2024-2025 PT #1
Application of Test Tolerances

1. If the difference between two tests are found to be within the allowable tolerances from Section 14 of the AOSA Rules, the difference can be attributed to:
    a. Reporting error
    b. Random sample variation
    c. Evaluation error
    d. Test conditions

Section 14: Tolerances
14.2 Purity tolerances
b. Regular Tolerances

14.2 Purity tolerances
b. Regular Tolerances – *Example 1*

14.2 Purity tolerances
c. Special tolerances
(1) Short Method – *Example 1*

14.4 Tolerances for comparing the percentage of pure seed of two tests based on the fluorescence test for ryegrass, the copper sulfate-ammonia test for sweet clover or other tests used for the separation of species based on morphological characteristics

14.5 Germination tolerances
b. Procedure for finding the maximum tolerance between replicates in a germination test – *Example 1*

14.5 Germination tolerances
b. Procedure for finding the maximum tolerance between replicates in a germination test – *Example 3*

14.7 Tolerances for tetrazolium tests
b. Procedure for determining whether two tetrazolium tests are within tolerance – *Example 1*

14.7 Tolerances for tetrazolium tests
b. Procedure for determining whether two tetrazolium tests are within tolerance – *Example 2*

14.7 Tolerances for tetrazolium tests
b. Procedure for determining whether two tetrazolium tests are within tolerance – *Example 3*

2. **True** or **False** When determining if the components of two purity tests are within tolerance of each other, the same tolerance table may be used for all components.

    Section 14 Tolerances

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Application of Test Tolerances

14.2 Purity tolerances
a. General

> **14.2 Purity tolerances**
> a. **General.** — The same tolerances are used for all four components of a purity analysis, namely: pure seed, other crop seed, weed seed, and inert matter. Tolerances for chaffy and super chaffy seeds differ from those for non-chaffy seeds. The bases for the purity tolerances are stated in Miles (1963).

3. Classification for Chaffy and Super Chaffy seeds can be found in column __2__ of Table 2A in the AOSA Rules.

Section 14 Tolerances
14.2 Purity tolerances
a. General

> Kinds with chaffy or super chaffy seeds are indicated in column 2 of Table 2A; all other kinds in Table 2A shall be considered non-chaffy seeds.

4. You are determining tolerances of a sample of *Vicia sativa* subsp. *sativa* (common vetch). What is the chaffy classification to be used in the tolerance table?
   a. Non-chaffy
   b. Chaffy
   c. Super chaffy

Section 2 Preparation of Working Samples
Table 2A

Table 2A. Weights for working samples

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)[a]	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
2		*Vicia sativa* L. subsp. *sativa* common vetch	150	500	19	540

Since no classification is given, the species is considered non-chaffy.

Section 14 Tolerances
14.2 Purity tolerances
a. General.

> Kinds with chaffy or super chaffy seeds are indicated in column 2 of Table 2A; all other kinds in Table 2A shall be considered non-chaffy seeds.

5. You are determining tolerances between the lab report and the analysis label of a mixture of big bluestem, Indian grass, and switchgrass. The sample consists of 15% big bluestem; 19% Indiangrass; and 66% switchgrass. What is the chaffy classification to be used for tolerances of this mixture?

a. Super chaffy
b. Chaffy
c. Non-chaffy

Section 2 Preparation of Working Samples
Table 2A

Table 2A. Weights for working samples

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)[a]	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
16	SC	*Andropogon gerardi* Vitman big bluestem	7	70	320	9,015
14		*Panicum virgatum* L. switchgrass	4	40	485-655 (570)	13,780-18,595
15	SC	*Sorghastrum* spp. indiangrass	-	-	-	

Section 14 Tolerances
14.2 Purity tolerances
a. General.

A mixture shall be considered chaffy if the total of all chaffy seeds is 33 percent or more and non-chaffy if the total of all chaffy seeds is less than 33 percent. If a sample is classified as chaffy, all components shall be considered chaffy. A mixture shall be considered super chaffy if the total of all super chaffy seeds or combination of chaffy and super chaffy seeds is 33 percent or more and non-chaffy if the total of all super chaffy seed or combination of super chaffy and chaffy seeds is less than 33 percent. If a sample is classified as super chaffy, all components shall be considered super chaffy. If a sample (unmixed seed or a mixture) is classified as non-chaffy, all components shall be considered non-chaffy.

