

The Syngenta logo is positioned on the right side of a horizontal bar. The bar consists of a thin light green top layer and a thicker dark green bottom layer. The logo itself is white, featuring the word "syngenta" in a lowercase, sans-serif font. A large, stylized, light gray leaf graphic is partially visible behind the bar, extending from the top right towards the bottom center.

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Sugarbeet Virtual Referee AOSA Southwest Region IV

2010-2011

Classification: External Use

Referee Purpose

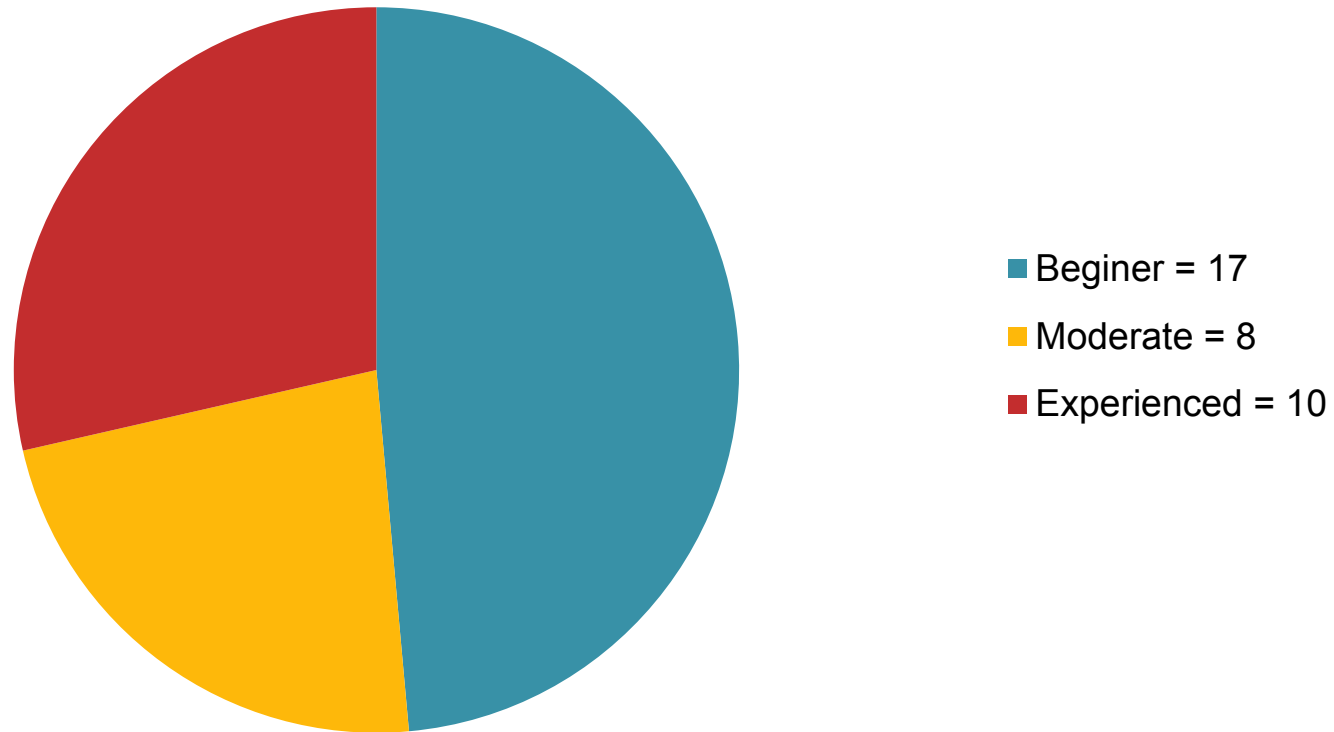
- To increase uniformity and repeatability across labs when evaluating sugar beets.
- To give evaluation access to analysts who do not regularly see sugar beets.
- To aid those taking the germination portion of testing exams.

