Seed Laboratory Report
FY 21-22 +
July 2021 – June 2022

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11-9-2022

Seed Lab Functions

- **Regulatory** (**label compliance**) testing - purity, noxious weed, germination
- **Service** testing - identification, purity, germination, seed vigor, viability (TZ), moisture content
- **Identifications**
- **Improvement** of existing seed testing rules
- **Development** of new methods/rules of seed testing
- **Investigations/Consultations**
- **Training** of analysts

Staffing Changes at the Seed Lab-1

Emi Kuroiwa was promoted to Associate Seed Botanist in January 2022. She had previously worked as an Environmental Scientist at the Seed Lab since April 2020.

Emi recently passed her Seed Analyst certification exams and is now a Certified Seed Analyst in both Purity and Germination (October 2022). Although involved with all aspects of seed testing, her main contribution to the Seed Lab will be in the area of purity testing.

Staffing Changes at the Seed Lab-2

Gordon Au recently joined the Seed Lab (March 2022) as an Agricultural Technician II. Gordon is a graduate of California State University, Sacramento, with a BS in Biological Sciences (General Biology).

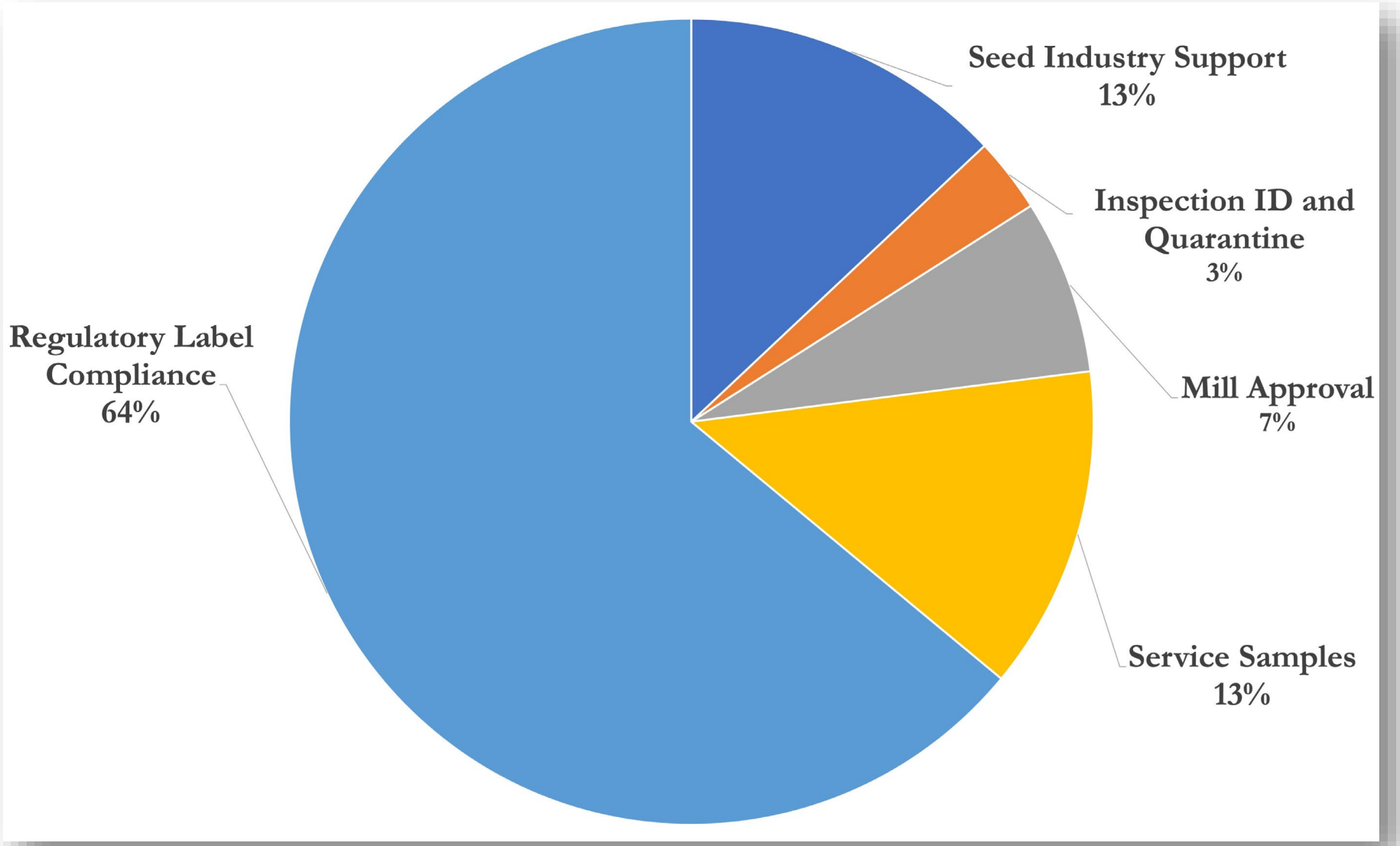
Gordon is charged with planting samples for germination testing, and with general maintenance of the Seed Viability & Germination lab. His diligent and consistent work has been a key factor in germination testing efficiency.