Since the total of the components classified as Super Chaffy in this mixture (15 +19 = 34%) is greater than 33%, the entire sample must be classified as Super Chaffy.

6. You are determining tolerances on a mixture of 24% hairy vetch (*Vicia villosa* subsp. *villosa*) and 76% rye (*Secale cereale* subsp. *cereale*). What is the chaffy classification for the tolerance table?
   a. Chaffy
   b. Non-chaffy
   c. Super chaffy

2024-2025 PT #1
Application of Test Tolerances

Section 2 Preparation of Working Samples
Table 2A

Table 2A. Weights for working samples

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)[a]	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
12		*Secale cereale* L. subsp. *cereale* rye	75	500	40	1,135
2		*Vicia villosa* Roth subsp. *villosa* hairy vetch	75	500	35	1,020

Since no classification is given for either species, the mixture is considered non-chaffy.

Section 14 Tolerances
14.2 Purity tolerances
a. General

A mixture shall be considered chaffy if the total of all chaffy seeds is 33 percent or more and non-chaffy if the total of all chaffy seeds is less than 33 percent. If a sample is classified as chaffy, all components shall be considered chaffy. A mixture shall be considered super chaffy if the total of all super chaffy seeds or combination of chaffy and super chaffy seeds is 33 percent or more and non-chaffy if the total of all super chaffy seed or combination of super chaffy and chaffy seeds is less than 33 percent. If a sample is classified as super chaffy, all components shall be considered super chaffy. If a sample (unmixed seed or a mixture) is classified as non-chaffy, all components shall be considered non-chaffy.

7. Laboratory ABC wants to compare the purity work of the analysts in their laboratory for proficiency among analysts. They pull two sub-samples from the same submitted sample of coriander (*Coriandrum sativum*) and have each analyst perform the same test for comparison. Which tolerance table would be used to compare the results from the two analysts?
    a. Table 14J
    b. Table 14B
    c. Table 14A
    d. Table 14E

Section 14 Tolerances
14.2 Purity tolerances
b. Regular tolerances

Table 14A is used to compare analyses (tests) of two sub-samples taken from one submitted sample to determine whether two analysts within the same lab or two laboratories obtain reasonably similar results (i.e., the two results are within tolerance) or whether one laboratory duplicates its analyses reasonably well (i.e., the differences between results is only due to random sampling variation). Tolerances in Table 14A, calculated as a two-way test at a five

8. Two samples are pulled from a lot of wheat seed for a purity test. Sample A is sent to Laboratory ABC, and Sample B is sent to Laboratory XYZ. The customer wants to determine

if the two laboratories are in tolerance with each other. Which tolerance table should be used to compare the results from the two laboratories?

a. Table 14J
b. Table 14B
c. Table 14A
d. Table 14E

Section 14 Tolerances
14.2 Purity Tolerances
b. Regular tolerances

Table 14B is used to compare two different submitted samples from the same seed lot whether the tests have been made in the same or in different laboratories. Tolerances in Table 14B, calculated as a one-way test at a five percent probability level for non- chaffy seeds, and at a one percent probability level for super chaffy seeds, are adapted from Miles (1963; p. 555, Table P1, columns A, B, C and F (P=0.05) and column G (P= 0.01)).

9. **True** or **False** When using Table 14B, there is no objection to seed lots found to be of better quality than those stated in the first analysis (or seed label).

Section 14 Tolerances
14.2 Purity tolerances
b. Regular tolerances

The one-way test is used in Table 14B to detect seed lots that are poorer quality than that stated in the first analysis (or seed label), however there is no objection to seed lots found to be of better quality than stated in the first analysis (or seed label). Therefore, the results of the first analysis (or seed label) and the second analysis (test) are considered different (i.e., out of tolerance) when the pure seed percentage in the second analysis (test) is significantly lower than the first test (or seed label); or when the inert matter, other crop seed or weed seed percentages are significantly higher in the second test than that in the first test.

