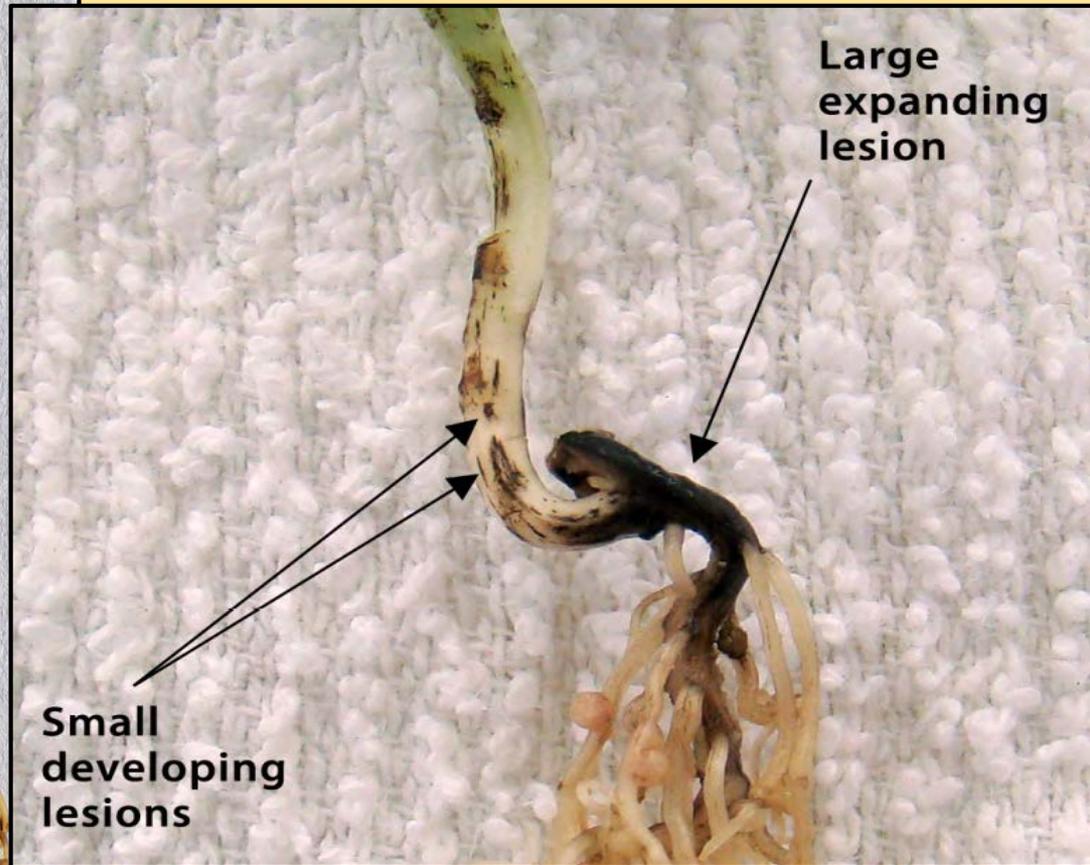


Diseases of seeds, seedlings and roots: Fusarium root rot



Photos:
Julie Pasche, NDSU (above)
Michael Wunsch, NDSU (left)



Fusarium

Symptoms:

- *When soil temperatures are high prior to emergence:*
Poor stand establishment due to seed decay and damping-off
- Root rot: lesions that are initially brick-red to brown and later necrotic
- Wilt: plants yellowing from the bottom up

Fusarium

Causal pathogens:

- *Fusarium* spp. (fungal pathogens)

Conditions that favor infection:

- Soil moisture: low to high
- Soil temperatures: high

Fusarium

Susceptibility:

- Field peas, lentils >> chickpeas
 - Chickpeas are not considered susceptible.
 - Lentils and field peas are highly susceptible.

Crop rotation:

- Effectiveness of crop rotation is limited by the pathogen's persistence in the soil and host range

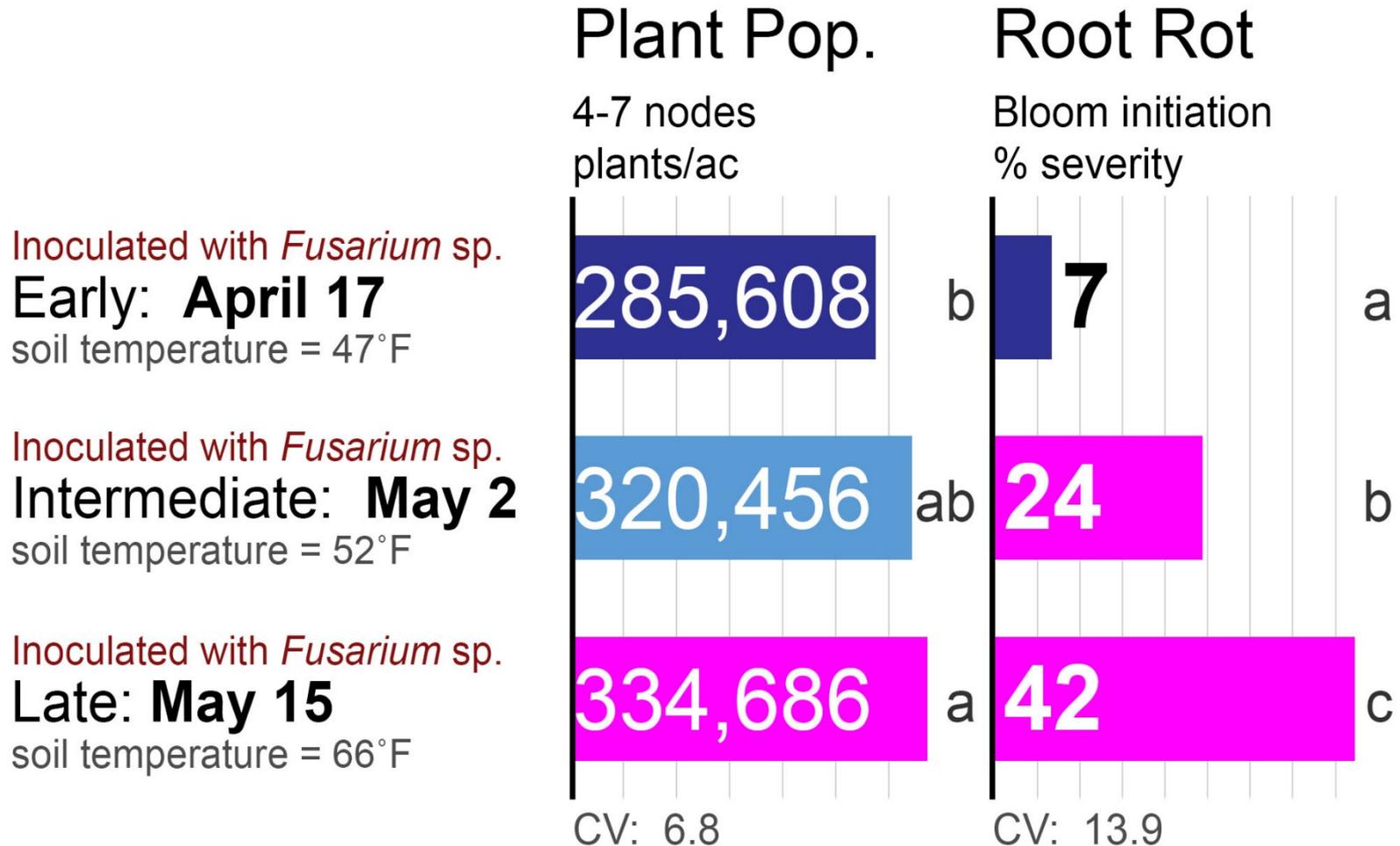
Fusarium

Seed treatments:

- Most seed treatments are effective against seed decay and damping off, not root rot.

Root rot develops during vegetative growth and bloom, when the concentration of fungicide active ingredients in the target tissues (tap root, epicotyl) is low.

