



Canadian Food  
Inspection Agency

Agence canadienne  
d'inspection des aliments



## **Preliminary Report:**

### **Referee Study on the Seedlings Evaluation of Field Corn (*Zea mays*)**

#### **Introduction:**

This referee study and survey were organized jointly by CSAAC and CFIA. The referee was specially designed to obtain information intended to provide helpful feedback to the participating seed analysts and to improve the accuracy and uniformity in corn seedling evaluation.

#### **Objectives of the Study:**

- To promote precision, standardization, and uniformity among seed laboratories with regard to the evaluation of corn seedlings in the germination test.
- To test the interpretation and adequacy of the existing Canadian Methods and Procedures for Seed Testing (M&P).
- To provide data to be used as supporting evidence for future seed testing procedures and rule changes, such as harmonization with AOSA and ISTA seed testing procedures and rules.
- To identify specific areas in corn germination test in which research is needed to promote uniformity among laboratories.

#### **Summary of Results**

##### **Participation**

Multiple participations from the same laboratory were allowed in this referee. Total of 97 individual results were received from CSAAC members and non-members, including 51 participants from the United States. These results were determined by seed analysts who used either Canadian Method and Procedures for Seed Testing (M&P, 46 results), or AOSA rules (51 results). Most participants have experience with variable numbers of samples tested (Table 1) for germination. Types of corn tested by participants included field corn, as well as sweet corn.



**Table 1. Numbers of Sample Tested and Rules Used in Participant Laboratories**

Participants		Number of Sample Tested by Participants		
Total	97	No. of Sample Tested	Participant No. or Percentage	
AOSA	51 (53%)	0	3	6%
		1-25	4	8%
		25-100	16	31%
		>100	28	55%
M&P	46(47%)	0	2	4%
		1-25	21	46%
		25-100	10	22%
		>100	13	28%

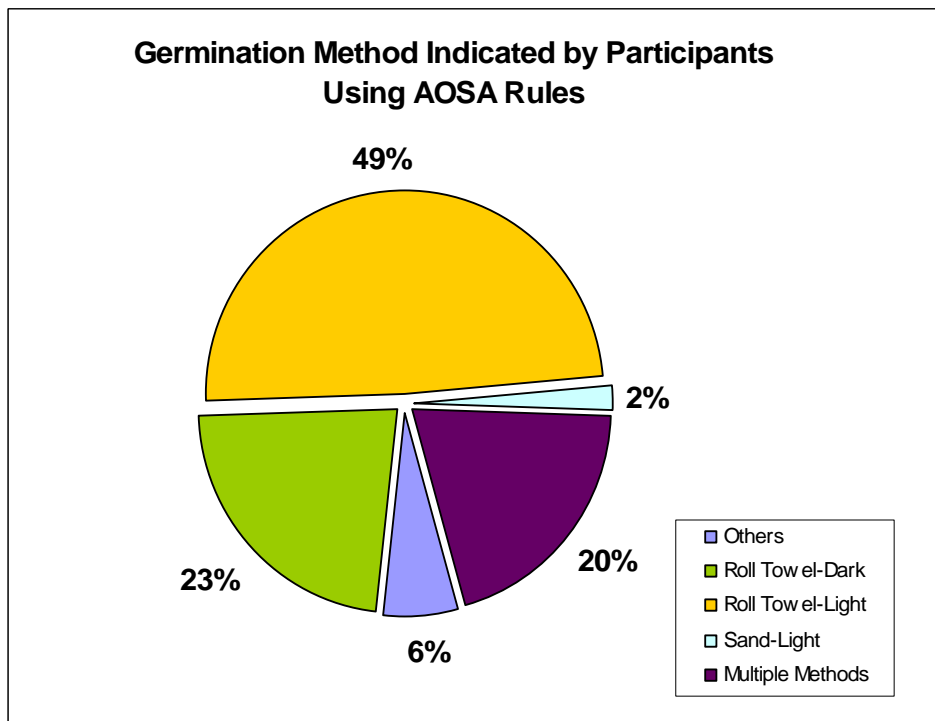
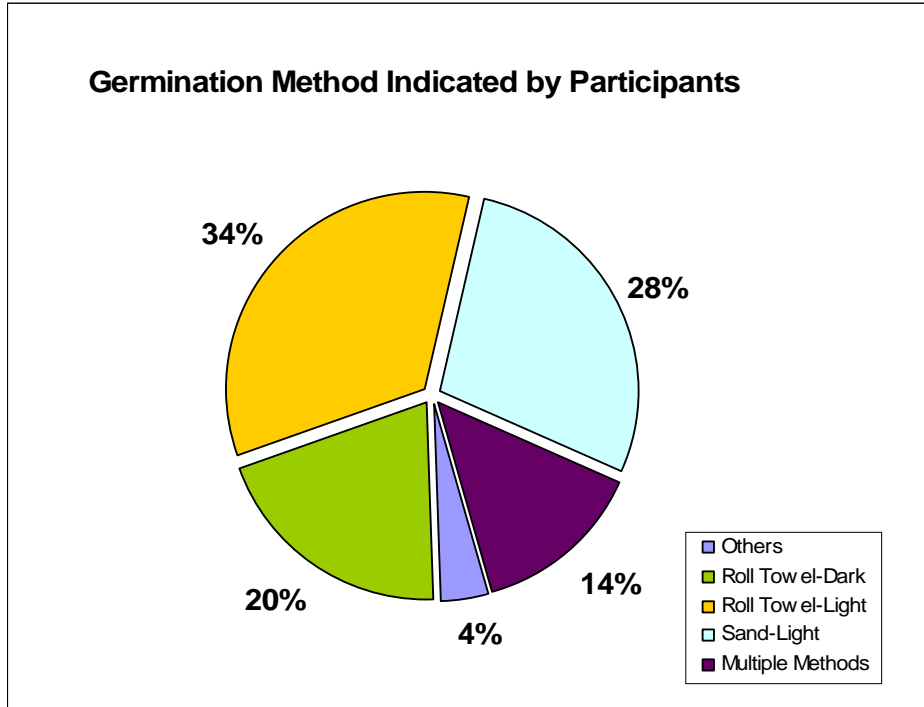
**Testing methods used in participant laboratories**

