

Evaluation of heat treatments used to control Japanese knotweed

Tina D'Hertefeldt
Halmstad University
Sweden



Overview

- Distribution of Japanese knotweed in Sweden
- Lab treatments
- Scaling up of heat treatments
- Treatment evaluation



Japanese knotweed situation in Sweden

Data from Artportalen 2024



- Common in South Sweden and follows the Baltic coast north
- Not reported from the mountain areas in the Northwest



Excavated soil contaminated with Japanese knotweed

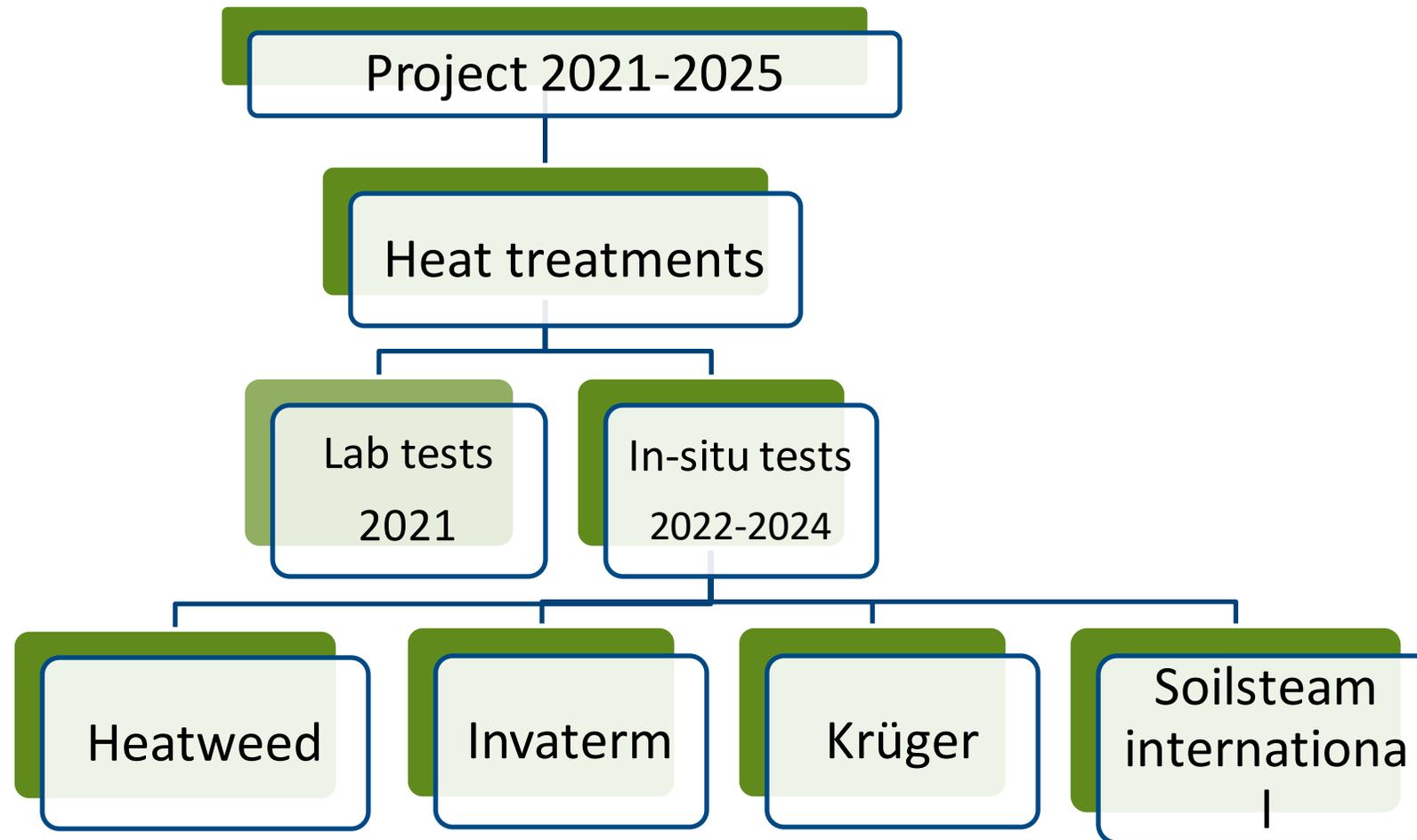
Construction of bike path



Geoweave to contain Japanese knotweed



Evaluation of heat treatments





Rhizomes



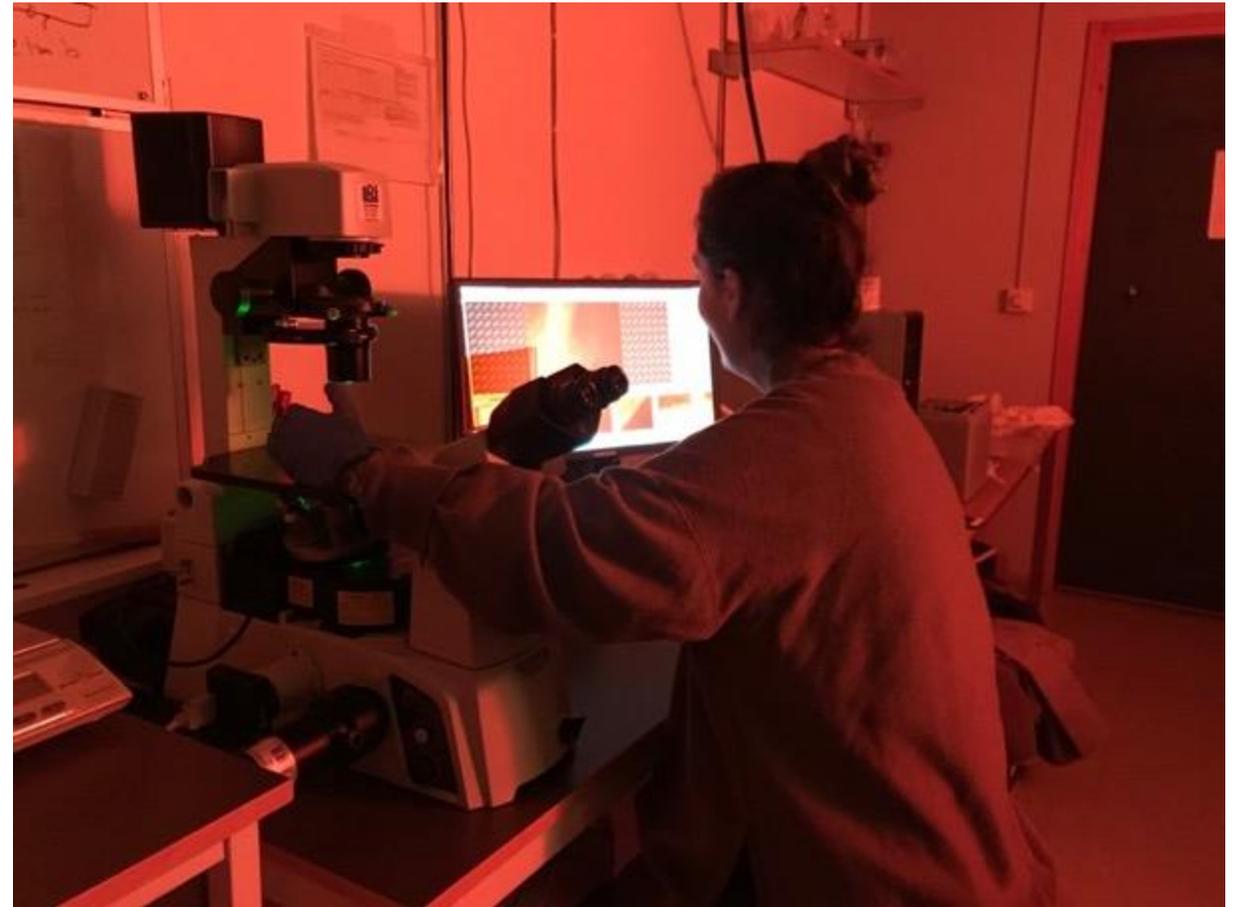
Thin rhizomes
Shoots

Evaluation of lab heat treatments

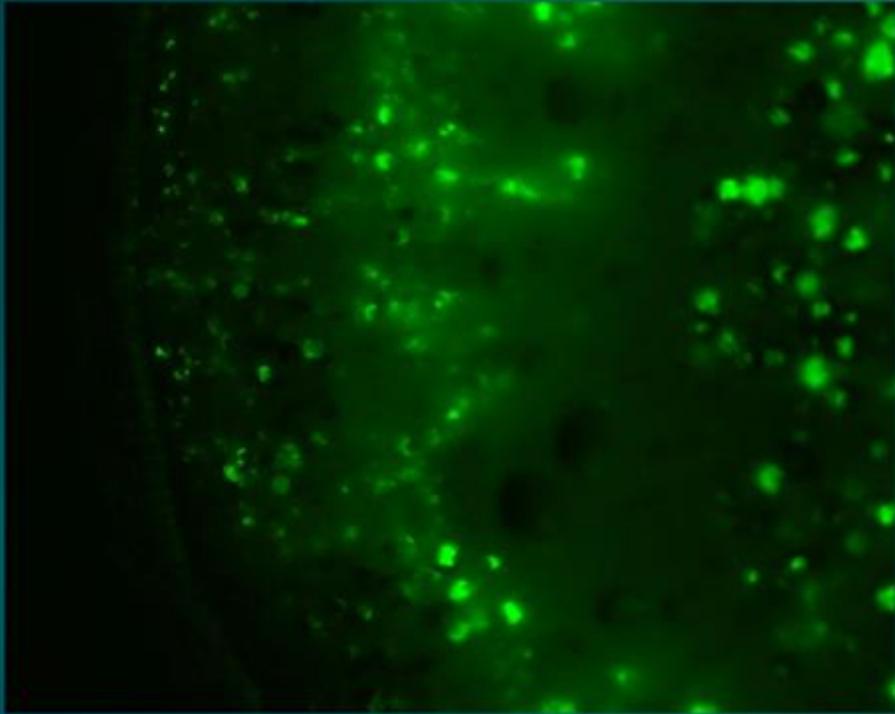
Cultivation



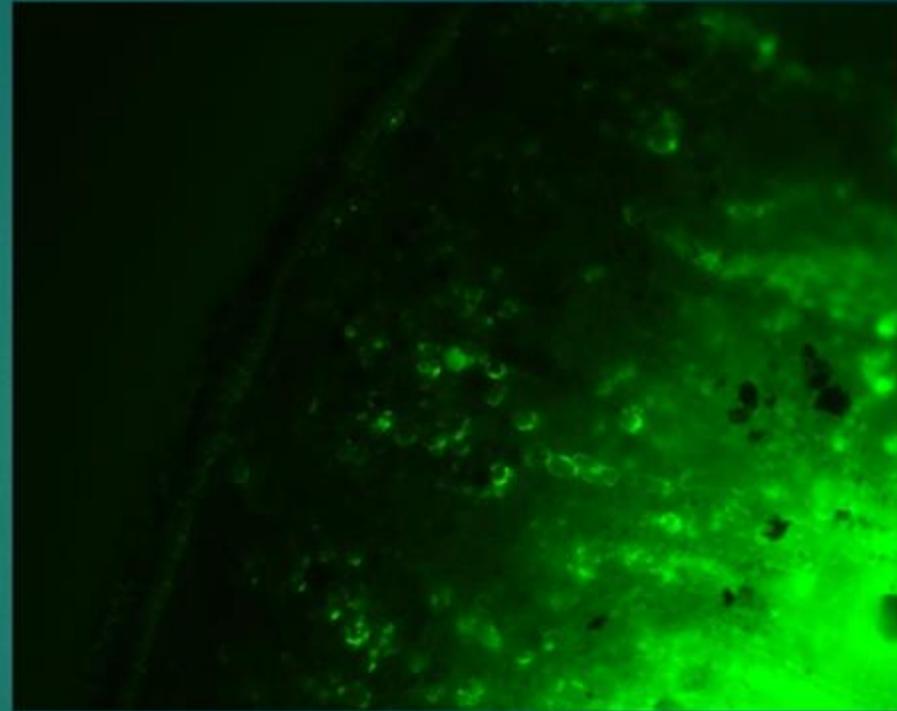
Fluorescence microscopy



Fluoresceine diacetate staining



Live control



Heat treatment 24 hours 80°C

Lab heat treatments



