Functional role of ammonium and nitrate in regulating transpiration for mass-flow acquisition of nutrients in *Phaseolus vulgaris* L.

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Outline

- Introduction
- Material and methods
- Preliminary results
- Discussion
- Conclusion
- Acknowledgements

Introduction

- Plants transpire up to 95 %, retaining less than 5% for cell expansion and plant growth.

- Transpiration serves in leaf cooling, maintaining turgor pressure, power solute transport from root to shoot *via* xylem, and driving mass-flow movement of soil nutrients through the soil to the root surface.

- Mass-flow acquisition may be a key functional role of transpiration, which is regulated by nitrogen availability.

- Whilst nitrogen is now known to regulate transpiration and mass-flow nutrient acquisition, the role of different N forms [ammonium (NH_4^+) or nitrate (NO_3^-)] remains unclear.

Cont…

Objectives :

- The main objective is to determine whether NH_4^+ or NO_3^- regulate the rate of transpiration, and consequently mass-flow acquisition of nutrients by Phaseolus vulgaris L.

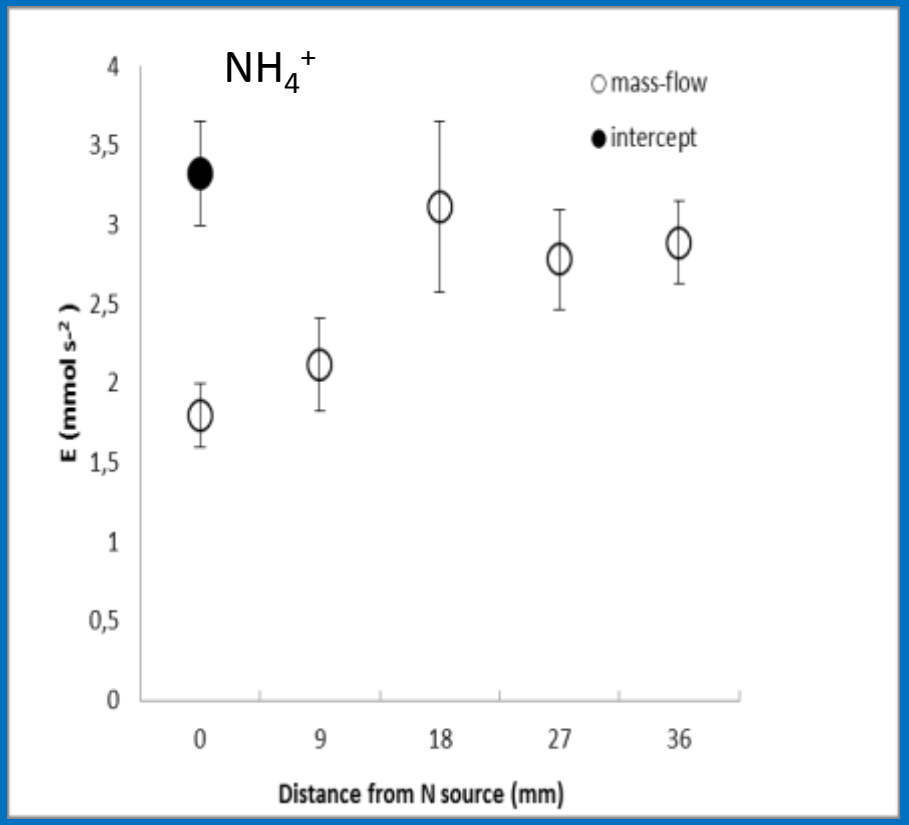
Specific objectives are :

