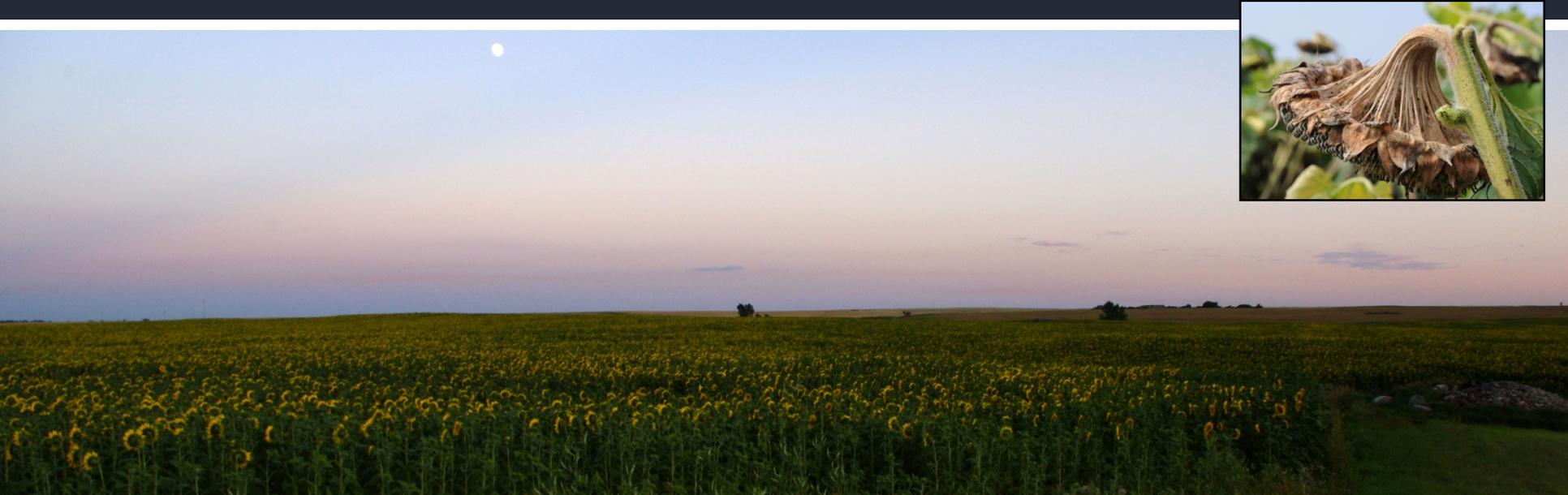


Susceptibility of sunflowers to *Sclerotinia* head rot relative to sunflower growth stage



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Susceptibility of sunflowers to head rot relative to growth stage:

IMPORTANCE OF UNDERSTANDING GROWTH STAGE-DEPENDENT DIFFERENCES IN SUSCEPTIBILITY TO HEAD ROT

Knowing when sunflowers are susceptible to head rot is critical for

- (1) Designing effective screening procedures for assessing the relative susceptibility of hybrids to head rot: Ensure that all hybrids are exposed to the same level of disease pressure irrespective of maturity/bloom date differences.
- (2) Rigorously assessing the potential use of fungicides for managing head rot by identifying what growth stages need to be protected and when a fungicide would likely need to be applied.

Susceptibility of sunflowers to head rot relative to growth stage:

HOW DOES SUSCEPTIBILITY TO HEAD ROT CHANGE AS SUNFLOWERS PROGRESS FROM R5 to R6 to R7 to R8 GROWTH STAGES?

Are sunflowers susceptible to infections through the back of the head at R7?

PLOTS: Minimum 21 to 29 feet of row per plot

DESIGN: Completely randomized block with a split-split-plot arrangement and minimum 4 replicates

Main factor = susceptible vs. partially resistant hybrid;

Sub-factor = bagged or unbagged heads (paper bags kept continually wet for 24 hours);

Sub-sub-factor = growth stage at which head was inoculated

2013: 6 to 16 replicates

2012: 6 to 7 replicates

2011: 4 to 6 replicates

INOCULATION: every head was inoculated twice at the target growth stage, usually on 2 subsequent days

- 15,000 ascospores of *S. sclerotiorum* applied to the front and back of heads on each of two different days (30,000 spores total to the front of head + 30,000 spores total to the back of head)
- Delivered with hand-held spray bottle calibrated to deliver 5,000 ascospores per squirt

