

Comparative efficacy of fungicides for managing *Ascochyta* blight in chickpeas: **FUNGICIDE TANK-MIXES WITH CHLOROTHALONIL**

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



Collaborative research: **Michael Wunsch & Blaine Schatz**, NDSU Carrington Research Extension Center
Jeremy Pederson, NDSU North Central Research Extension Center
Audrey Kalil, Tyler Tjelde, & Gordy Bradbury, NDSU Williston Res. Extension Center

Compiled by: **Michael Wunsch**, plant pathologist **NDSU Carrington Research Extension Center**

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

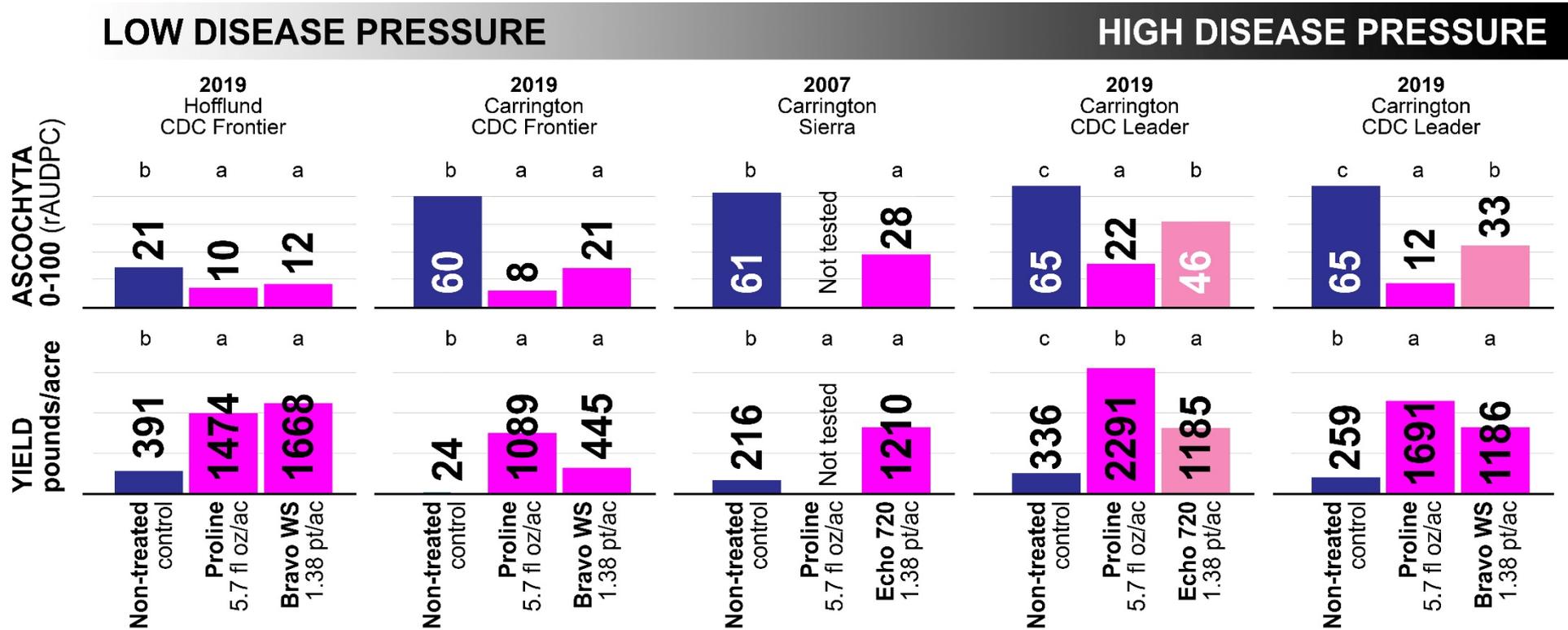


Fungicide efficacy, chickpea *Ascochyta* – FRAC M5 fungicides:

Bravo WeatherStik, registered at 1.38 to 2.0 pt/ac

BRAVO WEATHER STIK at 1.38 pints contains 469.5 grams chlorothalonil (FRAC M5)
 Many brands of chlorothalonil are available, and testing was also conducted with Echo 720.

Across five studies conducted in Carrington and Hofflund (30 miles east of Williston),
 Bravo WeatherStik or Echo 720 (1.38 pt/ac) was less effective than
 Proline (5.7 fl oz/ac) except under low disease pressure.



