Reproducible and Fast Assay for Replant Problems in Rosaceae and Physiological Investigation of the Plant Response

## Introduction

The problem of establishing new crops on old sites is known as replant problem or soil sickness. Nematodes, bacteria, fungi, toxins and nutrient deficiency are possible causes of replant problems in *Rosaceae* which is of special importance in coming years due to the outbound registration of the chemical soil disinfectant Basamid. The study aims at developing a test system for replant problems in *Rosaceae* and at identifying suitable plant materials for the test system in the genera *Rosa* and *Malus*.



Symptom of replant problem in rose nursery (Bönningstedt, University Kiel, Photo: Prof. Spethmann)

## Materials and Methods

### Three soil variants:

- Healthy soil
- Apple sick soil
- Rose sick soil (from Ellerhoop, Schleswig-Holstein)

### Treatments:

- Untreated (Control)
- Thermal treatment, 50 °C (T50)
- 100 °C (T100)
- Basamid
- Gamma irradiation

### Container sizes:

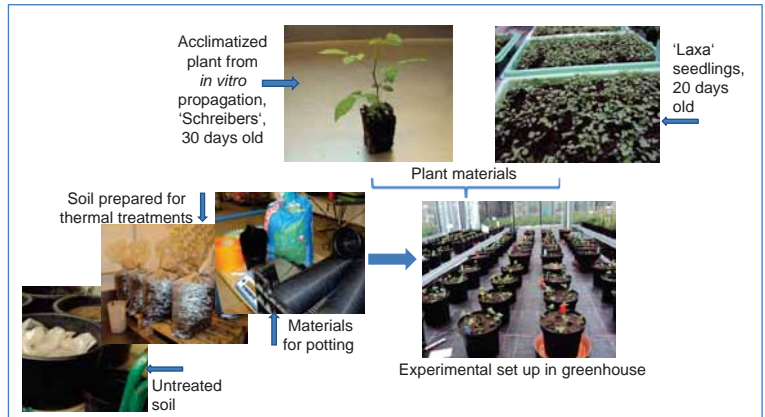
1 L, 3 L, and 5 L

### Osmocote 3-4 exact:

2 g/L soil

### Plant materials:

- Seedlings: *R. corymbifera* 'Laxa' and *Malus domestica* 'Bittenfelder'
- In vitro* propagation: *R. canina* 'Inermis', *R. polmeriana* 'Schreibers', *R. canina* 'Pfähnders' and apple rootstock 'M26'



## Results

### *R. corymbifera* 'Laxa'

#### Results in 2009



Fig. 1: 'Laxa' grown in apple sick soil in various treatments in 2009 (3 L containers)

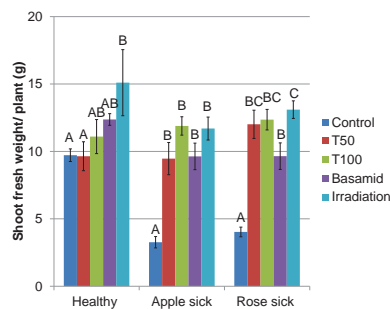


Fig. 2: Biomass of 'Laxa' grown in different soils in various treatments (Different letters indicate significant differences, Tukey test,  $l = \pm$  SD)

### *R. corymbifera* 'Laxa'

#### Results in 2010

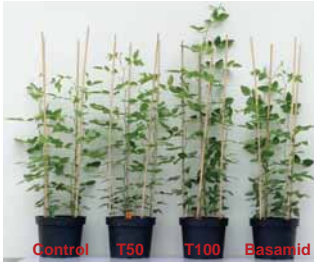


Fig. 3: 'Laxa' grown in apple sick soil in various treatments in 2010 (3 L containers)

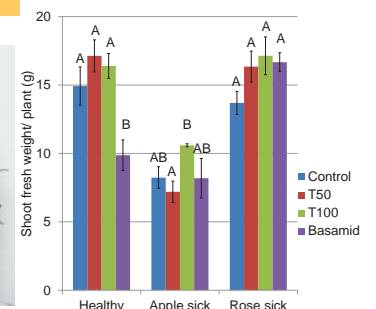


Fig. 4: Biomass of 'Laxa' grown in different soils in various treatments in 2010 (Different letters indicate significant differences, Tukey test,  $l = \pm$  SD)

### Apple M26

#### Results in 2010



Fig. 5: M26 grown in apple sick soil (5 L containers)

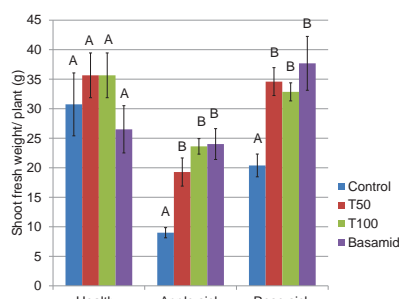


Fig. 6: Biomass of M26 grown in different soils in various treatments (Different letters indicate significant differences, Tukey test,  $l = \pm$  SD)

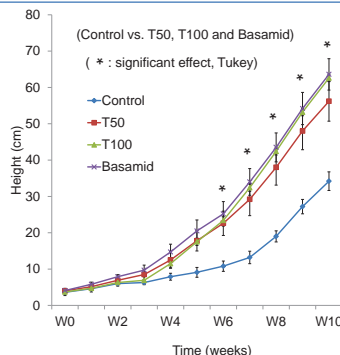


Fig. 7: Growth of M26 in apple sick soil in various treatments

### *R. corymbifera* 'Laxa'

- In 2009: severe reductions in shoot and root growth in apple sick and rose sick soil (Fig. 1, 2) that were significant already after 6-8 weeks.
- In 2010: No clear effects of soils with replant problems (Fig. 3, 4). Differences compared to 2009: Provider of plant material, soil collection by wheel loader.

### Apple M26

- Significant reductions in growth of shoots and roots in apple and rose sick soil (Fig. 5, 6) that could be detected already after 6 weeks (Fig. 7).

## Conclusions and Outlook

- The test system was carried out with small soil volumes in 1, 3 and 5 L containers. The duration can be shortened to 6-8 weeks.
- Differences between the two years point to the difficulties in identification and collection of soil with replant problems and plant materials.
- In vitro* plant material turned out to be a clean and homogenous alternative to seedlings in case of apple.