Comparative efficacy of fungicides for managing Ascochyta blight in chickpeas: TRIAZOLE (DMI) and SDHI FUNGICIDES (FRAC 3, 7)

A comprehensive review of 45 chickpea Ascochyta fungicide efficacy studies conducted across North Dakota from 2007 to 2019.

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Research funded by:

Northern Pulse Growers Association
North Dakota Crop Protection Product Harmonization Board & Registration Board
BASF, DuPont, Arysta LifeScience, and Syngenta

Comparative efficacy of fungicides for managing Ascochyta blight in chickpeas:

1. TRIAZOLE (DMI) FUNGICIDES (FRAC 3)

Including fungicides with a primary FRAC 3 mode of action

PROVYSOL: registered at 2.5 to 5.0 fl oz/ac

active ingredient: mefentrifluconazole (FRAC 3)

Efficacy at 5.0 fl oz/ac: **very good** Efficacy at 3.0 fl oz/ac: **good**

VELTYMA: registered at 2.5 to 5.0 fl oz/ac

active ingredient: mefentrifluconazole (FRAC 3) + pyraclostrobin (FRAC 11)

Efficacy at 10.0 fl oz/ac: **very good** Efficacy at 7.0 fl oz/ac: **good**

PROLINE: registered at 5.7 fl oz/ac

active ingredient: prothioconazole (FRAC 3)

Efficacy at 5.7 fl oz/ac: **good** Efficacy at 5.0 fl oz/ac: **fair**

QUASH: registered at 4.0 oz/ac

active ingredient: metconazole (FRAC 3)

NO EFFICACY DATA AVAILABLE.

DELARO: registered at 12.0 oz/ac

active ingredient: prothioconazole (FRAC 3) + trifloxystrobin (FRAC 11)

Delaro @ 12 fl oz contains the same amount of prothioconazole as Proline @ 4.5 fl oz

Delaro @ 12 fl oz should be supplemented with Proline @ 1.2 fl oz

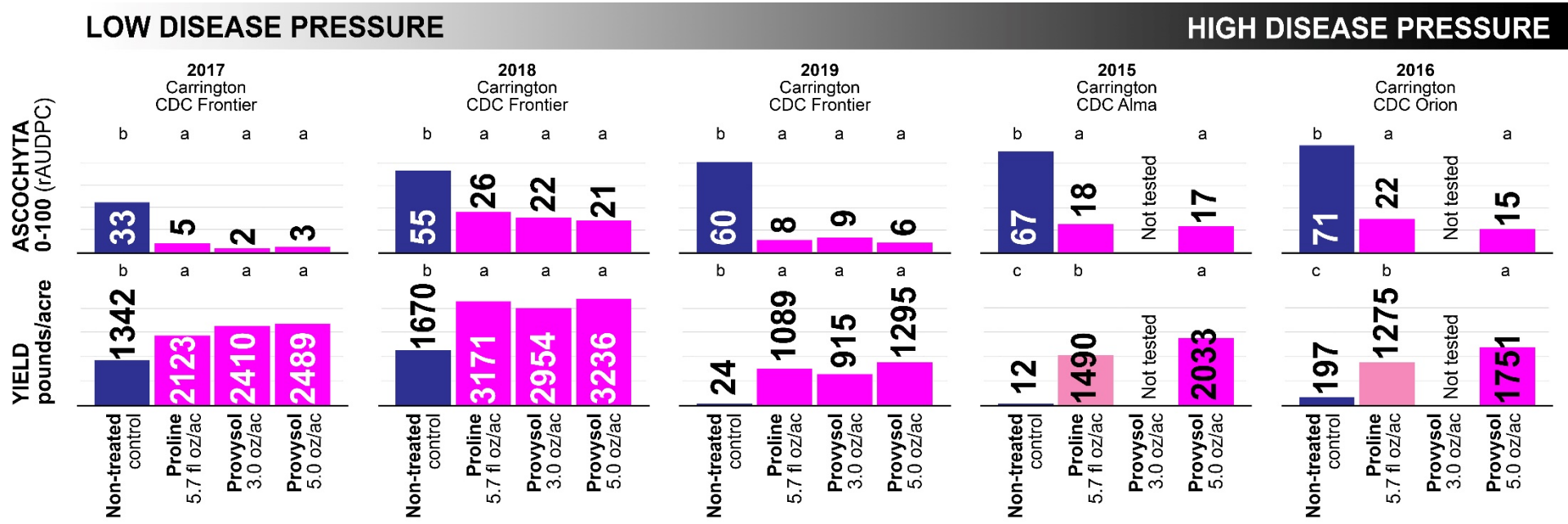
Fungicide efficacy, chickpea Ascochyta – Triazole (FRAC 3) fungicides:

Provysol, 3.0 or 5.0 fl oz/ac

PROVYSOL at 3.0 fl oz: 47 grams of the active ingredient mefentrifluconazole
PROVYSOL at 5.0 fl oz: 59 grams of the active ingredient mefentrifluconazole

At low to moderate Ascochyta pressure: Provysol (3.0 or 5.0 fl oz/ac) and Proline (5.7 fl oz/ac) have performed equivalently.

Under high Ascochyta pressure: Provysol (5.0 fl oz/ac) has been more effective than Proline (5.7 fl oz/ac)



Fungicide efficacy, chickpea Ascochyta – Triazole (FRAC 3) fungicides:

