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# Root distribution of winter wheat cultivars as affected by drought

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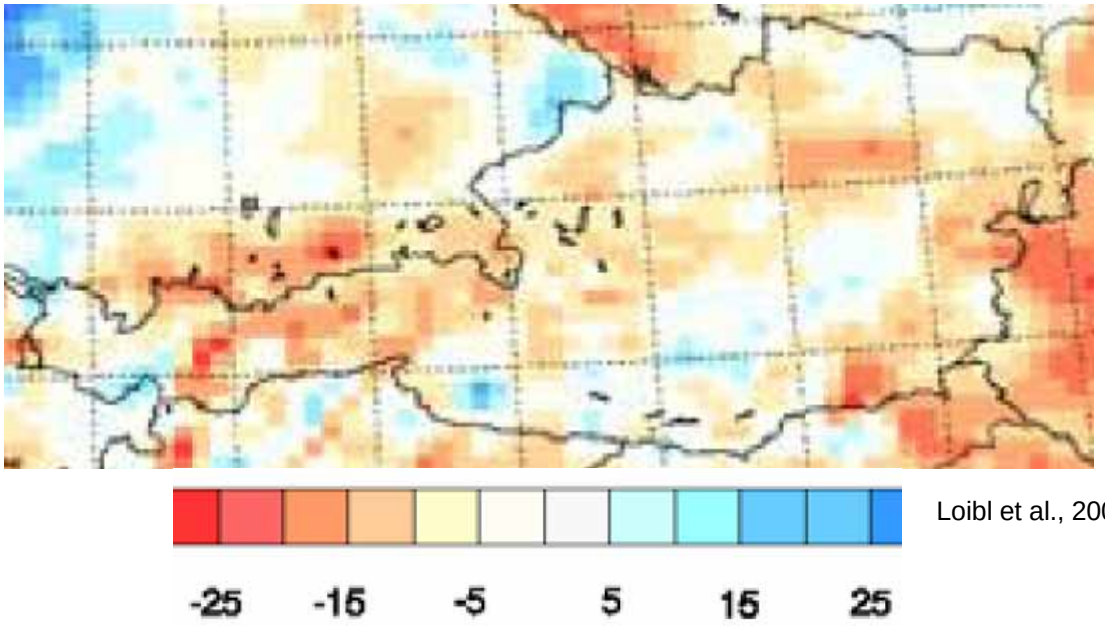
# Drought

- Agricultural production in Austria is affected by periods of low precipitation.
- Drought stress may result in severe yield reductions.
- Periods of drought stress may increase in length and intensity due to ongoing climate change.




Loibl et al., 2006 – reclip:more

**Relative difference [%] in mean seasonal summer precipitation between the simulated period 2041 to 2050 and the control period 1981 to 1990.**

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# Plants and drought stress

•Drought resistance may be conferred by the development and distribution of **roots** in deep soil layers.

•Water from deep soil may contribute significantly to yield.

•Root production and distribution are subject to genotypic variation.

**AIM**: Quantification of genotypic variation in root depth distribution as affected by drought stress.

In addition to root parameters, plants have developed various **shoot** morphological, anatomical and physiological adaptations to cope with drought stress.

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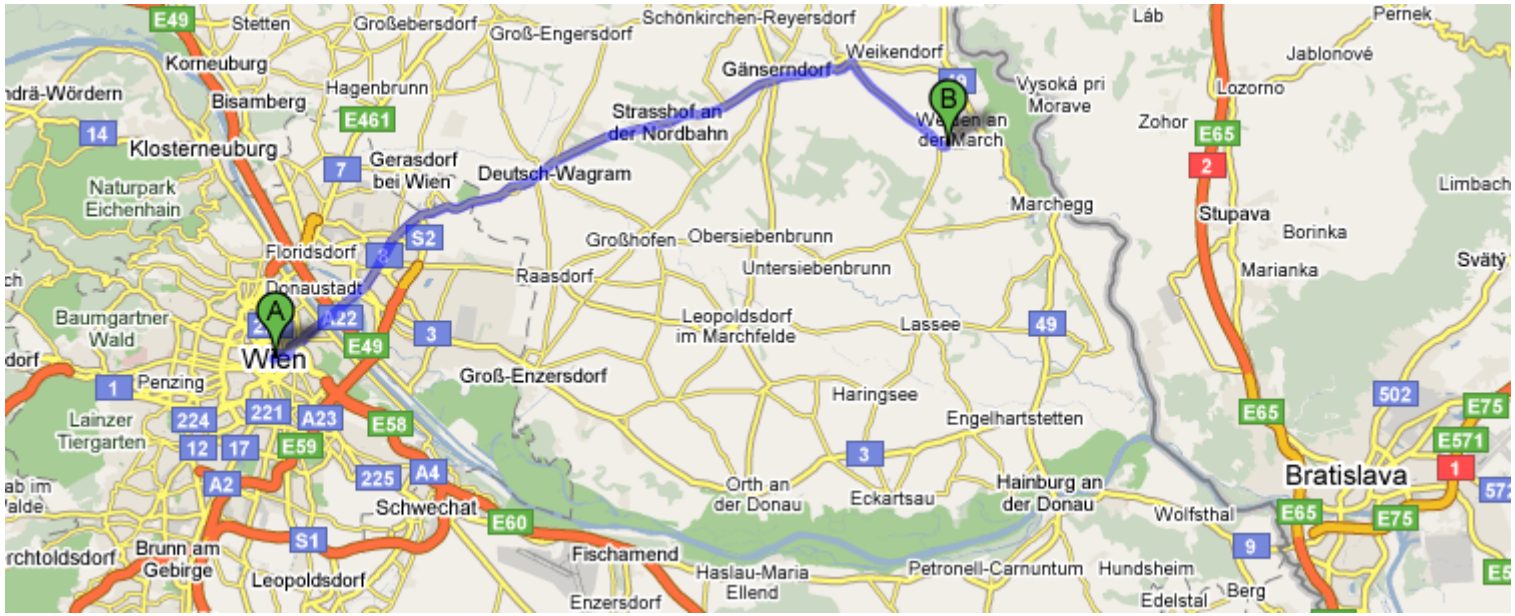
# Field experiment