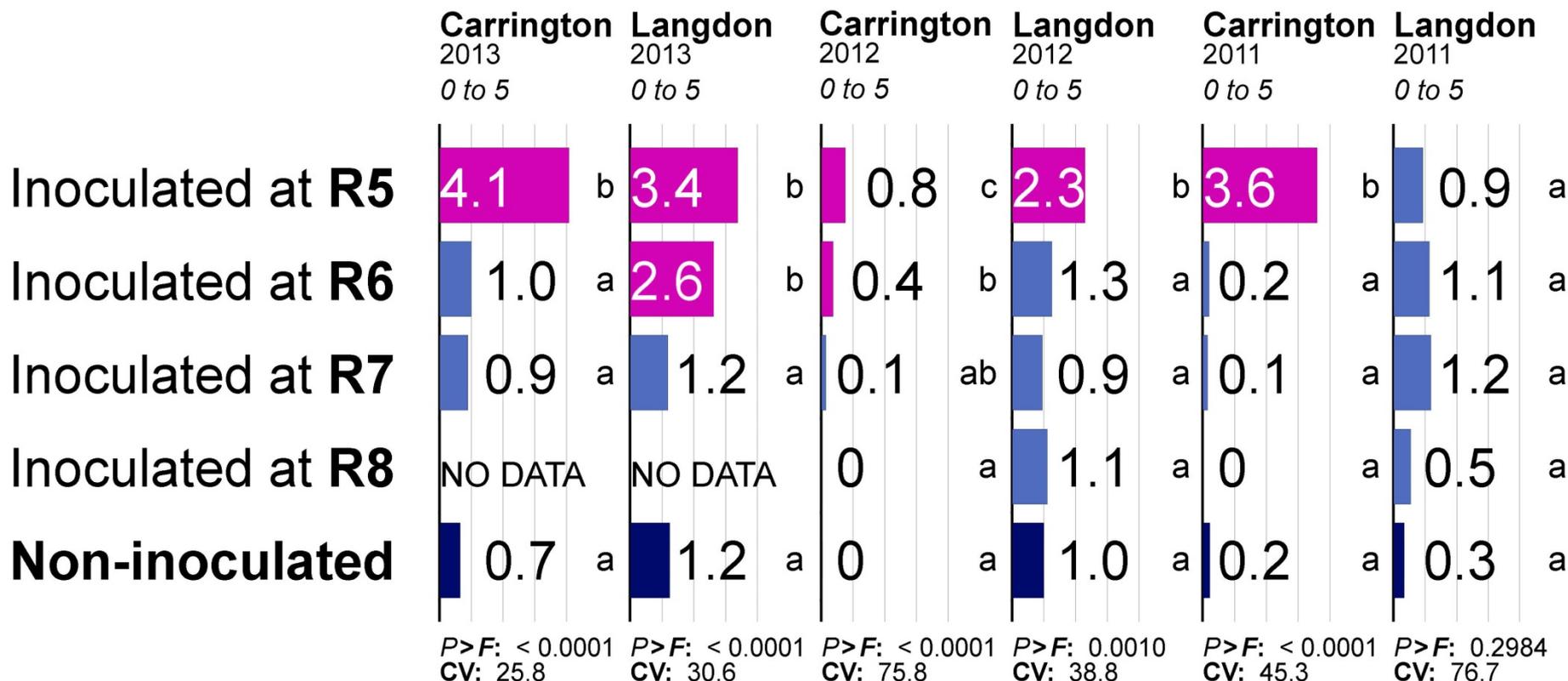
Susceptibility of sunflowers to head rot relative to growth stage:

SUSCEPTIBLE HYBRID, Carrington & Langdon, ND (2011-2013), sunflowers inoculated to front & back of heads:

Susceptibility to head rot dropped sharply at the R6 growth stage.

Sunflowers were not susceptible to head rot at the R7 growth stage

SUSCEPTIBLE HYBRID 2012, 2013: Croplan '305 DMR NS' **2011:** Mycogen '8H288 CL DM'
Sclerotinia head rot severity (0 to 5) was assessed at physiological maturity.



RESISTANT HYBRID, Carrington and Langdon, ND (2011-2013), sunflowers inoculated to front & back of heads:

Keeping the heads continually wet for 24 hours after inoculation by bagging heads did not increase susceptibility to head rot after bloom.

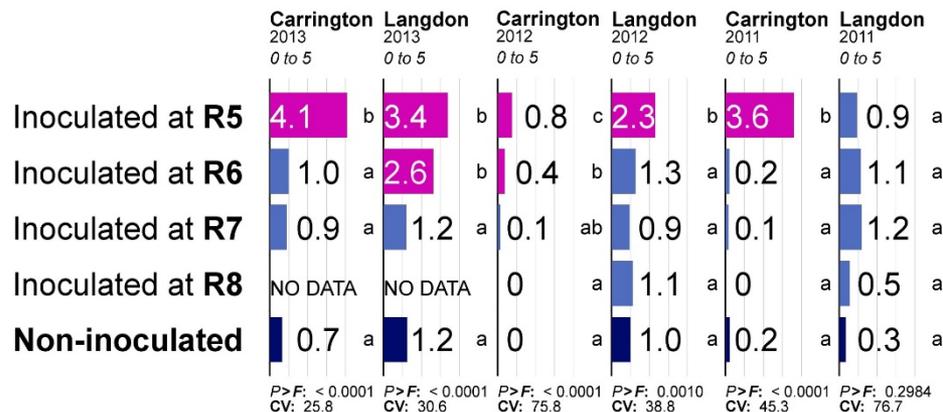
METHODS

HEADS BAGGED TO CREATE CONDITIONS HIGHLY FAVORABLE FOR HEAD ROT:

