Weed Competition in Spring Wheat Varieties

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Landraces – interesting traits for organic farming?

The goal was to test the potential of landrace spring wheat in organic farming

Guided by farmers with experience of landrace cereal production, we designed an experiment

Experiments in Uppland

Field trial with two levels of fertilisation
(0 and 100 kg N /ha), split-plot design in RCBD

3 years, 2019-2021
2 locations close to Ultuna, Ekhaga and Krusenberg

4 landraces:

Dala lantvete
Ölands lantvete — Historical

Källunda mix
Ekhaga (local) mix — Mixes

3 modern :

Dacke
Quarna
Skye — Common in organic

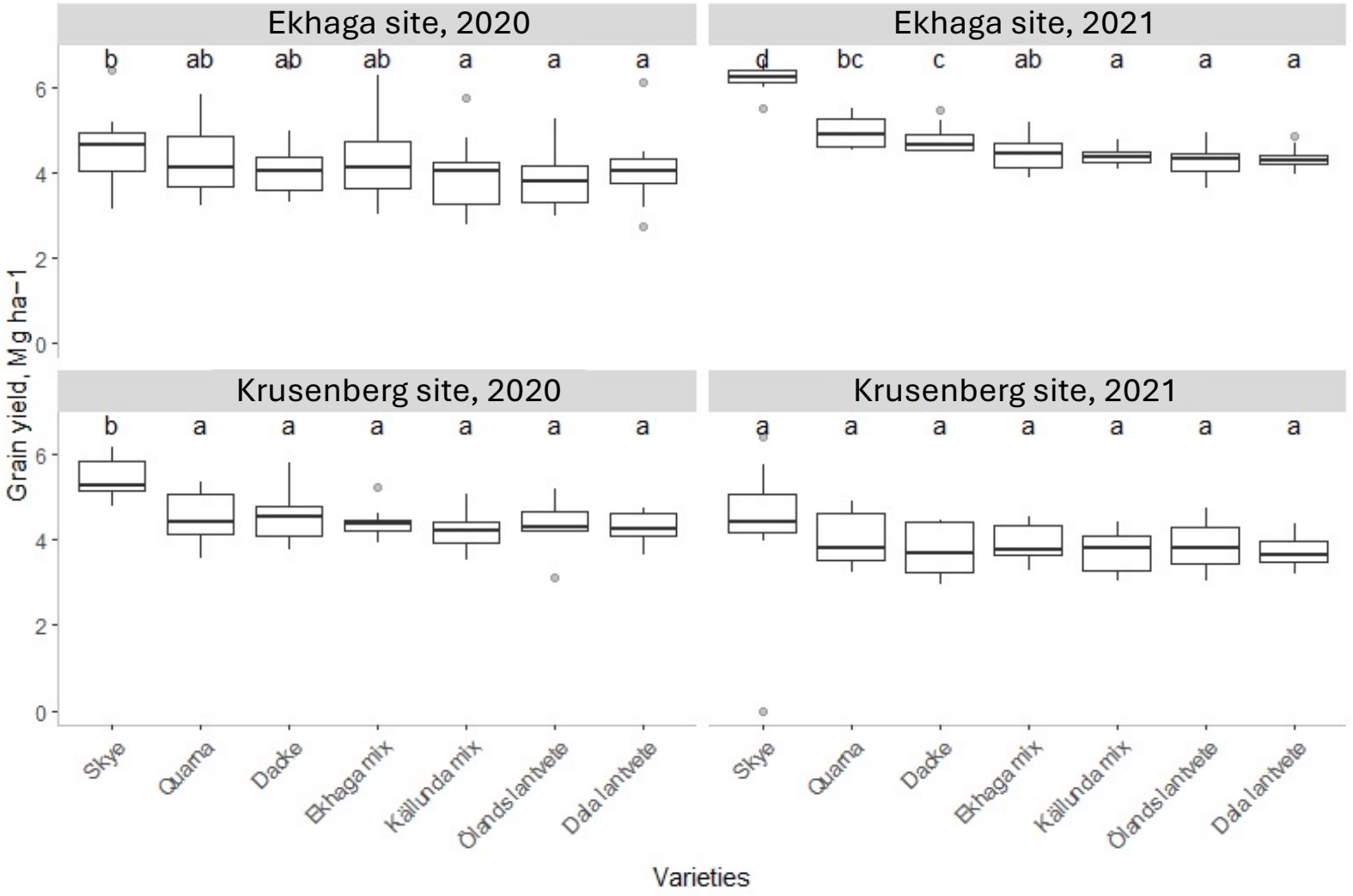
Spring wheat experiment: Landraces vs modern

- Poor seed quality in 2019, so all analysis were performed on data from 2020 and 2021
- The landraces performed well: Low and late N application works for them

Effect of fertilisers?