at Oberweiden (~40 km from Vienna)
540 mm average yearly rainfall
induced drought stress: -143 mm rain from end of shooting



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# Foil tunnels with rollable foil

Root sampling at wax-ripe stage:

- 4 cultivars
- +/- drought stress
- 3 replicates
- soil cores 0-100 cm (4 pooled cores = 1 sample)

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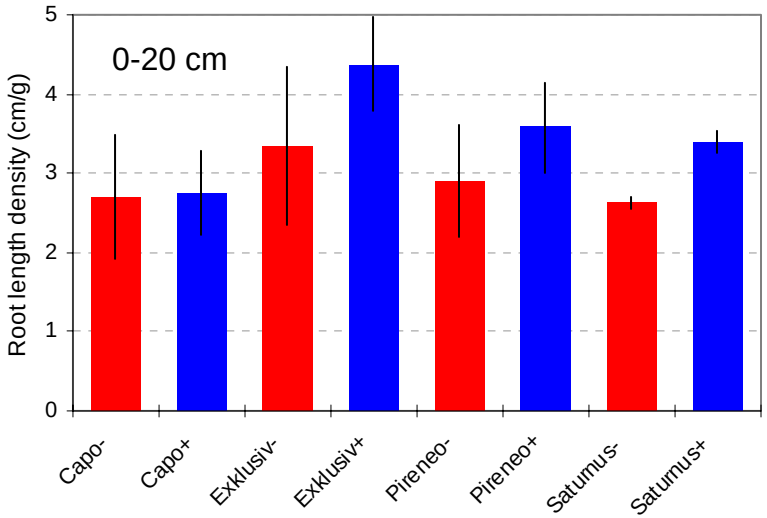
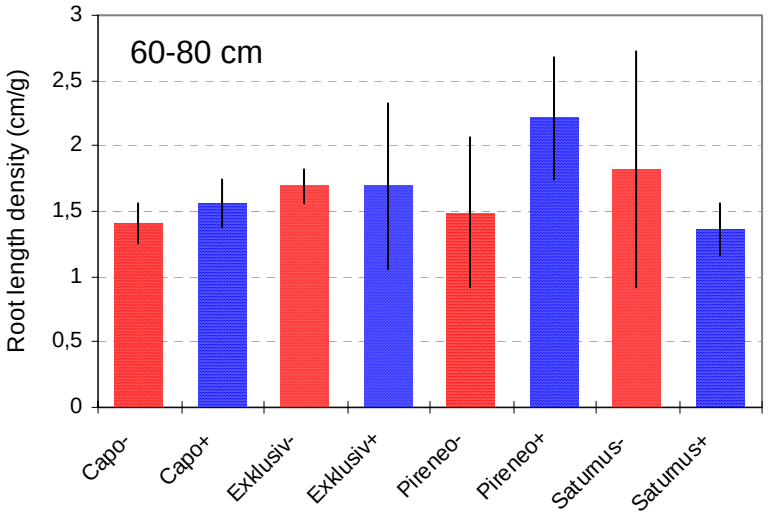
## soil cores



