

From seed to storage: disease management in organic beetroot production to reduce food waste

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High incidence of rot after prolonged storage

- Pathogens are usually not known
- Transmission:
 - By seed, soil or wind?
- Or are the tubers only infected after harvesting?



Overview of the project - Integrated strategy

Seeds



Investigation

- Germination rate
- Isolation
- Identification

Treatments

- Seed treatments

Field



Investigation

- Seedling emergence
- Leaf health

Treatments

- Watering freshly planted plants with organic control products (FZB24*)

Storage



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- Isolation
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- Physical measures
- Organic control products

*Is not approved for beetroot yet

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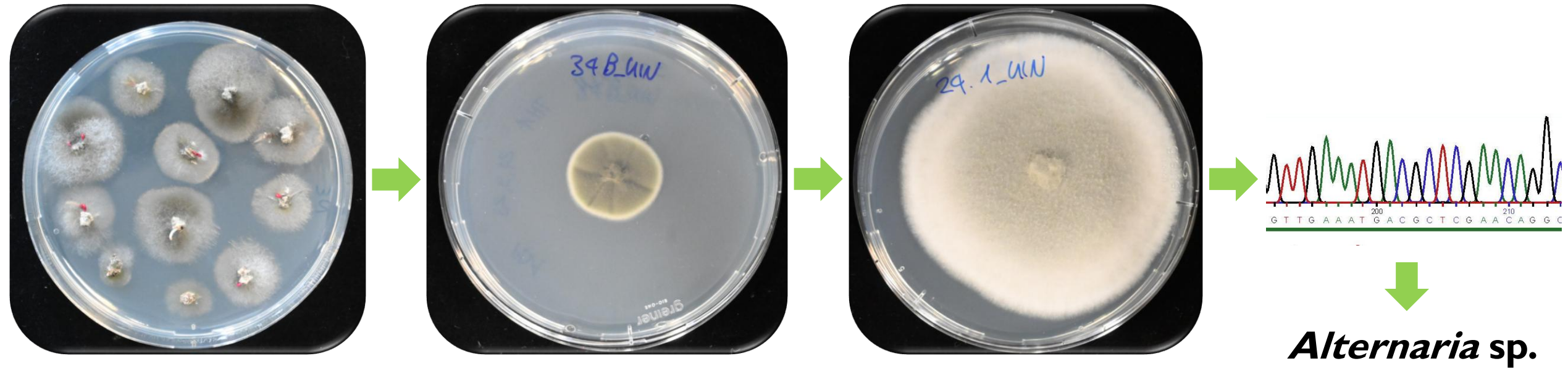
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Pathogens isolation and identification

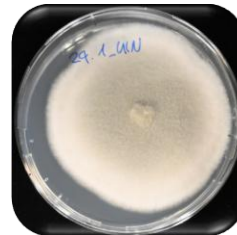


Sometimes seeds are as expected

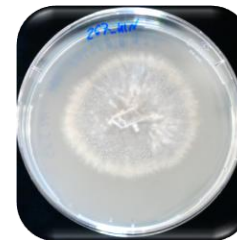
- Low availability of organic seed
 - As a rule, conventional, untreated (chemical) seed is used
 - Seed batches are treated industrially with steam

- Identified pathogens:

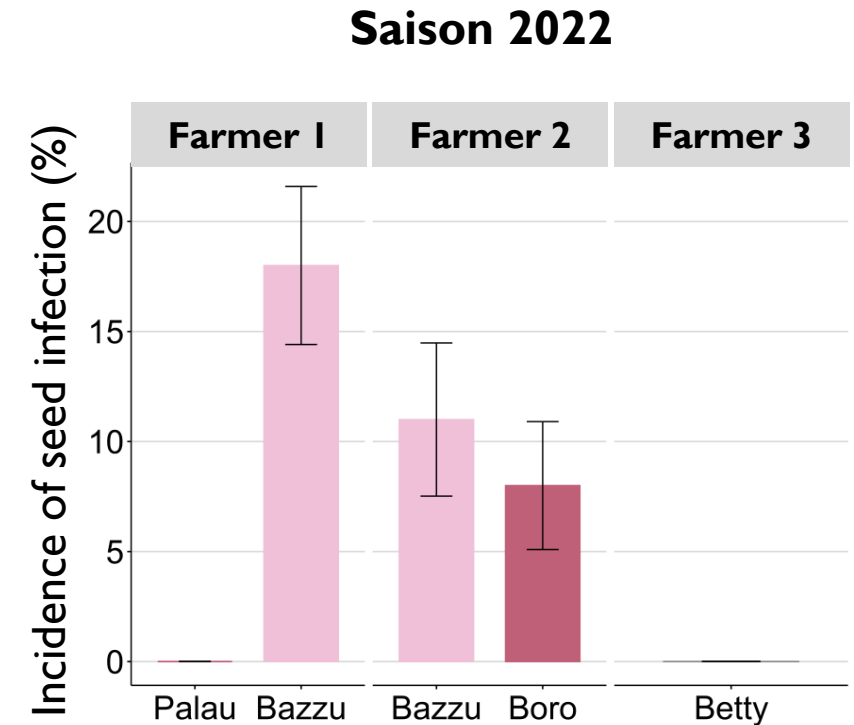
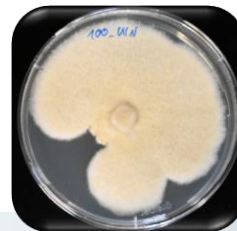
1. *Alternaria* sp.