8 days 80°C



20 minutes microwave

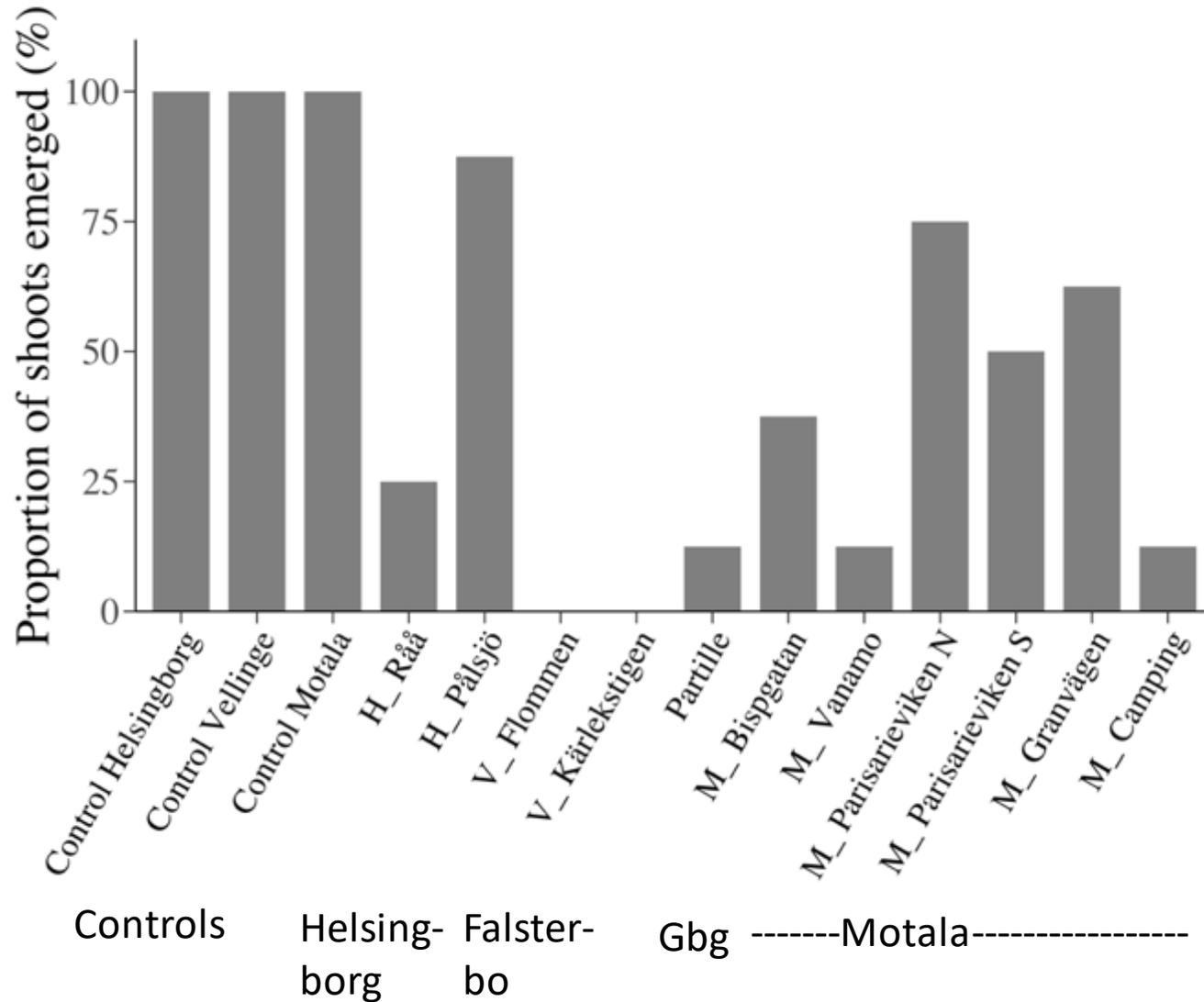
Heatweed

- Weed control
- Hot water
- Over 79°C



Shoot production in Heatweed-treated rhizomes

Rhizomes from 4 municipalities in Sweden



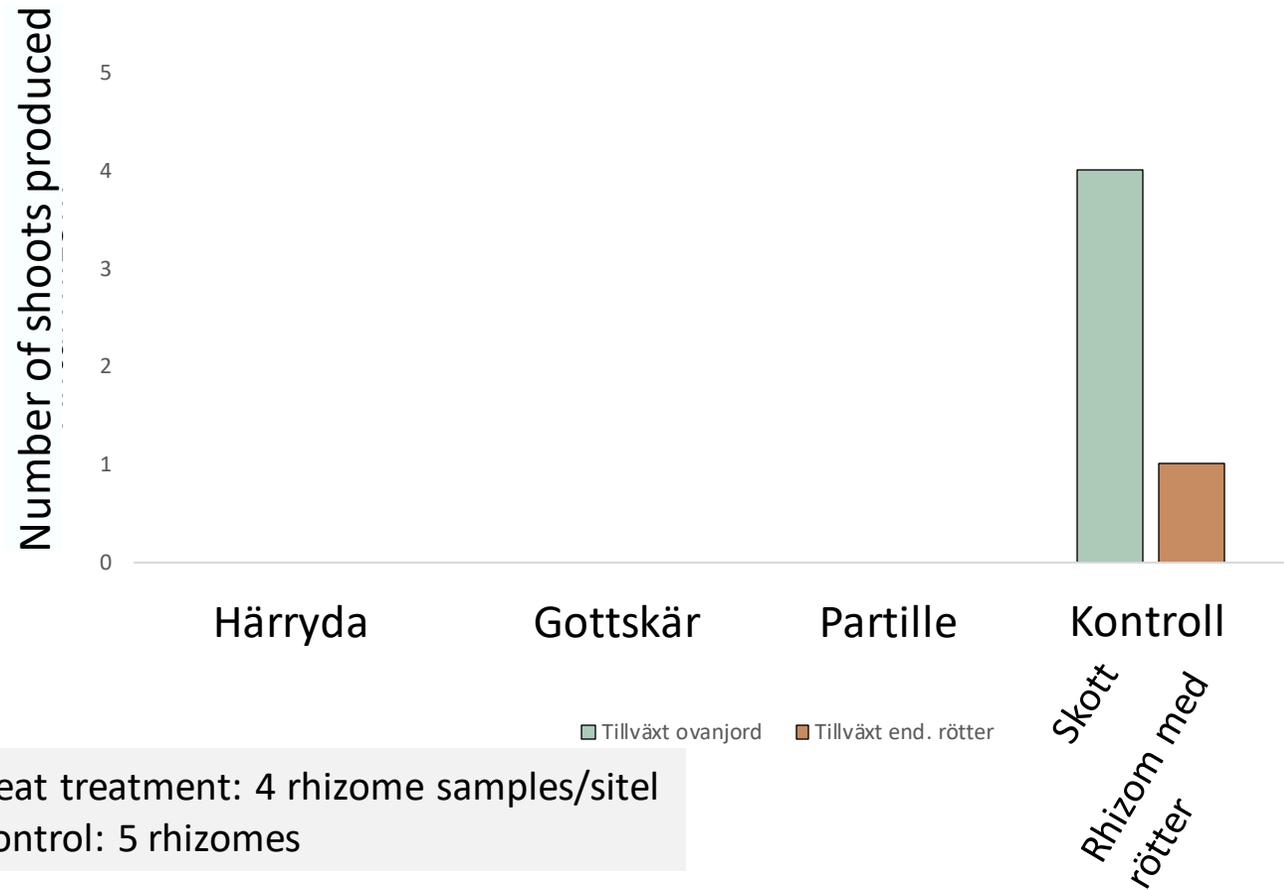
Invaterm

- In-situ
- Steam treatment
- 1,5-2 m depth
- Goal temperature 85°C

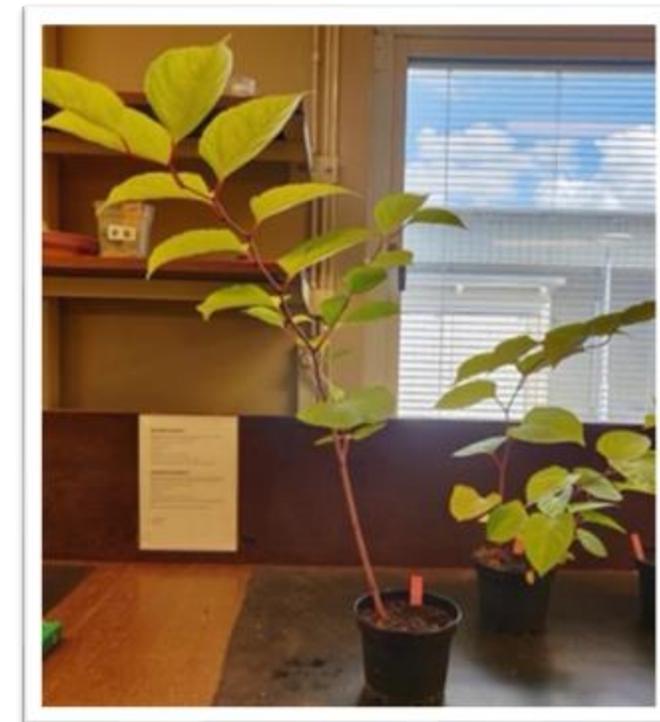


Invaterm rhizomes

Site	Temperature	Days
Härryda	75°C (max 90°C)	5,5
Gottskär	96°C (max)	3
Partille	82-98°C	6

