



Mid West Corn Referee

Leaf less than half the length of the coleoptile,
abnormality or test condition?





History and design



- The leaf less than half the length of the coleoptile was first described in Testing Agricultural and Vegetable Seeds, Handbook No. 30, page 141. Figure 40.
- The leaf less than half has been viewed by some as a testing artifact
- Seed was donated by three companies
- 15 laboratories participated
- Referee participants were urged to test the seed as an in-house test and with at least one other method.
- The only specific direction was to count and record: normal seedlings, seedlings with leaf less than half the length of the coleoptile, all other abnormal seedlings and dead seeds.



Results- abnormality affect on rep to rep variability vs. variability if the abnormality was added to the normal seedling counts



	# OOT rep to rep	Tests	% of tests OOT
Present rules	24	294	8.16
Count leaf <1/2 as normal	10	294	3.40
All rt	16	119	13.45
All RT/no light	15	77	19.48
RT Mean normal & leaf < 1/2	3	119	2.52
CCP	4	77	5.19*
CCP Mean normal & leaf < 1/2	4	77	5.19*
Sand, Soil, or Sand /CCP	4	95	4.21
Sand, Soil or Sand/CCP Mean normal & leaf< 1/2	3	95	3.16

* One lab reported a cart failure resulting in Kimpak drying



Variability within laboratory between substrate methodology due to the leaf less than half the length of the coleoptile vs. if the abnormality was added to the normal count

	OOT	Substrates by Sample	%
Normal	54	112	48.2
Mean normal & leaf < 1/2	24	112	21.4



Conclusion

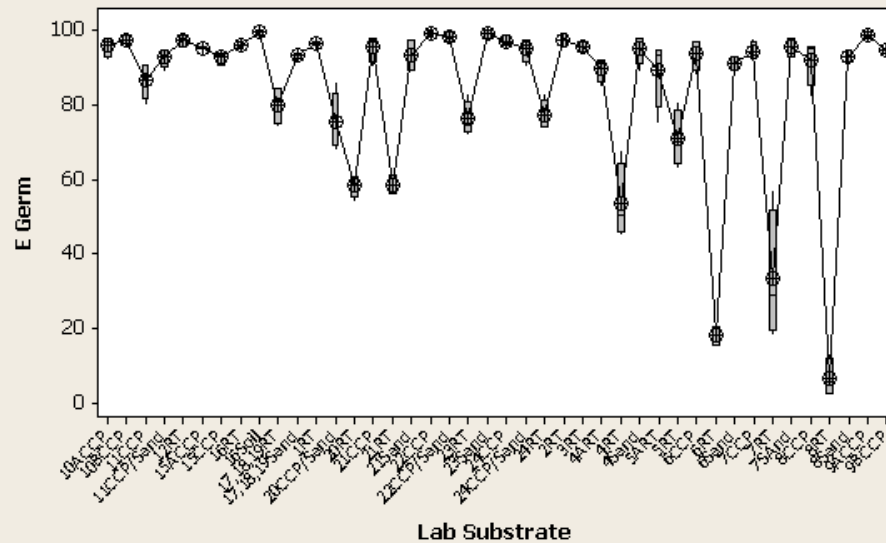
- This abnormality results in a substantial increase in retests due to rep to rep variability within an individual test
- Comparing results between different methods or different evaluators in the same lab would result in substantial number of retests
- Comparing test results between different labs, often conducting tests under different conditions would result in a substantial number of tests being out of tolerance
- **Can test factors be identified that add to Variability?**



Sample E Normal Germination vs. Sample E Germination if leaf <1/2 was not an abnormal