10. _____ tolerances are used on purity tests when the sample contains five percent or more of each of two kinds of cultivars of pure seed with different weights per seed when the weight ratio is 1.45:1 or greater.

a. Germination
b. Special
c. Chaffy
d. Regular

Section 14 Tolerances
14.2 Purity tolerances
c. Special tolerances

c. **Special Tolerances**. —The special tolerances are used when the sample contains five percent or more of each of two kinds or cultivars of pure seed with different weights per seed (different numbers of seeds per gram and the particle-weight ratio is 1.45:1 or greater).

11. Below are the results of two wheat (*Triticum aestivum*) purity tests performed in the same laboratory on two different sub-samples taken from the same submitted sample. Are all components of the two tests in tolerance?

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Application of Test Tolerances

	Analysis 1	Analysis 2
Pure Seed	98.27%	97.21%
Inert	1.72%	2.79%
Weed	0.01%	0.00%
Other Crop	0.00%	0.00%

a. Yes
b. No

Step 1: Determine which tolerance table to use.
Section 14 Tolerances
14.2 Purity tolerances
b. Regular tolerances

Regular tolerances. — The regular tolerances in Tables 14A and 14B are used when the sample contains only one kind of pure seed or when it contains more than one kind or cultivar but all have nearly the same weight per seed (approximately the same number of seeds per gram). Tables 14A and 14B can be used to compare two test results for any component of a purity test (i.e., pure seed, inert matter, other crop seed, or weed seed).

Table 14A is used to compare analyses (tests) of two sub-samples taken from one submitted sample to determine whether two analysts within the same lab or two laboratories obtain reasonably similar results (i.e., the two results are within tolerance) or whether one laboratory duplicates its analyses reasonably well (i.e., the differences between results is only due to random sampling variation). Tolerances in Table 14A, calculated as a two-way test at a five percent probability level for non-chaffy and chaffy seeds, and at a one percent probability level for super chaffy seeds, are adapted from Miles (1963; p. 566, Table P11, columns A, B, C and F (P=0.05) and column G (P= 0.01)).

Step 2: Find if wheat is considered chaffy, super chaffy, or non-chaffy.
Section 2 Preparation of Working Samples
Table 2A Weights for working samples

Pure Seed Unit #	Chaffy (C) or Super Chaffy (SC)[a]	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
12		*Triticum aestivum* L. and other spp. wheat (also durum)	100	500	25	710

Since neither chaffy or super chaffy is indicated, wheat is to be considered non-chaffy.
Section 14 Tolerances
14.2 Purity tolerances
a. General

Kinds with chaffy or super chaffy seeds are indicated in column 2 of Table 2A; all other kinds in Table 2A shall be considered non-chaffy seeds.

Step 3: Calculate the tolerances for this sample.
Pure Seed: Average: (98.27 + 97.21) ÷ 2 = 97.74%

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Difference: 98.27 – 97.21 = 1.06%
Inert Matter: Average: (1.72 + 2.79) ÷ 2 = 2.26%
Difference: 2.79 – 1.72 = 1.07%
Weed Seed: Average: (0.01 + 0.00) ÷ 2 = 0.01%
Difference: 0.01 – 0.00 = 0.01%
Other Crop: Average: (0.00 + 0.00) ÷ 2 = 0.00%
Difference: 0.00 – 0.00 = 0.00%

Step 4: Apply tolerances from Table 14A.
Pure Seed: Average (97.74) falls between 97.51 and 97.74 in Column A of Table 14A. Following this line across to Column C (non-chaffy seeds), the tolerance is 1.08. Since the difference of these two tests (1.06) is less than the allowable tolerance, the pure seed component is in tolerance.

Inert Matter Average (2.26) is between 2.25 and 2.49 (Column B), and the allowable tolerance in Column C on that line is 1.08, and the difference between this component of the two tests (1.07) is less than that tolerance.

The average of the two Weed Seed components is 0.01%, which falls between 0.00 and 0.04. The difference (0.01) is less than the tolerance (0.14) on this line.

Since the results of Other Crop for both tests is 0.00%, there's no need to check tolerances.