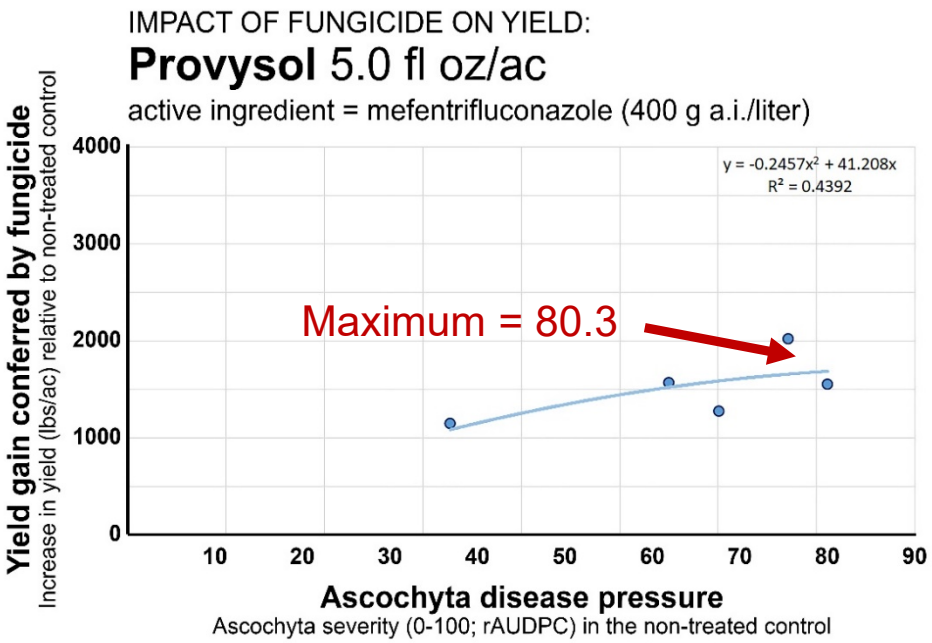
Provysol, 3.0 or 5.0 fl oz/ac

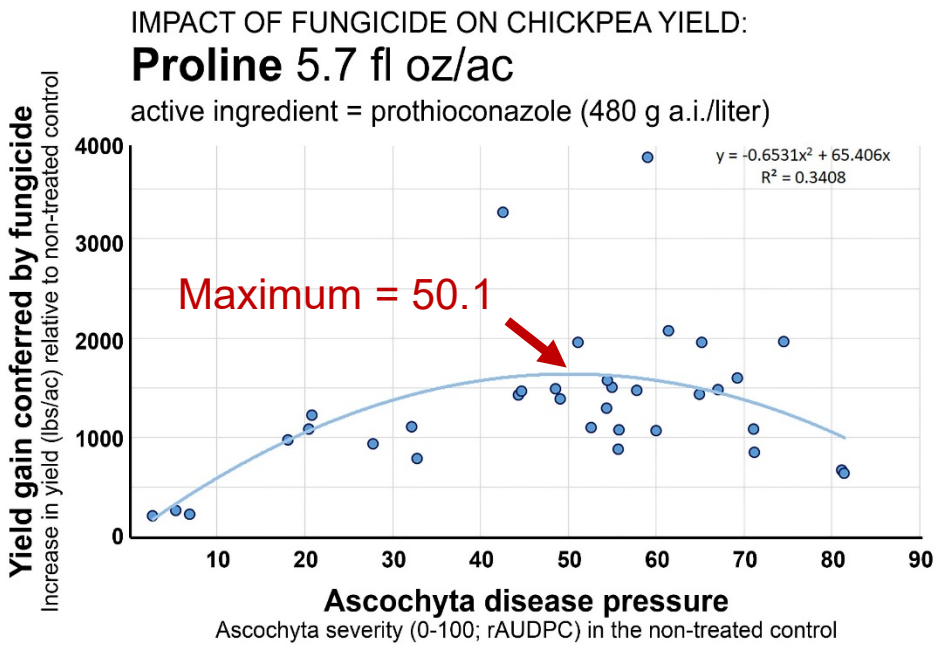
PROVYSOL at 3.0 fl oz: 47 grams of the active ingredient mefentrifluconazole
PROVYSOL at 5.0 fl oz: 59 grams of the active ingredient mefentrifluconazole

Across all studies in which Provysol (5.0 fl oz) and Proline (5.7 fl oz) were evaluated:

- Under high Ascochyta pressure, Provysol has performed more consistently than Proline

Blue dots: Each dot corresponds to the performance of the fungicide in one field trial.

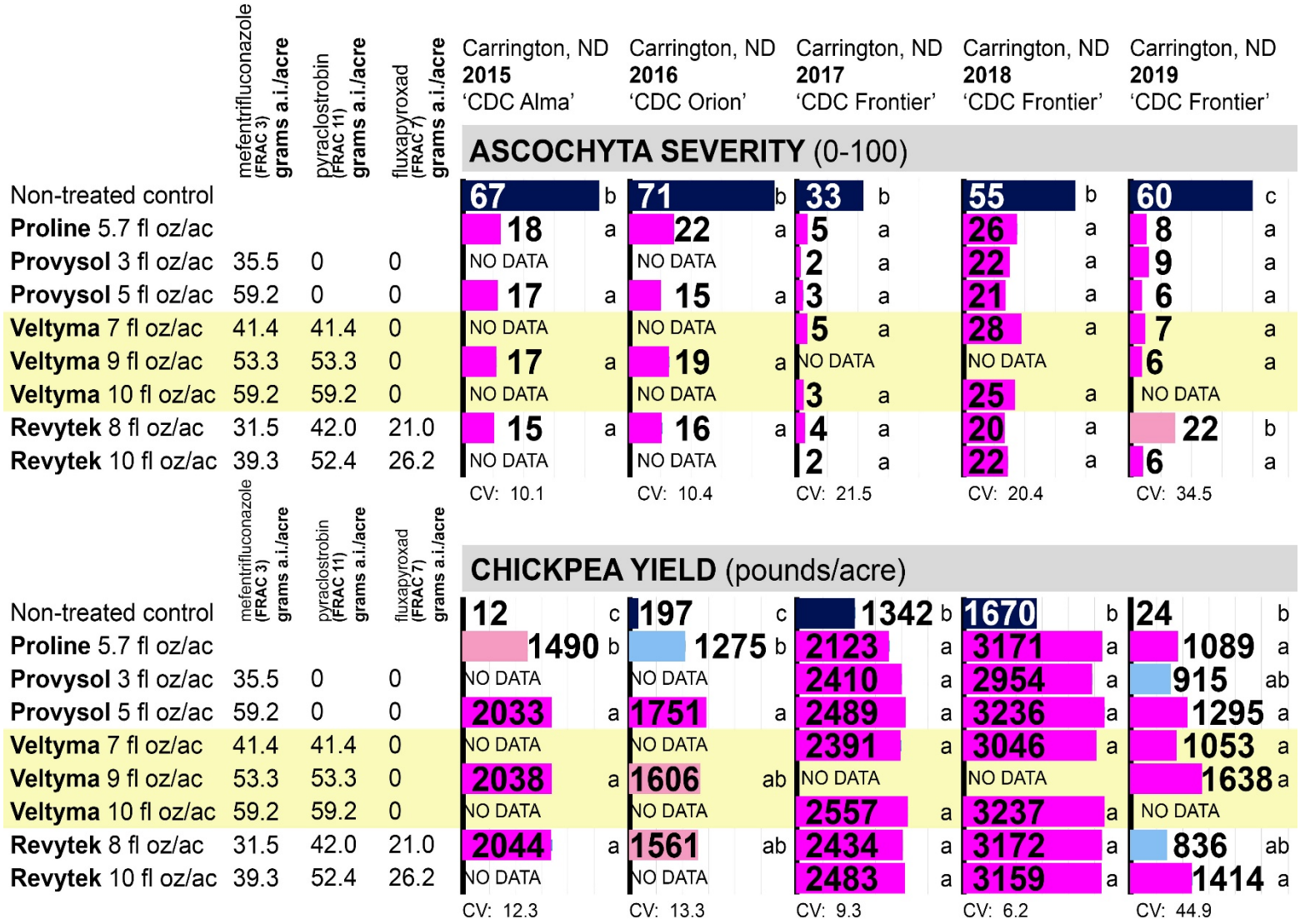




Fungicide efficacy, chickpea Ascochyta – Triazole (FRAC 3) fungicides:

Veltyma, 7.0 to 10.0 fl oz/ac

The performance of Veltyma is determined by the amount of the triazole active ingredient (mefentrifluconazole) **applied.**

