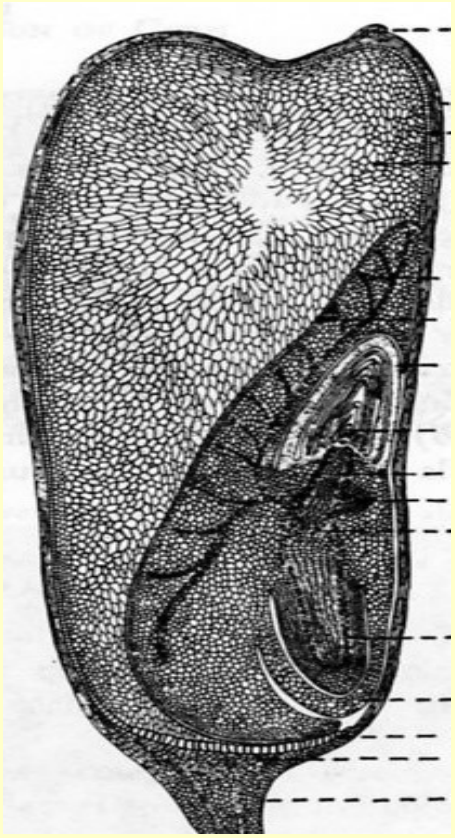
Germination of Supersweets: Imbibitional Chilling Injury

William F. Tracy
Department of Agronomy
College of Agricultural and Life Sciences
University of Wisconsin-Madison

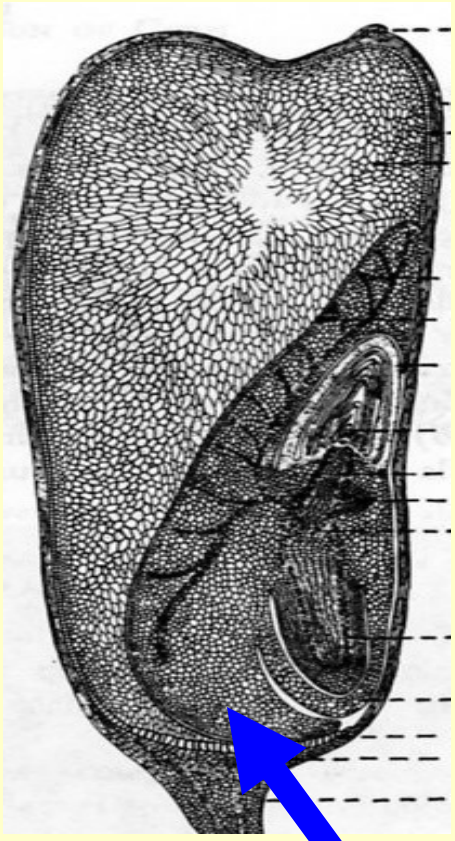
Germination can be divided into a number of distinct parts

1. Imbibition



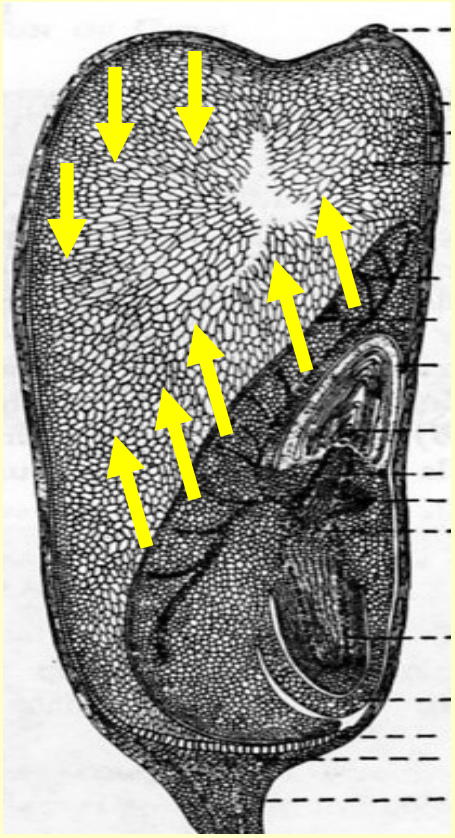
Germination can be divided into a number of distinct parts

1. Imbibition
   - Water and oxygen move slowly into the kernel through the tipcap
   - Membranes rehydrate and hormones are activated