General Information

- All sugar beets have been steeped in a water bath.
- All seedlings are at the final count.
- Reference the AOSA Rules for Testing Seeds Vol. 4 Seedling Evaluation.

35 Referee Participants Total.

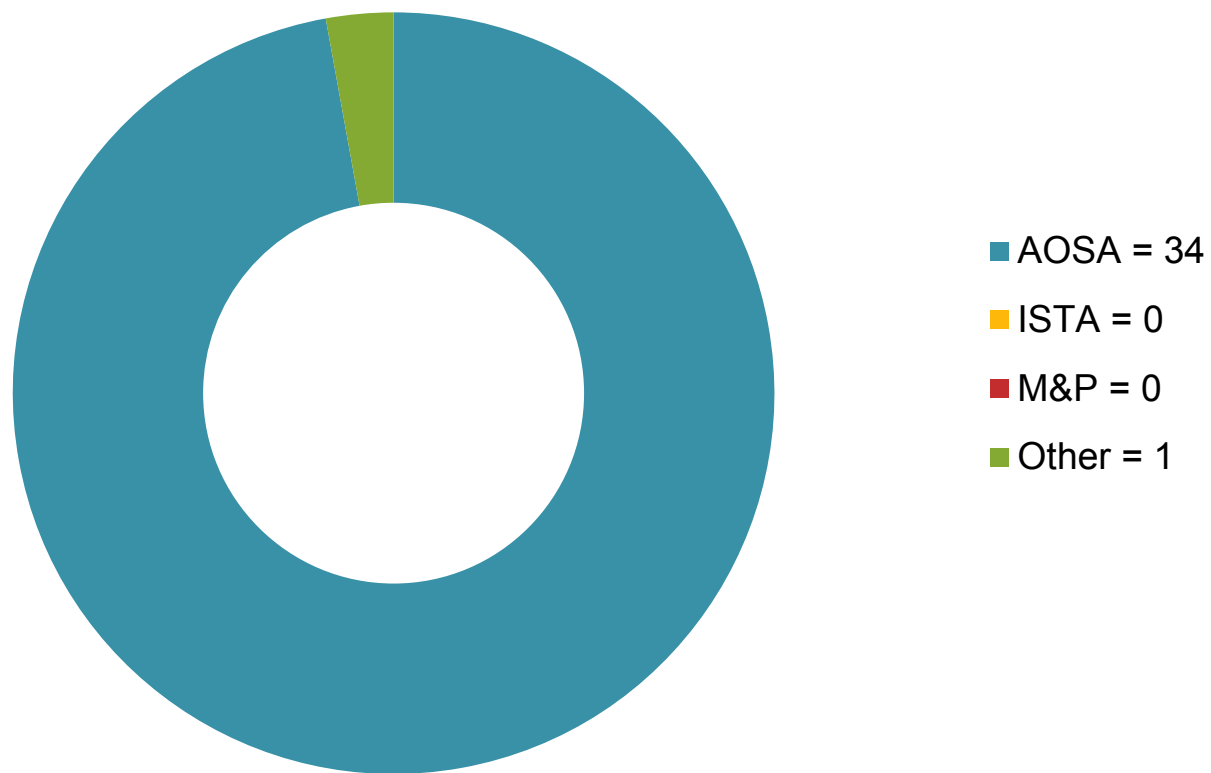
- How much experience do you have with Sugarbeets
(beginner, moderate, experienced)?