Fusarium - Response to planting date



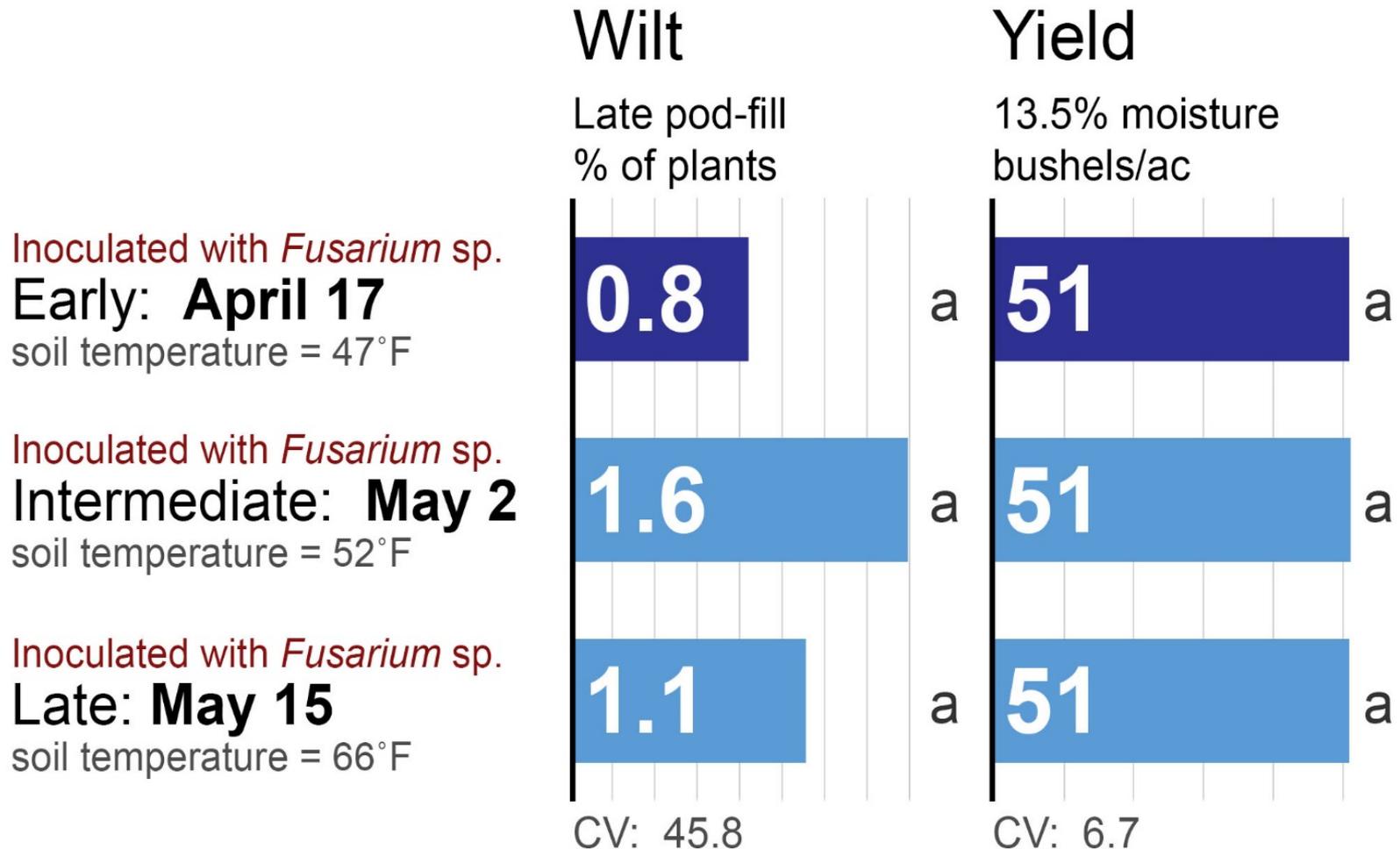
Variety: 'Abarth' (yellow-cotyledon type)

Seeding rate: 330,000 pure live seeds/ac **Direct-seeded** into wheat stubble

Seed treatment: Gaucho 1.6 fl oz/cwt + Evergol Energy 1.0 fl oz/ac +/- (with or without) fluopyram 0.05 mg ai/seed

Pathogen isolation: *Fusarium* sp. from **31%** of roots (early planting date), **26%** (intermediate), **26%** (late)
Aphanomyces sp. from **0%** of roots (early planting date), **0%** (intermediate), **0%** (late)

Fusarium - Response to planting date



Variety: 'Abarth' (yellow-cotyledon type)

Seeding rate: 330,000 pure live seeds/ac **Direct-seeded** into wheat stubble

Seed treatment: Gaucho 1.6 fl oz/cwt + Evergol Energy 1.0 fl oz/ac +/- (with or without) fluopyram 0.05 mg ai/seed

Pathogen isolation: *Fusarium* sp. from **35%** of roots (early planting date), **29%** (intermediate), **28%** (late)
Aphanomyces sp. from **0%** of roots (early planting date), **0%** (intermediate), **0%** (late)

Fusarium: efficacy of seed treatments

1. **Fludioxonil:** Maxim 4ST, Spirato 480ST, etc.
2. **Evergol Energy** (penflufen + prothioconazole)
3. **Vibrance Maxx** (fludioxonil + sedaxane)
4. **Obvius** (pyraclostrobin + fluxapyroxad)

Fusarium – Efficacy of seed treatments

Fludioxonil:

Maxim 4ST,
Spirato 480ST, etc.

NO PATHOGEN INOCULUM

Seed treatment: **metalaxyl or mefenoxam**

Inoculated with *Fusarium* sp.

Seed treatment: **metalaxyl or mefenoxam**

Inoculated with *Fusarium* sp.

Seed treatment: **metalaxyl or mefenoxam**
+ fludioxonil, 1.14 g ai/cwt

Plant population

Field Peas

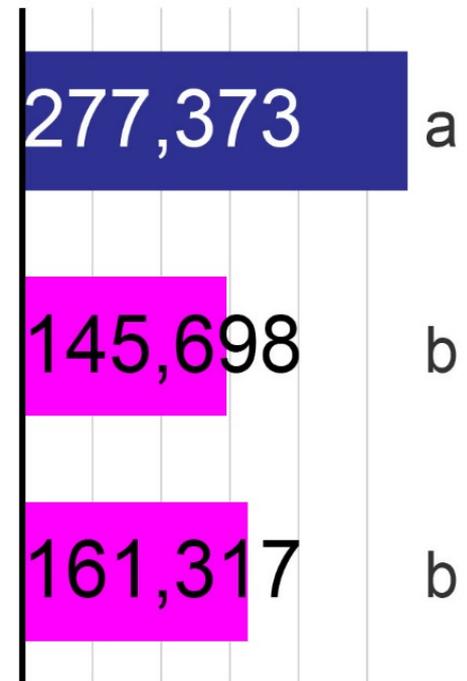
Six field trials
plants/ac



CV: 15.97

Lentils

Two field trials
plants/ac



CV: 3.2

Fusarium – Efficacy of seed treatments

Fludioxonil:

Maxim 4ST,
Spirato 480ST, etc.

NO PATHOGEN INOCULUM

Seed treatment: **metalaxyl or mefenoxam**

Inoculated with *Fusarium sp.*

Seed treatment: **metalaxyl or mefenoxam**

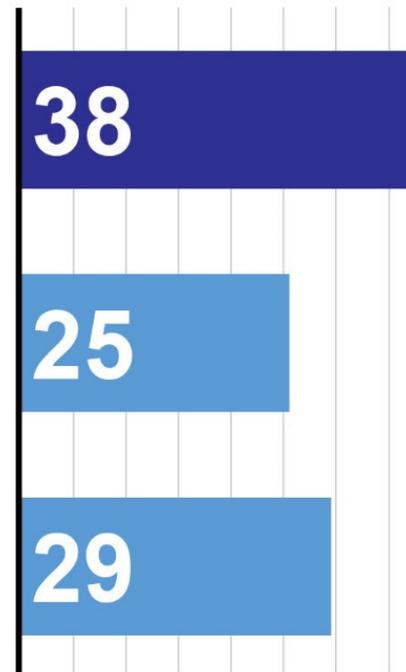
Inoculated with *Fusarium sp.*

Seed treatment: **metalaxyl or mefenoxam
+ fludioxonil, 1.14 g ai/cwt**

Yield

Field Peas

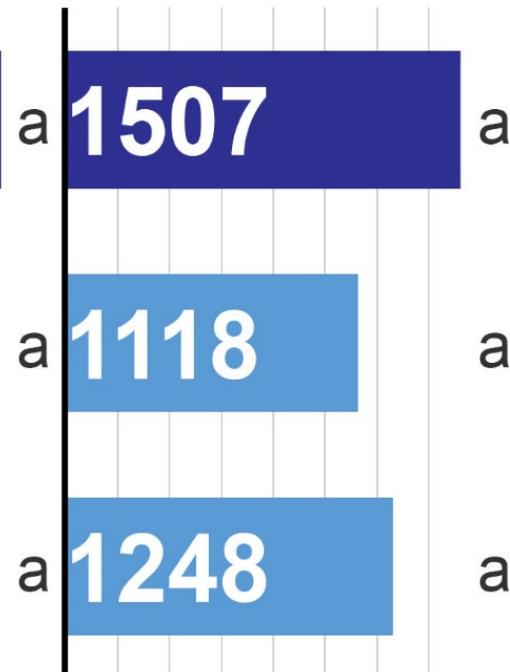
Six field trials
bushels/ac



CV: 26.3

Lentils

Two field trials
pounds/ac



CV: 9.9

Fusarium – Efficacy of seed treatments

Fludioxonil:

Maxim 4ST,
Spirato 480ST, etc.