- Late application of biodigestate fertilisers
- No significant difference between varieties in response, but higher yield and protein content for all

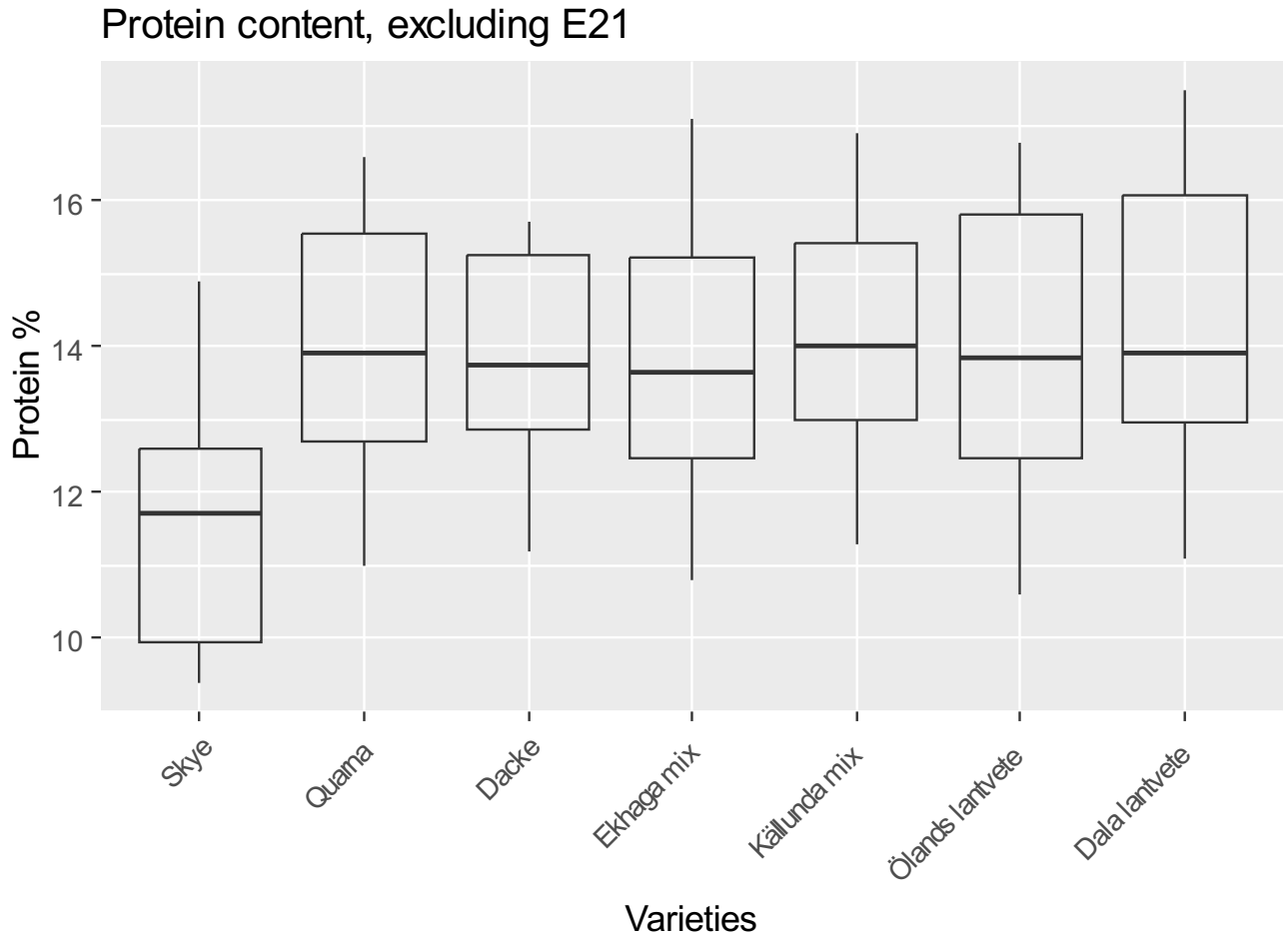
Grain yield

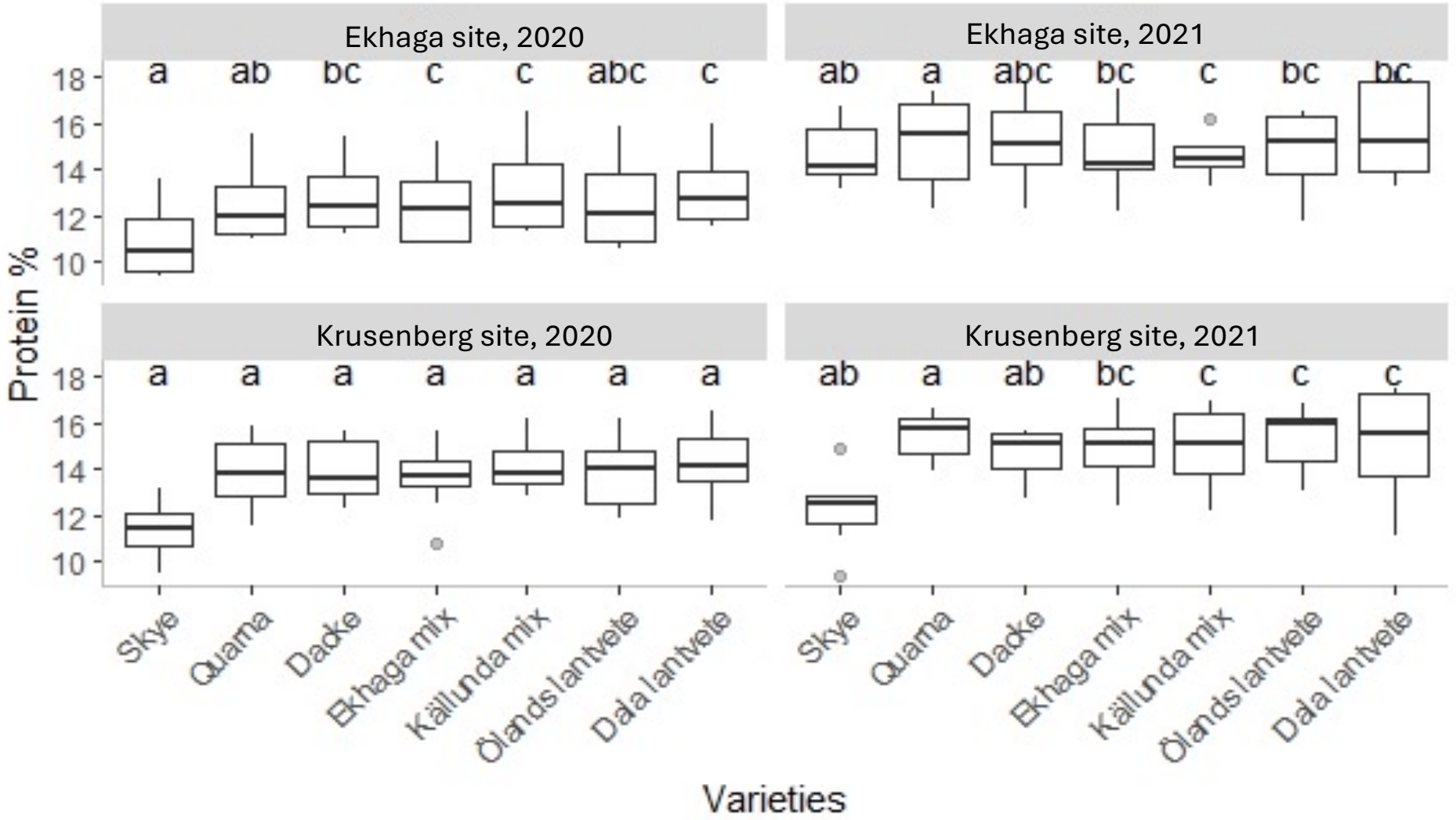


Variety *Environment (***P <0.001)

Protein content

- High protein content in the landraces and in Quarna and Dacke, over 13% all years
- Dala was always particularly high
- High protein were correlated with smaller kernels