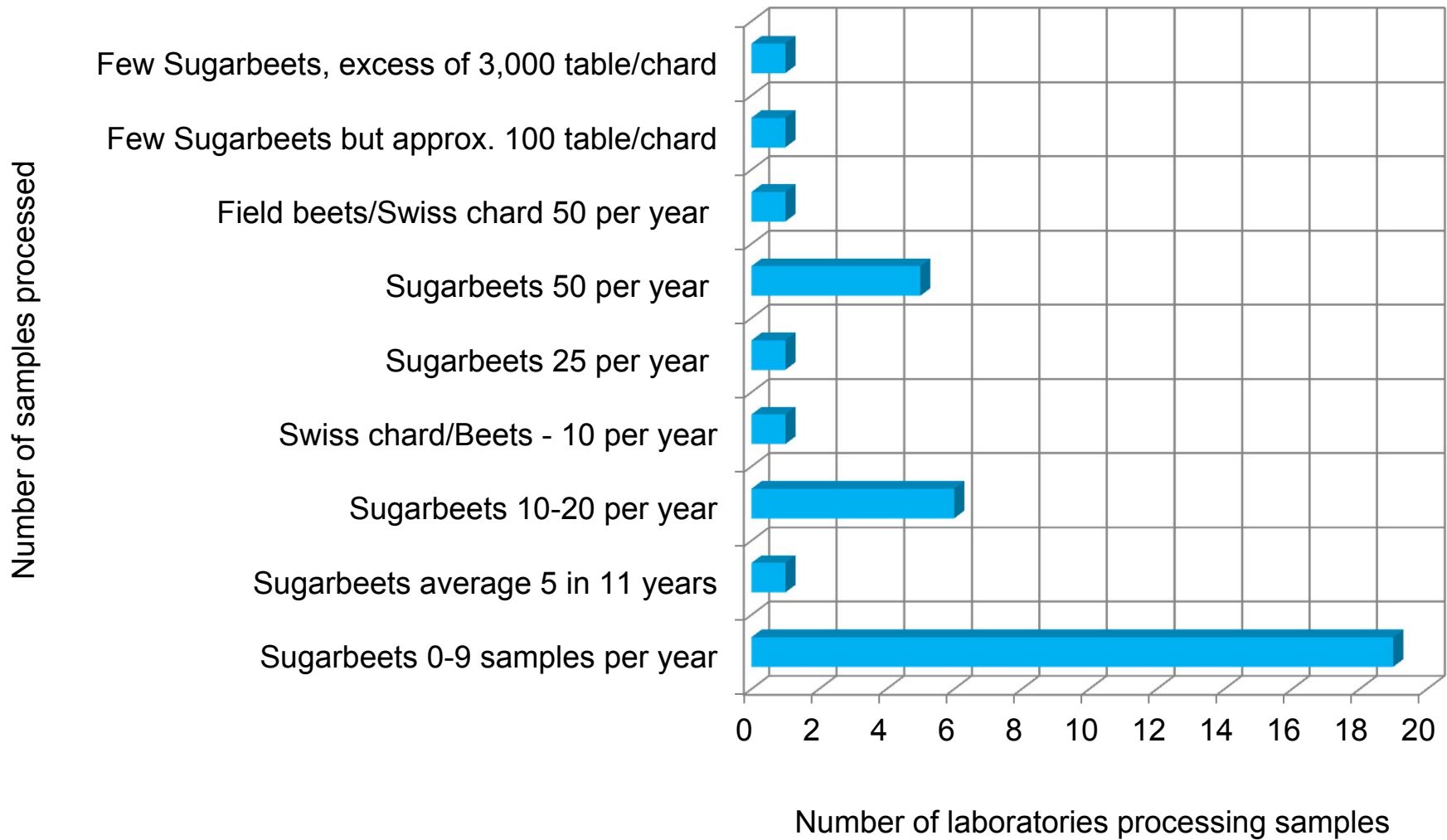
Data presented represents participants answers.
Not every question and/or seedling evaluation was answered by every participant.

Which testing methods do you follow for sugar beets?

AOSA, ISTA, Canada?



How many samples do you and your lab do a year?



Slide 1



| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 3 | 11 | 1 | 1 | 8 | | | 10 | |

Beginner's abnormal Comments:
Stubby root

Moderate's Abnormal Comments:
Appear to be deep open cracks
extending into the conducting
tissue, and missing/stunted
radicle.