All components of these two tests are in tolerance.

Table 14A. Regular tolerances for comparing purity test results of two sub-samples from the same submitted sample from the same seed lot analyzed in the same or in different laboratories (Columns C and D, 2-way test at *P*=0.05; Column E, 2-way test at *P*=0.01)

Average of 2 analyses (tests)		Non-chaffy seeds	Chaffy seeds	Super chaffy seeds
A	B	C	D	E
98.75 - 98.99	1.00 - 1.24	0.76	0.81	1.07
98.50 - 98.74	1.25 - 1.49	0.84	0.89	1.18
98.25 - 98.49	1.50 - 1.74	0.91	0.97	1.27
98.00 - 98.24	1.75 - 1.99	0.97	1.04	1.36
97.75 - 97.99	2.00 - 2.24	1.02	1.09	1.43
97.50 - 97.74	2.25 - 2.49	1.08	1.15	1.51
97.25 - 97.49	2.50 - 2.74	1.13	1.20	1.58

Average of 2 analyses (tests)		Non-chaffy seeds	Chaffy seeds	Super chaffy seeds
A	B	C	D	E
99.95 - 100.00	0.00 - 0.04	0.14	0.16	0.21
99.90 - 99.94	0.05 - 0.09	0.23	0.24	0.32
99.85 - 99.89	0.10 - 0.14	0.28	0.30	0.40
99.80 - 99.84	0.15 - 0.19	0.33	0.35	0.47
99.75 - 99.79	0.20 - 0.24	0.36	0.39	0.52

12. **True** or **False** There is a Special Purity Tolerance Test Tool available on the AOSA/SCST website.

AOSA Special Tolerances Test – Analyzeseeds
https://analyzeseeds.com/special-tolerances-test/

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13. When conducting a purity on coated seeds in a mixture, the special tolerance tables were established based on _____ seeds for all kinds included in a mixture.
    a. coated
    b. chaffy
    c. uncoated
    d. super chaffy

Section 14 Tolerances
14.2 Purity tolerances
c. Special Tolerances

When dealing with **coated seeds** in a mixture, seeds shall be de-coated (refer to sec. 3.8e). Calculate the particle weight ratio and the other components in the sample based on the de-coated sample. The special tolerance tables were established based on uncoated seeds for all kinds included in a mixture.

14. What table or tables are used to determine noxious weed seed tolerances? (select all that apply)
    a. Table 14E
    b. Table 14G
    c. Table 14L
    d. Table 14H

Section 14 Tolerances
14.3 Tolerances for noxious weed seeds examinations and bulk seed examinations
Table 14G caption

Table 14G. Maximum tolerated number of noxious weed seeds allowed in a second test made on an equal quantity of seed in the same or different laboratory (one-way test at P=0.05).

Everyone who answered Table 14G, Table 14H, or both of these, was given credit for this question.

It could be interpreted that since the specific contaminant being looked for in a bulk exam may be a species of noxious weed seed, which would constitute using Table 14H.

However, per an explanation from the Statistics Committee, Table 14H is not appropriate for any noxious weed seed tests, including internal testing, because it requires the exact count of seeds/particles, not results computed to another weight of seeds, such as seeds/pound. In addition, the tolerances in Table 14H are much wider than those in 14G, which makes it unsafe for use on prohibited noxious weeds.

The PT Committee will work with the Statistics Committee to draft a clarification and/or Rule Proposal to clear up wording in the Rules.

15. **True** or **False** All noxious weeds can be combined to determine tolerances and do not need to be done on an individual species level.