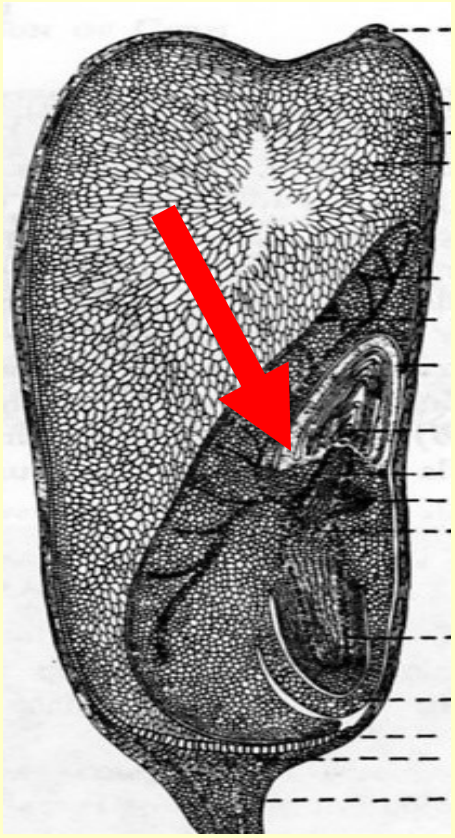
Germination can be divided into a number of distinct parts

2. Starch breakdown and energy mobilization
   - Enzymes begin to break down starch in endosperm



Germination can be divided into a number of distinct parts

2. Starch breakdown and energy mobilization
   - Enzymes begin to break down starch in endosperm
   - Sugars supply embryo with energy for metabolism and cell division



Germination can be divided into a number of distinct parts

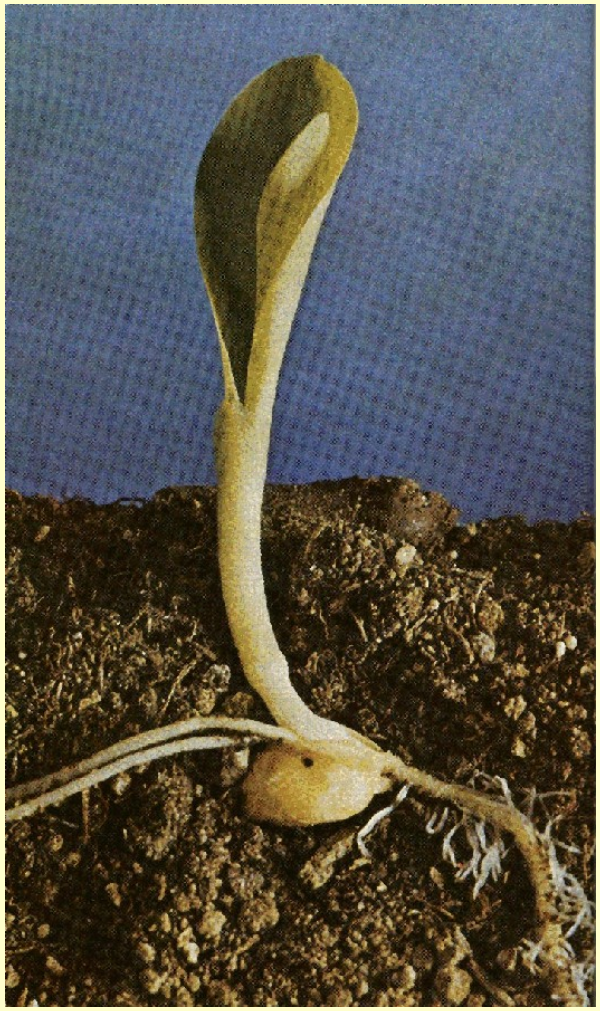
3. Cell elongation and differentiation

- Radicle emerges first

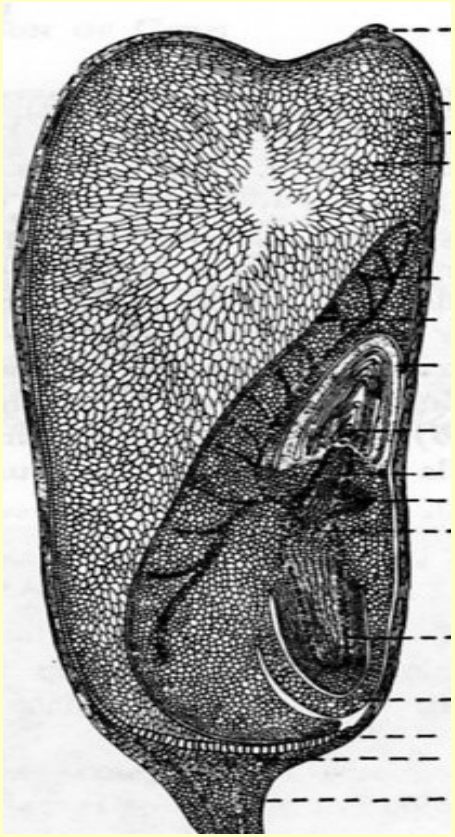
Germination can be divided into a number of distinct parts

