

Mechanisms of accelerated germination of *Astragalus utahensis* with *Alternaria* and *Aspergillus* fungi.

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Seed Germination

- Definition: "...the metabolic awakening of the latent seed and resumption of developmental processes."

Vasquez-Ramos, 2003

- Primary Step

- Speed in germination allows establishment
- Germination in xeric environment Evenari, 1962
 - optimal moisture
 - fast germination
 - seed bank
 - habitat restriction

Astragalus utahensis Utah milkvetch

- Family:
 - Fabaceae
- Genus: Rios & Waterman, 1997
 - Wide Distribution
 - Toxicity
 - Great Basin & Diversity
- Species: Barneby, 1964
 - perennial
 - non-toxic
 - herbaceous taproot
 - xerophyte



Astragalus utahensis-by: Bob Skowron, www.RMRP.com

The Fungi

- **Alternaria** Rotem, 1994

- Ubiquitous
- Parasitic or Saprophytic
- Dematiaceous hyphomycete
- Optimal growth:
 - Damage encouraging leaching.



Fungal photos by:
George Barron,
University of Guelph

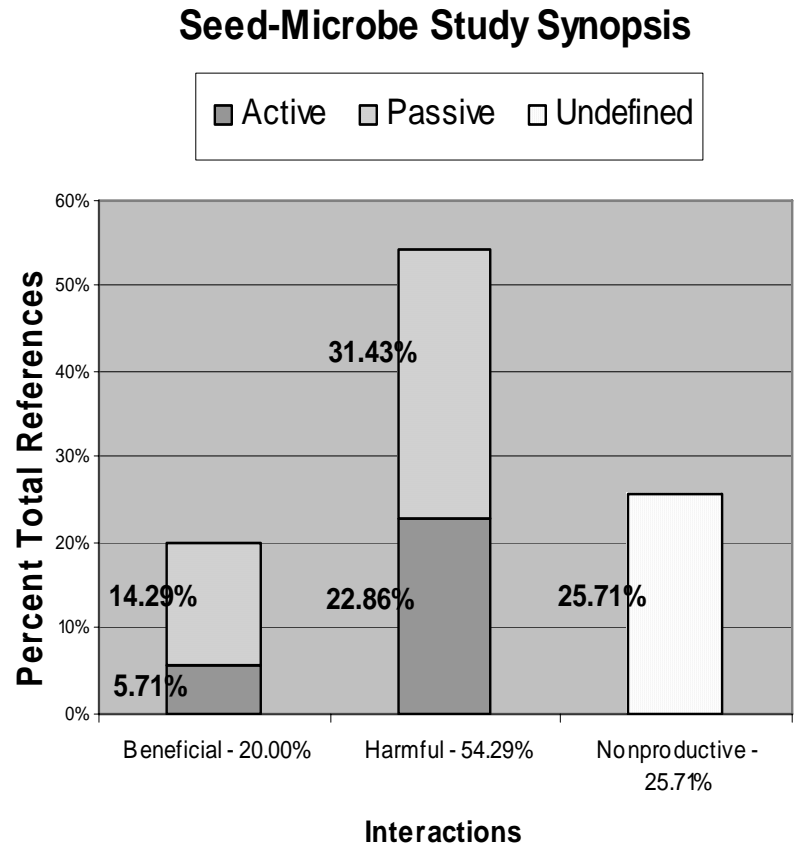


- **Aspergillus** Cotty et al., 1994

- Ubiquitous
- Saprophytic
- Aflatoxins
- Wide range of plant diseases
- Optimal growth:
 - Dry, droughty

Findings in the Literature

- 25 studies with 35 references to seed/microbial interactions
- Fungi dominate these interactions; 68% (approx. 24 of the 35 references)
- Beneficial interactions are a total minority participant; 20% (only 5 Fungal references; 1 study linked to test fungi)
- 35 references with only 1 linked to beneficial interactions by the test fungi; 3%.



