2007-2008 Triploid Watermelon and Squash Referee Southwest Region IV

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Purpose:

The purpose of this referee (using **triploid watermelon** and **squash** seed) was to compare germination results and photo evaluations between seed analysts to see if the “Rules” are detailed enough to achieve standardized test results for the cucurbit family. The goal of this referee was to discern where further expansion of the AOSA- Seedling Evaluation guidelines for *Cucurbitaceae* might be needed, so that questionable seedlings are more clearly categorized as normal or abnormal. In addition, the germination methods were also observed.

Materials and Methods:

- Two **triploid watermelon** and two **squash** seed samples, along with a photo questionnaire of each were sent to 30 seed analysts.
- Participants were to test 400 seeds (200 seeds for squash sample #2) using their own germination methods or the AOSA method for each seed sample.
- The questionnaires had photos and questions about various seedling characteristics which may affect seedling evaluations; young seedlings, cotyledon damage/malformations, seed coats, cotyledon color, decayed seedlings, root damage, hypocotyls damage/malformations, peg consideration, hypocotyl orientation, and possible chemical damage situations.
- Participants were also asked to state their relative experience in working with each crop.
- Twenty-two seed analysts returned the **triploid watermelon** and **squash** referees.

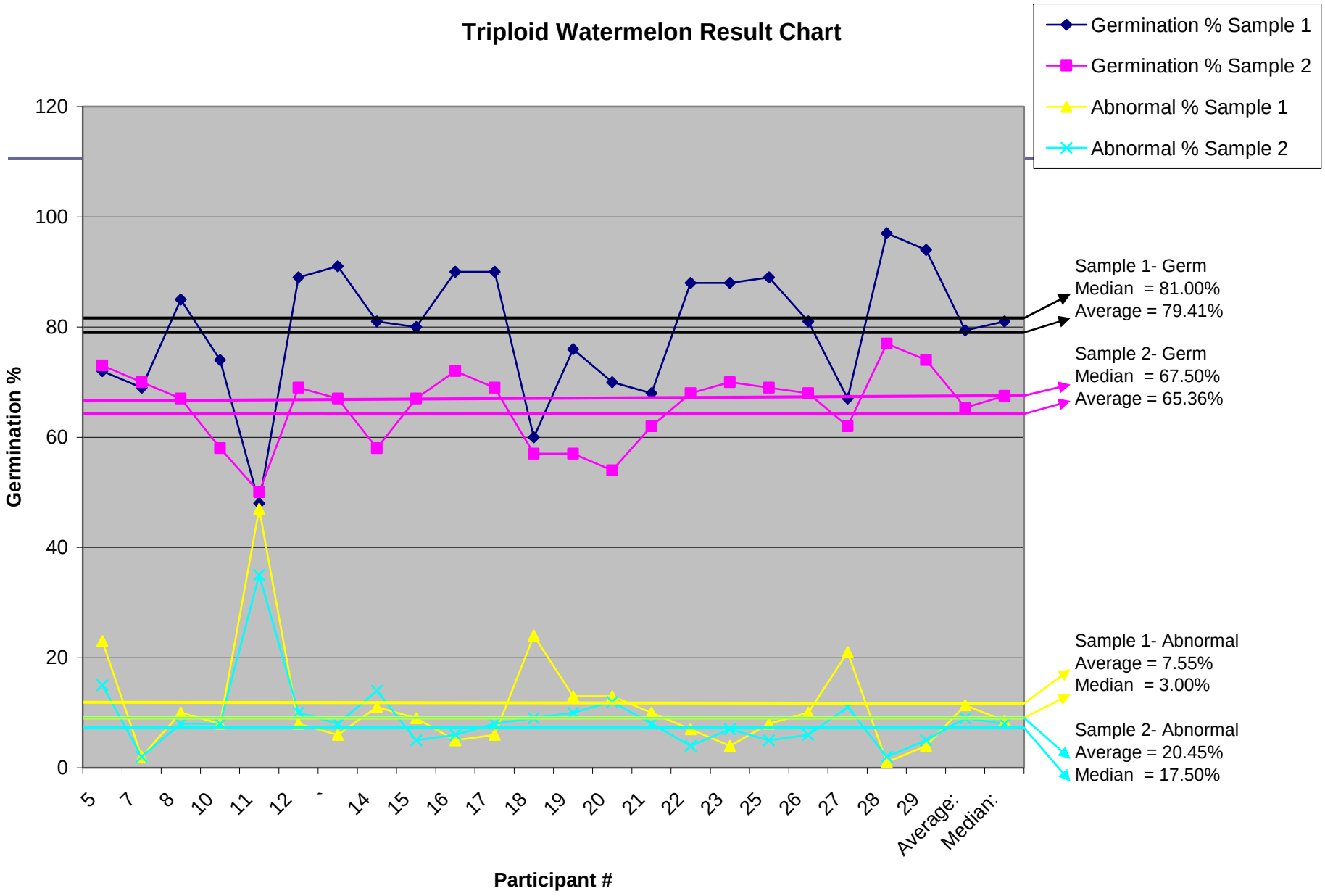
Results and Discussion:

