2016 AOSA Rules Change Proposal 16

Purpose of proposal: To clarify the rounding procedure for germination test results

Present Rule: (AOSA Rules Volume 1)

6.7 Calculation of percentage germination
a. *When a single test is made* in accordance with these rules and retesting is not required, calculate the result of the normal seedlings as the average of four 100 seed replicates (sub-replicates of 50 seeds or less must be combined into replicates of 100 seeds by combining the replicates that are closest together in the germinator). The percentage of each germination component of the germination test is determined as follows:

(1) Calculate the percentage normal seedlings to the nearest whole number. A fraction of 0.5 or higher is taken to the next whole number (e.g. xx.5 and higher is rounded to xx +1; xx.49 and lower is rounded to xx).

(2) After rounding the percentage normal seedlings to the nearest whole number, sum the integer part of all the remaining germination components (abnormal seedlings, hard, dormant and dead seeds) plus germination percentage. If the sum of all components is 100, the procedure ends (see examples 1 and 2 below). If not, continue with the following procedure.

(3) For determining percentages of abnormal seedlings, hard seeds, dormant and dead seeds:
(a) Find the germination component among abnormal seedlings, hard seeds, dormant and dead seeds with the greatest fraction part and round this percentage up to the next whole number, keep this value as a final result.
(b) Add the integer values of the remaining components plus the rounded values as in part (2). If the sum of all the germination components is 100, the procedure ends (see example 3 below).
(c) If the sum of the germination components is less than 100, of the remaining components round up the one with the greatest fraction of 0.5 or higher, and repeat the process until the total of all the germination components is equal to 100 (see example 4 below).
(d) In case of equal fractions, the priority for rounding up is abnormal seedlings, hard seeds, dormant seed and dead seeds (see example 5 below).

Note: If all germination component values are rounded down and the resulting sum is less than 100%, the percentage normal seedlings is adjusted upwards so that the final sum is 100% (see example 6 below)

Germination component	*Example 1*		*Example 2*	
	Original results	Final results	Original results	Final results
Normal	85.50	86	85.50	86
Abnormal	3.50	3	3.25	3
Hard	2.00	2	2.25	2
Dormant	-	-	-	-
Dead	9.00	9	9.00	9
Total	**100%**	**100%**	**100%**	**100%**

Germination component	*Example 3*		*Example 4*		
	Original results	Final results	Original results	First rounding	Final results
Normal	78.50	79	69.75	70	70
Abnormal	3.50	3	21.50	21	22
Hard	-	00.25	0	0	
Dormant	1.25	1	-	-	-
Dead	16.75	17	7.75	8	8
Total	**100%**	**100%**	**100%**	**99%**	**100%**

	Example 5		*Example 6*		
Normal	Original results	Final results	Original results	First rounding	Final results
Abnormal	82.00	82	90.25	90	91
Hard	6.50	7	2.25	2	2
Dormant	-	-	1.25	1	1
Dead	-	-	1.00	1	1
Total	11.50	11	5.25	5	5

Proposed Rule:

6.7 Calculation of percentage germination

a. *When a single test is made* in accordance with these rules and retesting is not required, calculate the result of the normal seedlings as the average of four 100 seed replicates (sub-replicates of 50 seeds or less must be combined into replicates of 100 seeds by combining the replicates that are closest together in the germinator). The percentage of each germination component of the germination test is determined as follows:

(1) First, round the percentage normal seedlings to the nearest whole number. A fraction of 0.5 or higher is taken to the next whole number (e.g., xx.5 and higher is rounded to xx +1; xx.49 and lower is rounded to xx).

(2) After rounding the percentage normal seedlings to the nearest whole number, sum the integer[1] part of all the remaining germination components (abnormal seedlings, hard, dormant and dead seeds) plus rounded germination percentage. If the sum of all components is 100%, the procedure

[1]An integer is a number that has no fractional part and no digits after the decimal. For rounding purposes, an integer part of a number refers to the non-fraction part of that number, regardless of the magnitude of the fraction (e.g., 82 is the integer part of 82.00, 82.25, 82.75 and 82.999).

ends, and these will be the final reported results ~~(see examples 1 and 2 below)~~. If not, proceed to the next step ~~continue with the following procedure~~.

(3) For determining percentages of abnormal seedlings, hard seeds, dormant and dead seeds:

(a) Find the germination component among abnormal seedlings, hard seeds, dormant and dead seeds with the greatest fraction part of X.50 or higher and round this percentage up to the next whole number, keep this value as a final result.

(b) Add the integer values of the remaining components plus the rounded values as in part (2). If the sum of all the germination components is 100%, the procedure ends ~~(see example 3 below)~~.

