

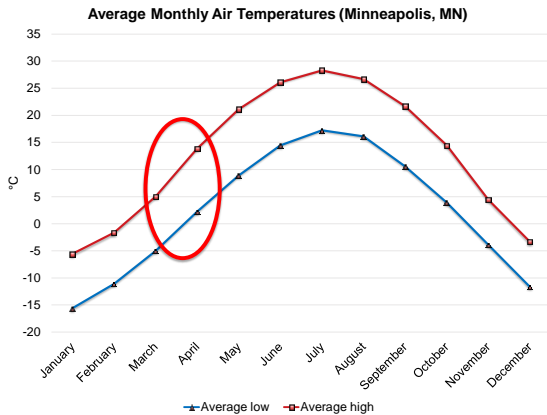
# Evaluation of Creeping Bentgrass Cultivar Germination Differences at Various Temperatures

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## Introduction

- Winter injury to putting greens is a common occurrence in northern climates.
- Revenue loss will continue until greens are re-established



## Introduction

- Quick spring establishment is a high priority
- Turfgrass species vary in establishment rates
- Cultivar choice could play a role

| Species            | Days to germination |
|--------------------|---------------------|
| Kentucky bluegrass | 6-28                |
| Perennial ryegrass | 3-10                |
| Fine fescue        | 5-12                |
| Tall fescue        | 4-12                |
| Creeping bentgrass | 6-10                |

Adapted from Christians, 1998



## Objectives

- To evaluate differences in germination of creeping bentgrass cultivars subjected to less than ideal (spring temperatures) in a controlled environment.
  - Time to initial germination
  - Rate of germination
  - Final germination percent



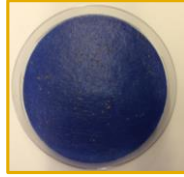
## Previous Research

- Temperature plays a role in time to germination between species (Larsen and Bibby, 2005)
- Bermudagrass differences among cultivars in terms of germination rate and total germination at different temperatures (Deaton and Williams, 2013)
- Rough bluegrass germination rates vary among cultivars under cool conditions (Liu et al., 2001)



## Materials and Methods

- Twenty-two commercially available creeping bentgrass cultivars were used.
- One-hundred seeds per cultivar were placed into a 100 x 15-mm petri-dish lined with two layers of blue blotter germination paper (4 replications).
- 9-ml of distilled water was initially added to moisten germination paper and seeds.



## Materials and Methods

- Petri-dishes were placed into growth chambers immediately after water was applied.
- Growth chambers were set to individual historical high/low temperature averages for Minneapolis, MN:
  - April 1<sup>st</sup>: 9.4/-1.1°C (**Low**)
  - April 24<sup>th</sup>: 16.1/5°C (**Medium**)
  - May 17<sup>th</sup>: 21.7/9.4°C (**High**)



## Materials and Methods

- An 8-hour day period with cool white florescent lamps followed by a 16-hour night period. (AOSA Rules for Testing Seed, 2014)
  - 320  $\mu\text{moles}/\text{m}^2/\text{s}$  of light provided
- Germination counts were taken daily until germination was no longer occurring.
- Distilled water was added at a rate of 1.2 ml every other day to maintain adequate moisture.

## Cultivars Used and Growth Chamber Germination Test

| Cultivar         | Germination Percent | Cultivar     | Germination Percent |
|------------------|---------------------|--------------|---------------------|
| Penn A1          | 97.7 a-d            | Cobra 2      | 98.0 abc            |
| Penn A4          | 92.3 gh             | T1           | 92.0 h              |
| Pure Distinction | 98.0 abc            | Alpha        | 97.3 a-e            |
| Pure Select      | 93.0 fgh            | V8           | 95.7 b-f            |
| Penncross        | 96.7 a-e            | L-93         | 95.3 c-f            |
| OO7              | 95.3 c-f            | Declaration  | 97.7 a-d            |
| MacKenzie        | 96.7 a-e            | Proclamation | 97.0 a-e            |
| SR1119           | 98.7 a              | Independence | 93.0 fgh            |
| SR1150           | 92.0 h              | Luminary     | 94.7 e-h            |
| Tyee             | 95.3 c-f            | Memorial     | 95.3 c-f            |
| Focus            | 95.0 d-g            | CY-2         | 98.3 ab             |