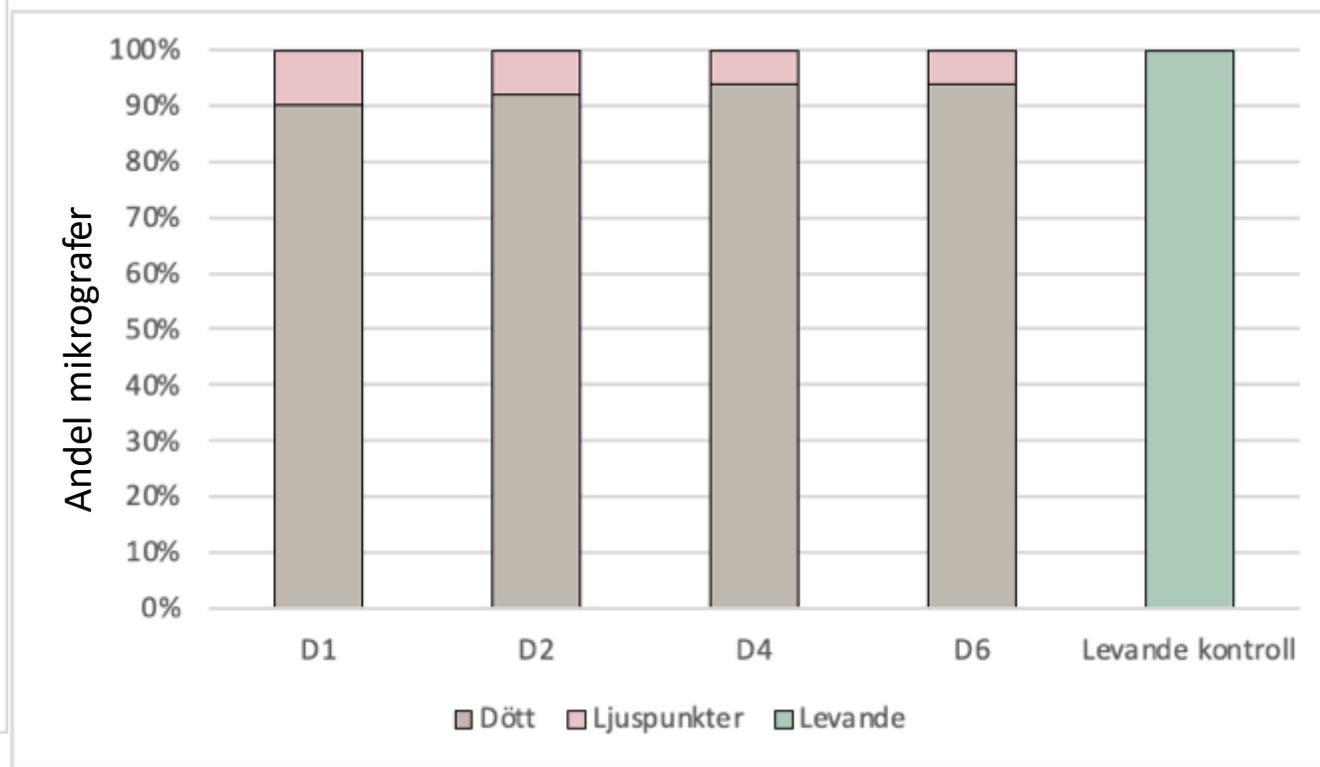
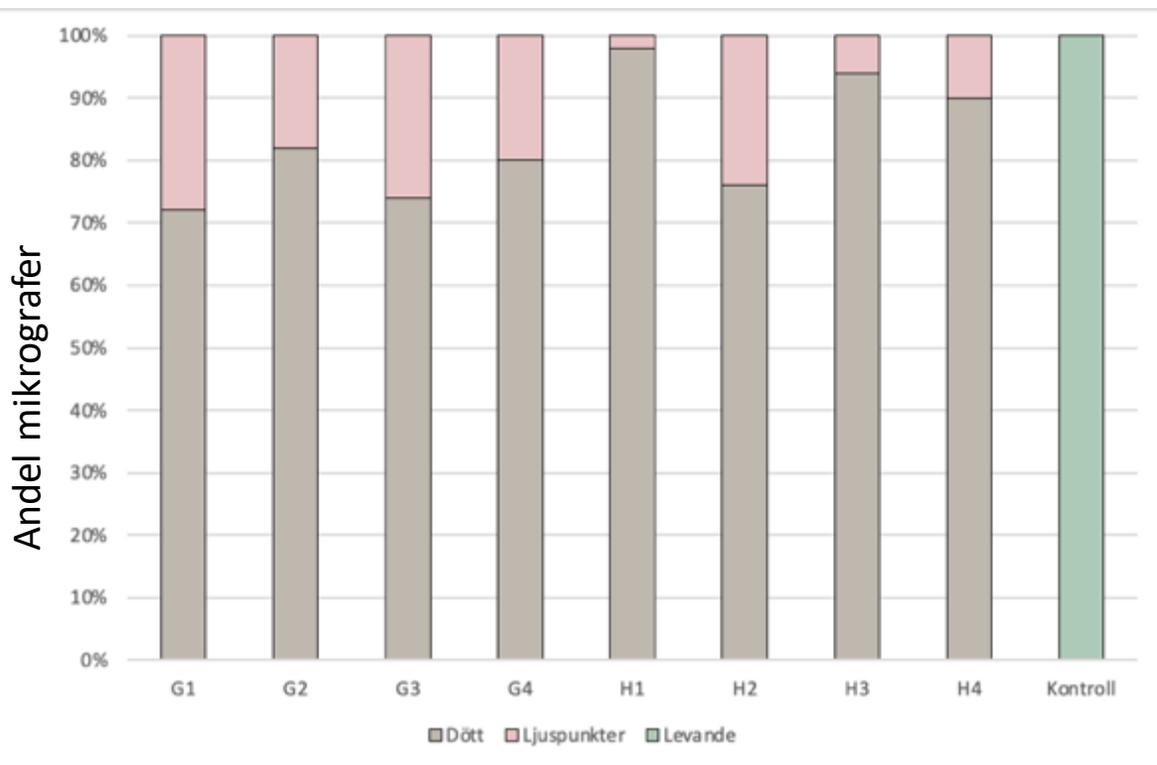


Heat treatment: 4 rhizome samples/site
Control: 5 rhizomes



Control

Microscopy



Gottskär and Härryda: 83% micrographs w/o live cells

Partille: 93% mikrographs w/o live cells

Soilsteam international

Steam treatment of
excavated material

(Bitarafan et al. 2021)



(B)



B) container of prototype device used in the experiments. Photos: Belachew Asalf Tadesse.

