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Department für Wasser-Atmosphäre-  
Umwelt

# Analysis of plant water stable isotopes using the water-vapor equilibrium method

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# Water-vapor equilibrium method



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## Background

Soil water isotopes measured by laser-spectroscopy:

- Put soil sample into bag and inflate
- Wait 3 days for equilibrium between soil water & headspace vapor
- Pierce bag with needle and measure headspace isotopes

## Hypothesis

The method can also be applied to measure plant water isotopes



# Water-vapor equilibrium method



## Objectives

Investigate preparation steps:

- 1-3 days equilibrium, cutting or grinding the plants
- Investigation done for roots, shoots, leaves and fruits
- Use two species: tomato and strawberry



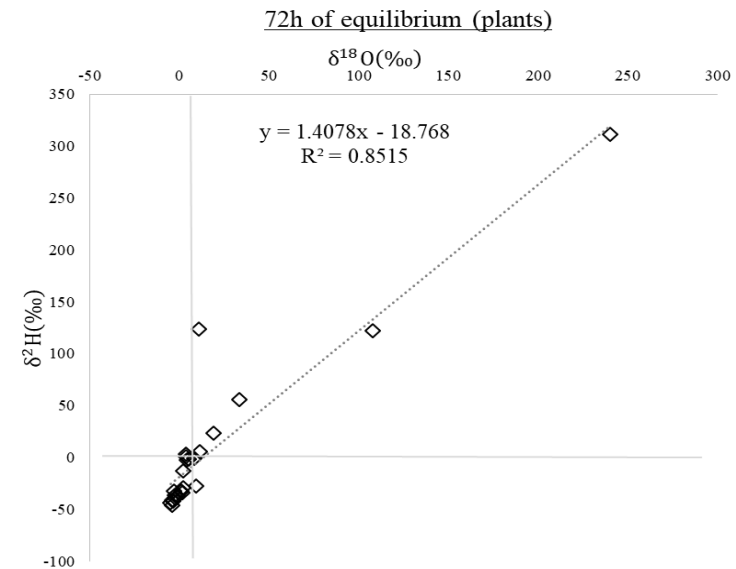
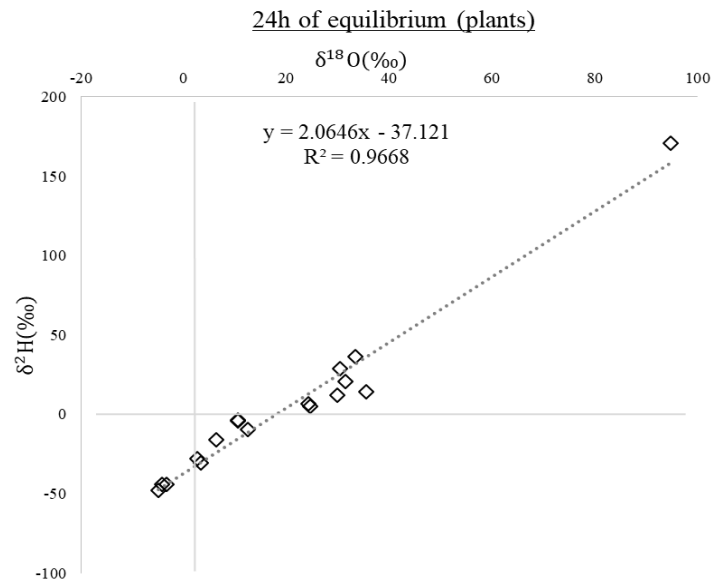
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# Equilibration time



Short equilibration time (24h) showed less scatter in data than longer time (72h) as plant material was less decomposed