## Time to Germination

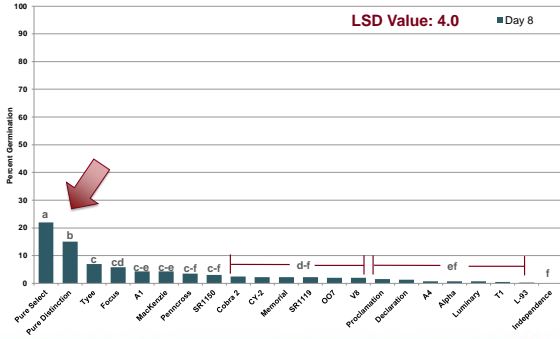
- **Low:** April 1<sup>st</sup> (9.4/-1.1°C)
  - First germination seen at 21 days
  - No germination after 31 days
  - Very little germination overall (0.4% total from all cultivars)
- **Medium:** April 24<sup>th</sup> (16.1/5°C)
  - First germination seen at 7 days
  - No germination after 25 days
  - Total germination ave 77.2%
- **High:** May 17<sup>th</sup> (21.7/9.4°C)
  - First germination seen at 4 days
  - No germination after 19 days
  - Total germination ave 89.4%



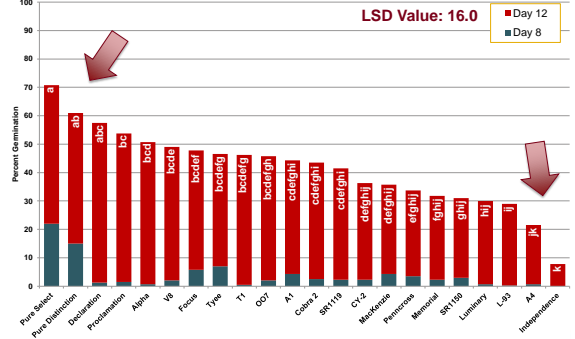
## Materials and Methods

- Statistical analysis-
  - Analysis of variance on daily cumulative percent germination in R
  - Means separation using Fisher's LSD at  $\alpha = 0.05$

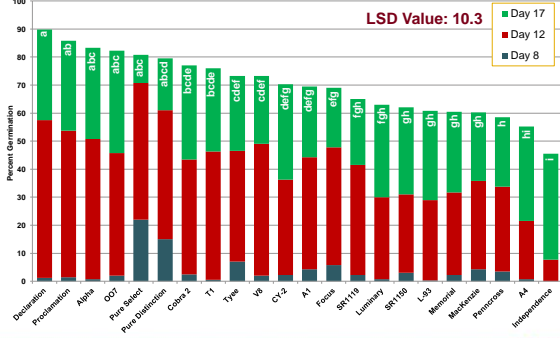
Cumulative Germination Day 8 Medium Temp



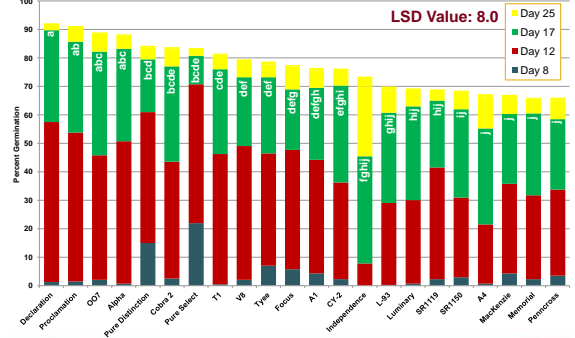
Cumulative Germination Day 12 Medium Temp



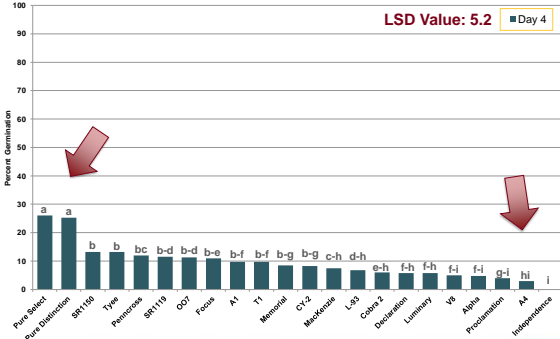
Cumulative Germination Day 17 Medium Temp



