

Virtual Lettuce Referee
Asteraceae, Sunflower family I
AOSA/SCST Annual Meeting 2013

Seedling Evaluation Handbook
Committee

- Number of participants in the referee test: **72**
- Number of participants who filled out the survey form: **96**

- Percent of participants with lettuce germination testing experience: **93%**
- Percent of participants with no lettuce germination testing experience: **7%**

Number of tested samples per year -in labs that regularly test lettuce -

Number of samples/year	Number of labs	% of labs
1-50	16	25.4
51-100	2	3.2
101-500	1	1.6
More than 500	44	69.8
1000	1	1.6
3000-3500	2	3.2
> 5000	1	1.6

Analyst experience level

-among analysts in labs that test lettuce-

- Very experienced -lettuce is my life: **4.6%**
- Experienced- comfortable testing this species: **55.4%**
- Somewhat experienced, becoming comfortable w/species: **26.1%**
- Trainee: **10.8%**
- No experience: **3.1%**

Analyst accreditation level

- Certified Seed Analyst, germination (AOSA): **15.9%**
- Registered Seed Technologist (SCST): **26.1%**
- Senior Analyst (CSAAC): **1.5%**
- Manager: **14.5%**
- No accreditation: **42.0%**

Type of laboratory

- Federal Seed Lab: **13.0%**
- State Regulatory Lab: **7.3%**
- Independent Seed Lab: **23.2%**
- Seed Company Lab: **47.7%**
- Certification/Crop Improvement Lab: **1.5%**
- Other; Seed Technology Lab: **7.3%**

Testing services offered by labs

- Internal company testing only, no service samples: **40.6%**
- Provide Service testing, no restrictions: **26.1%**
- Regulatory testing and service testing for in state companies only: **2.9%**
- Regulatory testing and service testing, no restrictions: **15.9%**
- Regulatory testing only, no service testing: **1.5%**
- Other: Seed Certification testing, Seed Technology Company: **13.0%**

Region

- Region 1 (AK, ID, MT, OR, WA, WY): **14.5%**
- Region 2 (IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, SD, WI): **21.7%**
- Region 3 (CT, DE, ME, MD, MA, NH, NJ, NY, PA, RI, VT, VA, WV): **2.9%**
- Region 4 (AZ, CA, CO, HI, NV, NM, OK, TX, UT): **43.5%**
- Region 5 (AL, AR, FL, GA, KY, LA, MS, NC, SC, TN): **7.2%**
- Region 6 (Canada): **5.8%**
- Other: **4.4%**

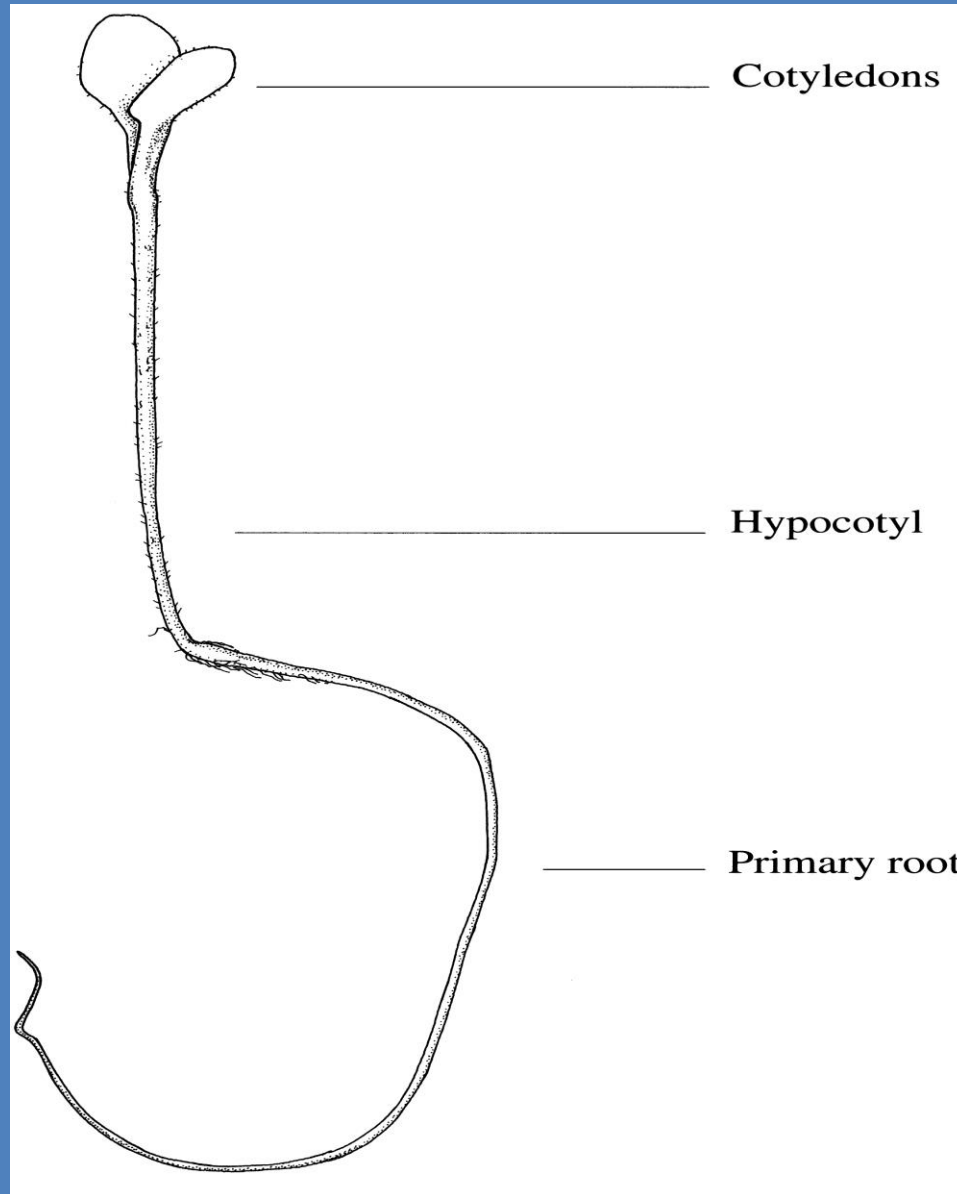
AOSA RULES

Lactuca sativa, lettuce

GENERAL DESCRIPTION

- Seedling type: Epigeal dicot.
- Food reserves: Cotyledons that expand and become thin, leaf-like and photosynthetic. Some varieties develop elongated petioles at the base of the cotyledons.
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- Shoot system: The hypocotyl elongates and carries the cotyledons above the soil surface. The epicotyl usually does not show any development within the test period.
- Root system: A long primary root.