Staffing Changes at the Seed Lab-3

In August 2022, Kevin Stoffel joined our Seed Lab as an Environmental Scientist. Kevin worked at UC Davis for 19 years, 14 years at the Seed Biotechnology Center and 5 at the Department of Dermatology.

Kevin's background is in genomics and molecular analysis, focusing on genome sequencing, SNP identification, qRT-PCR and transcriptome analysis. Kevin will oversee sample prep for sample analysis, scheduling and monitoring samples at all stages of analysis, as well as other organizational lab duties.

Time (%) spent on different seed lab activities

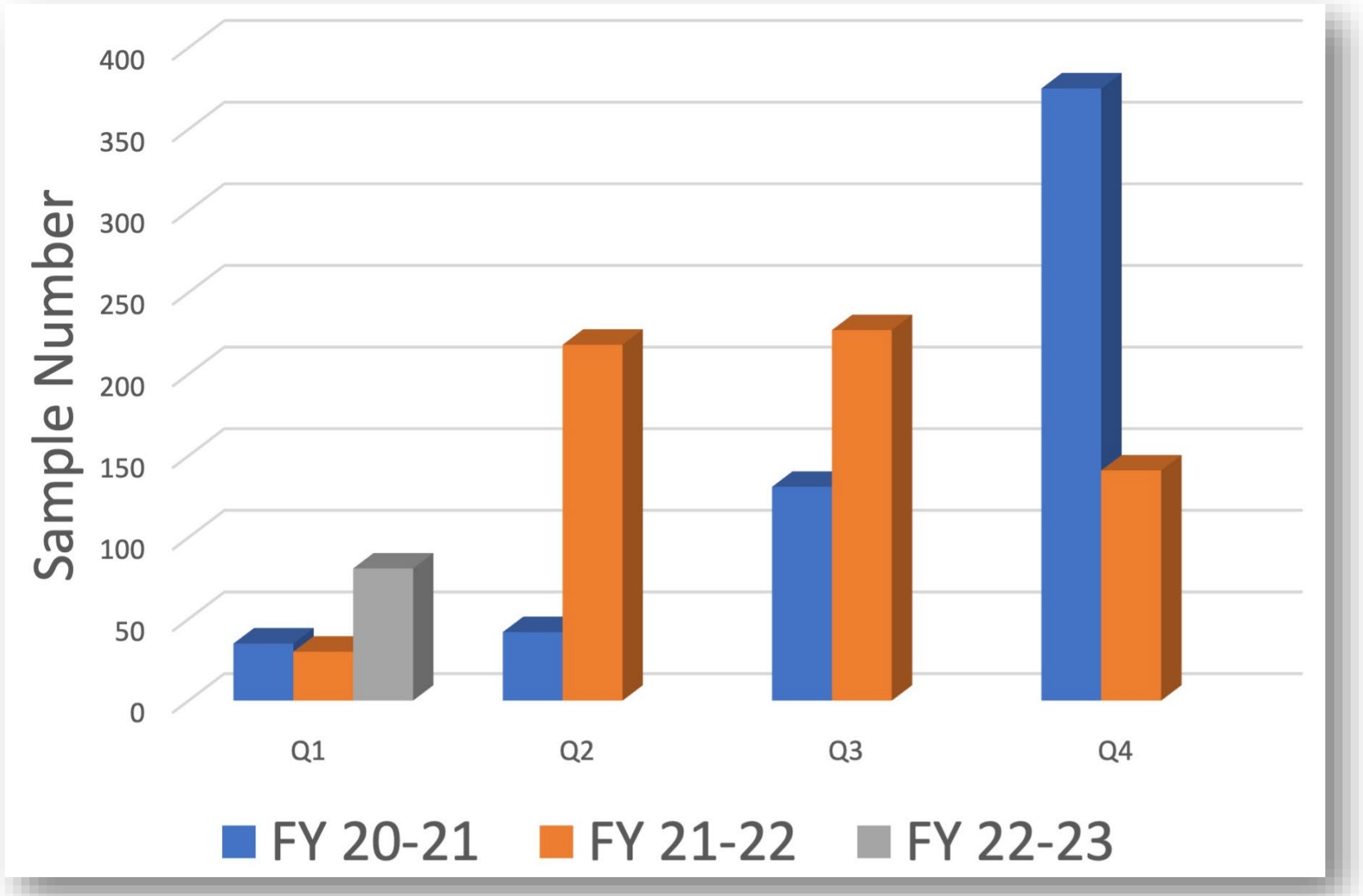


Label Compliance (Regulatory) Testing

Sample Numbers:

- **FY 21-22**: 615 samples released to SL (103% of 600 target)
- **FY 20-21**: 583 samples released to SL (97% of 600 target)

Sample Distribution By Quarter FY 20-21 and FY 21-22



Violations-1

Three categories of violations:

- **Labelling standards**
- **Purity**
- **Germination**

Violations-2

Number of samples with at least one violation:

- Average prior to FY 21-22: **17.4%**
- FY 17-18: **11%**
- FY 20-21: **18%**
- FY 21-22: **23%**
- FY 22-23: **26%***

Violations-3

Total number of violations, FY 21-22:

- **242** (from 615 samples)
- Samples with a single violation: **83**
- Samples with two violations: **36**
- Samples with three violations: **18**
- Samples with more than three violations (up to 6): **7**

Violation Types and Numbers

Violation Type	No.
No Mediation Statement	18
No Treatment Signal Word	16
No Labeler Address	10
Non-Registered Labeler	8
Mediation Statement Not Properly Labeled	12
Seed Kind	22
Pure Seed Percentage	30
% Viability Labeled (not Germination)	1
Different Purity %, Germ %, Test Date/Lot	1
PVP Notification	19
No Certification Tags Attached	1
No required treatment labelling	1
Treatment Precautions Not Labelled	8
Germination %	4
Germination Date of Test Expired	3
Unlabeled CA Restricted Noxious Weed Seed	1
Sell By/Packed for Season Date Mislabeled	2
Incorrect Labelling of a Mixture	1
No Labelled Sell By Date	2

Violation Type	No.
Unlabeled Coating Material %	10
Undeclared Mixture	1
Other Crop Seed Percentage	4
Inert Matter Percentage	16
Total Purity Components Not 100%	6
Non-Registered Labeler	11
No Noxious Weed Seed Component on Label	4
Different Purity %, Germ. %, Germ. Date of Tests/Lot	1
Incorrect Labeling of a Blend	5
Variety Name Mislabeled	1
No Certification Documentation/No Tags Attached	2
Doesn’t Meet Treatment Labelling Requirements	1
Certification Violation	5
Variety Not Stated	4
No Treatment Statement	7
Agriculture Crop vs. Vegetable Crop	1
Weed Seed %	1
Germ Percentage not labeled "Below Standard"	1

Most Common Violations, FY 21-22

Violation Type	No.	%
Pure Seed Percentage	30	5
Seed Kind	22	4
Non-Registered Labeler	19	3
PVP Notification	19	3
Germination Percentage	4	0.6

Service Testing-1

- **FY 21-22**
  - **262 samples for purity/germination testing**
    - 177 rice
    - 42 vegetables
    - Others (e.g., dichondra, peaches, vigor tests)
- **FY 22-23**
  - **55 samples for purity/germination testing**
    - Mostly vegetables (25), peaches (15) and dichondra (13)

Service Testing-2

- **FY 21-22**
  - **Seed IDs**
    - 50 IDs from 32 samples
- **FY 22-23**
    - 21 IDs from 16 samples

- **FY 21-22**
  - **Feed mill inspections: 134 certification samples**

Turnaround Time-1

What is a "good" turnaround time?

- **For a single species, the length of time it should take to test that species**

Turnaround Time-2

What is a "good" turnaround time?

- **Tomato germination takes 14 days (FSA, AOSA, ISTA)**
  - **Turnaround time for tomato is at least 14 days**

Turnaround Time-3

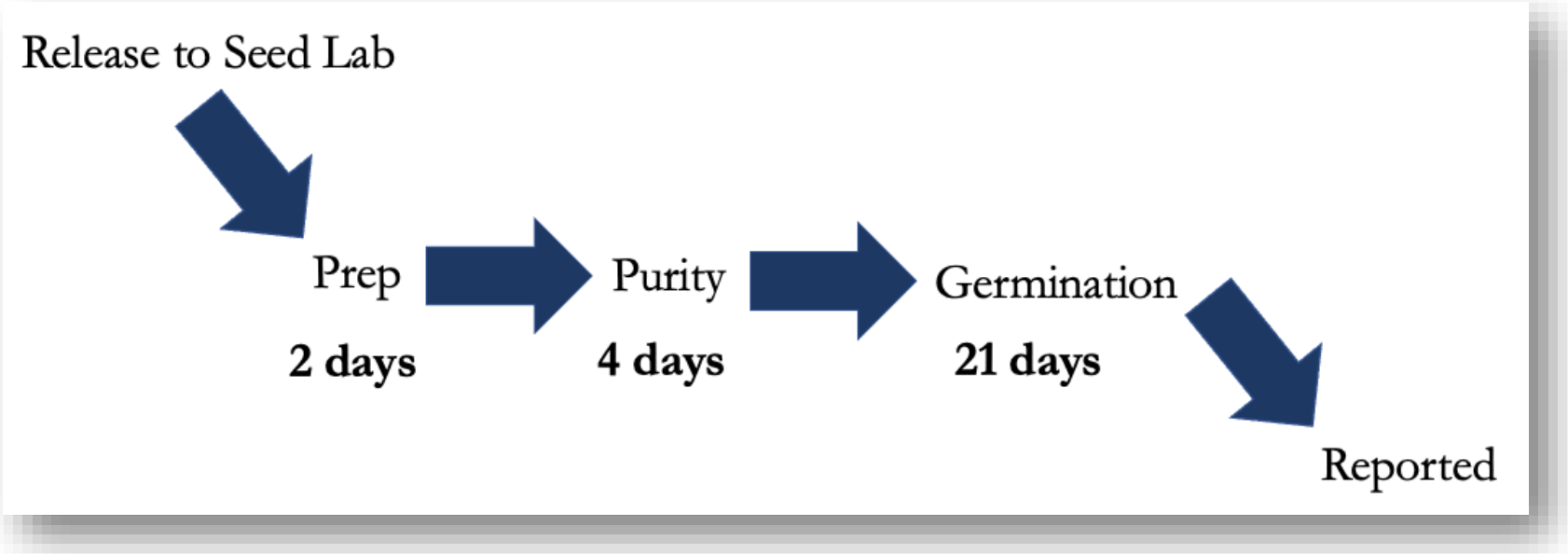
What is a "good" turnaround time?

