

Improving disease management in chickpeas and field peas

Ascochyta blight – chickpeas, field peas

Fusarium, Aphanomyces root rots – field peas



Collaborative research:

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Michael Wunsch, plant pathologist **NDSU Carrington Research Extension Center**



Managing Qol-resistant *Ascochyta* in chickpeas



Pathogen: *Ascochyta rabiei*

TIMELINE:

2007: laboratory confirmation of Qol resistance

2008: loss of efficacy in Carrington field trials

Ascochyta management in chickpeas:

Proline (FRAC 3) vs. Endura (FRAC 7)

Hofflund (2013)
CDC 'Frontier'

Three fungicide applications
Spray droplet size: **fine**

Carrington (2010)
'Sierra'

Four fungicide applications
Spray droplet size: **very fine**

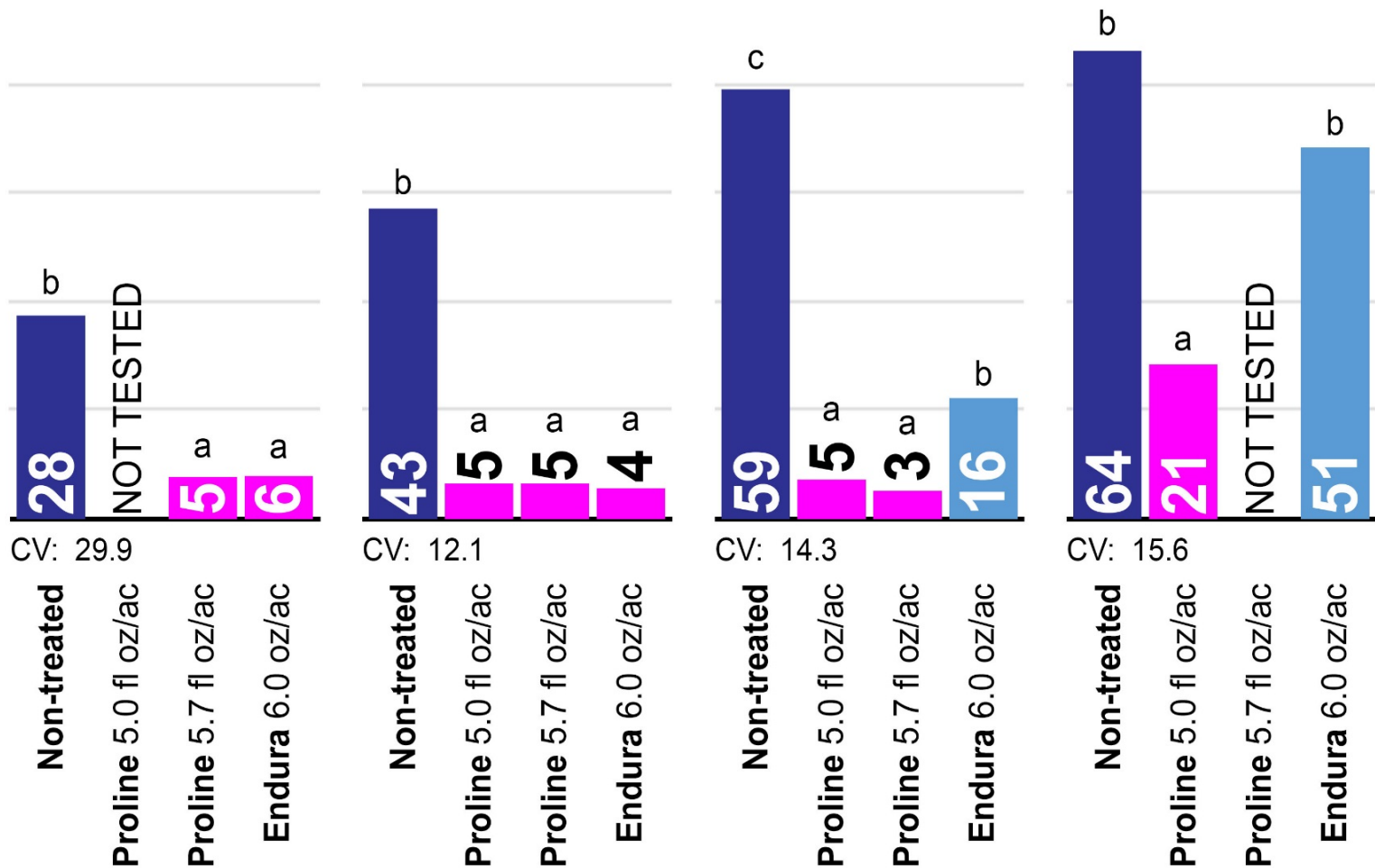
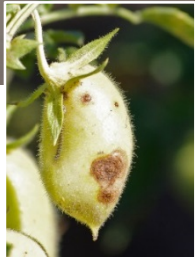
Carrington (2009)
'Sierra'

Three fungicide applications
Spray droplet size: **fine**

Minot (2011)
CDC 'Xena'

Four fungicide applications
Spray droplet size: **fine**

Ascochyta severity (0-100; bloom through maturity)



Spray volume:

2013
Hofflund:
20 gal/ac

2011
Minot:
17.5 gal/ac

2009, 2010:
17 gal/ac

Ascochyta management in chickpeas:

Proline (FRAC 3) vs. Endura (FRAC 7)