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Section 14 Tolerances
14.3 Tolerances for noxious weed seeds examinations and bulk seed examinations

It is important to note that each noxious weed seed species found in a sample must be evaluated independently. Also, the labeled value (or first test finding) and a second test must be made on or adjusted to equal quantities of seed (refer to Appendix 1 in the AOSA Rules for Testing Seeds Volume 1 for conversion of sample quantities). For example, if

16. A laboratory is conducting internal training and is trying to determine if their analysts are in tolerance of each other on the number of noxious weeds found. Which tolerance table should be used to check the work of their analysts?
    a. Table 14H
    b. Table 14G
    c. Table 14F
    d. Table 14I

Section 14 Tolerances
14.3 Tolerances for noxious weed seeds examinations and bulk seed examinations

Table 14H, as adapted from Miles (1963; Table F1b, p. 615), follows the binomial distribution. The tolerance values in Table 14H are based on a two-way test at five percent probability level, and are used to determine the maximum tolerated number of weed or other crop seeds, by numbers, allowed between two bulk seed examinations of an equal sample weight from the same seed lot tested in the same or different laboratory. This table may be used to compare two test results within or among laboratories for internal training or quality assurance and should not be used for regulatory purposes. For noxious weed seed examination tolerances use Table 14G.

Everyone who answered either Table 14G or Table 14H received credit for this question.

The description of Table 14H is misleading as it can lead one to believe that any internal testing involving weeds should be compared with Table 14H.

After further discussion with the Statistics Committee, Table 14H is not appropriate for any noxious weed seed tests, including internal testing, because it requires the exact count of seeds/particles, not results computed to another weight of seeds, such as seeds/pound. In addition, the tolerances in Table 14H are much wider than those in 14G, which makes it unsafe for use on prohibited noxious weeds.

The PT Committee will work with the Statistics Committee to draft a clarification and/or Rule Proposal to clear up wording in the Rules.

17. A label analysis shows that there were 6 field bindweed (*Convolvulus arvensis*) per pound in a lot of wheat. The laboratory test found 14 field bindweed seeds in 502.1 grams. Is the number of noxious weeds found in the laboratory test within tolerance of the label claim?
    a. Yes
    b. No

Step 1: Convert the seed label results **into the number of seeds found in the same weight as the lab analysis.**

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$\frac{6\ seeds}{1\ pound} = \frac{6\ seeds}{453.6\ grams}$ X 502.1g = 6.64, rounded to 7 seeds per 502.1g

Step 2: In Table 14G, find the number of seeds in 502.1g from the label (7) under Column A. In that line, the Maximum number within tolerance (Column B) is 11. The label is found to be not satisfactory because the number found (14) exceeds the maximum tolerated value (11).

Table 14G. Maximum tolerated number of noxious weed seeds allowed in a second test made on an equal quantity of seed in the same or different laboratory (one-way test at P=0.05).

Number labeled or represented	Maximum number within tolerance	Number labeled or represented	Maximum number within tolerance	Number labeled or represented	Maximum number within tolerance
A	B	A	B	A	B
6	9	40	50	74	87
7	11	41	51	75	89

18. What table or tables are used to determine germination tolerances? (select all that apply)
    a. Table 14A
    b. Table 14E
    c. Table 14K
    d. Table 14J

Section 14 Tolerances
14.5 Germination tolerances
a. Tolerances between replicates

Tolerances between replicates. – Table 14J lists the maximum tolerance between two and four replicates of 100 seeds in a single germination test. The tolerance values were

Section 14 Tolerances
14.5 Germination tolerances
c. Tolerances between germination tests

Tolerances between germination tests. Table 14K lists the maximum tolerance between two germination tests on the same seed lot. The values are to be used to compare germination percentages, other single components, or any combination of components

19. Germination tolerances are used to compare single components of a germination analysis, which includes (select all that apply):
    a. Dead seed
    b. Abnormal seedlings
    c. Dormant seed
    d. Normal seedlings
    e. Any combination of two or more components of a germ test (i.e. the sum of germination and hard seed).

Section 14 Tolerances
14.5 Germination tolerances

Germination tolerances are used to compare single components of germination analysis, i.e., normal seedlings, abnormal seedlings, dormant seed, hard seed and dead seed, or any combination of two or more of those components.

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Application of Test Tolerances

20. **True** or **False** The tolerances shown in Table 14J are the maximum difference allowed between the highest and lowest replicate of a germination test.

Section 14 Tolerances
14.5 Germination tolerances
b. Procedure for finding the maximum tolerance between replicates in a germination test

– To check if replicates are within tolerance for percentage germination, calculate the average germination of the two or four replicates to the nearest whole number. Calculate the difference between the highest and the lowest germinating replicates. Locate the average germination in

21. You have conducted a 400-seed germination test on a sample of corn and got the following results for normal seedlings. Are these replicates in tolerance?

