Rhizoctonia Inoculation Techniques

Jason Brantner, Carol Windels and Jeff Nielsen
University of Minnesota,
Northwest Research and Outreach Center

Trial design

- Field trial designs to minimize variation within replicates
  - Inoculated trials rather than natural infested fields

- Plot size and setup so all treatments (varieties, fungicides, etc.) receive inoculation by same equipment
  - Example: same units on a Gandy applicator
  - Inoculate center 4 rows of 6-row plots

Inoculum source & generation

- Start with locally isolated culture
- Test pathogenicity
- Grow on sterilized barley grain
  - Gaskill, 1968
  - Expanded to stainless steel pans
- Use whole to infest soil prior to planting
- Grind with Wiley mill, #3 round-hole screen
  - Grind just before use
  - Stores better on whole barley (refrig.)
- Plan so inoculum is used within 3-4 weeks

Inoculum application

- Apply whole infested barley across plot and incorporate into soil @ 35 kg/ha (Papavizas and Lewis, 1986)
  - Seed treatments
  - In-furrow fungicides
  - Early-season effects
- Apply ground infested barley using Gandy granular applicator (28 g/30 ft row) (Ruppel, et al., 1979)
  - Go both directions (1/2 each pass)
  - Can time onset of disease
  - Variety screening
  - Post-emergence fungicides
  - How natural?
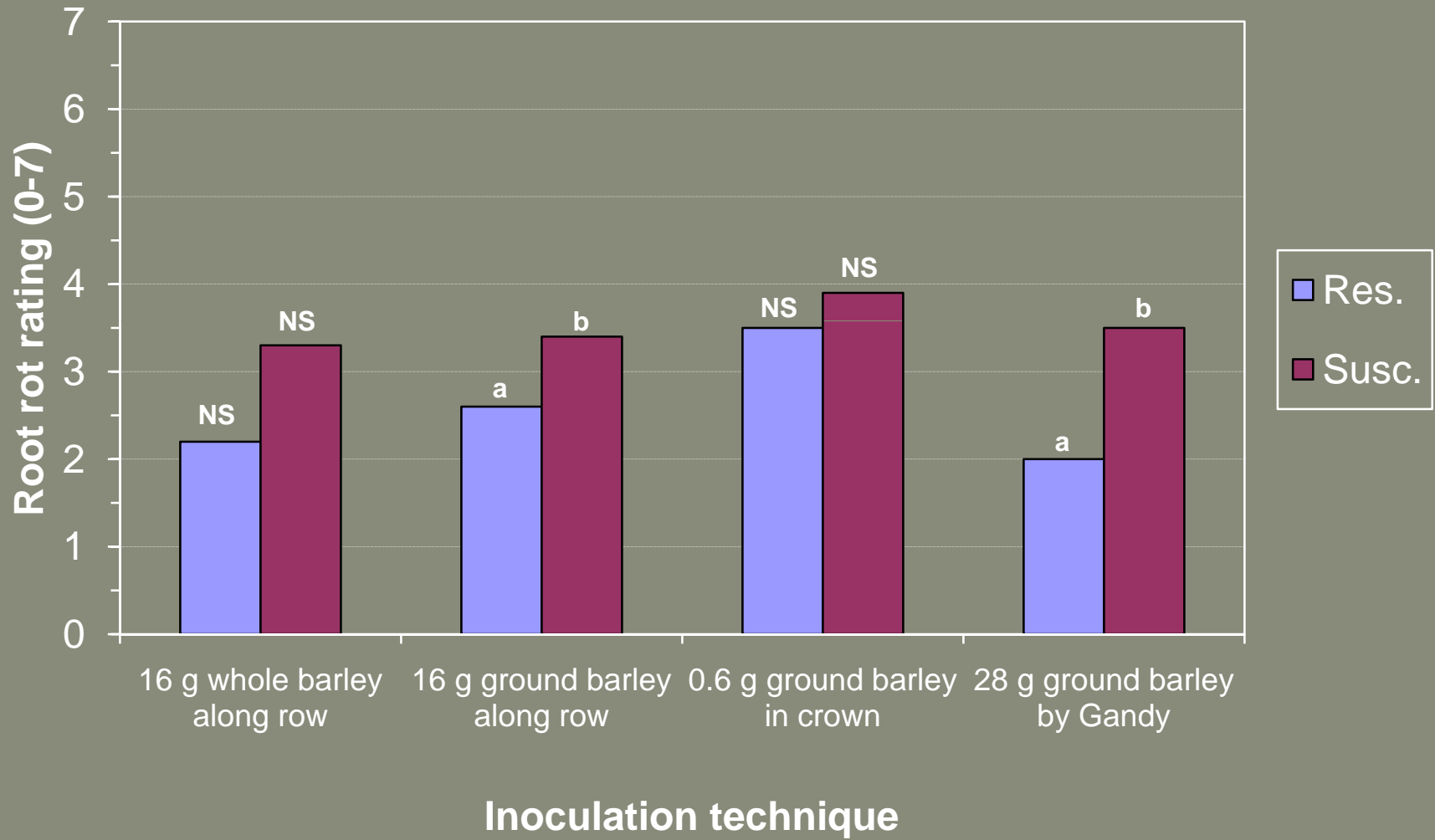
Promoting heavy, uniform infection

- Heavy cultivation after inoculation
- Hand raking

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- Increase rate of inoculation

28 g/30 ft row

40 g/30 ft row

Promoting heavy, uniform infection

- Heavy cultivation after inoculation
- Hand raking
- Irrigation
- Increase rate of inoculation
- Age at inoculation