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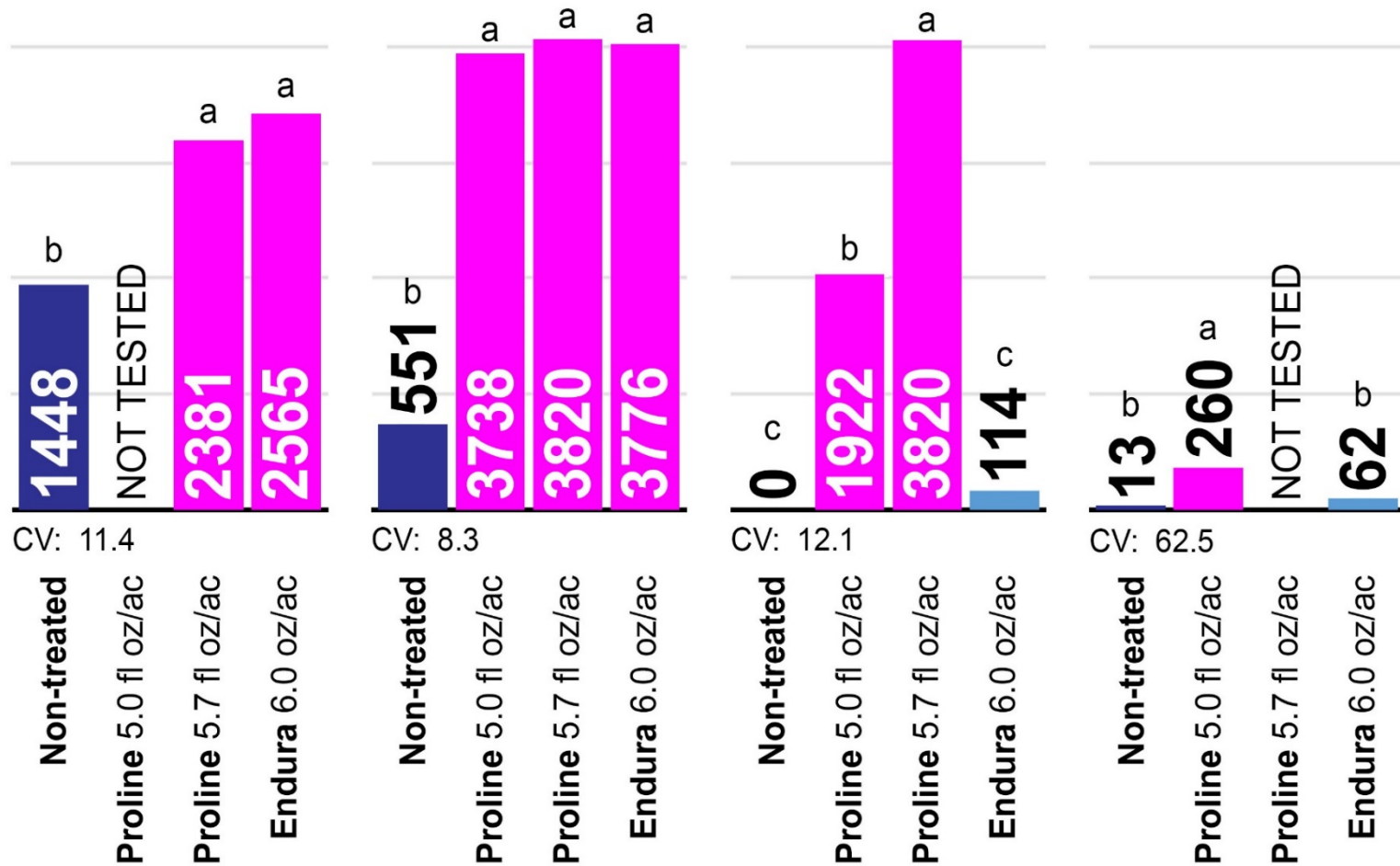
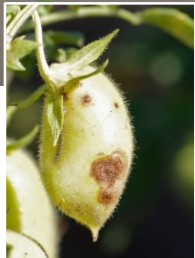
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Chickpea yield (pounds/acre; 13.5% moisture)



Spray volume:

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Minot:
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2009, 2010:
17 gal/ac

Ascochyta management in chickpeas:

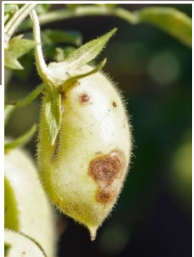
Proline (FRAC 3) vs. Delaro (FRAC 3,11)

Delaro should be applied with supplemental Proline

5.0 fl oz/ac Proline =
71 g/ac prothioconazole

5.7 fl oz/ac Proline =
81 g/ac prothioconazole

12 fl oz/ac Delaro =
63 g/ac prothioconazole



Ascochyta management in chickpeas: Proline (FRAC 3) vs. Priaxor (FRAC 7,11)

Carrington (2012)
CDC 'Frontier'

Three fung. applications
Spray droplet size: **fine**

Hofflund (2012)
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Four fung. applications
Spray droplet size: **fine**