Replicate 1 97%
Replicate 2 92%
Replicate 3 98%
Replicate 4 95%

a. Yes
b. No

Section 14 Tolerances
14.5 Germination tolerances
b. Procedure for finding the maximum tolerance between replicates

Step 1: Find the average of the four replicates to the nearest whole number.
(97 + 92 + 98 + 95) ÷ 4 = 96%

Step 2: Find the difference between the highest (98) and lowest (92) replicates.
98 – 92 = 6%

Step 3: Use Table 14J to check the tolerance.
Find the average (96) under "Average percent germination" (Column A). Follow the line over to the number of replicates in the test (Column C), which is 8. Since the difference between the highest and lowest replicates (6) is less than the allowable tolerance, the difference can be assumed to be due to random sampling variation.

Table 14J. Maximum tolerance values between two and four replicates of 100 seeds in a single germination or tetrazolium test (2-way test at $P = 0.025$)

Average percent germination*		No. replicates of 100 seeds		Average percent germination*		No. replicates of 100 seeds	
		4	2			4	2
A	B	C	D	A	B	C	D
99	2	5	---	75	26	17	14
98	3	6	---	74	27	17	14
97	4	7	6	73	28	17	14
96	5	8	6	72	29	18	14
95	6	9	7	71	30	18	14

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Application of Test Tolerances

22. **True** or **False** If replicates of a germination test are out of tolerance, the sample must be retested.

Section 6 Germination tests
6.6 When to retest

a. Retest when the range of 100-seed replicates of a given test exceeds the maximum tolerance (see section 14.5 a and b and Table 14J).

23. Table 14K lists the maximum tolerance between two germination tests on the same seed lot from _____.
    a. the same submitted sample tested in the same seed laboratory.
    b. different submitted samples tested in the same seed laboratory.
    c. different submitted samples tested in different seed laboratories.
    d. All of the above.

Section 14 Tolerances
14.5 Germination tolerances
d. Procedure for determining whether two tests are within tolerance.
Table 14K caption

Table 14K. Maximum tolerance values for comparing two 400-seed germination tests of the same or different submitted samples tested in the same or different laboratories (one-way test at *P=0.05*).

24. You have conducted a 400-seed germination test on a soybean sample and have been asked to compare the results with the current label. Is your test in tolerances with the current label for the seed lot?

Analysis 1 (label): 93%
Analysis 2 (your test): 86%

    a. Yes
    b. No

Section 14 Tolerances
14.5 Germination tolerances
d. Procedure for determining whether two tests are within tolerance.
Step 1: Calculate the average between the two tests to the nearest whole number.
(93 + 86) ÷ 2 = 90%

Step 2: Find the difference between the two tests.
93 – 86 = 7%

Step 3: Use Table 14K to check the tolerance of the two tests.
Follow the line for 87-90 from the average (90) in Column A, to Column C to find the tolerance of 6. Since the difference between the two tests (7) is greater than the allowable tolerance, the difference is considered significant and not due to random sampling

variation.

Table 14K. Maximum tolerance values for comparing two 400-seed germination tests of the same or different submitted samples tested in the same or different laboratories (one-way test at *P=0.05*).

Average Percent Germination*		Tolerance**
A	B	C
99	2	2
97 - 98	3 - 4	3
94 - 96	5 - 7	4
91 - 93	8 - 10	5
87 - 90	11 - 14	6

25. You have conducted a germination test on a lawn grass mixture composed of 89% tall fescue and 11% Kentucky bluegrass to determine if the seed is still in tolerance with the seed label. What percent needs to be added to the germination tolerances given in Table 14K when calculating the tolerance of the Kentucky Bluegrass results?

	Seed Label	Lab Analysis
89% Tall Fescue	85%	78%
11% Kentucky Bluegrass	85%	75%

a. 5%
b. 3%
c. 50%
d. 2%

Section 14 Tolerance
14.5 Germination tolerances
d. Procedure for determining whether two tests are within tolerance.
Table 14K *footnote:

* The same tabulated values are used to find the maximum tolerance between test results of other components, or a combination of two or more test components.
**When only 200 seeds of mixtures are tested, 2% shall be added to the above germination tolerances.

