

Alternative Approaches to Cotton Seed Germination Under Low Moisture Conditions

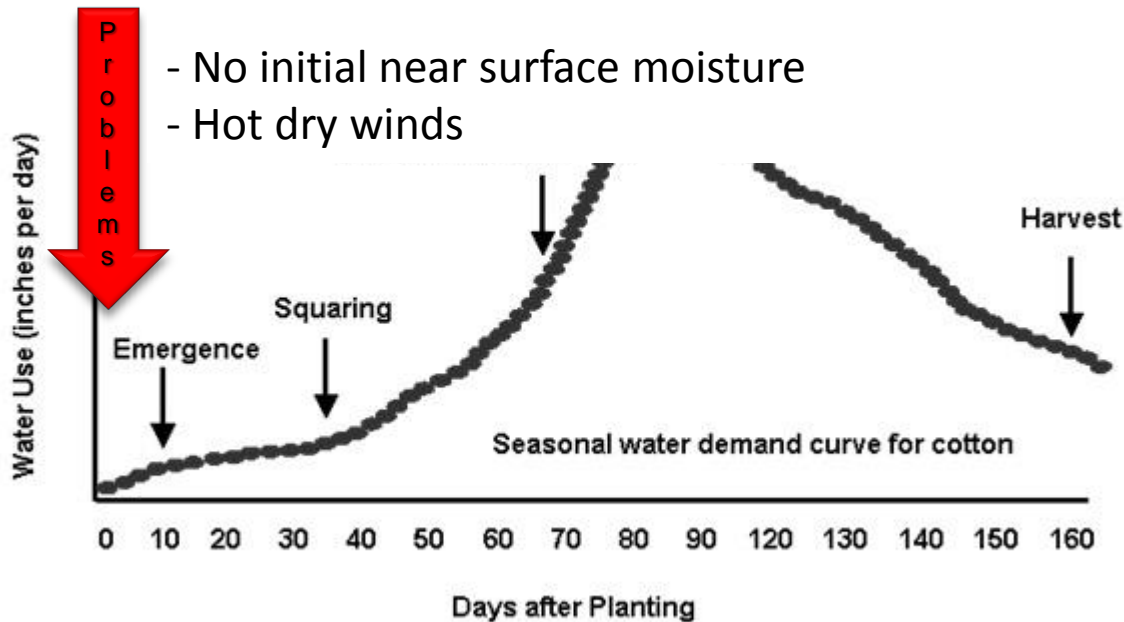
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Cotton Agronomy and Physiology

Dan McDonald¹, Kater Hake², Jin Han¹, Ron Michaels¹

¹Phenotype Screening Corporation

²Cotton Incorporated

West Texas Drought Driving Grower Innovation



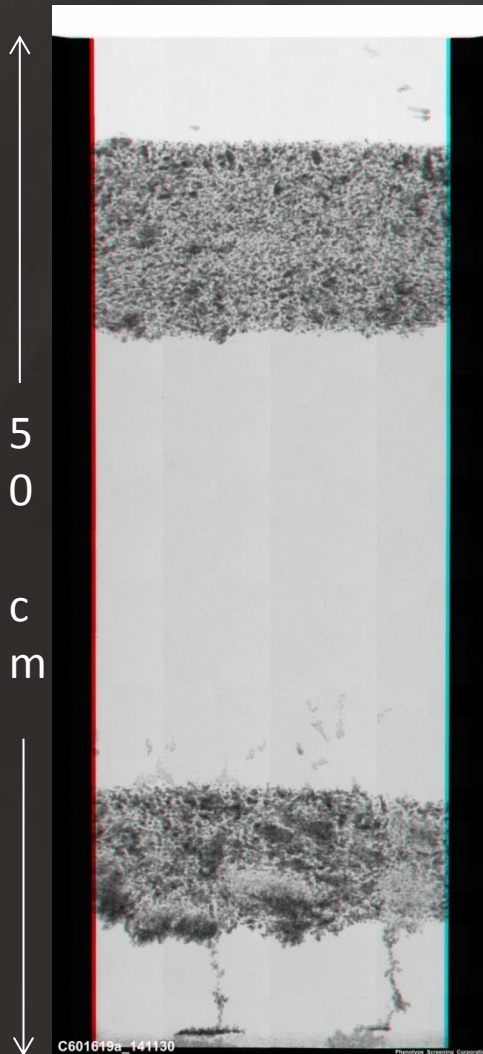
Can we accelerate germination and seedling taproot elongation?

