

# WATER VAPOR MOVEMENT AND UTILIZATION WITH CONDENSATION IN THE UPPER LAYERS OF A SANDY SOIL COLUMN

SIMRAN SEKHRI, VOLKER KLEINSCHMIDT, ANNETTE ESCHENBACH, JOSCHA N BECKER  
 INSTITUTE OF SOIL SCIENCE, CEN CENTRE FOR EARTH SYSTEM RESEARCH AND SUSTAINABILITY, UNIVERSITÄT HAMBURG

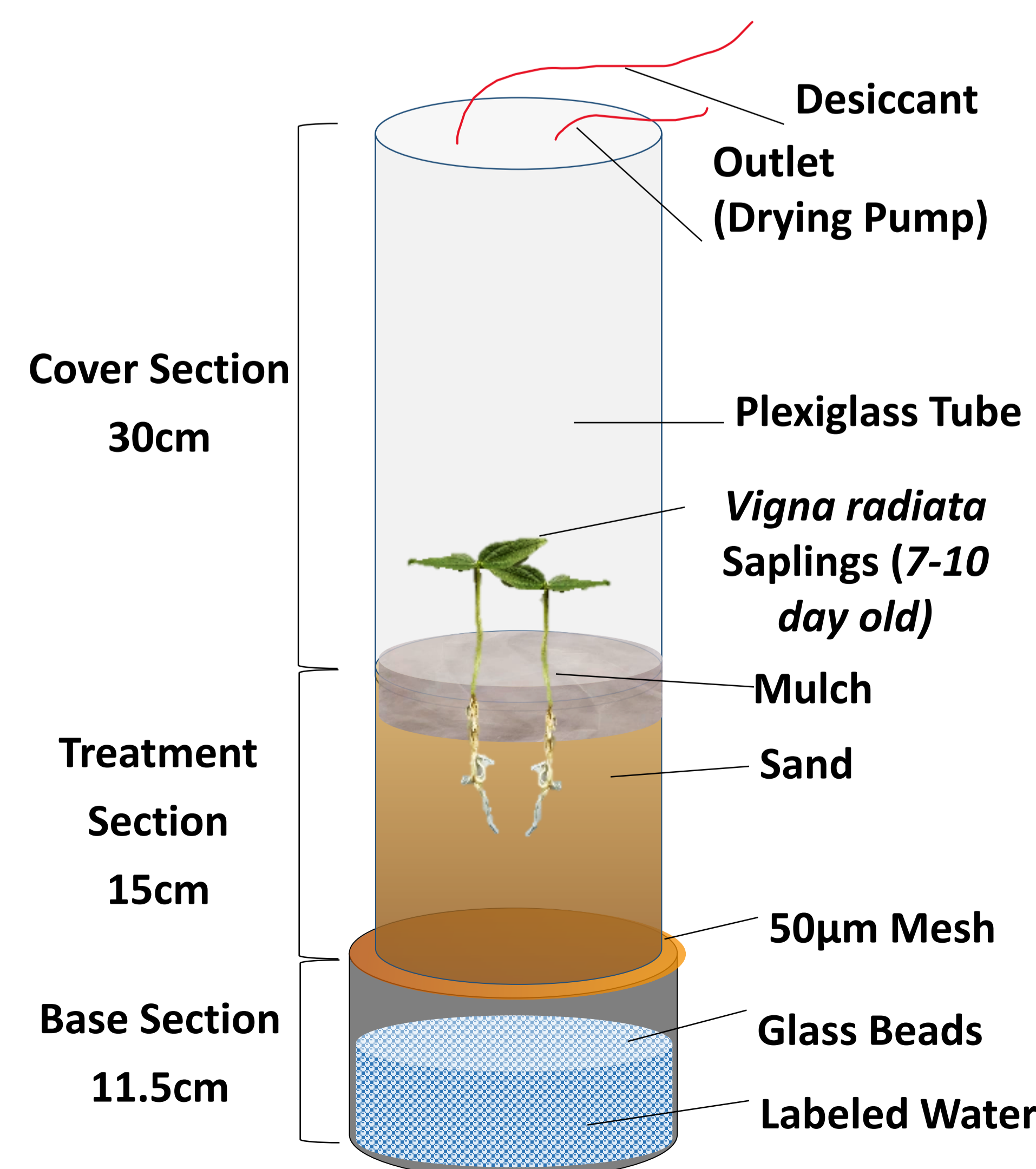
## 1. INTRODUCTION

- In semi-arid & arid regions prolonged dry spells lead to a significant reduction in topsoil moisture
- In sandy soils, dry soil layer is formed, where water can only move as vapor without much capillary rise
- Young crops with weakly developed root systems cannot directly reach deep water reservoirs
- Are plants able to acquire water from deep sources when water vapor condensates at night or at vapor barrier (eg: mulch)?