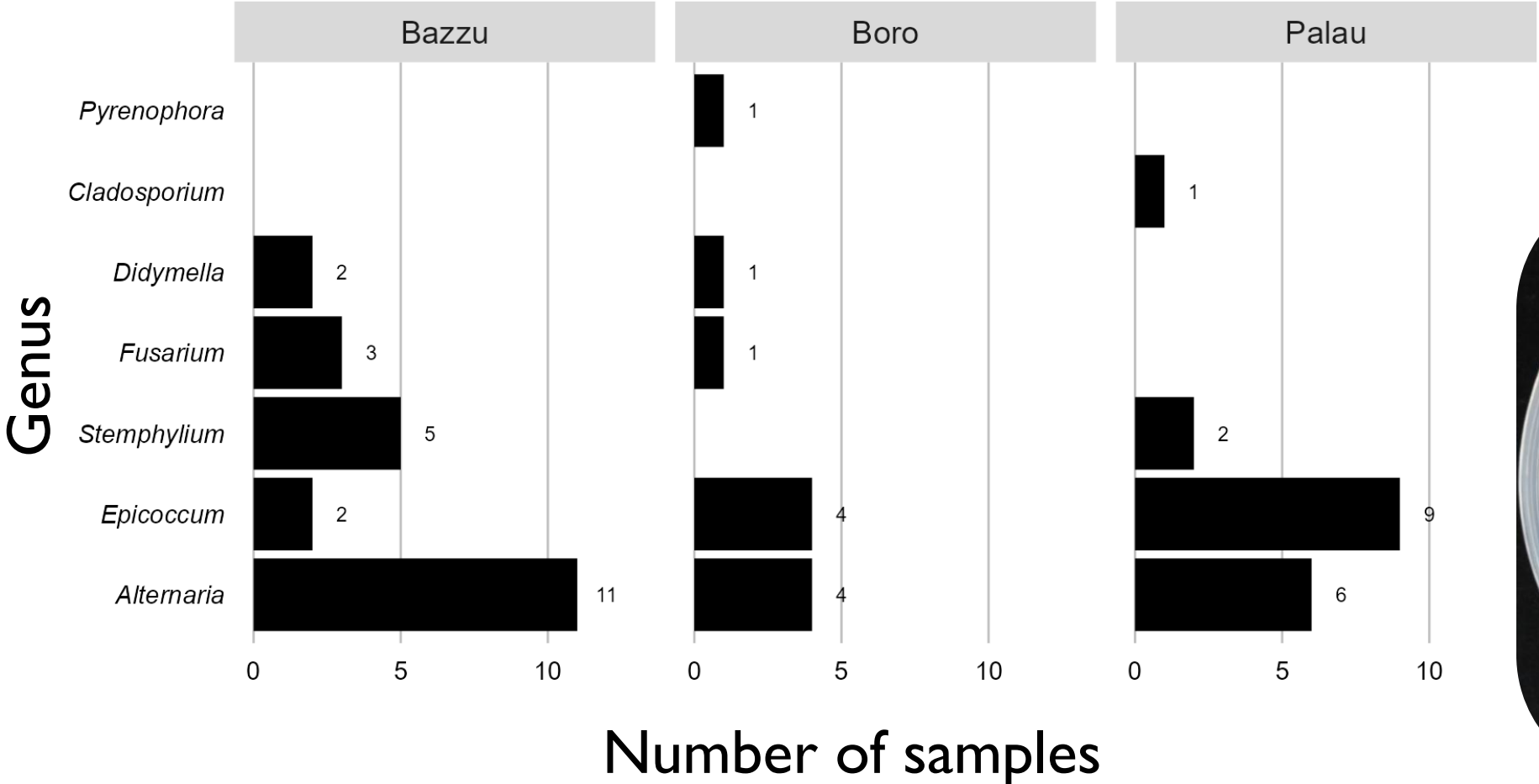
2. *Phoma betae*



3. *Fusarium* sp.



Sometimes seeds are heavily infected



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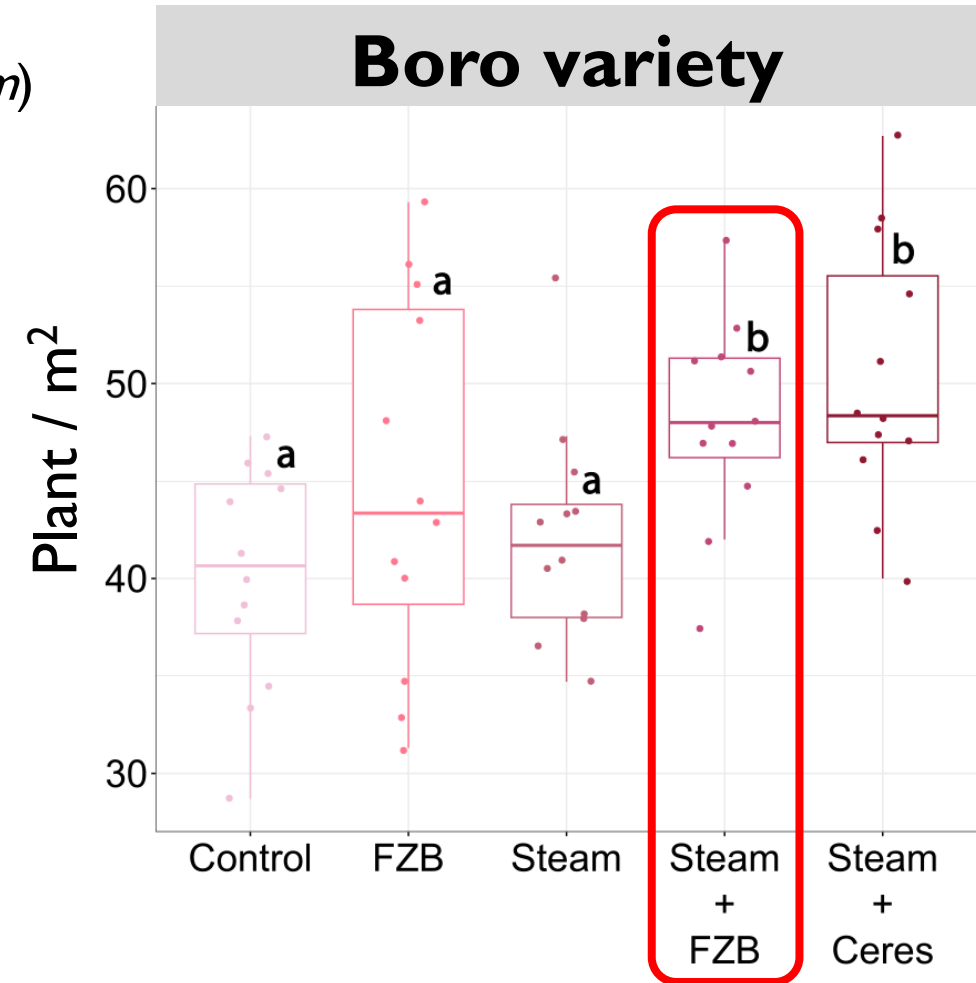
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FZB24* + steam improves seedling emergence – Saison 2022

- Seed treatment:
 - FZB24* (*Bacillus amyloliquefaciens*) + steam
 - Cérés (*Pseudomonas fluorescens* und *Trichoderma harzianum*)