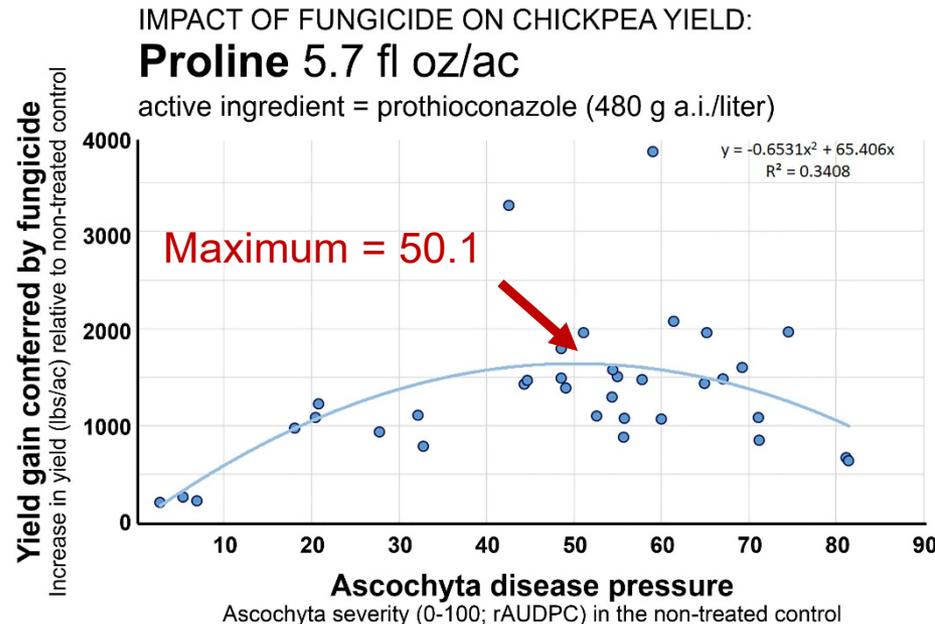
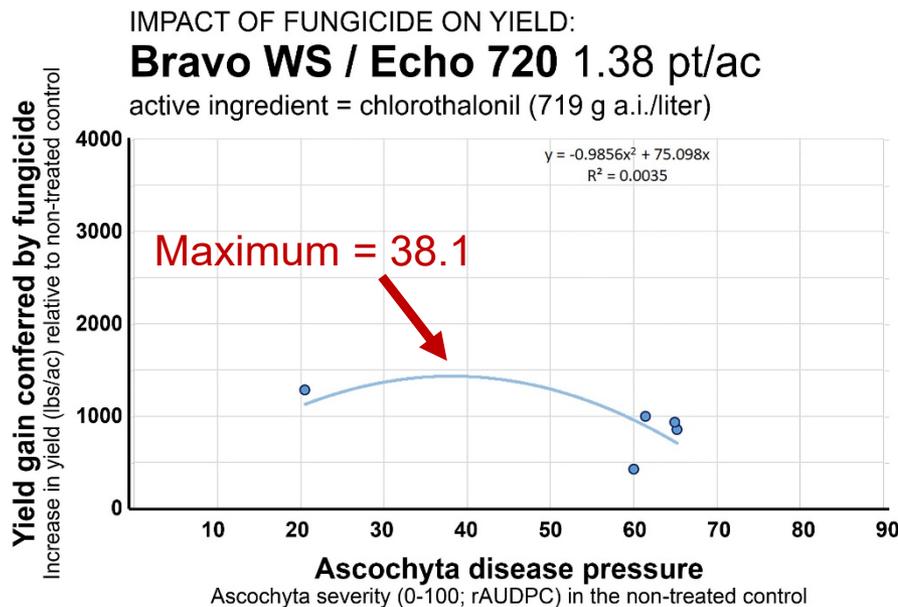
Bravo WeatherStik, registered at 1.38 to 2.0 pt/ac

BRAVO WEATHER STIK at 1.38 pints contains 469.5 grams chlorothalonil (FRAC M5)
Many brands of chlorothalonil are available, and testing was also conducted with Echo 720.

Across all studies in which Bravo Weather Stik or Echo 720 (1.38 pt) and Proline (5.7 fl oz) were evaluated:

- Bravo Weather Stik / Echo 720 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*
FRAC M5 fungicide:

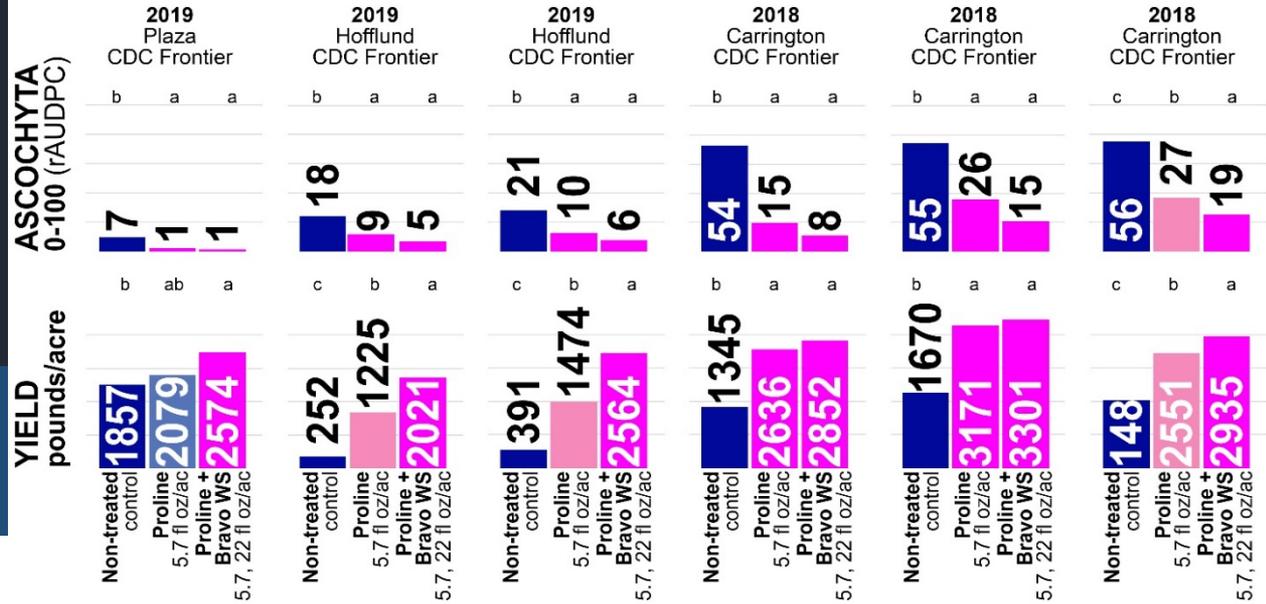
Bravo WeatherStik
(1.38 pt/ac)
tank-mixed with **Proline**
(5.0 or 5.7 fl oz/ac)