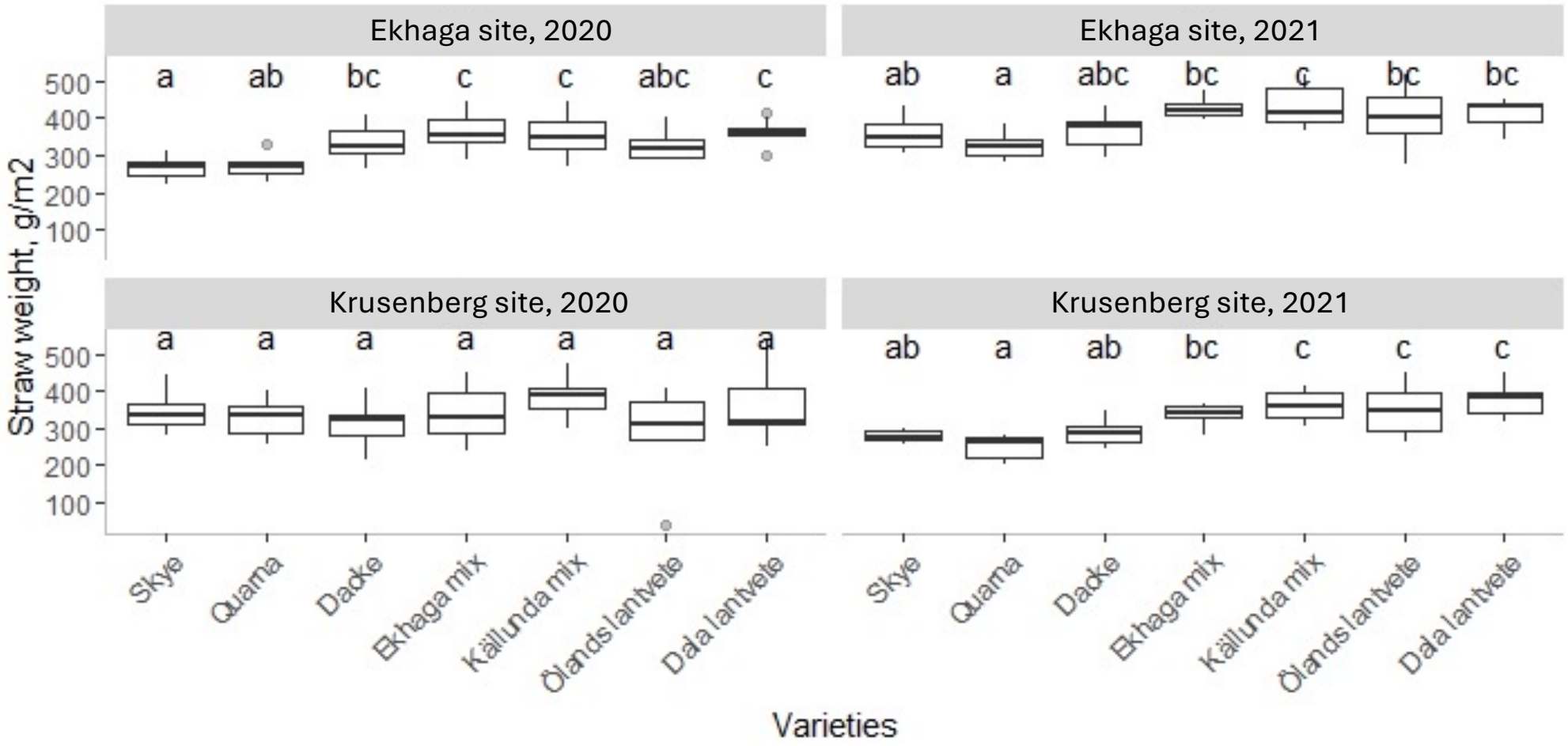


Variety *Environment (***P <0.001)

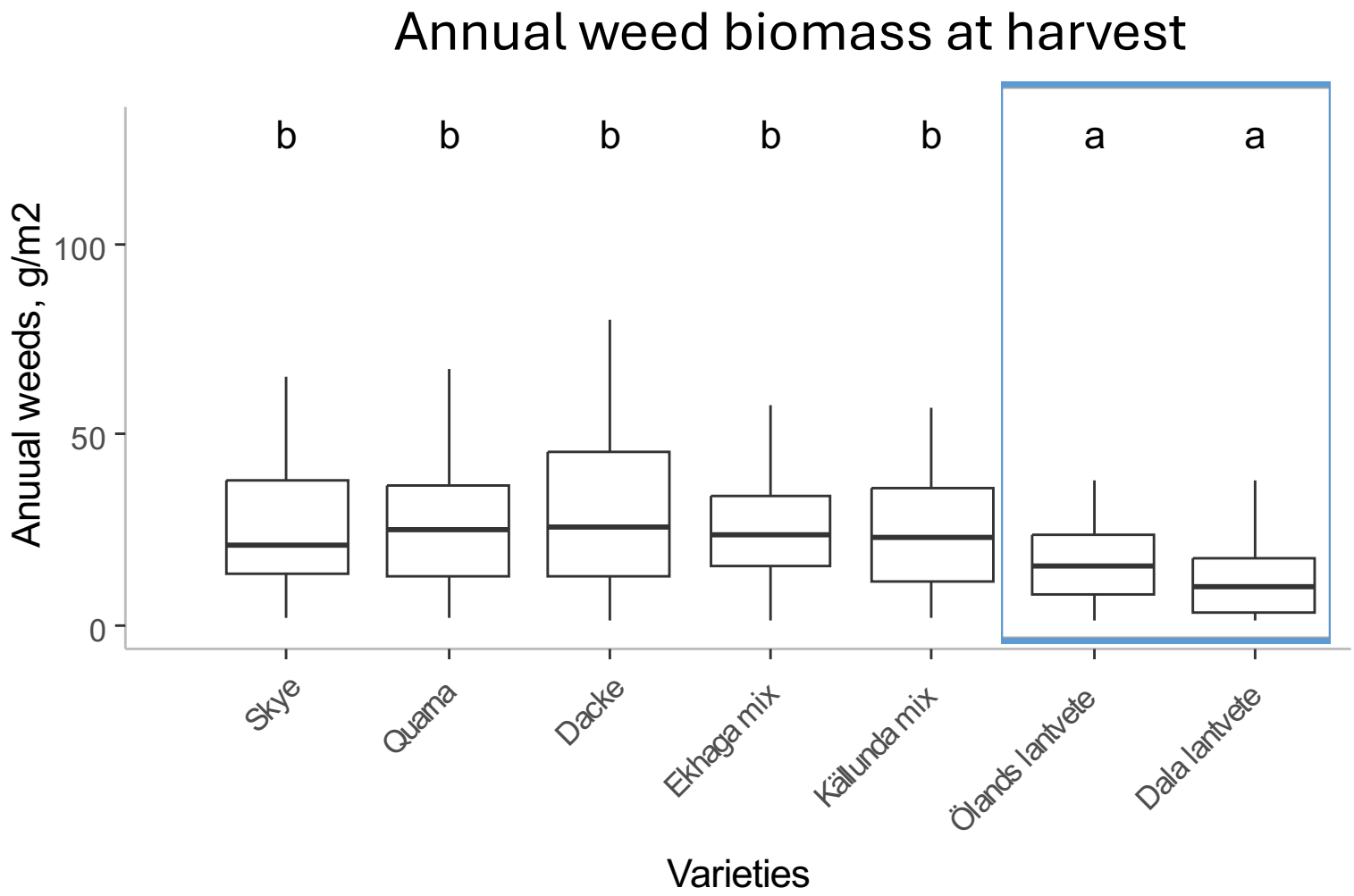
Straw yield

The landraces gave considerably higher average straw yield than the modern varieties

Straw- an interesting resource



Variety *Environment (P= 0.05)



Variety (***P <0.001)