NO PATHOGEN INOCULUM

Seed treatment: **metalaxyl or mefenoxam**

Inoculated with *Fusarium* sp.

Seed treatment: **metalaxyl or mefenoxam**

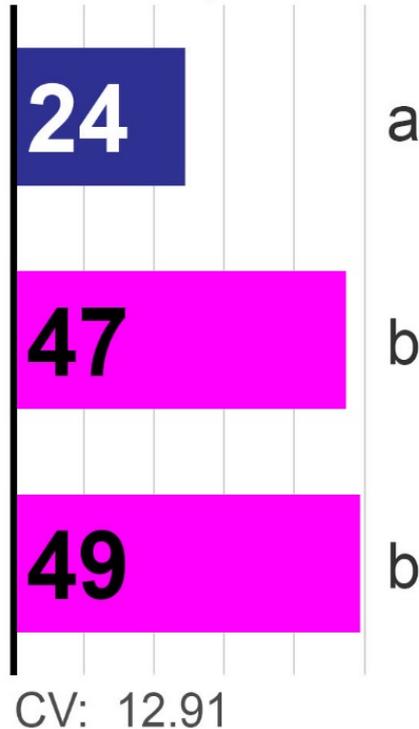
Inoculated with *Fusarium* sp.

Seed treatment: **metalaxyl or mefenoxam
+ fludioxonil, 1.14 g ai/cwt**

Root Rot

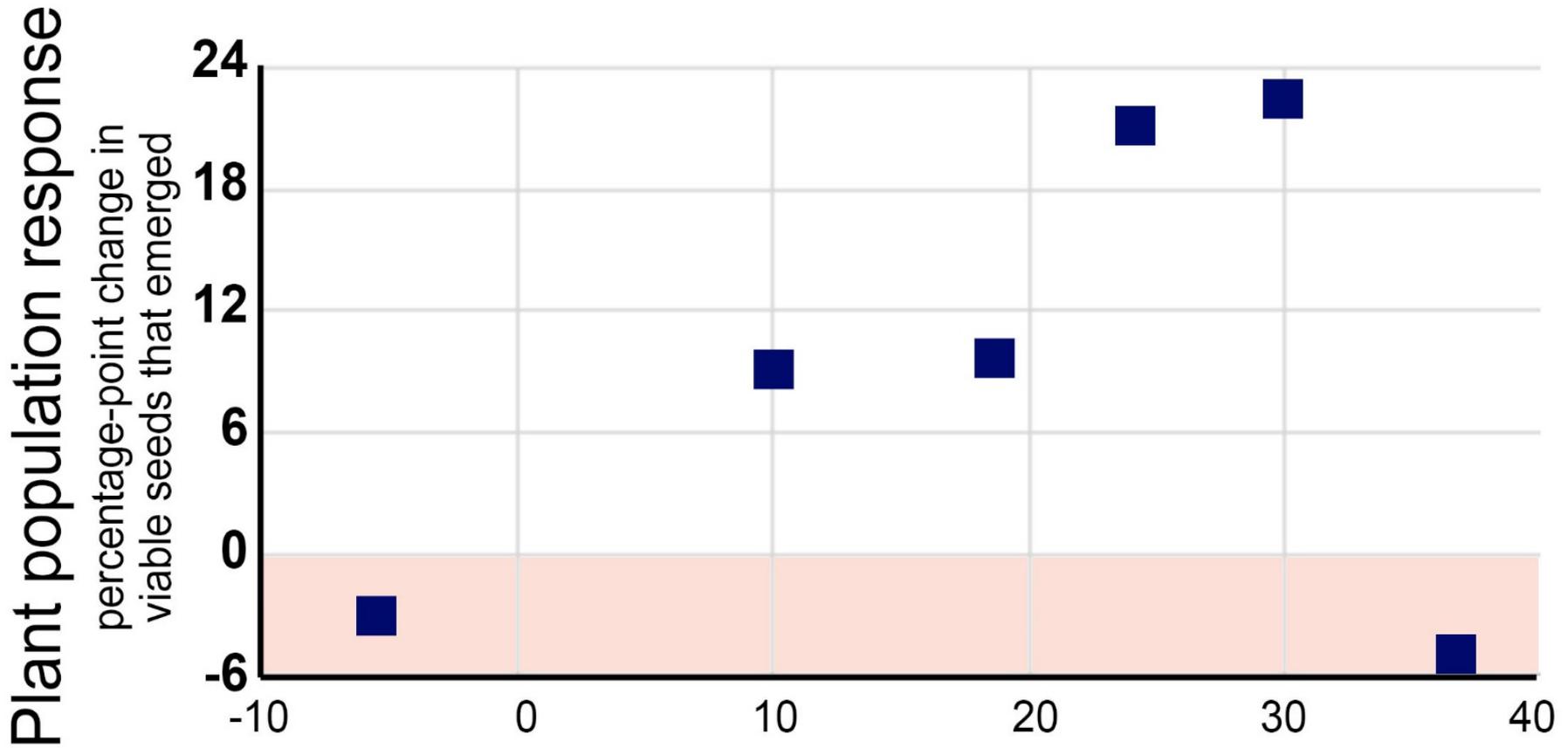
Field Peas

Six field trials
% severity



Response to seed treatment (field peas):

Fludioxonil, 1.14 g ai/cwt (Maxim 4ST, Spirato 480ST, etc.)