3. Cell elongation and differentiation

- The plumule emerges from the seed and then from the soil.
- Seedling begins photosynthesis

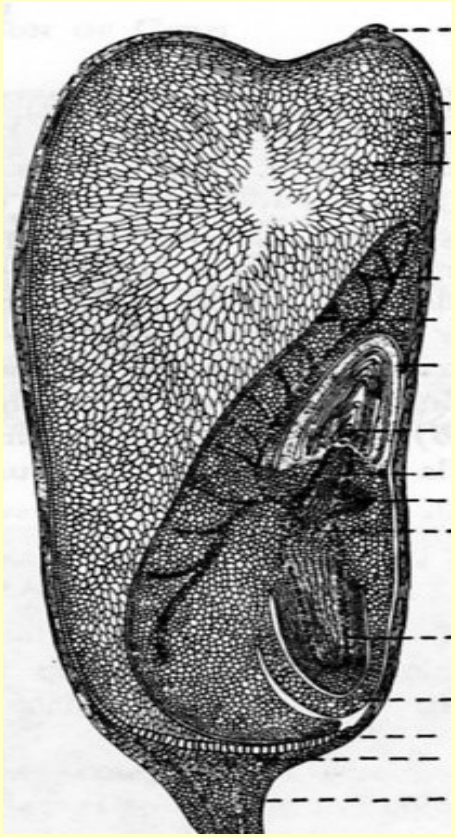


Imbibition can be a critical time for supersweets



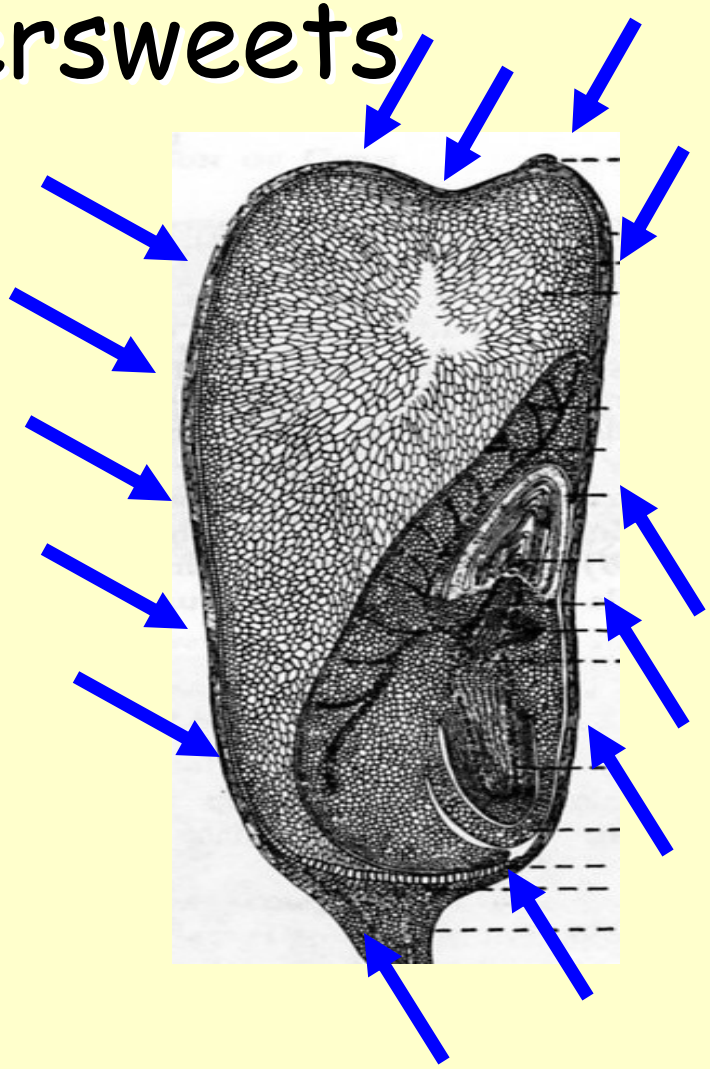
Imbibition can be a critical time for supersweets