Essential seedling structures



Abnormal Seedling Description

Cotyledons :

- less than half of the original cotyledon tissue remaining attached.
- less than half of the original cotyledon tissue free of necrosis or decay (see notes 5, 6 and 8).
- **cotyledons that are swollen, curled, deformed.**
- **seedlings with 4 cotyledons.**

Epicotyl:

- missing (may be assumed to be present if cotyledons are intact).
- any degree of necrosis, decay or damage at the point of cotyledon attachment.

Hypocotyl :

- deep open cracks extending into the conducting tissue.
- severely twisted or grainy.
- watery.
- **malformed, such as markedly shortened, curled or thickened.**

Abnormal Seedling Description

Root:

- none.
- primary root tip blunt, swollen and discolored.
- primary root with splits or lesions.
- **weak, stubby or missing primary root (secondary roots will not compensate for a defective primary root).**

Seedling:

- swollen cotyledons associated with extremely short hypocotyl and root.
- one or more essential structures impaired as a result of decay from primary infection.
- albino **or yellow.**

Notes

- 1. Toxic materials in the substrate will cause short, blunt roots. **The roots lift away from the substrate. Check media for toxicity and conduct retest if necessary on alternate approved media.**
- 2. Seedlings grown on top of white filter paper will be shorter than those **grown on dyed** blotters. **Retest if necessary.**
- 3. Remove attached seed coats for seedling evaluation.
- 4. Seedlings with slight dormancy or light sensitivity may be slow to germinate. **Extend test according to the rules.**
- 5. One type of necrosis on lettuce cotyledons is a physiological breakdown of the plant tissues, the cause of which has not been determined. It is manifested by discolored areas on the cotyledons, first appearing on or adjacent to the midrib and lateral veins, and should not be confused with the natural pigmentation of the different lettuce cultivars.

Notes

6. Seedlings with extensive physiological necrosis on the cotyledons may be slower in growth than those without such affected areas. Hypocotyl and root length may be affected by other factors such as proximity to light, delayed germination or dormancy.
7. Seedlings with three cotyledons should be considered as “normal”. Seedlings with 4 cotyledons are classified as “abnormal”. (Added to harmonize with ISTA.)
8. The 50% Rule must be followed to classify seedlings with mechanical damage (dark areas of discoloration or decay) as “abnormal” seedlings.

Image 2

Distribution of responses:

- Normal: 100%
- Abnormal: 0%

Most common reasons for classification:

Normal:

- All essential parts are normal.
- Healthy seedling.
- No signs of abnormality.



Image 4

Distribution of responses:

- Normal: 0%
- Abnormal: 100%

Most common reasons for classification:

Abnormal:

- Primary infection.
- Decayed cotyledons.
- 50% or more necrosis.