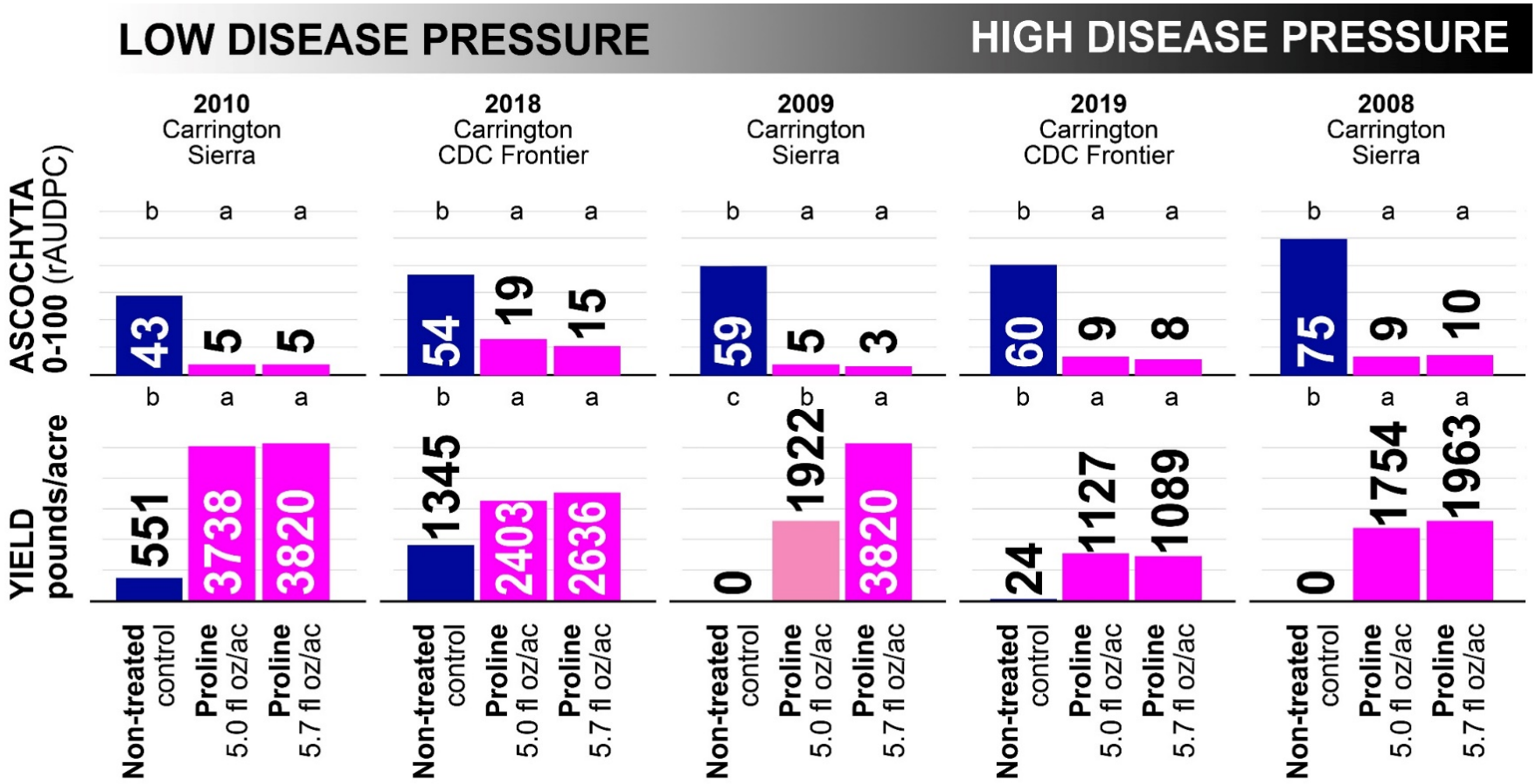


Fungicide efficacy, chickpea Ascochyta – Triazole (FRAC 3) fungicides:

Proline, 5.0 or 5.7 fl oz/ac

PROLINE at 5.0 fl oz: 71 grams of the active ingredient prothioconazole
PROLINE at 5.7 fl oz: 81 grams of the active ingredient prothioconazole

Proline exhibits a rate response: Proline is more effective applied at 5.7 fl oz/ac than 5.0 fl oz/ac



Fungicide efficacy, chickpea Ascochyta – Triazole (FRAC 3) fungicides:

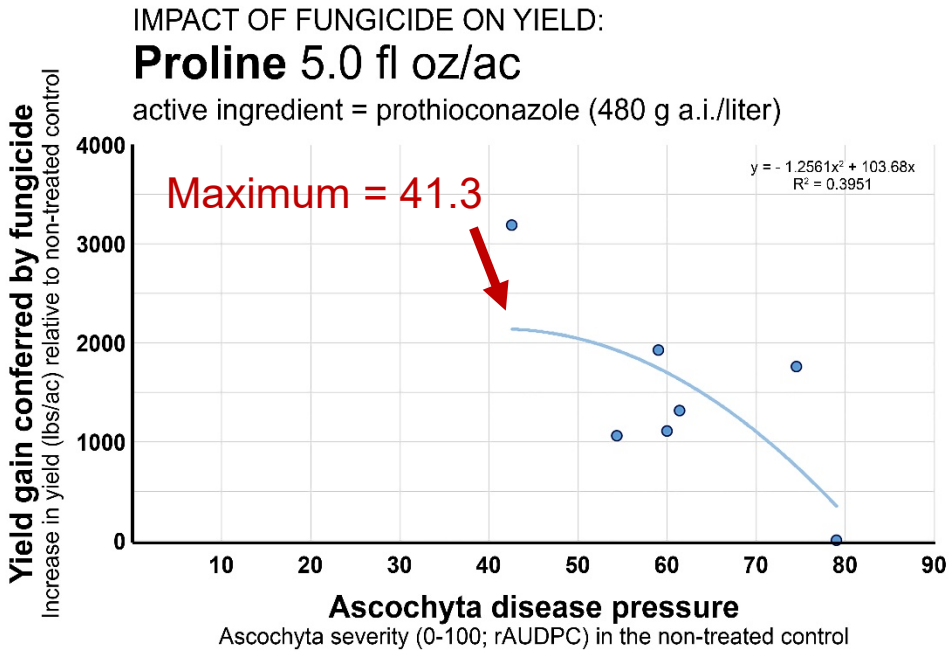
Proline, 5.0 or 5.7 fl oz/ac

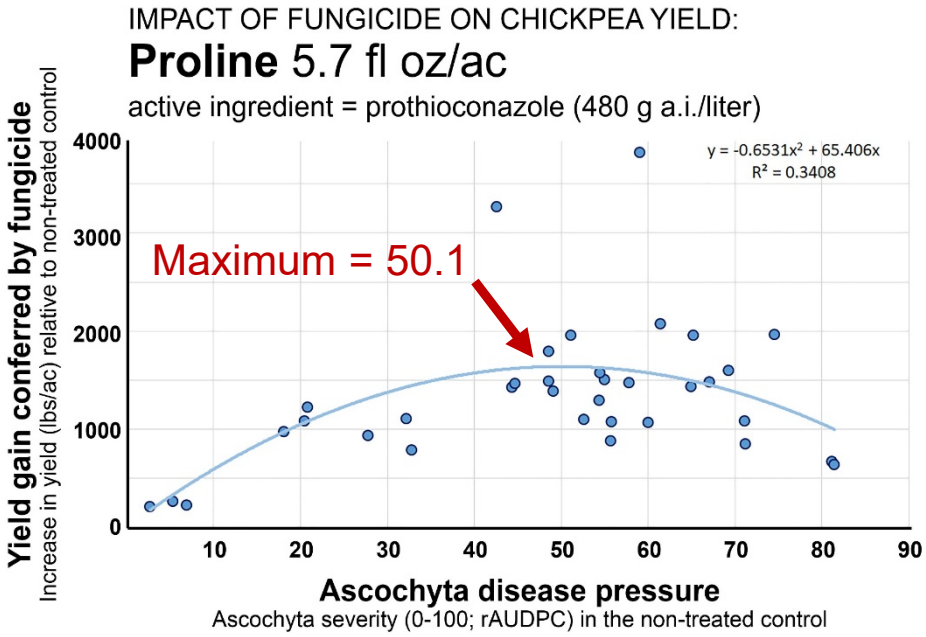
PROLINE at 5.0 fl oz: 71 grams of the active ingredient prothioconazole
PROLINE at 5.7 fl oz: 81 grams of the active ingredient prothioconazole

Across all studies in which Proline was evaluated at 5.0 or 5.7 fl oz/ac:

- Under high Ascochyta pressure, Proline (5.7 fl oz/ac) has performed more consistently than Proline (5.0 fl oz/ac)

Blue dots: Each dot corresponds to the performance of the fungicide in one field trial.





