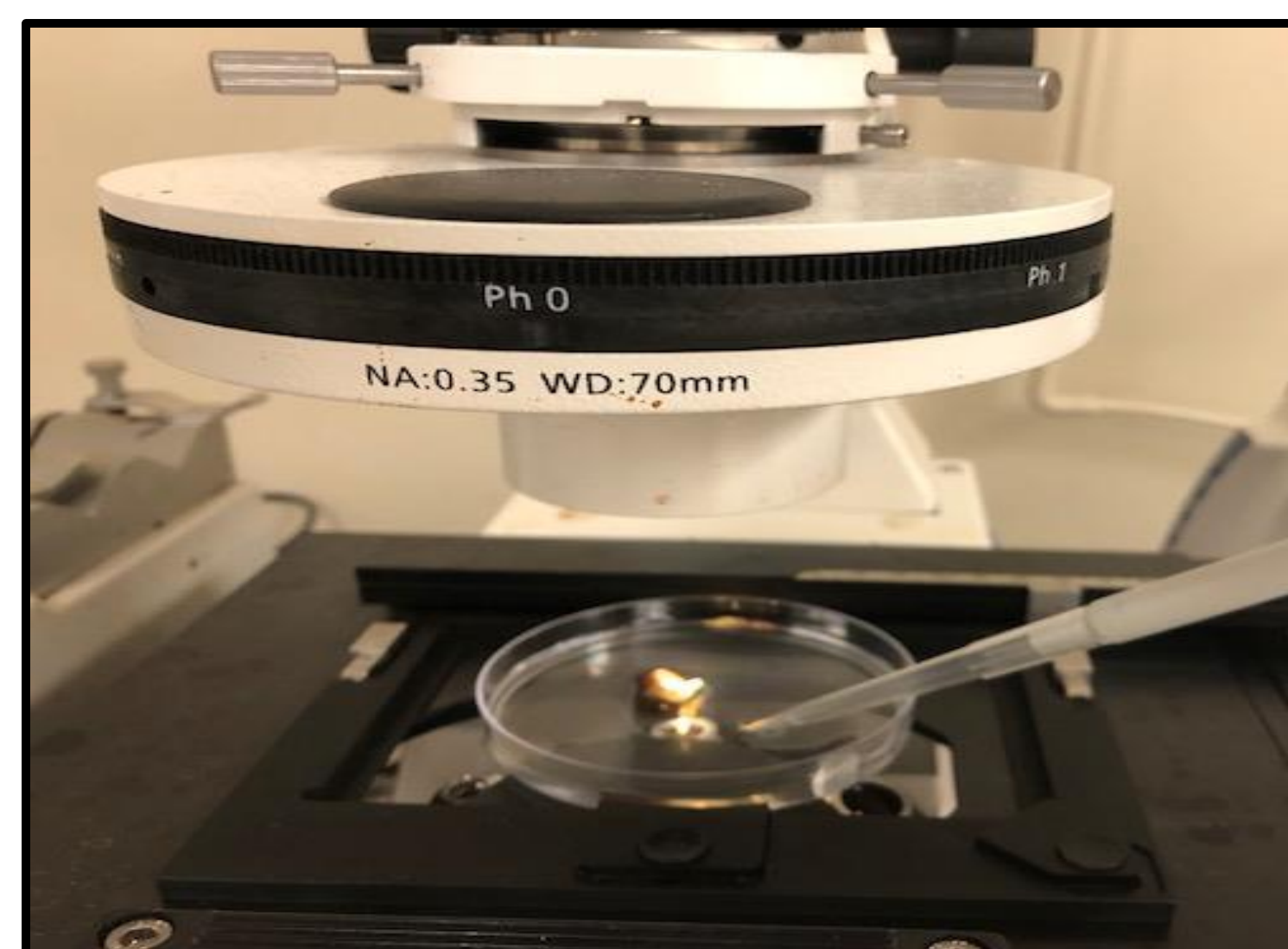


INTRODUCTION

Root hairs are lateral extensions of epidermal cells and constitute up to 60% of the root surface¹. If grown in abiotic stress conditions, such as phosphorous (P) and nitrogen (N) deficiency, root hairs show distinctive phenotypes that are linked to improved nutrient acquisition². These phenotypes are typically observed and evaluated after 1-2 weeks of stress treatments^{3,4}. The presented experimental system aims at evaluating responses of root hairs at the radicle stage (3-4 days after planting) to N- and P- stress to quantify responses in early development.