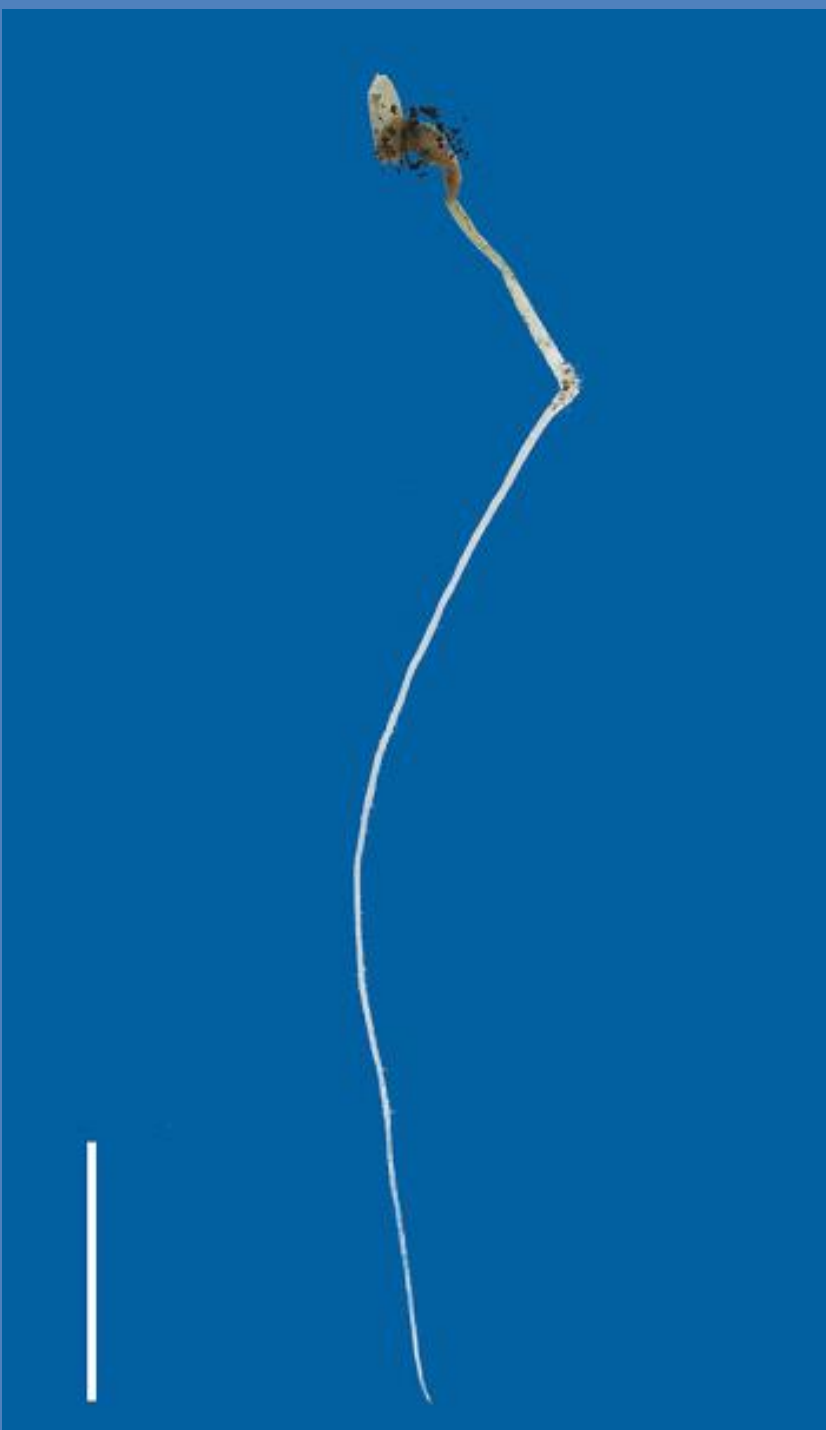


Image 5

Distribution of responses:

- Normal: 0%
- Abnormal: 100%

Most common reasons for classification:

Abnormal:

- Decay or necrosis at the point of attachment.
- Short and thick hypocotyl.
- Damaged stunted root.
- 50% or more necrosis.



Image 27

Distribution of responses:

- Normal: 0%
- Abnormal: 100%

Most common reasons for classification:

Abnormal:

- Decayed, weak, short or no root.
- Decay, short or no hypocotyl.
- Deformed and decayed sprout.



Image 8

Distribution of responses:

- Normal: 1.4%
- Abnormal: 98.6%

Most common reasons for classification:

Abnormal:

- Albino.



Image 13

Distribution of responses:

- Normal: 2.8%
- Abnormal: 97.2%

Most common reasons for classification:

Abnormal:

- Blunt root with a decayed tip.

Normal:

- Might recover.



Image 14

Distribution of responses:

- Normal: 98.6%
- Abnormal: 1.4%

Most common reasons for classification:

Normal:

- More than 50% functional cotyledon tissue remaining attached.
- Less than 50% necrosis.

Abnormal:

- Watery hypocotyl.
- More than 50% necrosis.
- Damaged cotyledons.



Image 21

Distribution of responses:

- Normal: 2.8%
- Abnormal: 97.2%

Most common reasons for classification:

Abnormal:

- Short, grainy or lesion hypocotyl.
- Decay at point of attachment.
- More than 50% necrosis.

Normal:

- Acceptable lesion on hypocotyl.



Image 22

Distribution of responses:

- Normal: 97.2%
- Abnormal: 2.8%

Most common reasons for classification:

Normal :

- Healthy sprout.



Image 20

Distribution of responses:

- Normal: 4.3%
- Abnormal: 95.7%

Most common reasons for classification:

Abnormal:

- More than 50% necrosis.
- Decayed cotyledons.

Normal:

- Less than 50% necrosis.

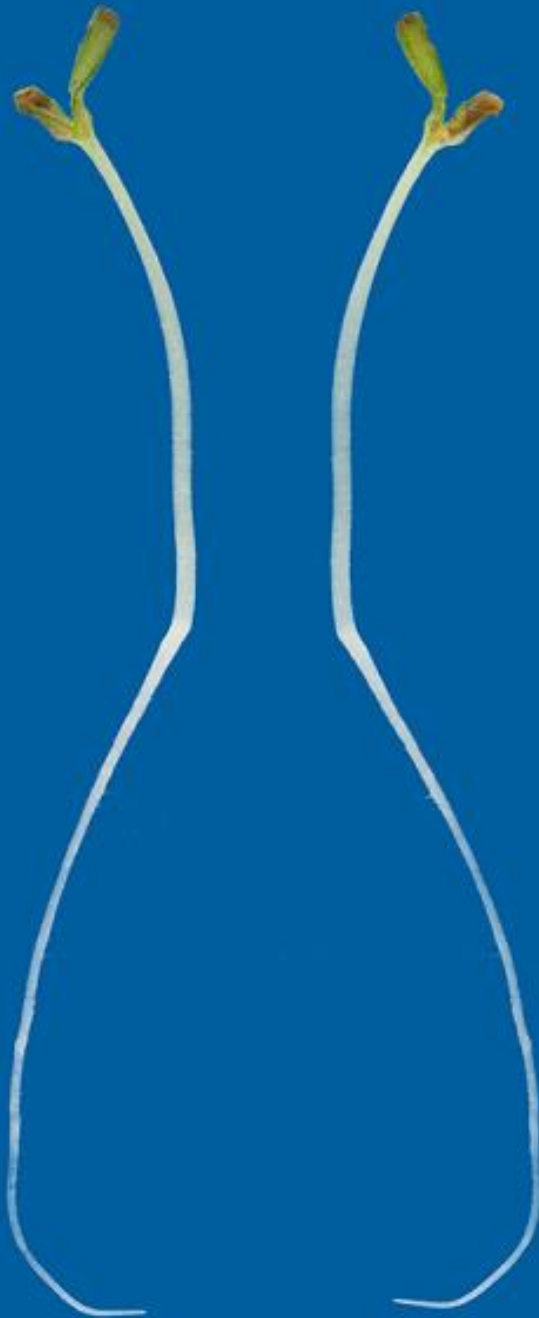


Image 9

Distribution of responses:

- Normal: 8.3%
- Abnormal: 91.7%

Most common reasons for classification:

Abnormal:

- More than 50% necrosis.

Normal:

- Less than 50% necrosis.