Slide 2



| Beginner | | |
|----------|--------|--------|
| normal | abnorm | extend |
| 10 | 6 | |

Beginner's Normal Comments:
Normal, so long as discoloration
is not due to decay.
May reset in soil

| Moderate | | |
|----------|--------|--------|
| norm | abnorm | extend |
| 6 | 3 | |

Moderate's Normal Comments:
Toxic substances from the cluster cause
discoloring of the hypocotyls and/or roots.
Doesn't appear to be the source for primary
infections.

| Experienced | | |
|-------------|--------|--------|
| norm | abnorm | extend |
| 4 | 6 | |

Slide 3



Moderate's Normal Comments:

Multiple seedlings, cotyledons trapped in cluster, secondary root infection.

Need to expose coleoptiles and check if normal

| Beginner | | |
|----------|--------|--------|
| normal | abnorm | extend |
| 16 | | |

| Moderate | | |
|----------|--------|--------|
| norm | abnorm | extend |
| 7 | | 2 |

| Experienced | | |
|-------------|--------|--------|
| norm | abnorm | extend |
| 9 | | 1 |

Slide 4



Beginner's Abnormal Comments:
no root development.

Moderate's Abnormal Comments:
no root development.
Missing/stunted radicle.

Slide 5



Beginner's Abnormal Comments:
Stubby roots.

Moderate's Abnormal Comments:

Decayed cotyledons, watery,
thickened and broken
hypocotyls.

Missing/stunted radicle.

| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 2 | 14 | | 2 | 7 | | 1 | 9 | |

Slide 6



Beginner's Abnormal Comments:
no root development

Moderate's Abnormal Comments:
Both cotyledons decayed, hypocotyls shortened
and primary root trapped in cluster.
Missing/stunted radicle, peel back seed coat to
expose possible radicle inside.

Experienced Abnormal Comments:
Extend test or remove seed coat and check root then
classify.

| Beginner | | |
|----------|--------|--------|
| normal | abnorm | extend |
| 1 | 15 | |

| Moderate | | |
|----------|--------|--------|
| norm | abnorm | extend |
| | 9 | |

| Experienced | | |
|-------------|--------|--------|
| norm | abnorm | extend |
| | 9 | 1 |

Slide 7



Moderate's Abnormal Comments:
Multiple seedlings both damaged

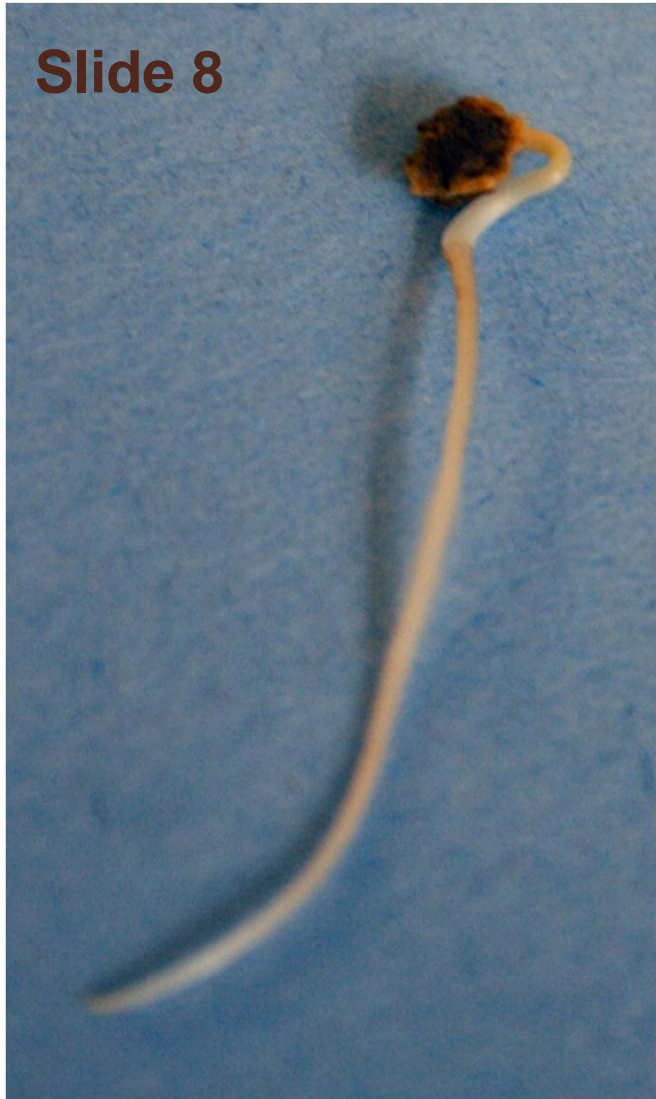
Moderate's Normal Comments:
Check coleoptiles inside seed coat