Experiment Methods

- Normal and Dehulled Cotton Seeds Were Treated Prior to Planting
 - The seeds were then germinated under adequate moisture in PSC root lab growth media.
 - A severe moisture profile was used to simulate extreme west Texas cotton growing conditions. (see next slide)
 - The media was allowed to dry over the course of the experiment introducing extreme moisture stress at some depth profiles

Initial Moisture Profile Used to Simulate West Texas Moisture Conditions

Very little make up water was added to keep substrate in a low moisture state.



~ 10% Moisture by volume,
simulating recent rain fall.

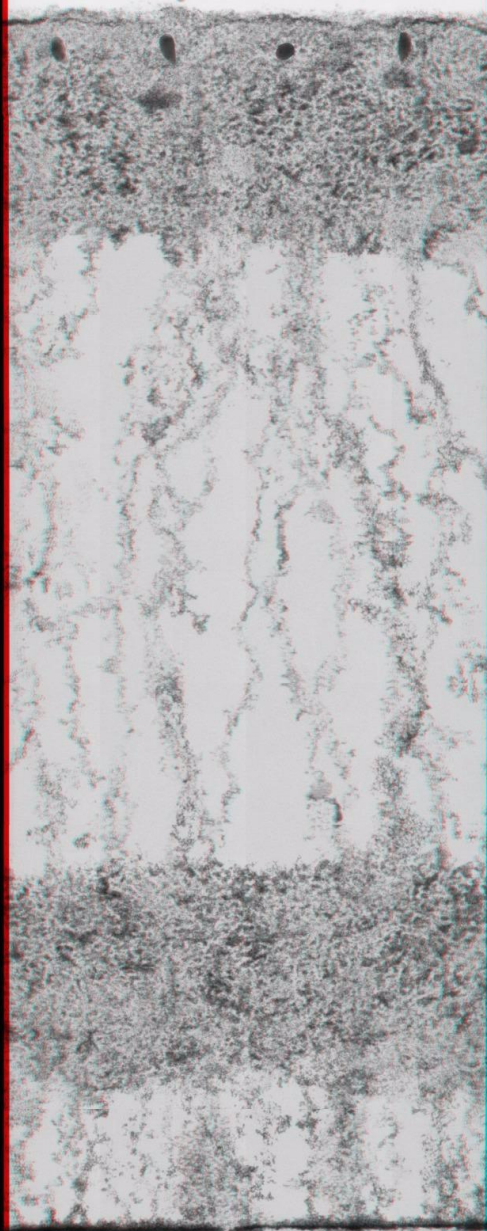
By end of experiment this region
was at 1% moisture by volume.

~ 10% Moisture by volume,
simulating submerged drip
irrigation.