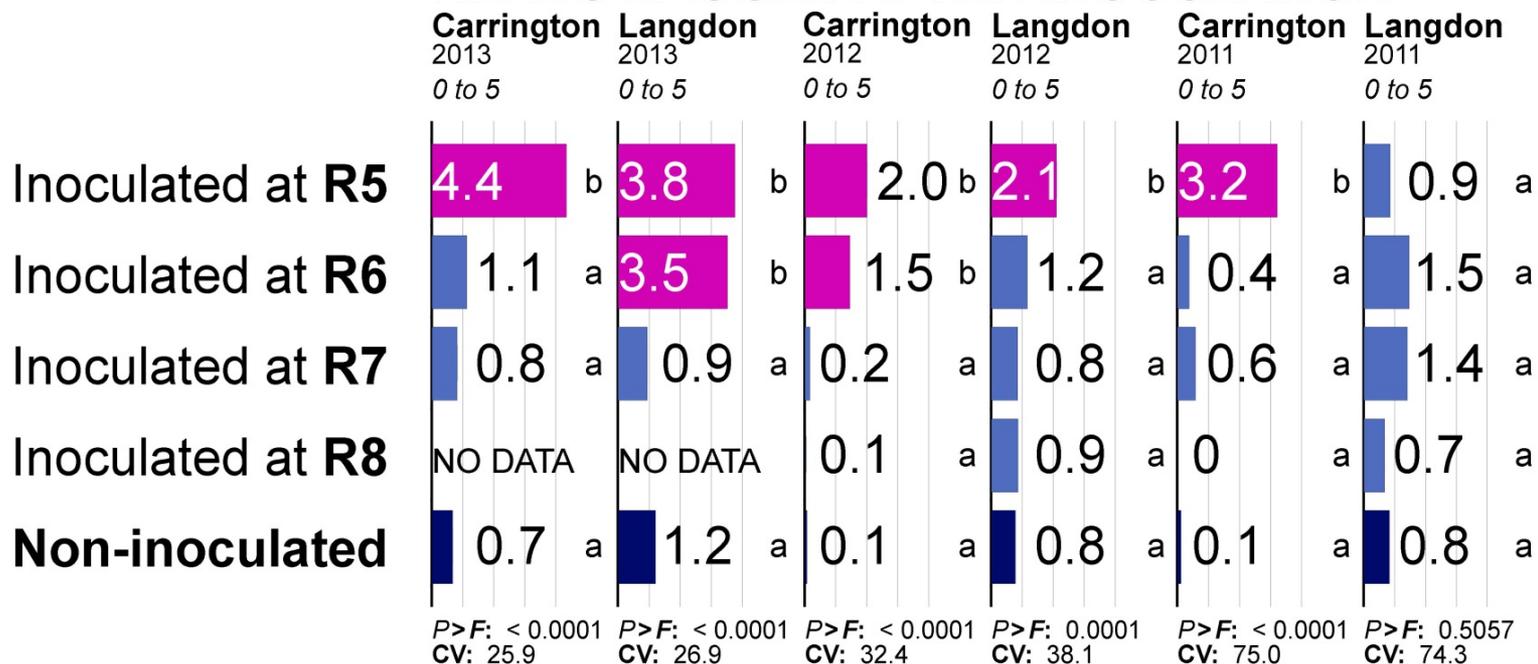
Paper bags placed over heads immediately after inoculation; supplemental overhead irrigation applied as needed to keep bags continually wet for 24 hours after inoculation

UNBAGGED HEADS: Supplemental irrigation applied at the same frequency as in the bagged-heads treatments but the absence of bags permitted limited intermittent drying of heads in the 24-hour period following pathogen inoculation.

HEADS NOT BAGGED AFTER INOCULATION:



HEADS BAGGED AFTER INOCULATION



Susceptibility of sunflowers to head rot relative to growth stage:

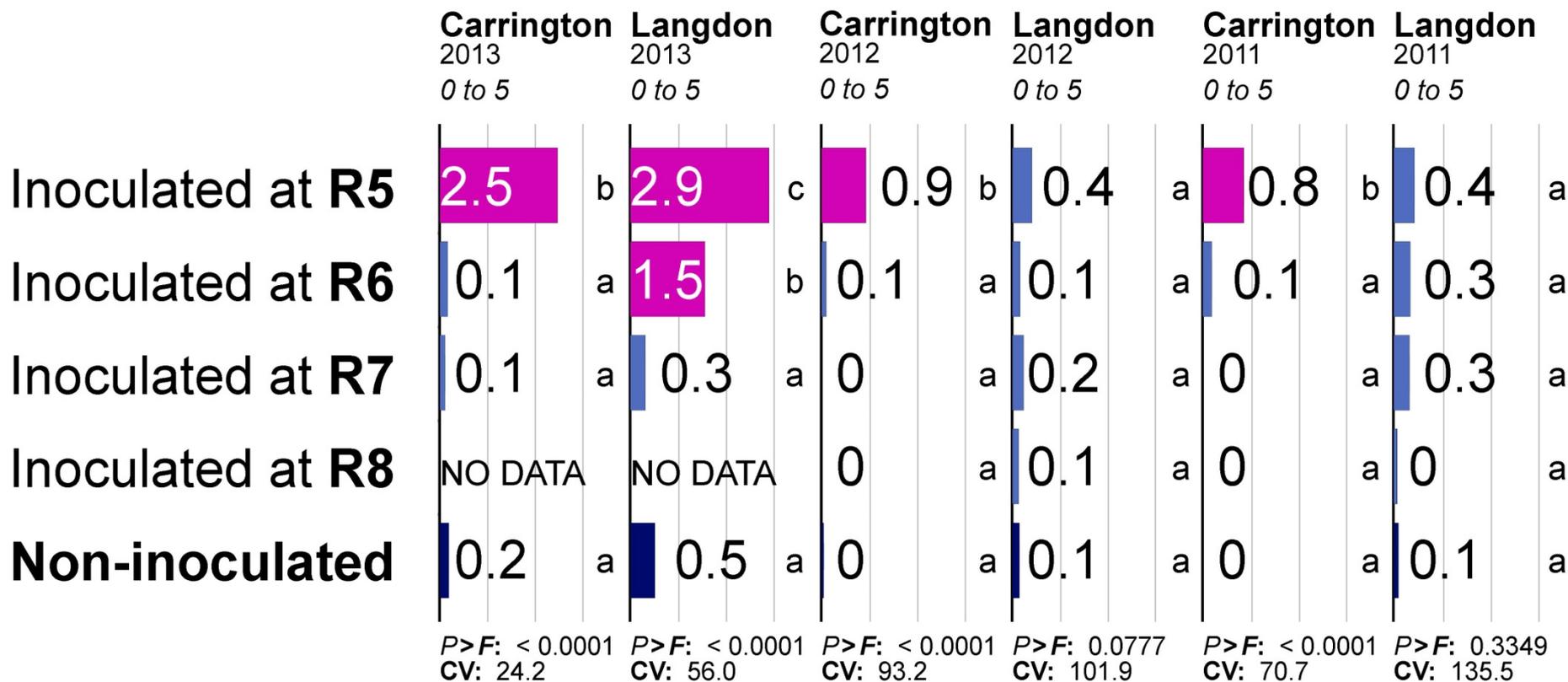
RESISTANT HYBRID, Carrington & Langdon, ND (2011-2013), sunflowers inoculated to front & back of heads:

Susceptibility to head rot dropped sharply at the R6 growth stage.

Sunflowers were not susceptible to head rot at the R7 growth stage

RESISTANT HYBRID 2012, 2013: Croplan '343 DMR HO' 2011: ProSeed 'E8'

Sclerotinia head rot severity (0 to 5) was assessed at physiological maturity.



SUSCEPTIBLE HYBRID, Carrington and Langdon, ND (2011-2013), sunflowers inoculated to front & back of heads:

Keeping the heads continually wet for 24 hours after inoculation by bagging heads did not increase susceptibility to head rot after bloom.

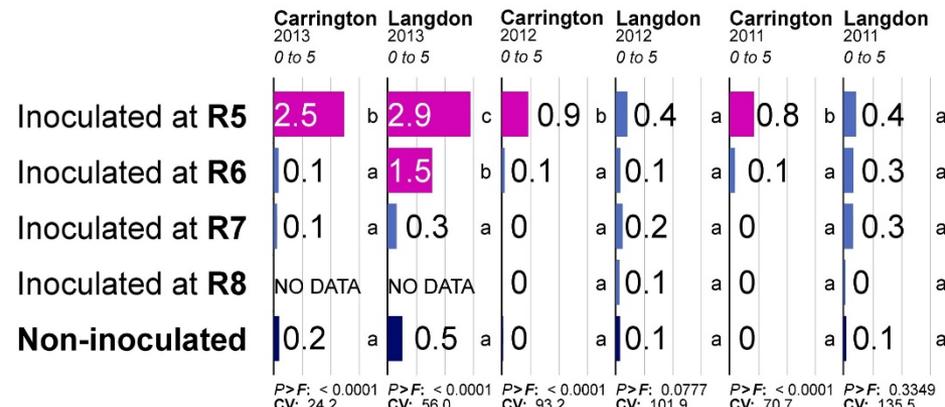
METHODS

HEADS BAGGED TO CREATE CONDITIONS HIGHLY FAVORABLE FOR HEAD ROT:

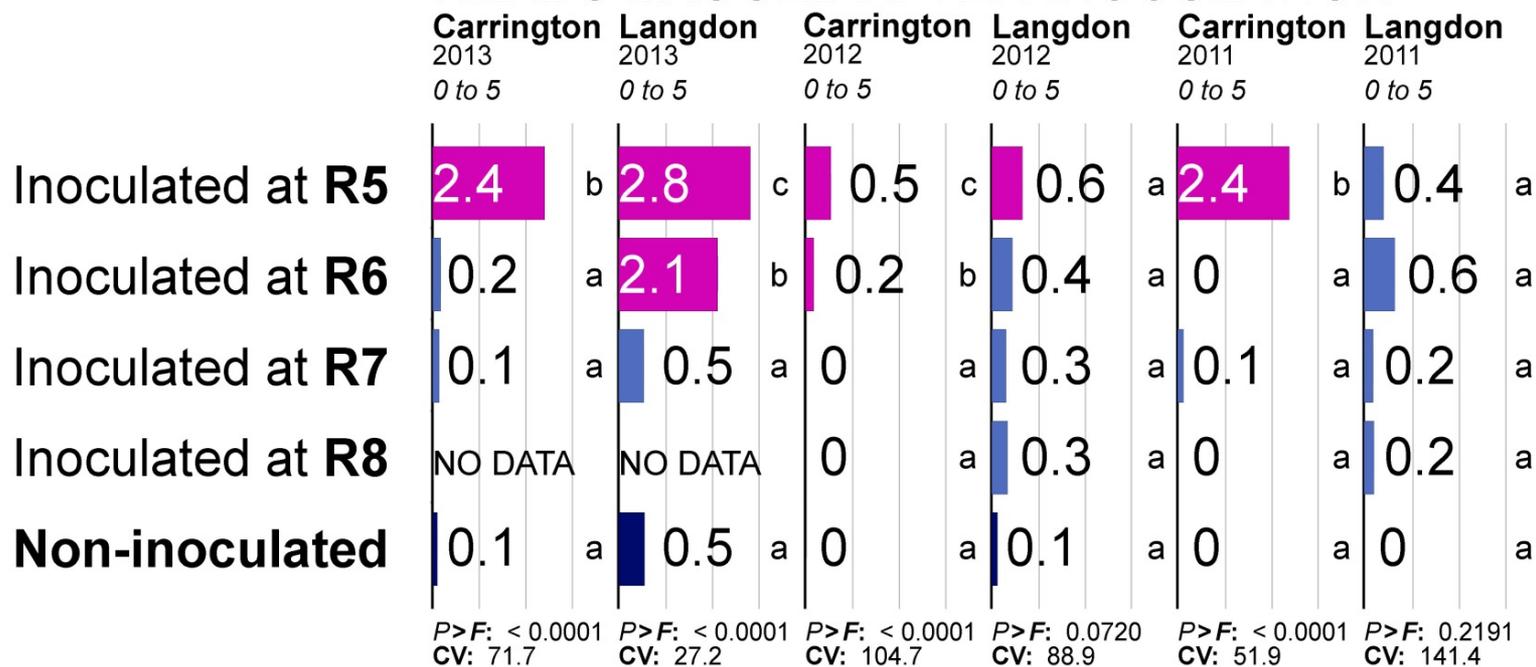
Paper bags placed over heads immediately after inoculation; supplemental overhead irrigation applied as needed to keep bags continually wet for 24 hours after inoculation

UNBAGGED HEADS: Supplemental irrigation applied at the same frequency as in the bagged-heads treatments but the absence of bags permitted limited intermittent drying of heads in the 24-hour period following pathogen inoculation.

HEADS NOT BAGGED AFTER INOCULATION:



HEADS BAGGED AFTER INOCULATION



Susceptibility of sunflowers to head rot relative to growth stage:

DOES THE USE OF A MORE AGGRESSIVE PATHOGEN ISOLATE IMPACT SUSCEPTIBILITY TO HEAD ROT **DURING BLOOM** vs. **AFTER BLOOM**?

PLOTS: Minimum 21 to 29 feet of row per plot

DESIGN: Completely randomized block with a split-split-split arrangement and 6 replicates

Main factor = susceptible or partially resistant hybrid

Sub-factor = growth stage when inoculation was conducted

Sub-sub-factor = pathogen isolate utilized for inoculations

INOCULATION: every head was inoculated twice at the target growth stage, usually on 2 subsequent days

- 15,000 ascospores of *S. sclerotiorum* applied to the front and back of heads on each of two different days (30,000 spores total to the front of head + 30,000 spores total to the back of head)
- Delivered with hand-held spray bottle calibrated to deliver 5,000 ascospores per squirt

Susceptibility of sunflowers to head rot relative to growth stage:

IRRESPECTIVE OF THE PATHOGEN ISOLATE UTILIZED FOR INOCULATIONS, Susceptibility to head rot dropped sharply at the R6 growth stage. Sunflowers were not susceptible to head rot at the R7 growth stage