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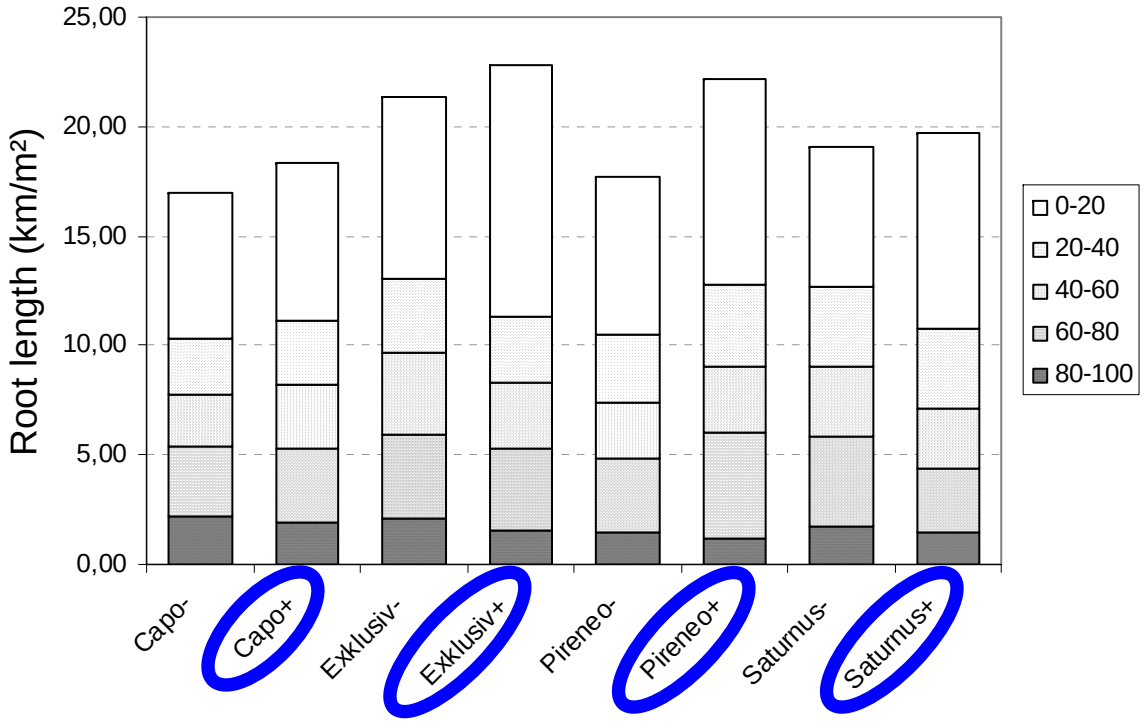


drought stress => reduced root length

| | | |
|---|---|---|
| •RLD | soil depth: | p<0.01 |
| •RLD * soil depth | cultivar: | p<0.05 |
| | drought stress: | p<0.01 |
| •RLD * soil depth * cv | drought stress: | n.s. |

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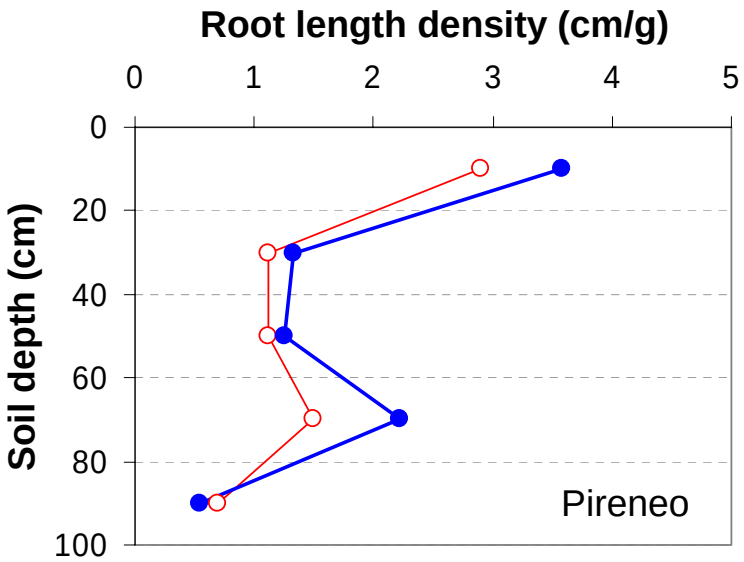