| Beginner | | |
|----------|--------|--------|
| normal | abnorm | extend |
| 14 | 1 | 1 |

| Moderate | | |
|----------|--------|--------|
| norm | abnorm | extend |
| 7 | 2 | |

| Experienced | | |
|-------------|--------|--------|
| norm | abnorm | extend |
| 5 | 4 | 1 |

Slide 8



Moderate's Abnormal Comments:

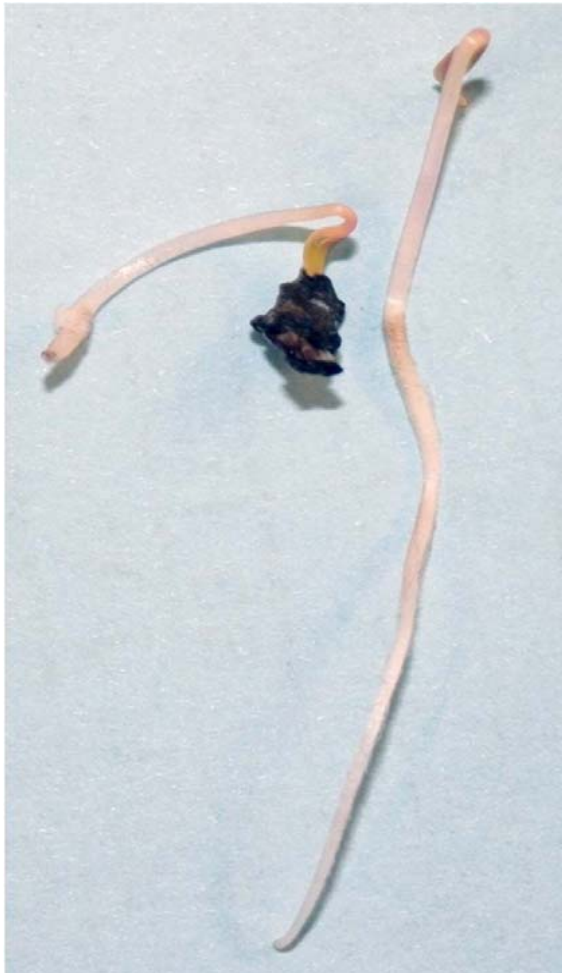
Cotyledons trapped in cluster, shortened hypocotyls with weak adventitious roots

Moderate's Normal Comments:

Check Coleoptiles inside seed coat

| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 14 | 1 | 1 | 7 | 2 | 9 | | 1 | |

Slide 9



Beginner's Normal Comments:

If they came from the same cluster, or one is abnormal due to slow root development.

Moderate's Normal Comments:

Multiple seedlings separated from cluster evaluated as one normal seedling.

One of the seedlings appears to completely normal.

