

With support from



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German Bundestag



Fungal Communities in Sea Buckthorn Plant Material

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Sea Buckthorn in Germany

Economic Relevance: Plantations

Ecological Relevance: Wild plants



- 1980s: Breeding of yield and pollinator varieties

- Cultivation area: 2021: 750 ha
 2022: 595 ha ↓

Statistisches Bundesamt 2021/ 2022

Sea Buckthorn Dieback

Economic Relevance: Plantations



Ecological Relevance: Wild plants



Plantations and wild plants increasingly affected: **Losses up to 100 %**



Sea Buckthorn Dieback

Economic Relevance: Plantations



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Plantations and wild plants increasingly affected: **Losses up to 100 %**

**Cause of
disease**

?



Sea Buckthorn Dieback

Economic Relevance: Plantations

Ecological Relevance: Wild plants



Plantations and wild plants increasingly affected

Effect of Cultivation
Techniques and Site
Conditions on Sea
Buckthorn Disease
Incidence in Northern
Germany

**Cause of
disease**

?



Sea Buckthorn Fungal Pathogens



Complex of fungi

Dieback in Northern Germany:

- *Hymenopleella hippophaeicola*
- *Diaporthe* spp. (syn.: Phomopsis)

SEA BUCKTHORN DISEASES CAUSED BY PATHOGENIC FUNGI

Kristine Drevinska and Inga Moročko-Bičevska

Institute of Horticulture, Latvia University of Life Sciences and Technologies, 1 Grau

Drevinska & Moročko-Bičevska 2022

Wilt: *Verticillium* spp., *Fusarium* spp.

Dried-shrink disease: *Fusarium* spp., *Diaporthe* spp.

Canker: *Stigmina* sp., *Cytospora hippophaes*, *Eutypa* sp.

Bracket fungus: *Fomitiporia hippophaeicola* (syn.: *Phellinus hippophaeicola*)

Further: *Alternaria*, *Botrytis*, *Fomes*, *Rhizoctonia*, *Pythium*, *Phytophthora*



Prokkola 2003, Ruan et al. 2010, Xia et al. 2021, Zalewska et al. 2023

Age and Tissue



Ruan et al. 2010 DSD:

Age:

- Plants are ≥ 3 years
- no disease in 1-2 year old plants observable

Tissue:

- infected parts often occur at the base of the plant
- Ramets can develop if infected parts are removed

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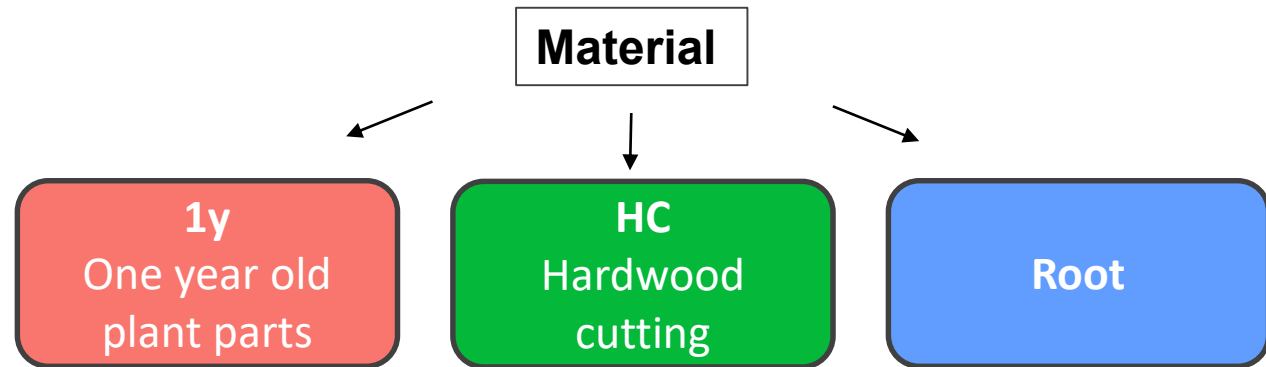
Questions:

1. Are there differences in the fungal community in regard to Material (1 year old vs. hardwood cutting vs. root)?
2. Do cultivars differ in the fungal community?
3. Can potentially dieback/ DSD associated fungi already be found in nursery plants?

Method

Cultivars:

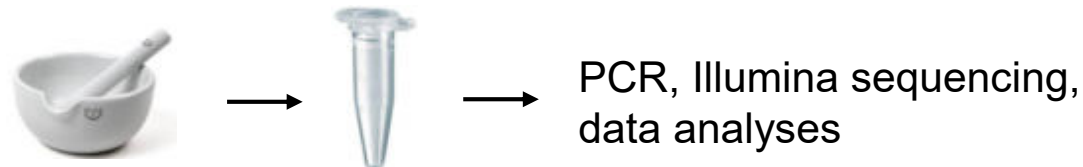
Leikora, Habego, Hergo, Pollmix 3+4
3 plants each, 1-2 years old from 3 nurseries



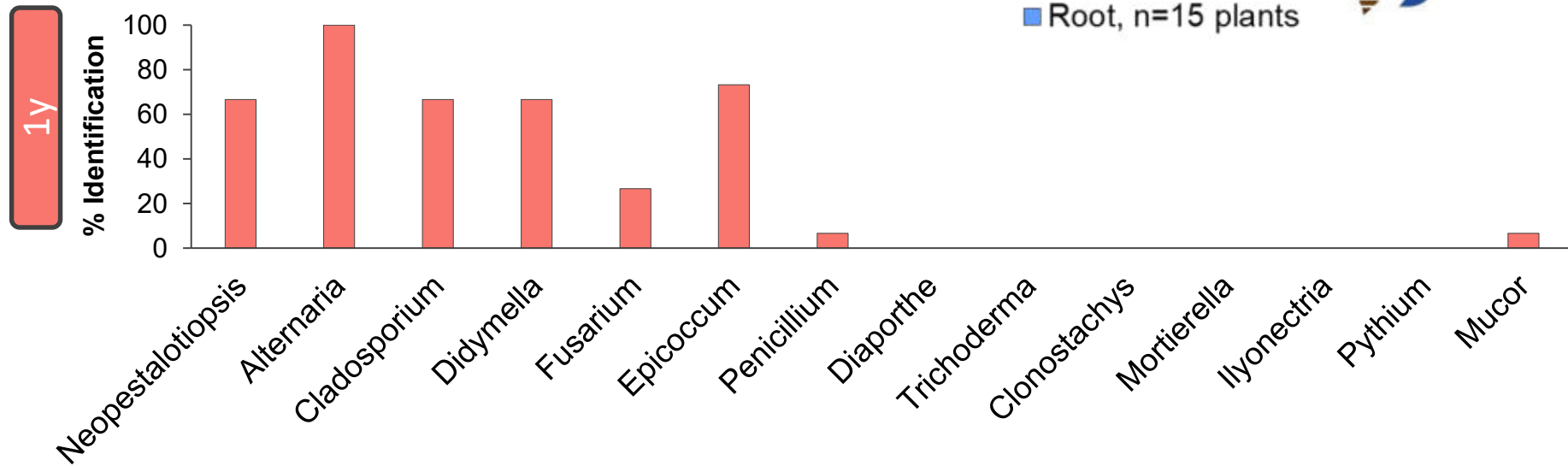
Isolation (only Leikora):