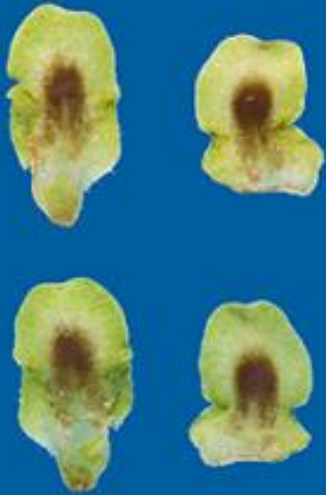


Image 11

Distribution of responses:

- Normal: 90.1%
- Abnormal: 9.9%

Most common reasons for classification:

Normal:

- Healthy sprout.

Abnormal:

- Damaged or short hypocotyl.
- Short blunt root.



Image 24

Distribution of responses:

- Normal: 12.7%
- Abnormal: 87.3%

Most common reasons for classification:

Abnormal:

- Watery hypocotyl.
- Damaged or lesioned hypocotyl.
- Necrosis.
- Test condition.

Normal:

- Acceptable hypocotyl damage.
- Test condition.
- Less than 50% necrosis.



Image 23

Distribution of responses:

- Normal: 85.9%
- Abnormal: 14.1%

Most common reasons for classification:

Normal:

- Less than 50% necrosis or early necrosis.
- Acceptable hypocotyl defects.

Abnormal:

- Grainy, twisted, watery or swollen hypocotyl.

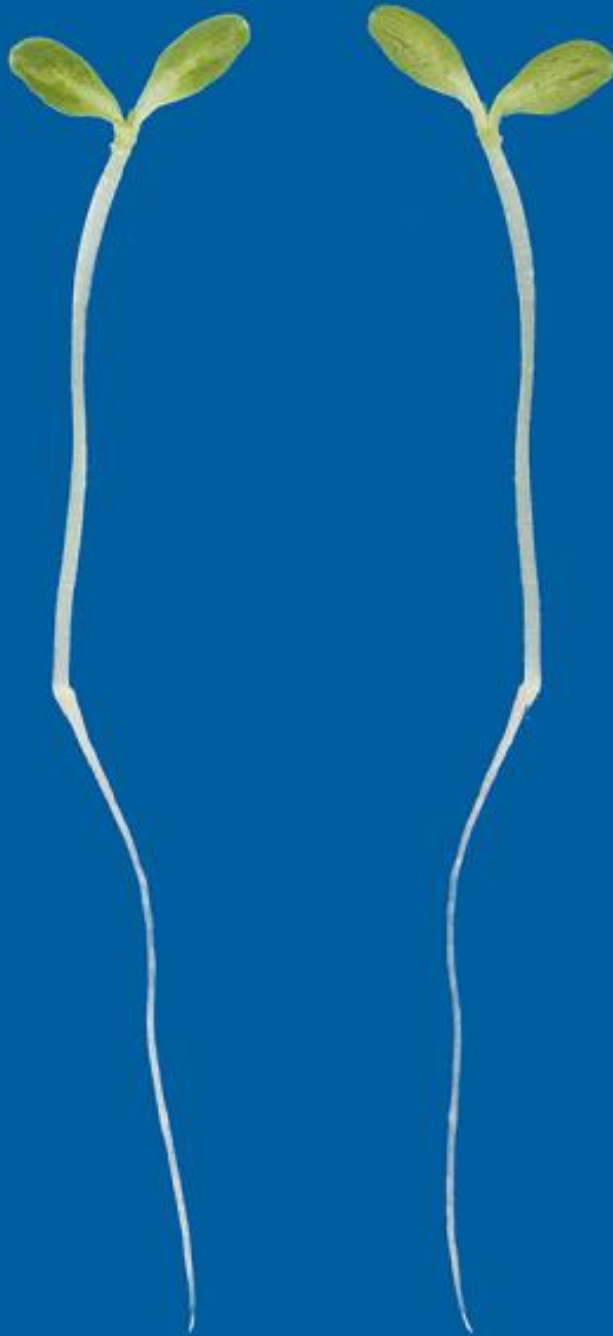


Image 16

Distribution of responses:

- Normal: 20%
- Abnormal: 80%

Most common reasons for classification:

Abnormal:

- Short and blunt root.
- More than 50% necrosis.

Normal:

- Less than 50% necrosis.
- Acceptable short root.

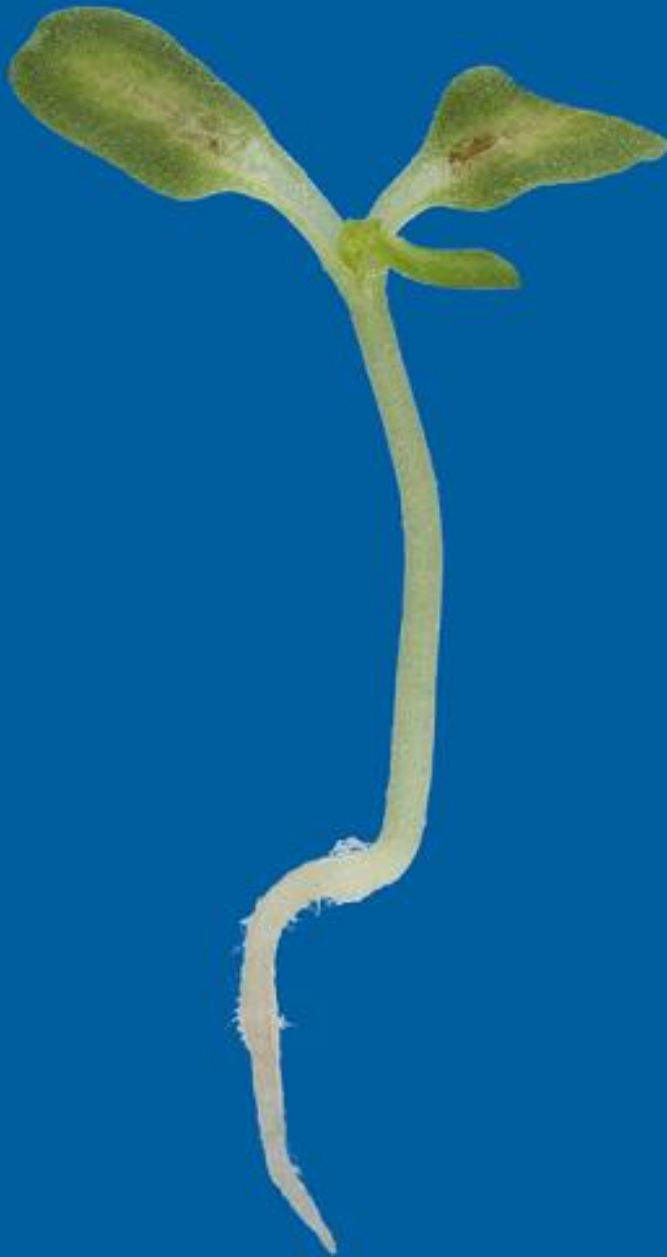


Image 12

Distribution of responses:

- Normal: 78.9%
- Abnormal: 21.1%

Most common reasons for classification:

Normal:

- Less than 50% necrosis.