Comparative efficacy of fungicides for managing Ascochyta blight in chickpeas:

2. SDHI FUNGICIDES (FRAC 7)

Including fungicides with a primary FRAC 7 mode of action

PRIAXOR: registered at 4.0 to 8.0 fl oz/ac

active ingredient: fluxapyroxad (FRAC 7) + pyraclostrobin (FRAC 11)

Efficacy at 6.0 fl oz/ac: **good** Efficacy at 4.0 fl oz/ac: **fair to good**

MIRAVIS NEO: registered at 13.7 fl oz/ac

active ingredient: pydiflumetofen (FRAC 7) + azoxystrobin (FRAC 11) + propiconazole (FRAC 3)

Not enough data to rigorously assess efficacy

VERTISAN: registered at 14.0 to 20.0 oz/ac

active ingredient: penthiopyrad (FRAC 7)

Efficacy at 20.0 oz/ac: **fair**

ENDURA: registered at 6.0 oz/ac

active ingredient: boscalid (FRAC 7)

Efficacy at 6.0 oz/ac: **fair**

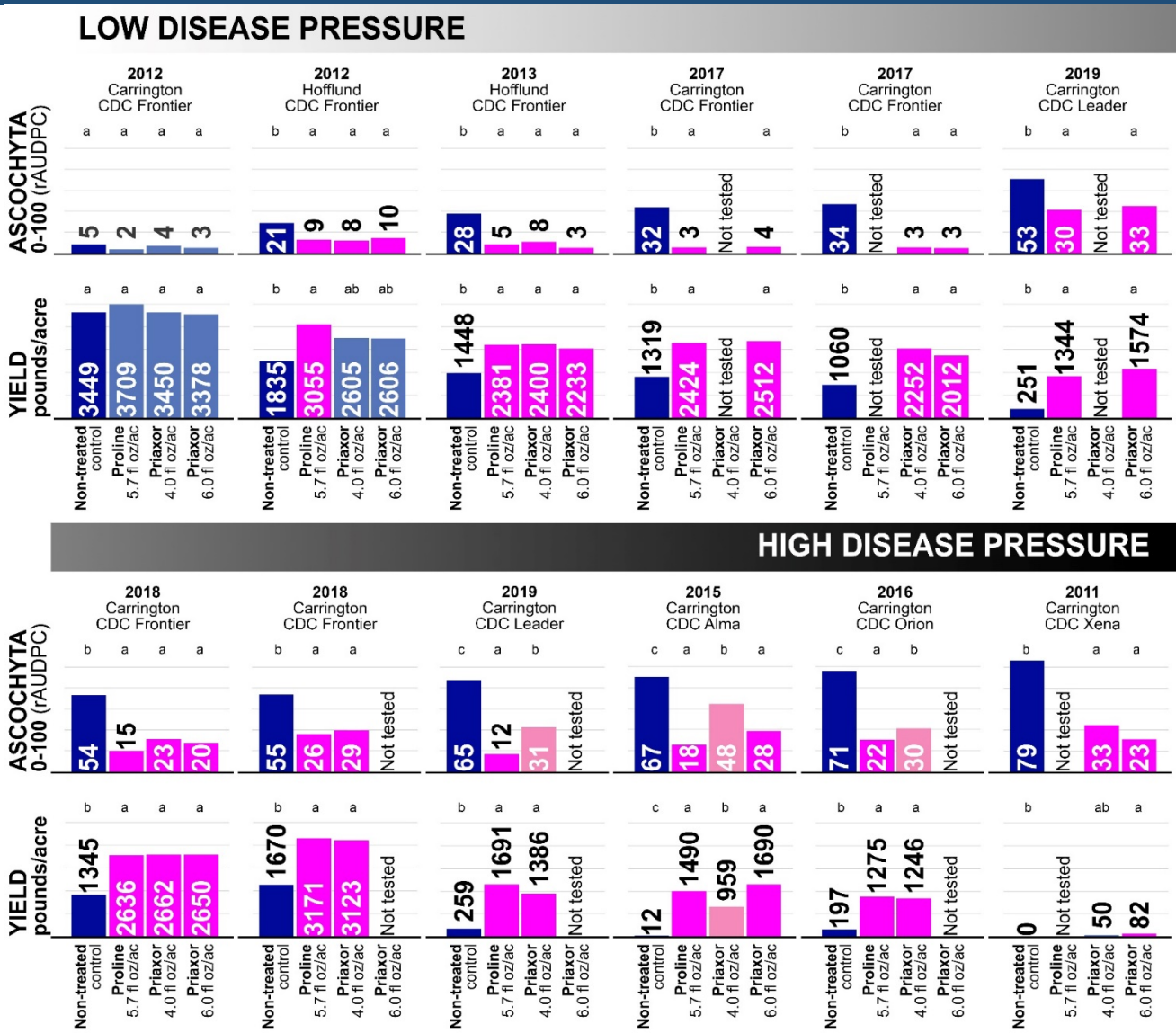
Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

Priaxor, 4.0 or 6.0 fl oz/ac

PRIAXOR at 4.0 fl oz: 19.7 grams fluxapyroxad (FRAC 7) + 39.4 grams pyraclostrobin (FRAC 11)
PRIAXOR at 6.0 fl oz: 29.6 grams fluxapyroxad (FRAC 7) + 59.1 grams pyraclostrobin (FRAC 11)

At low to moderate Ascochyta pressure: Priaxor (4.0 and 6.0 fl oz/ac) and Proline (5.7 fl oz/ac) have performed similarly.

Under high Ascochyta pressure: Proline (5.7 fl oz/ac) and Priaxor (6.0 fl oz/ac) have been more effective than Priaxor (4.0 fl oz/ac)



Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

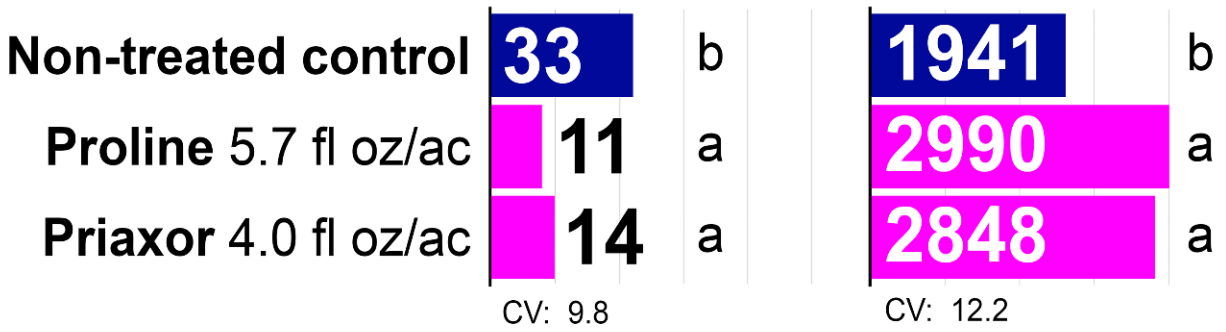
Priaxor, 4.0 fl oz/ac

PRIAXOR at 4.0 fl oz: 19.7 grams fluxapyroxad (FRAC 7) + 39.4 grams pyraclostrobin (FRAC 11)

At low to moderate Ascochyta pressure: Priaxor (4.0 fl oz/ac) and Proline (5.7 fl oz/ac) have performed similarly.

LOW TO MODERATE DISEASE PRESSURE

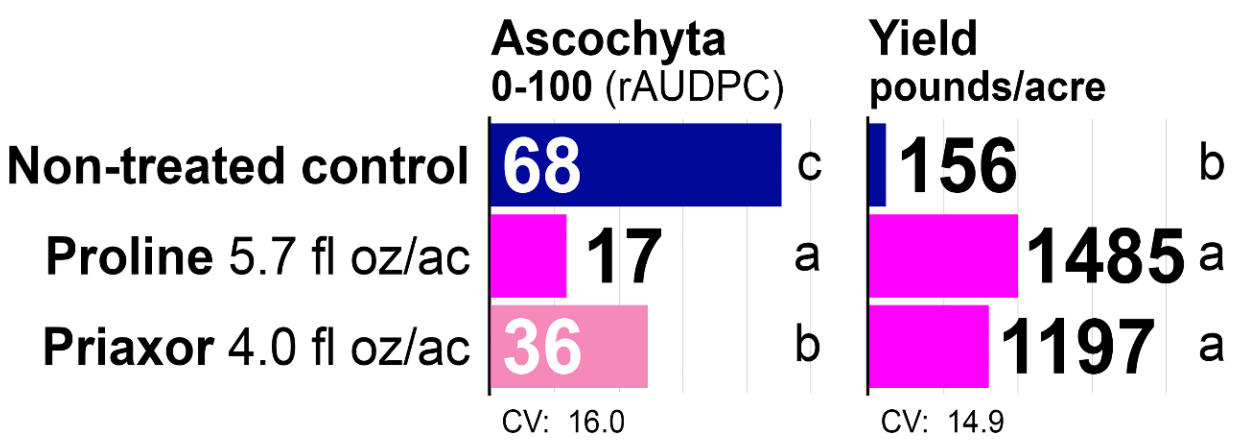
COMBINED ANALYSIS ACROSS **5 STUDIES**



Under high Ascochyta pressure: Proline (5.7 fl oz/ac) has been more effective than Priaxor (4.0 fl oz/ac)