- **For lettuce and wheat: 7 days**
- **For red fescue and giant bermudagrass: 21 days**
- **For Kentucky bluegrass (FSA), parsley and dichondra: 28 days**
- **Johnsongrass: 35 days**

Turnaround Time-4

The calculated turnaround time based on germination Rules would be **21 days** for **FY 21-22**.

Total days at all stages: days: **27**



Turnaround time-5

Factors that extend the turnaround time:

- Pre-treatments
- Dormant seeds/extended test
- Sample distribution
- Staff Absences
- Scheduling limitations

- The average turnaround time: **30-35 days**.

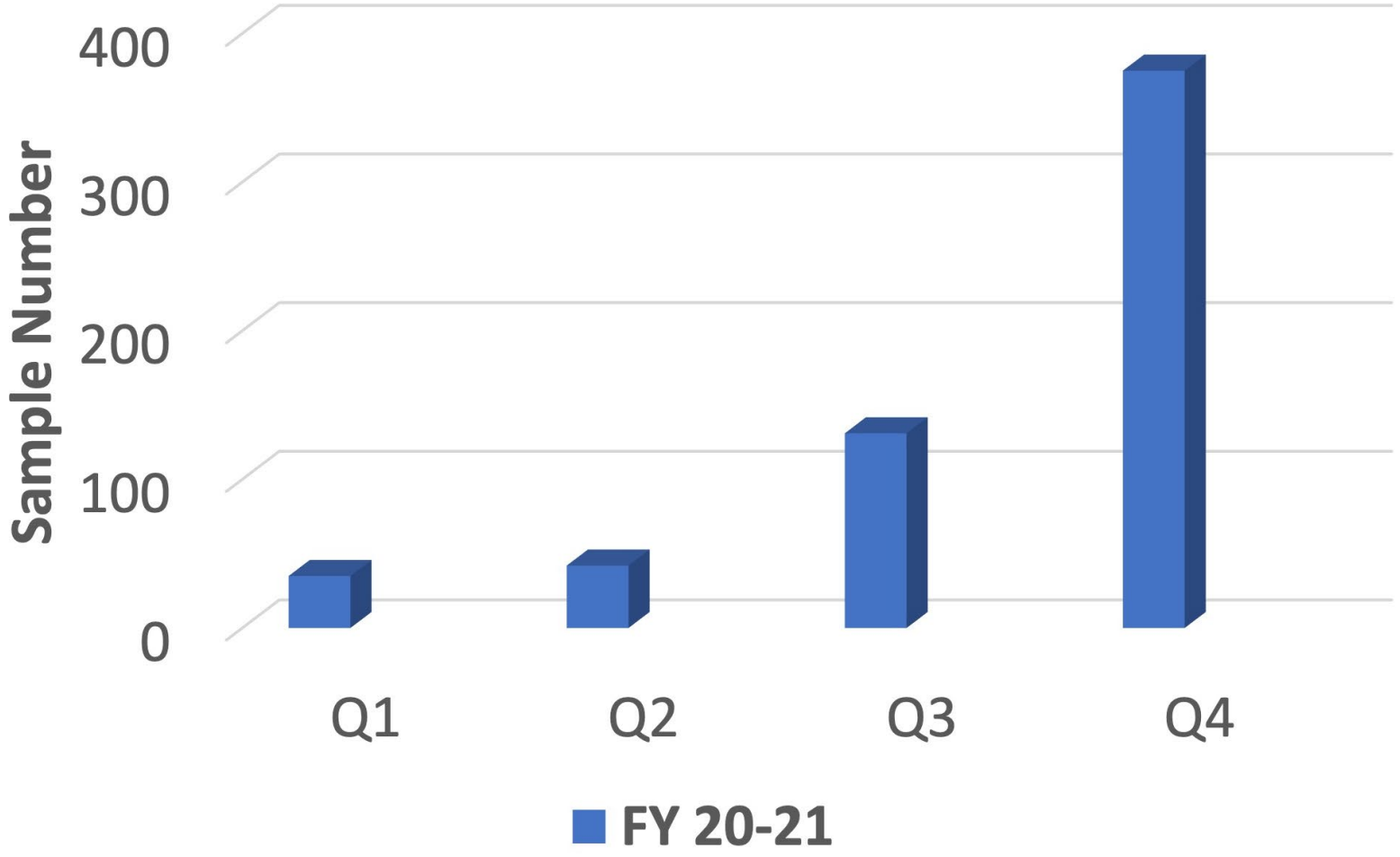
CA Seed Lab Turnaround Days Last 10 Years