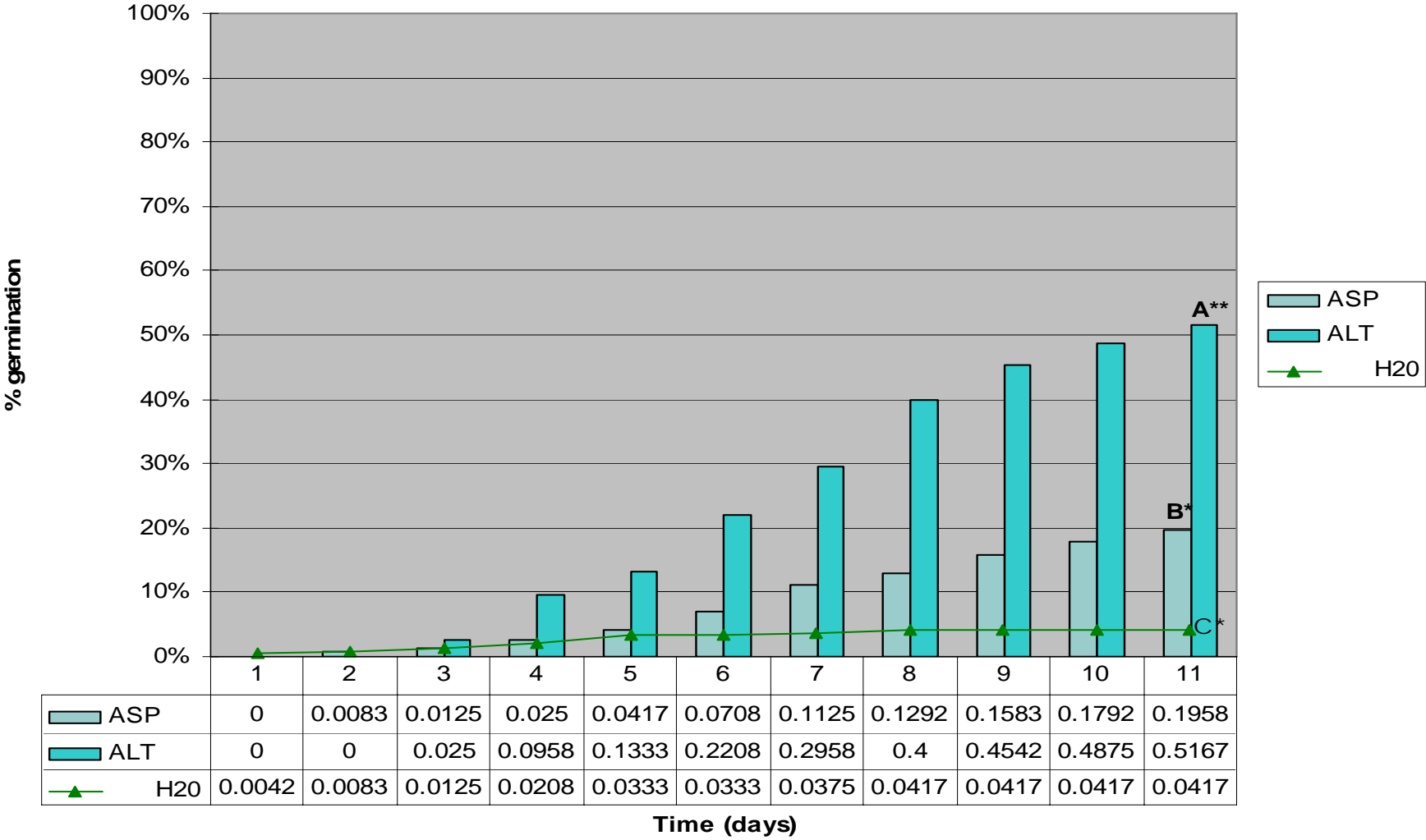
Materials and Methods

- Confirm response
 - Direct Inoculation
 - Scarify- 98% H₂SO₄.
 - Inoculate with spore solution.
 - Record germination.
- 2 test confirmations
- 1st generic-spore count
 - 2nd precise-spore count equal to 1.0x10⁶ sprs/mL.