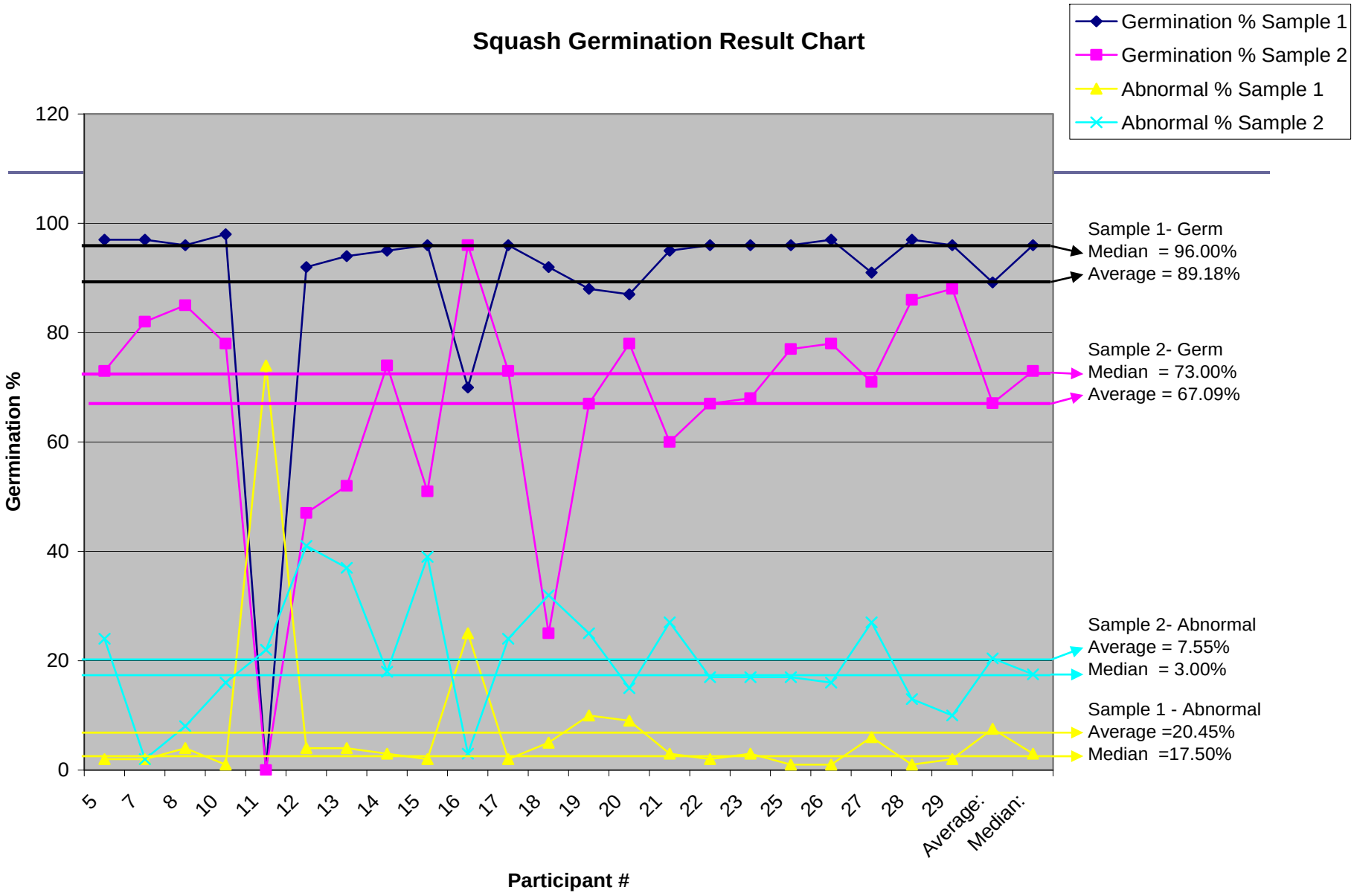
Triploid Watermelon Germination Results:

	Germination %		Abnormal %		Dead %		Firm %	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
Average:	79.41	65.36	11.36	9.00	7.64	21.77	1.59	3.86
Median:	81	67.5	8.5	8	6.5	22.5	0	0

Squash Germination Results:

	Germination %		Abnormal %		Dead %		Firm %	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
Average:	89.18	67.09	7.55	20.45	2.95	11.59	0.50	0.95
Median:	96	73	3	17.5	2	6.5	0	0


Triploid Watermelon Result Chart
Germination % Sample 1
Germination % Sample 2
Abnormal % Sample 1
Abnormal % Sample 2
Germination %
120
100
80
60
40
20
0
5
7
8
10
11
12
14
15
16
17
18
19
20
21
22
23
25
26
27
28
29
Average:
Median:
Participant #
Sample 1- Germ
Median = 81.00%
Average = 79.41%
Sample 2- Germ
Median = 67.50%
Average = 65.36%
Sample 1- Abnormal
Average = 7.55%
Median = 3.00%
Sample 2- Abnormal
Average = 20.45%
Median = 17.50%

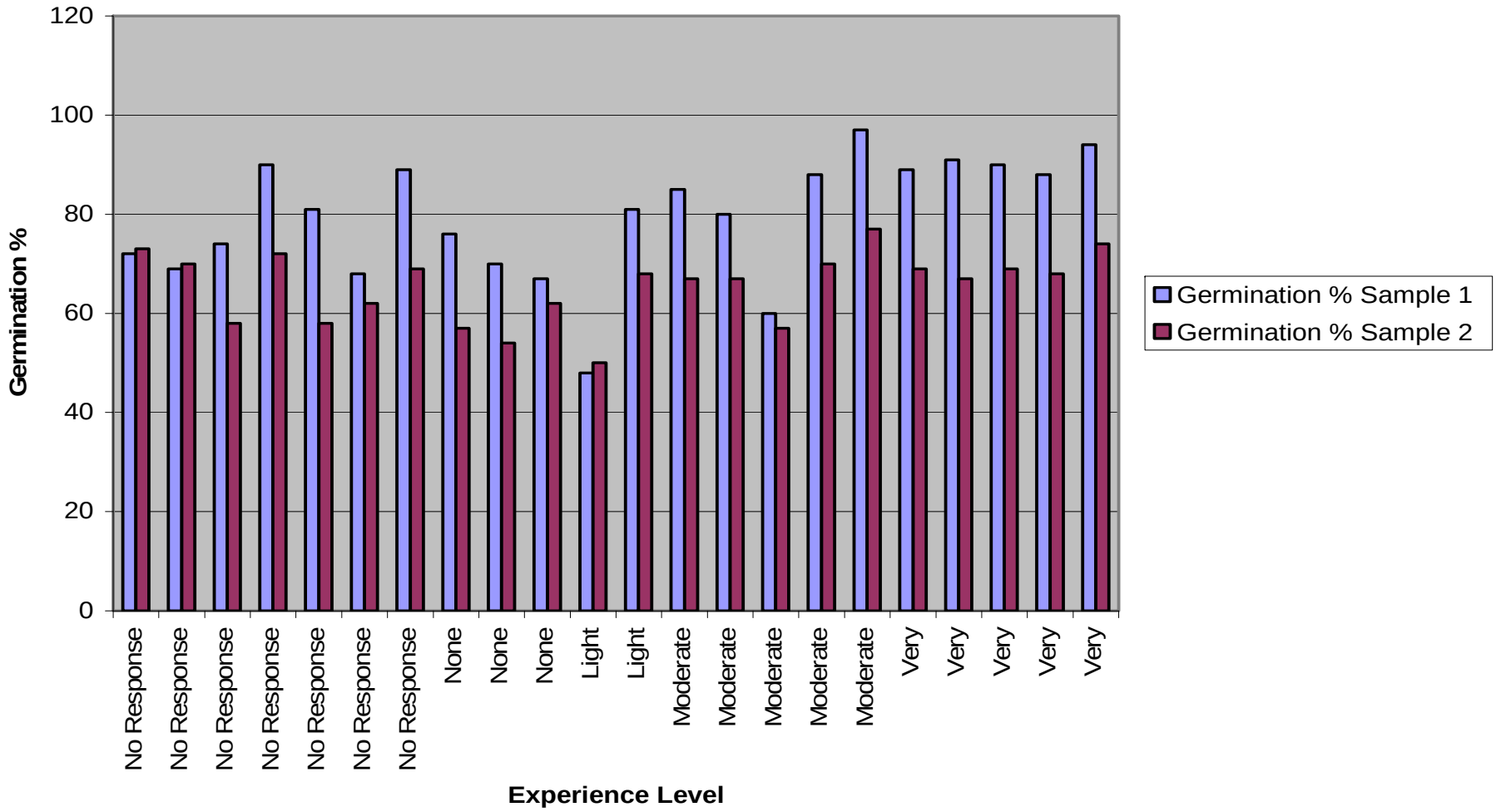

Squash Germination Result Chart
Germination % Sample 1
Germination % Sample 2
Abnormal % Sample 1
Abnormal % Sample 2
Germination %
120
100
80
60
40
20
0
5
7
8
10
11
12
13
14
15
16
17
18
19
20
21
22
23
25
26
27
28
29
Average:
Median:
Participant #
Sample 1- Germ
Median = 96.00%
Average = 89.18%
Sample 2- Germ
Median = 73.00%
Average = 67.09%
Sample 2- Abnormal
Average = 7.55%
Median = 3.00%
Sample 1 - Abnormal
Average =20.45%
Median =17.50%

Results and Discussion, cont.:

- The germination methods did not seem to impact the germination results as much as the evaluation methods. The total number of sprouts, whether normal or abnormal, was fairly consistent for all samples.