Weed suppression was correlated to:

- High straw yield
- High LAI (Leaf area index)
- High number of ears/plant

Conclusions:

- The landraces showed high weed suppression compared to modern varieties used in organic farming

- Combined with other traits, such as an ability to give relatively high yields with acceptable protein levels, landraces shows traits that can be of interest in organic farming

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EKHAGASTIFTELSEN

2024-11-07 FoU DAGARNA

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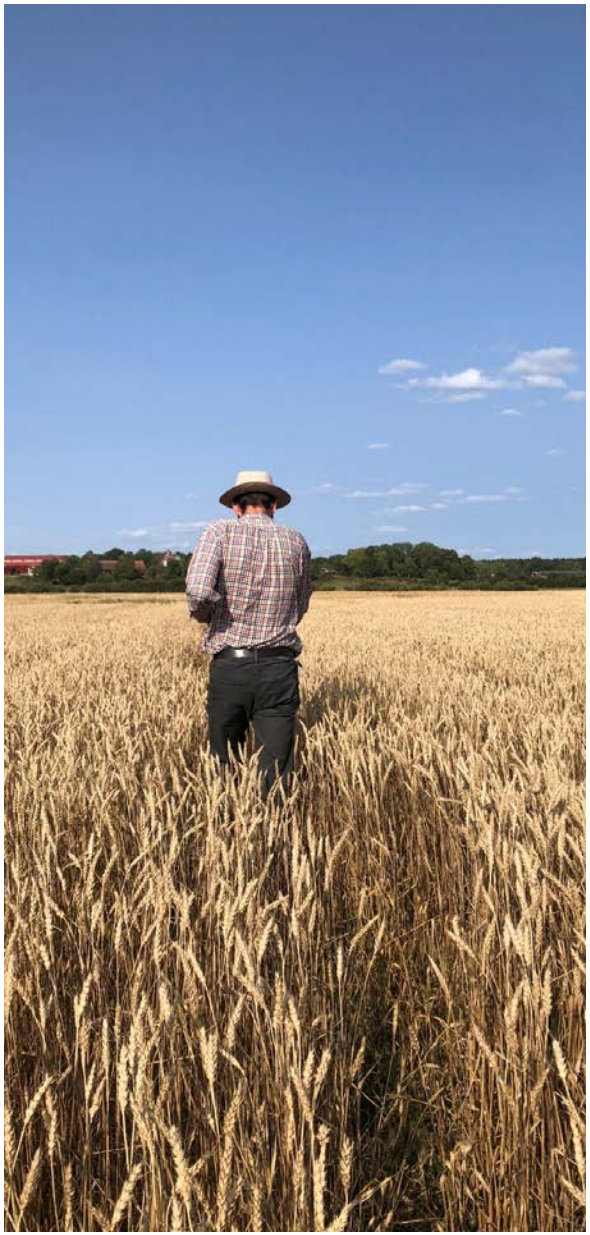
THE PROBLEM

- Crop yield gap between organic and conventional agriculture
- May contribute to decline in organic conversion rate in Sweden
- Few modern crop cultivars and varieties adapted for organic farming

THE PROPOSED SOLUTION

- Prior studies: benefits from crop mixtures and genetic diversity
- Landrace cereals in Sweden- more diverse crop populations
- Adaptability to low-input conditions
- Evidence of yield benefit, but let's look deeper at why



THE GOALS

- Find benefits of increased crop diversity in organic agriculture
- Connect these benefits with their ecological mechanisms