Soil steam international

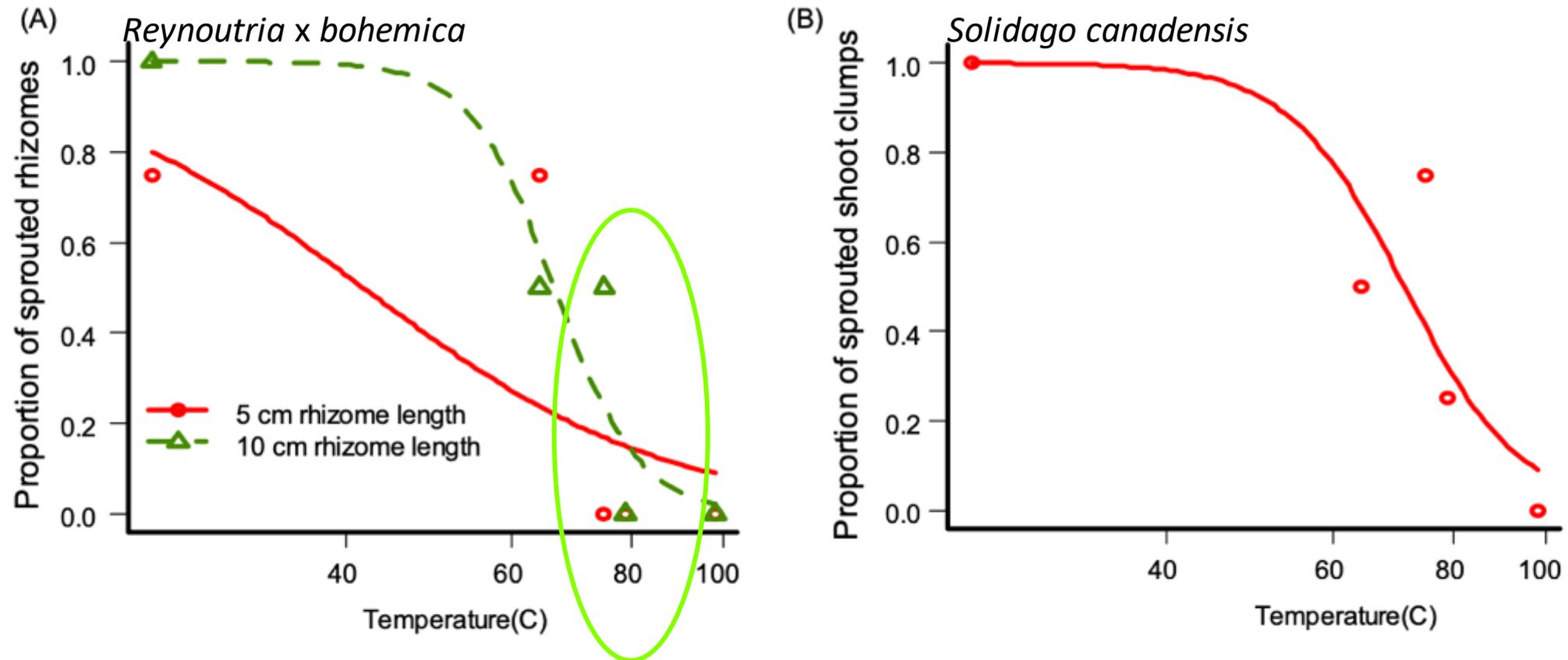


Figure 4. Dose-response curves of the mortality of rhizome fragments of (A) *Reynoutria x bohemica* (solid red and dotted green curves correspond to 5- and 10-cm rhizome lengths, respectively) and (B) *Solidago canadensis* in response to exposure to steaming at soil temperatures