On the left = abnormal, on the right normal: if from the same seed unit is normal

Expert's Comments:

Evaluated both one as abnormal the other as normal.

| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 11 | 5 | | 8 | 1 | | 8 | 3 | |

Slide 10



| Beginner | | |
|----------|--------|--------|
| normal | abnorm | extend |
| 1 | 15 | |

| Moderate | | |
|----------|--------|--------|
| norm | abnorm | extend |
| 1 | 8 | |

| Experienced | | |
|-------------|--------|--------|
| norm | abnorm | extend |
| 5 | 5 | |

Beginner's Normal Comments:
Difficult to tell from photo whether cotyledons are free of necrosis.

Moderate's Abnormal Comments:
Cotyledons decayed, hypocotyls shortened and thickened with weakened primary root

Watery/thick hypocotyl.

Slide 11 - The hypocotyl is not watery.



Moderate's Normal Comments:

Appears to be secondary infection from dead seed.

| Beginner | | |
|----------|--------|--------|
| normal | abnorm | extend |
| 10 | 6 | |

| Moderate | | |
|----------|--------|--------|
| norm | abnorm | extend |
| 8 | | 1 |

| Experienced | | |
|-------------|--------|--------|
| norm | abnorm | extend |
| 9 | | 1 |

Slide 12



| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 16 | | | 9 | | | 10 | | |

Moderate's Normal Comments:
seedling with separated cluster

Slide 13



| Beginner | | |
|----------|--------|--------|
| normal | abnorm | extend |
| 1 | 14 | 1 |

| Moderate | | |
|----------|--------|--------|
| norm | abnorm | extend |
| | 9 | |

| Experienced | | |
|-------------|--------|--------|
| norm | abnorm | extend |
| 1 | 9 | |

Beginner's Normal Comment:

May reset in soil

Beginner's Abnormal Comment:

Assuming discoloration on root is decay.

Moderate's Abnormal Comments:

Appears to be primary source of infection.

One or more essential structures impaired as a result of decay from primary infection

Slide 14



| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 7 | | 9 | 3 | 1 | 5 | 10 | | 6 |

Moderate's Comments to extend testing:
Late germinating seedling extend test two more days.

Experienced Comments:
Evaluated all seedlings

Moderate's Normal Comments:
Extend test two days/check for normal coleoptiles development.