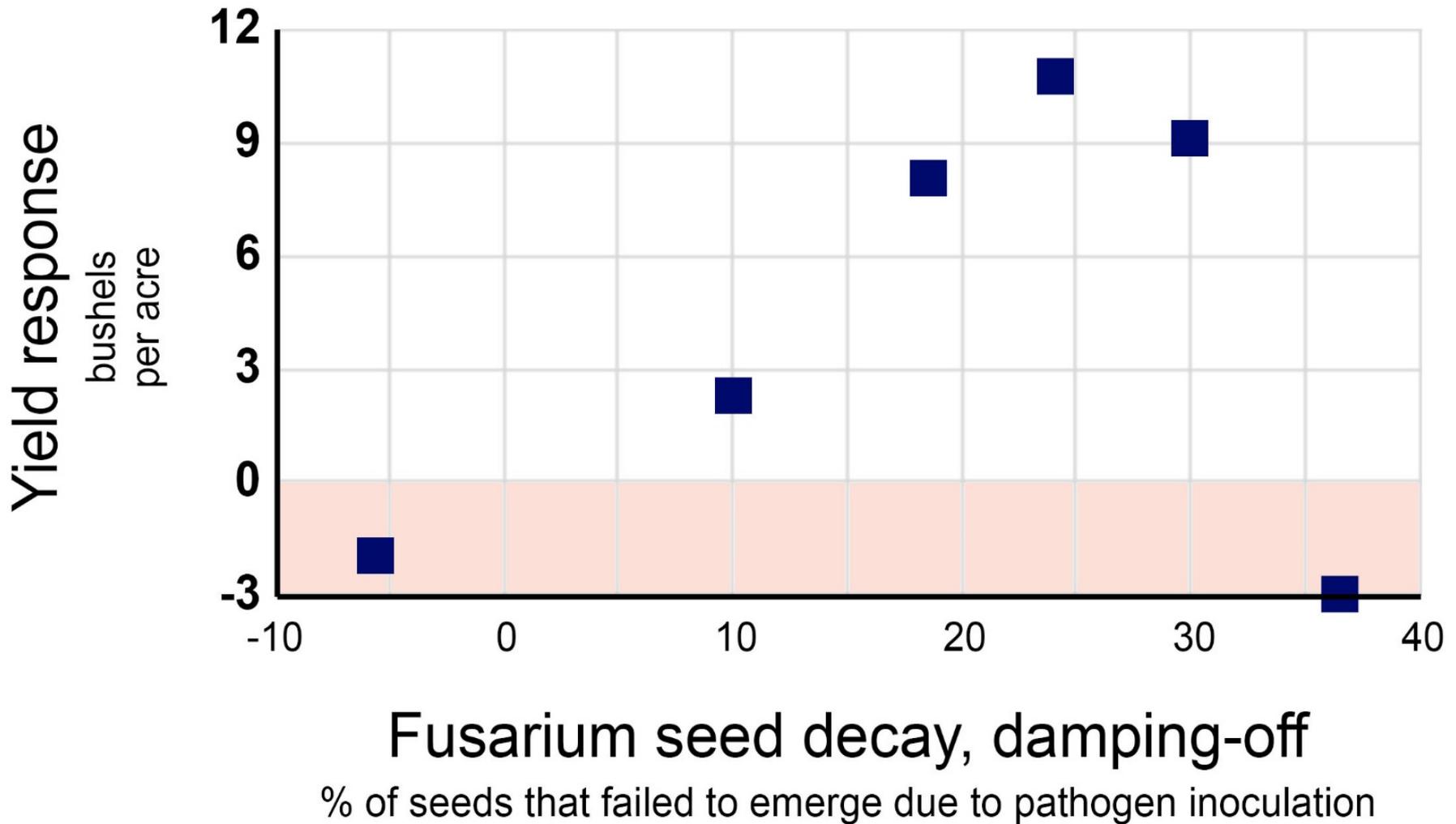
Fusarium seed decay, damping-off

% of seeds that failed to emerge due to pathogen inoculation

■ INDIVIDUAL FIELD TRIAL; Carrington or Oakes, ND

Response to seed treatment (field peas):

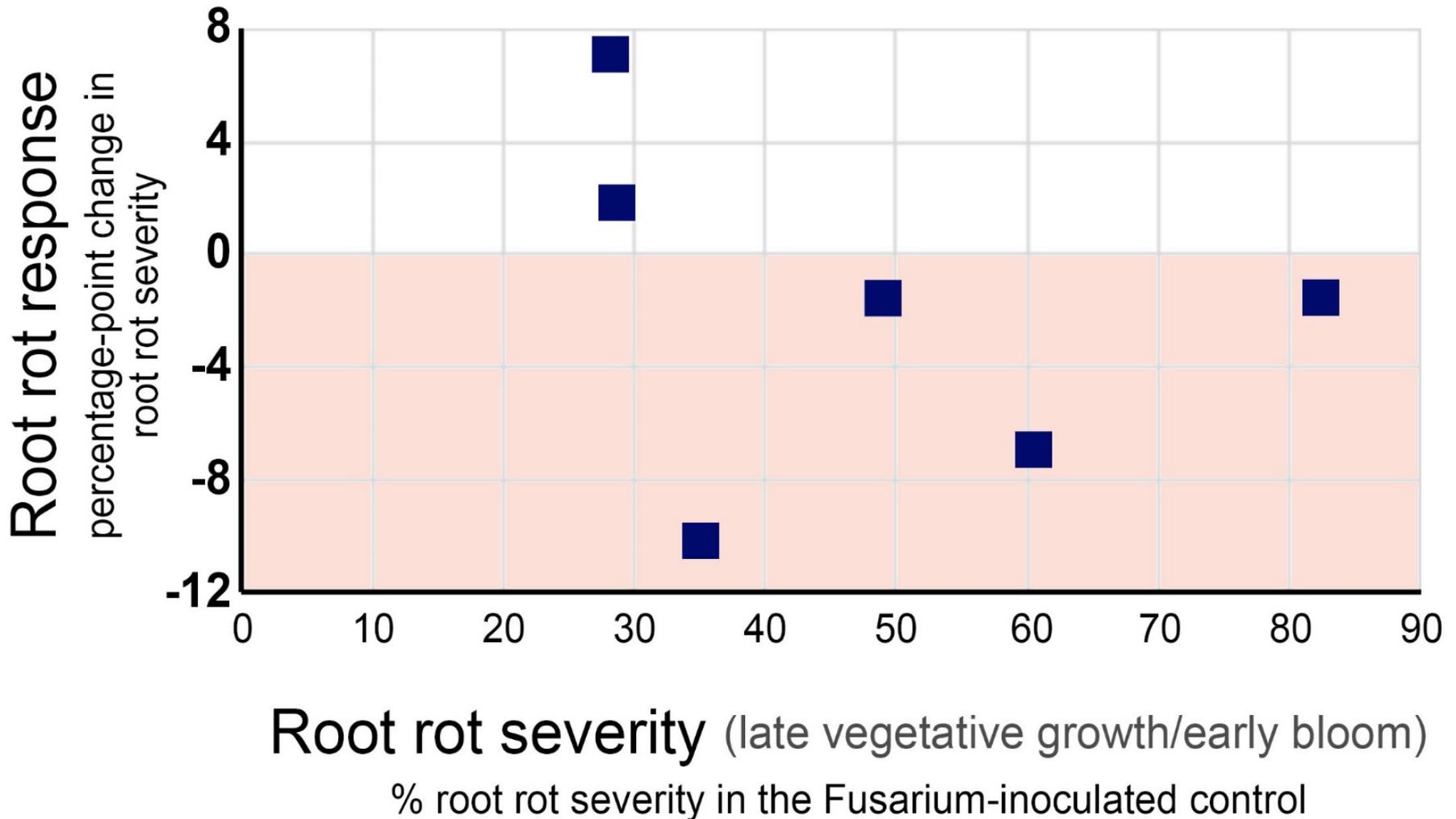
Fludioxonil, 1.14 g ai/cwt (Maxim 4ST, Spirato 480ST, etc.)



■ INDIVIDUAL FIELD TRIAL; Carrington or Oakes, ND

Response to seed treatment (field peas):

Fludioxonil, 1.14 g ai/cwt (Maxim 4ST, Spirato 480ST, etc.)



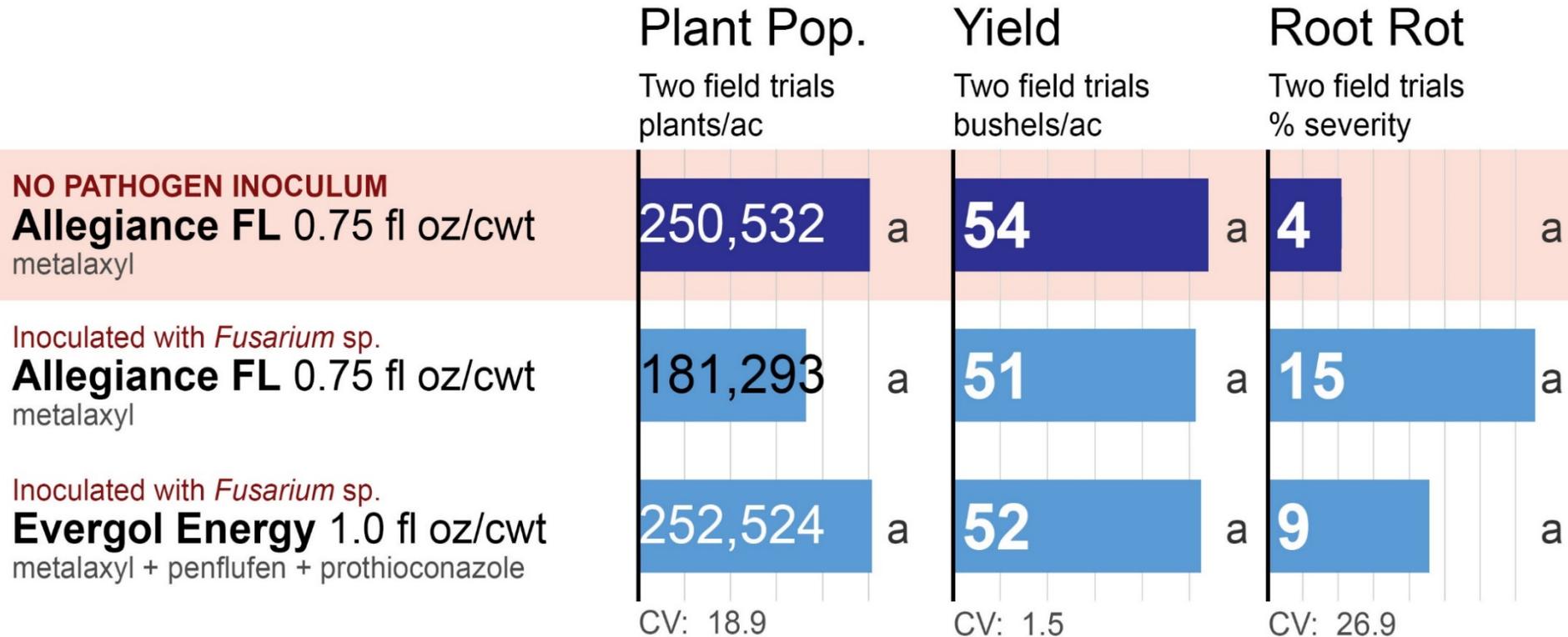
■ INDIVIDUAL FIELD TRIAL; Carrington or Oakes, ND