Bravo Weather Stik is most effective as a tank-mix partner with other fungicides

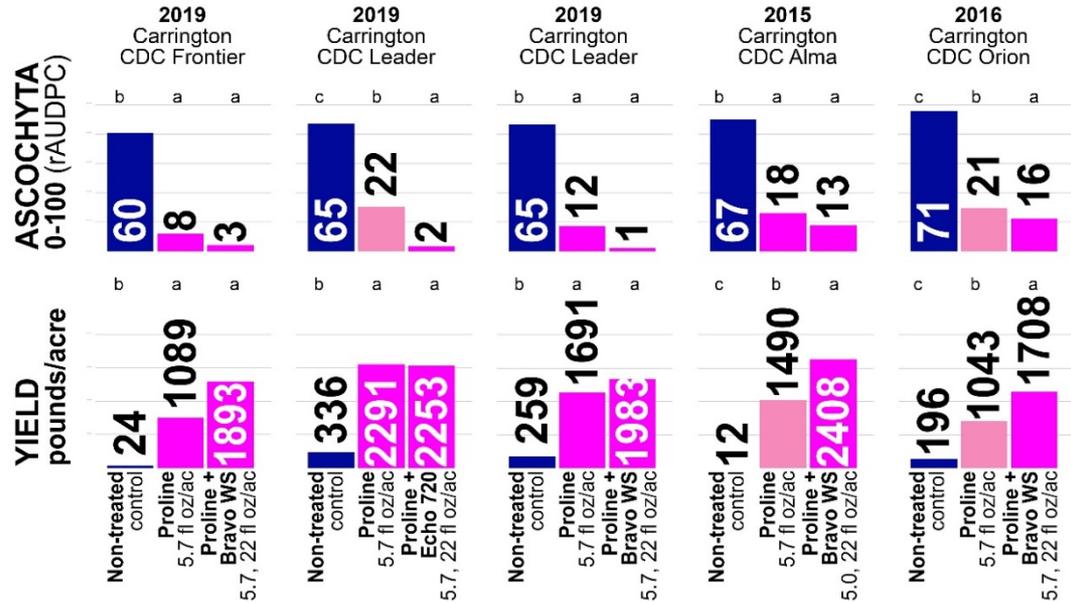
Across 11 studies conducted over 4 years, Tank-mixing Bravo WeatherStik (1.38 pt/ac) and Proline (5.0 or 5.7 fl oz/ac) consistently improved *Ascochyta* management relative to Proline applied alone.

Gains in disease control and yield were observed at low, moderate and high *Ascochyta* disease pressure.

LOW DISEASE PRESSURE



HIGH DISEASE PRESSURE



Fungicide efficacy, chickpea *Ascochyta* FRAC
M5 fungicide:

Bravo WeatherStik

(1.38 pt/ac)

tank-mixed with **Proline**

(5.0 or 5.7 fl oz/ac)

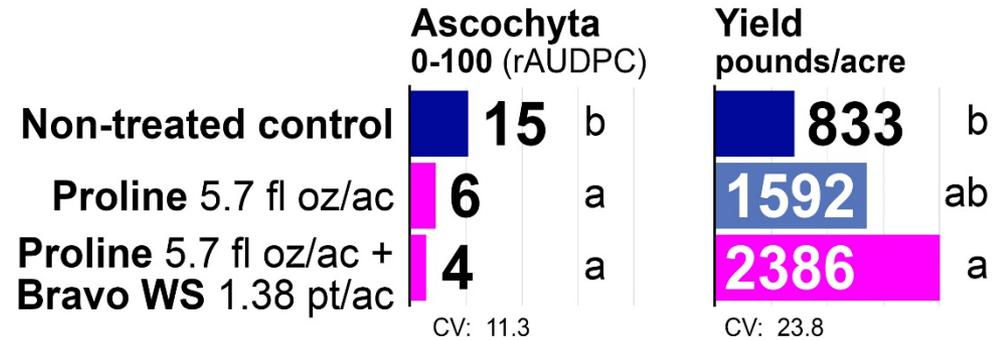
Bravo Weather Stik is
most effective as a tank-mix partner
with other fungicides

Across 11 studies conducted over 4 years, Tank-mixing Bravo WeatherStik (1.38 pt/ac) and Proline (5.0 or 5.7 fl oz/ac) consistently improved *Ascochyta* management relative to Proline applied alone.