1. In some supersweets the pericarp (hull) has many tiny cracks.



Imbibition can be a critical time for supersweets

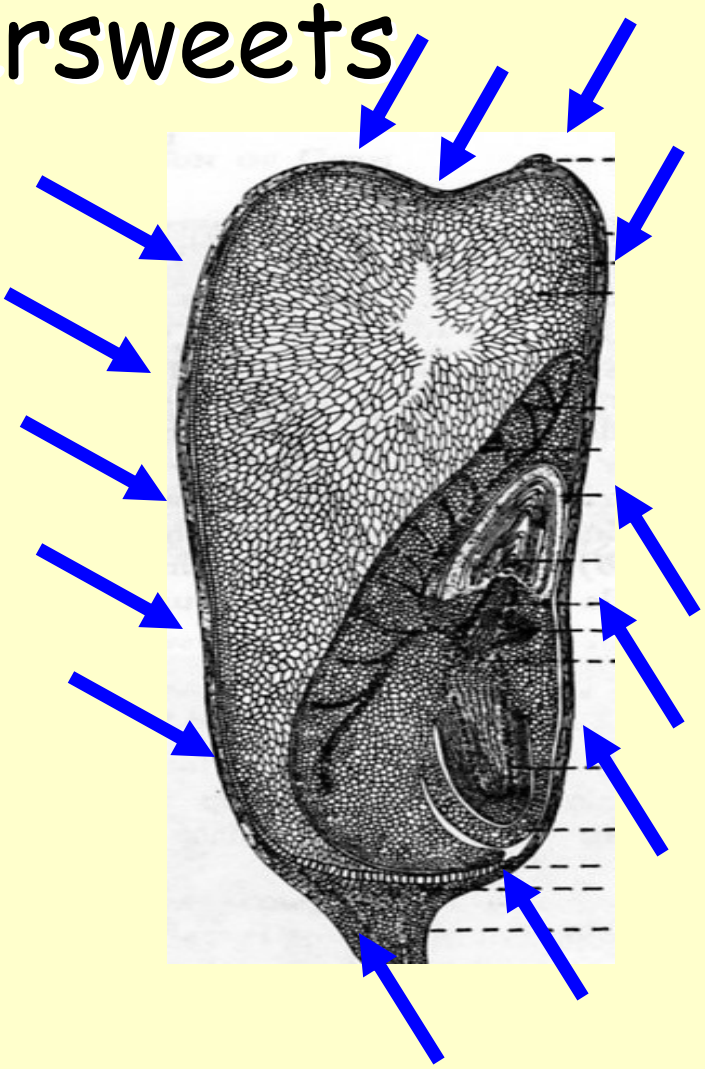
2. Water rushes in from all sides through the cracks



Imbibition can be a critical time for supersweets

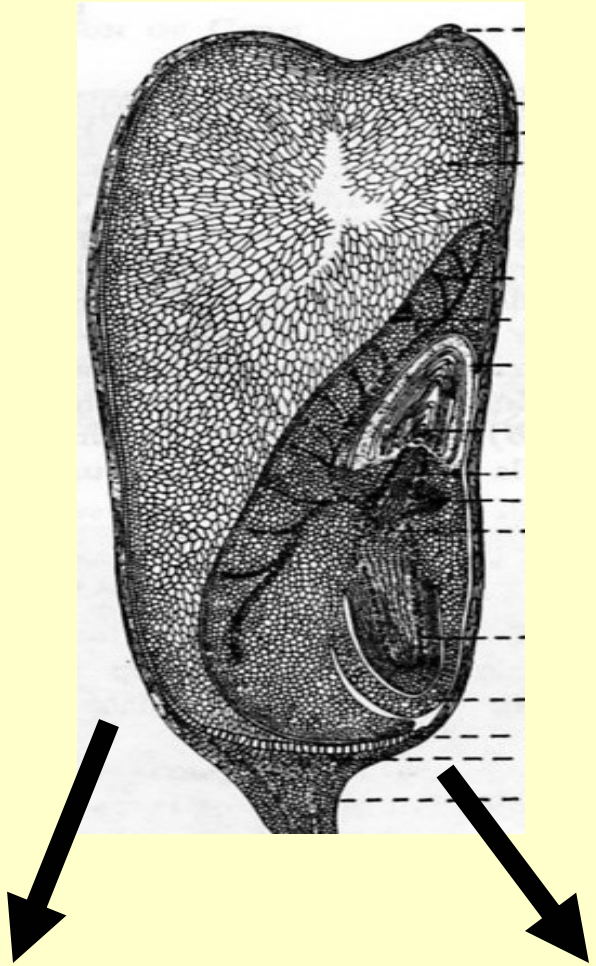
3. Membrane rehydration is disrupted

<u>Cold water is much more disruptive than warm water</u>



Imbibition can be a critical time for supersweets

4. Sugars and salts leak from the cells and kernel
5. Providing a food sources for potential pathogens and other microbes

