# Rule Change Proposal 21

**Purpose of Proposal:** Revise sec. 14.4 and modify the interpolation formula.

## 1. Present Rule

**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

These tolerances are applicable when two independent tests have been made on the same properly mixed bulk lot. The chances of difference between the two tests exceeding the tolerance will not be greater than 5%. (Leggatt, 1939).

The tolerances in Table 14I recognize the sampling error introduced by the small number of seeds used and are to be applied in determining the variation~~s~~ for those factors affected by the use of a small number of seeds. If the fluorescence test~~s~~ of ryegrass, the copper sulfate-Ammonia test for sweet clover, or any test uses morphological characteristics to separate species are used in computing the percentages of pure seed, one-half of the regular pure seed tolerance shall be added to the tolerance for the 400 to 1000-seed separation. The tolerances to be used have been computed to a certainty level of five percent (P = 0.05) and are given in Table 14I.

Method of using Table 14I: Enter the percentage of pure seeds of the second test that is based on the fluorescence test for ryegrass, the copper sulfate test for sweet clover, or any other morphological test to which the tolerance is to be applied in the first left-hand column. Next, find in the very top horizontal row the number of seeds used in your test (i.e., the second test that is conducted to verify a label or a first test) and to which the tolerance is to be applied; then, find in the second horizontal row the number of seeds used in the first test (or label) with which your second test results are to be compared. (If the number of seeds is not known, assume that 400 seeds were used.) The corresponding tolerance will be found in the column below. This tolerance figure plus one-half the pure seed tolerance (from the second test before the fluorescence test or any other test is conducted) should be the final tolerance value to be considered. Tolerances for fractions of percentages entered in column 1 should be interpolated. Thus, the tolerance in the 400/400 seed column for 94.5 percent is 2.75 (Table 14I).

**Example of interpolation:**

What is the interpolated tolerance value of the purity percentage of 94.50? (Refer to Table 14I)

- According to Table 14I, the interpolated tolerance value of 94.50% pure seed of 400/400 tests lies between 2.6 and 2.9
- Since 94.50% purity value lies between 95.00% and 94.00%; look first for the tolerance values of 95% purity (1st column) under 400/400 seed tests (2nd column), it is 2.6. Then look for the tolerance values of 94.00% purity under the same column, it is 2.9

The calculation of the interpolated tolerance value for 94.50% purity is as follows:

X= 2.6 + [(2.9 – 2.6) x (95.00-94.50)] = 2.75

It can also be identified as:

$X = 2.9 – [(2.9-2.6) \times (95.00 – 94.50)] = 2.75$

The interpolation formula is:

$$X = x_0 + [(x_1 – x_0)\ x\ (y – y_0)];\ \text{or}\ X = x_1 - [(x_1 – x_0)\ x\ (y – y_0)]$$

Where, x is the interpolated tolerance value need to be identified, $x_0$ is the lower tolerance value (in the range of purity percentage), $x_1$ is the higher tolerance value (in the range of purity percentage), y is the higher purity percentage, $y_0$ is the specific purity percentage where the interpolated tolerance value need to be identified.

***Examples:***

**Fluorescence test of ryegrass. Refer to sec. 5.2b (2).**

For one-way comparison of a second test against a first test (or a label).

| | | |
|---|---|---|
| *Seed lot label states:* | Perennial ryegrass | 92.50 % |
| | Other crop | 4.00% |
| | Inert matter | 3.36% |
| | Weed seed | 0.14% |

**Test Results** *(second test):*

When a test is conducted to determine if the label is correct 98.40% *Lolium* spp. is found. A 400-seed fluorescence test is conducted to determine the percentage of perennial ryegrass. The varietal fluorescence level (VFL) of variety being tested = 0%.

## 1. Proposed rule

**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**

These tolerances are applicable when two independent tests have been made on the same properly mixed bulk lot. The chances of difference between the two tests exceeding the tolerance will not be greater than 5%~~.~~ (Leggatt, 1939).