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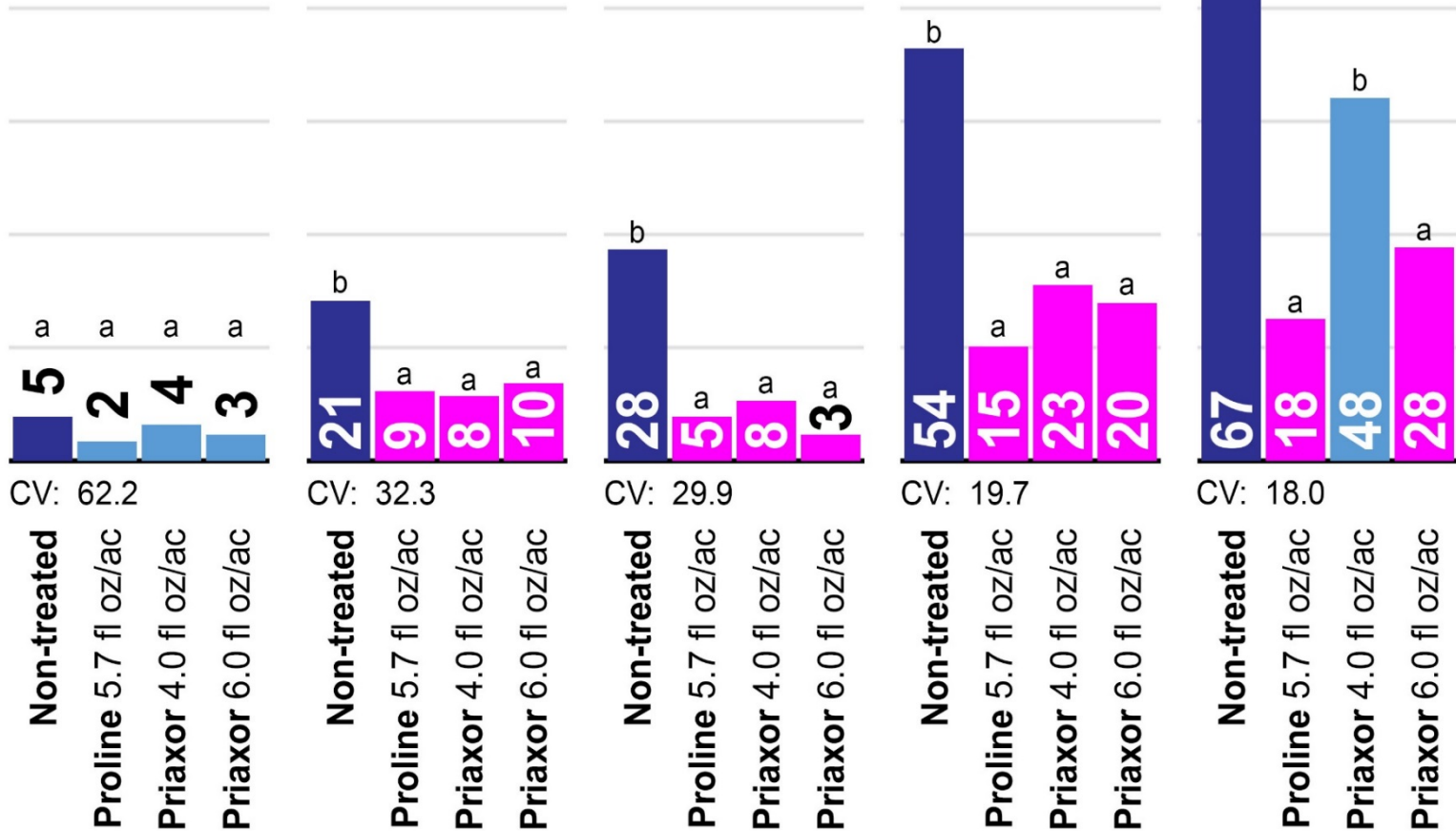
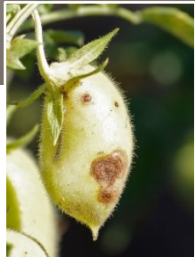
Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplets: **medium**

Carrington (2015)
CDC 'Alma'

Four fung. applications
Spray droplet size: **fine**

Ascochyta severity (0-100; bloom through maturity)



Spray volume:

2012, 2013
Hofflund:
20 gal/ac

2012
Carrington:
17.5 gal/ac

2015, 2018:
15 gal/ac

Ascochyta management in chickpeas: Proline (FRAC 3) vs. Priaxor (FRAC 7,11)

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Three fung. applications
Spray droplet size: **fine**

Hofflund (2012)
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Four fung. applications
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Hofflund (2013)
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Three fung. applications
Spray droplet size: **fine**