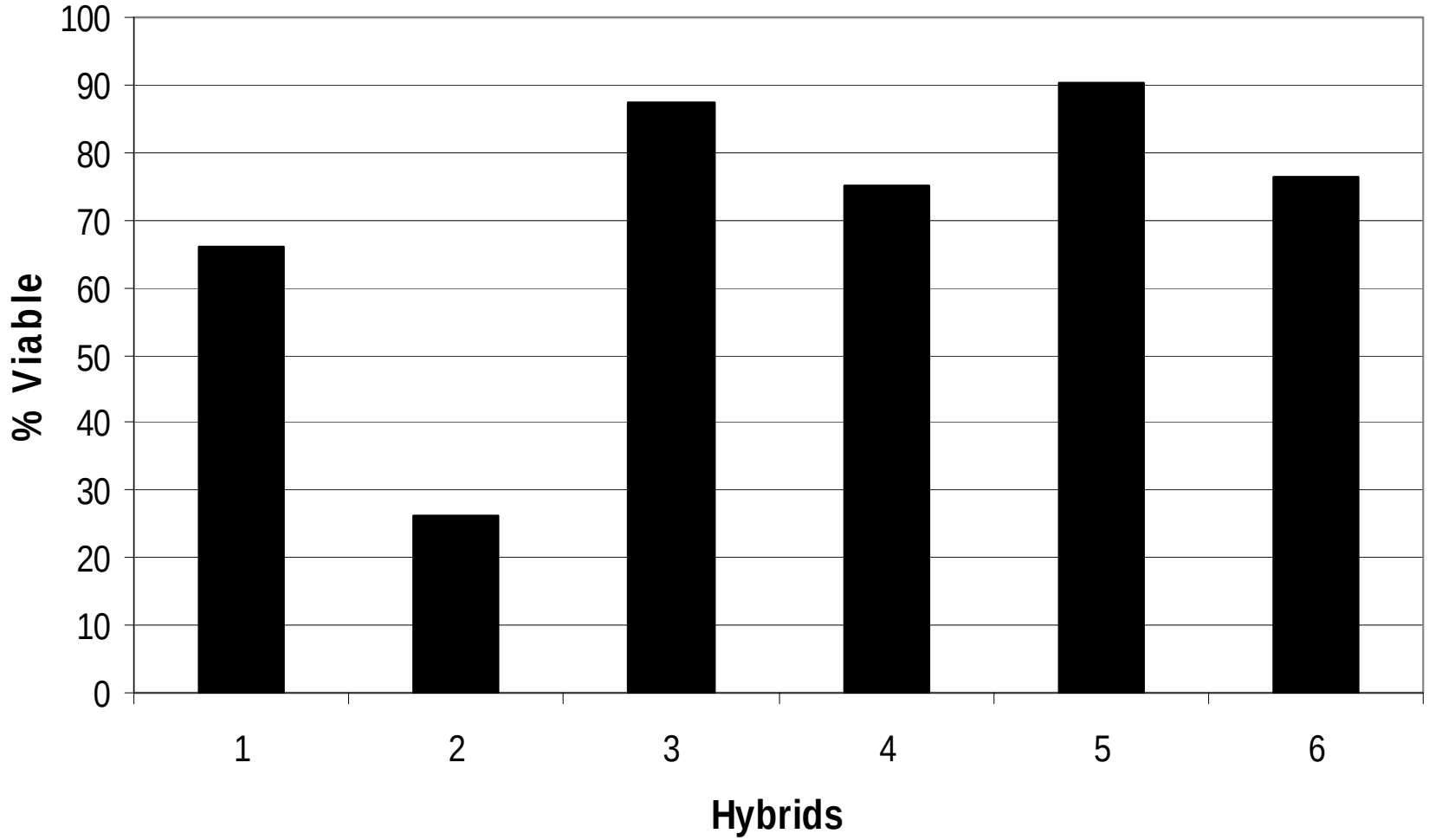


When is the Seed Most Sensitive?

Experiment 1.

- Untreated seed of six supersweet hybrids was exposed to six treatments
- Each treatment consisted of one 24 hour period at 40°F and five days at 75°F
- The treatment number corresponds to the 24 hour cold period.
- Rag dolls with no soil.
- Eight reps 25 seeds per rep.