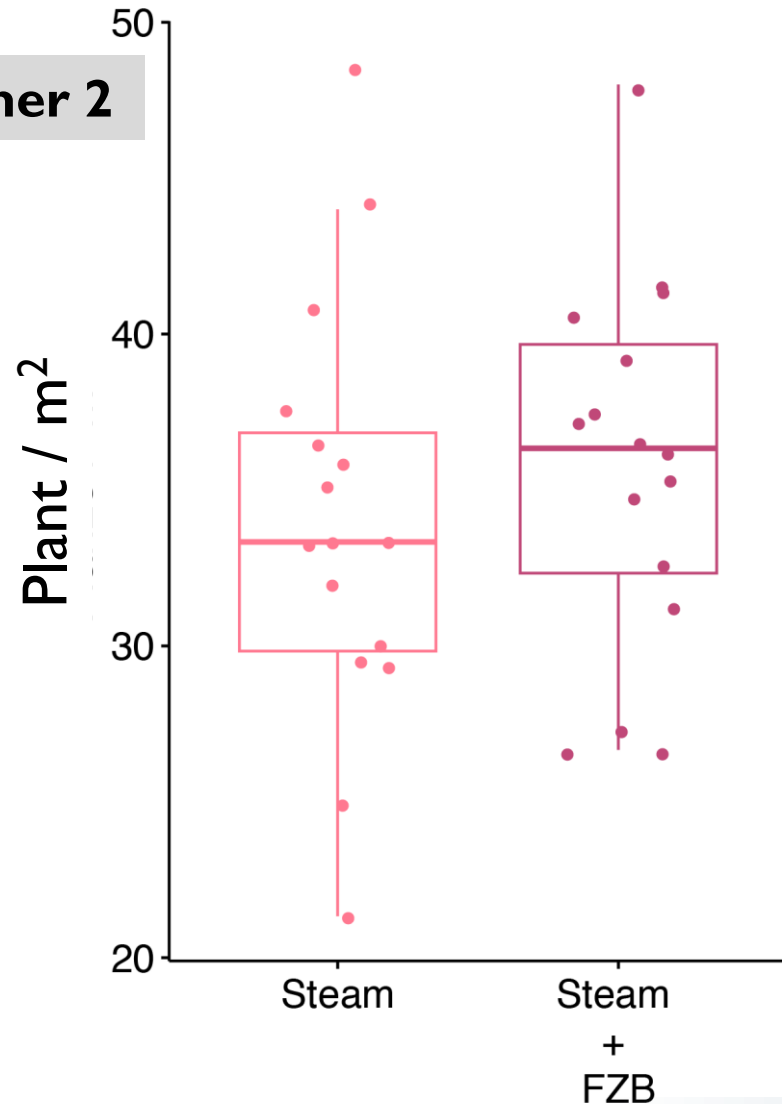


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FZB24* + steam improves seedling emergence – Saison 2023

Farmer 2



Bazzu

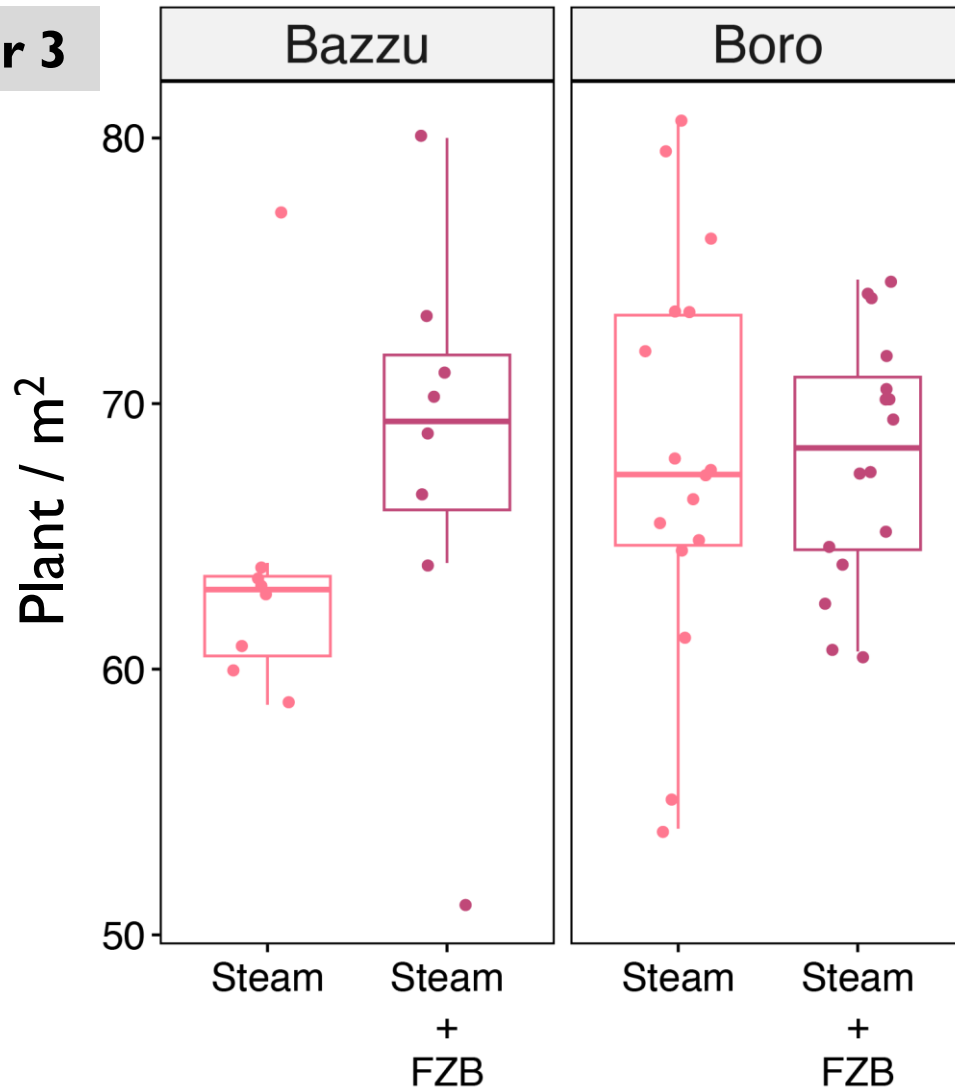


- Seed treatment with FZB24* (*Bacillus amyloliquefaciens*) + steam

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FZB24* + steam improves seedling emergence – Saison 2023