(c) If the sum of the germination components is less than 100%, of the remaining components round up the one with the greatest fraction of 0.5 or higher, and repeat the process until the total of all the germination components is equal to 100% ~~(see example 4 below)~~.

(d) In case of equal fractions, the priority for rounding up is abnormal seedlings, hard seeds, dormant seed and dead seeds ~~(see example 5 below)~~.

(e) ~~Note:~~ If all germination component values are rounded down and the resulting sum is less than 100%, the percentage normal seedlings is adjusted upwards so that the final sum is 100% ~~(see example 6 below)~~.

Example 1.

Component	Original results	*First, only round normal results; a fraction of 0.5 or higher is rounded up, a fraction less than 0.5 is rounded down; next, sum the integer parts of all components; check if the total is 100%:*	*The total is 100%; the rounding procedure is complete, and the final results are listed below.*
Normal	85.50	85.50→86	86%
Abnormal	3.50	3.50	3%
Hard	2.00	2.00	2%
Dormant	-	-	
Dead	9.00	9.00	9%
Total	**100%**	**86+3+2+9=100%**	**100%**

Example 2.

Component	Original results	*First, only round normal results; a fraction of 0.5 or higher is rounded up, a fraction less than 0.5 is rounded down; sum the integer parts of all components; check if the total is 100%:*	*Since the total is 99%, determine the next component to round up based on original results; pick the one with the greatest fraction of 0.50 or higher, and round up to the next whole number; in this example, abnormal results are rounded next; sum the integer parts of all components; check if the total is 100%:*	*The total is 100%; the rounding procedure is complete, and the final results are listed below.*
Normal	88.25	88.25→88	88	88%
Abnormal	1.50	1.50	1.50 →2	2%
Hard	-	-	-	
Dormant	-	-	-	
Dead	10.25	10.25	10.25	10%
Total	**100%**	**88+1+10=99%**	**88+2+10=100%**	**100%**

Example 3.

Component	Original results	*First, only round normal results; a fraction of 0.5 or higher is rounded up, a fraction less than 0.5 is rounded down; sum the integer parts of all components; check if the total is 100%:*	*Since the total is 98%, determine the next component to round up based on original results; pick the one with the greatest fraction of 0.50 or higher, and round up to the next whole number; in this example, dead results are rounded next; sum the integer parts of all components; check if the total is 100%:*	*Since the total is 99%, determine the next component to round up based on original results; pick the one with the greatest fraction of 0.50 or higher, and round up to the next whole number; in this example, abnormal results are rounded next*; sum the integer parts of all components; check if the total is 100%:*	*The total is 100%; the rounding procedure is complete, and the final results are listed below.*
Normal	63.25	63.25→63	63	63	63%
Abnormal	11.50	11.50	11.50	11.50→12	12%
Hard	5.50	5.50	5.50	5.50	5%
Dormant	-	-	-		
Dead	19.75	19.75	19.75→20	20	20%
Total	**100%**	**63+11+5+19=98%**	**63+11+5+20=99%**	**63+12+5+20=100%**	**100%**

*Although abnormal and hard results both have equal fractions of 0.50, according to the order of priority listed in section 6.7.3.d, abnormal seedling results should be rounded up before hard seed results.

Example 4.

Component	**Original results**	***First, only round normal results; a fraction of 0.5 or higher is rounded up, a fraction less than 0.5 is rounded down; sum the integer parts of all components; check if the total is 100%:***	***Since the total is 99%, determine the next component to round up based on original results; pick the one with the greatest fraction of 0.50 or higher, and round up to the next whole number; in this example, none of the remaining components has a fraction of 0.50 or higher, so none can be rounded up; in such situations, and to bring the total up to 100%, normal results are increased by 1% (see section 6.7.3.e); sum the integer parts of all components and check if the total is 100%:***	***The total is 100%; the rounding procedure is complete, and the final results are listed below.***
Normal	71.25	71.25→71	71→72	72%
Abnormal	5.25	5.25	5.25	5%
Hard	-	-	-	-
Dormant	8.25	8.25	8.25	8%
Dead	15.25	15.25	15.25	15%
Total	**100%**	**71+5+8+15=99%**	**72+5+8+15=100%**	**100%**

(The above 4 examples will replace examples 1-6 in the current rules)

Harmonization and Impact Statement:

The suggested changes do not alter the rounding rules, but merely clarify the procedure to be followed, therefore do not impact harmonization. Additionally, the proposed change corrects a mathematical error in one of the current examples listed under section 6.7.

Supporting Evidence:

The proposed changes are in response to requests by many analysts to clarify the rounding procedure, and include step-by-step examples that cover different possibilities.

Submitted by:

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