FY	TA days	Notes
10-11	31	Four seed botanists on staff
14-15	53	Seed Lab staff reduction
19-20	46	Reduction in SL staff due to retirement
20-21	40	Covid-19

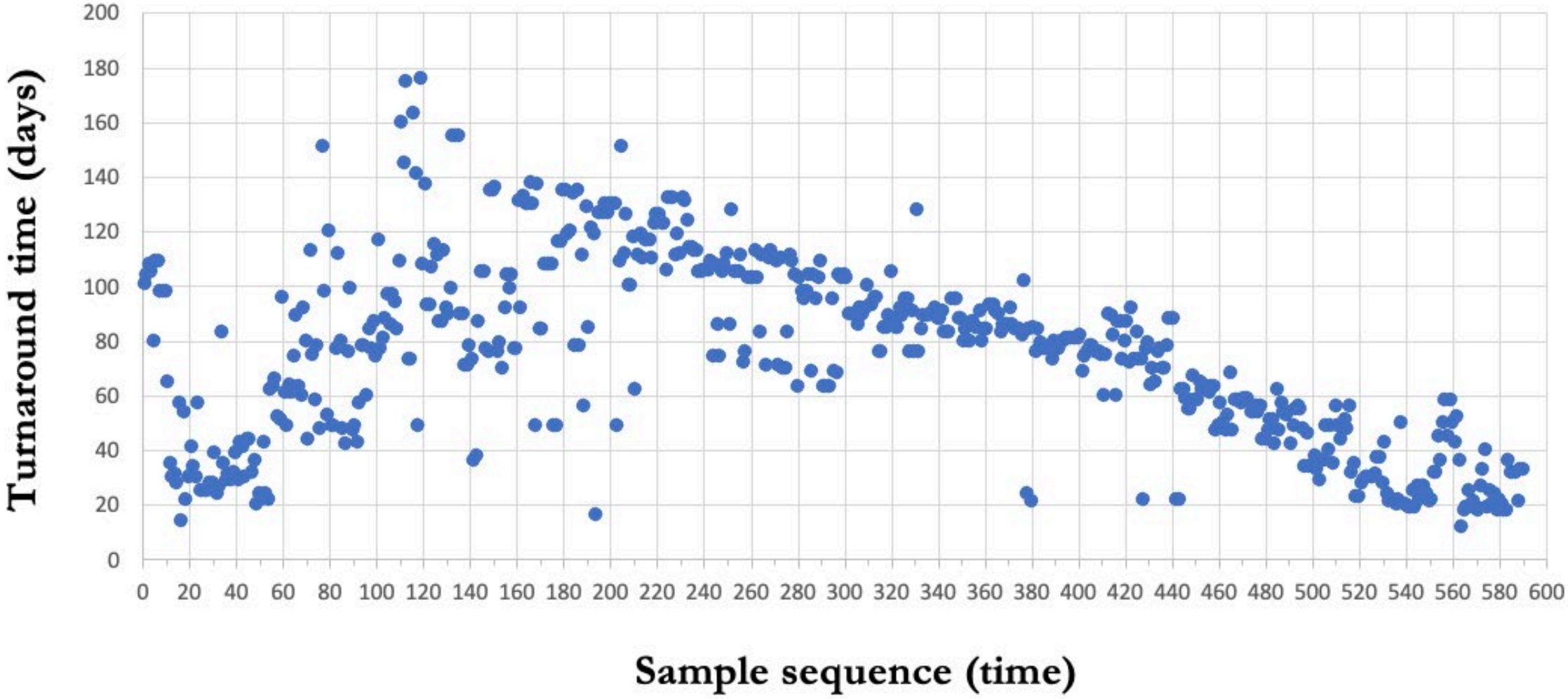
Turnaround Time FY 21-22

Type	Days
Agricultural	71
Lawn Seed	77
Vegetables	75
Overall Average	**74**

Sample Distribution By Quarter, FY 20-21



Turnaround days for each sample released to the Seed Lab (FY 21-22)



Turnaround Time* FY 2022-2023
(*Based on 130 samples)

Overall Turnaround Time:	18.6 days
Agricultural (untreated):	13.0
Lawn (untreated):	15.5
Vegetables (untreated):	15.1
Vegetables (treated):	16.1

Activities in Support of the Seed Industry

- Training Analysts
- Changes to testing rules
- Purity weight calculator
- Lettuce necrosis evaluation