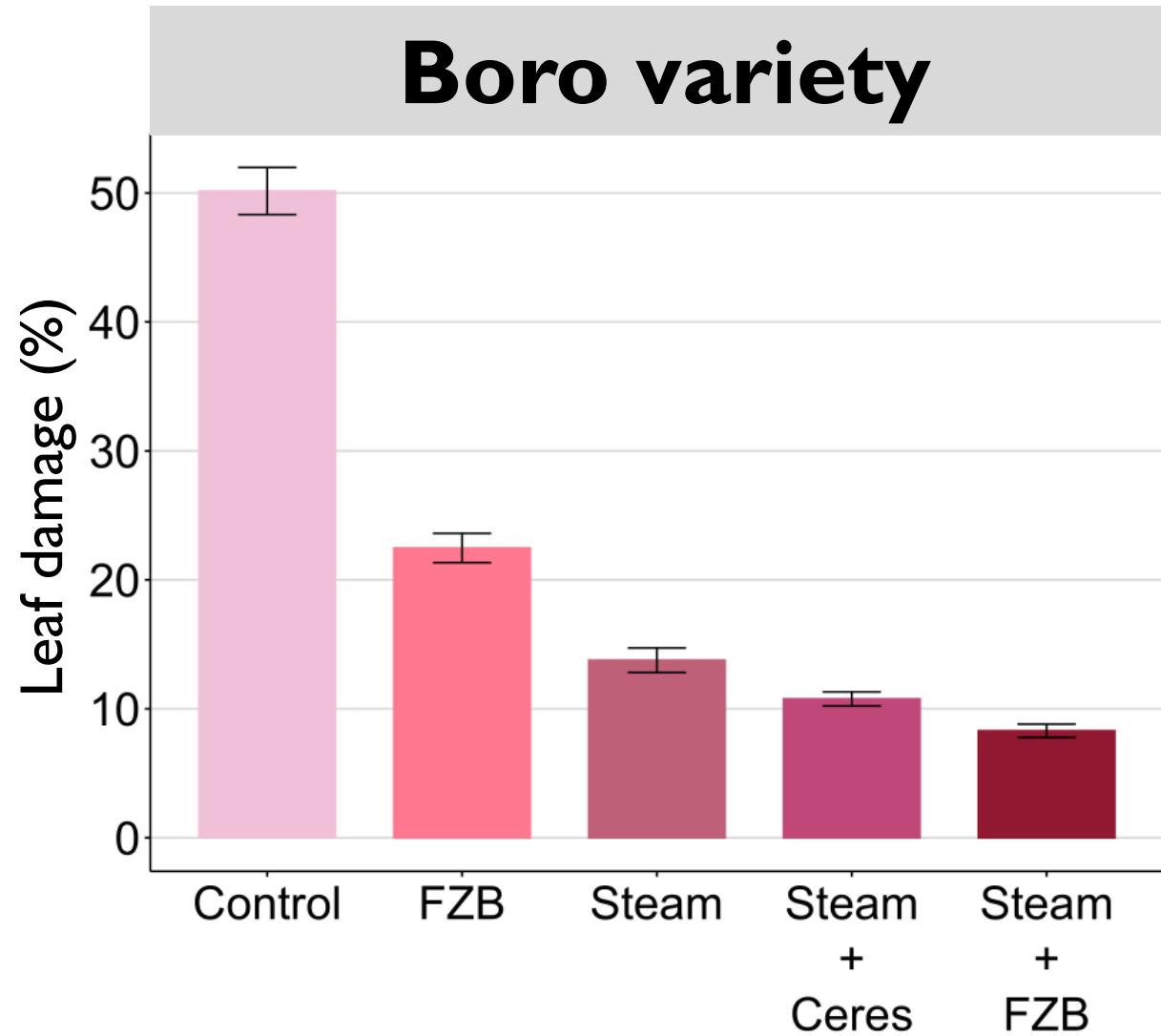
Farmer 3



- Seed treatment with FZB24* (*Bacillus amyloliquefaciens*) + steam

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FZB24* + steam improves leaf health



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FZB24* + steam improves leaf health

↙
Cercospora-
Blattflecken



Control



Seed treatment: FZB24* + steam
Watering: FZB24*

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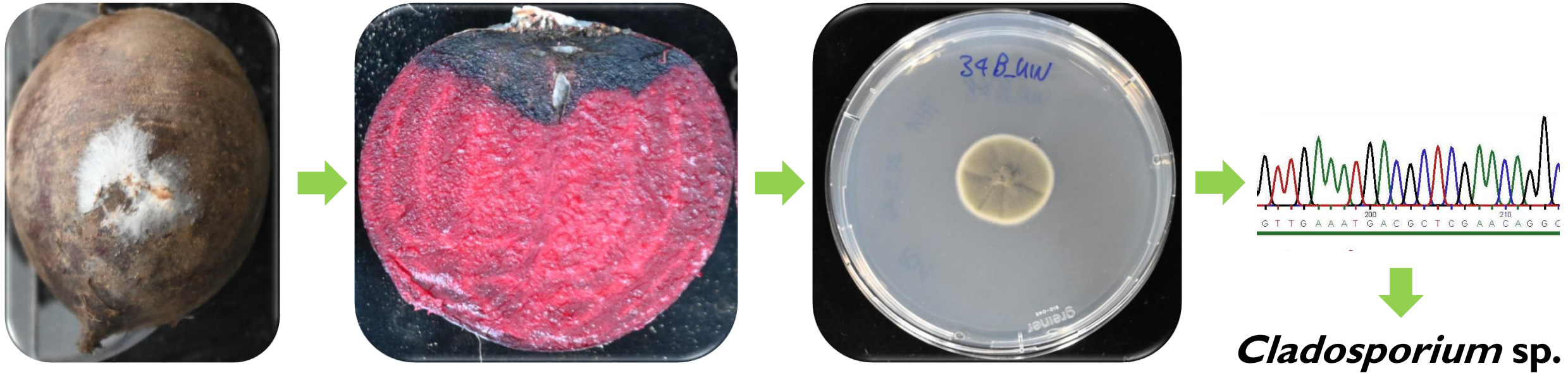
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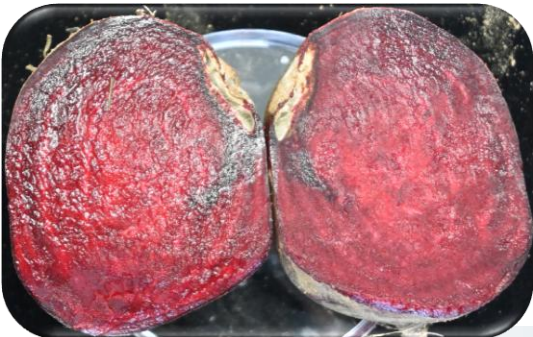
Three main pathogens affect the storage of beetroot