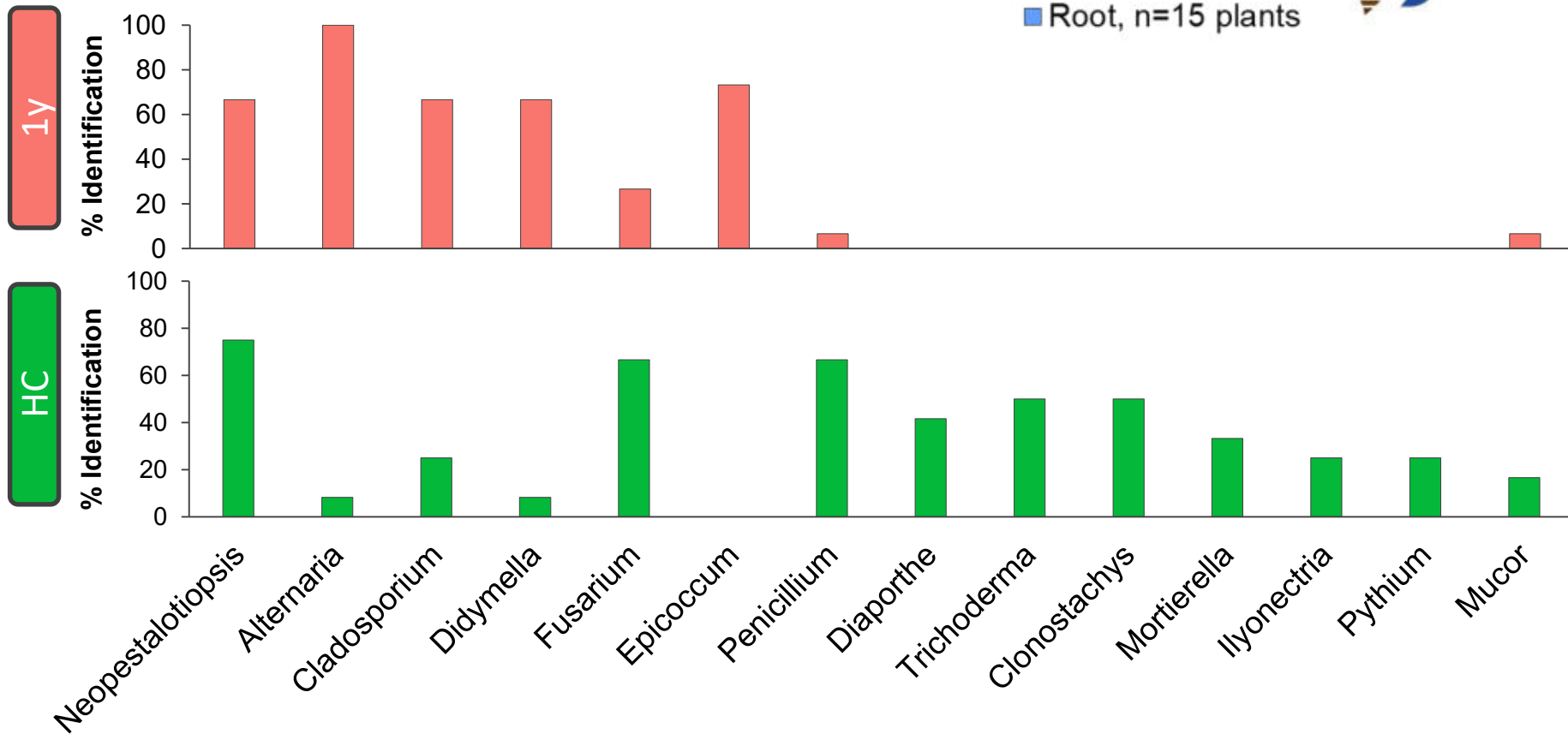
Amplicon sequencing ITS1



Isolation Leikora



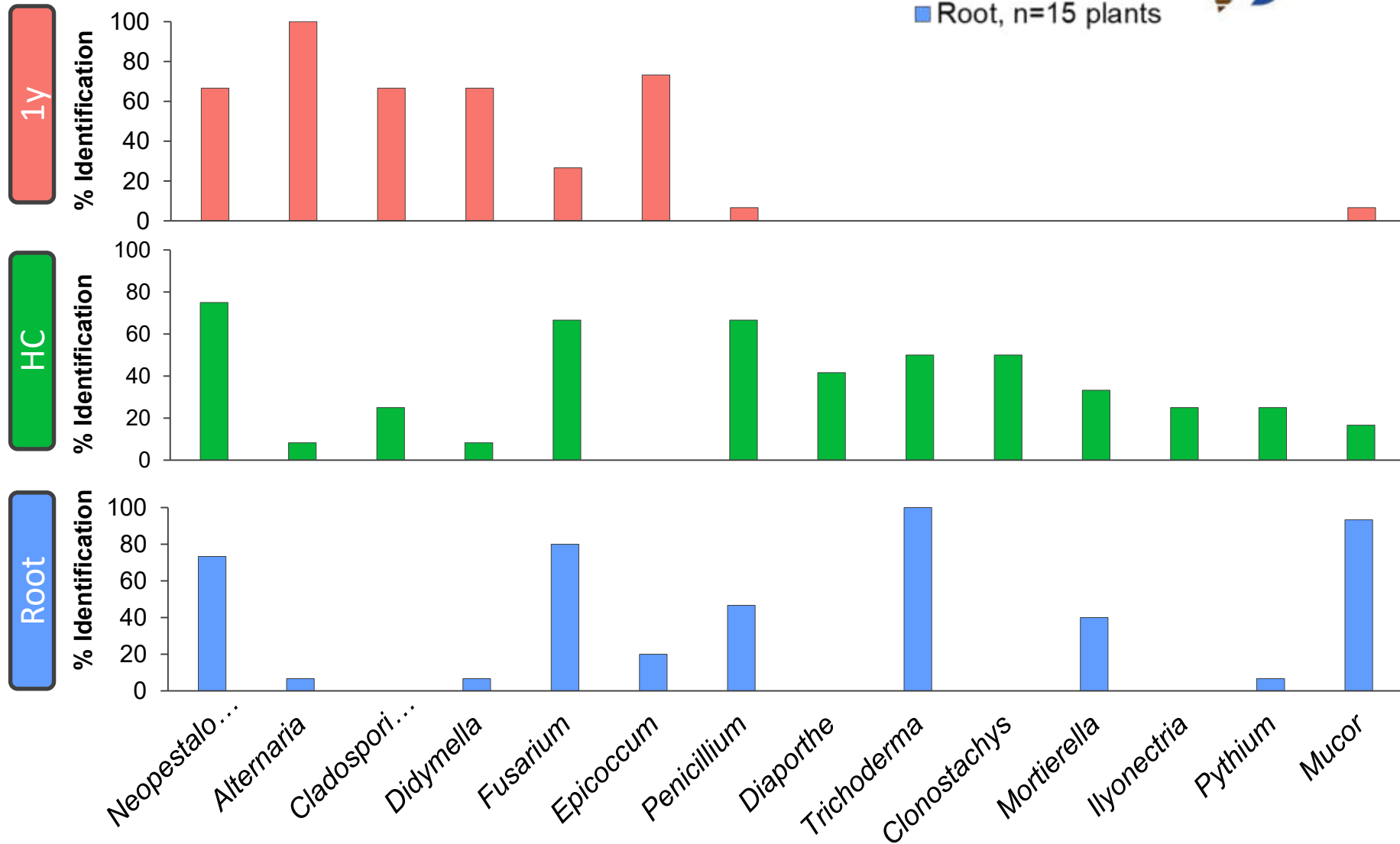
Isolation Leikora