Gains in disease control and yield were observed at low, moderate and high *Ascochyta* disease pressure.

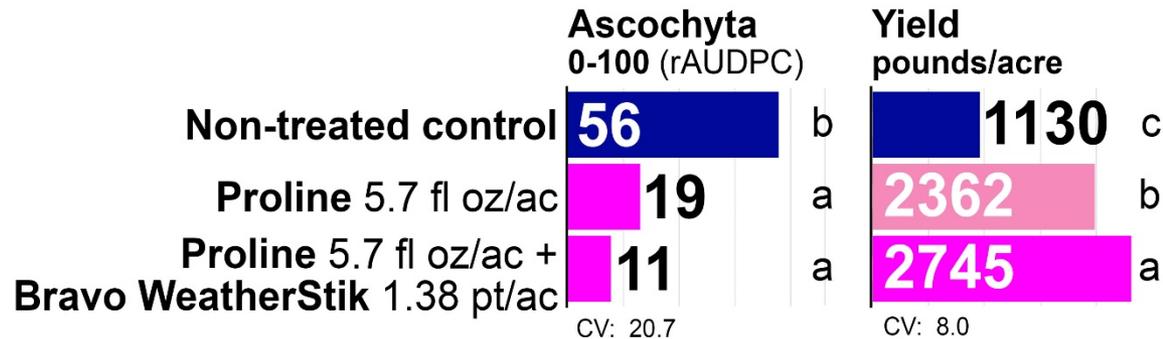
LOW DISEASE PRESSURE:

COMBINED ANALYSIS ACROSS 3 STUDIES



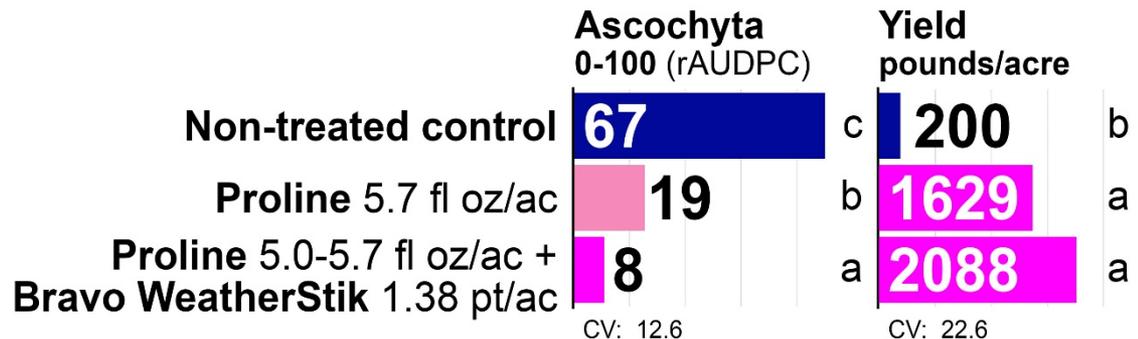
MODERATE to HIGH DISEASE PRESSURE:

COMBINED ANALYSIS ACROSS 4 STUDIES



HIGH to VERY HIGH DISEASE PRESSURE:

COMBINED ANALYSIS ACROSS 4 STUDIES



Fungicide efficacy, chickpea Ascochyta - FRAC M5 fungicide:

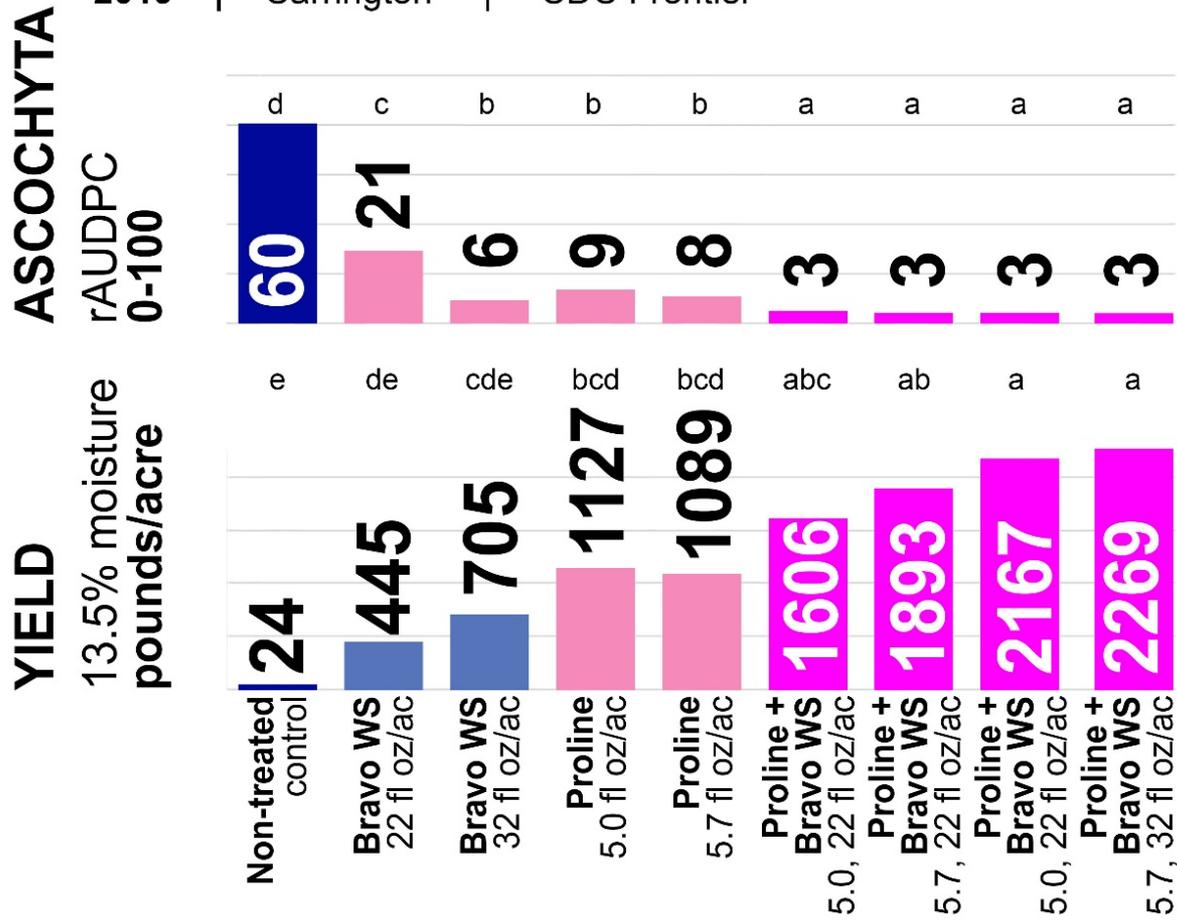
Bravo WeatherStik (1.38 or 2.0 pt/ac)
tank-mixed with **Proline** (5.0 or 5.7 fl oz/ac)