Phoma betae



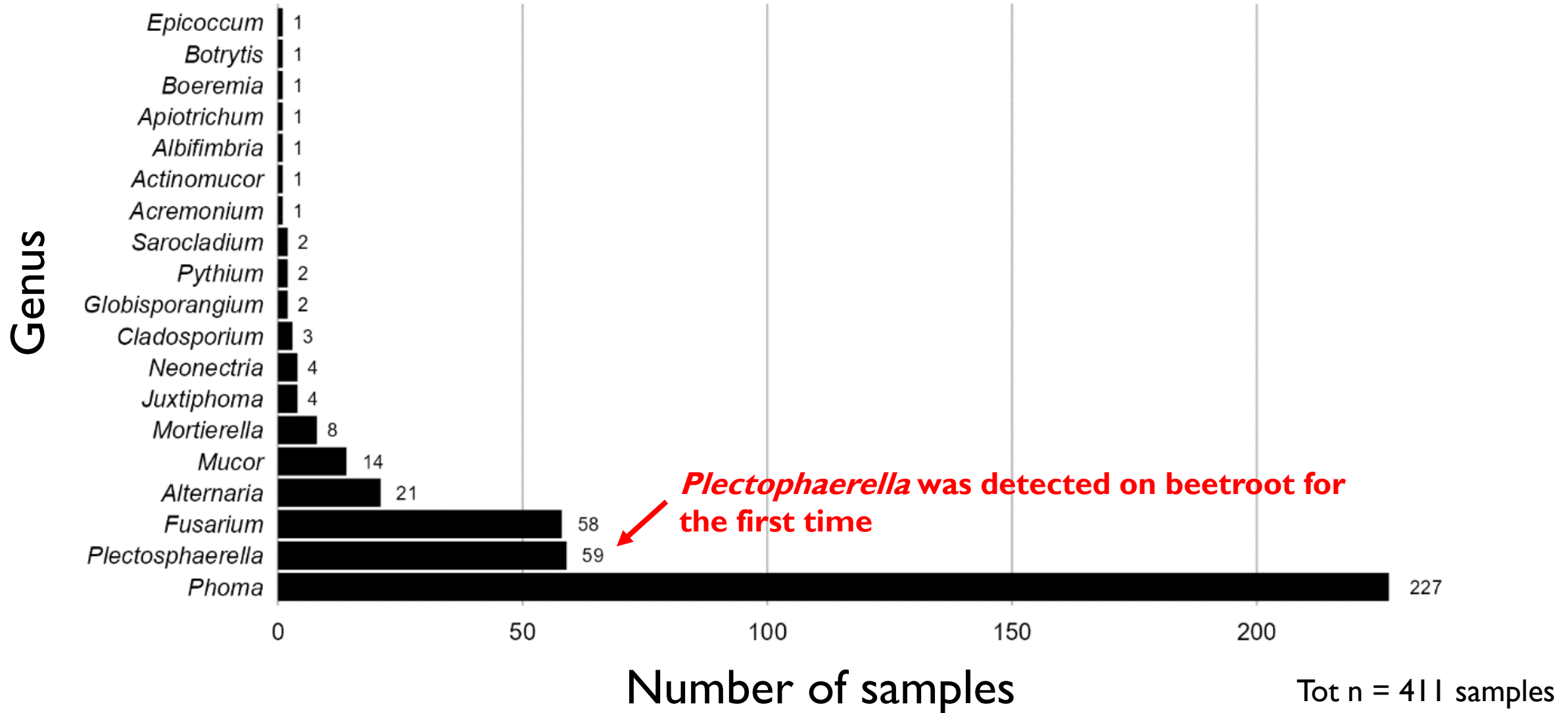
Plectosphaerella sp.