Changes to Testing Rules-1

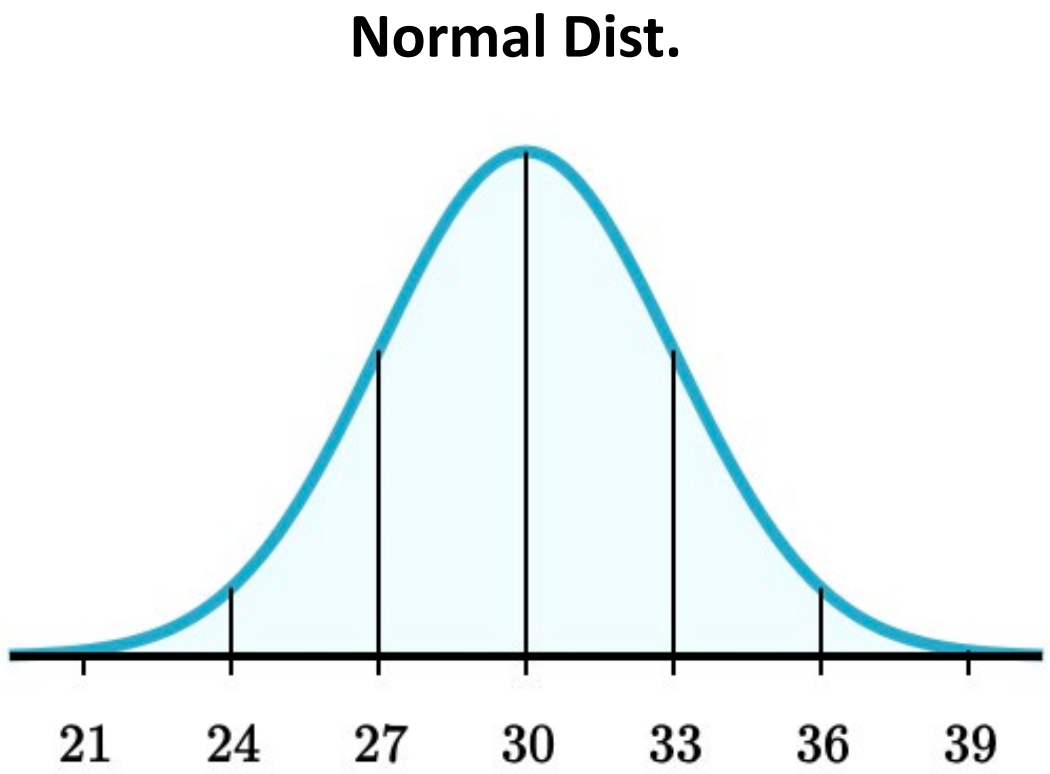
- **<u>Revision of germination Rules</u>: duration of the prechill period should not be included in the germination periods given in Table 6A. *Riad Baalbaki and David Johnston***
- **<u>Revision of purity Rules</u>: added requirement to report the number of other crop and weed seeds found in the purity analysis. *ROAWG (D. Meyer)***
- **<u>Revision of germination Rules</u>: added example sketches as an aid to uniform seedling evaluation of Apiaceae. *Albre Brown and Riad Baalbaki***

Purity Weight Calculator-1

2A. Weights for working samples

Kind of seed	Minimum weight for purity analysis[b]	Minimum weight for noxious weed seed or bulk examination	Approximate number of seeds per gram[c]	Approximate number of seeds per ounce[d]
	Grams	Grams	Number	Number
Nicotiana tabacum L. tobacco	0.5	5	15,625	442,970
Cucurbita pepo L., *C. moschata* Duchesne and *C. maxima* Duchesne squash	200	500	14	395

Purity Weight Calculator-2



- This is most relevant for adding native/wild/flower species to the Rules
- These species tend to have a higher degree of variation in seed weight within and among lots

Purity Weight Calculator-3

MINIMUM PURITY/BULK/NOXIOUS WEED WEIGHTS CALCULATOR

-Start by entering all seed lot/sample IDs; you can enter and analyze data for up to 20 seedlots (Part A).

-Follow instructions starting with part A, Part B, Part C if necessary, and finally Part D. Numbered instructions in each box (B, C, and D) refer to procedures in identically numbered parts of the calculator.

-Parts B and C are used to calculate purity and bulk/noxious seed weights for individual seedlot samples. Part D is then used to determine the minimum purity and bulk/noxious weed working weights for inclusion in Table 2A of the Rules, vol. 1 (2022).

***Please read** the accompanying document (Determining Purity-Bulk-Noxious exam Weights.pdf) for test requirements, method descriptions, and examples.*

This calculator is password protected to prevent accidental changes. To keep your data and output, please save this file under another name.

A

Lot/sample identification

Lot	ID
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

B

B1. Enter the weights of 8 replications (1-8) for a single sampled seedlot. Ignore the ranked results with marked red dots generated for the first 8 replicates. Ranked results are only used in Part C below.

B2. Check the CV. If the CV is 6% or less for chaffy kinds, or 4% or less for non-chaffy kinds, proceed to B3. If the CV is greater than 6% or 4% for chaffy and non-chaffy kinds, respectively, skip steps B3-B5 and go to part **C**.