Figure 1. Total percent viable over all treatments



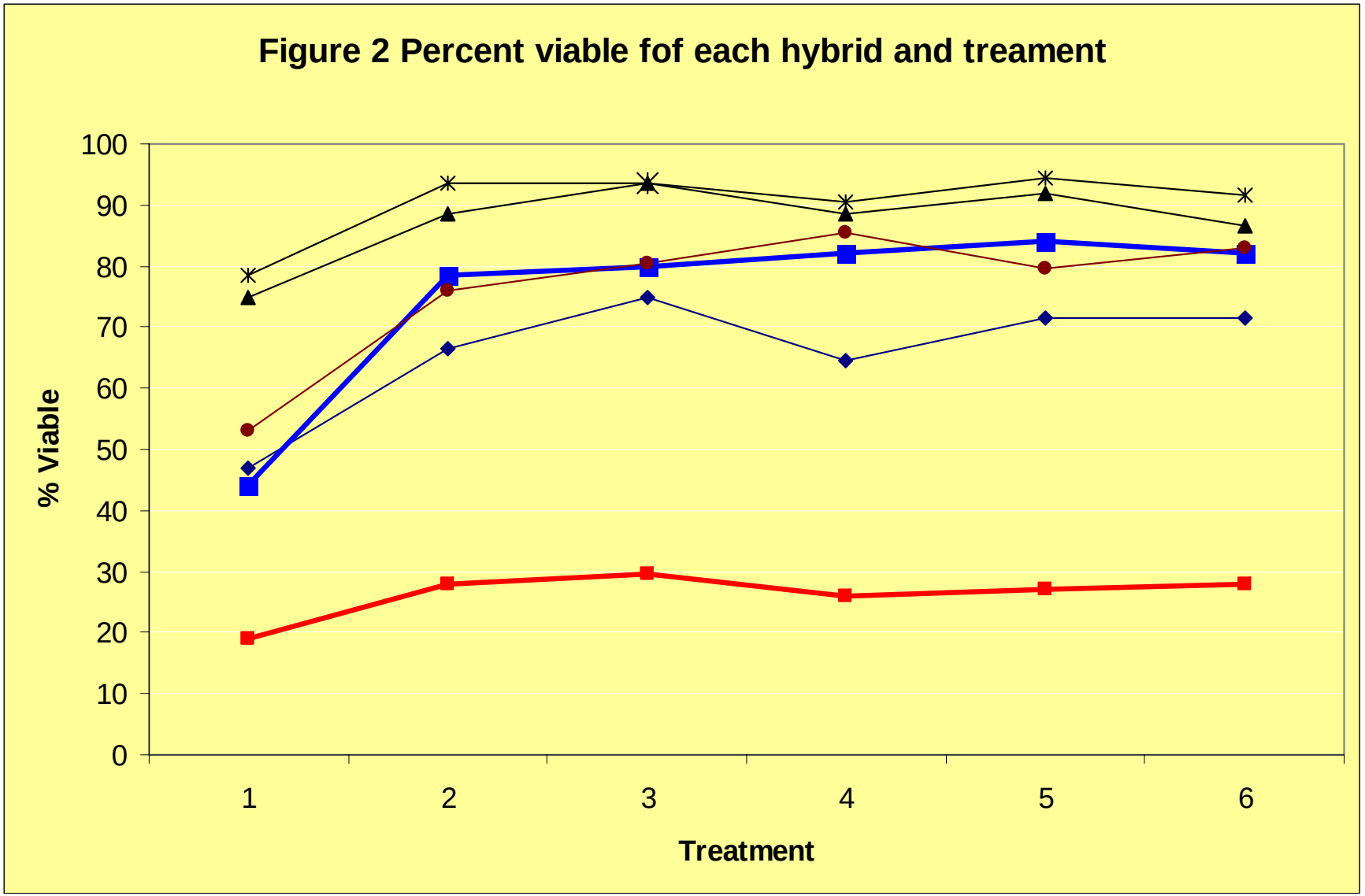


Figure 2 Percent viable fof each hybrid and treament
100
90
80
70
60
50
40
30
20
10
0
% Viable
1
2
3
4
5
6
Treatment