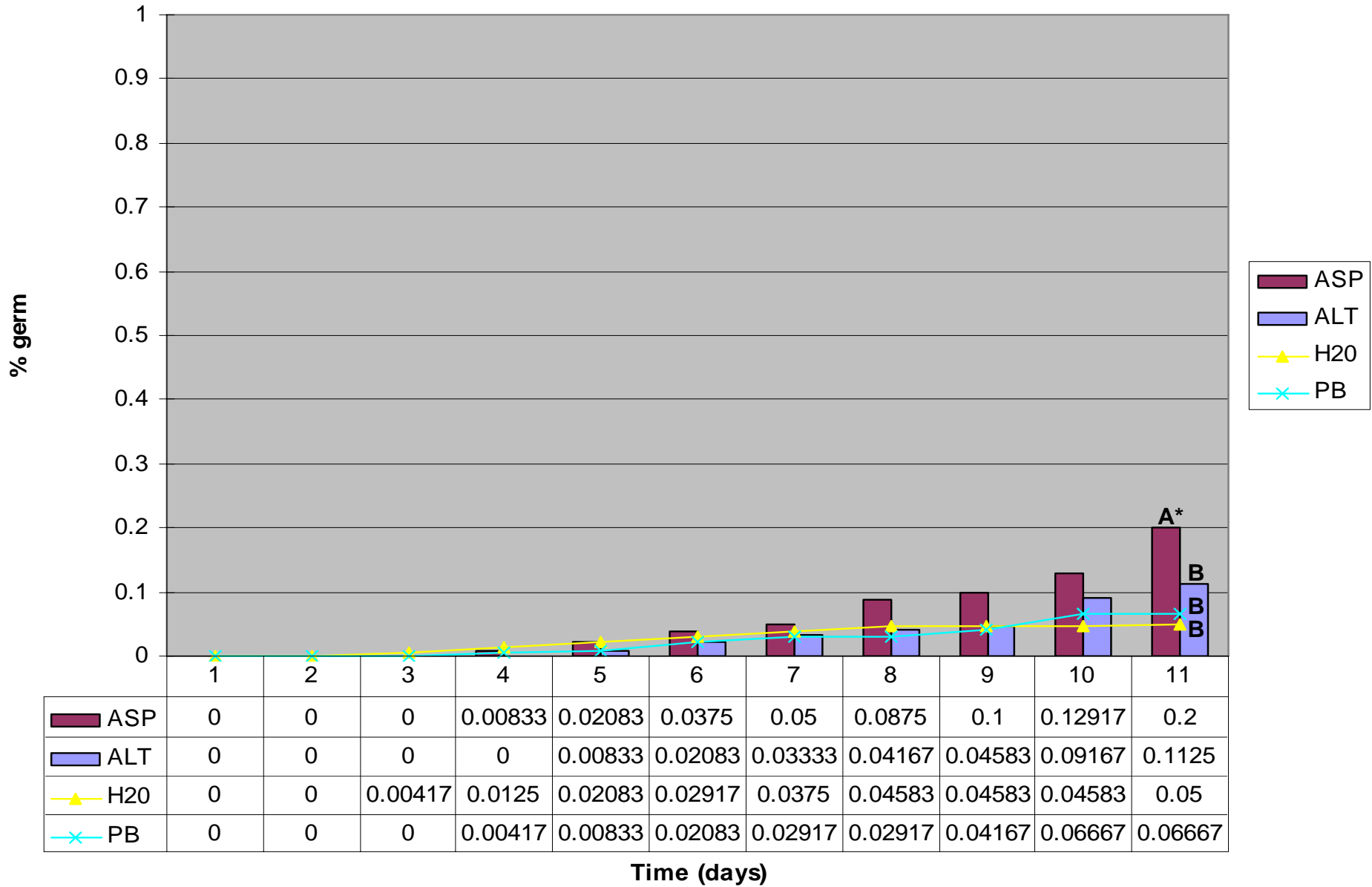


In-Vitro Germination Response

'Fixed Spore Count' Direct Inoculation: Tests 1-3



Chem TC 1-3 p

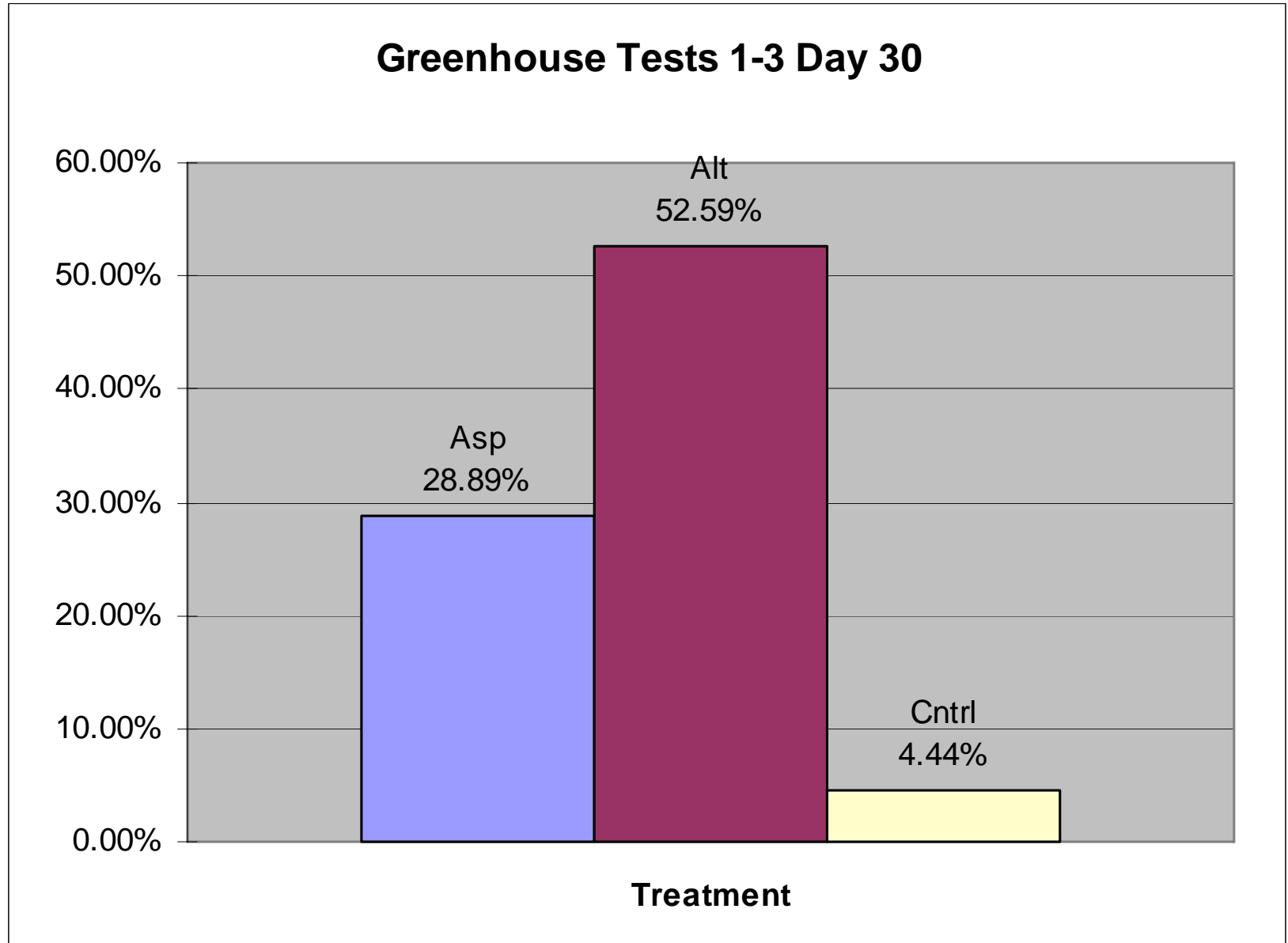


Materials and Methods

- Scarify: 98% H₂SO₄, 20 min.
- Flood Inoculate: with solution @ 1.0X10⁶ spores/mL.
- Plant: Randomized Complete Block Design.