Fusarium: efficacy of seed treatments

Evergol Energy, 1.0 fl oz/cwt

Metalaxyl, 1.80 g ai/cwt + Penflufen, 1.14 g ai/cwt + Prothioconazole, 2.26 g ai/cwt

Field Peas

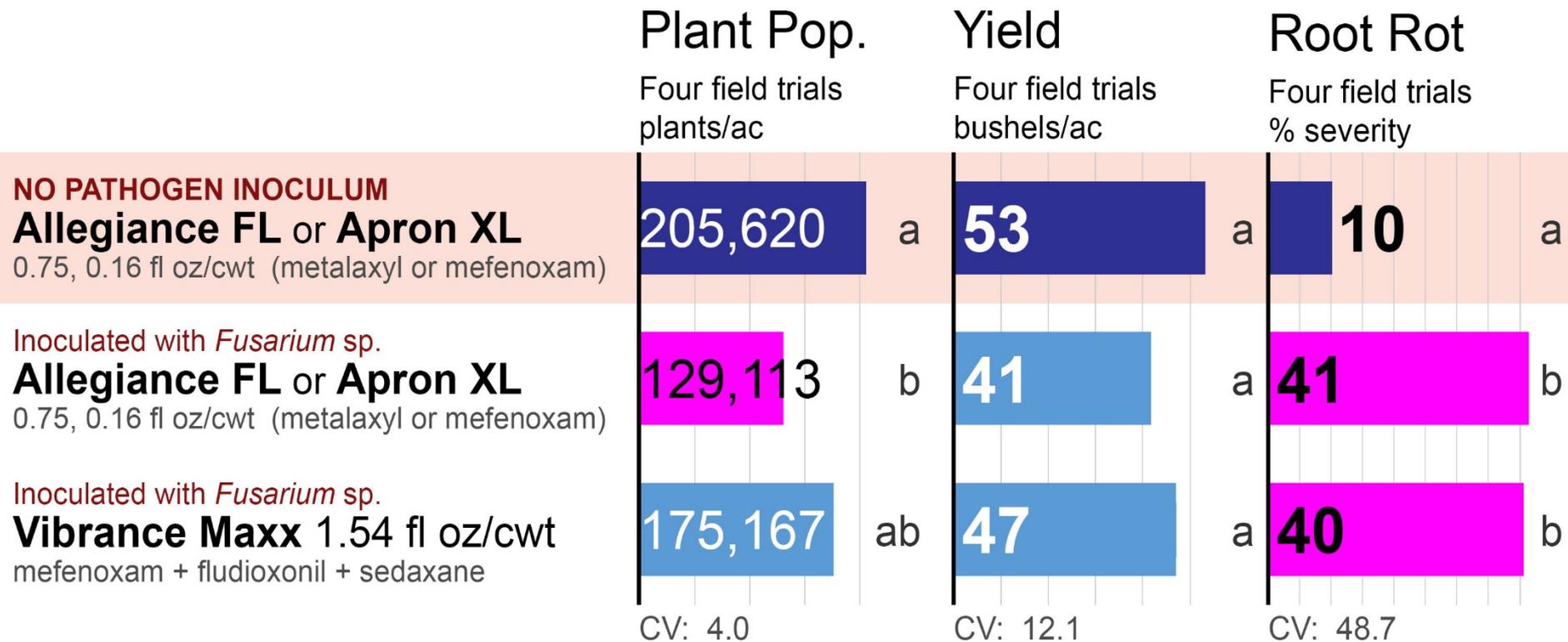


Fusarium: efficacy of seed treatments

Vibrance Maxx, 1.54 fl oz/cwt

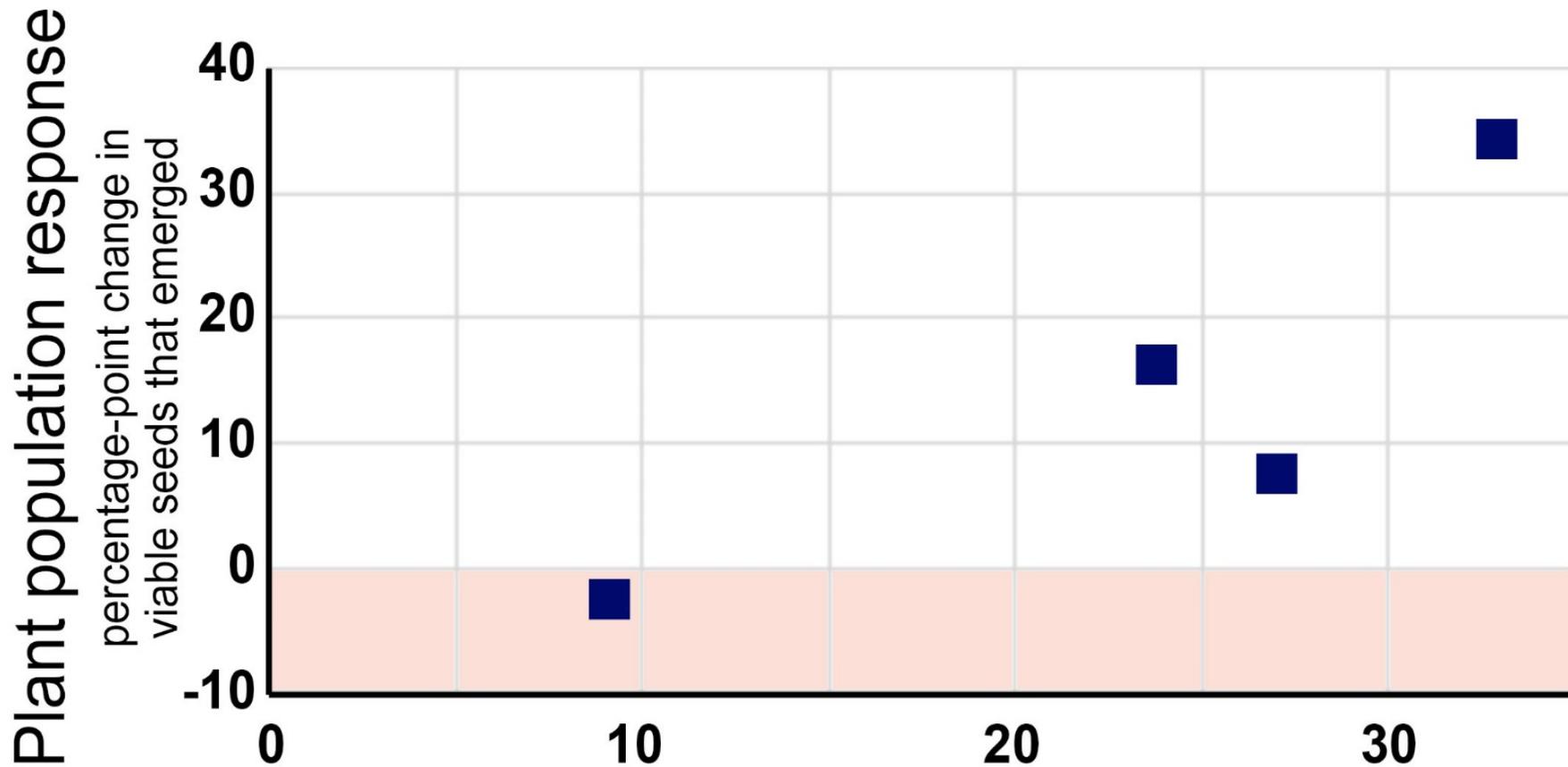
Mefenoxam, 1.69 g ai/cwt + Fludioxonil, 1.14 g ai/cwt + Sedaxane, 2.29 g ai/cwt