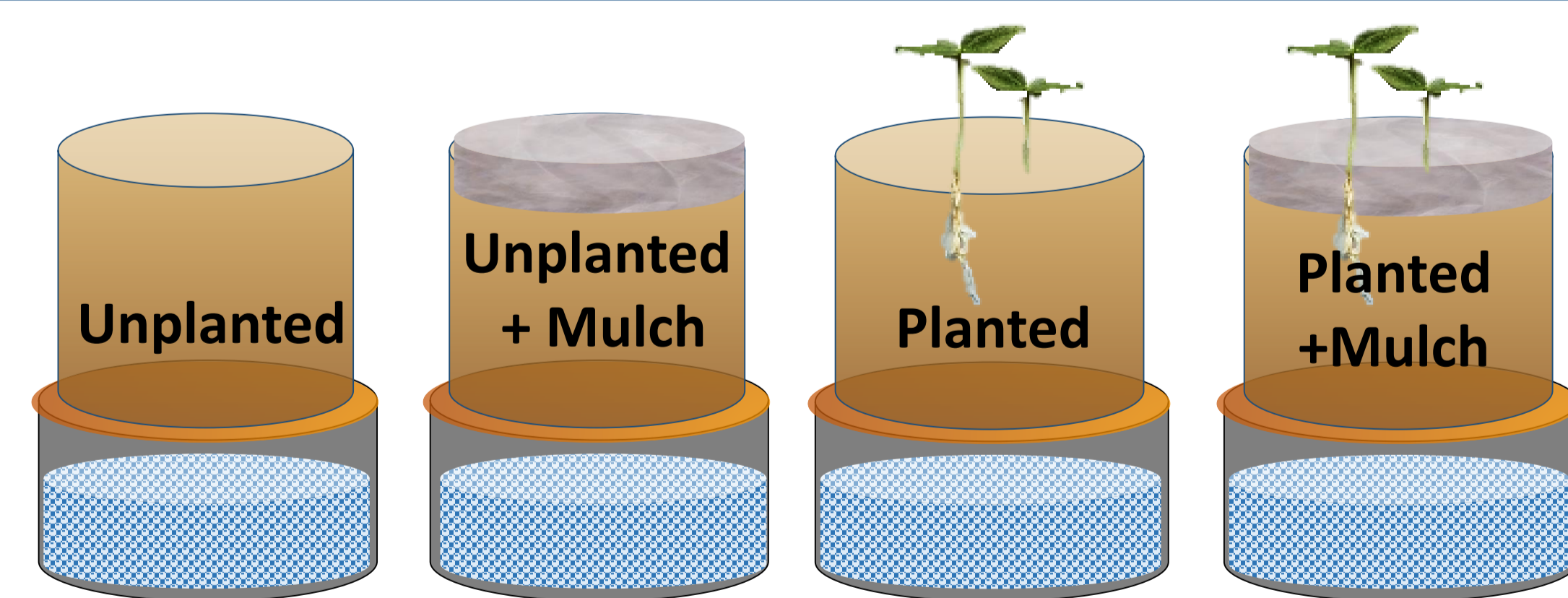
**Objective:** To trace and quantify the potential uptake of water vapor by young plant saplings

## 2. METHODS

A sand column experiment using  $D_2O$  labeled water was setup in a Poly Climatic Chamber