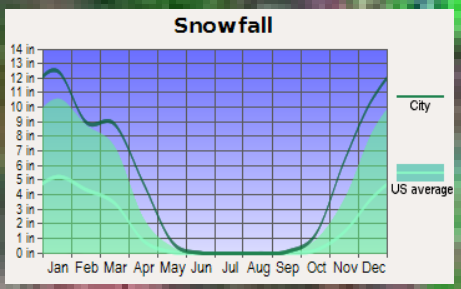
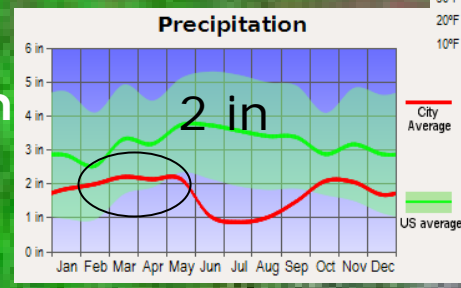
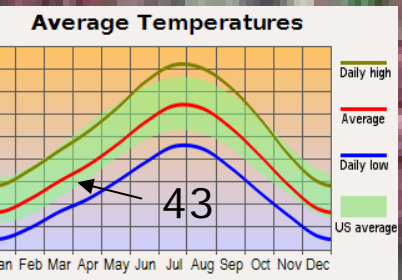
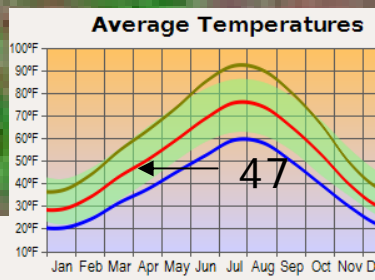
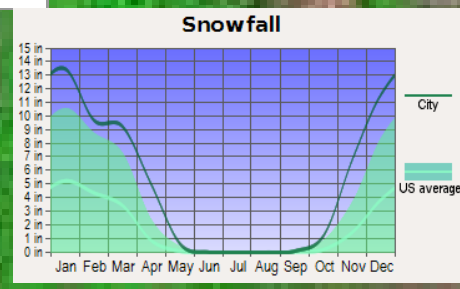
Greenhouse Trials



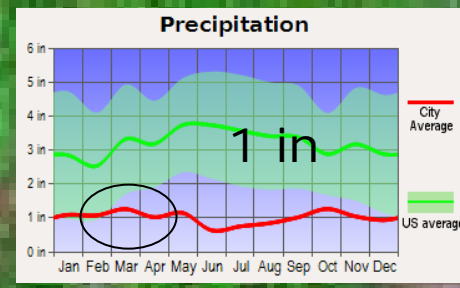
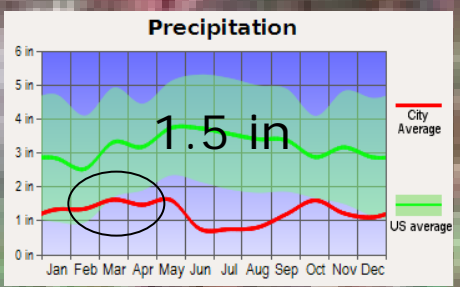
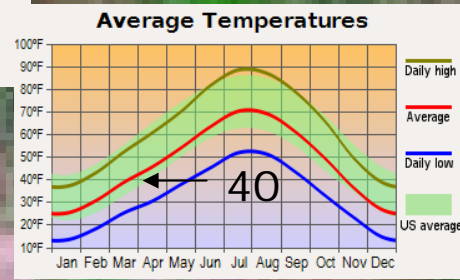
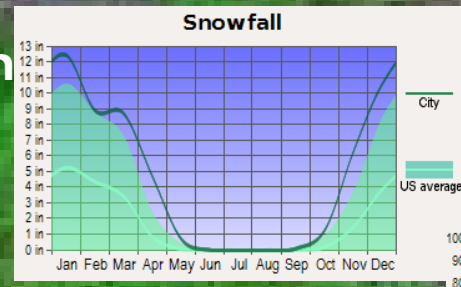
Field Trials