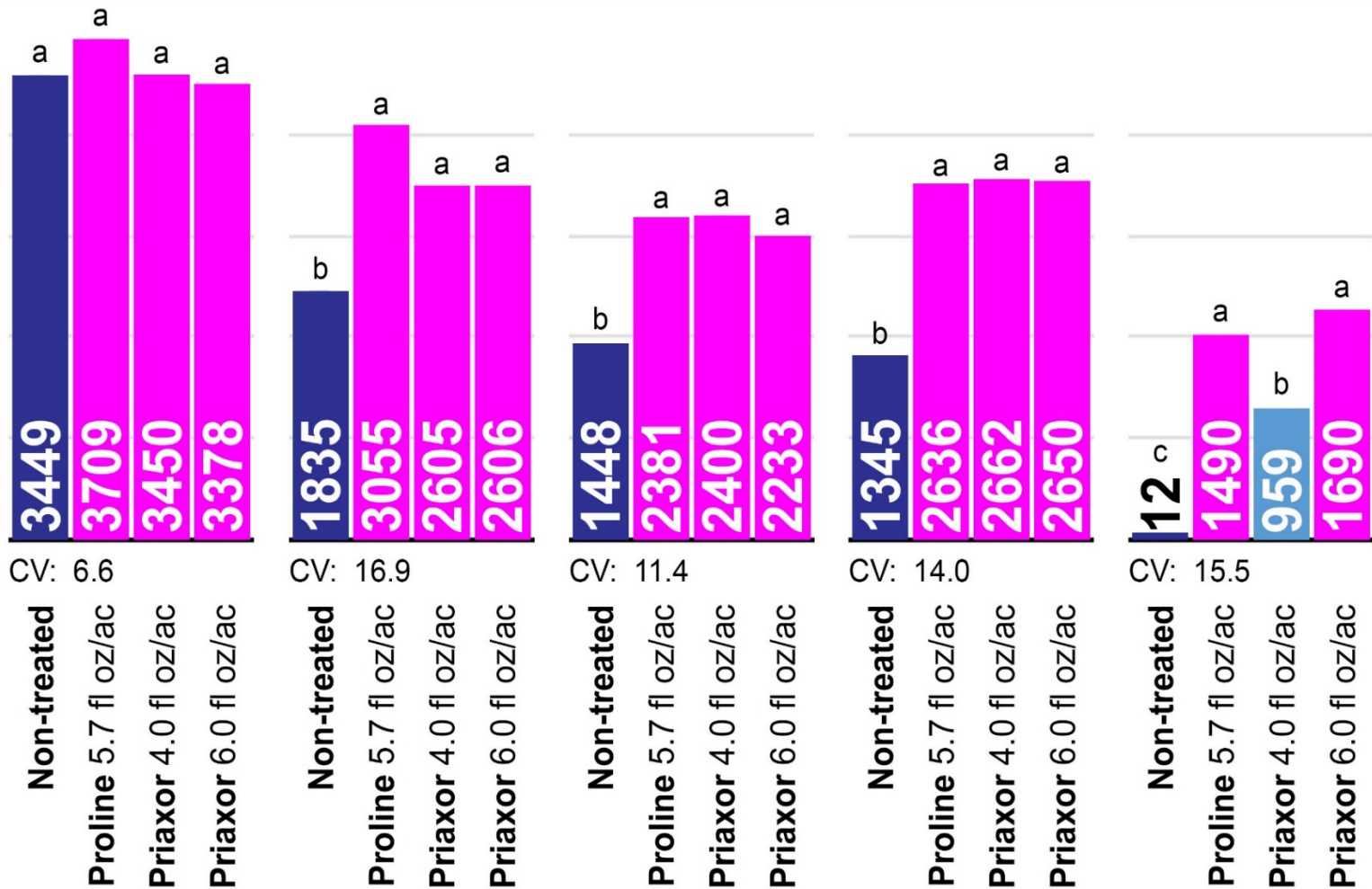
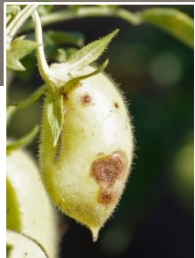
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Four fung. applications
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Chickpea yield (pounds/acre; 13.5% moisture)



Spray volume:

2012, 2013
Hofflund:
20 gal/ac

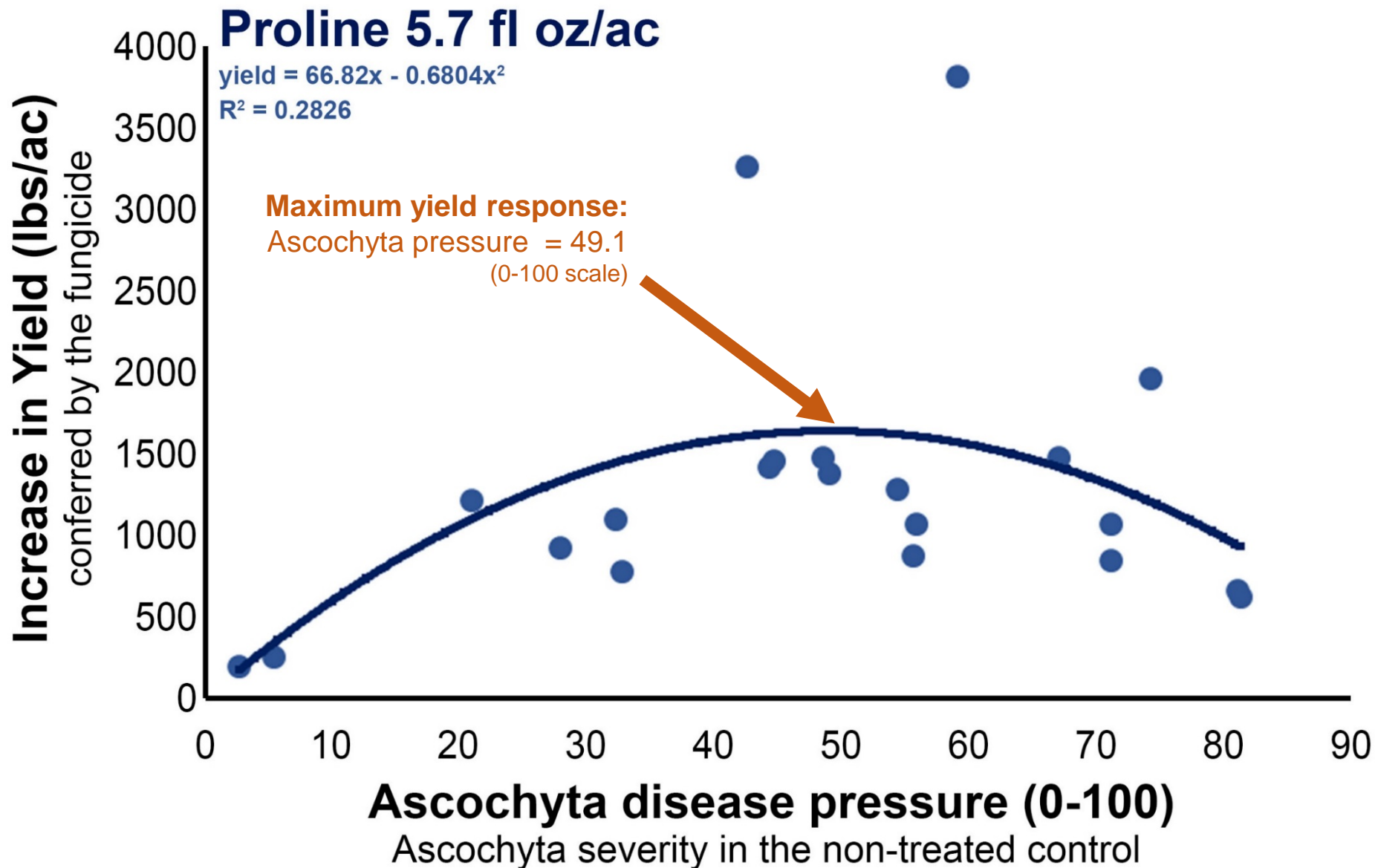
2012
Carrington:
17.5 gal/ac

2015, 2018:
15 gal/ac

Performance of Proline relative to Ascochyta pressure in chickpeas

'CDC Frontier', 'CDC Alma', 'CDC Orion' and 'Sierra' kabuli chickpeas

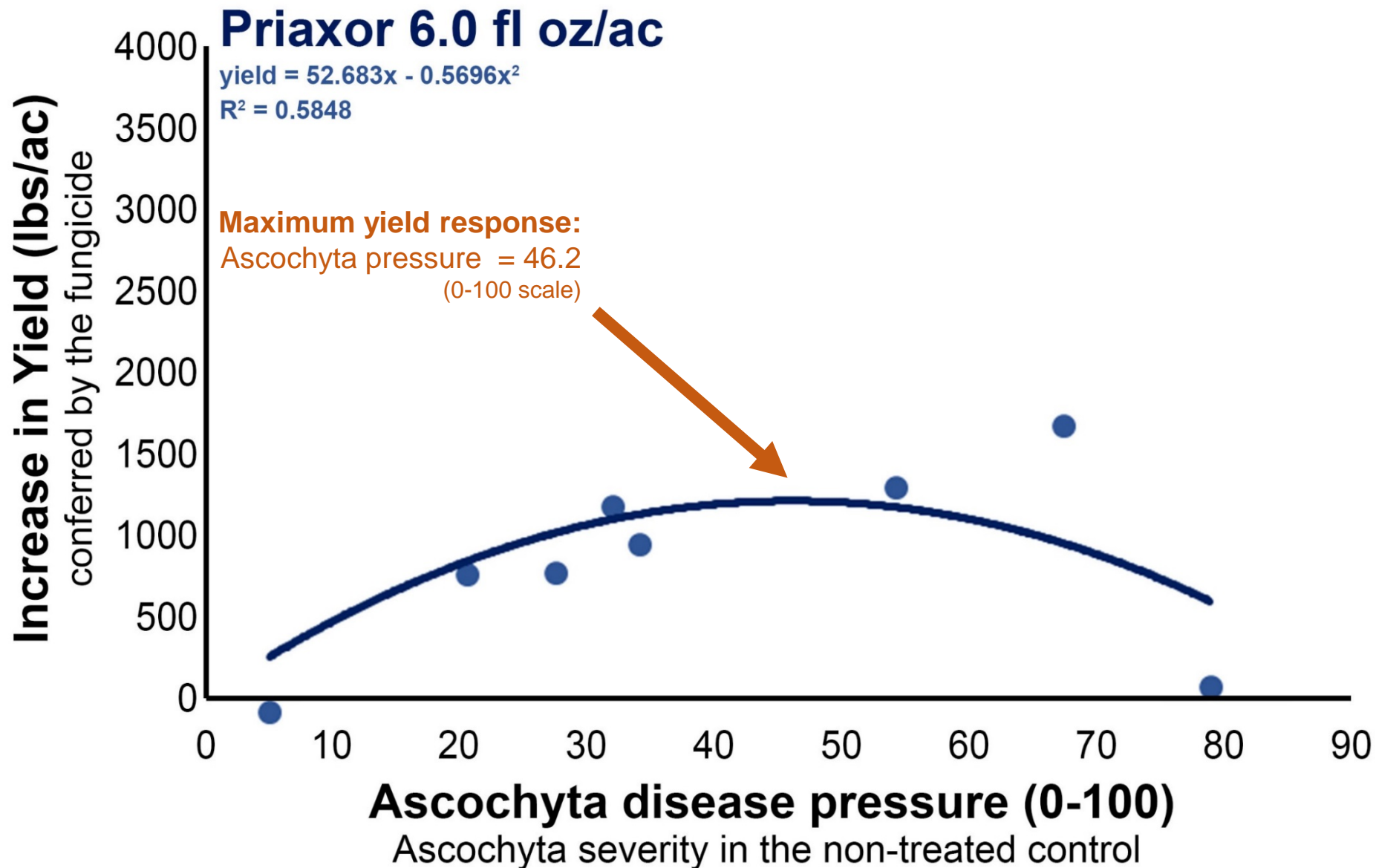
Carrington and Hofflund, ND (2008-2018)



Performance of Priaxor relative to Ascochyta pressure in chickpeas

'CDC Frontier', 'CDC Alma', and 'CDC Xena' kabuli chickpeas

Carrington and Hofflund, ND (2011-2018)



Performance of Priaxor relative to Ascochyta pressure in chickpeas

'CDC Frontier', 'CDC Alma', 'CDC Orion' and 'CDC Xena' kabuli chickpeas

Carrington and Hofflund, ND (2011-2018)