HIGH DISEASE PRESSURE

COMBINED ANALYSIS ACROSS **3 STUDIES**



Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

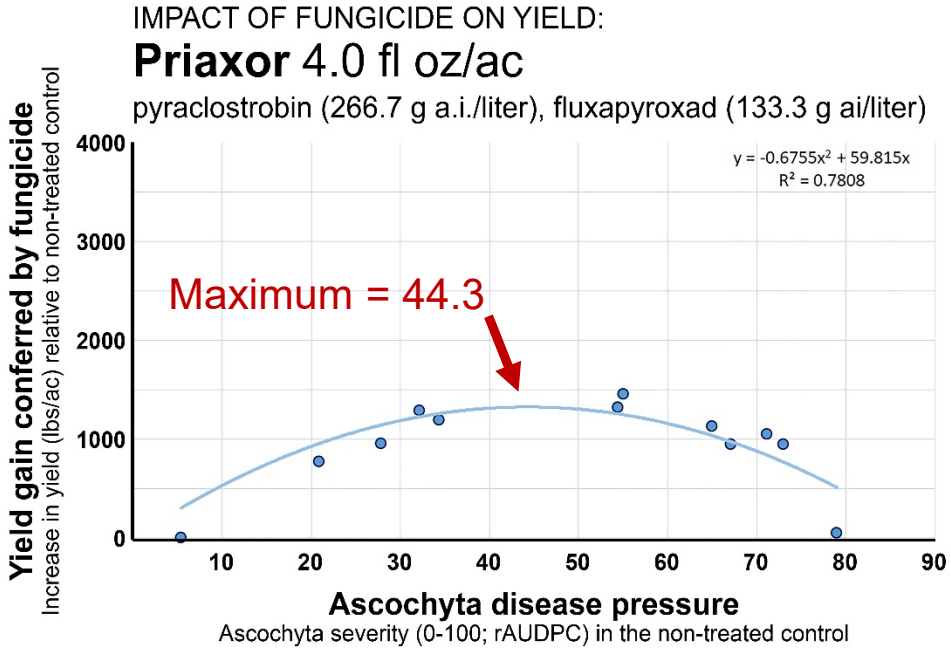
Priaxor, 4.0 or 6.0 fl oz/ac

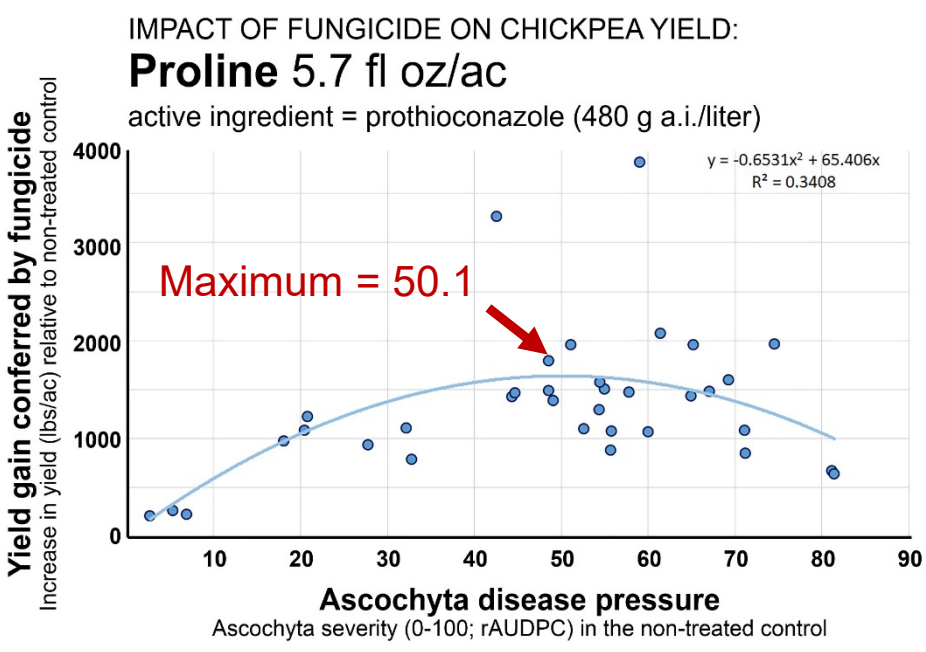
PRIAXOR at 4.0 fl oz: 19.7 grams fluxapyroxad (FRAC 7) + 39.4 grams pyraclostrobin (FRAC 11)
PRIAXOR at 6.0 fl oz: 29.6 grams fluxapyroxad (FRAC 7) + 59.1 grams pyraclostrobin (FRAC 11)

Across all studies in which Priaxor (4.0 fl oz) and Proline (5.7 fl oz) were evaluated:

- Priaxor (4.0 fl oz/ac) has been overwhelmed by Ascochyta at lower levels of disease pressure than Proline (5.7 fl oz/ac)

Blue dots: Each dot corresponds to the performance of the fungicide in one field trial.





Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

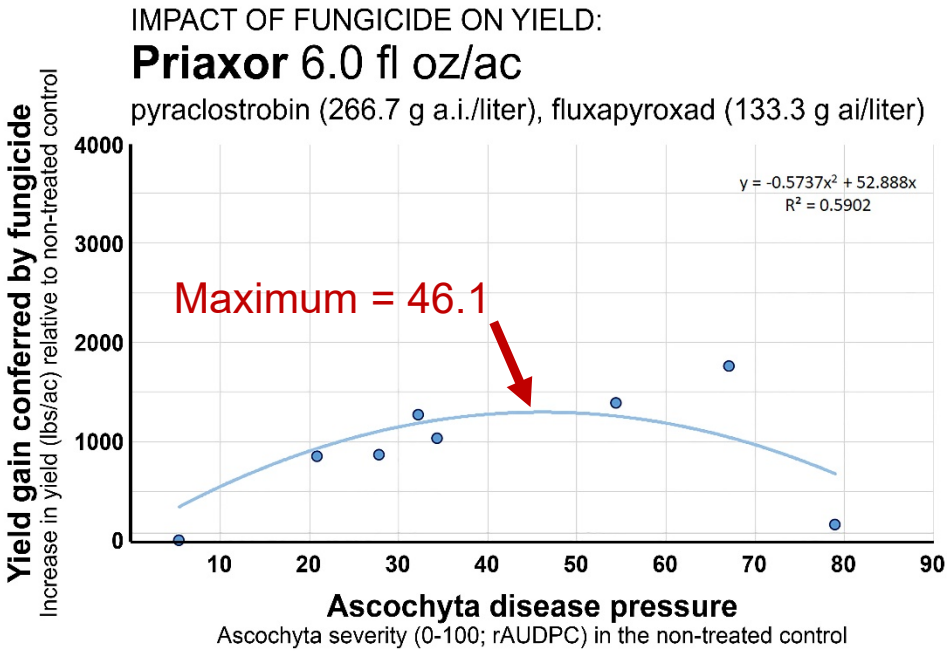
Priaxor, 4.0 or 6.0 fl oz/ac

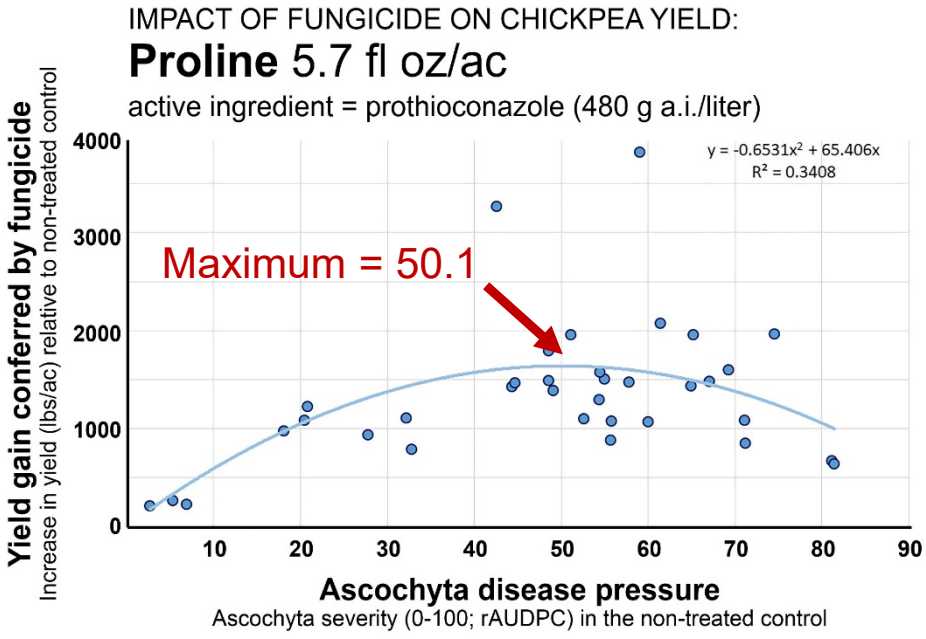
PRIAXOR at 4.0 fl oz: 19.7 grams fluxapyroxad (FRAC 7) + 39.4 grams pyraclostrobin (FRAC 11)
PRIAXOR at 6.0 fl oz: 29.6 grams fluxapyroxad (FRAC 7) + 59.1 grams pyraclostrobin (FRAC 11)

Across all studies in which Priaxor (6.0 fl oz) and Proline (5.7 fl oz) were evaluated:

- Priaxor has performed better at 6.0 than 4.0 fl oz but was still overwhelmed by Ascochyta at lower levels of disease pressure than Proline (5.7 fl oz/ac)

Blue dots: Each dot corresponds to the performance of the fungicide in one field trial.



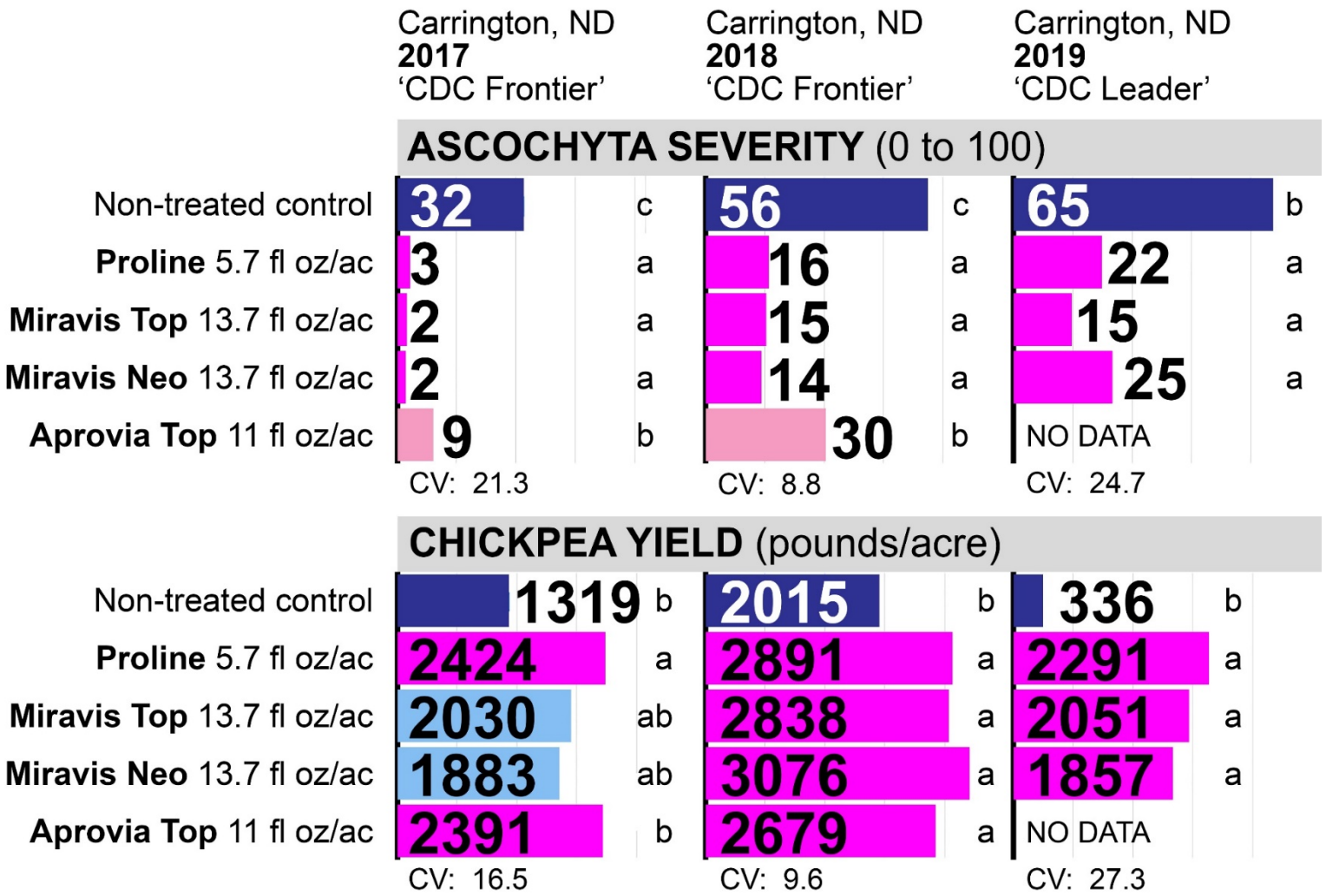


Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

Miravis Neo, 13.7 fl oz/ac

13.7 fl oz Miravis Neo contains 30.6 g pydiflumetofen (FRAC 7), 40.3 g azoxystrobin (FRAC 11), and 50.5 g propiconazole (FRAC 3). Efficacy against Ascochyta is conferred primarily by pydiflumetofen (FRAC 7).

Miravis Neo: no enough data to rigorously assess comparative efficacy.



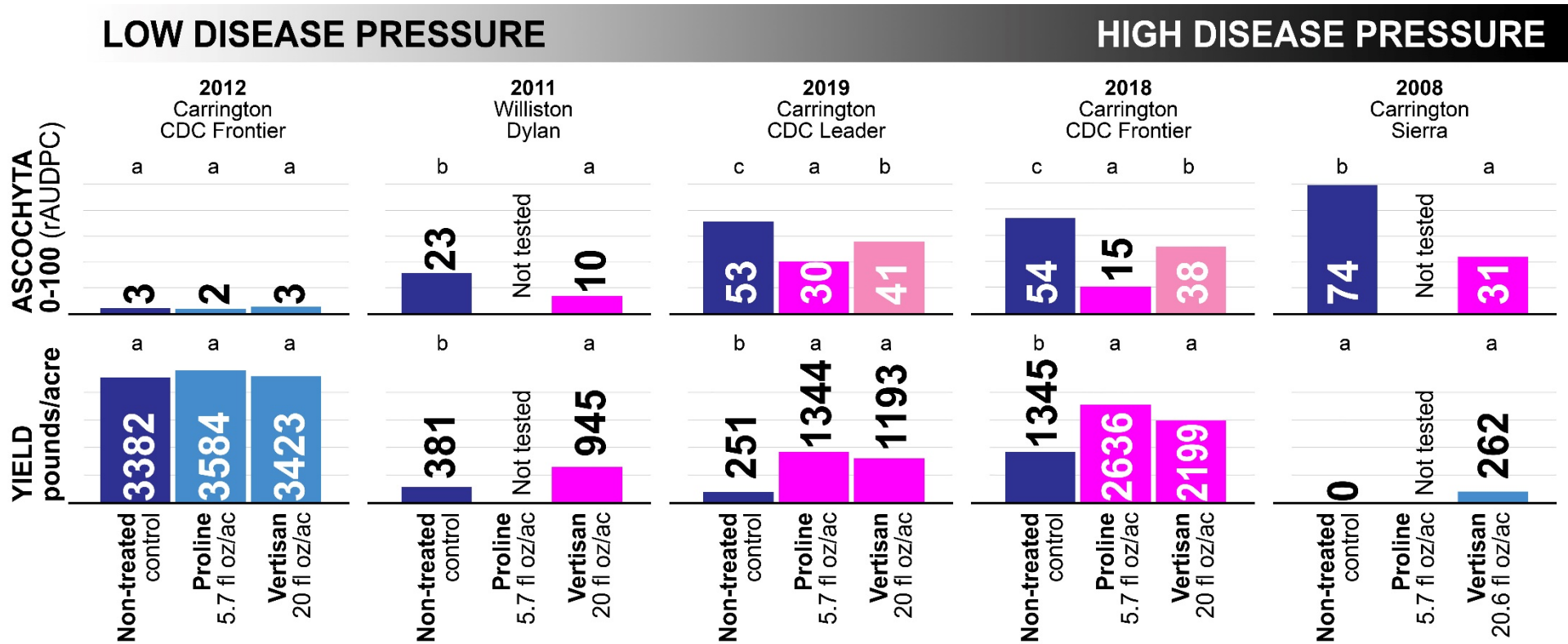
Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