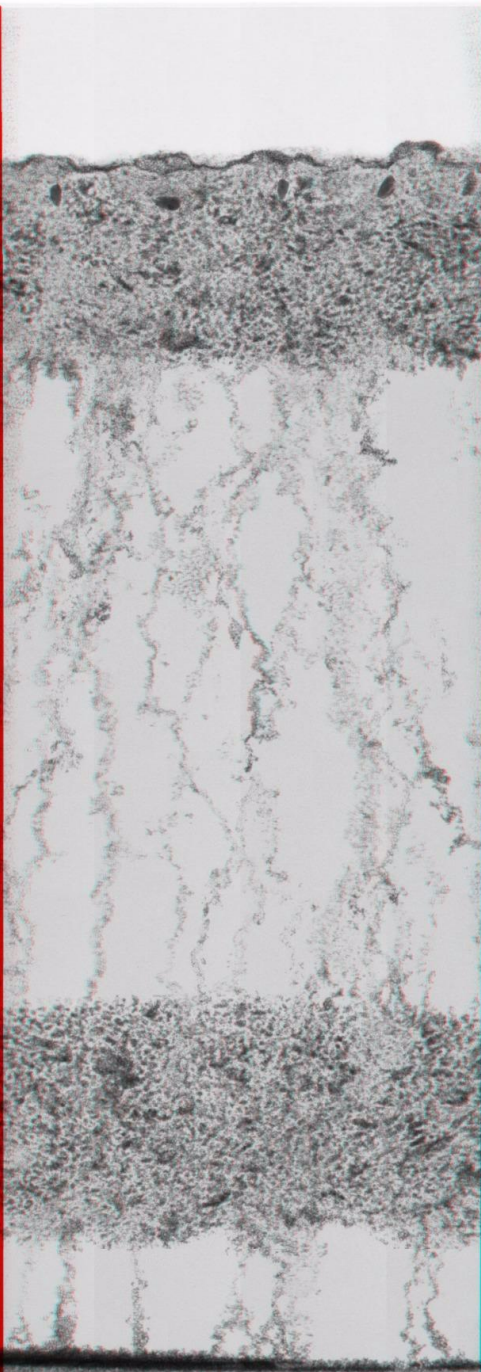
Seed Treatments

Normal seeds	Decorticated seeds
No treatment	No treatment
Commercial Treatment One	Commercial Treatment One
Commercial Treatment Two	
Commercial Treatment One Plus Polymer Coating	Commercial Treatment One Plus Polymer Coating

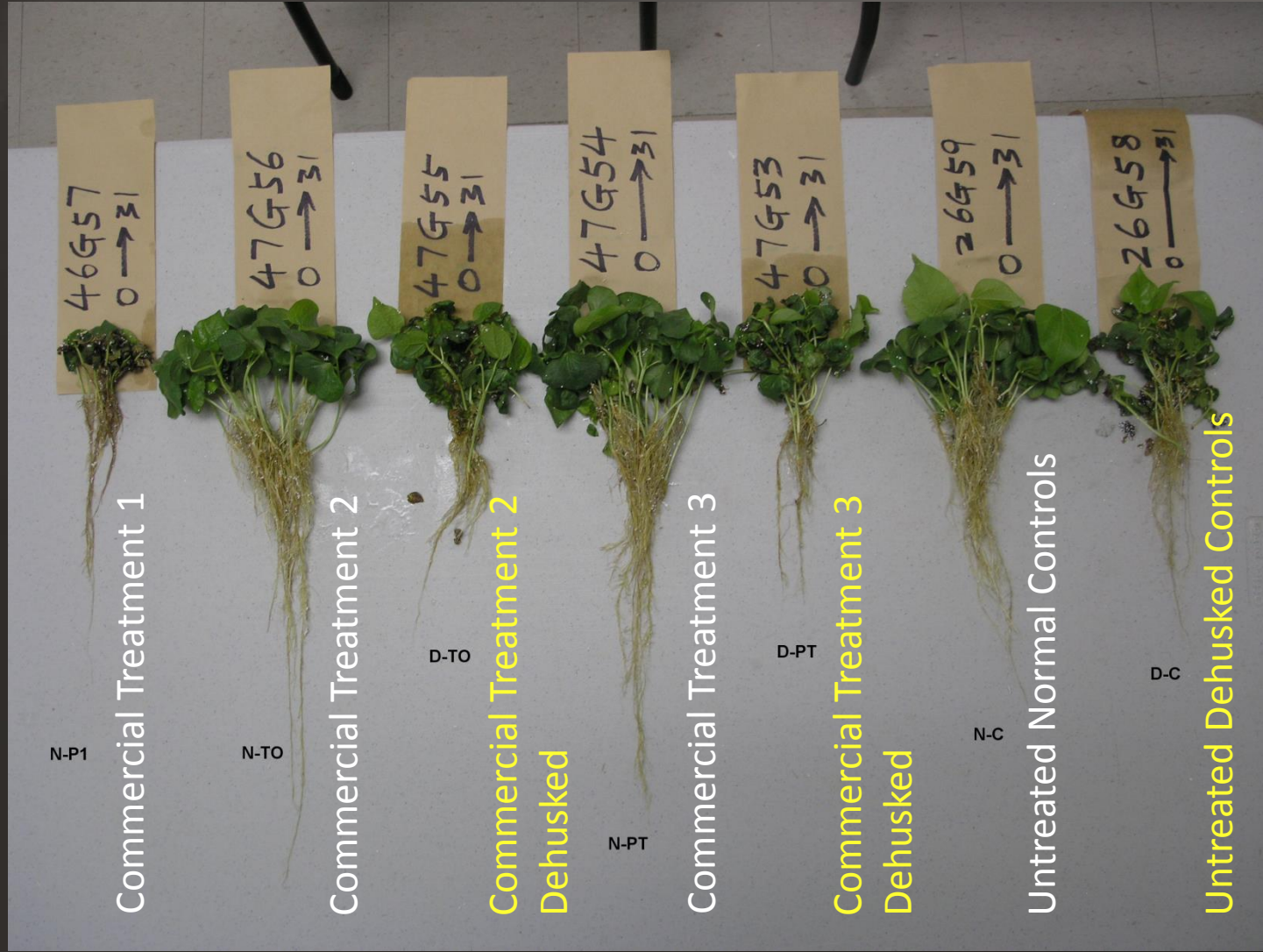
Cotton Seedling Development (1st 15 days) with Commercial Seed Treatment