Priaxor 4.0 fl oz/ac

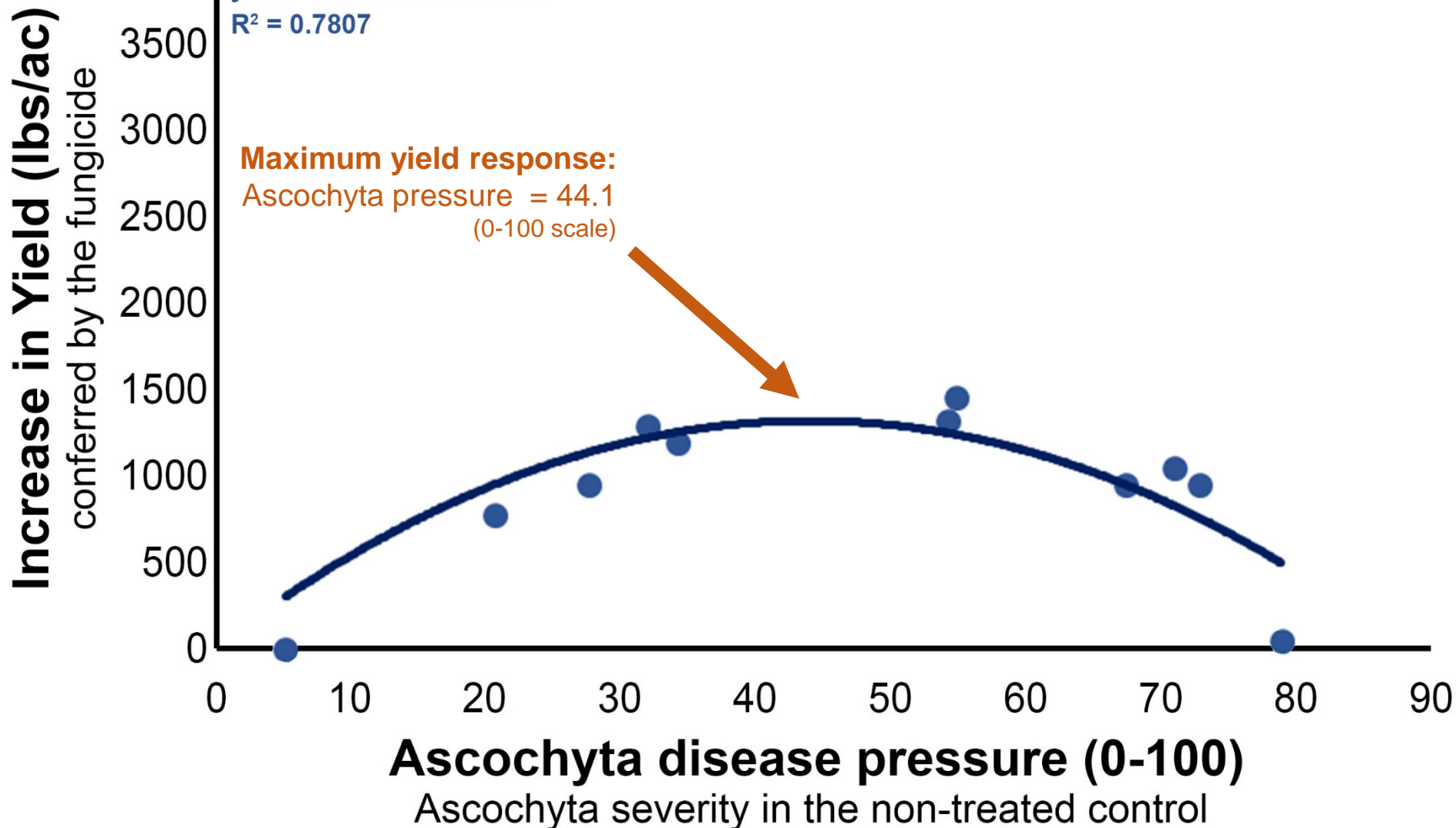
$$\text{yield} = 59.645x - 0.6755x^2$$

$$R^2 = 0.7807$$

Maximum yield response:

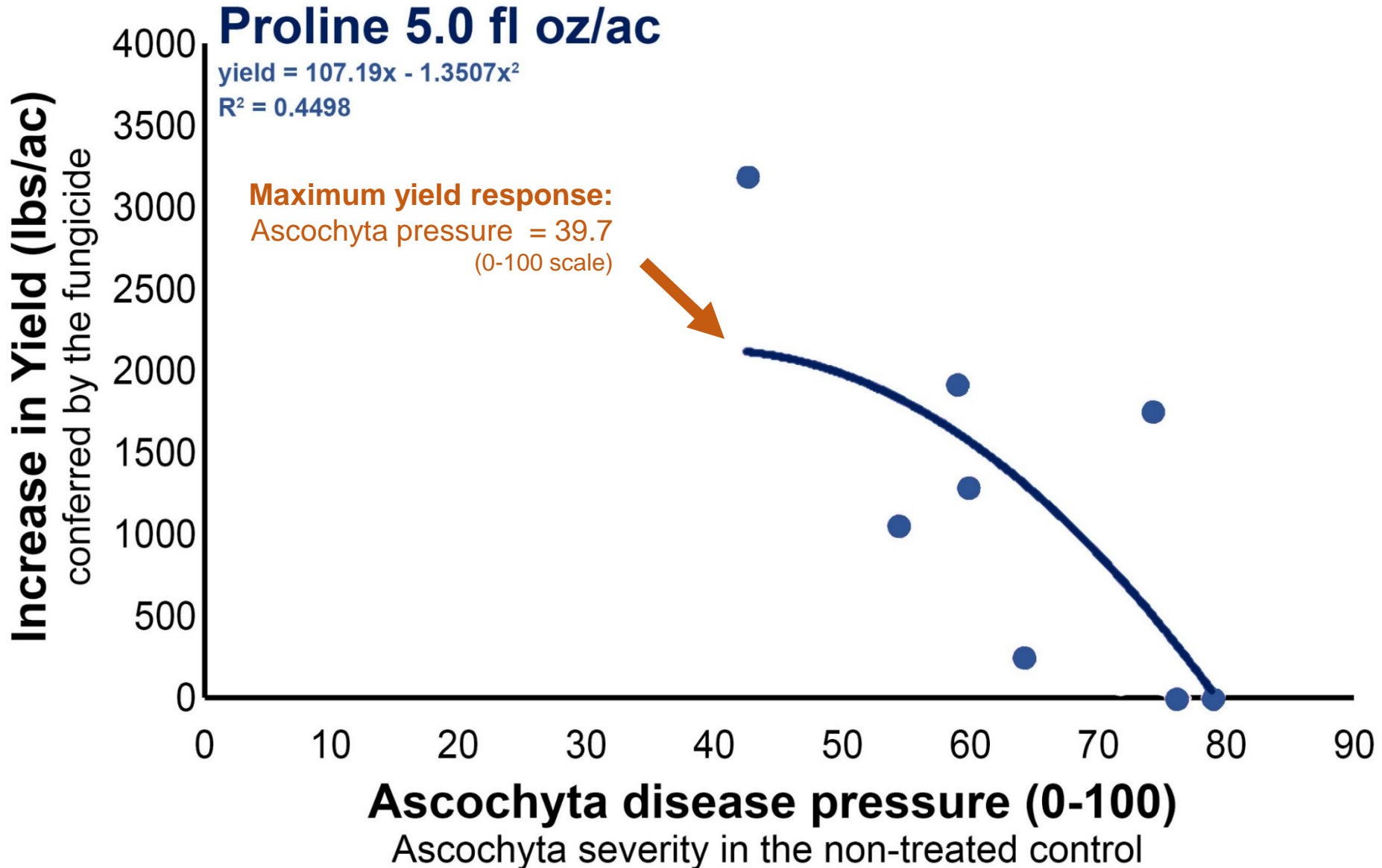
Ascochyta pressure = 44.1

(0-100 scale)



Performance of Proline relative to Ascochyta pressure in chickpeas

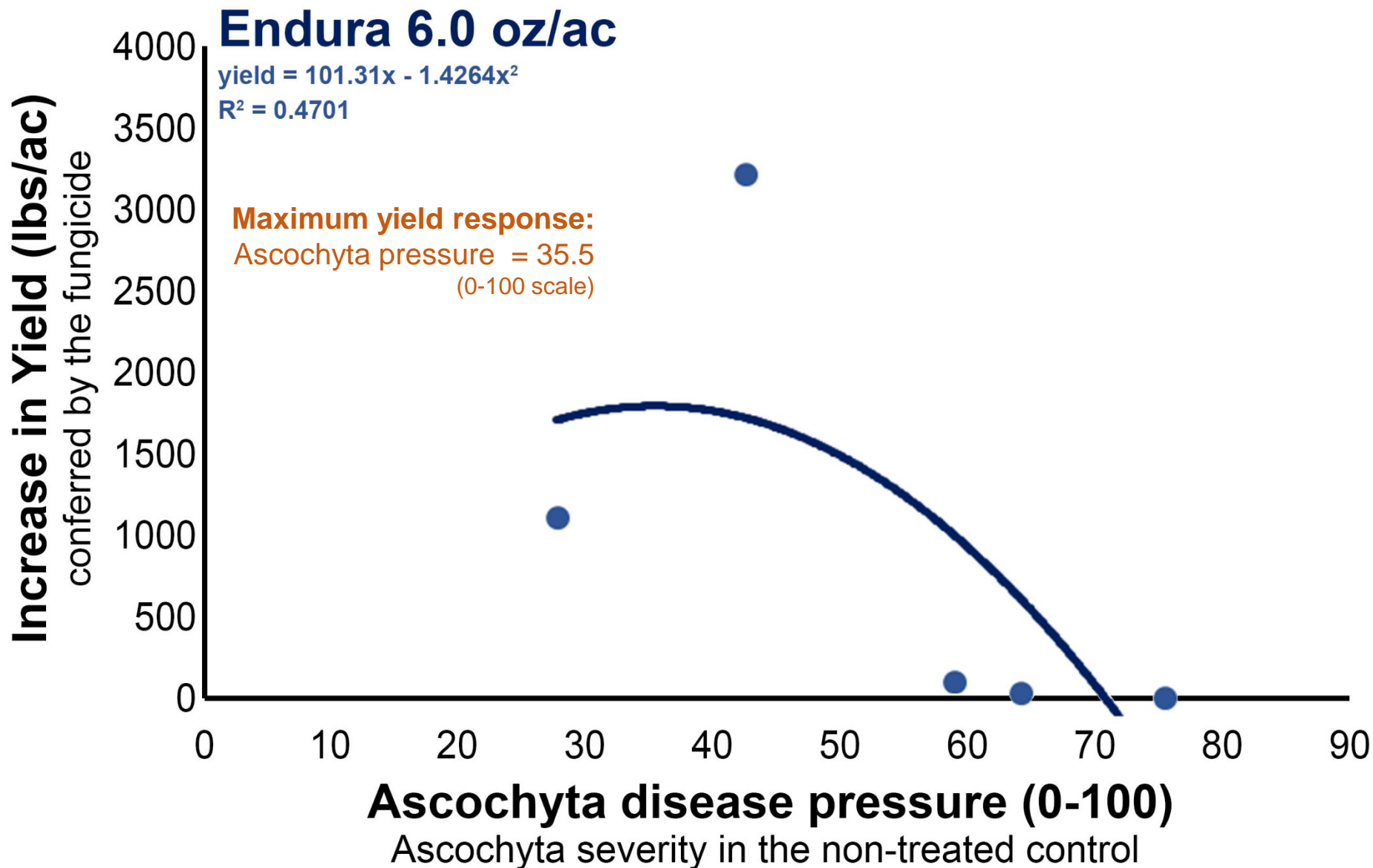
'CDC Frontier', 'CDC Alma', 'CDC Orion' and 'Sierra' kabuli chickpeas
Carrington and Minot, ND (2007-2018)