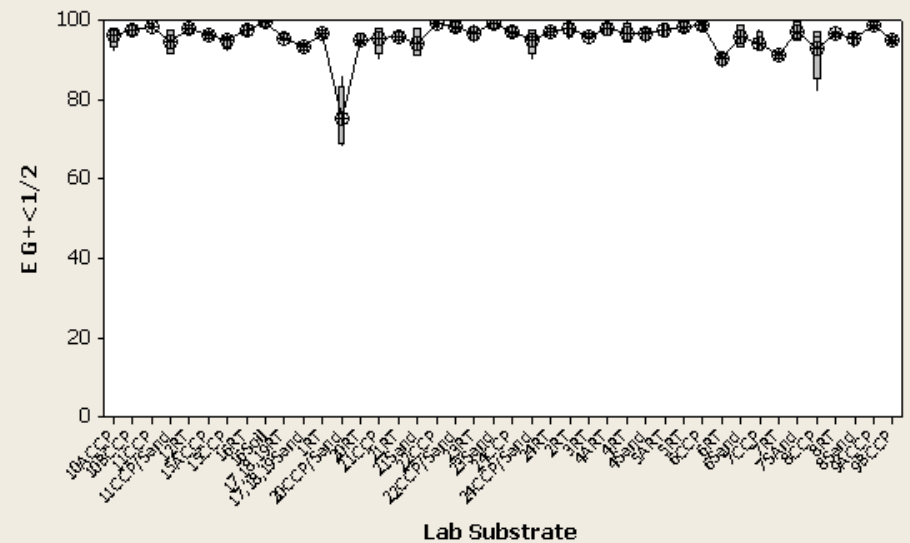
Boxplot of E Germ



Lab Substrate

P= 0.000
Pooled SD= 4.74

Boxplot of E G+<1/2



Lab Substrate

P= 0.000
Pooled SD= 2.45



Additional means to reduce variability



- The function of the coleoptile is to shield the leaves from abrasion with the ground while the seedling is emerging from the ground
- The coleoptile stops elongation when pressure is released or if light is sensed
- Light appears to 'solve' the abnormal, however, the roll towel method is the preferred method for many laboratories facing space or volume constraints
- Light is not uniform throughout the roll towel, therefore abolishment of this abnormality for vigorous seedlings would promote more uniform testing within and between labs



Test Conditions- Substrate vs. Light

Substrate		OOT	Tests	%OOT	OOT G & <1/2	Count N& <1/2	% Normal and < 1/2
RT	No Light	8	35	22.86	2	35	5.71
RT	Light	8	84	9.52	1	84	1.19
CCP	Light	4	84	4.76	4	84	4.76
Sand	Light	1	55	1.82	0	55	0.00
Sand/CCP	Light	2	28	7.14	2	28	7.14
Soil	Light	0	7	0.00	0	7	0.00
Total	No Light	8	35	22.86	2	35	5.71
Total	Light	15	258	5.81	7	258	2.71



Next step:

- Five organizations or companies have volunteered to conduct seedling emergence counts on the seven samples
- Seedlings will be destroyed upon completion of counts
- Results will be made available to the members of AOSA/SCST upon summarization
- A steering committee has been solicited to consider a potential rule change proposal



Thanks to Participant Labs:

- Ag Reliant Genetics, Cal West Seed, Harris Moran Seed Company, Illinois Crop Improvement, Illinois Foundation Seed, Iowa State University Seed Science Center, Michigan Crop Improvement, Monsanto-Waterman, Mycogen- Marshalltown, Pioneer Hi-Bred - Johnston, Pioneer Hi-Bred - Tipton, Syngenta - Nampa, Syngenta – Owatonna, , Texas Ag Department-Lubbock, Texas Ag Department-Stephenville
- Some laboratories had multiple participants at that site



Thanks and Acknowledgements

- Sample preparation, lab randomization, shipping and data collection: Iowa State University Seed Science Center, Mike Stahr and staff
- Statistical Analysis : Monsanto, Harold Armstrong
- Seed provided by: AgReliant Genetics, Pioneer Hi-Bred Int'l and Monsanto
- Land and Employee time for emergence studies: AgReliant Genetics, Iowa Seed Science Center, Indiana Crop Improvement, Pioneer Hi-Bred Int'l and Monsanto