There are three main methods, sand with light (SL), roll towel with or without light (RL, RD), more or less equally used for corn germination testing. Interestingly, sand with light method was used more (58%) among participants who followed M&P. While roll towel with light was the main method (49%) among participants who used AOSA rules (Fig 1). Another referee will be sent out for assessing the accuracy and uniformity among these three methods; SL, RD and RL.



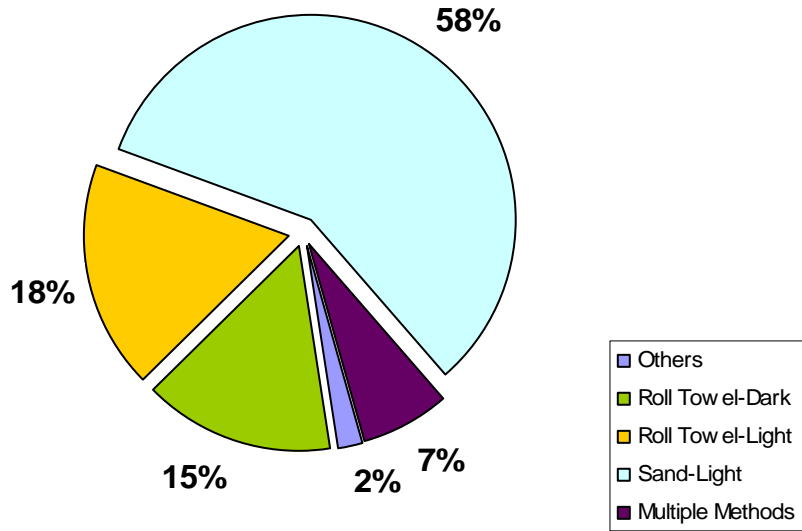
**Fig 1 Method Partition among Participants**

**Note:** Multiple methods mean the participant laboratory used sand with light, roll towel in dark, roll towel with light and other germination methods. Other methods could be crepe cellulose paper, kimpack.





### Germination Method Indicated by Participants Using M & P





### Seedling Evaluations and Answer Sheet

Evaluation data will be further analyzed for more information. The overall results of 97 participants for the referee are shown in the Table 2.

Table 2. Answer Sheet of Seedling Evaluation According to M&P or AOSA Rules, and Error Rates of Submitted Results\*.

Picture No.	Answer	AOSA (51 participants)			M&P (46 participants)		
		Normal (+)	Abnormal (-)	unknown	Answer	Normal (+)	Abnormal (-)
1	-	13	38		+	38	9
		25%	75%			83%	20%
2	-	14	37		-	22	24
		27%	73%			48%	52%
3	+	22	28	1	+	13	33
		43%	55%	2%		28%	72%
4	+	51	0		+	45	1
		100%	0%			98%	2%
5	+	37	13	1	+	27	19
		73%	25%	2%		59%	41%
6	-	15	36		+	29	17
		29%	71%			63%	37%
7	-	7	44		-	1	45
		14%	86%			2%	98%
8* Photo not very clear	-	37	14		-	35	11
		73%	27%			76%	24%
9	-	7	44		-	11	35
		14%	86%			24%	76%
10	-	7	44		-	2	44
		14%	86%			4%	96%
11	+	42	9		+	38	8
		82%	18%			83%	17%
12	+	51	0		+	43	3
		100%	0%			93%	7%

\*Note: Red Data indicates the error rates. Please see detailed information in the attached power point slides.



Highlights of the evaluation results as follow:

- The corn seedling evaluation rules in AOSA and M&P are not in agreement in the evaluation of normal or abnormal seedlings in the cases of Seeding No. 1 and No. 6. The difference being that the M&P does not refer to the coleoptile damage (e.g., split for more than one-third of the length from the tip) in the descriptions of abnormal corn seedlings.
- There are divergences in interpreting the Rules in Seedling No. 2. Rules both in M&P and AOSA state: Missing primary root with weak seminal roots is classified as abnormal. Among participants this can be interpreted as requiring at least 2 strong seminal roots to be considered normal. There is mixed opinion whether only one strong seminal root is “insufficient or weak”.
- The need for training or rule reviewing is identified by the results of Seedling No. 3 for many participants (62% overall participants). Both rules stated: Abnormal seedlings could be: One or more essential structures impaired as a result of decay from primary infection. Attention to the description or training may be needed for those participants to be more familiar about with how to differentiate the symptoms of the primary and secondary infection.
- Rule clarity or training may be needed to improve the interpretation of qualitative descriptions such as “weak”, “badly shredded”.
- Seedling evaluation descriptions in the Rules can not describe every possibility in biological growth. Common understanding and knowledge are required for seed analysts to draw from their experience or training for decision making.