Field Peas



Response to seed treatment (field peas):

Vibrance Maxx, 1.54 fl oz/cwt



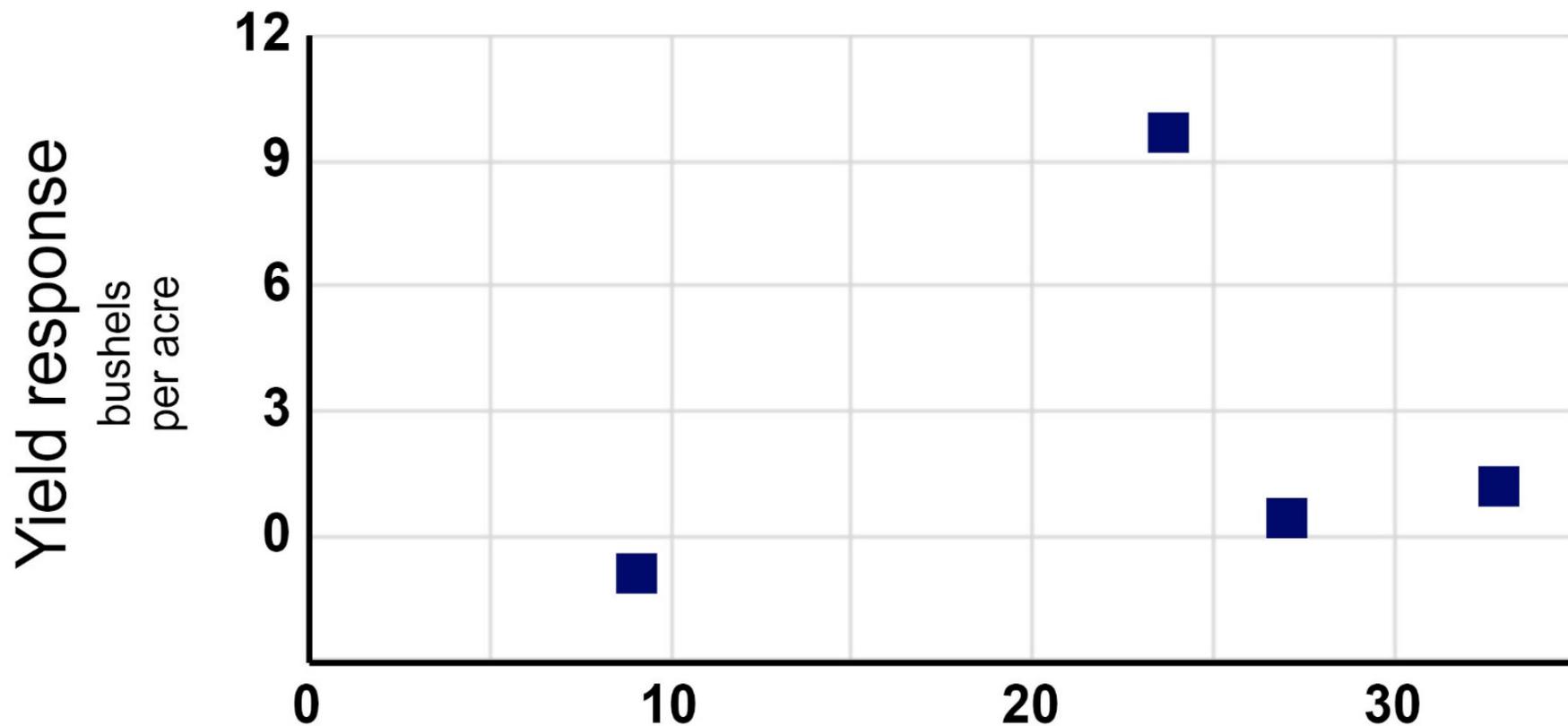
Fusarium seed decay, damping-off

% of seeds that failed to emerge due to pathogen inoculation

■ INDIVIDUAL FIELD TRIAL; Carrington or Oakes, ND

Response to seed treatment (field peas):

Vibrance Maxx, 1.54 fl oz/cwt



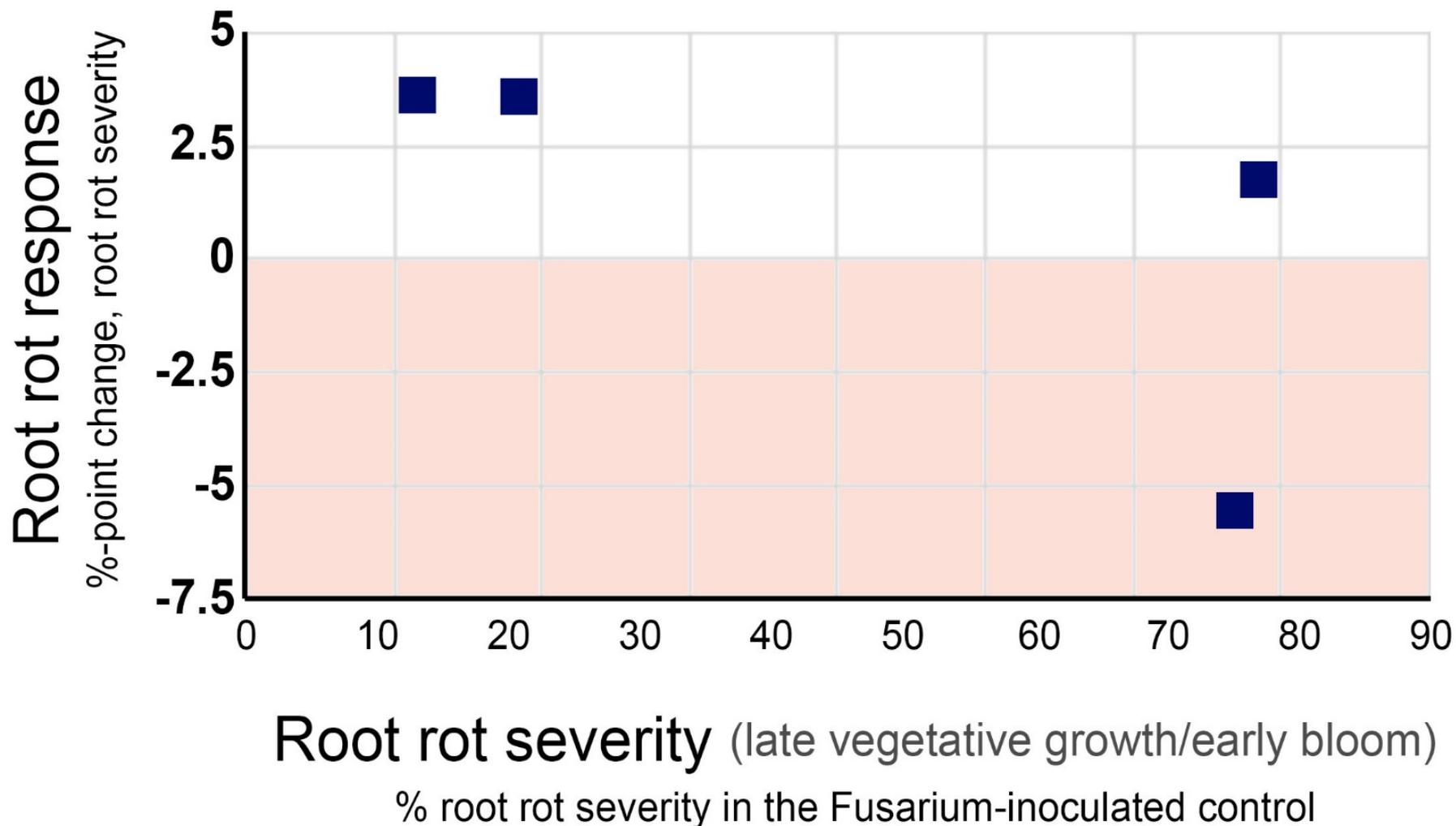
Fusarium seed decay, damping-off

% of seeds that failed to emerge due to pathogen inoculation

■ INDIVIDUAL FIELD TRIAL; Carrington or Oakes, ND

Response to seed treatment (field peas):

Vibrance Maxx, 1.54 fl oz/cwt



■ INDIVIDUAL FIELD TRIAL; Carrington or Oakes, ND

Fusarium – Efficacy of seed treatments

Obvius, 4.6 fl oz/cwt

Metalaxyl, 1.82 g ai/cwt +
Pyraclostrobin, 2.28 g ai/cwt +
Fluxapyroxad, 2.28 g ai/cwt

NO PATHOGEN INOCULUM

Allegiance 0.19 or 0.75 fl oz/cwt
metalaxyl

Inoculated with *Fusarium* sp.