Abnormal:

- Missing epicotyl.
- Watery or lesioned hypocotyl.



Image 15

Distribution of responses:

- Normal: 78.9%
- Abnormal: 21.1%

Most common reasons for classification:

Normal:

- Less than 50% necrosis.
- Less than 50% mechanical damage.

Abnormal:

- Twisted, swollen or watery hypocotyl.
- Damaged cotyledons.
- More than 50% necrosis.

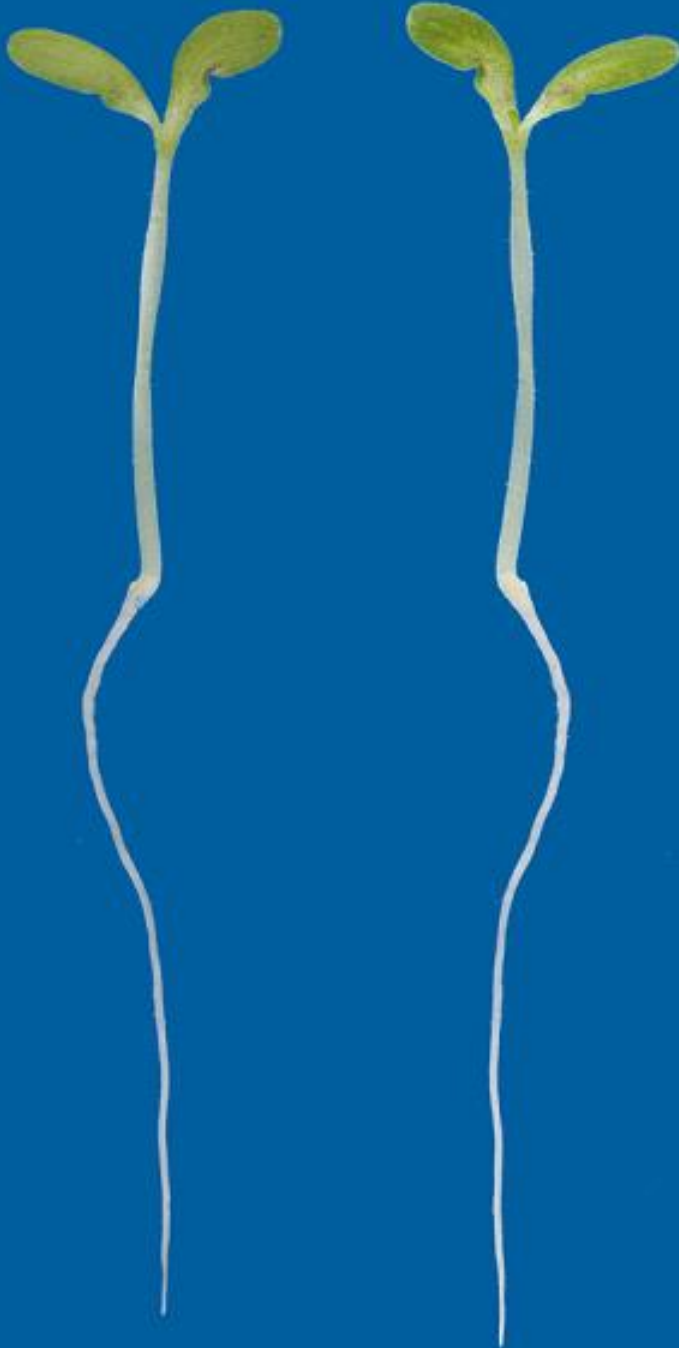


Image 19

Distribution of responses:

- Normal: 21.1%
- Abnormal: 78.9%

Most common reasons for classification:

Abnormal:

- Split root.
- Stunted or insufficient roots.

Normal:

- Healthy sprout.
- Short but sufficient roots.



Image 3

Distribution of responses:

- Normal: 77.5%
- Abnormal: 22.5%

Most common reasons for classification:

Normal:

- Less than 50% necrosis.

Abnormal:

- More than 50% necrosis.



Image 18

Distribution of responses:

- Normal: 32.4%
- Abnormal: 67.6%

Most common reasons for classification:

Abnormal:

- More than 50% necrosis.
- Watery hypocotyl.

Normal:

- Less than 50% necrosis.
- Natural varietal pigmentation.

