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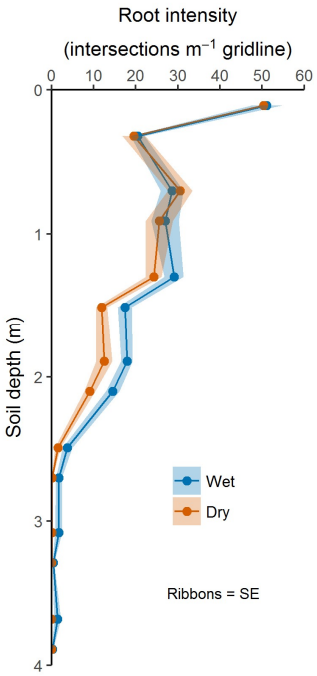
Chicory Grows Roots Below 3 m Is That Beneficial under Water Stress?

DeepFrontier - Exploring the Potential of Deep Roots

Chicory is deep rooted, but can chicory escape topsoil drought by increasing deep water uptake?

Certain crops grow roots of several meters depth within a growing season. This potentially allows them to explore subsoil resources.

We observed that chicory was capable of growing roots below 3 m within 3 months. There was clear evidence of water uptake by the deep roots. Yet our results could not confirm the higher uptake from deep soil layers when water availability was limited in the topsoil.



Substantial deep root growth

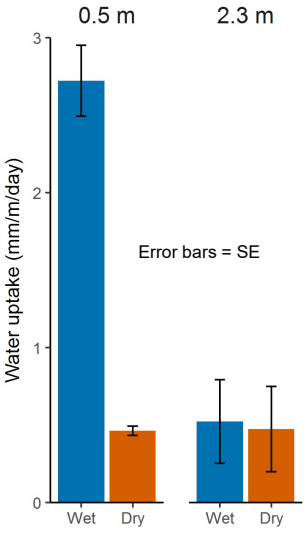
← Chicory root intensity 3 months after transplanting and 1 month after introducing the dry and wet treatments.

At this point chicory roots had reached below 3 m, and the root system tended to be denser in the wet than in the dry treatment below 1 m.

↑ **The Grid Intersection method** was used to estimate root intensity. A grid is placed on the images taken of the soil-rhizotron interface, and the number of intersections m^{-1} gridline is counted.

Transparent panels on the side of the rhizotrons allow inspection of root growth at the soil-rhizotron interface on the entire surface. The surface was photographed using a designated photo box several times during the season.

We grew chicory (*Cichorium intybus L.*) in these 4 m tall soil filled rhizotrons. TDR sensors logged the volumetric water content continuously. Late season, two treatments were established. "Wet", where water was supplied regularly to avoid water limitations and "Dry" where no water was supplied.



Limited deep water uptake

← Water uptake in the dry and wet treatments in 0.5 and 2.3 m. Water uptake is estimated as the average daily decrease in soil volumetric water content over a 5 day period 1 month after introducing the dry and wet treatment.

Water uptake from 2.3 m significantly contributed to the plant water budget.

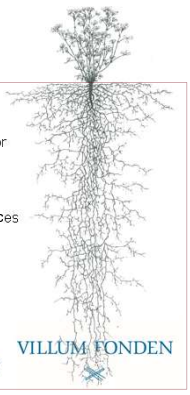
In the dry treatment, plant water uptake from 0.5 m was severely impeded, and not counterbalanced by an increased water uptake deeper in the soil profile, where water was available.

Above ground biomass was alike in the two treatments, and cannot explain the difference in top soil water use.

DeepFrontier

The DeepFrontier project is developing methods, facilities and ideas for future research into sustainable food production.

Our aim is to improve the understanding of deep rooting, i.e. what determines deep rooting, the activities of deep roots and which resources from deep soil layers are utilized by plants. The project will also study cropping systems with deep rooted species.



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