Allegiance 0.19 or 0.75 fl oz/cwt
metalaxyl

Inoculated with *Fusarium* sp.

Obvius 4.6 fl oz/cwt
metalaxyl + pyraclostrobin + fluxapyroxad

Plant population

Field Peas

Three field trials
plants/ac

291,686

a

212,753

a

281,204

a

CV: 12.9

Lentils

One field trial
plants/ac

314,877

a

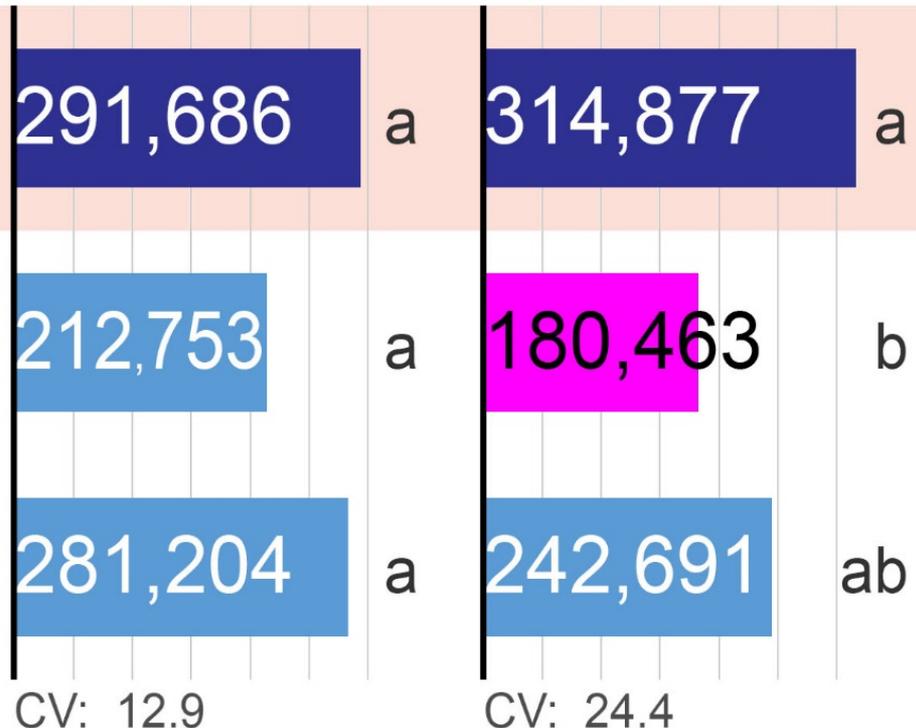
180,463

b

242,691

ab

CV: 24.4



Fusarium – Efficacy of seed treatments

Obvius, 4.6 fl oz/cwt

Metalaxyl, 1.82 g ai/cwt +
Pyraclostrobin, 2.28 g ai/cwt +
Fluxapyroxad, 2.28 g ai/cwt

NO PATHOGEN INOCULUM

Allegiance 0.19 or 0.75 fl oz/cwt
metalaxyl

Inoculated with *Fusarium* sp.

Allegiance 0.19 or 0.75 fl oz/cwt
metalaxyl

Inoculated with *Fusarium* sp.

Obvius 4.6 fl oz/cwt
metalaxyl + pyraclostrobin + fluxapyroxad

Yield

Field Peas

Three field trials
bushels/ac

47

44

49

CV: 4.0

Lentils

One field trial
pounds/ac

1746

1204

1863

CV: 19.6

a

a

a

a

a

a

Fusarium – Efficacy of seed treatments

Obvius, 4.6 fl oz/cwt

Metalaxyl, 1.82 g ai/cwt +
Pyraclostrobin, 2.28 g ai/cwt +
Fluxapyroxad, 2.28 g ai/cwt

NO PATHOGEN INOCULUM

Allegiance 0.19 or 0.75 fl oz/cwt
metalaxyl

Inoculated with *Fusarium* sp.

Allegiance 0.19 or 0.75 fl oz/cwt
metalaxyl

Inoculated with *Fusarium* sp.

Obvius 4.6 fl oz/cwt
metalaxyl + pyraclostrobin + fluxapyroxad

Root Rot

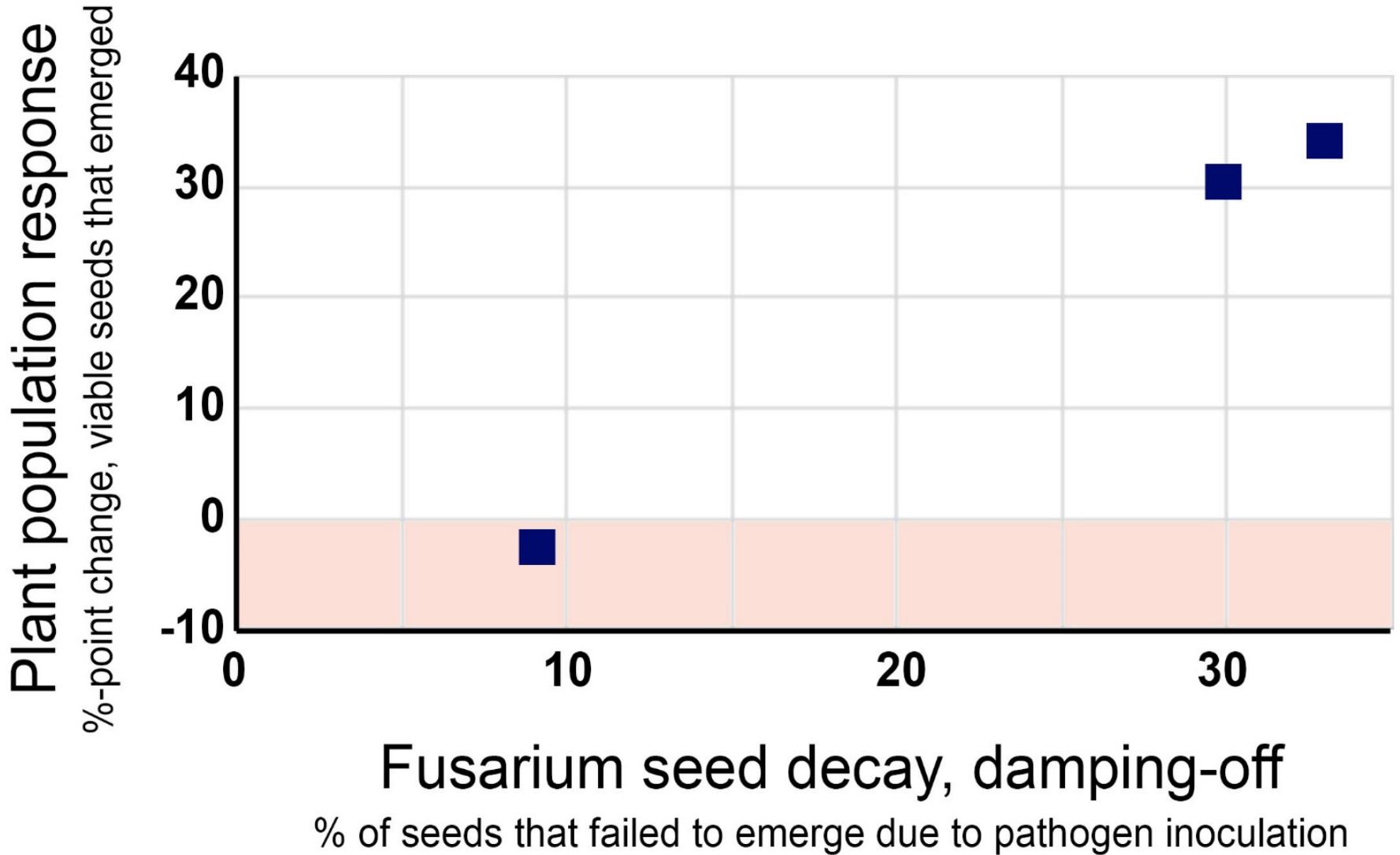
Field Peas

Three field trials
% severity



Response to seed treatment (field peas):