B3. The output shows the unrounded mean, with all possible rounding options. Use section 2.3a of AOSA Rules, vol. 1 (2021) to determine the correct number of decimals for your final answer. Section II.5 of the accompanying instructions also describes correct rounding.

B4. Manually enter the correctly rounded mean from B3 in the provided field.

B5. The purity and bulk/noxious weed exam weights are calculated for this seedlot. Enter the purity weight without further rounding in D1 for that seedlot. *If you copy and paste the purity weight from B5 to D1, make sure you use the 'Paste as value' function in Excel. Otherwise, Excel will paste the equation for calculating the purity weight rather than the actual value. Double clicking on the destination cell before pasting is a shortcut for pasting just cell values (double clicking only works for single cells, not when multiple cells are selected).*

Repeat for samples from each seed lot. Before each new analysis, make sure you clear the contents you entered under B1 and B4.

B1. Data entry

Replication	100-seed weight (g)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	

B2. CV (%); first 8 replicates:

C

This part is only needed if the CV(%) calculated in part B is above the maximum acceptable limit for either chaffy or non-chaffy seeds.

Enter the additional replicate weights (9-16) from the same sample in B1. The rank of each replicate weight, based on its absolute difference from the mean, is displayed to the right of the data. Among the 16 replicates, the two replicate weights with the largest absolute difference from the mean, ranked 1 and 2 from higher to lower, are marked by a corresponding red dot.

C1. A revised CV is calculated based on all 16 replicates. If the CV is within acceptable limits (equal to or less than 4% or 6%) skip C3 and proceed to C4 without checking for outliers. If the CV is greater than the acceptable limit, go to C3.

C2. Outlier checks for the two replicate weights with the largest absolute difference from the mean are calculated using the ESD test (*refer to section III of the accompanying instructions for test details*). Note that outlier checks are only valid when performed on the complete data set (16 replicates), and are irrelevant after a replicate weight has been deleted from the data. If the replicate with the largest difference from the mean (Rank 1) is identified as an outlier ('YES' result), while Rank 2 replicate is not an outlier ('NO'), delete the replicate weight corresponding to Rank 1 and proceed to C4 after confirming that the CV is now within acceptable limits. If the second ranked replicate weight (Rank 2) is identified as an outlier ('YES'), regardless of Rank 1 status, this seedlot's results cannot be included in determining purity/bulk/noxious working weights. *Presence of more than one outlier indicates possible methodological errors (refer to accompanying instructions for more details).*

C3. The unrounded revised mean of all remaining replicates is calculated. Use section 2.3a of AOSA Rules, vol. 1 (2022), or refer to section II.5 of the accompanying instructions to determine the correct number of decimals for your final answer.

C4. Manually enter the correctly rounded mean from C4 in the provided field.

C5. The purity and bulk/noxious weed exam weights are calculated for this seedlot. Enter the purity weight without further rounding in D1 for that seedlot. *If you copy and paste the purity weight, make sure you use the 'Paste as value' function in Excel. Otherwise, Excel will paste the equation rather than the actual value. Double clicking on the destination cell before pasting is another way of just adding cell value (double clicking only works for single cells, not when multiple cells are selected).*

Repeat for samples from each seed lot when the CV is above acceptable limits. Before each new seedlot analysis, make sure you clear the contents you entered under B1, B4, and C4.

B3. Mean before rounding:	---
Mean after rounding to 4 decimals:	---
Mean after rounding to 3 decimals:	---
Mean after rounding to 2 decimals:	---
Mean after rounding to 1 decimal:	---
Mean after rounding to whole number:	---

B4. Enter rounded mean value here:

B5. Purity and bulk/noxious exam weights

Purity wt. (2500 seeds):	
Bulk/noxious weed wt. (25,000 seeds):	

C1. Revised CV (%); all replicates:

C2. Outlier check

This test is designed to check for outliers using the full data set. Do not use after a replicate weight is discarded.

100-seed weight rank	Outlier
Rank 1	
Rank 2	

C3. Revised mean before rounding:	---
Mean after rounding to 4 decimals:	---
Mean after rounding to 3 decimals:	---
Mean after rounding to 2 decimals:	---
Mean after rounding to 1 decimal:	---
Mean after rounding to whole number:	---

C4. Enter rounded mean value here:

C5. Purity and bulk/noxious exam weights

Purity wt. (2500 seeds):	
Bulk/noxious weed wt. (25,000 seeds):	

D

D1. For each seed lot, enter the average purity weight (2500 seeds) calculated in either B5 or C6 without further rounding.

D2. Check the CV. For the purposes of determining the minimum weight of a purity sample (or bulk/noxious weight), the CV should not exceed 10% for either chaffy or non-chaffy kinds. If the CV is greater than 10%, single reliable estimates of minimum purity and bulk/noxious weed weights cannot be calculated based on the sampled seed lots.