Vertisan, 20.0 fl oz/ac

VERTISAN at 20 fl oz contains 118.4 grams of the active ingredient penthiopyrad (FRAC 7)

At low Ascochyta pressure: Vertisan (20.0 fl oz/ac) and Proline (5.7 fl oz/ac) have performed similarly.

Under moderate and high Ascochyta pressure: Proline (5.7 fl oz/ac) was more effective than Vertisan (20.0 fl oz/ac)



Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

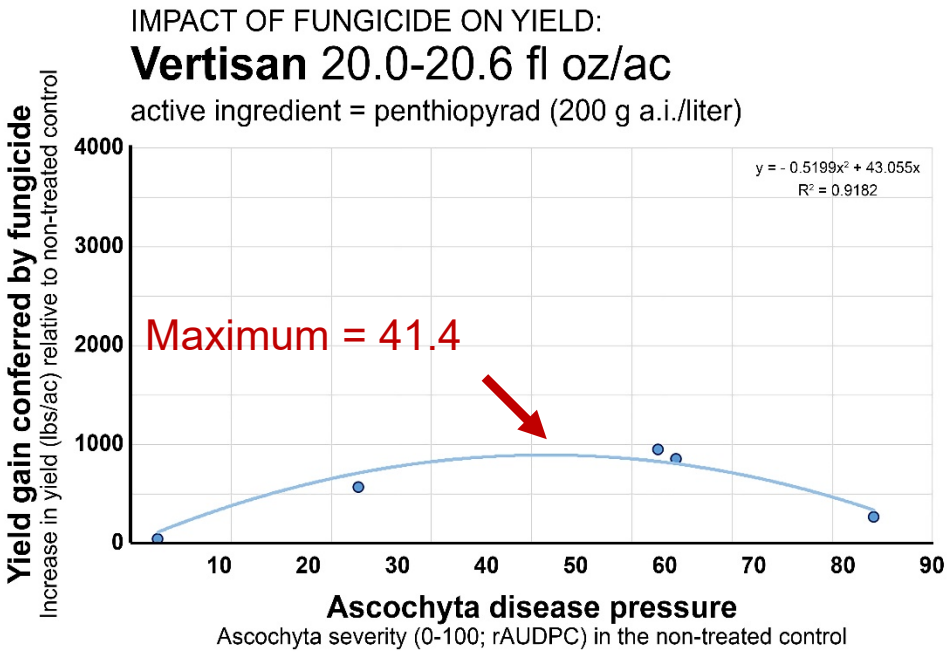
Vertisan, 20.0 fl oz/ac

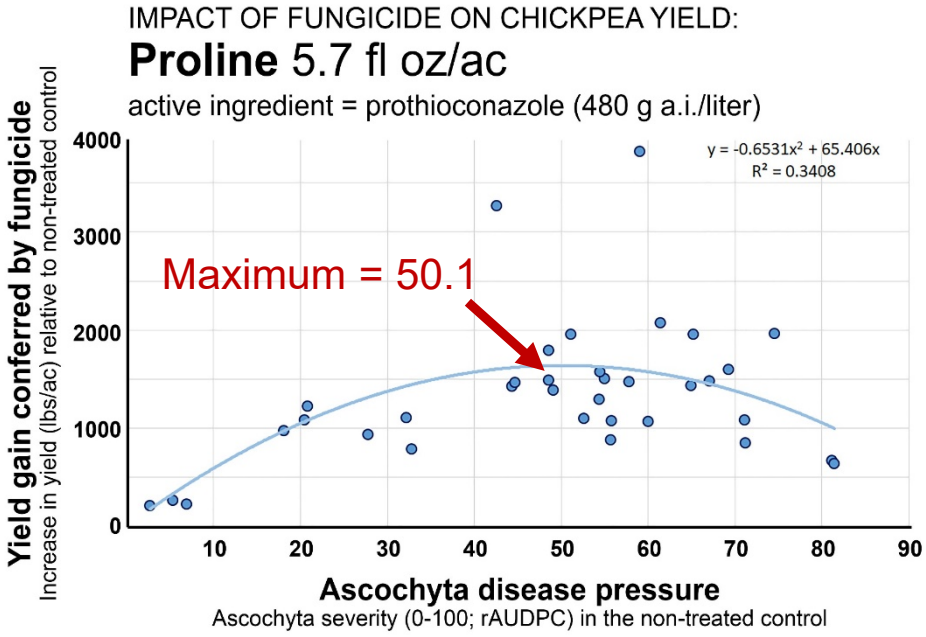
VERTISAN at 20 fl oz contains 118.4 grams of the active ingredient penthiopyrad (FRAC 7)

Across all studies in which Vertisan (20.0 fl oz) and Proline (5.7 fl oz) were evaluated:

- Vertisan (20.0 oz/ac) was overwhelmed by Ascochyta at lower levels of disease pressure than Proline (5.7 fl oz/ac)

Blue dots: Each dot corresponds to the performance of the fungicide in one field trial.





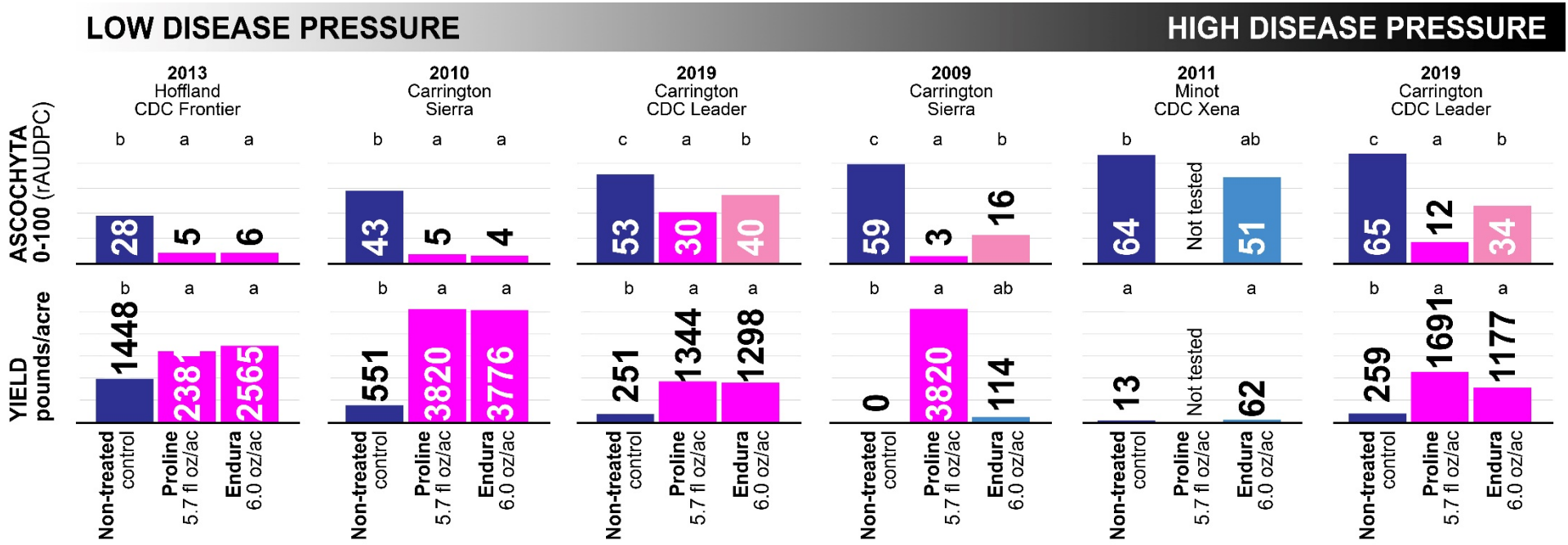
Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