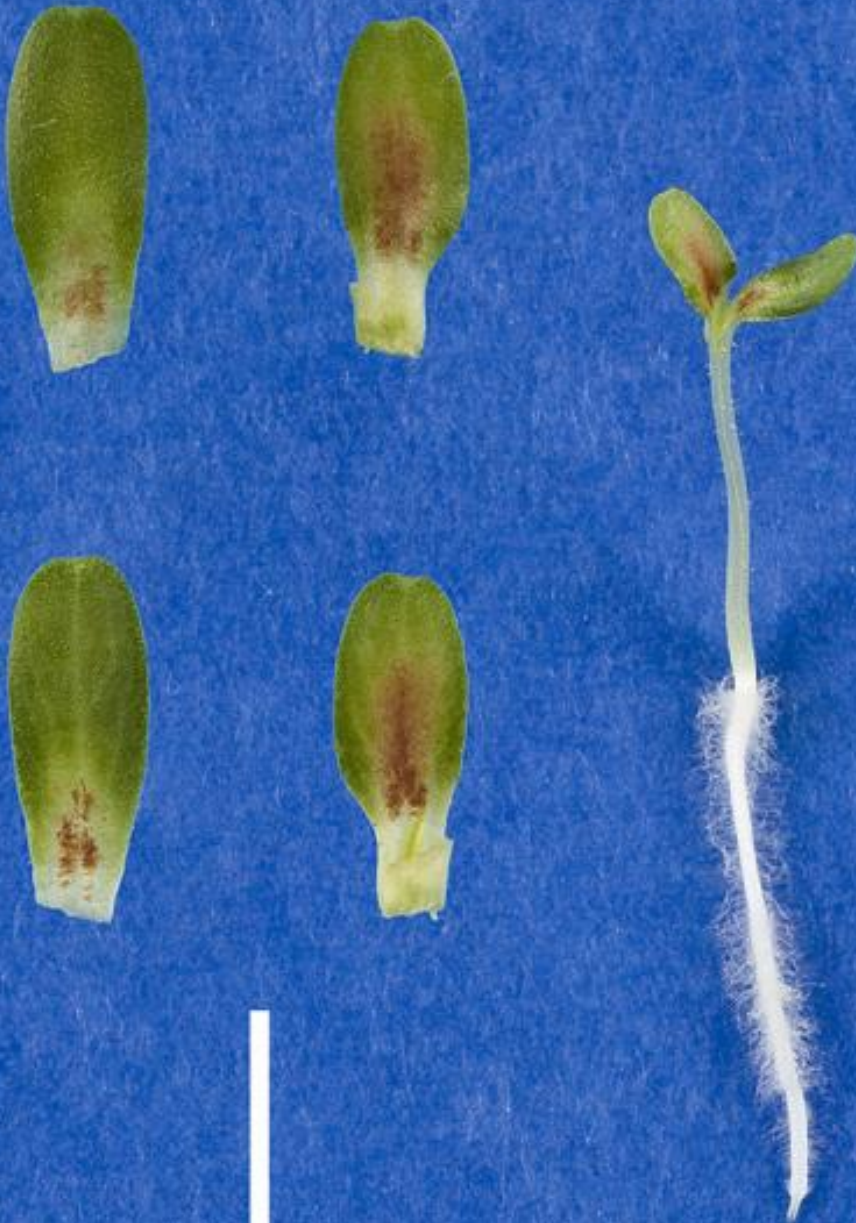


Image 6

Distribution of responses:

- Normal: 33.3%
- Abnormal: 66.7%

Most common reasons for classification:

Abnormal:

- Albino or yellow cotyledons.
- Deficient or no chlorophyll.
- Chlorosis.

Normal:

- Yellow not albino.
- Varietal color variation.
- Weak chlorophyll due to lack of light.

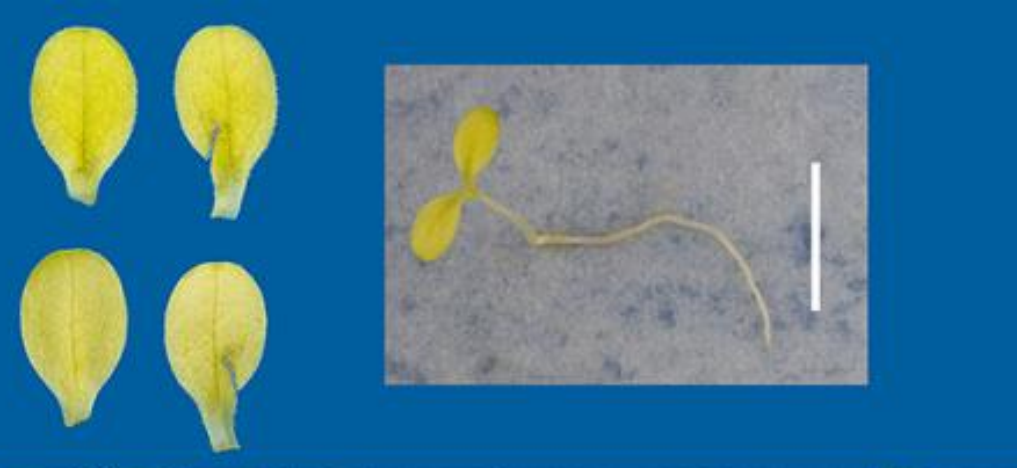


Image 17

Distribution of responses:

- Normal: 66.2%
- Abnormal: 33.8%

Most common reasons for classification:

Normal:

- Less than 50% necrosis.
- Less than 50% mechanical damaged.
- Less than 50% damaged and or decayed cotyledons.

Abnormal:

- Weak, swollen or lesioned root.
- Short watery hypocotyl.