The tolerances in Table 14I recognize the sampling error introduced by the small number of seeds used and are to be applied in determining the variations for those factors affected by the use of a small number of seeds. If the fluorescence test of ryegrass, the copper sulfate-ammonia test for sweet clover, or any test uses morphological characteristics to separate species ~~are used in~~ for computing the percentages of pure seed, one-half of the regular pure seed tolerance shall be added to the tolerance for the 400 to 1000-seed separation. The tolerances to be used have been computed to a certainty level of five percent (P = 0.05) and are given in Table 14I.

Method of using Table 14I: Enter the percentage of pure seeds of the second test that is based on the fluorescence test for ryegrass, the copper sulfate-ammonia test for sweet clover, or any other morphological test to which the tolerance is to be applied, in the first left-hand column. Next, find in the very top horizontal row the number of seeds used in your test (i.e., the second test that is conducted to verify a label or a first test) and to which the tolerance is to be applied; then, find in the second horizontal row the number of seeds used in the first test (or label) with which your second test results are to be compared. ~~(~~If the number of seeds is not known, assume that 400 seeds were used.~~)~~ The corresponding tolerance will be found in the column below. This tolerance figure plus one-half the pure seed tolerance (from the second test before the fluorescence test or any other test is conducted) should be the final tolerance value to be considered. Tolerances for fractions of percentages entered in column 1 should be interpolated according to one of the interpolation formulas below:

Interpolation formulas:

$x = x_1 + (x_2 - x_1) * (y_2 - y)$ [Addition formula]

**OR**

$x = x_2 - (x_2 - x_1) * (y - y_1)$ [Subtraction formula]

**Where:**

***x*** = Interpolated tolerance value to be calculated

$x_1$ = The lower tolerance value

$x_2$ = The higher tolerance value

***y*** = The specific purity percentage, where the interpolated tolerance value is to be identified

$y_1$ = The lower purity percentage

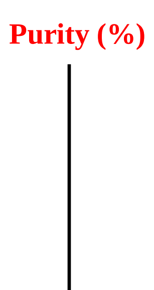
$y_2$ = The higher purity percentage

Based on the above, to interpolate using the "Addition formula," subtract the higher purity percentage from the purity value found in the analysis. However, to interpolate using the "Subtraction formula," subtract the purity value found in the analysis from the lower purity percentage.

Figure 1 is a schematic explanation of variables used in the interpolation formula using data from interpolation example A.

***Examples-interpolation*:**

A. What is the interpolated tolerance value of the purity percentage of 94.50? (Refer to Table 14I)
   - According to Table 14I, the interpolated tolerance value of 94.50% pure seed of 400/400 tests lies between 2.6 and 2.9.
   - Since the 94.50% purity value lies between 95.00% and 94.00%, look first for the tolerance value~~s~~ of 95.00% purity (1st column) under 400/400 seed tests (2nd column); it is 2.6. Then look for the tolerance value~~s~~ of 94.00% purity under the same column; it is 2.9.