- A factor in the germination variance for both crops could be the experience level of the seed analyst. Here is a chart showing germ % as compared to seedling evaluation experience:

Triploid Watermelon Experience Level



Results and Discussion, cont.:

- The **photo questionnaires** for both the **triploid watermelon** and **squash** seedlings show some of the reasons for the variances in germination results.
- The results for the **Triploid Watermelon Photo Referee** and for the **Squash Photo Referee** begin on the next page. (Two pages of the referee were put on one sheet.) The count of normal and abnormal seedlings is below each photo along with a % breakdown and comments given by seed analysts for their choices.

Triploid Watermelon Photo Referee Results

a. Young seedlings: would these be considered normal or abnormal at final count? Why?

N= 12 (55%) A= 10 (45%)

Comments: All parts OK Extend

Comments: Short Primary root Stunted

N= 8 (36%) A= 13 (64%)

Comments: Extend test Borderline

Comments: Extend test Swollen Hypocot. Pinched pt. of attach.

N= 12 (57%) A= 9 (43%)

Comments: Extend test Borderline Check cots.

Comments: Short hypocot. Spindly/Stunted

N= 13 (59%) A= 8 (41%)

Comments: Extend test Short but strong

Comments: Short Hpctl. Stunted

N= 7 (33%) A= 14 (67%)

Comments: Small- Extend test

Comments: No Hpctl. Dev. Stunted No hook

b. **Cotyledon Damage**: Would you consider these normal or abnormal?