Figure 3. Seed mortality under three imbibition treatments

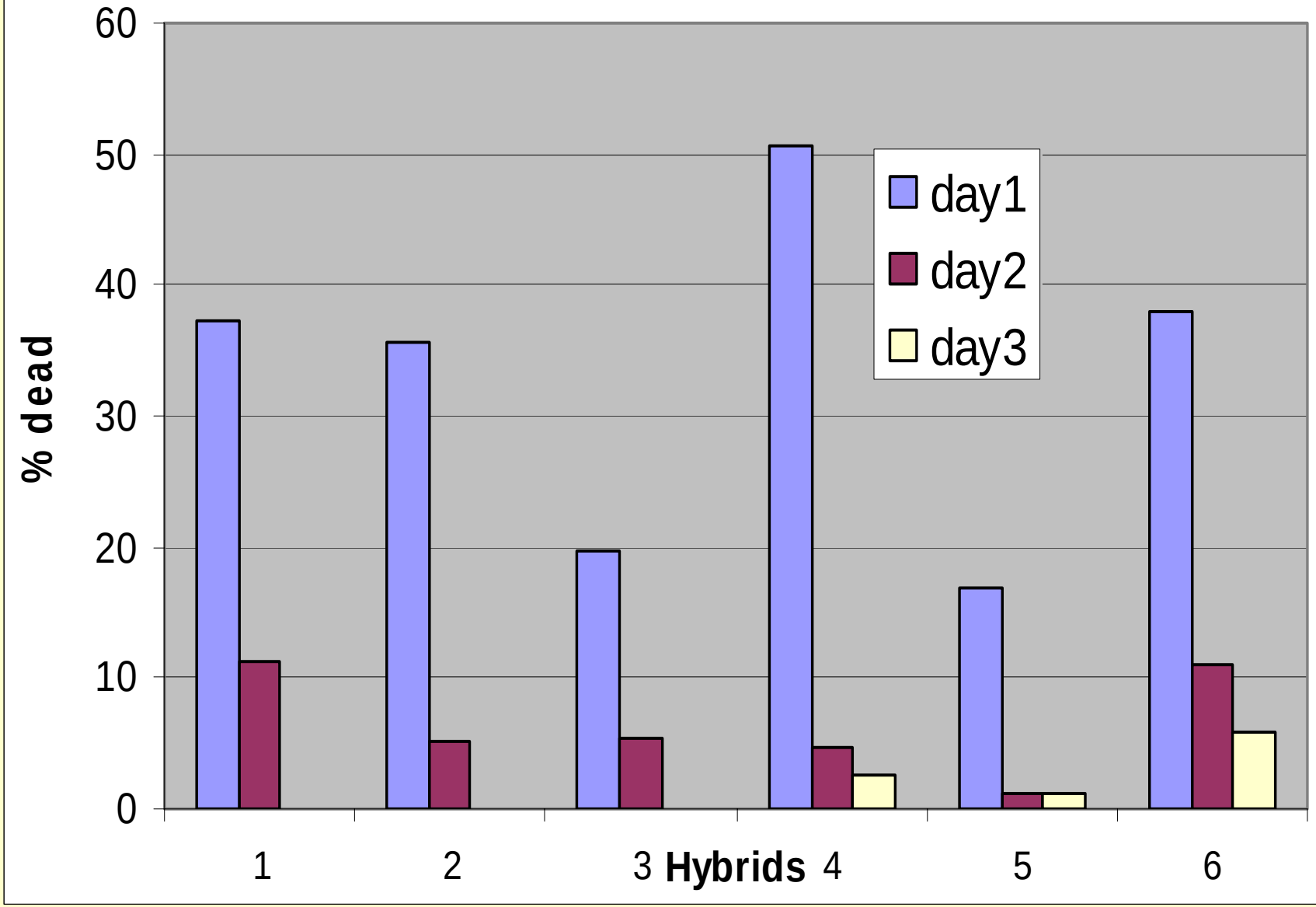
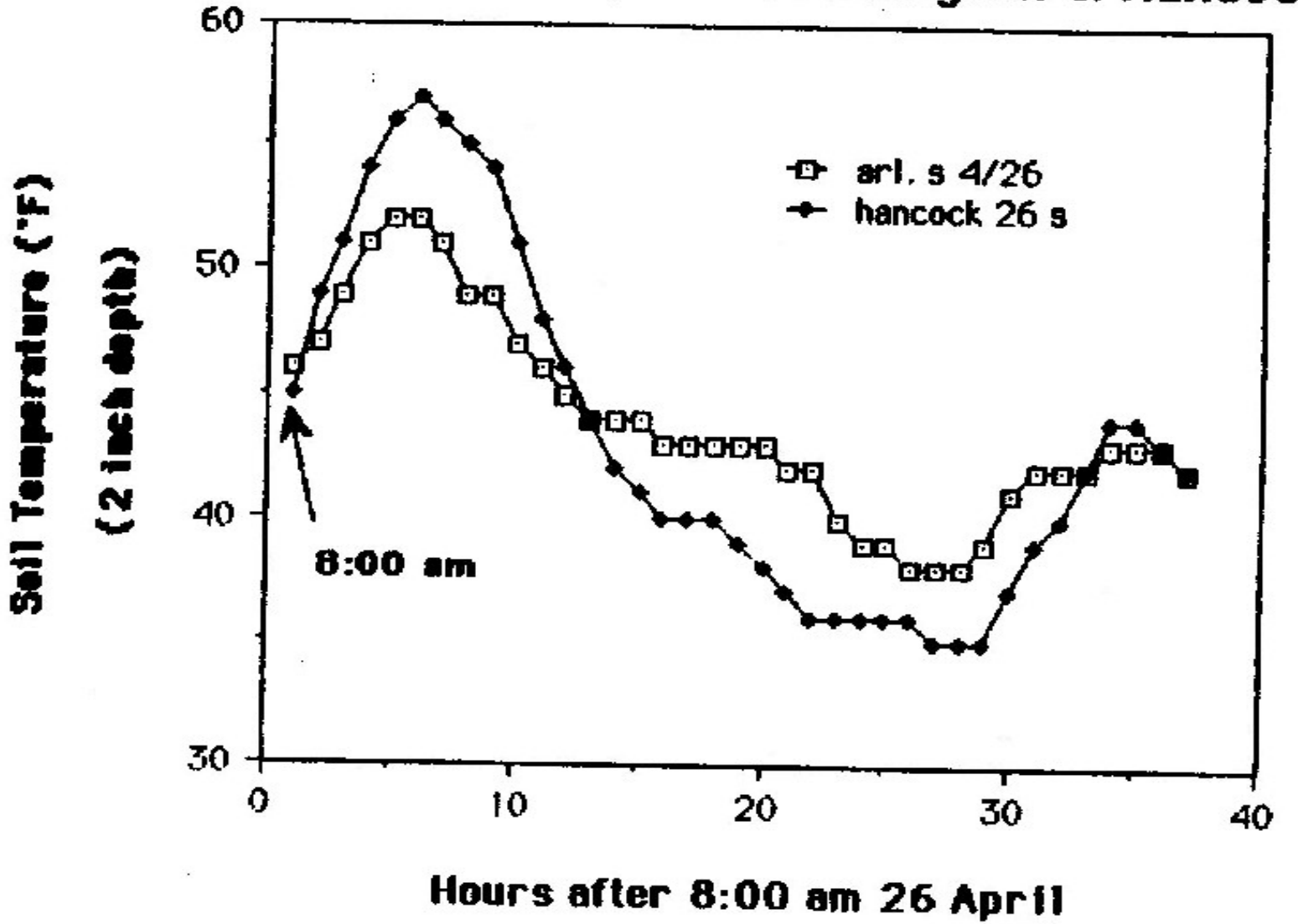