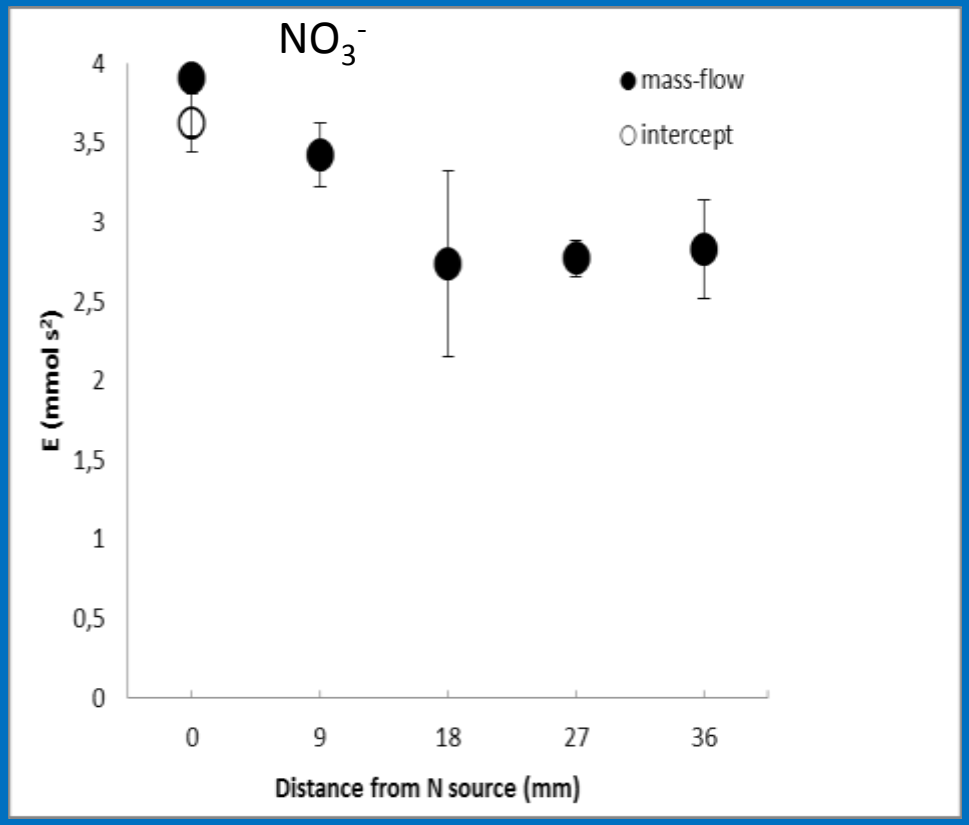
- to determine the functional role of NO_3^- and NH_4^+ on plant water fluxes and mass-flow acquisition of nutrients in P. *vulagaris* L.

- to evaluate plant water fluxes and mass-flow acquisition of nutrients in P. vulgaris L when supplied with NH_4^+ and NO_3^- at varying distances from the roots.