BYU
1300 m



Fountain Green
1500 m 1800 m



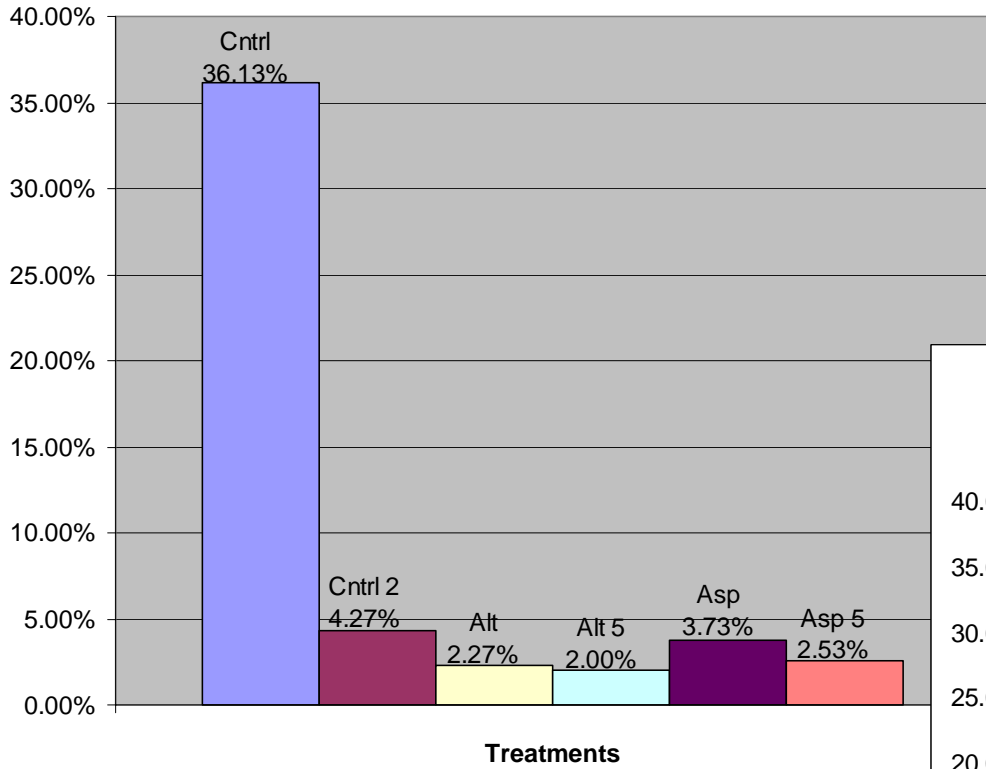
Materials and Methods



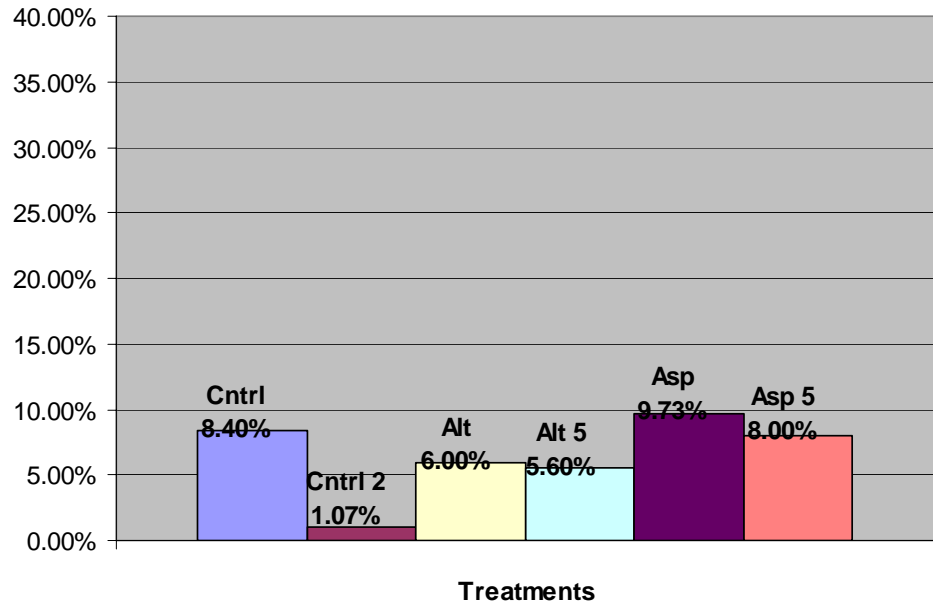