Slide 15



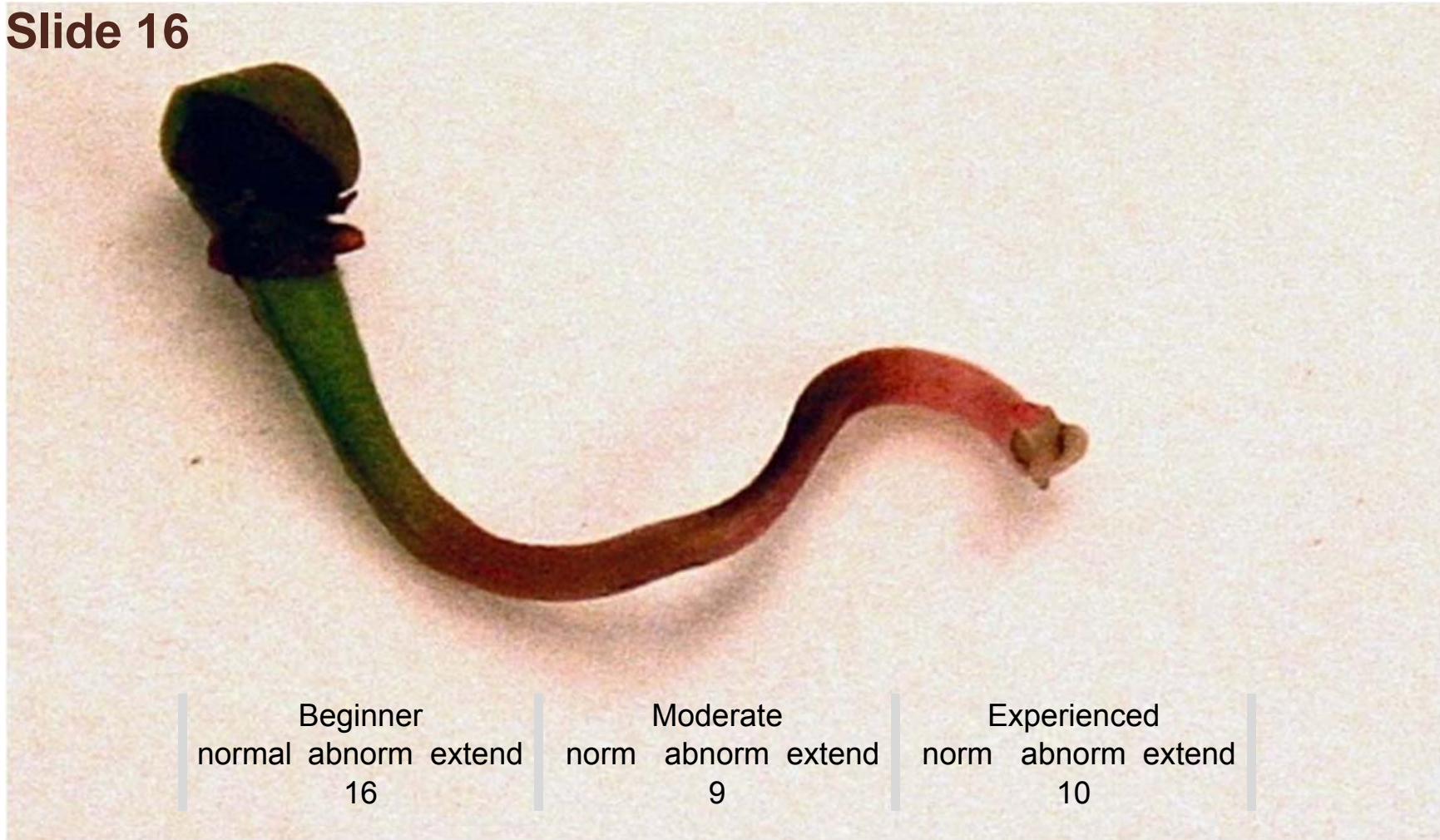
| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 16 | | | 7 | | 2 | 9 | | 1 |

Moderate's Normal Comments:

Extend test two more days seedling has good primary root and adventitious roots

Remove seed coat to examine coleoptiles

Slide 16



Beginner's Abnormal Comment:
Stubby root

Moderate's Abnormal Comments:
All essential structures decayed.
Missing radicle

Slide 17



| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 16 | | | 8 | 1 | | 10 | | |

Moderate Normal Comment:
multiple seedling one normal

Slide 18



| Beginner | | | Moderate | | | Experienced | | |
|----------|--------|--------|----------|--------|--------|-------------|--------|--------|
| normal | abnorm | extend | norm | abnorm | extend | norm | abnorm | extend |
| 2 | 14 | | 3 | 6 | | | 10 | |

Beginner's Abnormal Comment:
Stubby root, thickened hypocotyl.

Moderate's Abnormal Comments:
Shortened decayed primary
Stunted radicle.

Slide 19



| Beginner | | |
|----------|--------|--------|
| normal | abnorm | extend |
| 16 | | |

| Moderate | | |
|----------|--------|--------|
| norm | abnorm | extend |
| 7 | 1 | 1 |

| Experienced | | |
|-------------|--------|--------|
| norm | abnorm | extend |
| 9 | | 1 |

Moderate's Abnormal Comments:

Multiple seedlings both cotyledons trapped in cluster, shortened hypocotyls, watery primary roots with weak secondary or adventitious roots

Moderate's Normal Comment: Remove seed coat to examine coleoptiles.

Conclusion

- Sugarbeet crop identification of normal's vs. abnormal's data appears to be fairly consistent between evaluators, with a few exceptions.
- Additional education/experience would be beneficial for this specie

Many Thanks to all the participants



Any questions can be directed to:
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