ROOT GROWTH PROTOCOL

- Hydro-priming is applied to seeds.
- Each seed is placed within shredded stonewool fiber.
- Seeds germinate under imposed P- and N- stress as well as in non-limiting conditions using specialized hydroponic solutions⁵.
- Roots are grown to radicle stage (3 days) in growth chambers at 27°C.



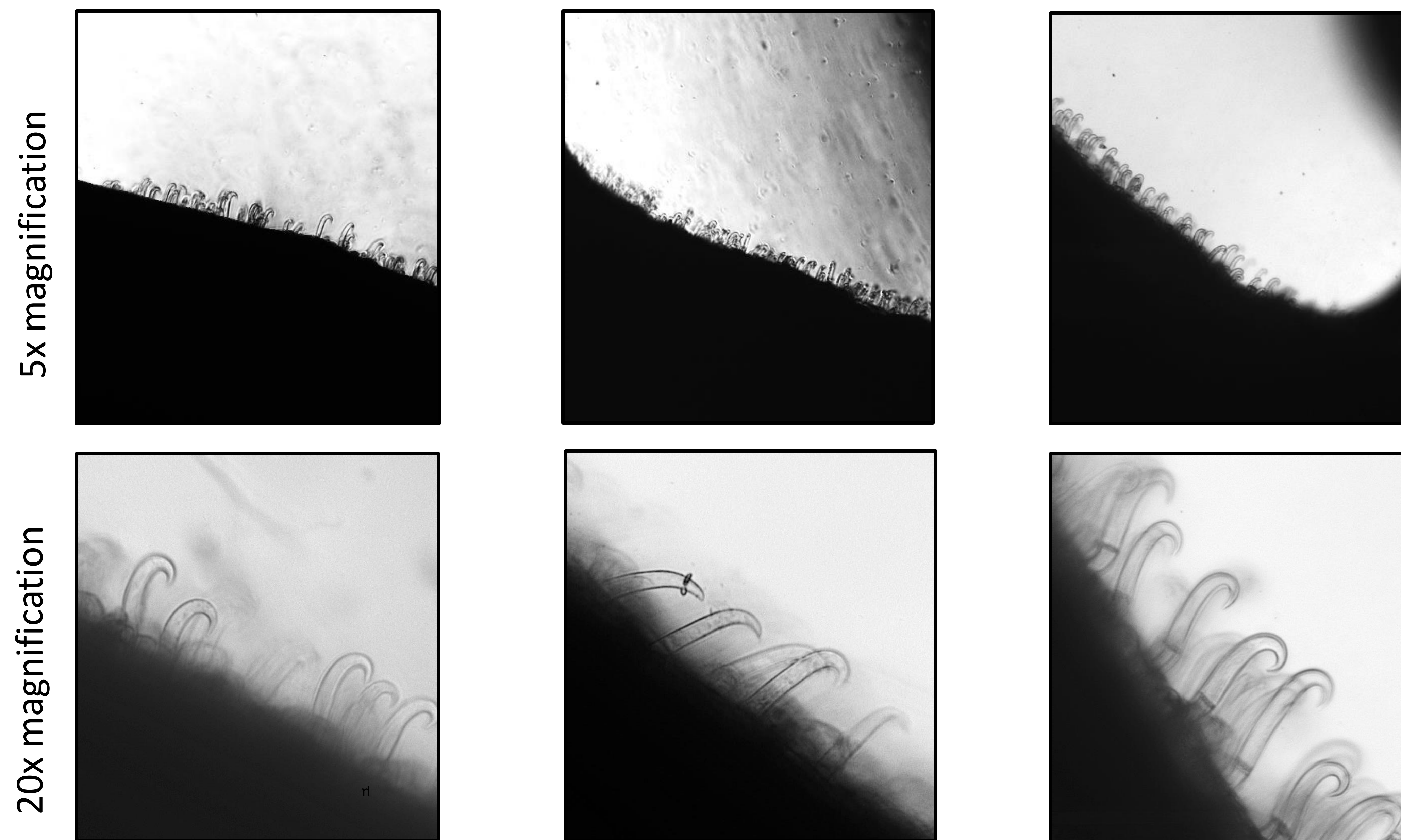
MICROSCOPY

- Root hairs are imaged with a Zeiss inverted microscope.
- Radicles are placed in a Petri dish.
- Root hair images are captured at 5x and 20x magnification.