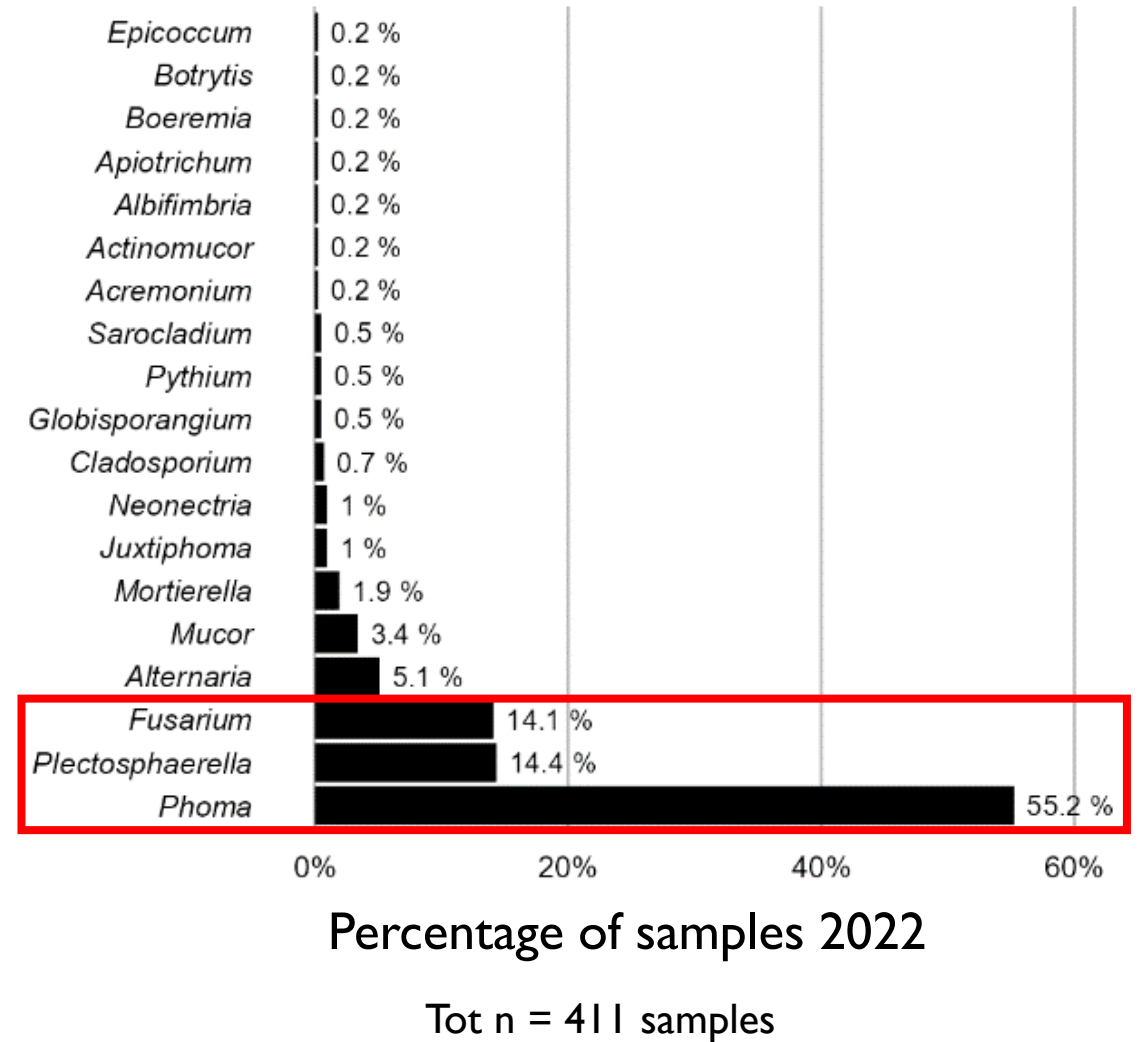
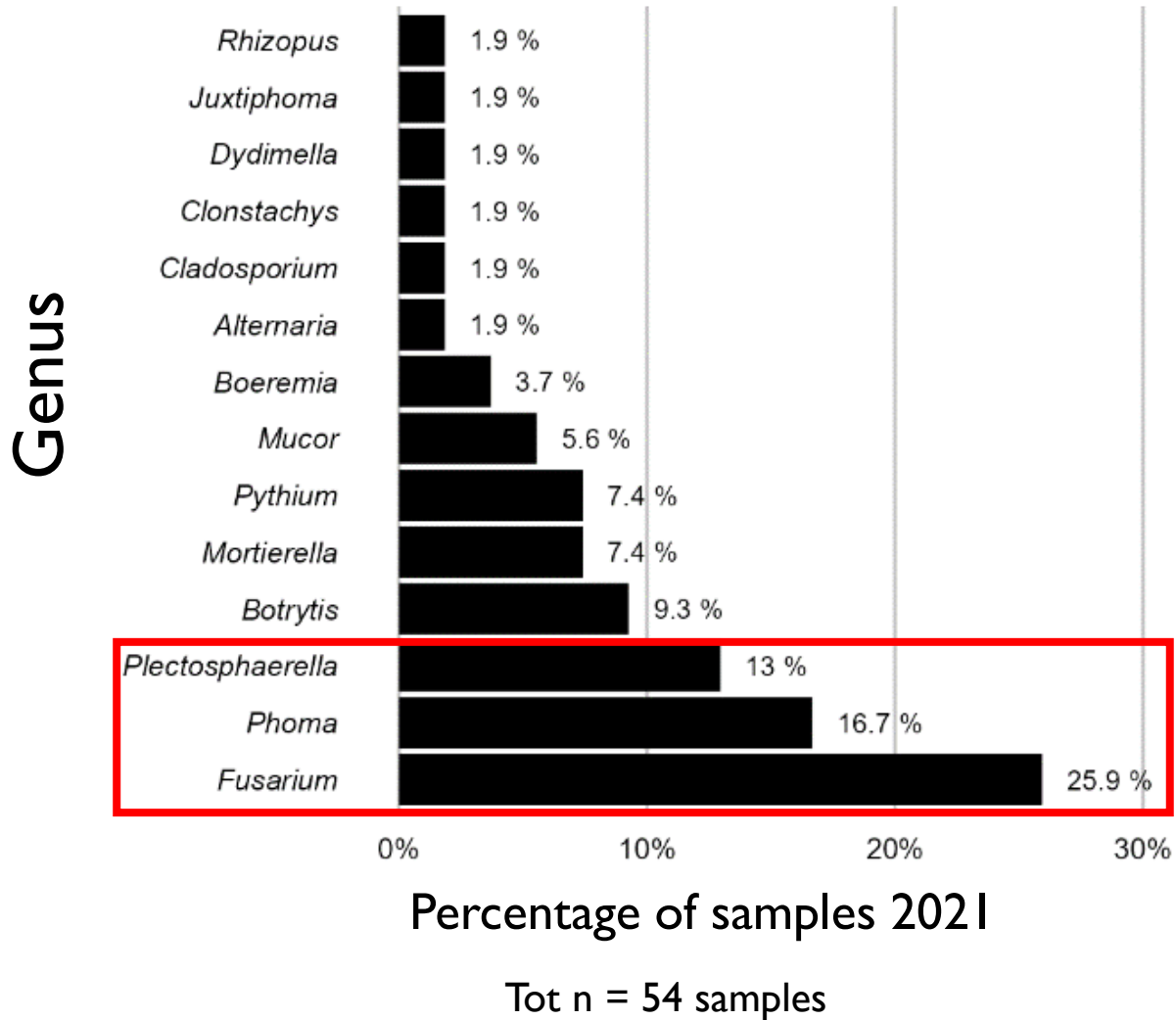
Fusarium sp.