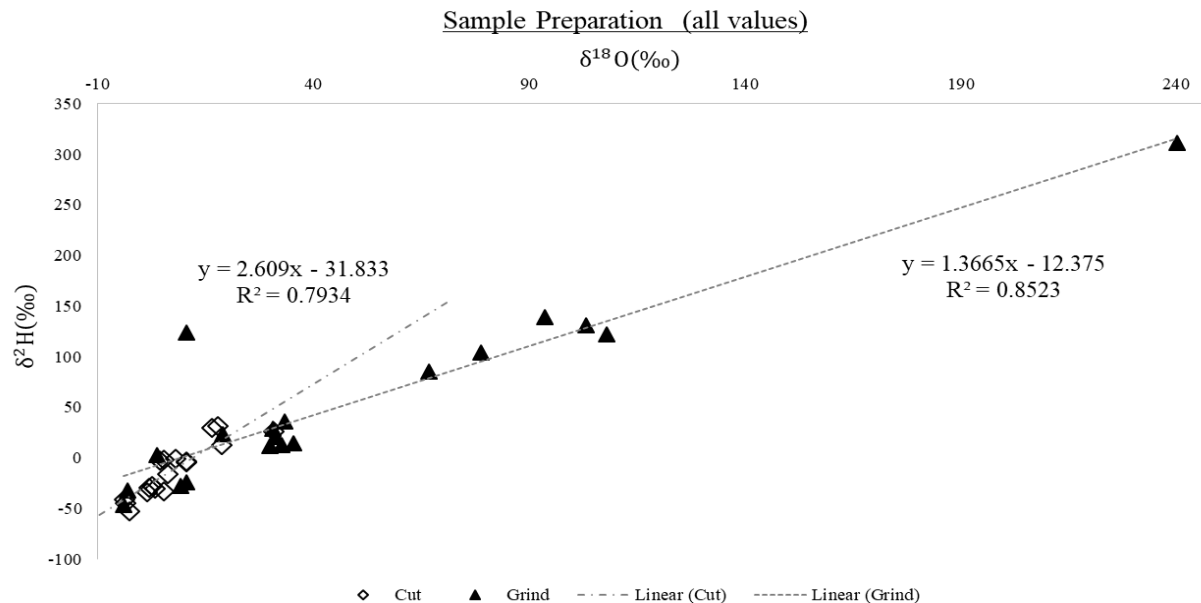
Equilibration time of 24h sufficient

# Cutting or grinding?

Grinding plant samples led to strongly enriched isotope ratios, possibly due to volatile organic components and release of cell water rather than mobile plant water only



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Cutting of samples preferred

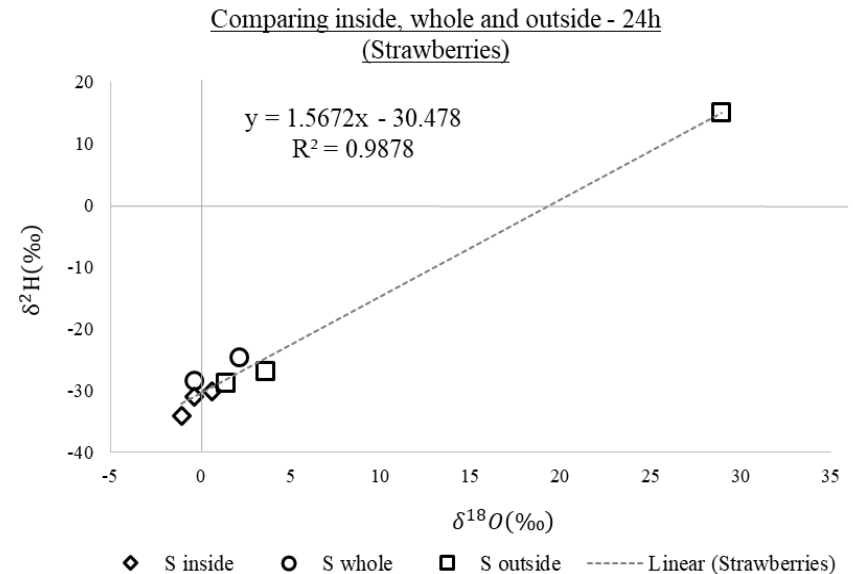
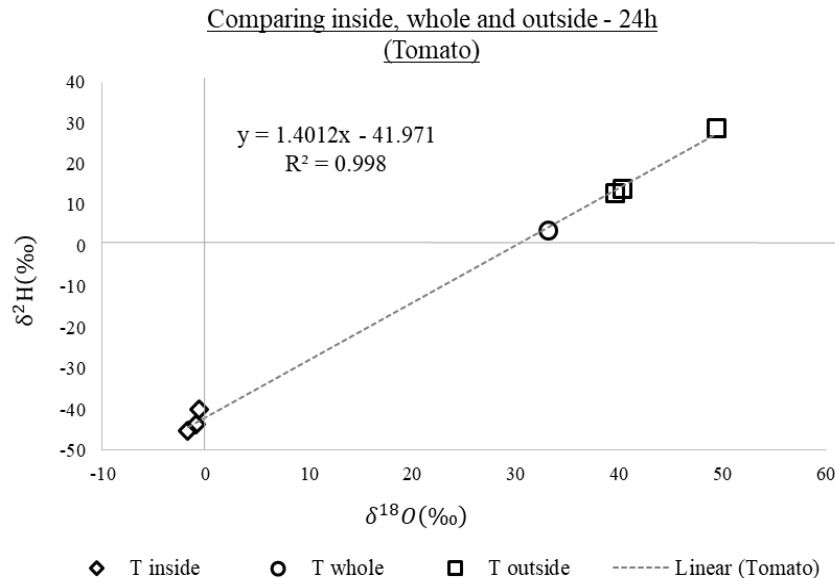
# Fruits