SUSCEPTIBLE OILSEED HYBRID

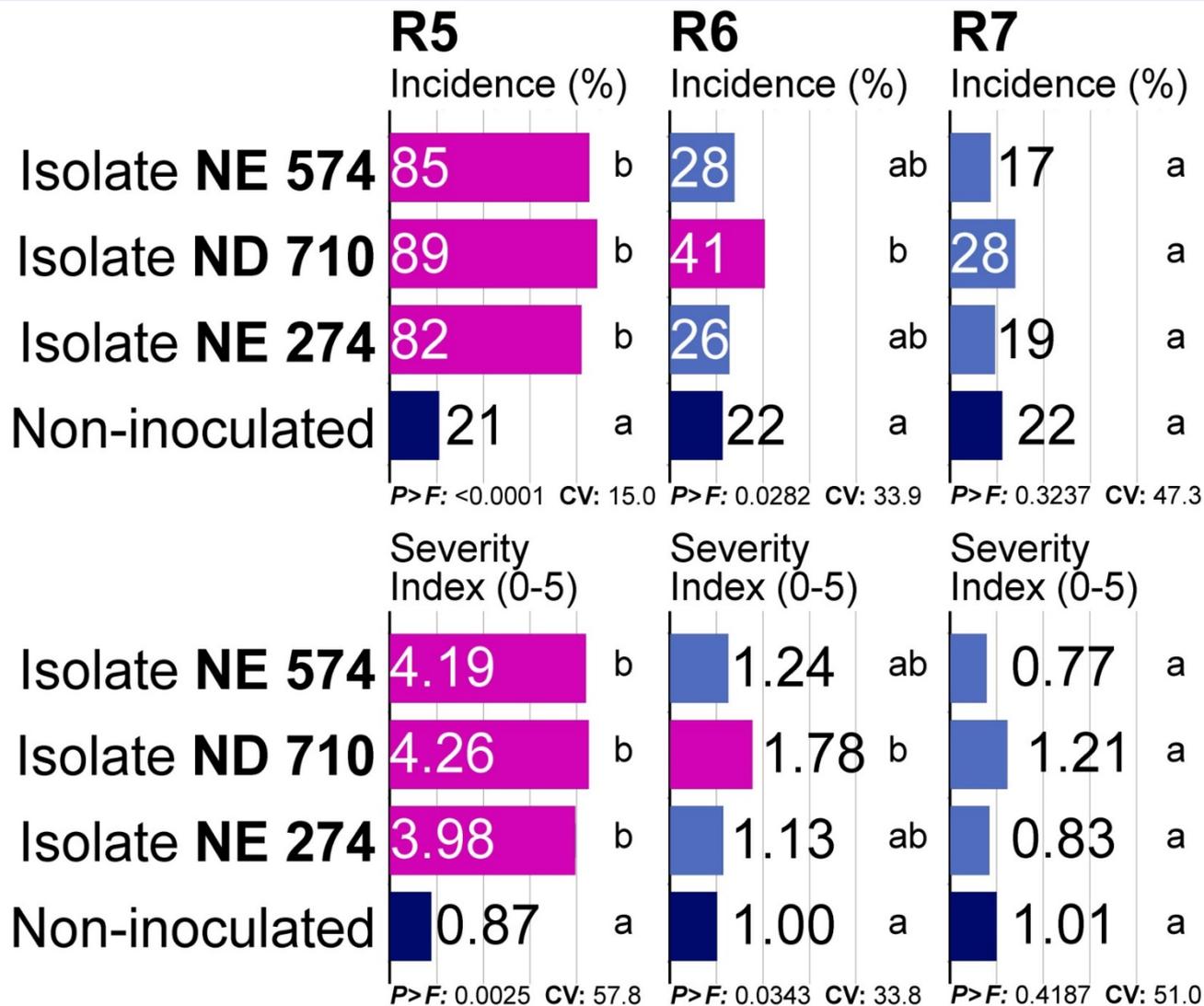
Mycogen '8H288' CL DM

Carrington, ND (2012)

Inoculations were conducted with laboratory-produced ascospores of three different isolates

Sclerotinia sclerotiorum

Sclerotinia head rot was assessed at physiological maturity.



Susceptibility of sunflowers to head rot relative to growth stage:

IRRESPECTIVE OF THE PATHOGEN ISOLATE UTILIZED FOR INOCULATIONS,

Susceptibility to head rot dropped sharply at the R6 growth stage.