- Soilborne diseases → Problem originates from the soil and/or seeds

Phoma was detected with a particularly high frequency

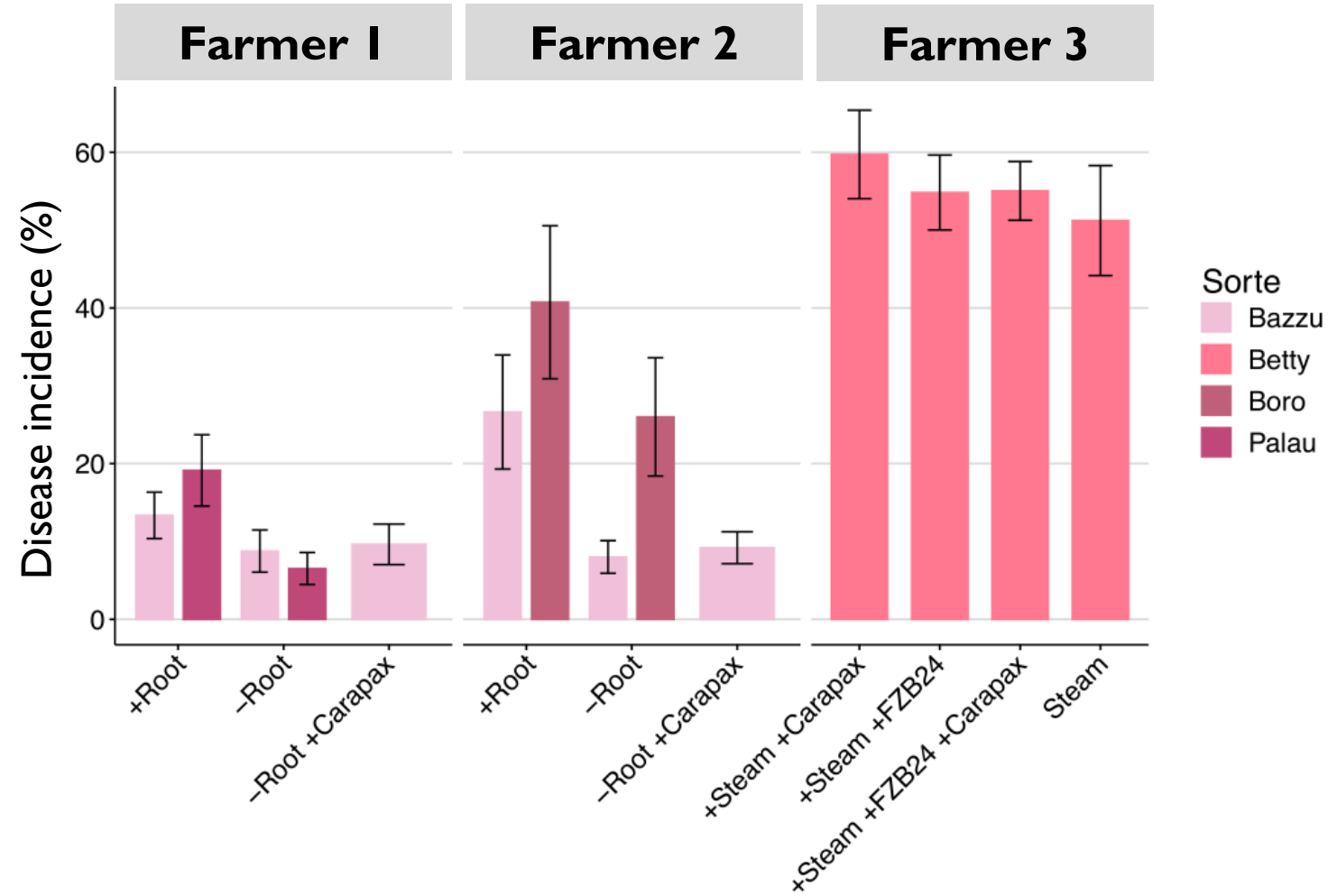
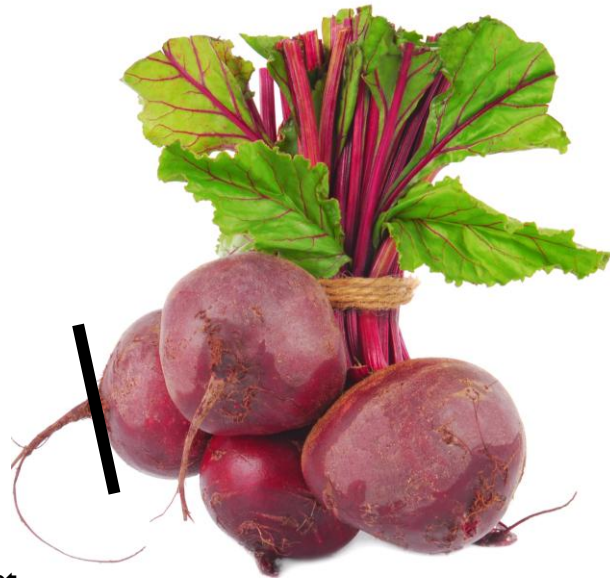


Consistency between the results of the Saisons 2021 und 2022



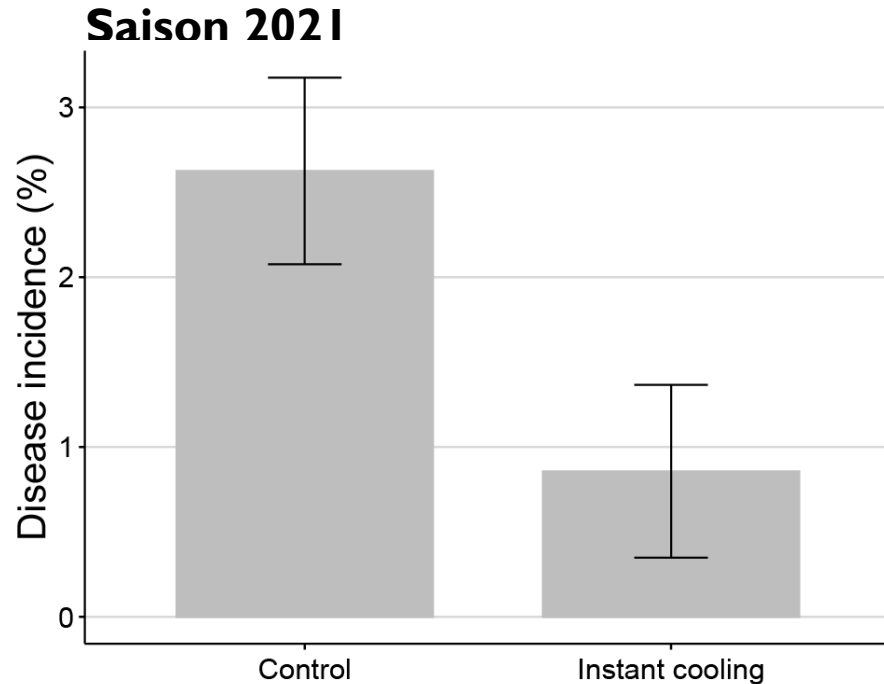
Storage without roots reduces the occurrence of storage diseases