Cotton Seedling Development (1st 15 days) Dehulled with No Commercial Seed Treatment



Overview of all test samples and treatments at the end of 15 days



Hull Removal is Common Practice in Downstream Cotton Seed Processing

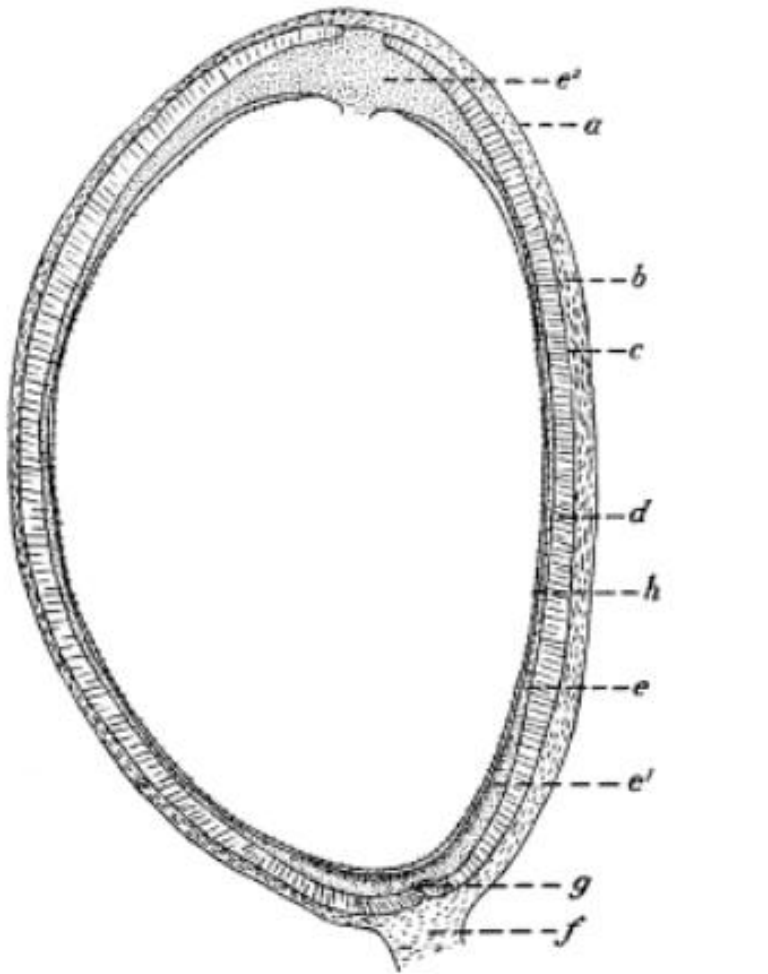


Delinted Cotton Seeds

Decorticated Cotton Seeds

Seeds were of a conventional glandless variety "Acala GLS."
Decortication was via cryogenic dehulling.