Inoculated at 4-leaf stage

Inoculated at 8-leaf stage

Rating timing & methods

- Inclusion of proper controls
  - Susceptible and resistant varieties/germplasm
  - Untreated controls: inoculated and non-inoculated
- 0-7 scale (Ruppel, et al., 1979)
  - Center two rows lifted, weighed, and piled
  - Rate 20 plants/plot (random from pile)
  - Quality sample from 10 of the 20 rated

Rhizoctonia crown and root rot visual disease severity rating scale

0 1 2 3 4 5 6 7

From: Ruppel et al., 1979

Photos by G. Reynolds

Data analysis

- Stand counted after thinning
- History says expect ~15% stand loss
- Adjusted ratings
  - Excessive stand loss from Rhizoctonia

Inoculated at 4-leaf stage

Inoculated at 8-leaf stage

Data analysis

- Stand counted after thinning
- History says expect ~15% stand loss
- Adjusted ratings
  - Excessive stand loss from Rhizoctonia
  - Example: Stand at thinning = 105
                  Stand at harvest = 35
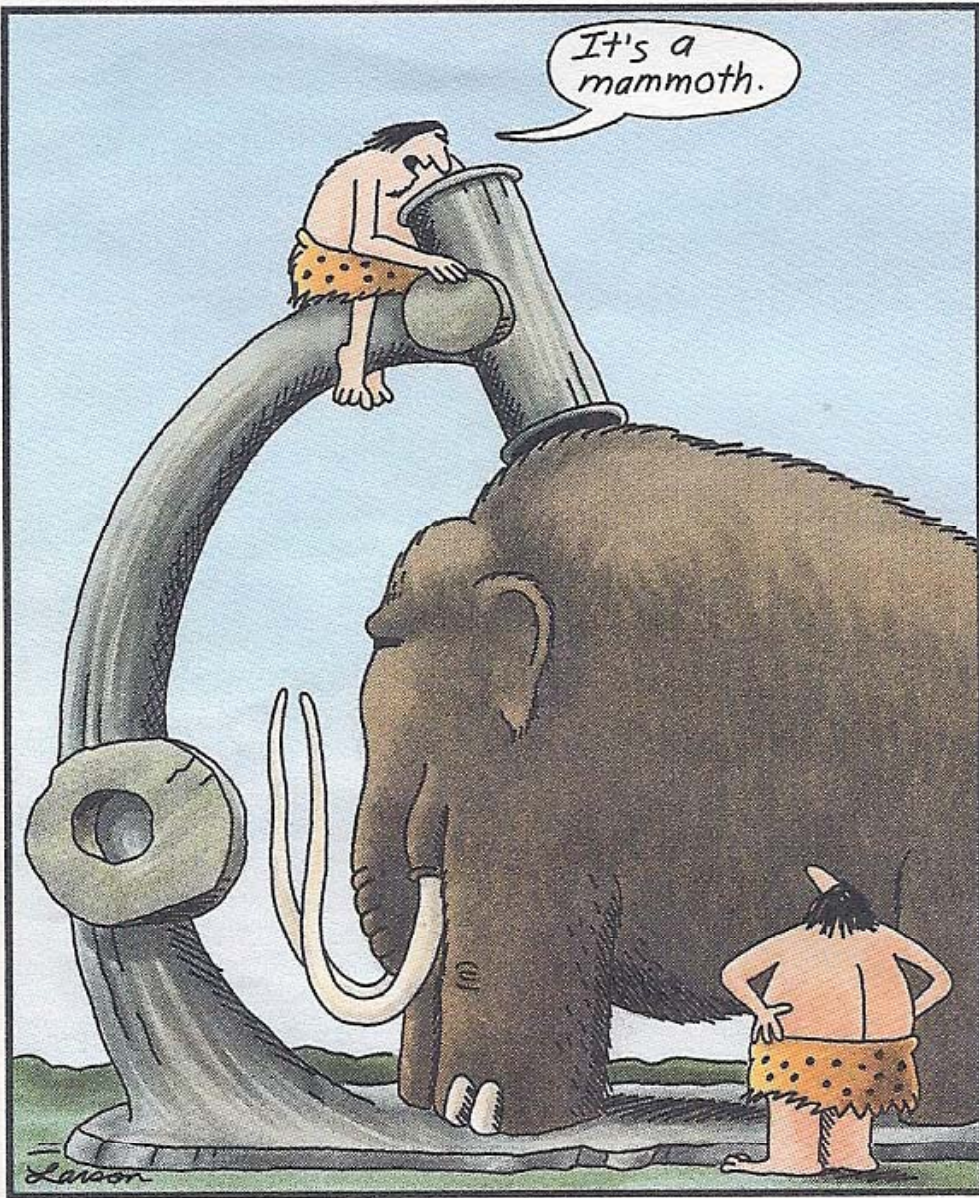   Mean rating at harvest = 3.0

$$\frac{[((\text{stand at thinning} * 0.85) - \text{stand at harvest}) * 7] + (\text{avg rating at harvest} * \text{stand at harvest})}{(\text{stand at thinning} * 0.85)}$$

$$\frac{[((105 * 0.85) - 35) * 7] + (3.0 * 35)}{(105 * 0.85)}$$ $$\frac{[(89 - 35) * 7] + (105)}{(89)}$$ $$\frac{(54 * 7) + (105)}{(89)}$$ 5.4

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- Ruppel, E.G., Schneider, C.L., Hecker, R.J., and Hogaboam, G.J. 1979. Creating epiphytotics of Rhizoctonia root rot and evaluating for resistance to Rhizoctonia solani in sugarbeet plots. Plant Dis. Rep. 63:518-522.

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