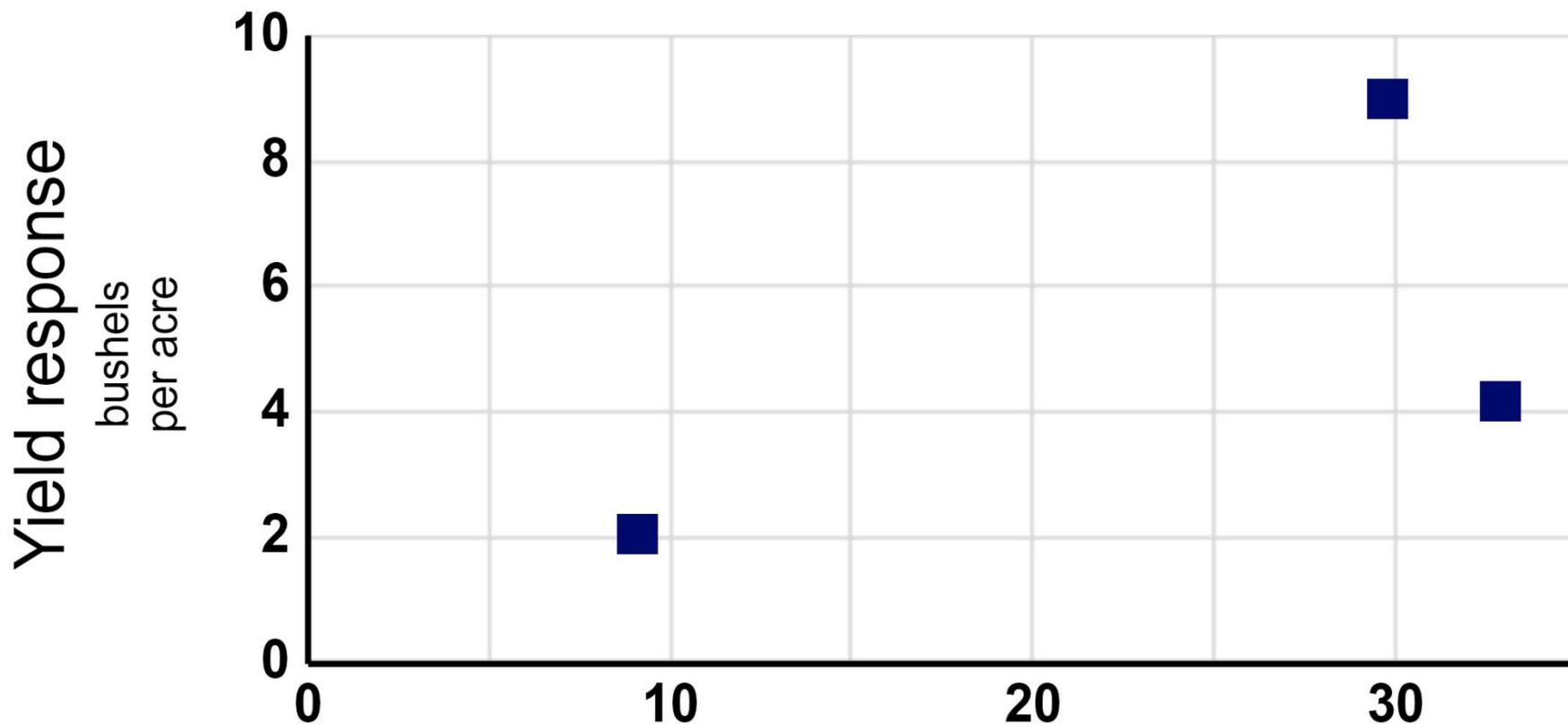
Obvius, 4.6 fl oz/cwt



■ INDIVIDUAL FIELD TRIAL; Carrington, ND

Response to seed treatment (field peas):

Obvius, 4.6 fl oz/cwt



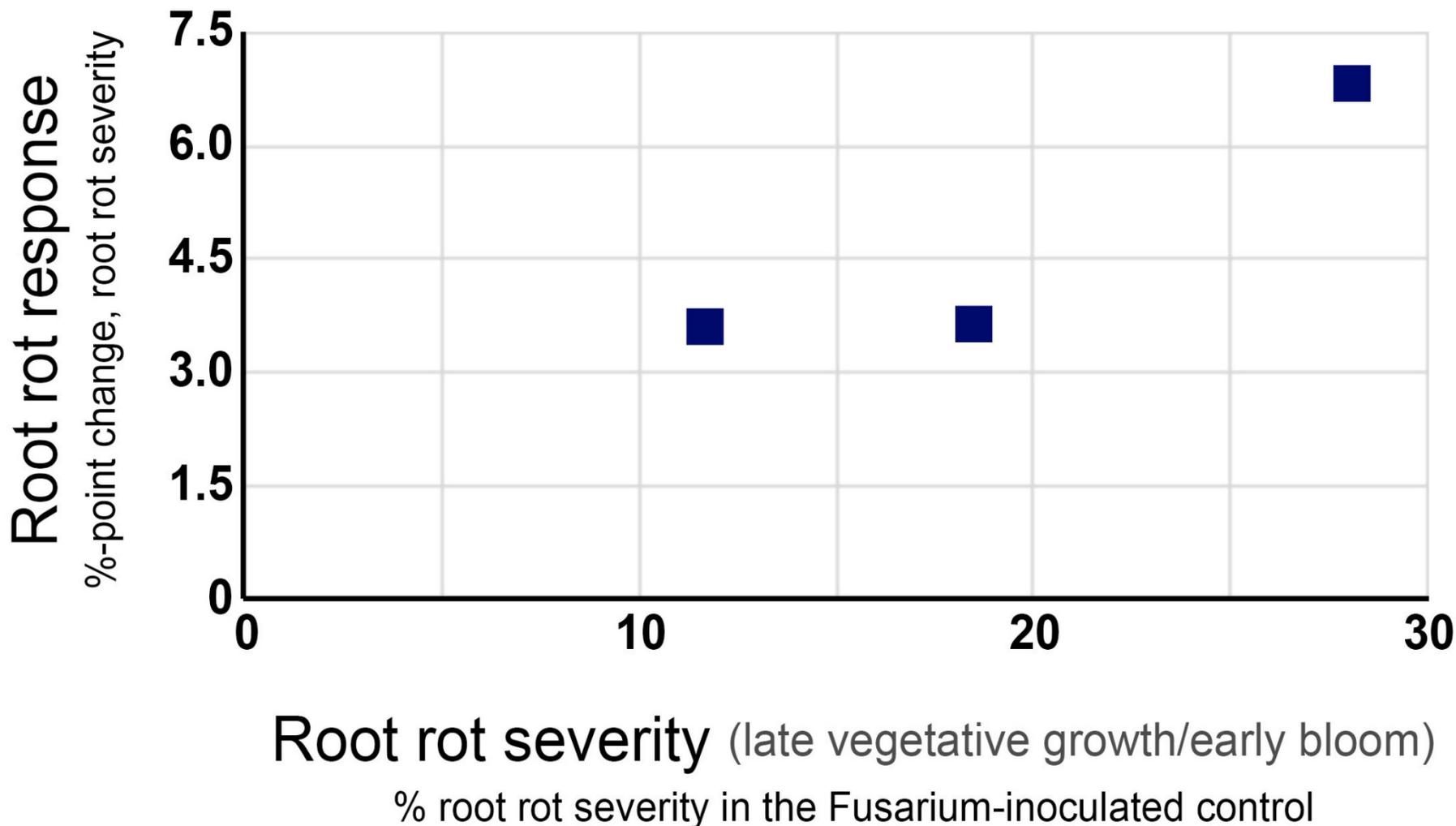
Fusarium seed decay, damping-off

% of seeds that failed to emerge due to pathogen inoculation

■ INDIVIDUAL FIELD TRIAL; Carrington, ND

Response to seed treatment (field peas):

Obvius, 4.6 fl oz/cwt



■ INDIVIDUAL FIELD TRIAL; Carrington, ND