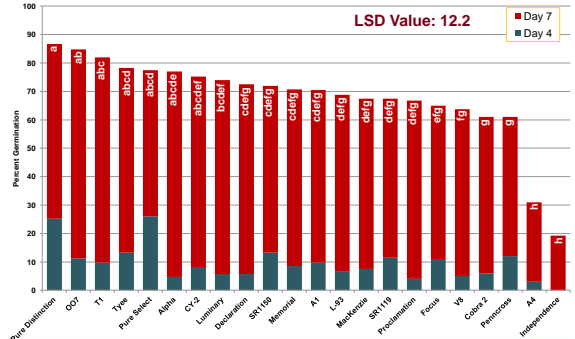
Cumulative Germination Day 25 Medium Temp



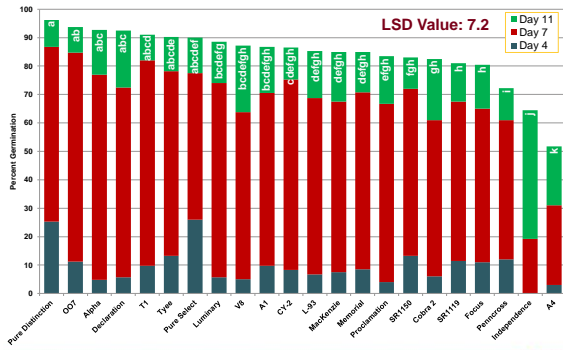
Cumulative Germination Day 4 High Temp



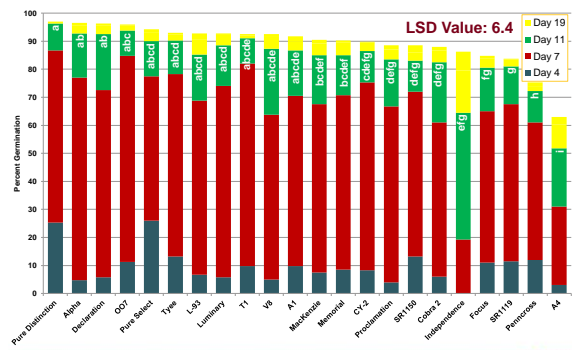
Cumulative Germination Day 7 High Temp



Cumulative Germination Day 11 High Temp



Cumulative Germination Day 19 High Temp



Conclusions

- Germination speed, cumulative rate, and final germination percent differ by cultivar and this is affected by temperature
  - Greatest initial germination (medium and high temperatures)- 'Pure Distinction' and 'Pure Select'
  - Over time, cumulative germination differences become less apparent, but statistical differences still exist.
- Seeding at temperatures that are too low (April 1<sup>st</sup>) may not be a good investment

The Next Step

- Validate current data with new seed lots
- Modify growth chamber temperatures to reflect increasing temperature over time as is seen in the spring
- Field trial with select cultivars and establishment methods (disturbance type and fertility)
- Value of dormant seeding vs. spring seeding

Thank You

- Minnesota Golf Course Superintendents Association
- Seed Research of Oregon
- DLF International Seeds
- Jacklin Seed by Simplot
- Landmark Turf
- Lebanon Turf
- Tee-2-Green

References

Deaton, M.T. and D. W. Williams. 2013. Temperature effects on the speed and completion of germination of 19 commercially available seeded bermudagrass cultivars. Hort Technology. 23:1, p. 82-85.

Larsen, S.U., and B. M. Bibby. 2005. Differences in thermal time requirement for germination of three turfgrass species. Crop Science. 45:5, p. 2030-2037.

Liu, C., Camberato, J.J., Martin, S.B., and A.V. Turner. 2001. Rough bluegrass germination varies with temperature and cultivar/seed lot. 36:1, p. 153-156.