- Steam, Carapax and FZB24* did not improve beetroot quality during storage
- Storage **without the root** seems to reduce the incidence of disease

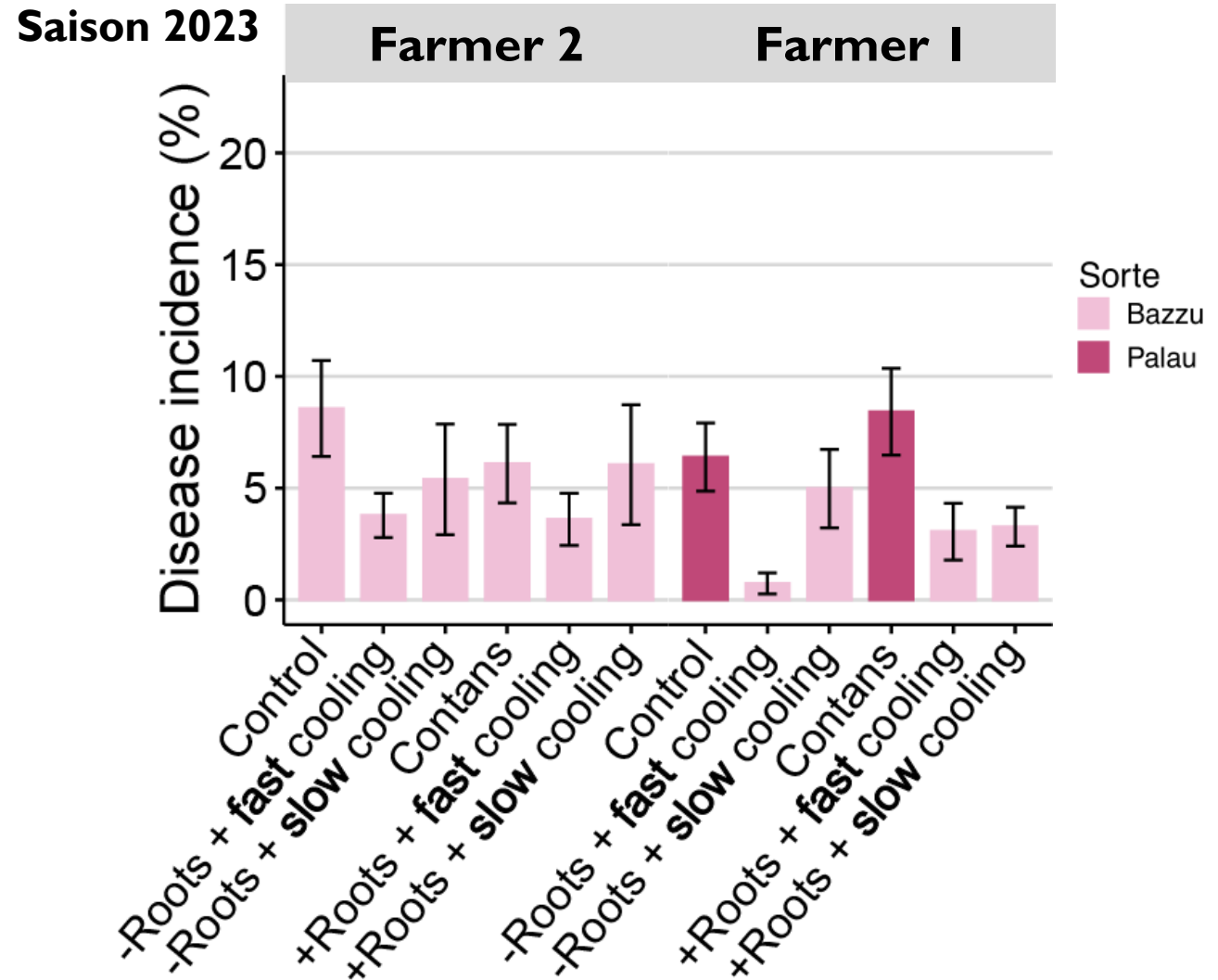


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Rapid cooling seems to reduce the incidence of diseases



- Rapid cooling after harvesting **tends to** reduce diseases frequency



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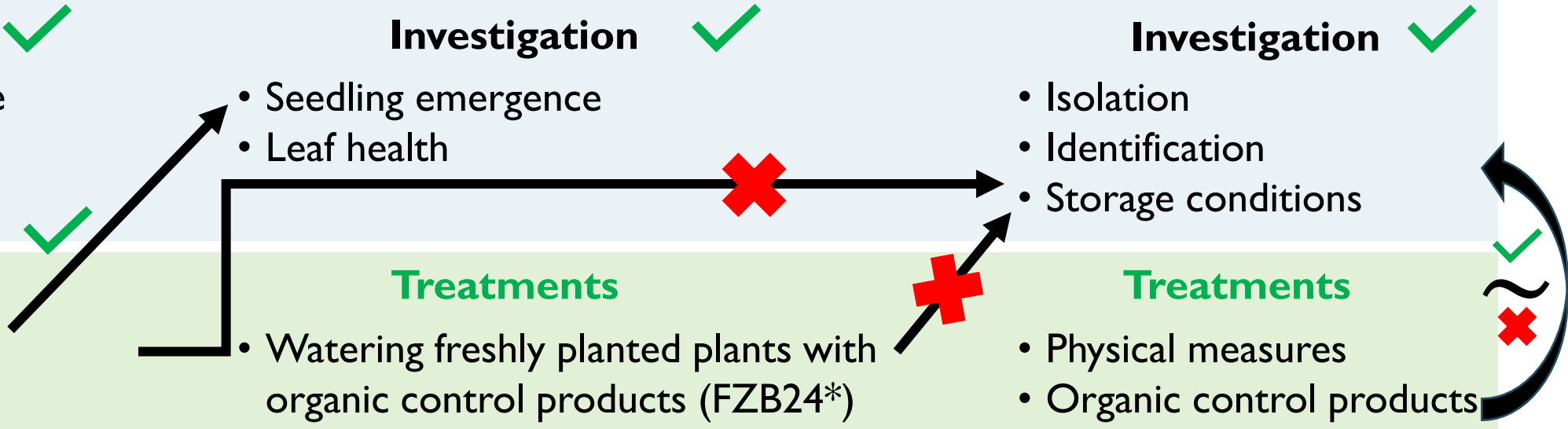
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Acknowledgements



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