ALMACO equipment

2005 Fall Field Trials

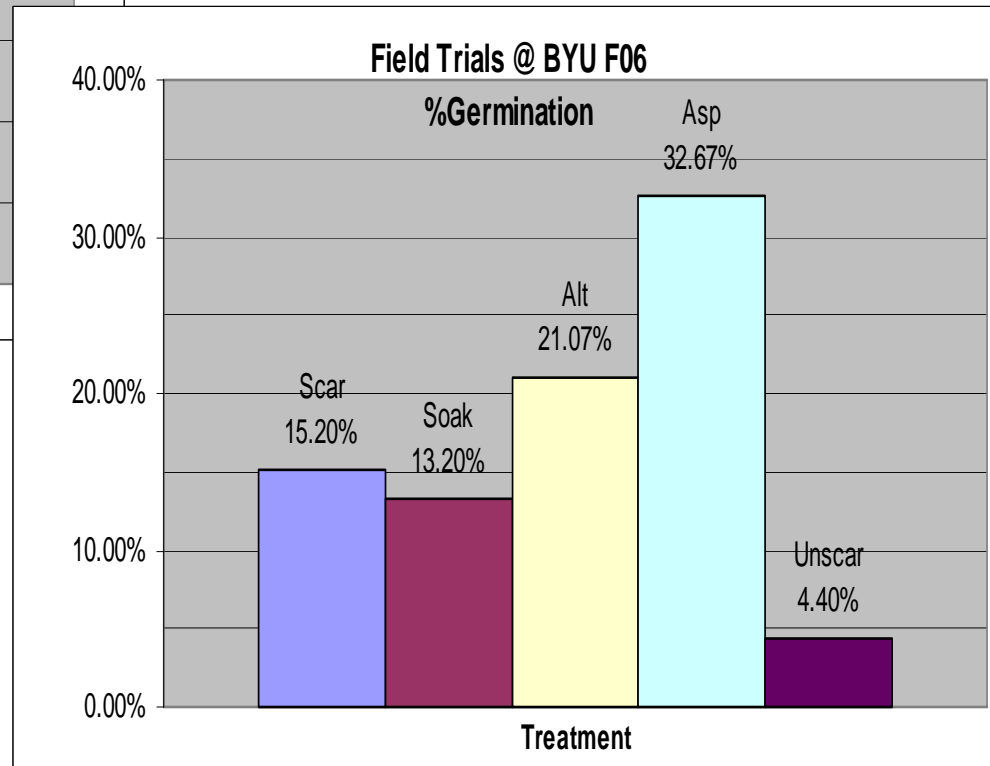
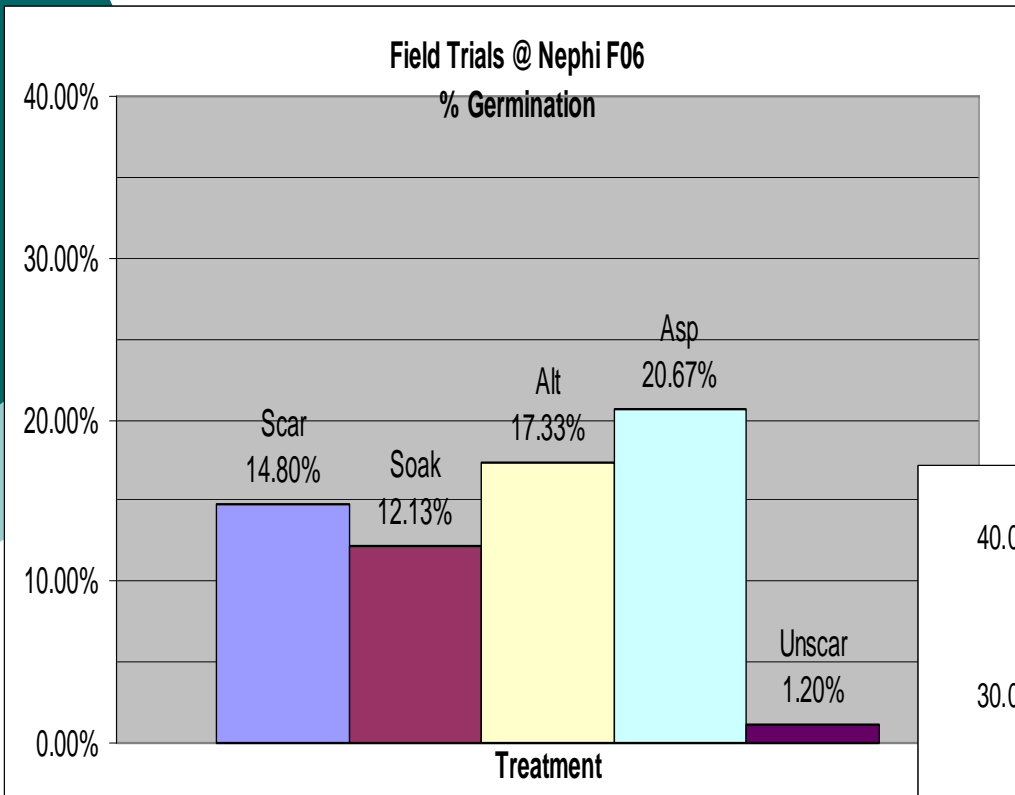
**Field Trials @ Nephi F05
%Germination**