of 64, 75, 79, and 98 C applied for 90 s. Points are the means of exact counts, and lines are estimated dose-response curves based on counts (Equation 2).

Krüger

- Thermal conductive heating
- Goal temperature 95°C to 3 m depth
- Japanese knotweed area 150 m²

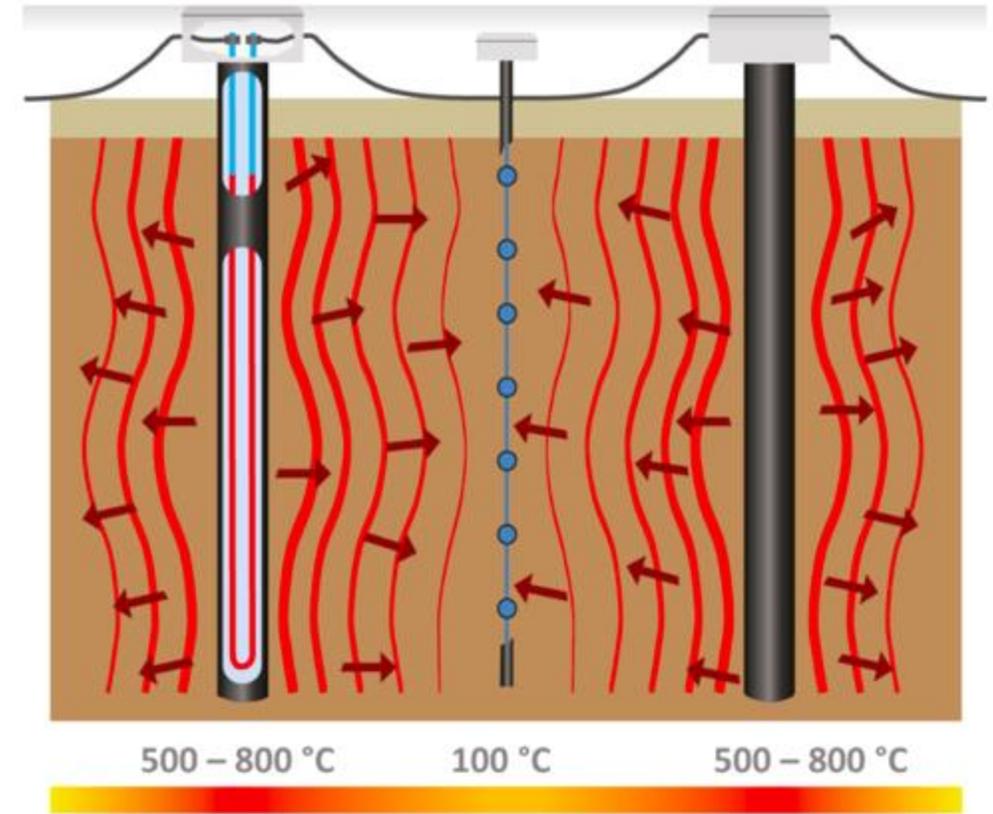
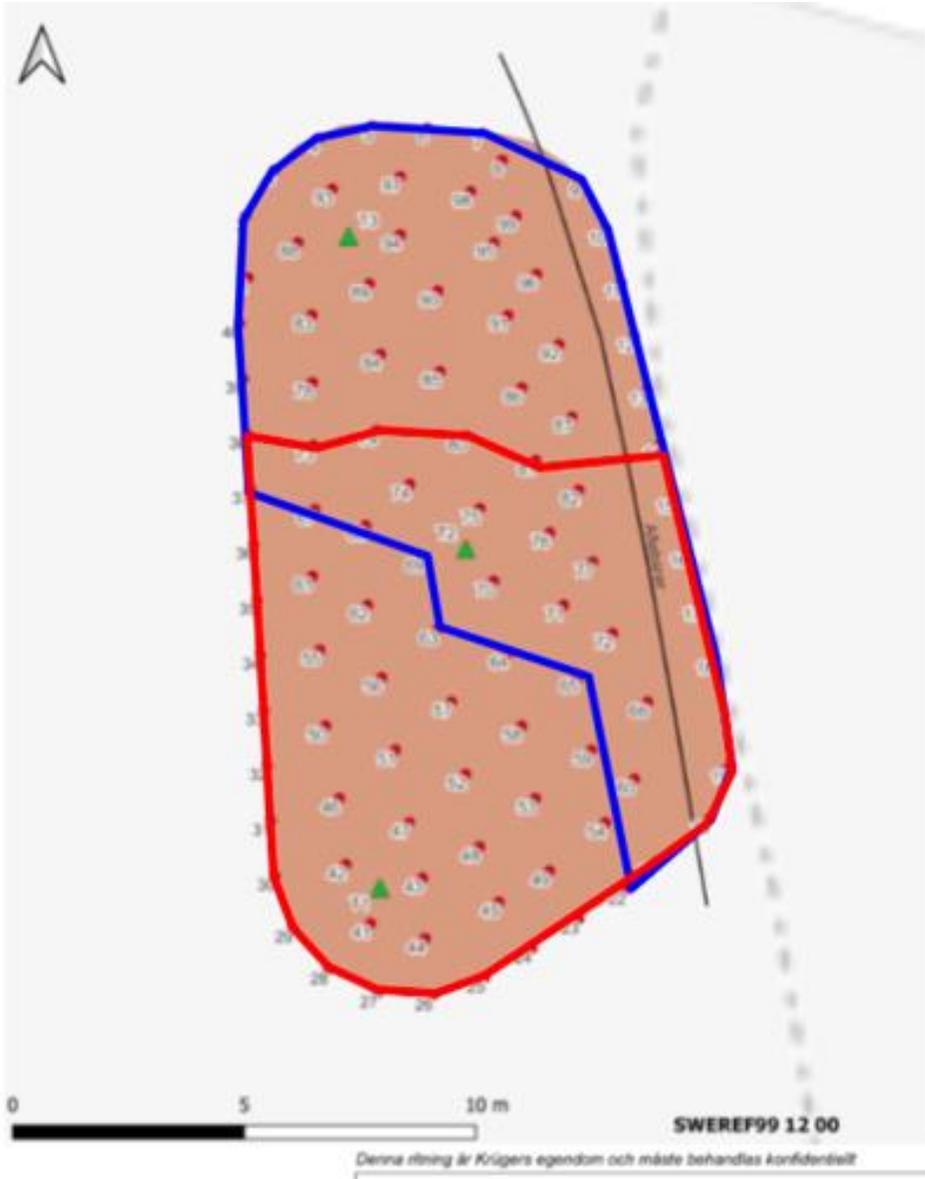