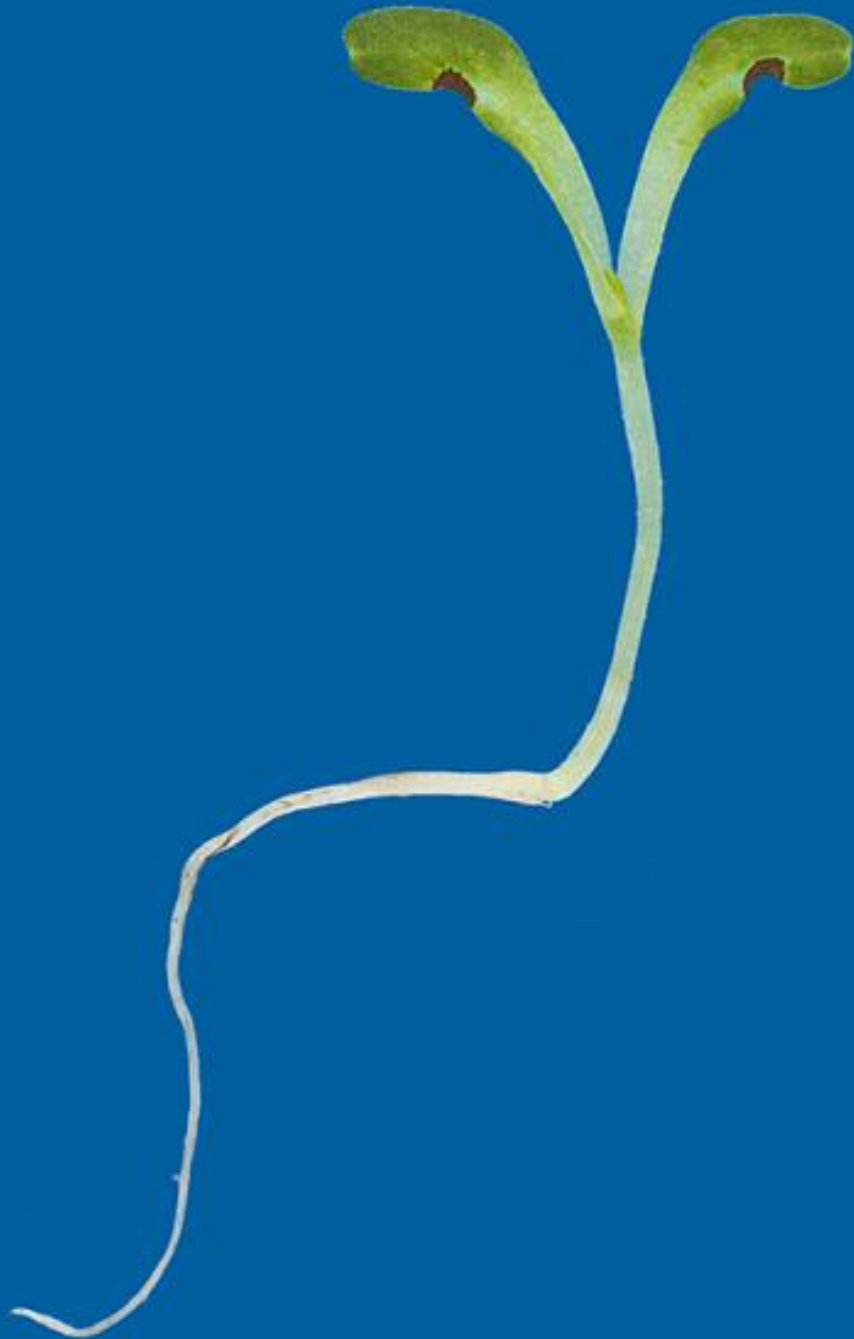


Image 28

Distribution of responses:

- Normal: 35.7%
- Abnormal: 64.3%

Most common reasons for classification:

Abnormal:

- More than 50% necrosis.
- More than 50% decayed.

Normal:

- Less than 50% necrosis.
- Less than 50% decayed.
- Natural varietal pigmentation.

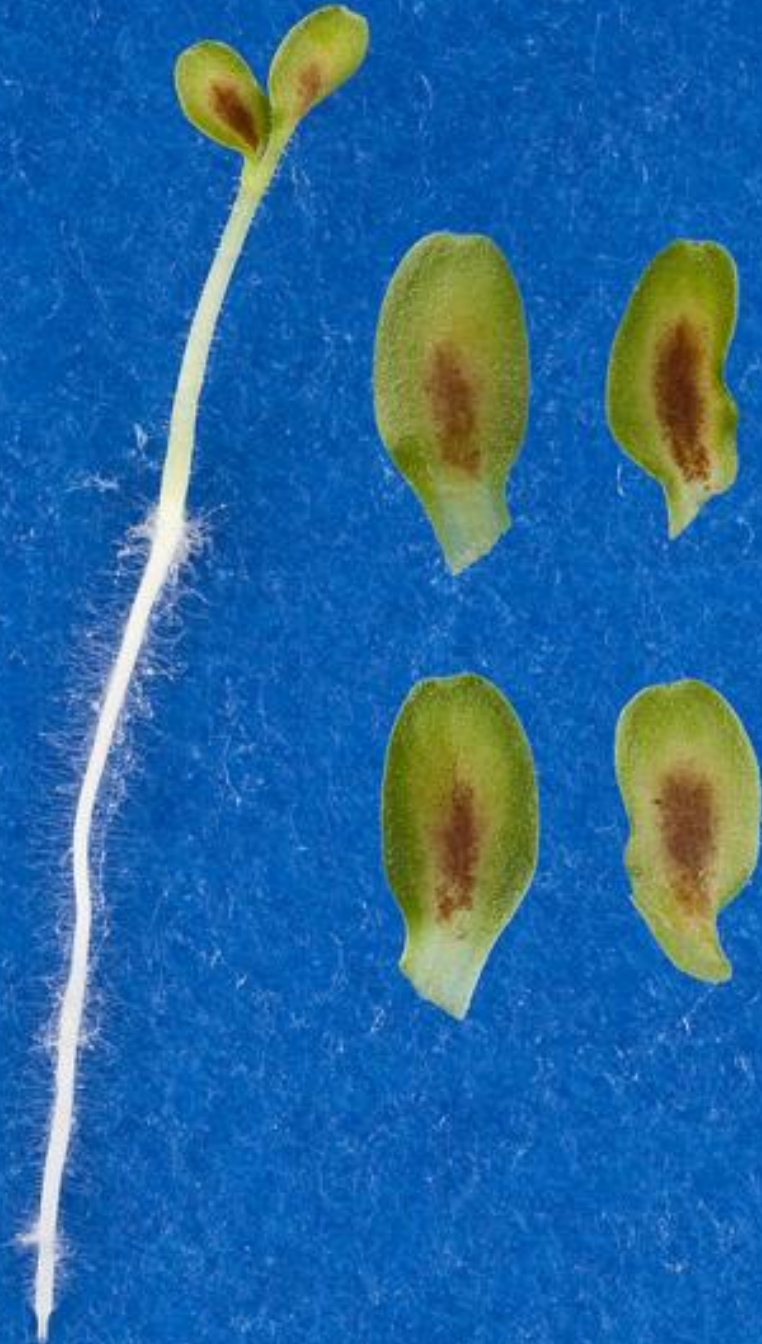


Image 10

Distribution of responses:

- Normal: 59.7%
- Abnormal: 40.3%

Most common reasons for classification:

Normal:

- Less than 50% necrosis.
- Less than 50% mechanical damaged.