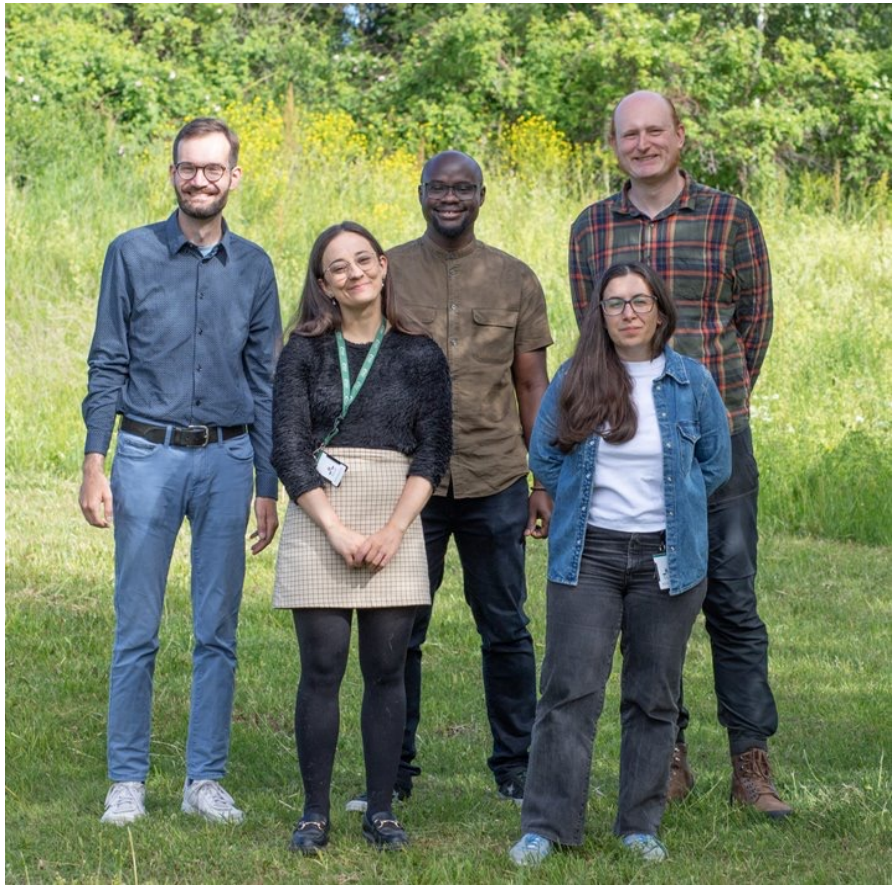
EXPERIMENTAL SET UP

E = elite cultivar, H = heritage cultivar, L = landrace, B = bean

EXPERIMENTAL SET UP

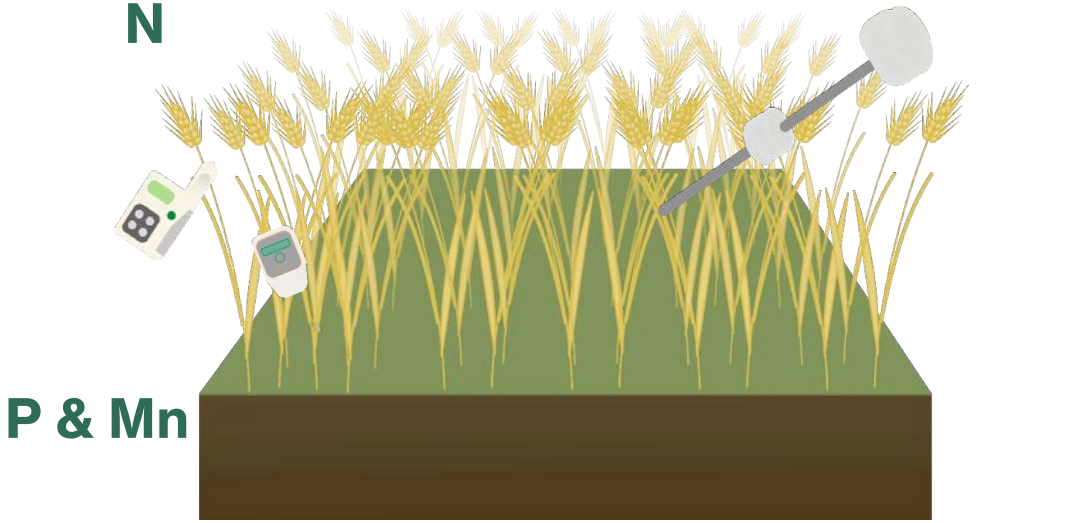
Interdisciplinary approach with

diverse set of measurements



The team (L-R): Darwin Hickman, Fede Berckx, James Ajal, Eirini Daouti, and Jonathan Cope