Figure 1. Basic principle of thermal conductive heating



Treated area

Temperature development for part of the treated area

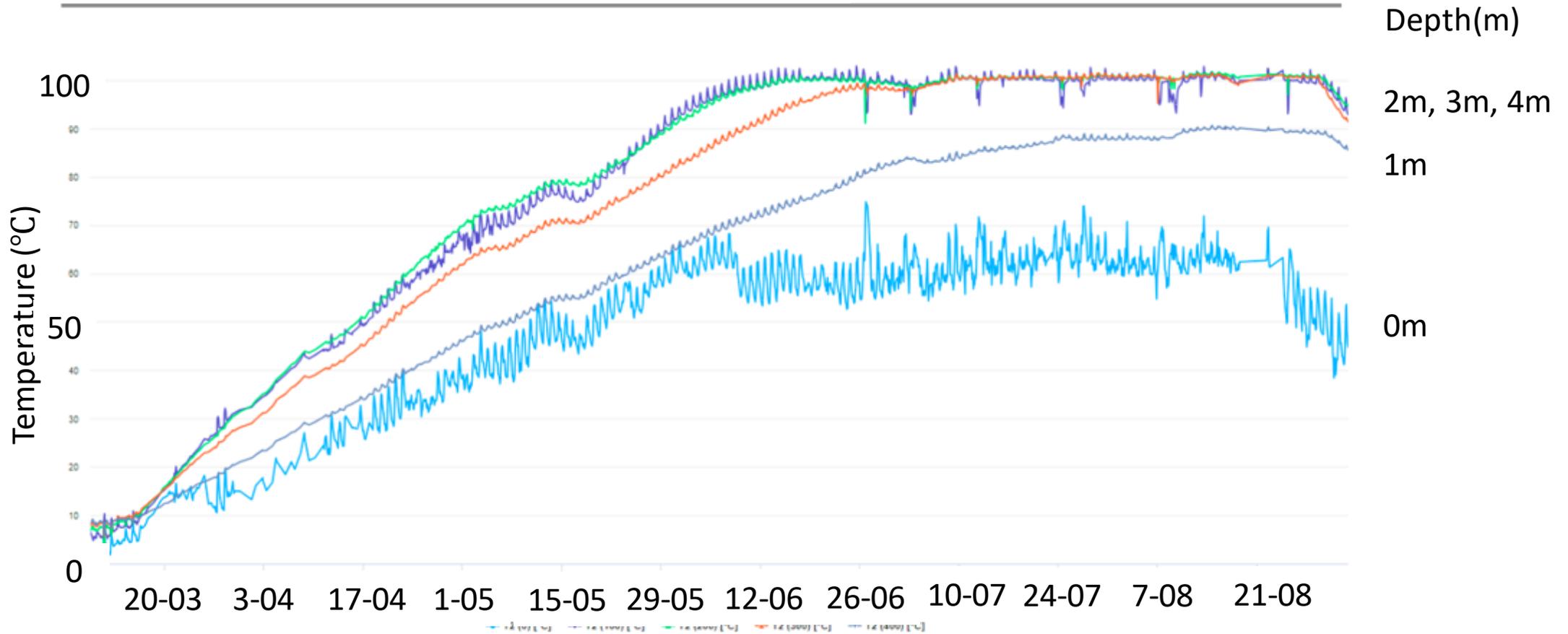


Figure 7. Temperatures measured in the central T2

Temperaturutveckling och fältobservationer

Sampling dates	Temperatures (min-max)
20230126	Before heating
20230426	40-64°C
20230511	45-78°C
20230608	60-85°C
20230828	55-85°C