N= 21 (95%) A= 1 (5%)

Comments:

Comments: Damage >50%

N= 20 (91%) A= 2 (9%)

Comments: Cot. Decay <50%

Comments: Damage >50%

N= 16 (73%) A= **6** (27%)

Comments: Cots. Convoluted OK

Comments: Deformed at Pt. of attachment

N= 14 (64%) A= 8 (36%)

Comments:

Comments Cotyledon damage>50% Cots. moldy

N= 7 A= 15

(32%) (68%)

Comments: Comments:

Check cots. Damage at pt. of attachment

N= 6 A= 16

(27%) (73%)

Comments: Comments:

Cot. Damage<50% Cotyledon damage>50%

Decayed cots.

Seed coat picture cont.:

c. Do you remove the all seed coats? At what point during the test? Explain:

Yes= 16

(73%)

Comments:

Remove at 1st count if loose

Remove at final, if tight extend test, may retest in soil.

Must evaluate cotyledons

AOSA rule at final read

No= 6

(23%)

Comments:

Only if cots. not visible

Only normal looking ones

d. Do you consider cotyledon color? Explain:

Yes= 8

(38%)

Comments:

Consider light exposure to seedlings.

Test condition

Yellow/green OK, grayish =abnormal

50% rule

No= 13

(62%)

Comments:

Check for albino only

Test condition

g. Triploid watermelon sometimes does not have a very pronounced "peg". As a result seed coats often stay attached to the cotyledons. Is the "peg" considered in your seedling evaluation?

Yes= 1 (5%)
Comments:
Helps remove seedcoat/prevent decay

No= 20 (95%)
Comments:
Not an essential structure

h. How would you evaluate a seedling in which the hypocotyl is pointing down?

N= 15 (68%)
Comments:
Normal if essential structures are present.
Test condition
Not in Rules
Seedling OK

A= 7 (32%)
Comments:
Split root tip, Brown spot at root/Hypocotyl junction

i. Would you consider these decayed seedlings normal or abnormal? Explain;

N= 17 (77%)
Comments:
2nd infection
Essential parts OK
Retest in soil/sand

A= 5 (23%)
Comments:
Fungus-
Retest in soil.

N= 18 (82%)
Comments:
2nd infection
Retest in soil
Essential parts OK

A= 4 (18%)
Comments:
Glassy-
Retest in soil

N= 6 (27%)
Comments:
Remove seed coat
Retest in soil

A= 16 (73%)
Comments:
Decayed cotyledon-
Retest in soil.
Primary infection

j. Root Damage: Would you consider these normal or abnormal? Explain;

N= 7 (32%)
Comments:
Borderline
Sufficient roots
2nd infection

A= 15 (68%)
Comments:
Stubby Primary root-
Weak 2nd roots
Insufficient roots
Borderline

N= 1 (5%)
Comments:

A= 21 (95%)
Comments:
No primary root-
Insufficient roots
Borderline
Weak 2nd roots

Root Damage Cont.:

N= 4 (18%)
Comments:
Borderline
Sufficient 2nd roots

A= 18 (82%)
Comments:
Stubby Primary root-
Weak secondary roots
Insufficient root

N= 1 (5%)
Comments:
Primary root- OK
Root damage-test cond.

A= 21 (95%)
Comments:
Short Primary root-
Weak secondary roots
Borderline

N= 14 (64%)
Comments:
Primary root ok.
Sufficient 2nd root

A= 8 (36%)
Comments:
Primary root-
damaged
Insufficient root

N= 11 (50%)
Comments:
2nd roots OK
Borderline
Different variety?

A= 11 (50%)
Comments:
Slender Hypocot.
Weak 2nd roots
Weak seedlings

N= 13 (59%)
Comments:
Borderline
2nd roots OK

A= 9 (41%)
Comments:
Stunted primary
root, weak
adventious root.
Weak hook

k. Questionable Hypocotyls: Would you consider these normal or abnormal?

N= 4 (18%)
Comments:
Water break
Test condition

A= 18 (82%)
Comments:
Hypocot. cracked open
Test condition?
Shreaded Hypocot.