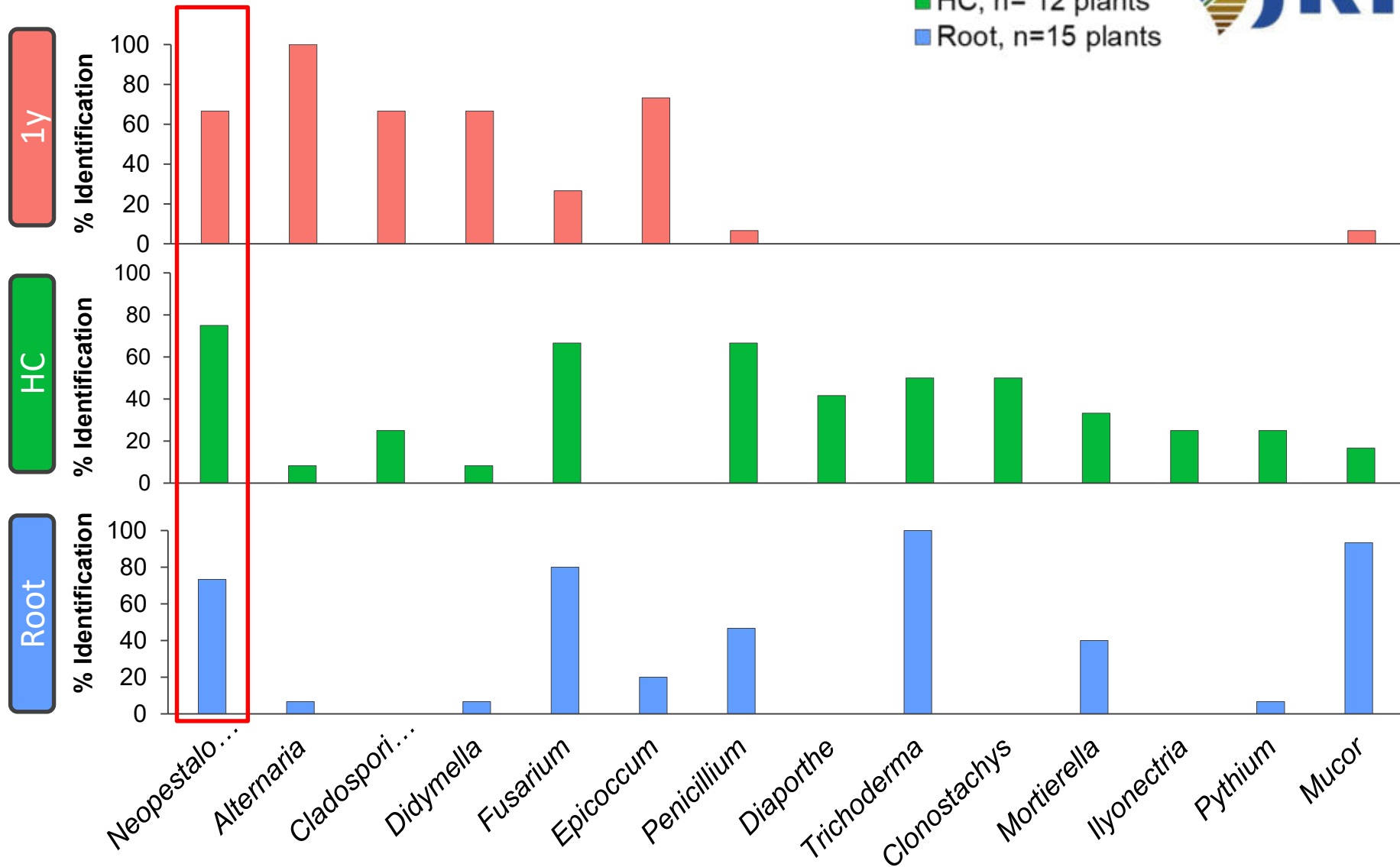
Isolation Leikora



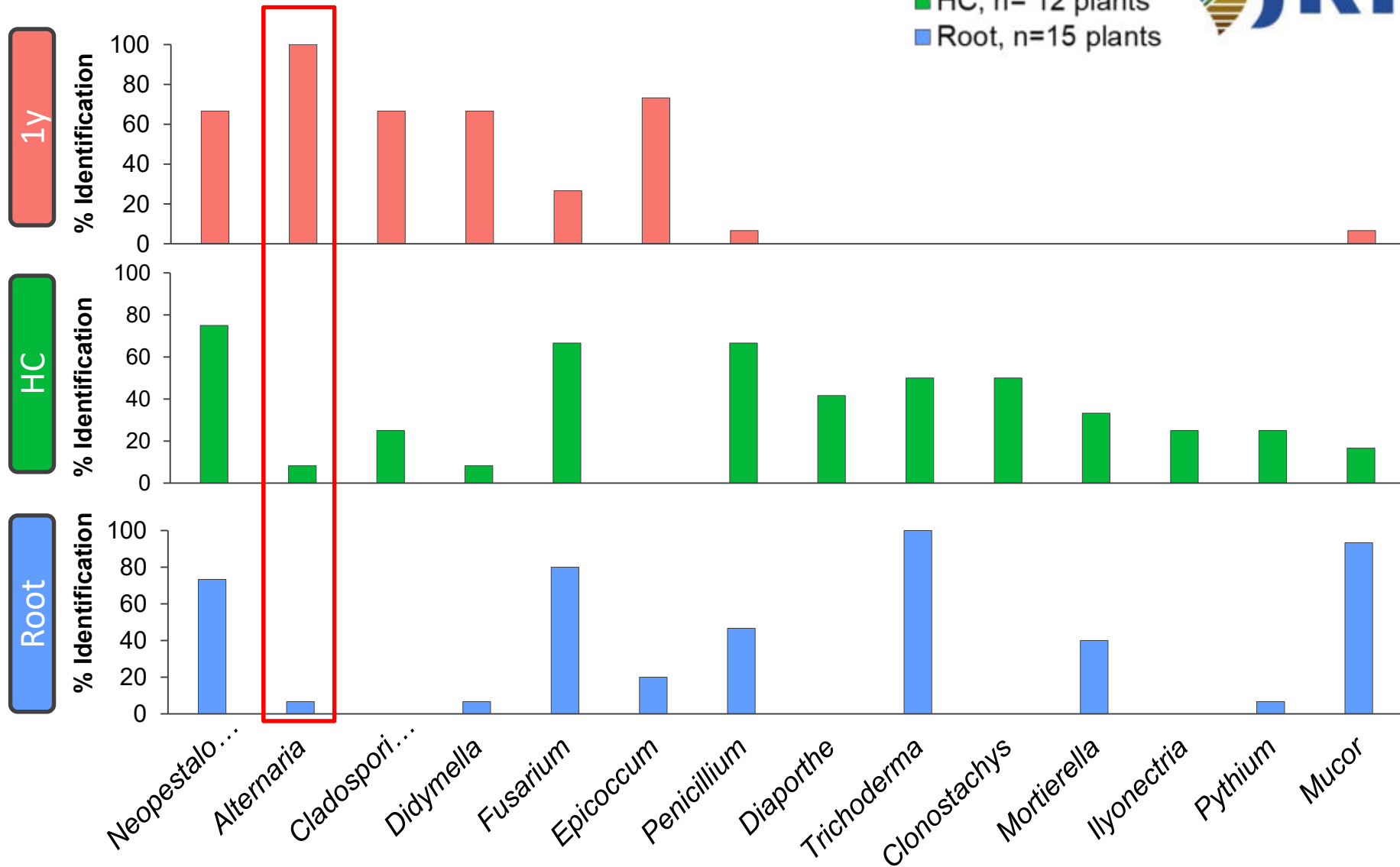
■ 1y, n=15 plants
■ HC, n= 12 plants
■ Root, n=15 plants