Outside (skin) of fruits was more enriched compared to inside, possibly due to contact with atmosphere



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Hard tomato skin seems to protect inside of fruit better than soft strawberry skin

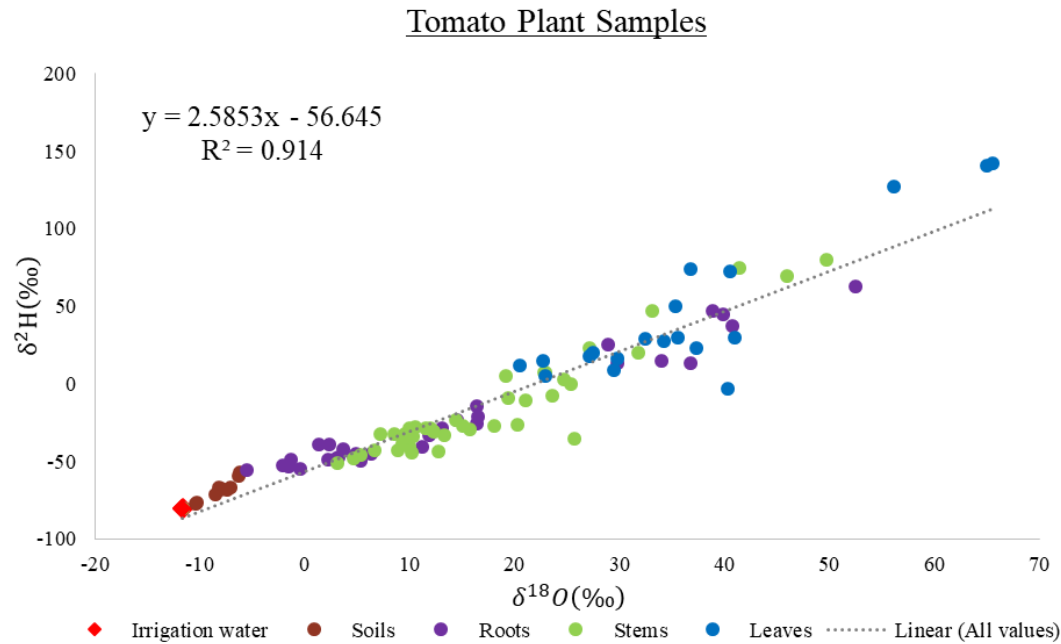
# Roots, shoots, leaves and fruits



Progression of isotope values as they continuously enrich during plant passage



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Plant samples linear regression originating from source water



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