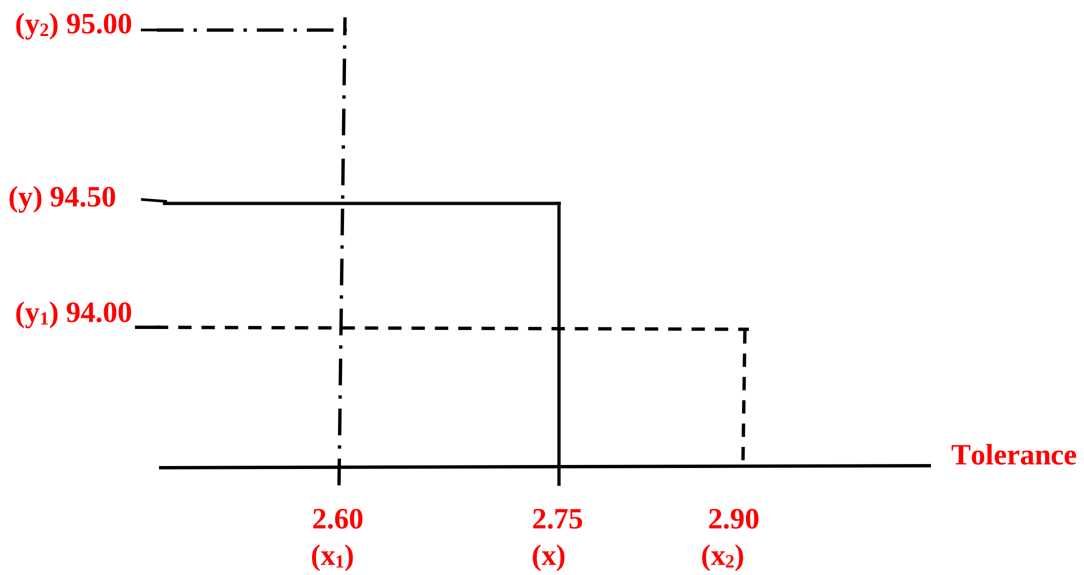



**Figure 1.** Schematic diagram to explain the interpolation formula.

- The calculation of the interpolated tolerance value for 94.50% purity is as follows:

   1. ***Using the addition formula***

      $x = x_1 + (x_2 - x_1) * (y_2 - y)$

      $x = 2.6 + (2.90 - 2.60) * (95.0 - 94.5)$

      $x = 2.6 + (0.3)(0.5)$

      $x \text{ (Tolerance value of } 94.50\%) = 2.75$

   2. ***Using the subtraction formula***

      $x = x_2 - (x_2 - x_1) * (y - y_1)$

      $= 2.9 - (2.90 - 2.60) * (94.5 - 94.0)$

      $x = 2.9 - (0.3) * (0.5)$

      $x \text{ (Tolerance value of } 94.50\%) = 2.75$

B. What is the interpolated tolerance value of the purity percentage of 92.40? (Refer to Table 14I)

- According to Table 14I, the interpolated tolerance value of 92.40% pure seed of 400/400 tests lies between 3.2 (for 93.00% purity) and 3.4 (for 92.00% purity).

- The calculation of the interpolated tolerance value for 92.40% purity is then as follows:

1. ***Using the addition formula***

$$x = x_1 + (x_2 - x_1) * (y_2 - y)$$

$$x = 3.2 + (3.40 - 3.20) * (93 - 92.4)$$

$$x = 3.2 + (0.2) * (0.6)$$

$$x \ (Tolerance\ value\ of\ 92.40\%) = 3.32$$

2. ***Using the subtraction formula***

$$x = x_2 - (x_2 - x_1) * (y - y_1)$$

$$= 3.4 - (3.40 - 3.20) * (92.4 - 92.0)$$

$$x = 3.4 - (0.2) * (0.4)$$

$$x \ (Tolerance\ value\ of\ 92.40\%) = 3.32$$

***Examples-application of tolerances:***

**Fluorescence test of ryegrass. Refer to sec. 5.2 b(2).**

For one-way comparison of a second test against a first test (or a label).

| | | |
|---|---|---|
| *Seed lot label states:* | Perennial ryegrass | 92.50 % |
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**Test Results** *(second test):*

When a test is conducted to determine if the label is correct, 98.40% *Lolium* spp. is found. A 400-seed fluorescence test is conducted to determine the percentage of perennial ryegrass. The varietal fluorescence level (VFL) of variety being tested = 0%.

## 2. Harmonization and Impact Statement

This proposal corrects an error in one of the examples listed under section 14.4, and provides an expanded formula for interpolations of tolerance values. The proposal does not impact the harmonization of the Rules.

## 3. Supporting Evidence

N/A

## 4. Submitted by:

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