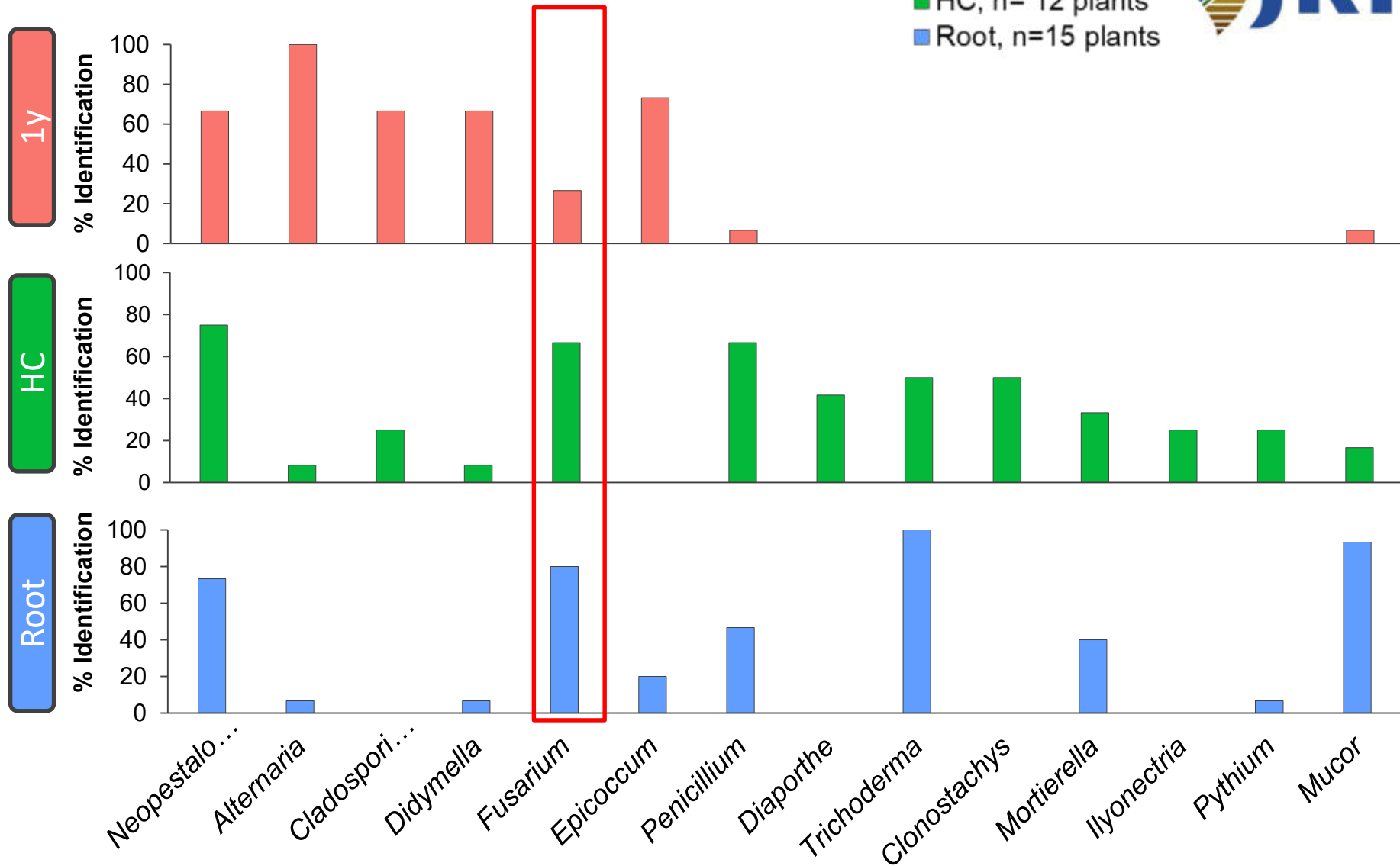
Isolation Leikora



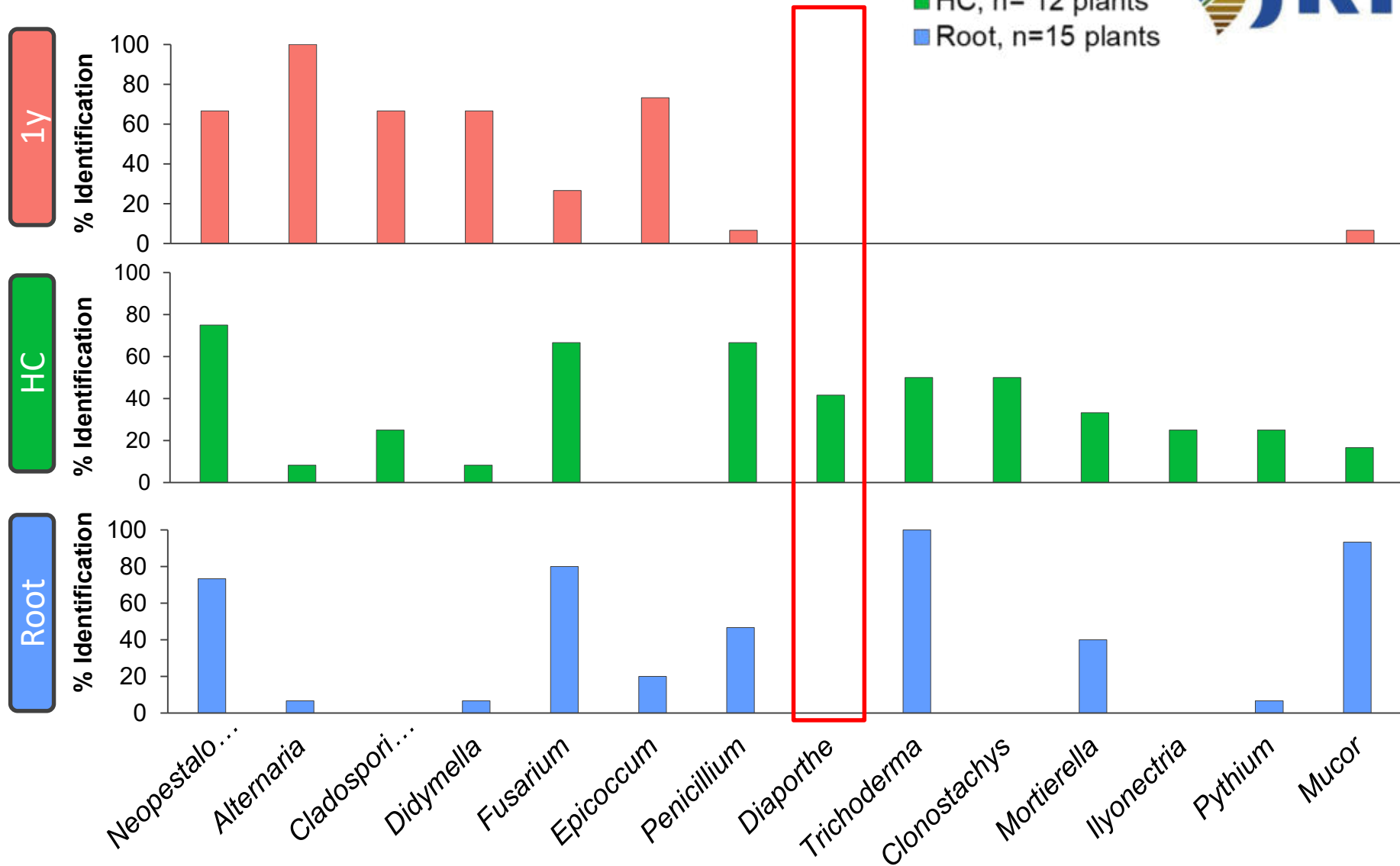
Isolation Leikora



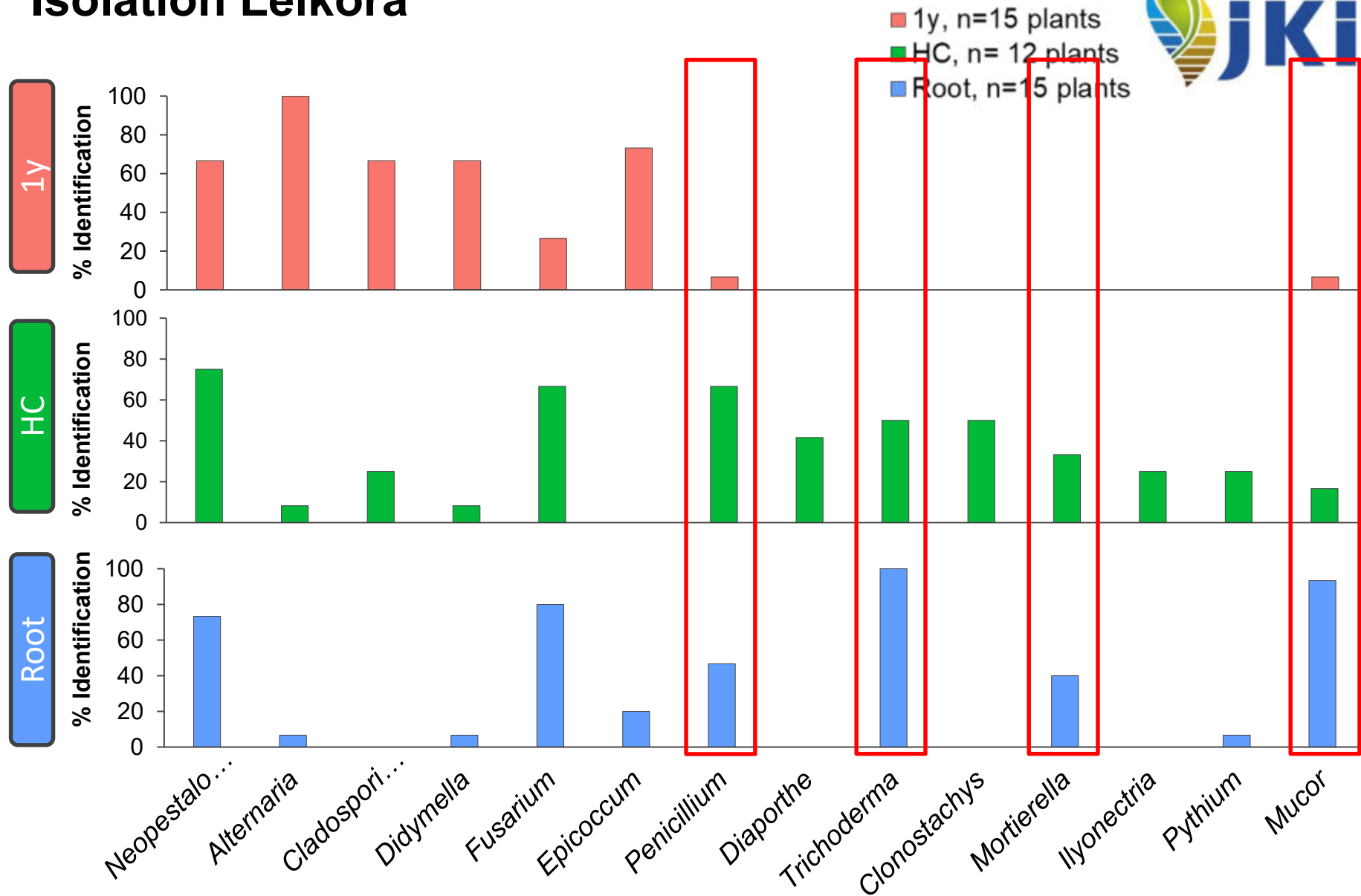
Isolation Leikora



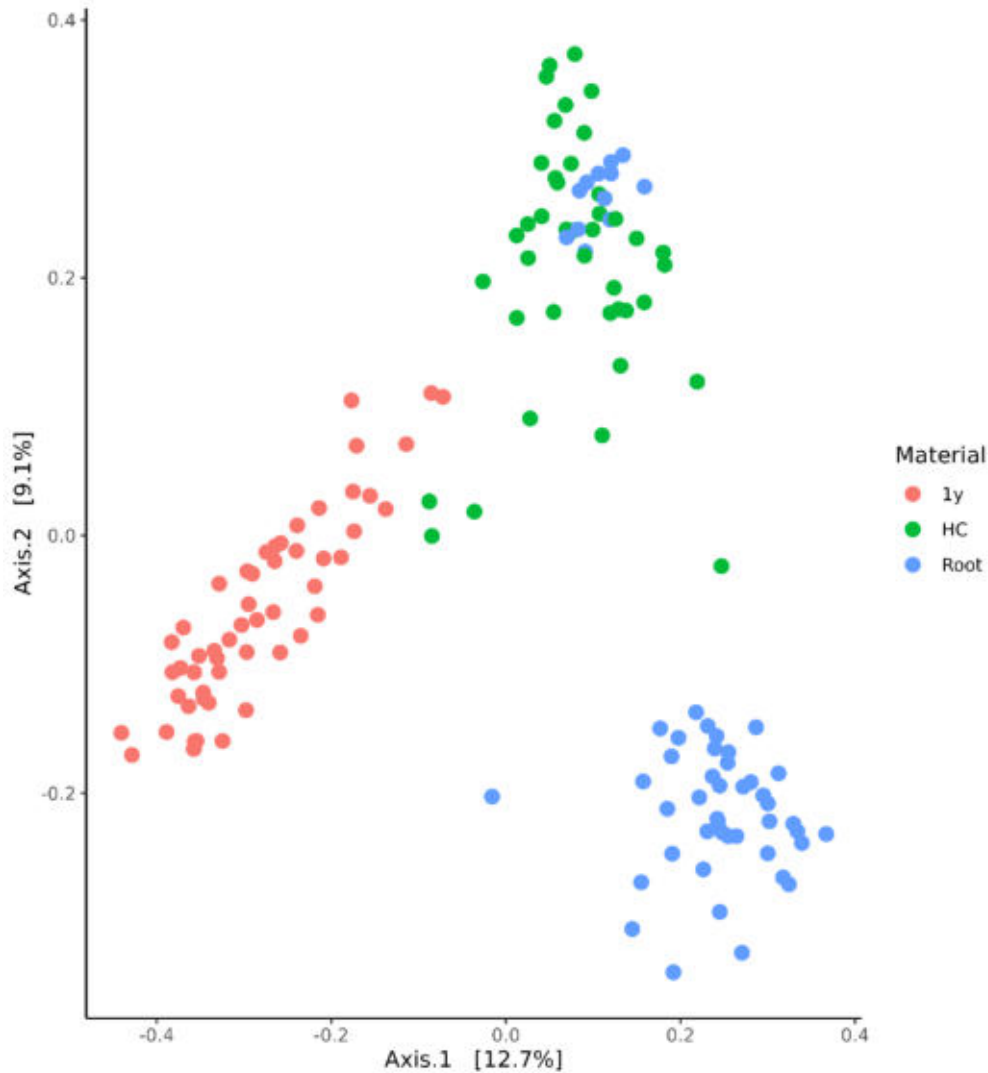
Isolation Leikora



Isolation Leikora

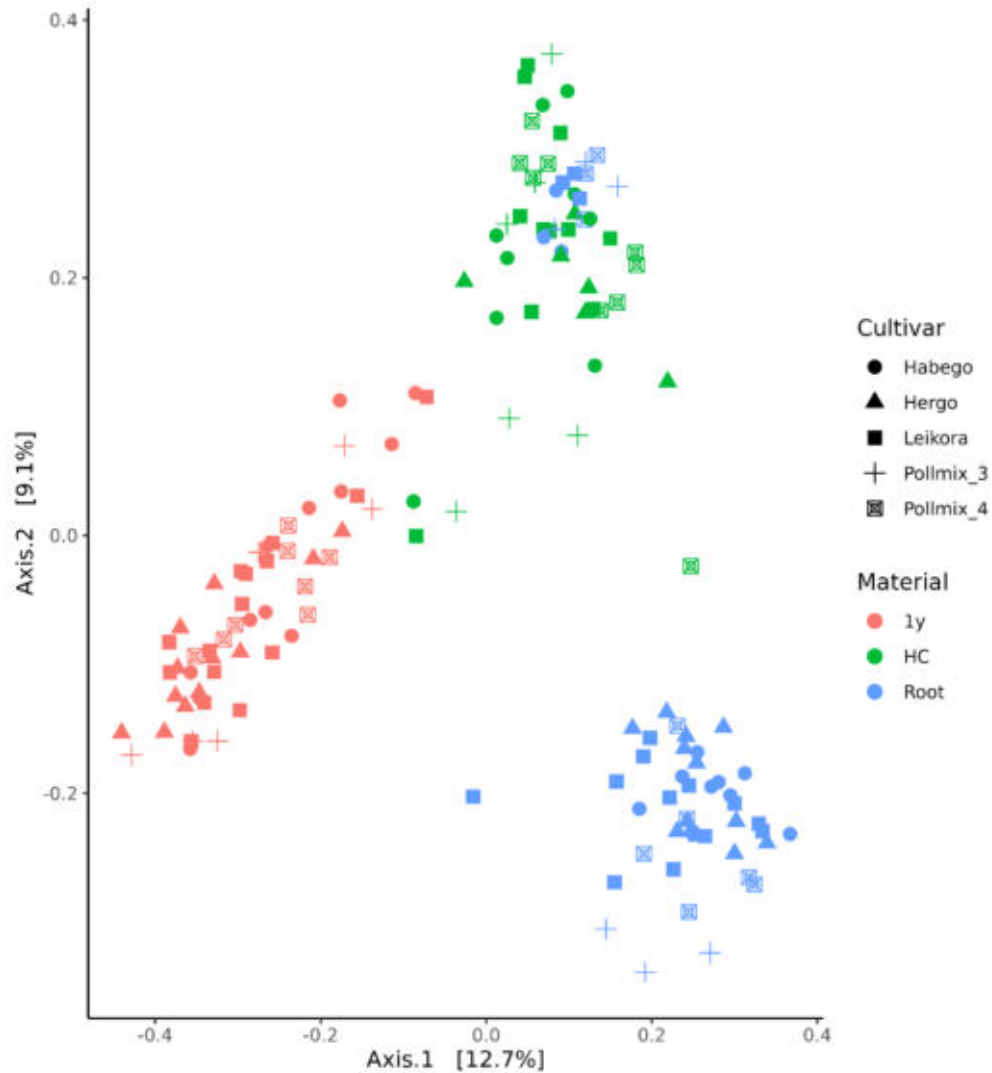


PCoA Material



$p \leq 0.001$ ***
 $p \leq 0.01$ **
 $p \leq 0.05$ *

PCoA Material + Cultivar



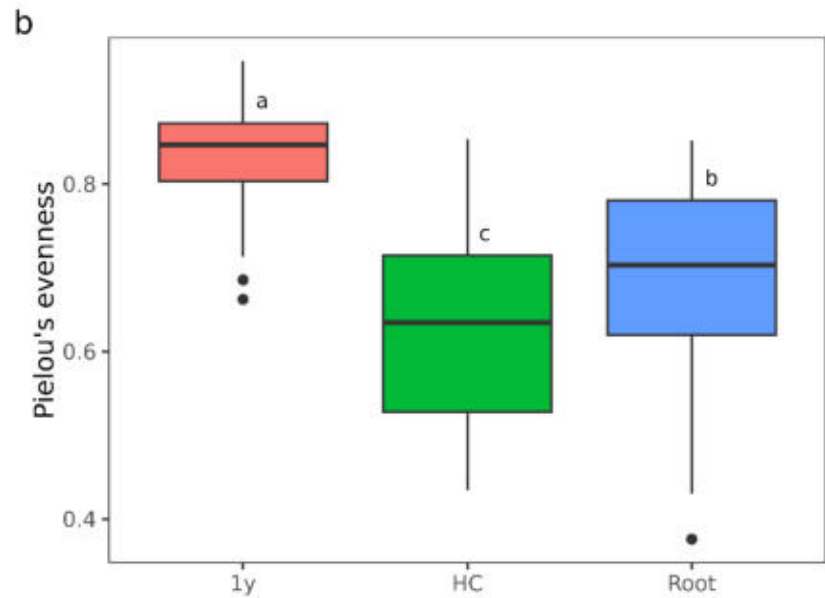
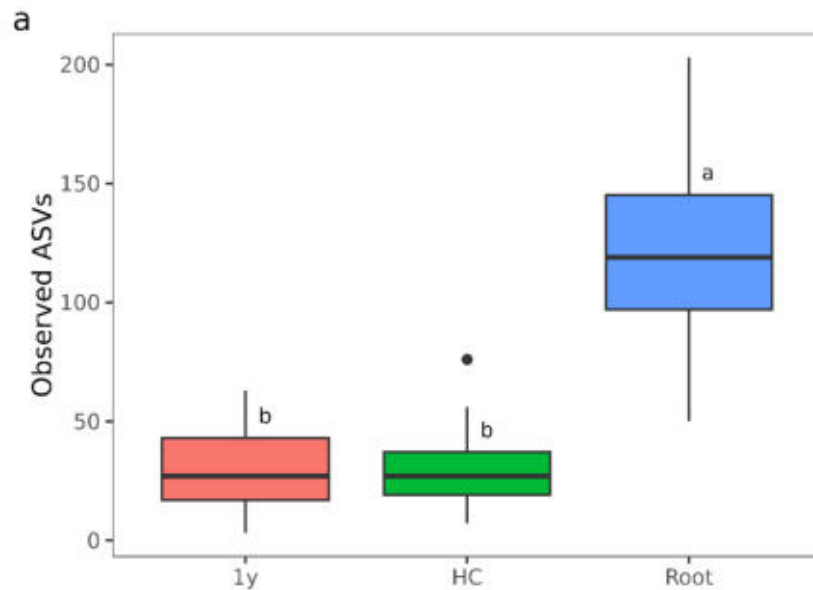
PERMANOVA

R² Material: 0.17 ***

R² Cultivar: 0.03 ***

$p \leq 0.001$ ***
 $p \leq 0.01$ **
 $p \leq 0.05$ *

Alpha diversity Material



Age and Tissue



Ruan et al. 2010 DSD:

Age:

- Plants are ≥ 3 years
- no disease in 1-2 year old plants observable

Tissue:

- **infected parts often occur at the base of the plant**
- Ramets can develop if infected parts are removed

Questions:

1. Are there differences in the fungal community in regard to Material (1 year old vs. Hardwood cutting vs. root)
2. Do cultivars differ in the fungal community?
3. Can potentially dieback/ DSD associated fungi already be found in Nursery plants?

4 years old plants 'Leikora' JKI

n= 4 plants



Ruan et al. 2010 DSD:

Age:

- Plants are ≥ 3 years
- no disease in 1-2 year old plants observable

Tissue:

- **infected parts often occur at the base of the plant**
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4 years old plants 'Leikora' JKI