D3. The average purity weight from all lots is calculated. *Do not use this value when proposing an addition/change to Table 2A of the Rules, vol. 1 (2022).*

D4. The **Minimum Purity Working Weight (g)**, derived from the value in D3, is calculated without rounding. This value is the upper limit 95% confidence interval for the mean (D3). Results must be rounded to the correct number of decimal places, as described in sec. 13.4b.1 of the rules, vol. 1 (2022), before inclusion in Table 2A of the rules.

D5. Manually enter the correctly rounded mean from D4 in the provided field. *This is the value to be proposed for addition to Table 2A of the rules .*

D6. The minimum bulk/noxious weed weight for inclusion in Table 2A is automatically generated.

Before a new analysis for a different species, make sure to clear the data entered under A1, B1, B4, C4, D1 and D5.

D1. Average purity weight for each seed lot

Lot No.	ID	Calculated purity weight (g)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

D2. CV (%):

D3. Mean purity weight ---

D4. Unrounded Minimum Purity Working Weight (g):	---
Minimum purity weight rounded to 2 decimals:	---
Minimum purity weight rounded to 1 decimal:	---
Minimum purity weight rounded to whole number:	---

D5. Minimum Purity Working Weight (g):

D6. Minimum bulk/noxious weed weight (g):

Purity Weight Calculator-4

B1. Data entry		
Replication	100-seed weight (g)	
1	1.2342	8
2	1.2278	10
3	1.2241	12
4	1.2259	11
5	1.1165	4
6	1.2001	15
7	1.2341	9
8	1.2365	7
9	1.1956	16
10	1.2117	14
11	1.2876	2
12	1.0889	1
13	1.1276	6
14	1.2213	13
15	1.1127	3
16	1.1258	5
B2. CV (%); first 8 replicates:	3.3	
B3. Mean before rounding:	1.21240	
Mean after rounding to 4 decimals:	1.2124	

D2. CV (%):	6.9
D3. Mean purity weight	1.2034
D4. Unrounded Minimum Purity Working Weight (g):	1.25863
Minimum purity weight rounded to 2 decimals:	1.26
Minimum purity weight rounded to 1 decimal:	1.3
Minimum purity weight rounded to whole number:	1
D5. Minimum Purity Working Weight (g):	1.26
D6. Minimum bulk/noxious weed weight (g):	12.6

Lettuce Necrosis Evaluation

- **Considerable confusion and lack of uniformity in evaluating lettuce cotyledon necrosis.**

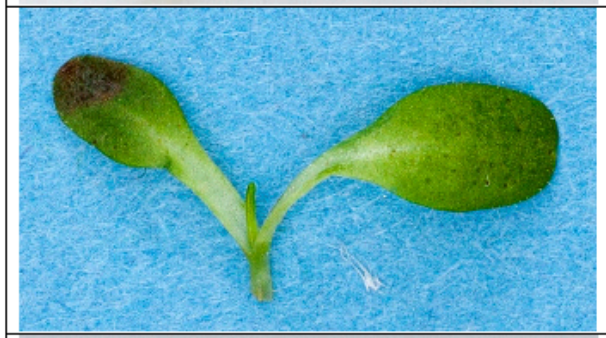
	**Figure 3** **Normal** **Minor necrosis on one cotyledon. Apparent blotchiness on surface is outer epidermal cells of cotyledons.**
	**Figure 4** **Normal** **Necrosis or decay affects less than 50% of cotyledon tissue; no necrosis at point of attachment to hypocotyl. Healthy epicotyl.**
	**Figure 5** **Normal** **Physical necrosis affecting less than 50% of cotyledon tissue; no necrosis at point of attachment to hypocotyl.**
	**Figure 6** **Abnormal** **Necrosis at the point of cotyledon attachment to the hypocotyl.**

	**Figure 7** **Abnormal** **Severe necrosis at the point of cotyledon attachment to the hypocotyl as well as other pre-necrotic (light green or brown) cotyledonary tissue.**
	**Figure 8** **Abnormal** **Necrosis or decay at point of attachment, extending into the hypocotyl and the epicotyl.**
	**Figure 9** **Abnormal** **Necrosis at the point of cotyledon attachment to the hypocotyl. Same seedling is depicted from two angles.**
	**Figure 10** **Abnormal** **Necrosis at the point of cotyledon attachment to the hypocotyl and extending to the rest of the cotyledons.**

Figure 11

Abnormal

Necrosis affecting more than 50% of cotyledonary tissue. Light-green tissue surrounding dark necrotic area is an example of early stages of necrosis.

Figure 12

Abnormal

Necrosis and pe-necrosis affecting most cotyledonary tissue. 'Transparent' tissue of the cotyledon-hypocotyl juncture is normal for lettuce.

Figure 13

Normal

Physical necrosis, usually due to insect or mechanical damage. Epicotyl is healthy. 'Transparent' tissue at the hypocotyl juncture is normal.

Figure 14

Normal

Example of physical rather than physiological necrosis due to insect or mechanical damage, affecting less than 50% of cotyledon tissue.

Thank You!