26. Using the information given in question 25, is the result of the Lab Analysis for the tall fescue component of the mixture in tolerance with the seed label?

a. Yes
b. No

Section 14 Tolerances
14.5 Germination tolerances
d. Procedure for determining whether two tests are within tolerance.
Table 14K
Step 1: Calculate the average and Difference of the two tests:
Average: (85 + 78) ÷ 2 = 82%
Difference: 85 – 78 = 7%

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Step 2: Apply tolerance in Table 14K:

Table 14K. Maximum tolerance values for comparing two 400-seed germination tests of the same or different submitted samples tested in the same or different laboratories (one-way test at *P=0.05*).

Average Percent Germination*		Tolerance**
A	B	C
82 - 86	15 - 19	7
76 - 81	20 - 25	8
70 - 75	26 - 31	9

The allowable tolerance the average of 82% (82-86 in Column A) is 7 (Column C). Since the difference between the two tall fescue tests (7) is within that tolerance, the tests are within tolerance and can be assumed to be due to random sample variation.

27. Using the information given in question 25, is the result of the Lab Analysis for the Kentucky bluegrass component of the mixture in tolerance with the seed label?
    a. Yes
    b. No

Step 1: Calculate the average and Difference of the two tests:

Average: (85 + 75) ÷ 2 = 80%
Difference: 85 – 75 = 10%

Step 2: Apply tolerance in Table 14K:
Because the Kentucky bluegrass only comprises 11% of the mixture, only a 200-seed germination test is required.

Section 6 Germination tests
6.4 Number of seeds for germination

Number of seeds for germination — At least 400 seeds shall be tested for germination except that in mixtures 200 seeds of those kinds present to the extent of 15 percent or less may be used. In this case an additional two (2) percent is to be added to the regular germination tolerances (Table 14J). These seeds shall be tested in replicate tests of 100 seeds or less to avoid crowding on the substratum.

Section 14 Tolerances
14.5 Germination tolerances
d. Procedure for determining whether two tests are within tolerance.
Table 14K *footnote

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Table 14K. Maximum tolerance values for comparing two 400-seed germination tests of the same or different submitted samples tested in the same or different laboratories (one-way test at *P=0.05*).

Average Percent Germination*		Tolerance**
A	B	C
82 - 86	15 - 19	7
76 - 81	20 - 25	8
70 - 75	26 - 31	9

* The same tabulated values are used to find the maximum tolerance between test results of other components, or a combination of two or more test components.
**When only 200 seeds of mixtures are tested, 2% shall be added to the above germination tolerances.

In Table 14K, for 80% average germination, the tolerance is 8%. Since the tests being compared are 200-seed tests, 2% is added to the tolerance, for a total of 10%. The difference between the two test results (10%) is within tolerance for a 200-seed test, so it can be assumed to be due to random sample variation, thus the two test results are within tolerance.

28. What table or tables are used to determine seed count tolerances? (select all that apply)
    a. Table 14J
    b. Table 14H
    c. Table 14Q
    d. Table 14M

Section 14 Tolerances
14.9 Tolerances for comparing two seed count test results

To calculate the maximum tolerance allowed between two seed count test results, multiply the labeled or first seed count test result by the appropriate tolerance factor found in Table 14Q to determine your tolerance (see the example below). Round the tolerance (the number

29. When comparing two seed count test results on a soybean sample, you must multiply the labeled/first result by a factor of ____% to determine the tolerance allowed.
    a. 2
    b. 9
    c. 5
    d. 4

Section 14 Tolerances
14.9 Tolerances for comparing two seed count test results
Table 14Q

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Table 14Q. Tolerance factors to be used in calculating the maximum allowed tolerance for comparing two seed count test results or a label with a second test in the same or different laboratory for corn, field beans, soybean and wheat.