N= 20 (91%)
Comments:
Small-good cot.
Strong primary
Hpctl. long enough
Extend 2 days

A= 2 (9%)
Comments:

N= 1 (5%)
Comments:

A= 21 (95%)
Comments:
Damaged cot.
Thick Hypctl.
Short Hypctl.
No hypctl. curve

N= 1 (5%)
Comments:
Test Condition

A= 21 (95%)
Comments:
Hypocot. damaged
Malformed
Watery root

N= 18 (82%)
Comments:
Slight damage

A= 4 (18%)
Comments:
Thick Hypocot.

N= 8 (36%)
Comments:
Test condition

A= 14 (64%)
Comments:
Open crack
Cot. Damage

Questionable Hypocotyls Cont.:

N= 13 (59%)
Comments:
Test condition

A= 9 (41%)
Comments:
Hypocot. Twisted & constricted
Thin hypocotyl
No hook

N= 10 (48%)
Comments:
Check cotyledons
Test condition

A= 11 (52%)
Comments:
Constricted at hypocot./cot. junction
No hook
Deformed Cots

1. Other considerations or comments?

Hard to determine normal or not from photos.

Squash Evaluation Photo Referee Results

(Note: Not all photos had a definite response)

a. Young seedlings/short-medium hypocotyls: would these be considered normal or abnormal at final count? Why?

N= 11 (52%)
Comments:
Remove seedcoat
Extend 2 days

A= 10 (48%)
Comments:
Short hypocotyls

N= 10 (59%)
Comments:
Remove seedcoat
Late germ
Extend 2 days
Hypocot-long enough
Has all essential structures

A=7 (41%)
Comments:
Hypocot- too short
Extend 2 days

b. **Young seedlings**/ slight hypocotyl malformation/damage; would these be considered normal or abnormal at final count? Why?

N= 13 (59%)
Comments:
Test condition
Water break

A= 9 (41%)
Comments:
Deep cut

N= 19 (86%)
Comments:
Slight damage
Many roots

A= 3 (14%)
Comments:
Malformed

N= 7 (32%)
Comments:
Weak but normal
Borderline hypocot length
Sufficient root
Extend 2 days

A= 15 (68%)
Comments:
Thick/swollen hypocotyl
Insufficient root
Hypocotyl. too short

c. **Young seedlings**/stunted primary root; would these be considered normal or abnormal at final count? Why?

N= 8 (40%)
Comments:
Sufficient 2nd roots

A= 12 (60%)
Comments:
Short/weak primary root
Weak 2nd roots
Insufficient 2nd roots
Stunted sprout

N= 19 (86%)
Comments:
Check cotyledons
Hypocotyl long enough
Sufficient roots
Normal development

A= 3 (14%)
Comments:
Extend 2 days
Swollen/stunted hypocotyl
Insufficient 2nd roots

d. **Young seedlings**/ damaged primary root; would these be considered normal or abnormal at final count? Why?

N= 12 (55%)
Comments:
Hypocotyl long enough
Sufficient 2nd roots

A= 10 (45%)
Comments:
Short hypocotyls

N=1 (5%) A= 21 (95%)
Comments:
No hpctl.
Tight seedcoat

N= 4 (18%) A= 18 (82%)
Comments:
Short hpctl.

N= 4 (18%) A= 18 (82%)
Comments:
Hpctl OK
Comments:
Short hpctlt

Damaged primary root cont.;

N= 22 (100%)
Comments:
Strong 2nd roots

A= 0 (0%)
Comments:

N= 17 (77%)
Comments:
Strong 2nd roots

A= 5 (23%)
Comments:
Short Hypocotyl

Decayed test cont.;

N= 3 (14%)
Comments:
2nd infection, strong root/hpctl.
Test condition

A= 19 (86%)
Comments:
Detached cotyledons (Normal if test condition)
Primary infection
>50% decayed cots
Retest soil/sand

e. **Young seedlings**/ decayed test; would these be considered normal or abnormal at final count? Why?

N= 11 (50%)
Comments:
Late germ
Hpctl. long
Enough,
Lots 2nd roots

A= 11 (50%)
Comments:
Short hpctl.

N= 9 (41%)
Comments:
Late germ
Hpctl. long
Enough,
Lots 2nd roots

A= 13 (59%)
Comments:
Damaged hpctl.