Sunflowers were not susceptible to head rot at the R7 growth stage

RESISTANT OILSEED HYBRID

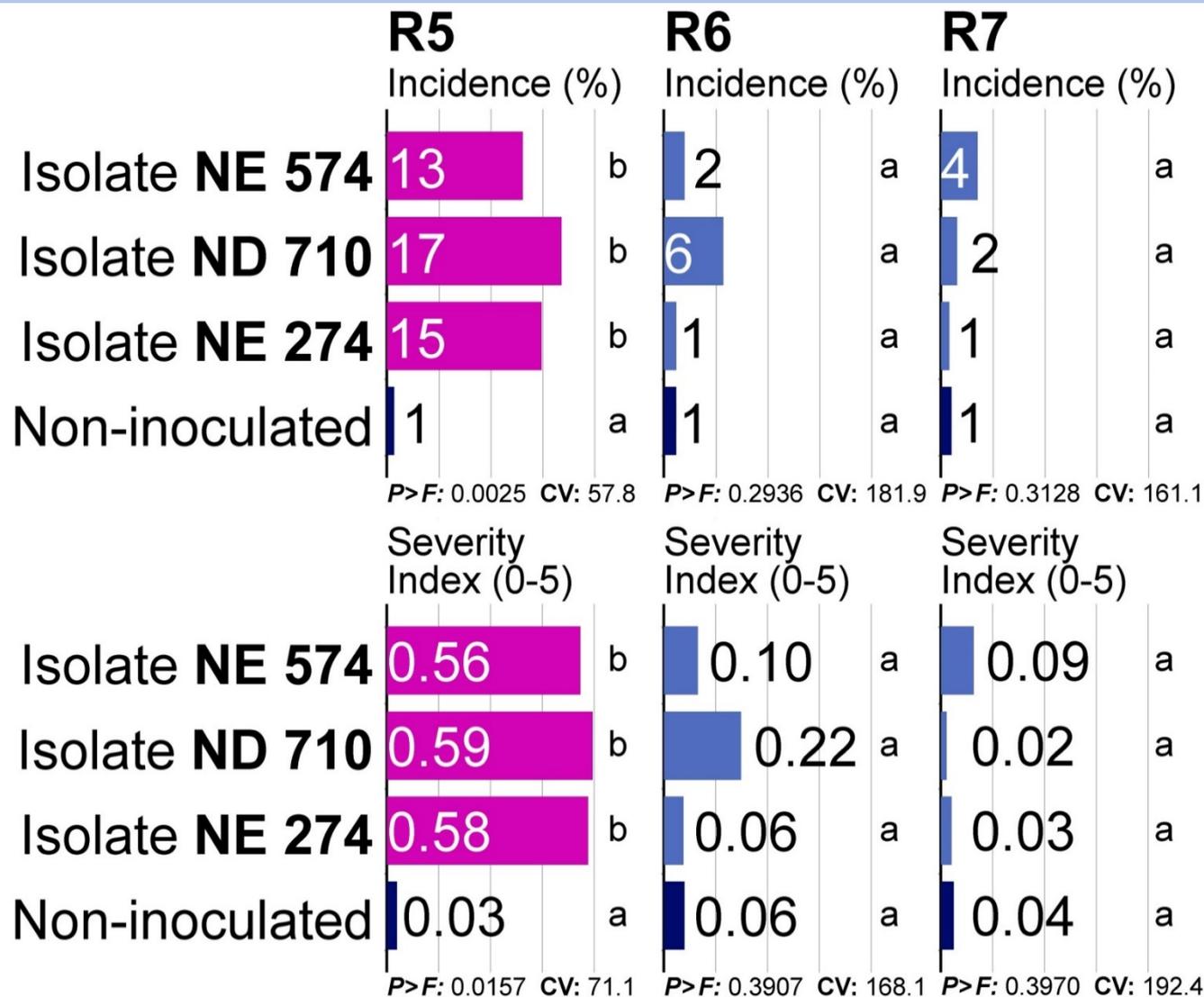
ProSeed 'E8'

Carrington, ND (2012)

Inoculations were conducted with laboratory-produced ascospores of three different isolates

Sclerotinia sclerotiorum

Sclerotinia head rot was assessed at physiological maturity.



Susceptibility of sunflowers to head rot relative to growth stage:

HOW DOES SUSCEPTIBILITY TO HEAD ROT CHANGE AS SUNFLOWERS PROGRESS FROM EARLY to MID to LATE BLOOM to R6?

Does susceptibility change as bloom progresses?

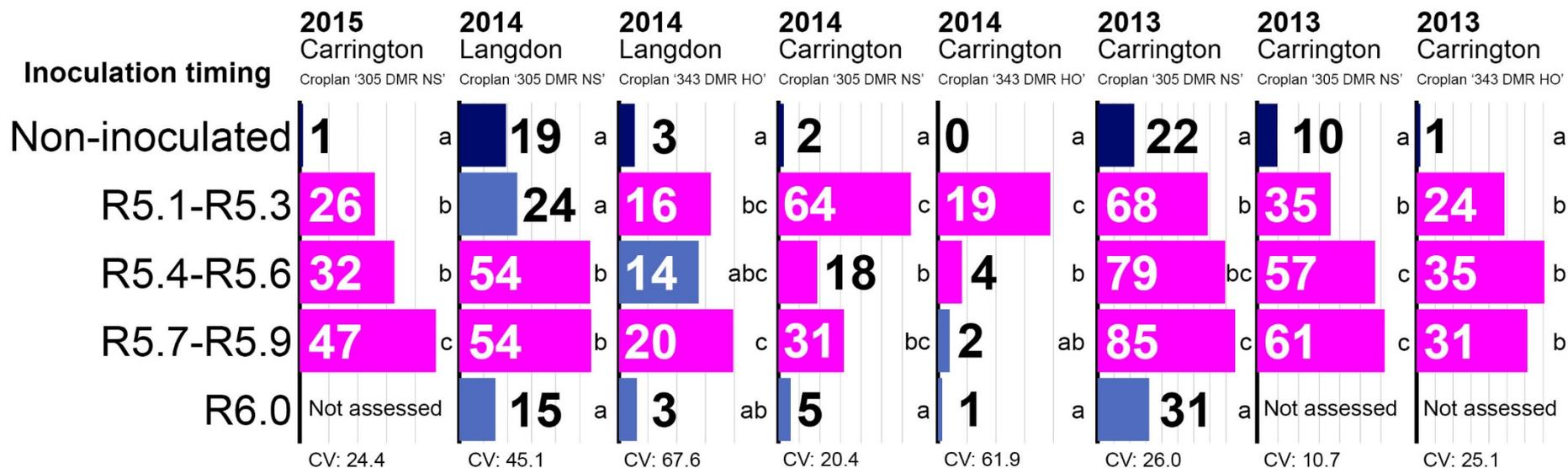
DESIGN: Randomized complete block with a minimum 6 replicates