Bravo Weather Stik is most effective as a tank-mix partner with other fungicides

Preliminary data from a study conducted in Carrington in 2019:
Increasing the application rate of Bravo WeatherStik from 1.38 pt/ac to 2.0 pt/ac may increase the efficacy of tank-mixes with Proline.

Optimizing application rates: Bravo WeatherStik, Proline tank-mix

2019 | Carrington | 'CDC Frontier'



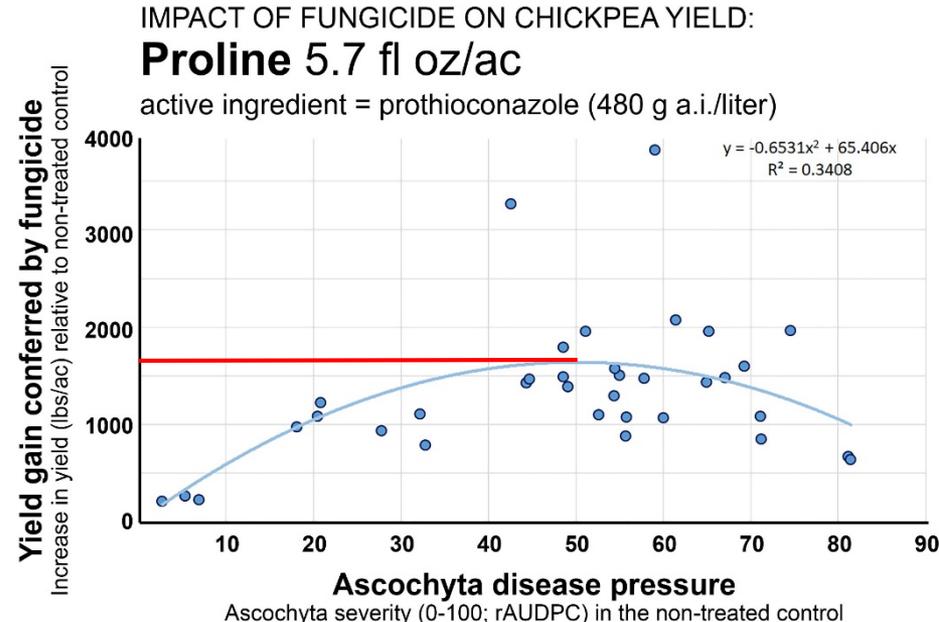
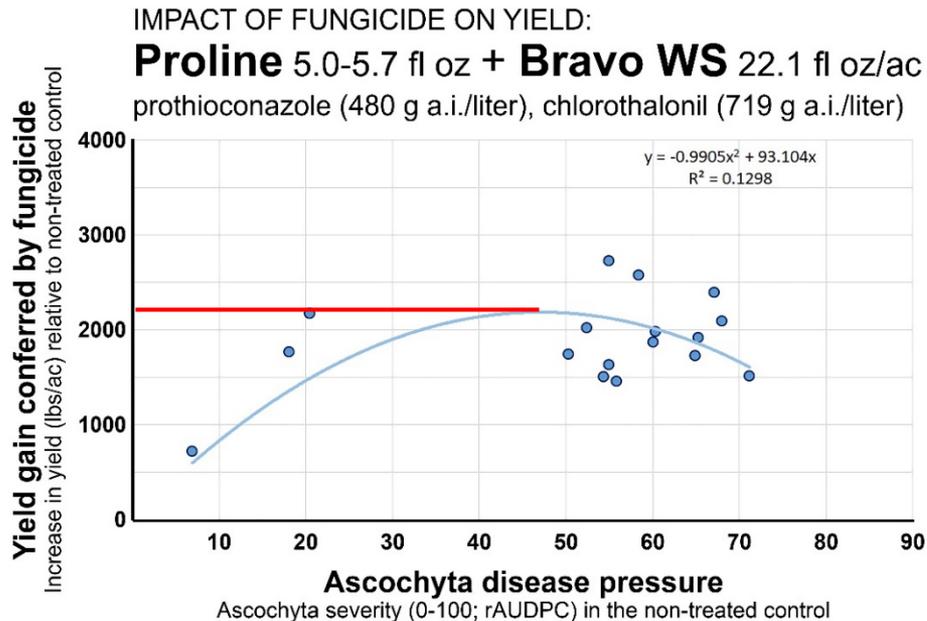
Fungicide efficacy, chickpea *Ascochyta* - FRAC M5 fungicide:
Bravo WeatherStik (1.38 or 2.0 pt/ac)
tank-mixed with **Proline (5.0 or 5.7 fl oz/ac)**