Crop	Tolerance factor
Corn (round, flat, or plateless)	2%
Field Bean	5%
Soybean	4%
Wheat	3%

30. The seed count on an analysis label for a sample of soybeans states 2,457 seeds/pound. The laboratory test has a seed count of 2,556 seeds/pound. Are these lab results in tolerance with the previous label?
    a. Yes
    b. No

Section 14
14.9 Tolerances for comparing two seed count test results
Kind of seed: Soybean = Use 4% Tolerance Factor
Label Claim (1st Test): 2,457 seeds/lb
Lab Test (2nd Test): 2,556 seeds/lb

Step 1: Calculate tolerance value:
Multiply label claim by 4%: 2,457 x 0.04 = 98.28 seeds/lb
Round to the nearest whole number: 98 seeds/lb

Step 2: Determine the difference between label claim and lab test:
2556 – 2457 = 99 seeds/lb

Since the difference between the two tests (99) is larger than the allowable tolerance (98), the two tests are out of tolerance.

31. What table or tables are used to compare two seed moisture tests? (select all that apply)
    a. Table 14Q
    b. Table 14M
    c. Table 14R
    d. Table 14P

Section 14 Tolerances
14.8 Seed moisture determination tolerances

To determine whether two test results are within tolerance, the average percentage of the two tests is entered in the appropriate column of Table 14P (adapted from Bonner, 1984). If the difference between the two tests exceeds the maximum percentage of the tolerance allowed, then the difference among results is significant and the two tests are out of tolerance.

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32. **True** or **False** If the difference between two replications of a seed moisture determination test exceeds 0.2%, the test must be repeated.

Section 14 Tolerances
14.8 Seed moisture determination tolerance

> Tolerances shall be applied to the average of two tests from the same sample tested in the same or different laboratories. The moisture determination of each test shall be based on the mean of two replications. If the difference between the two replications exceeds 0.2 percent, the test must be repeated.

33. You have performed a 400-seed tetrazolium test as a retest to a 200-seed test. Are these two tests in tolerance with one another?
    Analysis 1 (200-seed): 84%
    Analysis 2 (400-seed): 89%

a. Yes
b. No

Step 1: Determine which tolerance table to use:
Section 14 Tolerances
14.7 Tolerances for tetrazolium tests
Table 14M caption:

> **Table 14M. Maximum tolerance values for comparing two tetrazolium tests of the same or different submitted samples tested in the same laboratory (two-way test at *P* = 0.05)**

Step 2: Calculate the tolerance values for the tests:
Average: (84 + 89) ÷ 2 = 87%
Difference: 89 – 84 = 5%

Step 3: Apply tolerances from Table 14M:
Follow the line for the average of the two tests (87) in Column A over to the column for comparing a 200 and 400 seed test (Column E). The difference between the two tests (5) is less than the tolerance value (6). Therefore, these two tests are in tolerance.

Table 14M. Maximum tolerance values for comparing two tetrazolium tests of the same or different submitted samples tested in the same laboratory (two-way test at *P* = 0.05)

Average of two tests		Number of seeds in each test		
		400 seeds	200 seeds	200 and 400
A	B	C	D	E
89	12	5	7	6
88	13	5	7	6
87	14	5	7	6
86	15	5	7	6
85	16	5	8	7

34. A laboratory is conducting a referee study to add a new TZ procedure into the TZ Handbook. Which tolerance table should they use to determine if two laboratories that participated in the referee are within tolerance of each other?
    a. Table 14Q
    b. Table 14O

c. Table 14N
d. Table 14M

Section 14 Tolerances
14.7 Tolerances for tetrazolium tests

Table 14O is a **two-way test** at a probability level of five percent and is appropriate for proficiency and referee studies.

35. A laboratory is conducting a TZ test to determine if the results from the analysis label and the laboratory test are within tolerance of one another. Which tolerance table should be used to determine if the test results and the analysis label are within tolerance?
    a. Table 14R
    b. Table 14N
    c. Table 14M
    d. Table 14L

Section 14 Tolerances
14.7 Tolerances for tetrazolium tests

Table 14N is a **one-way test** at a probability level of five percent and is appropriate for seed law enforcement purposes since the intent is to identify seed lots that have a laboratory analysis significantly lower (poorer) than values stated on the label.