INOCULATION: every head was inoculated twice at the target growth stage, usually on 2 subsequent days

- 15,000 ascospores of *S. sclerotiorum* applied to the front of heads on each of two different days (30,000 spores total to the front of head)
- Delivered with hand-held spray bottle calibrated to deliver 5,000 ascospores per squirt

Susceptibility to Sclerotinia head rot relative to sunflower growth stage

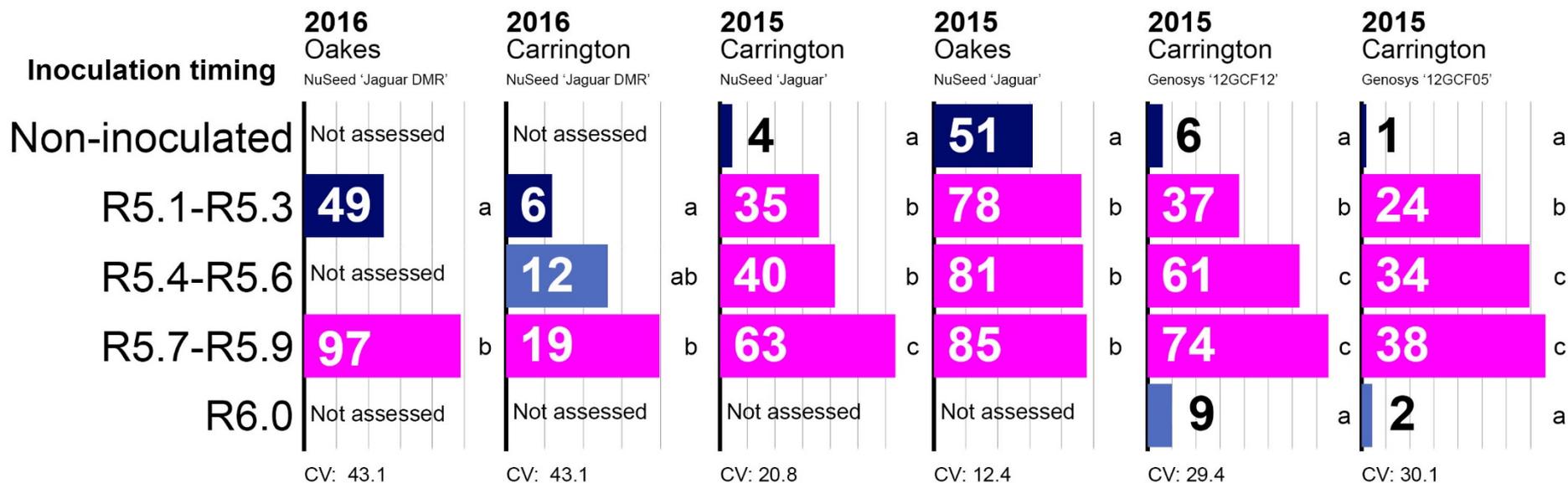
Oilseed sunflowers:



- In six of eight trials, susceptibility increased as bloom progressed
- In two trials, susceptibility was highest in the first third of bloom
- Susceptibility dropped sharply at the R6 growth stage

Susceptibility to Sclerotinia head rot relative to sunflower growth stage

Confection (non-oil) sunflowers:



- In five of six trials, susceptibility increased as bloom progressed
- In one trial, sunflowers were equally susceptible throughout bloom
- Susceptibility dropped sharply at the R6 growth stage

Susceptibility to Sclerotinia head rot relative to sunflower growth stage

Conclusions from infection timing studies:

Susceptibility to Sclerotinia head rot is conditioned by (1) growth stage and (2) environmental conditions.

- **Susceptibility increases as bloom progresses** unless environmental conditions strongly favor infection at early bloom and become unfavorable at late bloom
- **Susceptibility drops sharply at the end of bloom:** Infections occur at R6 only when conditions are highly favorable for head rot
- **Sunflowers do not appear to be susceptible to head rot at R7**

THANK YOU!

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