Bravo Weather Stik is most effective as a tank-mix partner with other fungicides

Across all studies in which Proline (5.0-5.7 fl oz) + Bravo WS (1.38 pt) and Proline (5.7 fl oz) were evaluated:

- At very high *Ascochyta* pressure, the yield gains from the tank-mix also declined just as with Proline applied alone, but average yield gains at any given level of disease pressure were higher with the tank-mix.

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



Bravo WeatherStik tank-mixed with Provysol, Veltyma or Revytek, new fungicides containing the triazole mefentrifluconazole (FRAC 3)

Mefentrifluconazole might also respond strongly to tank-mixing with Bravo WS

ACTIVE INGREDIENTS:

PROVYSOL (FRAC 3)
Provysol, 3.0 fl oz
 mefentrifluconazole, 35.5 grams
Provysol, 5.0 fl oz
 mefentrifluconazole, 59.2 grams

Proline, 5.0 fl oz/ac + **Bravo WeatherStik**, 1.38 pt/ac
Proline, 5.7 fl oz/ac + **Bravo WeatherStik**, 1.38 pt/ac
Proline, 5.0 fl oz/ac + **Bravo WeatherStik**, 2.0 pt/ac
Proline, 5.7 fl oz/ac + **Bravo WeatherStik**, 2.0 pt/ac

VELTYMA (FRAC 3, 11)
Veltyma, 7.0 fl oz
 mefentrifluconazole, 41.4 g
 pyraclostrobin, 41.4 grams
Veltyma, 9.0 fl oz
 mefentrifluconazole, 53.3 grams
 pyraclostrobin, 53.3 grams

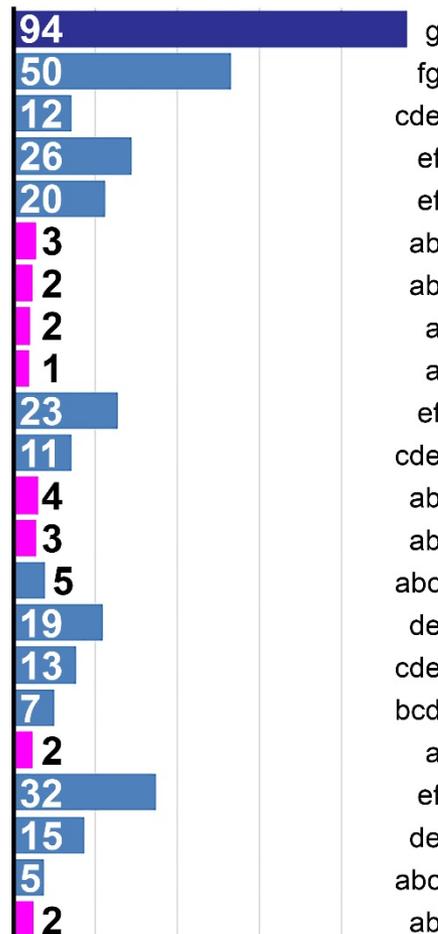
Provysol 3 fl oz + **Bravo WeatherStik** 1.38 pt
Provysol 3 fl oz + **Bravo WeatherStik** 2.0 pt
Provysol 5 fl oz + **Bravo WeatherStik** 1.38 pt

REVYTEK (FRAC 3, 7, 11)
Revytek, 8.0 fl oz
 mefentrifluconazole, 31.5 grams
 fluxapyroxad, 21.0 grams
 pyraclostrobin, 42.0 grams
Revytek, 10.0 fl oz
 mefentrifluconazole, 39.3 grams
 fluxapyroxad, 26.2 grams
 pyraclostrobin, 52.4 grams

Veltyma 7 fl oz + **Bravo WS** 1.38 pt
Veltyma 9 fl oz + **Bravo WS** 1.38 pt
Revytek 8 fl oz
Revytek 10 fl oz
Revytek 8 fl oz + **Bravo WS** 1.38 pt
Revytek 10 fl oz + **Bravo WS** 1.38 pt