REFERENCES

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OBSERVATIONS IN DOR 364



N-Stress: $0.121 \frac{\text{root hair}}{\mu\text{m}}$

- Density decreased
- Heterogeneous length

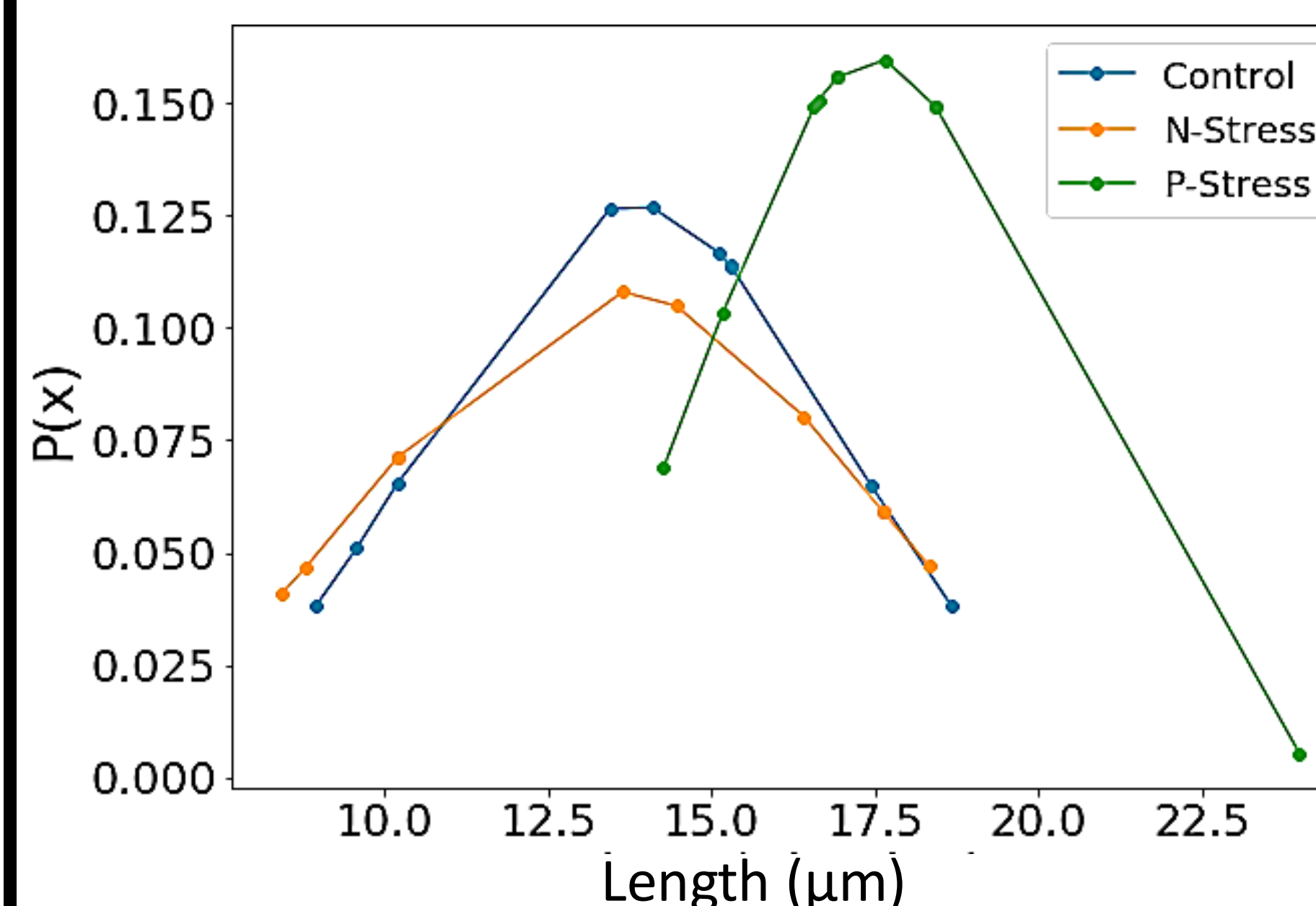
Control: $0.144 \frac{\text{root hair}}{\mu\text{m}}$

- Bending of root hairs is consistently observed.

P-Stress: $0.153 \frac{\text{root hair}}{\mu\text{m}}$

- Density increased
- Homogeneous length

PDF's for root hair length



*Measured for the ten longest root hairs

FUTURE CHALLENGES

- Develop an imaging pipeline to automatically quantify variation in the hook phenotype in terms of length, density and bending curvature of root hairs.
- Quantify differences in trait variation across N- and P-stress within and among several genotypes.
- Study rapid response of root hairs when N- and P-stress is removed.



Ankita Roy

Ph.D. candidate at University of Georgia
Dept. of Plant Biology, Bucksch Lab
Contact: Ankita.Roy@uga.edu

706-248-8397