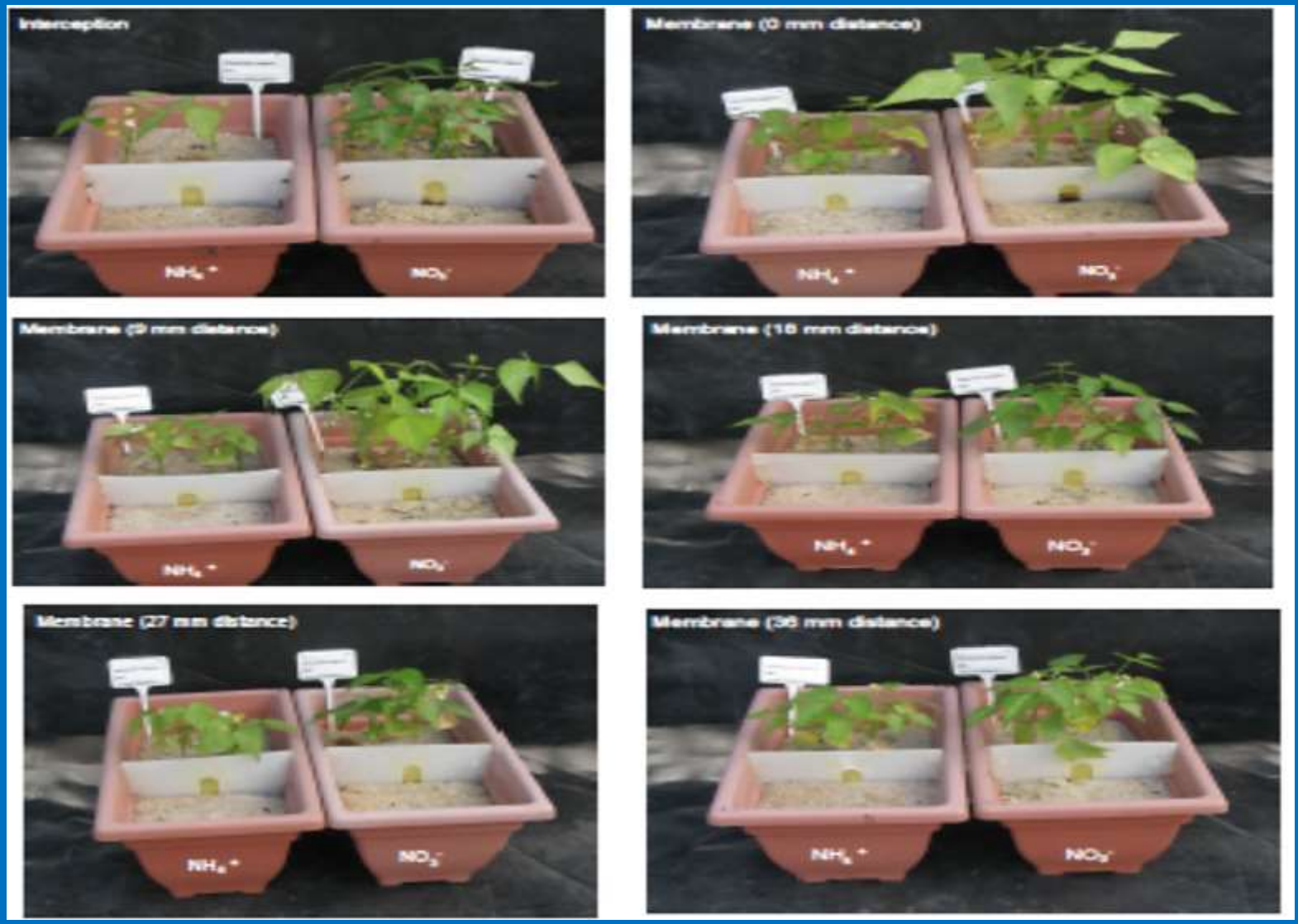
Cont…

Preliminary results

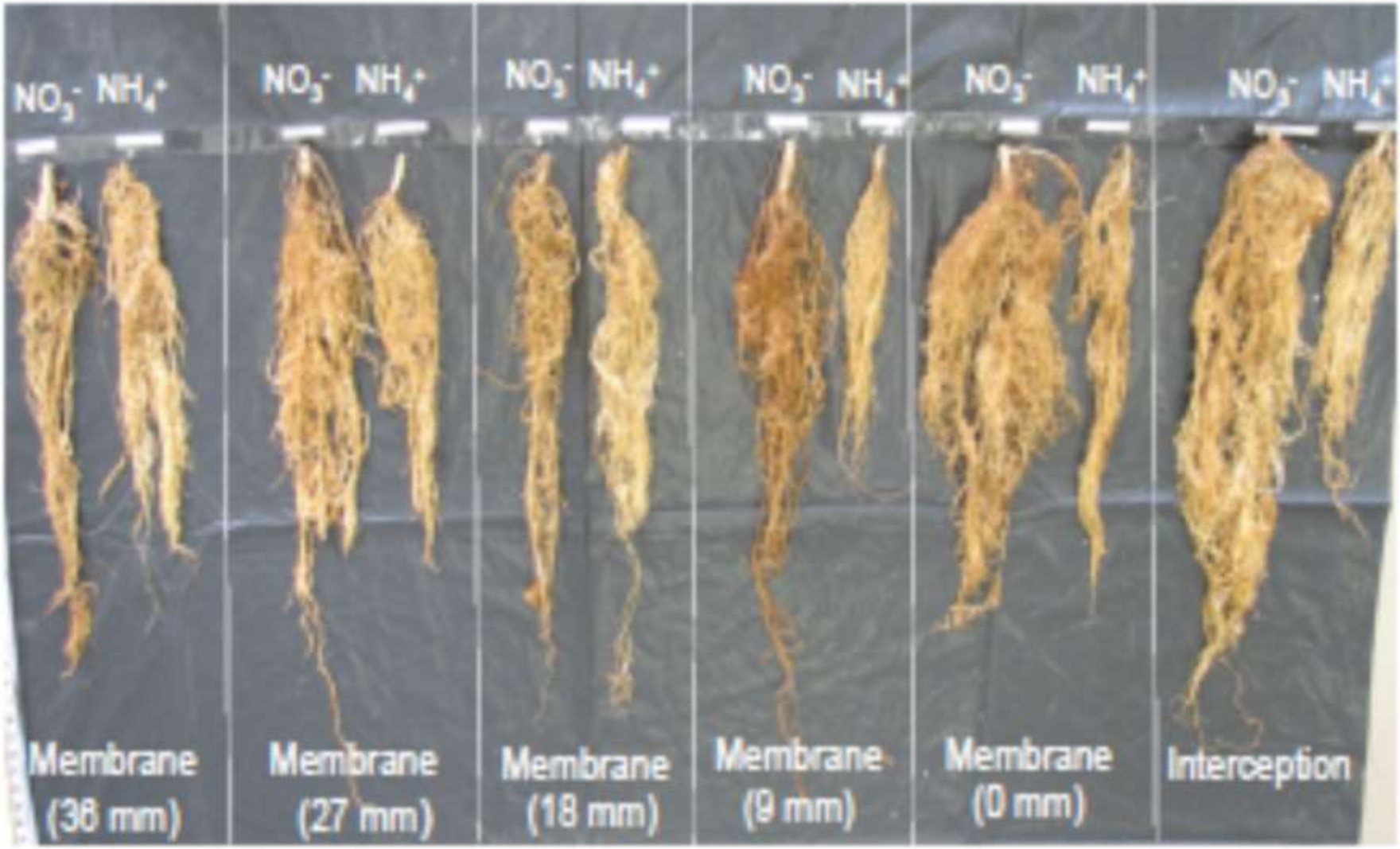




Cont…


Interception
Membrane (0 mm distance)
Membrane (9 mm distance)
Membrane (18 mm distance)
Membrane (27 mm distance)
Membrane (36 mm distance)

Cont…


NO_3^- NH_4^+
Membrane (36 mm)
Membrane (27 mm)
Membrane (18 mm)
Membrane (9 mm)
Membrane (0 mm)
Interception

Discussion

- Defoliation of NH_4^+-fed plants with increased access to the nutrient (‘interception’).

- NO_3^- fed plants that were distant from the nylon mesh must have down-regulated their transpiration rates to minimize further water loss.

Cont…

- NH_4^+-fed plants did not show control of stomatal opening.

- Foliar nutrient assays (in progress) will reveal the role of N in regulating acquisition of other nutrients from the soil.

- Study has implication on plant physiology especially in a global environment where CO_2 levels may influence stomatal regulation.

Conclusion

- Increased distances of NO_3^- source seem to cause plants to shut down their stomata apertures.

- However, NH_4^+ fed plants lack the mechanism to down regulate their water fluxes and as a result the display the ‘ammoniacal syndrome’.

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THANK YOU !!!

QUESTIONS ????