ABOVEGROUND CROP TRAITS

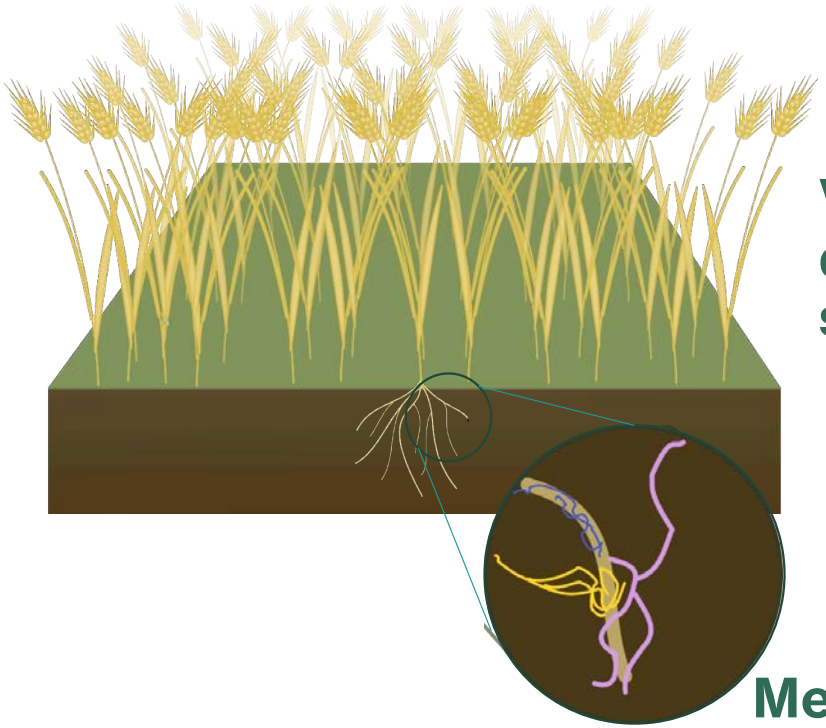


BELOWGROUND CROP TRAITS

Root
System
Architecture

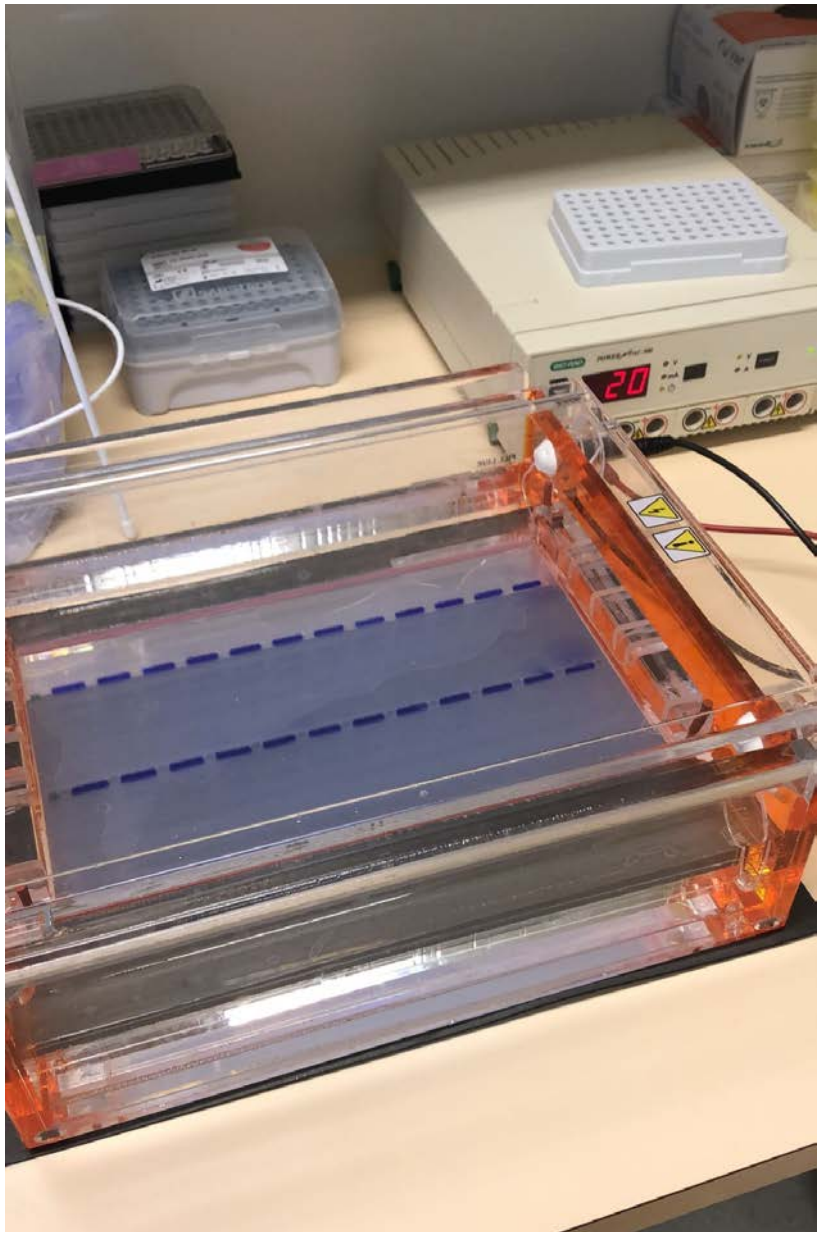
Shovelomics demonstration

INTERACTIONS: FUNGI

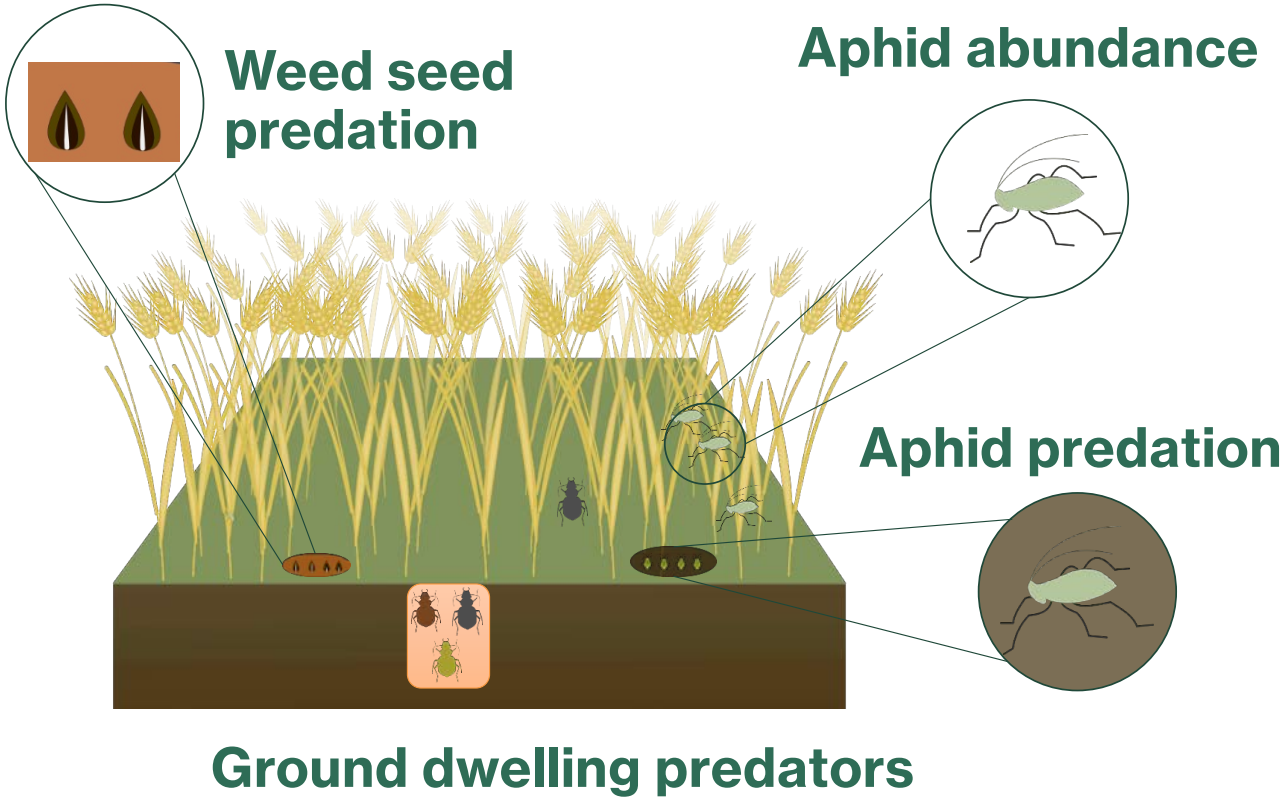


Visual disease scoring

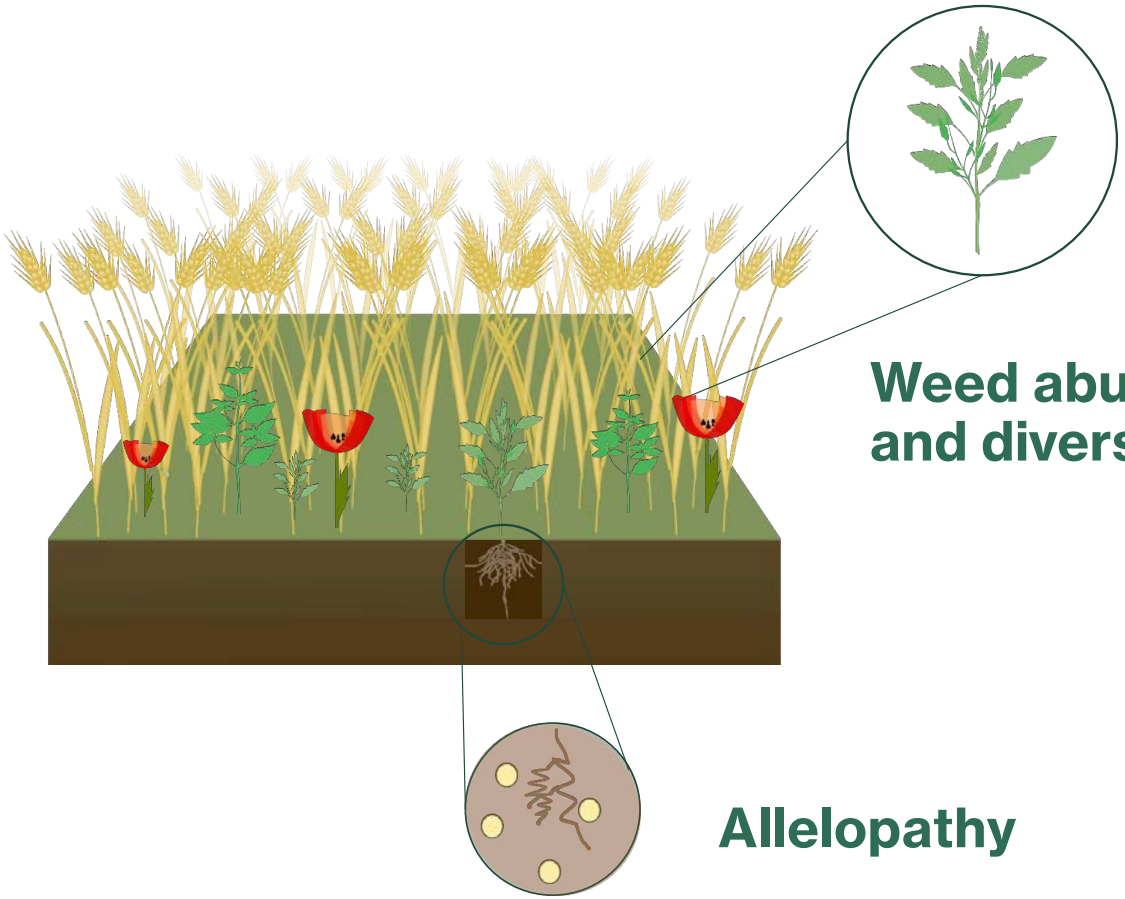
Metabarcoding



INTERACTIONS: INSECTS



INTERACTIONS: WEEDS



Weed abundance and diversity

Allelopathy

FROM PLOT TO FIELD

WHERE FROM HERE?

SEASON 2 → ANALYSES → IDENTIFYING TRENDS → SCALING UP / ZOOMING IN

ACKNOWLEDGEMENTS

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