Endura, 6.0 oz/ac

ENDURA at 6.0 oz contains 119.1 grams of the active ingredient boscalid (FRAC 7)

At low Ascochyta pressure: Endura (6.0 oz/ac) and Proline (5.7 fl oz/ac) have performed similarly.

Under moderate and high Ascochyta pressure: Proline (5.7 fl oz/ac) was more effective than Endura (6.0 oz/ac)



Fungicide efficacy, chickpea Ascochyta – SDHI (FRAC 7) fungicides:

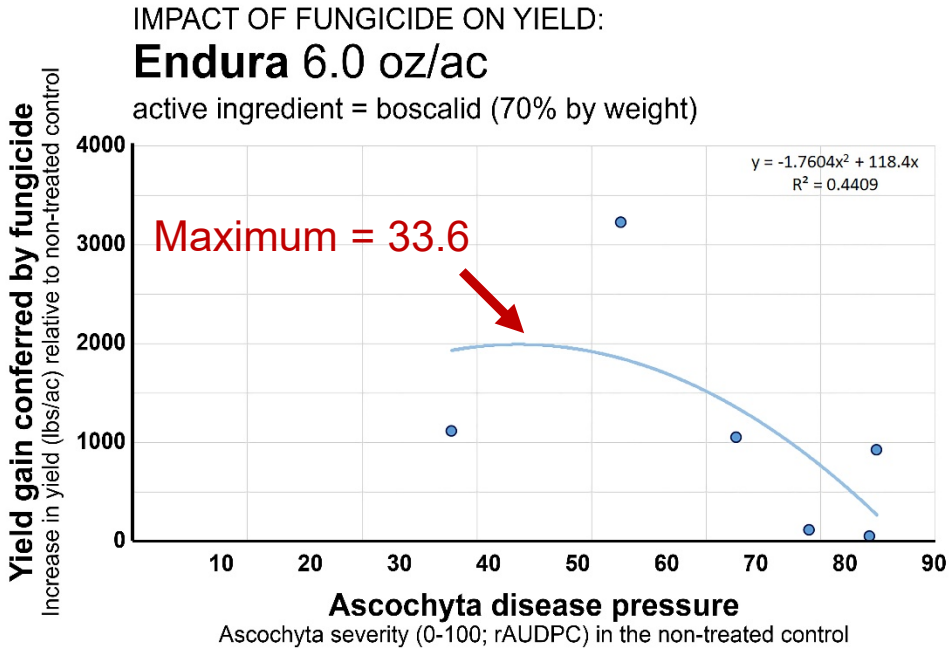
Endura, 6.0 oz/ac

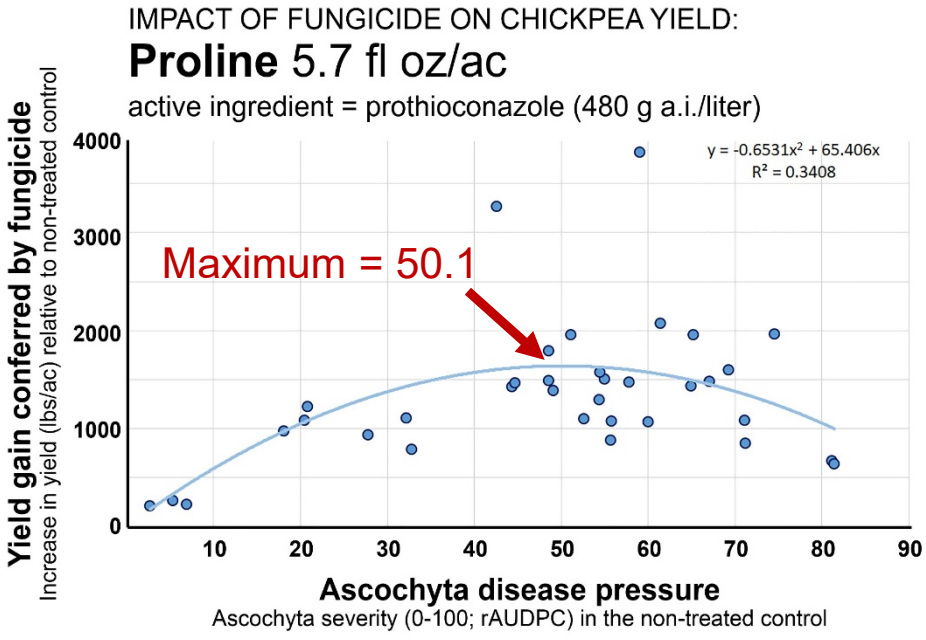
ENDURA at 6.0 oz contains 119.1 grams of the active ingredient boscalid (FRAC 7)

Across all studies in which Endura (6.0 oz) and Proline (5.7 fl oz) were evaluated:

- Endura (6.0 oz/ac) was overwhelmed by Ascochyta at lower levels of disease pressure than Proline (5.7 fl oz/ac)

Blue dots: Each dot corresponds to the performance of the fungicide in one field trial.





Fungicide application timing:

- The first application was made at the first appearance of Ascochyta symptoms (one or two small lesions on a low percentage of plants).
  - In dry years, this typically has corresponded to early bloom.
  - In wet years, this typically has corresponded to late vegetative growth.

- Subsequent applications were made 10-14 days apart until chickpeas began to senesce except when there is an extended stretch of dry weather, in which case an application is delayed until shortly before forecasted rain.
  - In most years, this corresponds to 3 to 5 applications.

FUNGICIDE APPLICATION TIMING AND METHODS

Fungicide application methods:

- Spray volume: 15 or 17.5 gal/ac.
- Droplet size: fine or medium
- Nozzles, pressure: TeeJet extended-range flat-fan nozzles, 30 to 40 psi

Fungicide rotation: Rotating fungicide modes of action

- Rotating fungicide modes of action is critical for maintaining the effectiveness of fungicides. It also improves disease control.
- When conducting fungicide efficacy testing in chickpeas, the same fungicide is applied sequentially in order to ensure that every fungicide is exposed to the same conditions all season.
- The fungicide efficacy results are meant to be used as tools for choosing appropriate fungicides when developing fungicide rotation strategies.

Why the comparative performance of fungicides sometimes differs across studies:

Fungicides differ in residual activity – how long a fungicide confers satisfactory disease control after being applied.

- When disease pressure occurs primarily shortly after fungicides are applied, both long and short-residual fungicides perform well.
- When disease onset is late, only long-residual fungicides perform well.

Fungicides differ in the level of disease pressure that can be successfully controlled by the fungicide.

- Under low to moderate disease pressure, many fungicides may perform well.
- Under high disease pressure, only the most effective fungicides perform well.

Thank you!

Research funded by:
Northern Pulse Growers Association
North Dakota Crop Protection Product Harmonization Board & Registration Board
BASF, DuPont, Arysta LifeScience, and Syngenta