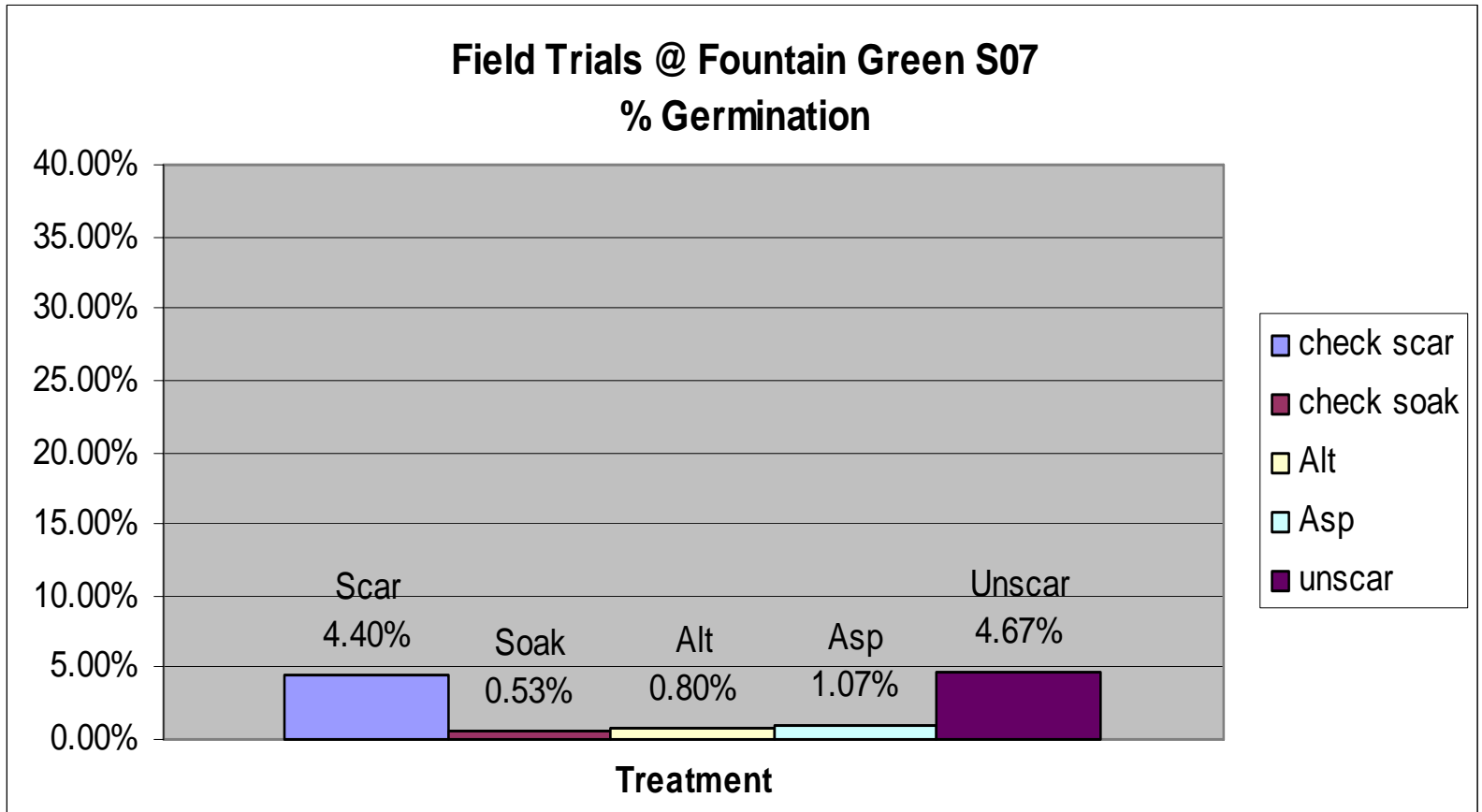
**Field Trials @ Fountain Green F05
%Germination**



2006 Field Trials



2007 Field Trials





Conclusions

- Greenhouse tests show a pattern of response nearly identical to the previously established in-vitro tests.
- Field trials showed variability between sites and inconsistency in treatment response as compared with the in-vitro and greenhouse trials.
- It is evident from the results that due to availability of moisture and other factors Fall plantings supply a greater benefit than Spring plantings.
- It should be noted that the greatest benefit comes as a result of the greenhouse plantings and practical application would serve to utilize treatment as a part of preparing seedlings for transplant rather than direct seeding in the field.