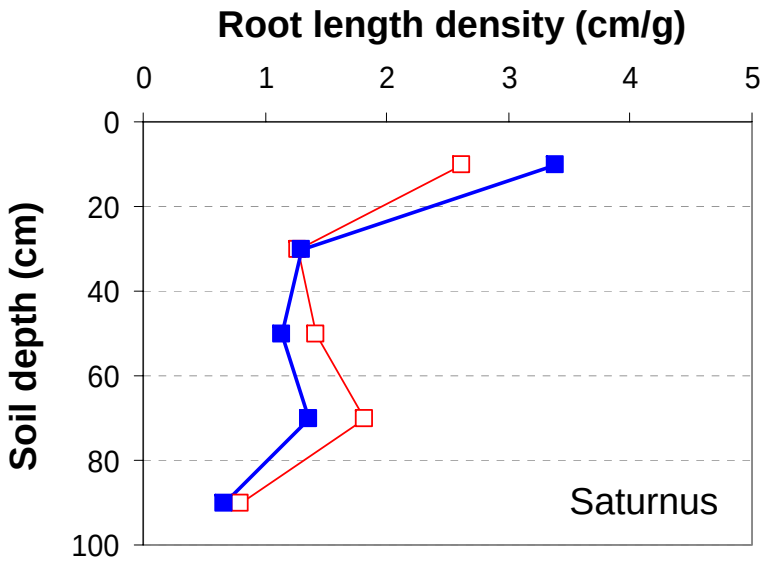

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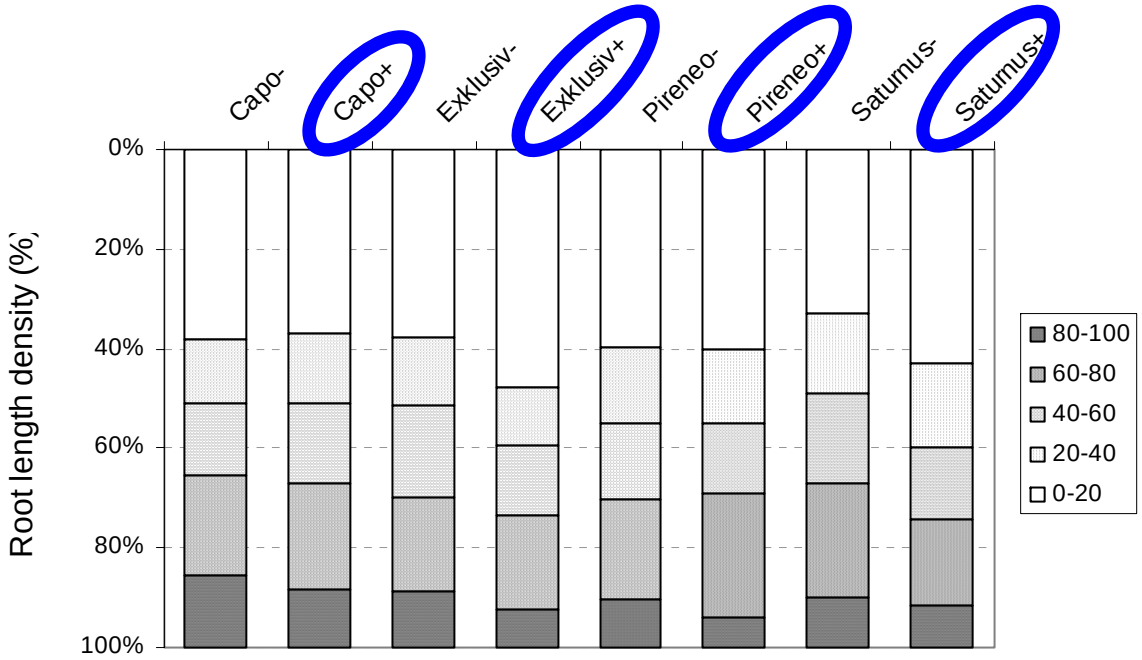


- RLD
- RLD * soil depth
- RLD * soil depth * cv

| | |
|---|---|
| soil depth: | p<0.01 |
| cultivar: | n.s. |
| drought stress: | p<0.05 |
| drought stress: | n.s. |

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## observed yield reduction

Capo
Pireneo
Exklusiv
Saturnus

## based on root data - expected sensitivity against drought

Pireneo
Capo
Exklusiv
Saturnus

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# General summary & outlook

•Root lengths and root length densities measured in this study are comparable to previously reported values.

•The observed increase in RLD at 60 to 80 cm soil depth may be due to a relative to the above-lying layers higher water content of the 60 to 80 cm soil layer which may have stimulated root growth.

•Data for root production and distribution presented here are from only one growing season. Additional data will be necessary to determine whether the examined cultivars differ in the distribution of their roots in the soil profile in response to water stress.

•The data presented on root production and distribution need in future studies to be combined with data on above-ground biomass production and yield.

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•‘Institut für Sortenwesen’ of the Austrian Agency for Health and Food Safety planned, set up and conducted the experiments.

•my colleagues at Bio Forschung Austria for their assistance in sampling and data generation/analysis