Cotton Seed Coat



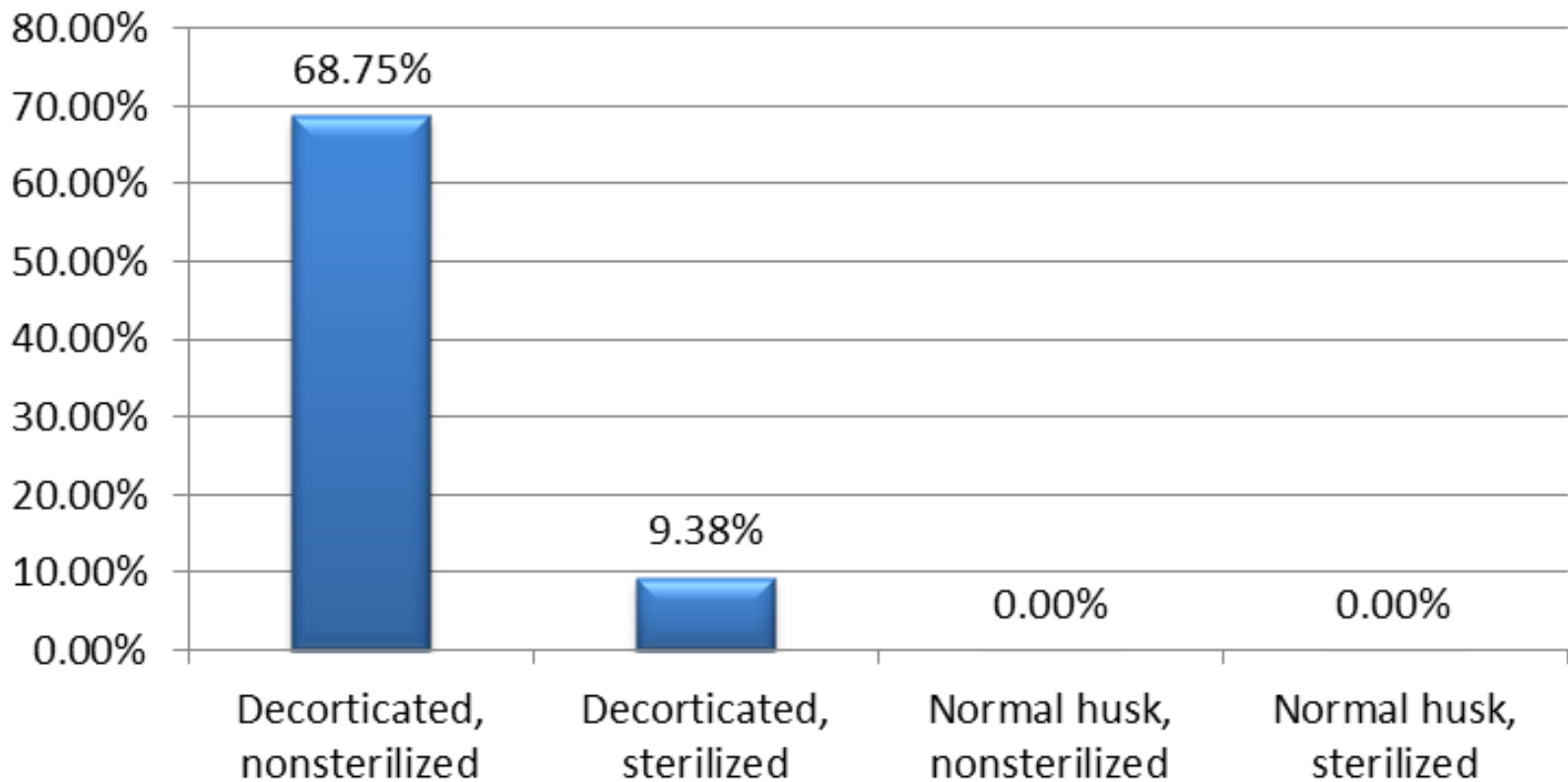
- Chalazal cap
- Epidermis
- Outer Pigment
- Colorless
- Palisades
- Fringe
- Inner pigment
- Differentiated inner pigment
- Micropyle
- Funiculus

“The structure of the micropyle and chalaza appear to be of importance in interpreting some of the physiological phases of seed germination.”