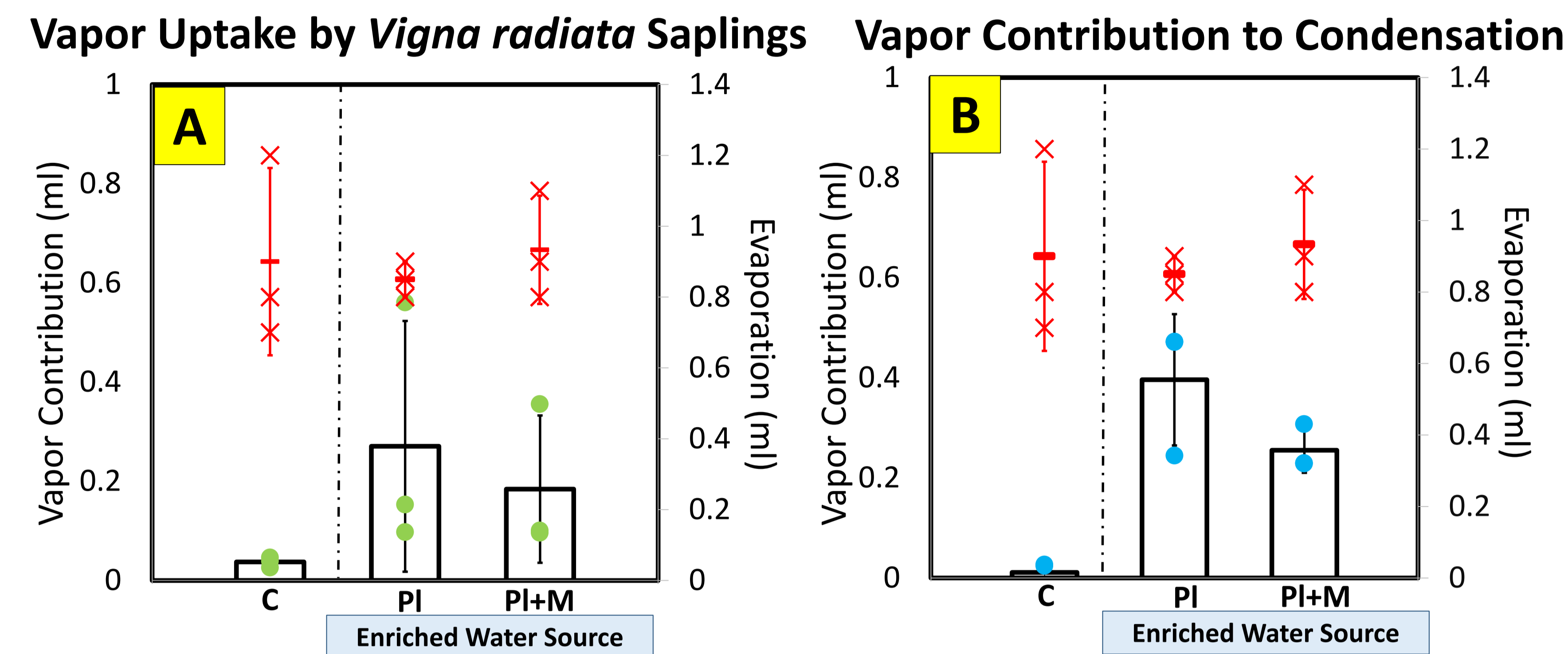
### Treatments



### Analysis

- 30°C day & 15°C night temperatures and undisturbed light conditions maintained for 7 days
- Constant air flow to ensure vapor deficit and to reduce foliar uptake of water vapor
- Cryoextraction of liquid water from the system
- ABB LosGatos Triple Isotopic Water Analyser used to trace  $D_2O$  signal strength