Abnormal:

- More than 50% necrosis.
- Damaged cotyledons.



Image 25

Distribution of responses:

- Normal: 42.3%
- Abnormal: 57.7%

Most common reasons for classification:

Abnormal:

- Short, watery hypocotyl.
 - Damaged point of attachment.
 - Decay or necrosis at the point of attachment.
 - Missing epicotyl.
-
- Normal:
 - Less than 50% necrosis.
 - Less than 50% damaged cotyledons



Image 26

Distribution of responses:

- Normal: 56.3%
- Abnormal: 43.7%

Most common reasons for classification:

Normal:

- 50% functional cotyledon tissue free of necrosis or decay, remaining attached.

Abnormal:

- Damaged or decayed cotyledons.
- More than 50% necrosis.
- Missing or weak epicotyl.



Image 7

Distribution of responses:

- Normal: 44.4%
- Abnormal: 55.6%

Most common reasons for classification:

Abnormal:

- Damaged or decayed root.
- Weak watery root.

Normal:

- Secondary infection.
- Root dried out from test conditions.



Image 1

Distribution of responses:

- Normal: 54.9%
- Abnormal: 45.1%

Most common reasons for classification:

Normal:

- Less than 50% necrosis.

Abnormal:

- More than 50% necrosis.
- Decayed or damaged growing point.

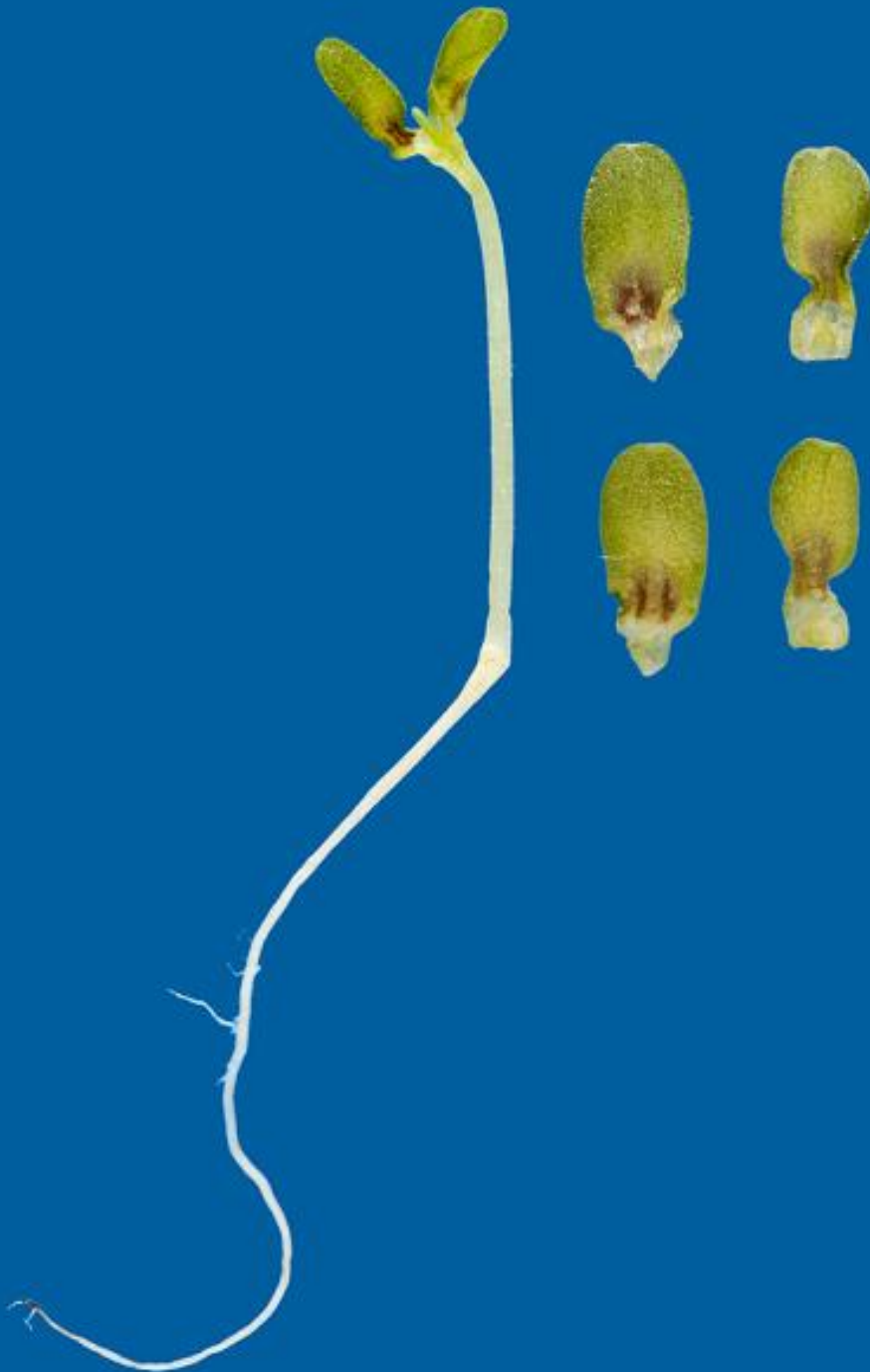


Image 30

Distribution of responses:

- Normal: 53.7%
- Abnormal: 46.3%

Most common reasons for classification:

Normal:

- Natural varietal pigmentation.

Abnormal:

- More than 50% necrosis.
- Short, swollen or grainy hypocotyl.
- Decayed, swollen cotyledons.
- Spindly roots.

Notes: 5 participants did not answer this question.



Committee Objectives

- Produce and conduct a lettuce evaluation webinar.
- Propose changes to the AOSA Rules.

Asteraceae, Sunflower family I

Seedling Evaluation Handbook

Committee Members:

Jane Kohn

Ha Ung

David Johnston

Connie O'Brian

Elizabeth Bada

Special thanks to:

Riad Baalbaki and Sabry Elias