Ascochyta severity

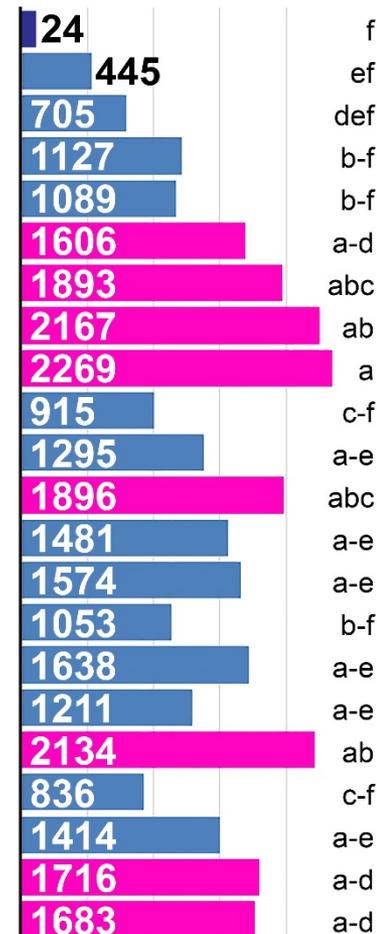
August 22-24 | early senescence percent of canopy



CV: 18.9

Yield

13.5% moisture pounds/acre



CV: 35.8

Fungicide efficacy, chickpea *Ascochyta* - FRAC M5 fungicide:

Bravo WeatherStik (1.38 pt/ac) tank-mixed with Priaxor (4.0 fl oz/ac)

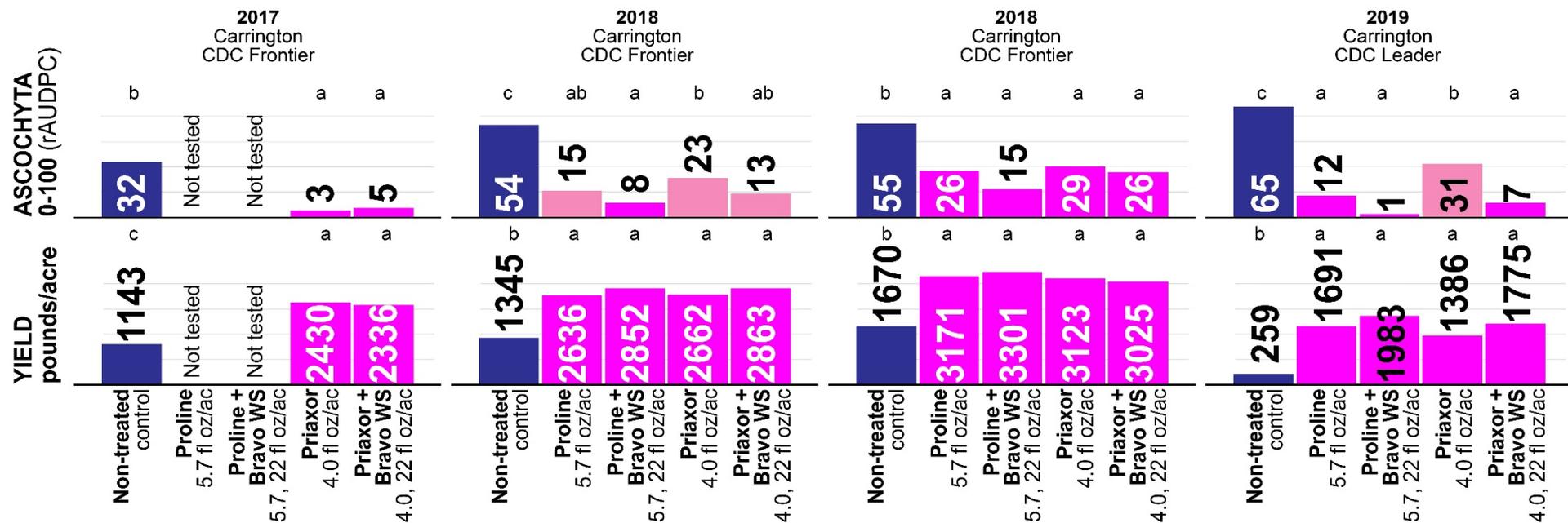
Priaxor is a premix of fluxapyroxad (FRAC 7) and pyraclostrobin (FRAC 11)

Across four studies conducted in Carrington from 2017-2019,
Tank-mixing Priaxor (4.0 fl oz) with Bravo WS (1.38 pt) sometimes, but not
always, improved *Ascochyta* management.

This tank-mix performed strongest under very high disease pressure and otherwise performed less
consistently than Proline + Bravo WS.