N= 1 (5%)
Comments:

A=21 (95%)
Comments:
Thickened hpctl.
Decayed Cotyledons
Primary infection

f. **Young seedlings**/ seed coats attached; do you remove seed coats for evaluation? Would these be considered normal or abnormal at final count? Why?

N=17 (81%)
Comments:
Check cots.
Remove seedcoats
Sufficient root

A=4 (19%)
Comments:
Weak 2nd rts.

N=2 (10%)
Comments:
Suffic. Rt.
Hypcot. OK

A= 19 (90%)
Comments:
Insuffic. Root
Poor dev.

N= 18 (86%)
Comments:
Check cots.
Remove seedcoats
Root OK

A=3 (14%)
Comments:

g. **Mature seedlings**/ seed coat attached; do you remove seed coats for evaluation? Yes= 17 (77%)

Comments:
Check for 50% rule
Check at Final count

No= 5 (23%)

Comments:

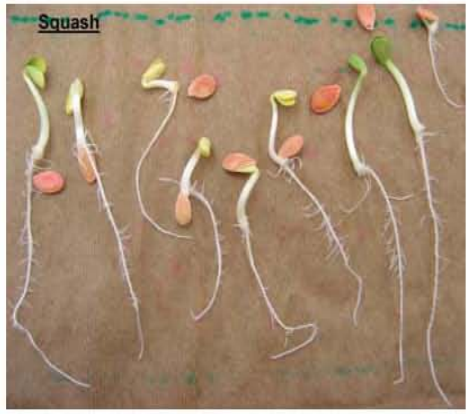
h. Do you consider cotyledon color? Yes= 8 (36%)

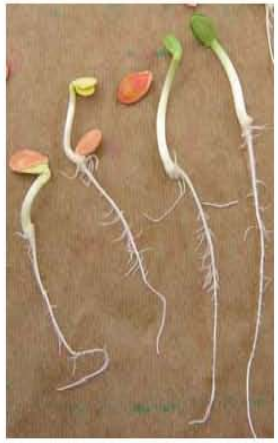
Comments:
Check if albino or chlorotic
Picture is low light test condition

If so, to what extent?

No= 14 (64%)

Comments:
Only check for albino
Test condition





i. How would you handle this test at final count?

N= 10 (45%)

Comments:
Extend 2 days
Extend 3-4 days
Retest in soil/sand

A= 12 (55%)

Comments:
All abnormal- retest in soil, do TZ
Chemical damage- Retest

j. To what extent do you consider cotyledon malformation?

N= 19 (86%)

Comments:
>50% good tissue
Deformities/convoluted cotyledons considered normal use >50% rule

A= 3 (14%)

Comments:
Judge-can cots expand to form normal seedling

Cotyledon malformation cont.:

N= 20 (91%)
Comments:
1 good cot.,strong hpctl./roots
Check epicotyl
>50% good cotyledon

A= 2 (9%)
Comments:

N= 12 (55%)
Comments:
Check terminal bud
Both cots present

A= 10 (45%)
Comments:
Bad damaged/deformed cot,
weak roots

k. Other considerations or comments?
Thickened / shortened seedlings are retested in sand or soil if chemical damage is suspected.

Conclusions:

- Some seed analysts do vary their **germination methods** away from both the AOSA and ISTA germination rules.
- The **experience level** of the seed analyst does seem to have some effect on the germ results for the triploid watermelon sample.
- The **photo referee** showed that the inconsistency in germs is probably mostly due to the inconsistency in seedling evaluations.

Conclusions:

- In order to bring seed analysts into closer agreement in their seedling evaluations of the cucurbit family, expanding and clarifying the “Rules” would be beneficial. Adding drawings and/or pictures and clearly categorizing questionable seedlings as normal or abnormal would take away some of the “judgment” calls by seed analysts. The photo referee shows various areas of inconsistency. These areas could be used as a starting point, as areas which need clarification and expansion in the Seedling Evaluation Handbook.

Acknowledgements:

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Questions?

A more detailed report of this referee, including the photos used in the referee, can be obtained from Olga Maseda:

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