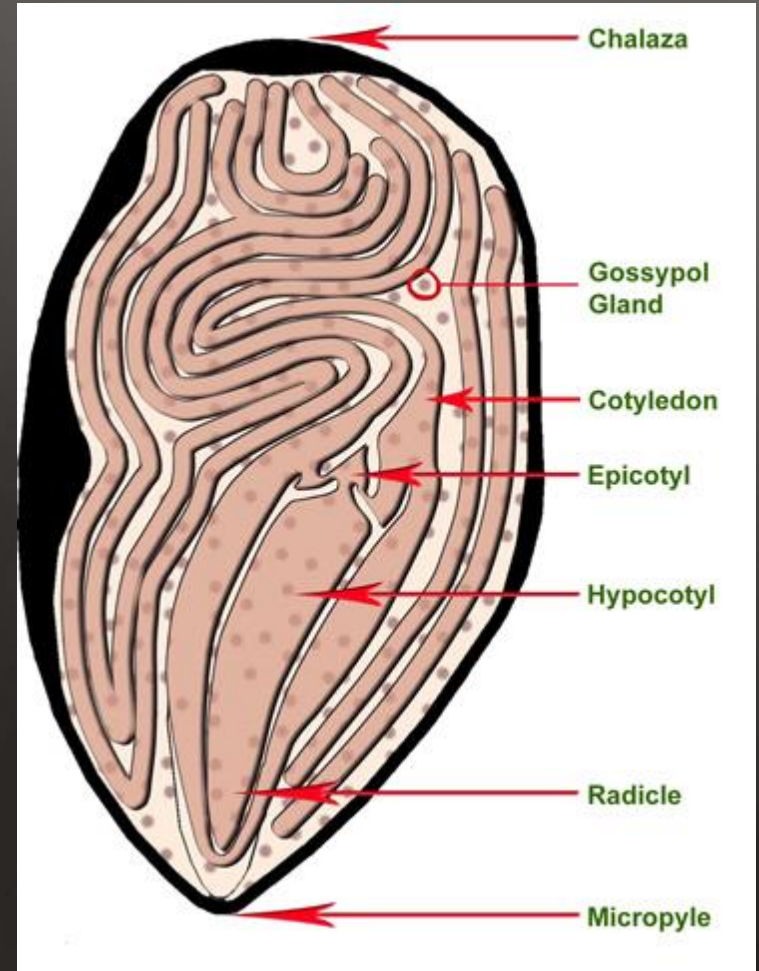
The variations in the structure of the micropyle and chalazal regions appear important as points of water absorption and gas exchange and as focal points of infection.