LOW DISEASE PRESSURE

HIGH DISEASE PRESSURE

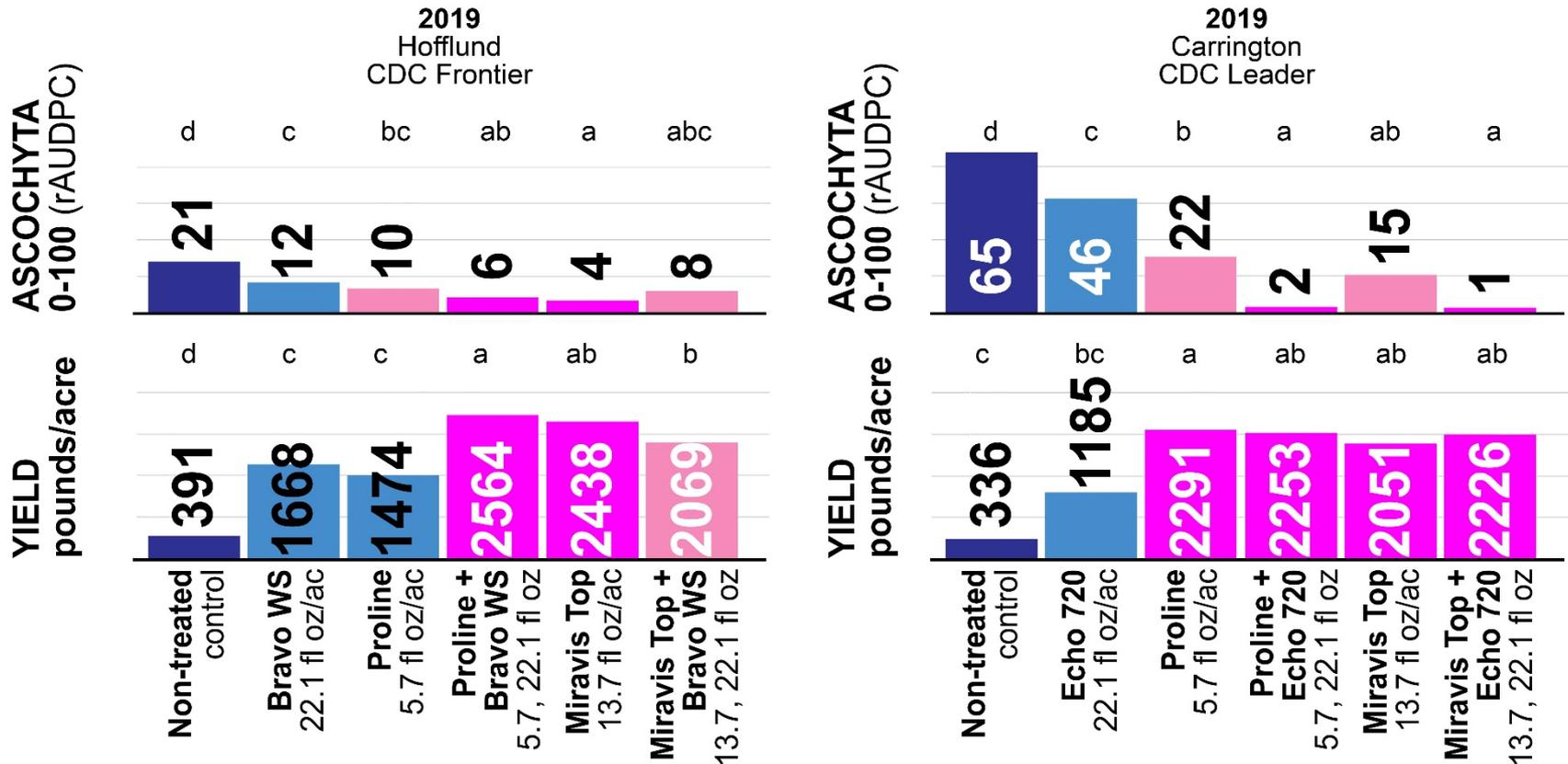


Bravo WeatherStik (1.38 pt/ac) tank-mixed with Miravis Top (13.7 fl oz/ac)

Miravis Top is a premix of pydiflumetofen (FRAC 7) and difenoconazole (FRAC 3)

Across two studies conducted in Carrington and Hofflund, ND in 2019, Tank-mixing Miravis Top (13.7 fl oz) with Bravo WS (1.38 pt) sometimes, but not always, improved *Ascochyta* management.

This tank-mix performed less consistently than Proline + Bravo WS.



Tank mixes with **Bravo WeatherStik** (1.38 pt/ac):

CONCLUSIONS

Preliminary conclusions from ongoing research

- **Tank-mixing Bravo WeatherStik** (1.38 pt/ac) and **Proline** (5.0 or 5.7 fl oz/ac) **consistently improved Ascochyta management** relative to Proline applied alone. Gains in disease control and yield were observed at low, moderate and high Ascochyta disease pressure.
- **Increasing the application rate of Bravo WeatherStik** from 1.38 pt to 2.0 pt/ac may increase the efficacy of tank-mixes with Proline (5.0 or 5.7 fl oz/ac).
- **Provysol**, the new triazole fungicide from BASF, and associated premix fungicides may also show strong increases in efficacy when tank-mixed with Bravo WeatherStik.
- **Tank-mixing Bravo WS with the SDHI fungicide Priaxor and the SDHI + triazole premix fungicide Miravis Top** improved Ascochyta management under high disease pressure but did not provide consistent improvements in Ascochyta management.

Managing Ascochyta blight of chickpeas with fungicides:

Methods

FUNGICIDE APPLICATION TIMING AND METHODS

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.

Managing Ascochyta blight of chickpeas with fungicides:

Methods

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.

Managing Ascochyta blight of chickpeas with fungicides:

Overview

UNDERSTANDING THE FACTORS THAT INFLUENCE FUNGICIDE EFFICACY

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