Fig. 1. Soil temperature over a 36 hour period on 26 and 27 of April at Arlington & Hancock

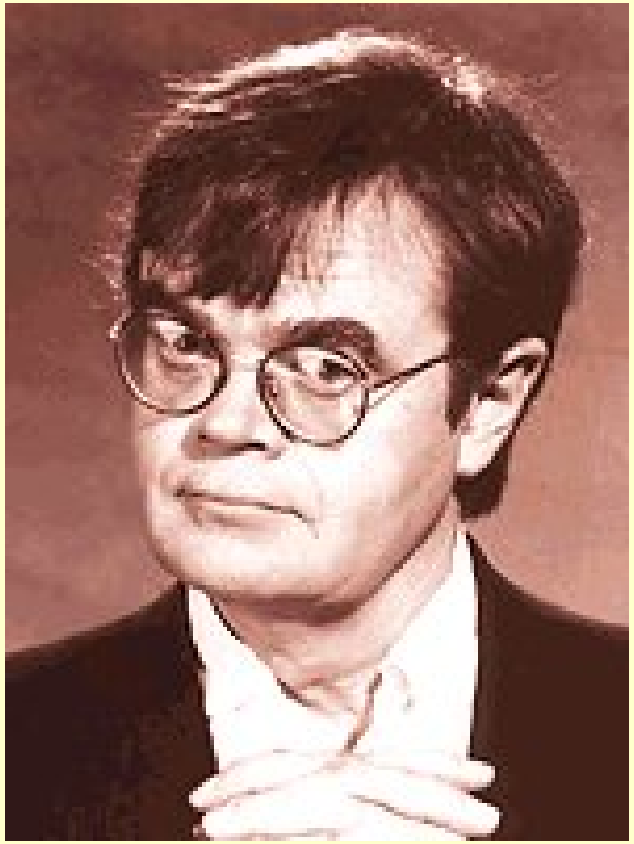


Conclusions

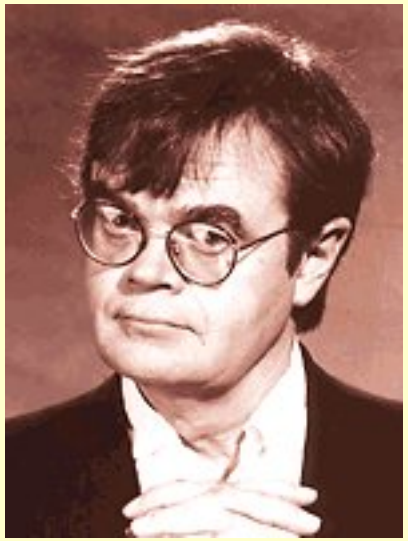
- Supersweet corn seeds are sensitive to imbibitional chilling damage.
- Imbibitional chilling damage occurs in the first 24 hours after planting.
- We could not narrow the critical time down further.
- While sandy soils warm more quickly they cool more quickly as well.

"people have tried and tried, but sex is not better than fresh **sweet corn**."

– Garrison Keillor



Sweet corn was our family's weakness.
We were prepared to resist atheistic communism, immoral Hollywood, hard liquor, gambling and dancing, smoking, fornication,



but if Satan had come around with sweet corn we at least would have listened to what he had to sell.