Decorticated Seeds Are More Susceptible to Fungal Contamination

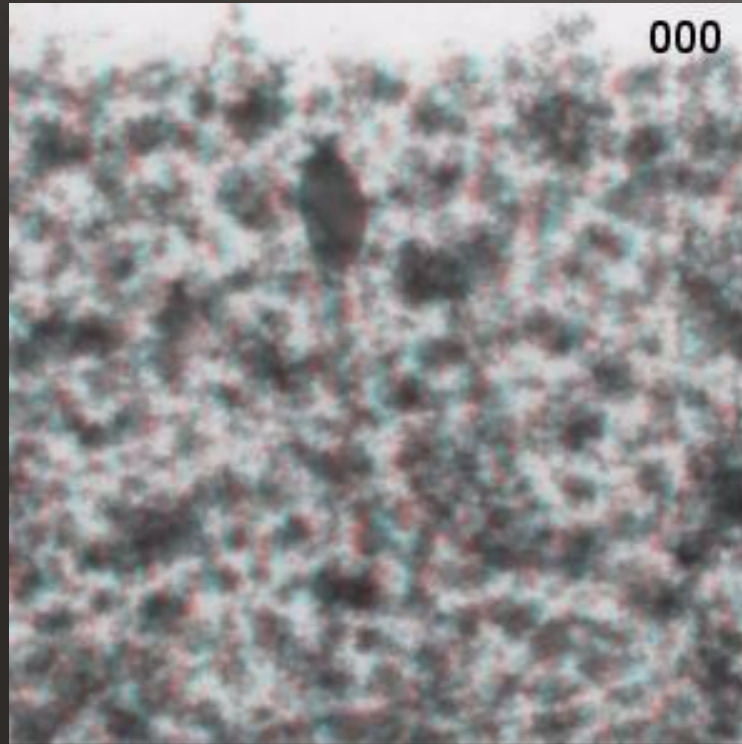
Percent Fungal Contamination



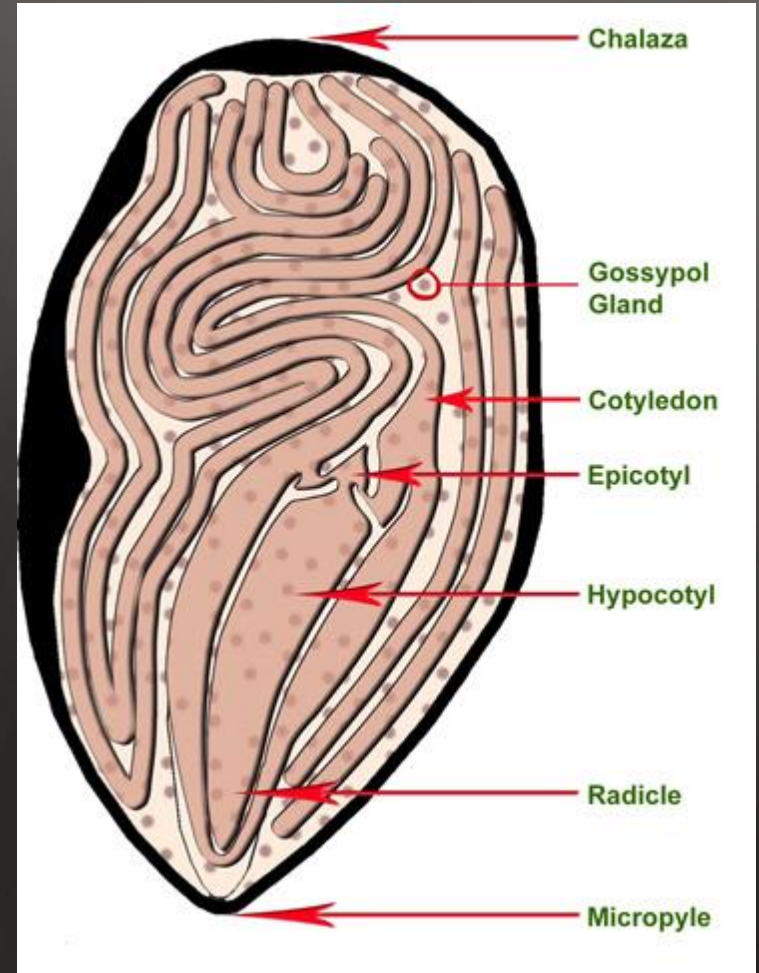
Internal Structure of Cotton Seeds



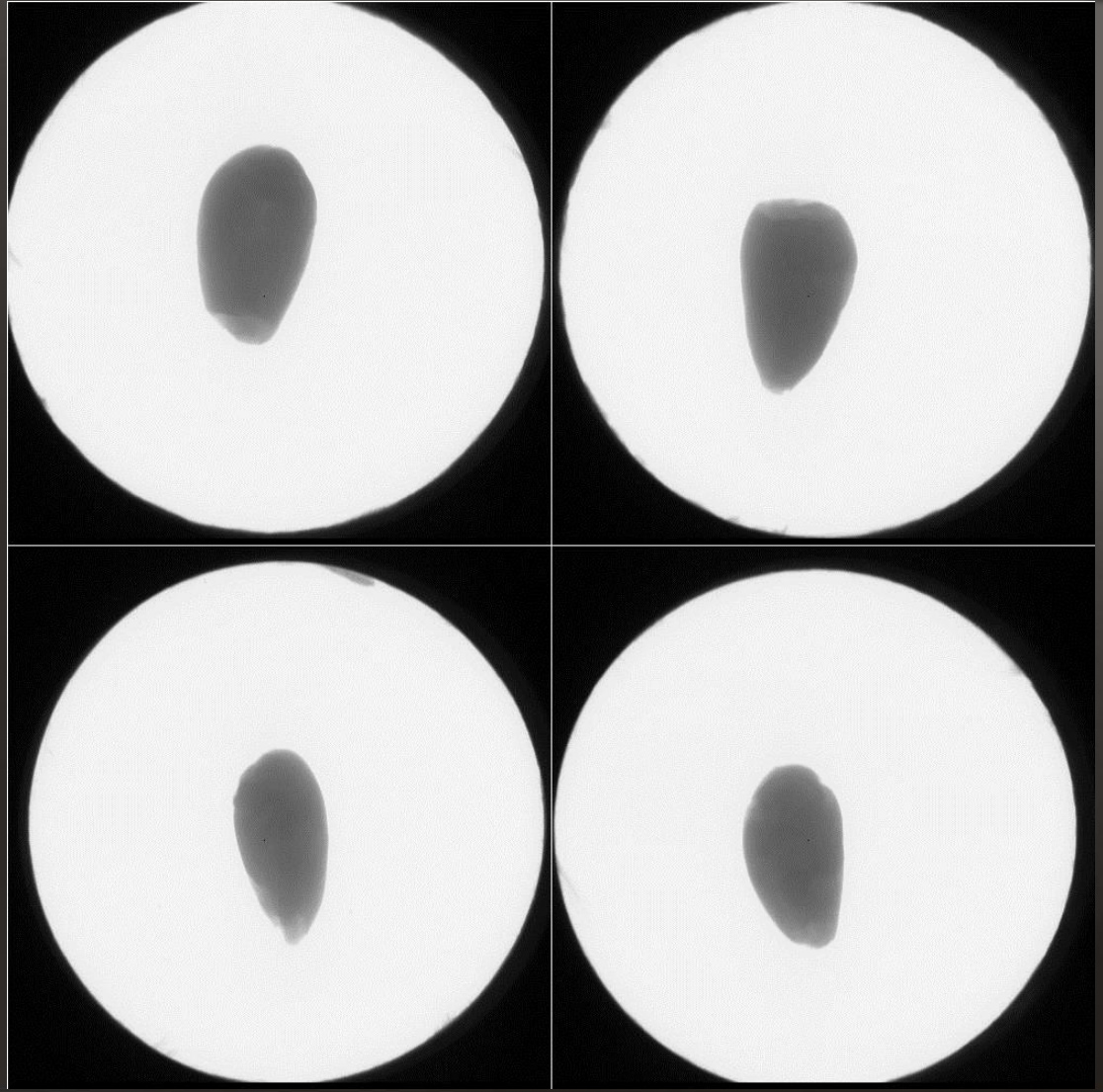
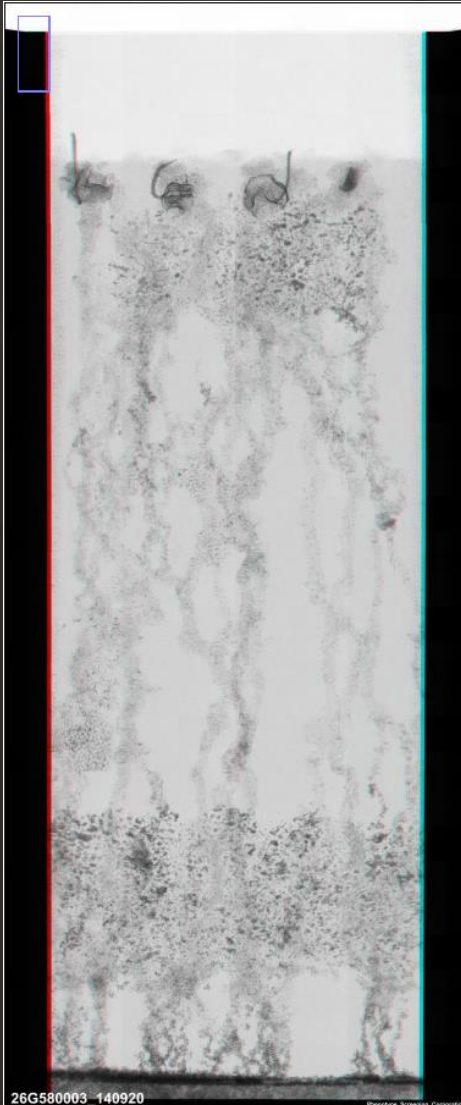
Decorticated Cotton Seed Germination and Emergence in Eight Hour Increments



X-ray Imaging of Cotton Seeds



Damage to Radicle Accounts for Loss of Gravitropism & Some Root Stunting



Can Decortication Process Be Improved?



Conclusions

- Seed Treatments Can Improve Root Elongation Even Under Low Moisture Conditions
- Decorticated Seeds Are More Vulnerable to Pathogens
- Decorticated Seeds Are More Susceptible to Radicle and Cotyledon Leaf Damage.
- Testa Water Regulation May Not Be As Critical to Seedling Development
- Treatment Formulations May Require Adjustments For Use on Dehulled Seeds
- Premature Leaf Unfurling May be Limiting Factor With Decorticated Seeds