Important to reach heating throughout the area

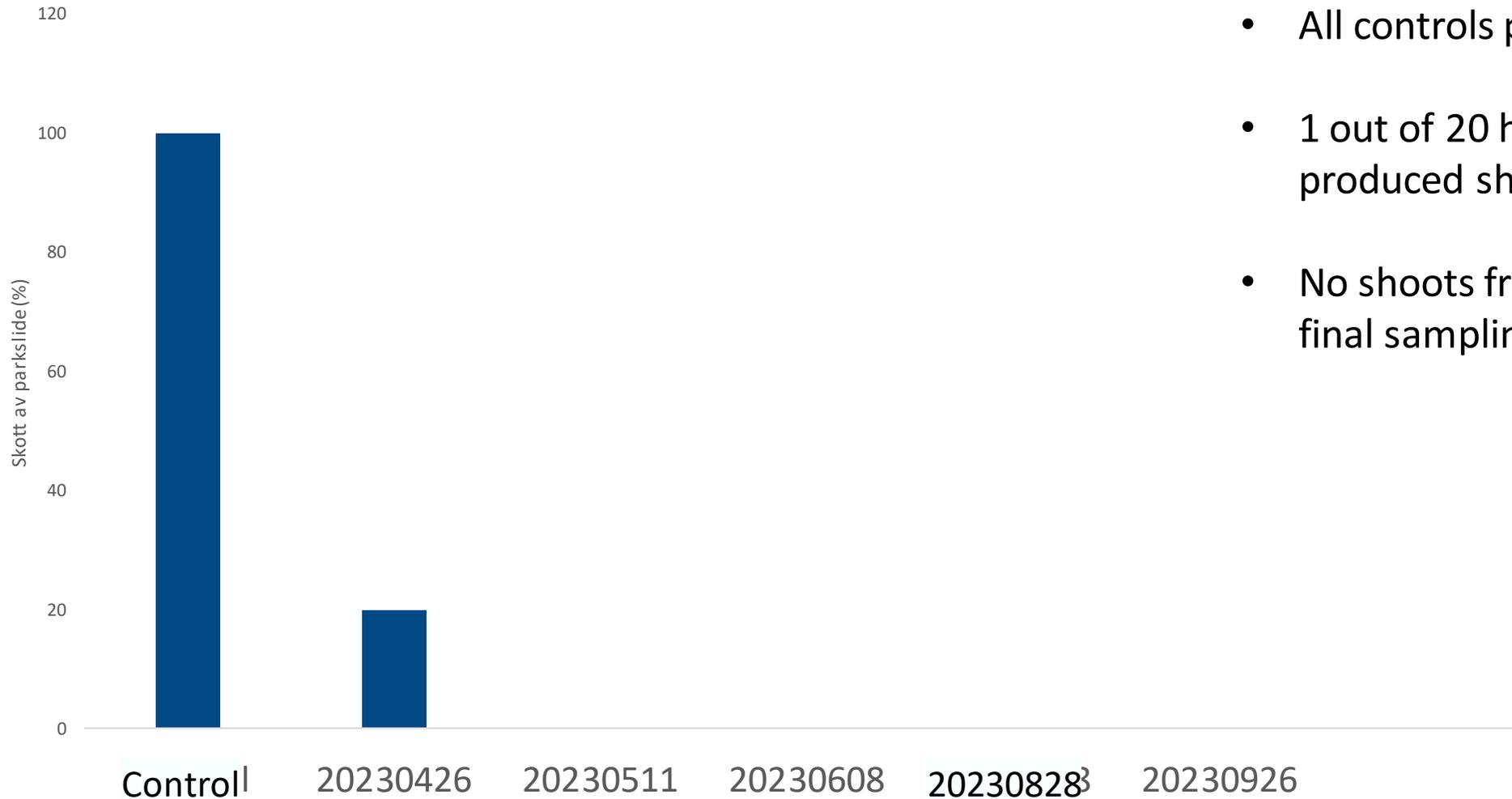
Final sampling conductive heating



Final sampling september



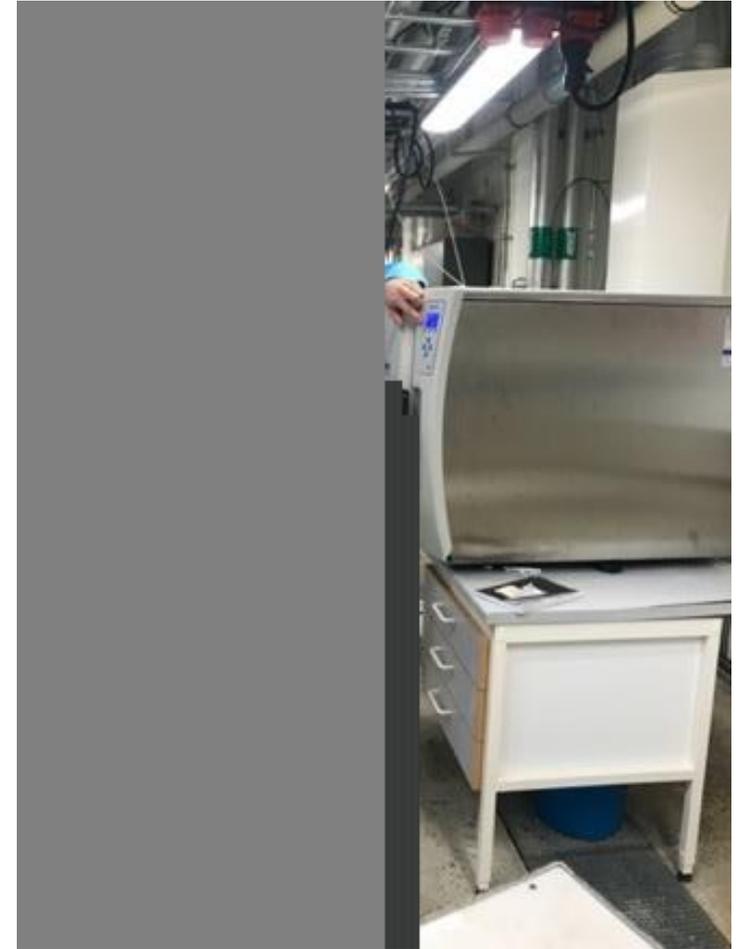
Cultivation of heat treated rhizomes



- All controls produced shoots
- 1 out of 20 heat treated rhizomes produced shoot
- No shoots from rhizomes from final sampling

Conclusion heat treatment

- Temperatures of 80-90 °C seem to be efficient
- In-situ treatment requires long heating period
- Excavated material can be treated with short heating periods



Collaborations



Lunds university and Lund Technical university

Federico Gomez
Grant Thamkaew
Edvin Ruuth

Hushållningssällskapet
Ingela Löfqvist

Lars Brorsson
Magnus Nyman
Erika Frisk

Eila Forsman David Kindgren
Bartholdsson Maria Åkesson Mikael
Ståhlberg
Anna Hedlund Elin Kannerby
Lisa Skoghem Wiman Michelle Karlsson
Susanna Ibjer

Thank you for listening