n= 4 plants



Tip

Phloem



Wood



Bottom

Phloem



Wood



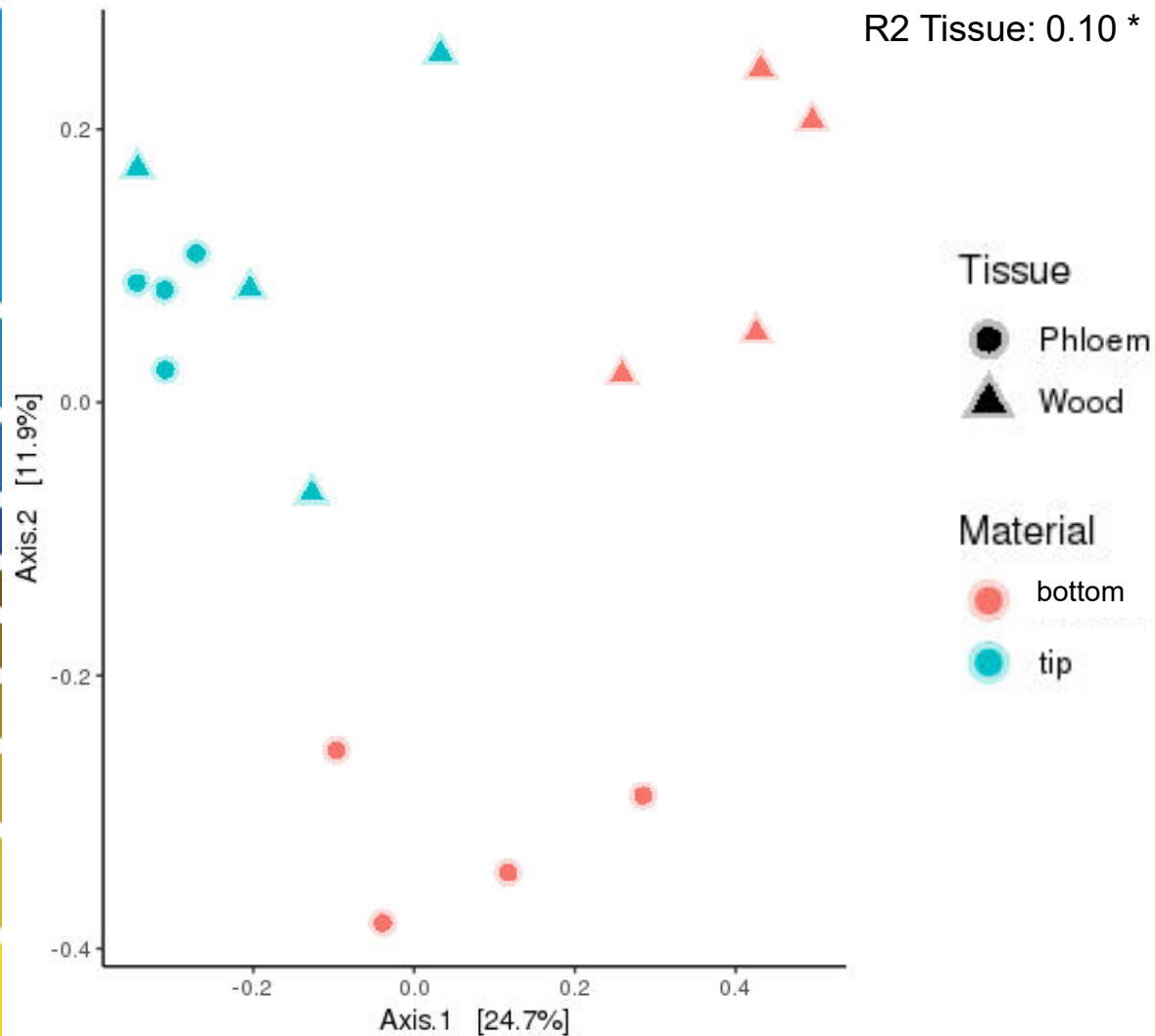
PCoA 'Leikora' 4 years old plants



PERMANOVA

R² Material: 0.19 ***

R² Tissue: 0.10 *



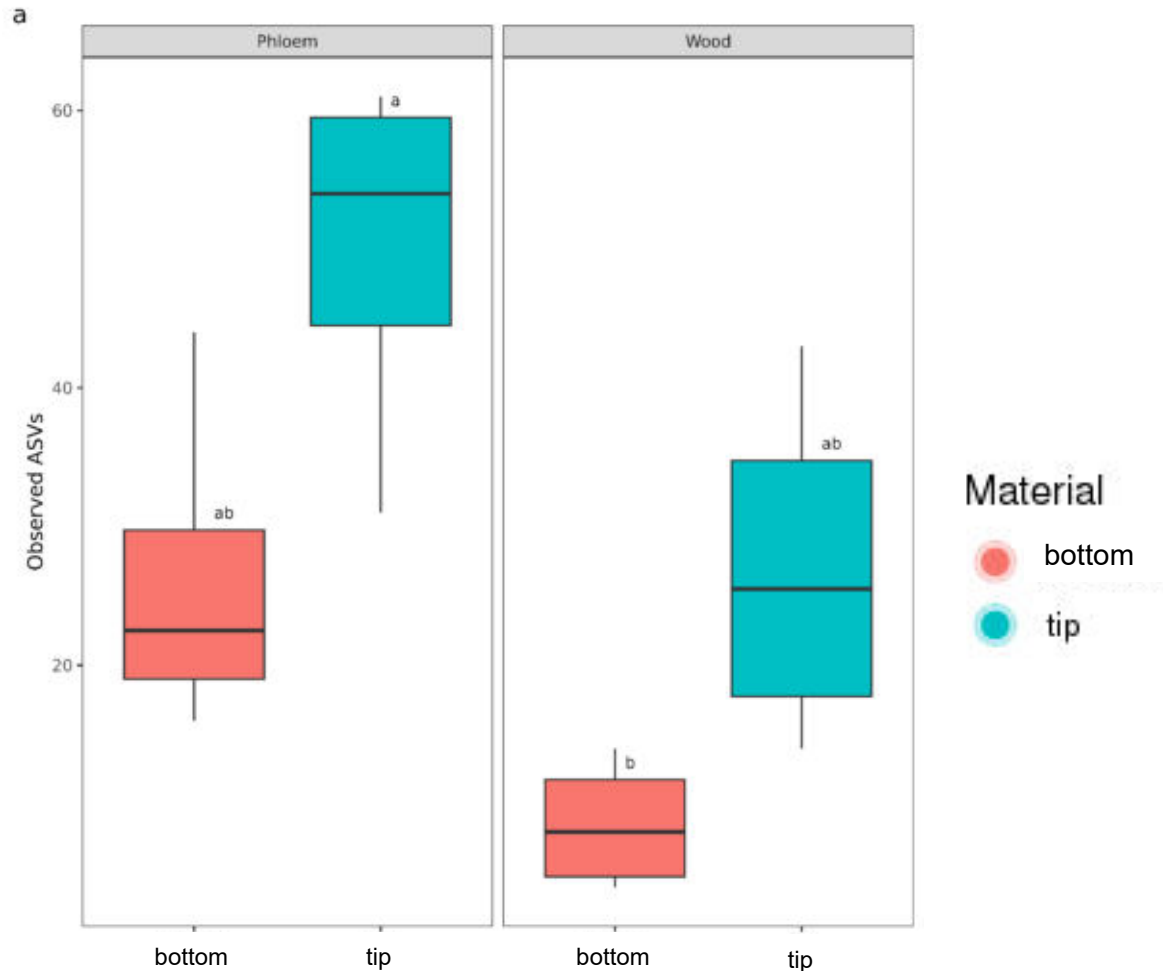
$p \leq 0.001$ ***

$p \leq 0.01$ **

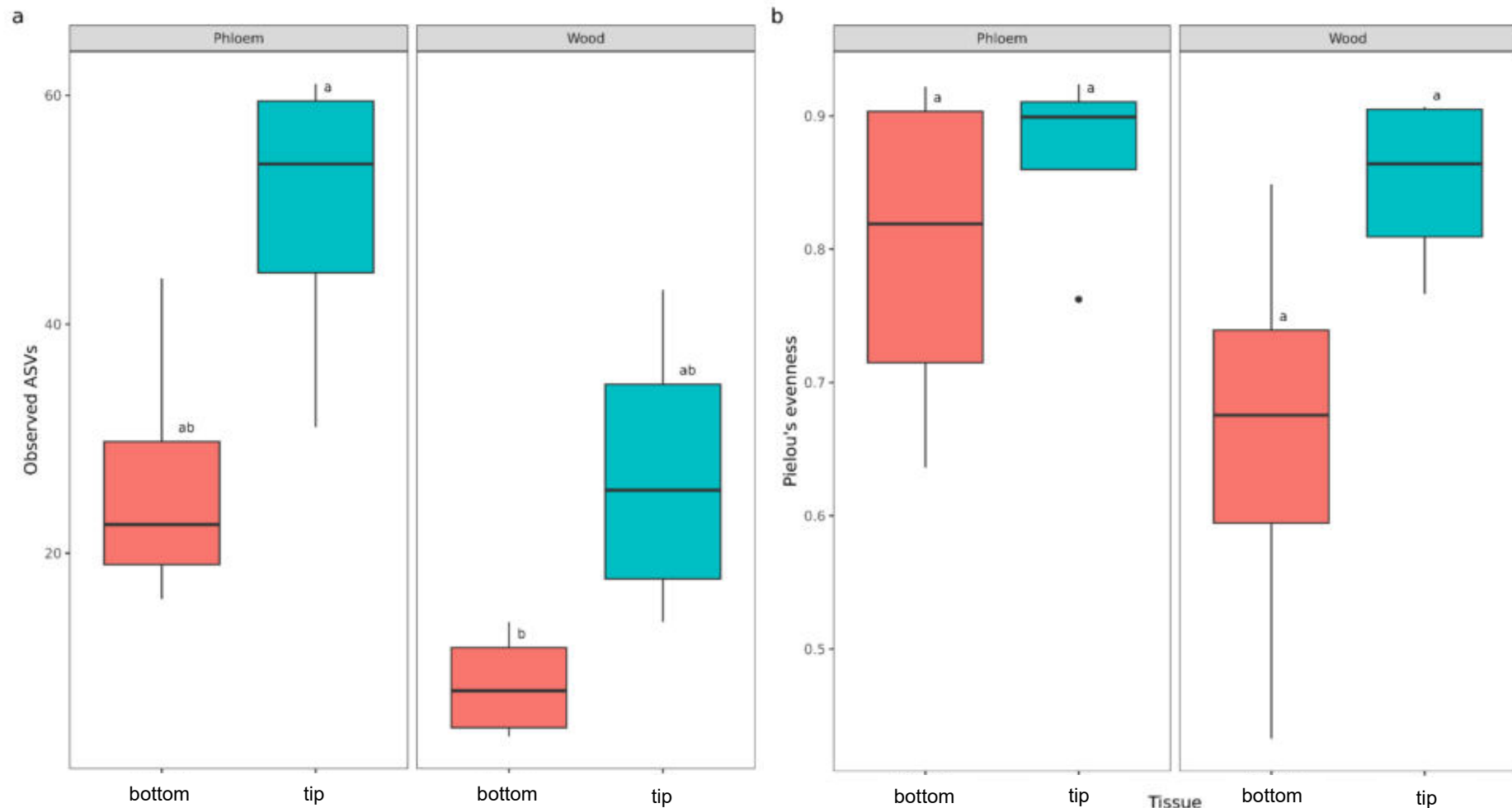
$p \leq 0.05$ *

'Leikora' 4 years old plants

Alpha diversity



'Leikora' 4 years old plants



Age and Tissue



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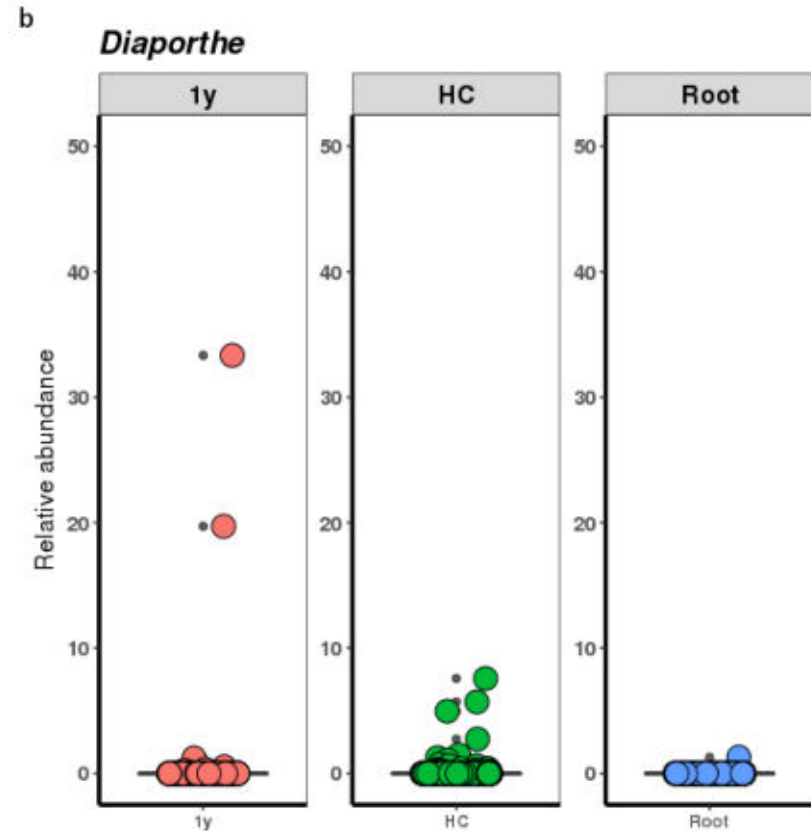
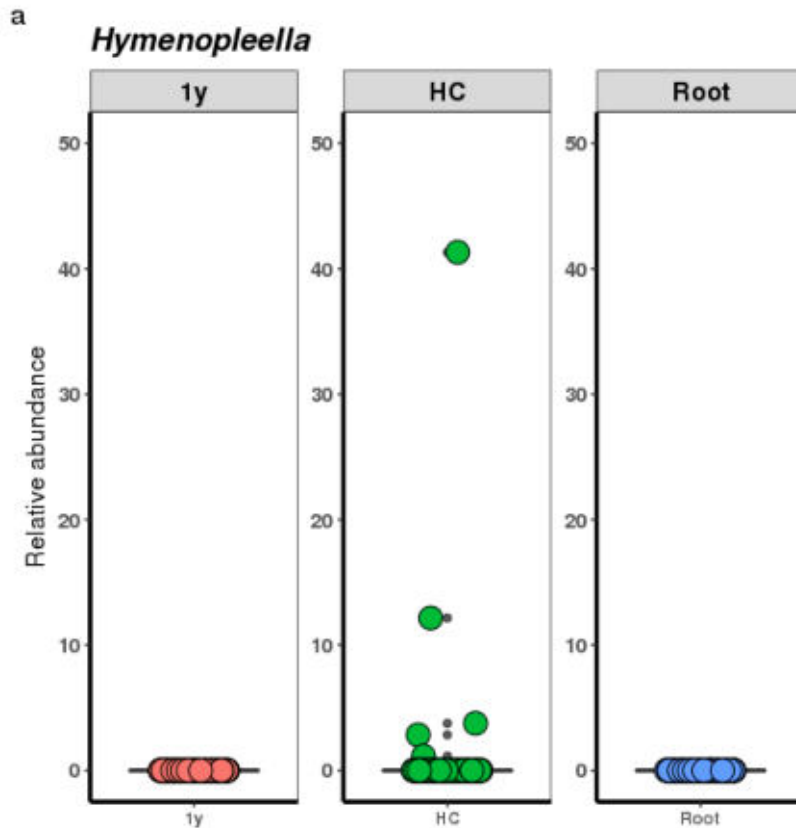
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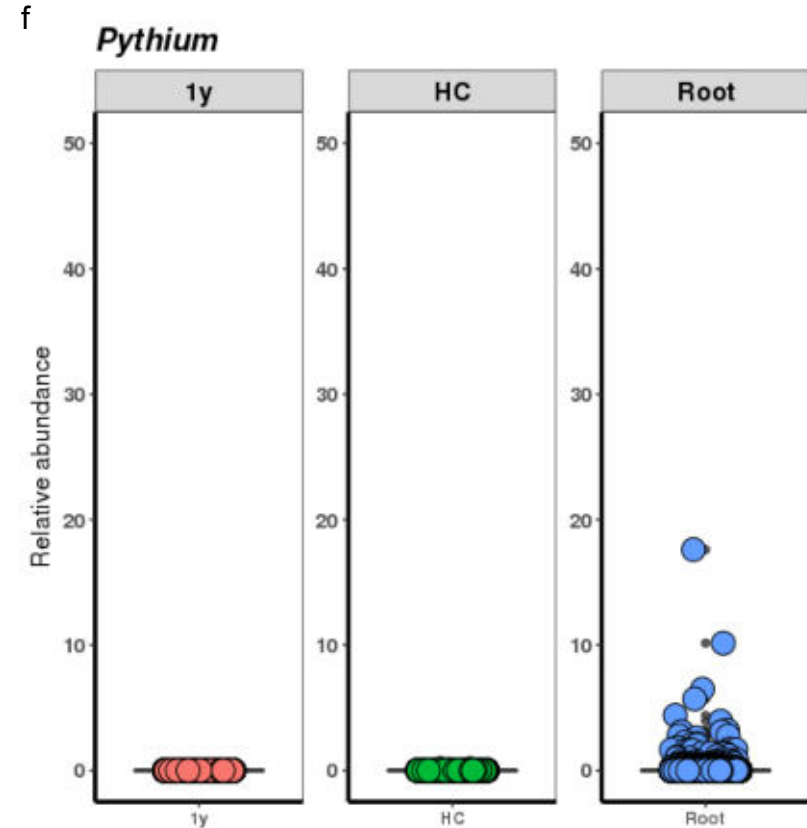
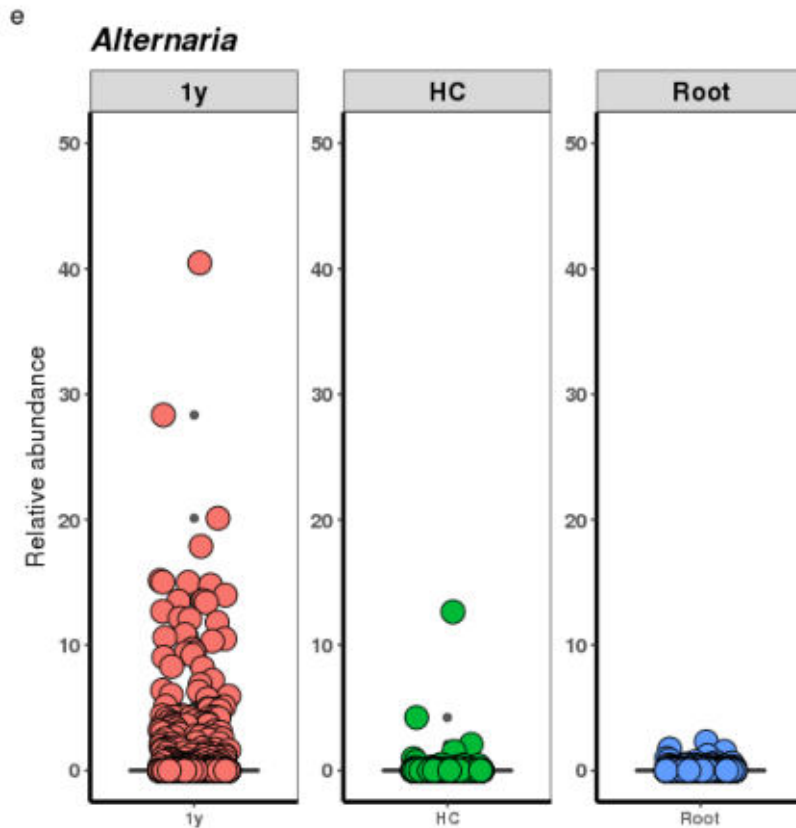
Questions:

1. Are there differences in the fungal community in regard to Material (1 year old vs. Hardwood cutting vs. root) **YES!**
2. Do cultivars differ in the fungal community? **Only small difference, effect of Material is more pronounced.**
3. Can potentially dieback/ DSD associated fungi already be found in Nursery plants?

Potential Pathogens



Relative abundance fungal taxa



Sea Buckthorn Fungal Pathogens



Complex of fungi

Dieback in Northern Germany:

- *Hymenopleella hippophaeicola*
- *Diaporthe* spp. (syn.: Phomopsis)

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Prokkola 2003, Ruan et al. 2010,
Zalewska et al. 2023

Sea Buckthorn Fungal Pathogens



Complex of fungi

Dieback in Northern Germany:

- *Hymenopleella hippophaeicola* → few HC
- *Diaporthe* spp. (syn.: Phomopsis) → few HC

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Wilt: *Verticillium* spp. (2), *Fusarium* spp. → some, all tissues

Dried-shrink disease: *Fusarium* spp., *Diaporthe* spp.

Canker: *Stigmina* sp. (3), *Gytospora hippophaes*, *Eutypa* sp. (1)



Bracket fungus: *Fomitiporia hippophaeicola* (syn.: *Phellinus hippophaeicola*)

Further: *Alternaria* → plenty 1y, *Botrytis* sporadic, *Fomes* (1),
Rhizoctonia sporadic, *Pythium* some, root, *Phytophthora*

Prokkola 2003, Ruan et al. 2010,
Zalewska et al. 2023

Summary



- Fungal community in SBT plants differs in regard to material
- Community in 4 year old plants differs between tip and bottom → Sampling!
- Communities comparing German cultivars quiet similar
- Dieback associated and other pathogens were rarely detected in this trial SBT plant material 😊

Acknowledgement

Prof. Wilhelm Jelkmann
Prof. Michael Fischer
Dr. Sabine Kind
Dr. Falk Behrens



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by decision of the
German Bundestag

Mykologie Labor:

Alicia Balbín-Suárez
Jona Höfflin
Andreas Engelhardt
Sebastian Faus
Letizia Sauer



Viren & Phytoplasmen:

Kerstin Zikeli
Constanze Berwarth
AG Virology

Gardener Team JKI Dossenheim

LALLF:

Jenny Scheel
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LFA:

Dr. Frank Hippauf
Daniela Kuptz
Gunnar Kaßburg