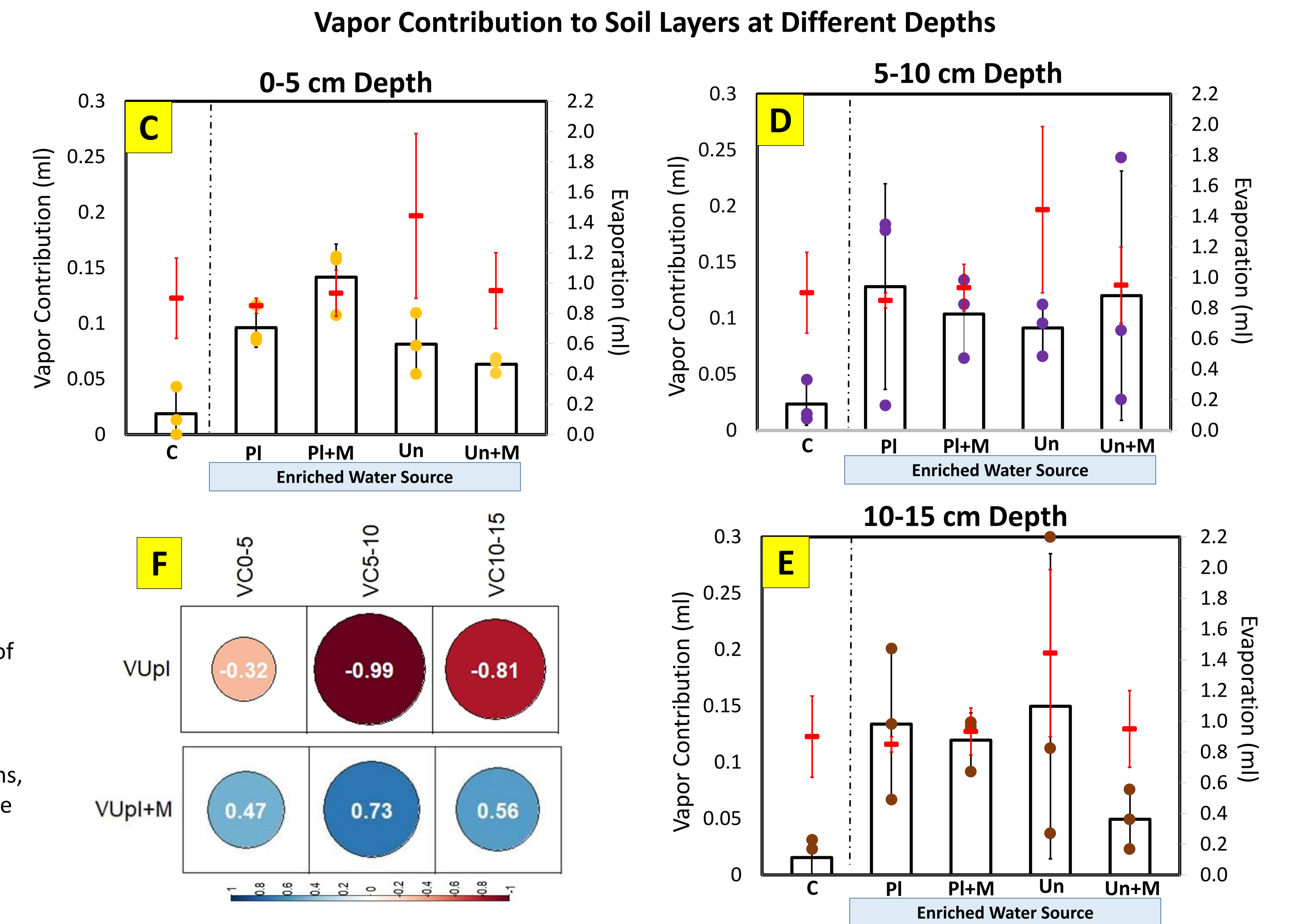
## 3. RESULTS



**Figure A & B** showcase results for the control (C), planted (PI) and planted + mulched (PI+M) treatments for the vapor uptake by saplings and vapor contribution to condensation respectively. X Mean Evaporation from Source. ● Vapor Uptake by *Vigna radiata* Saplings. ● Vapor Contribution to Condensation

**Figure F** highlights the correlation among the vapor contribution to upper soil layers and plant uptake of water vapor under mulched and un-mulched conditions. The colour gradient showcase the level of correlation, blue representing a positive and red represents the

negative relation. Under mulched conditions, a positive relation can be observed



**Figure C, D & E** showcase results for the control (C), planted (PI), planted + mulched (PI+M), Unplanted (Un) and Unplanted (Un) + Mulched (Un+M) treatments for the vapor contribution to different soil depths of 0-5 cm, 5-10 cm and 10-15 cm. — Mean Evaporation from Source. ● Vapor Contribution to 0-5 cm Soil Layer. ● Vapor Contribution to 5-10 cm Soil Layer. ● Vapor Contribution to 10-15 cm Soil Layer

## 4. CONCLUSION and OUTLOOK

- Young *Vigna radiata* saplings were able to take up water vapor from the bottom water source
- Mulch enhances vapor condensation in upper soil layers
- Further research could focus on the extent of prolongation of plant life during dry spells

Abstract QR (OSPP)



Contact: [Simran.Sekhri@uni-hamburg.de](mailto:Simran.Sekhri@uni-hamburg.de)

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