Performance of Endura relative to Ascochyta pressure in chickpeas

'CDC Frontier', 'CDC Xena', and 'Sierra' kabuli chickpeas

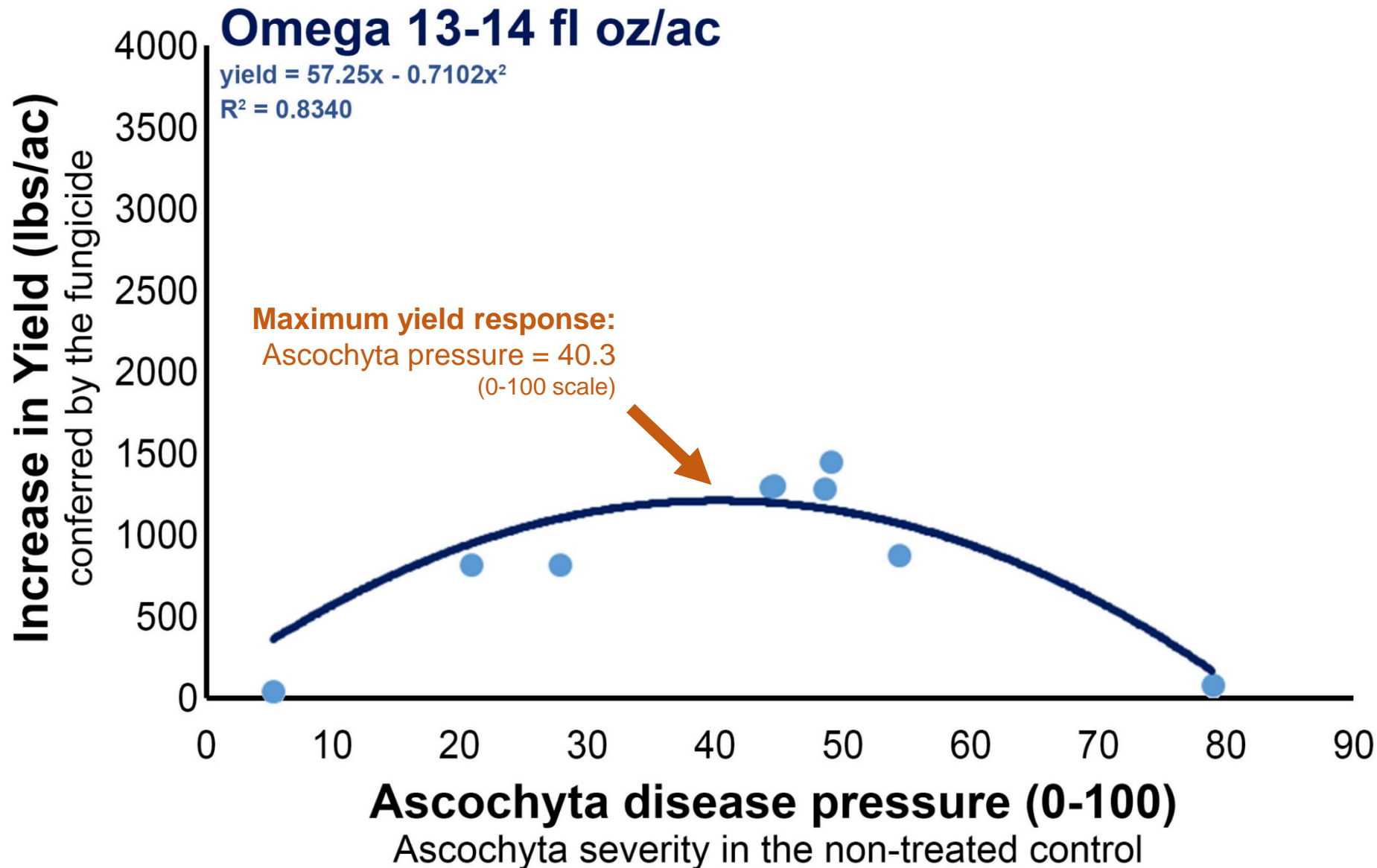
Carrington, Minot and Hofflund, ND (2009-2013)



Performance of Omega relative to Ascochyta pressure in chickpeas

'CDC Frontier', 'CDC Alma', 'CDC Xena' and 'Sierra' kabuli chickpeas

Carrington and Hofflund, ND (2011-2018)



Ascochyta management in chickpeas:

Proline (FRAC 3) vs. Proline + Bravo WS (FRAC 3, M)

Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplets: **medium**

Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplets: **medium**

Carrington (2018)
CDC 'Frontier'

Five fung. applications
Spray droplets: **fine**

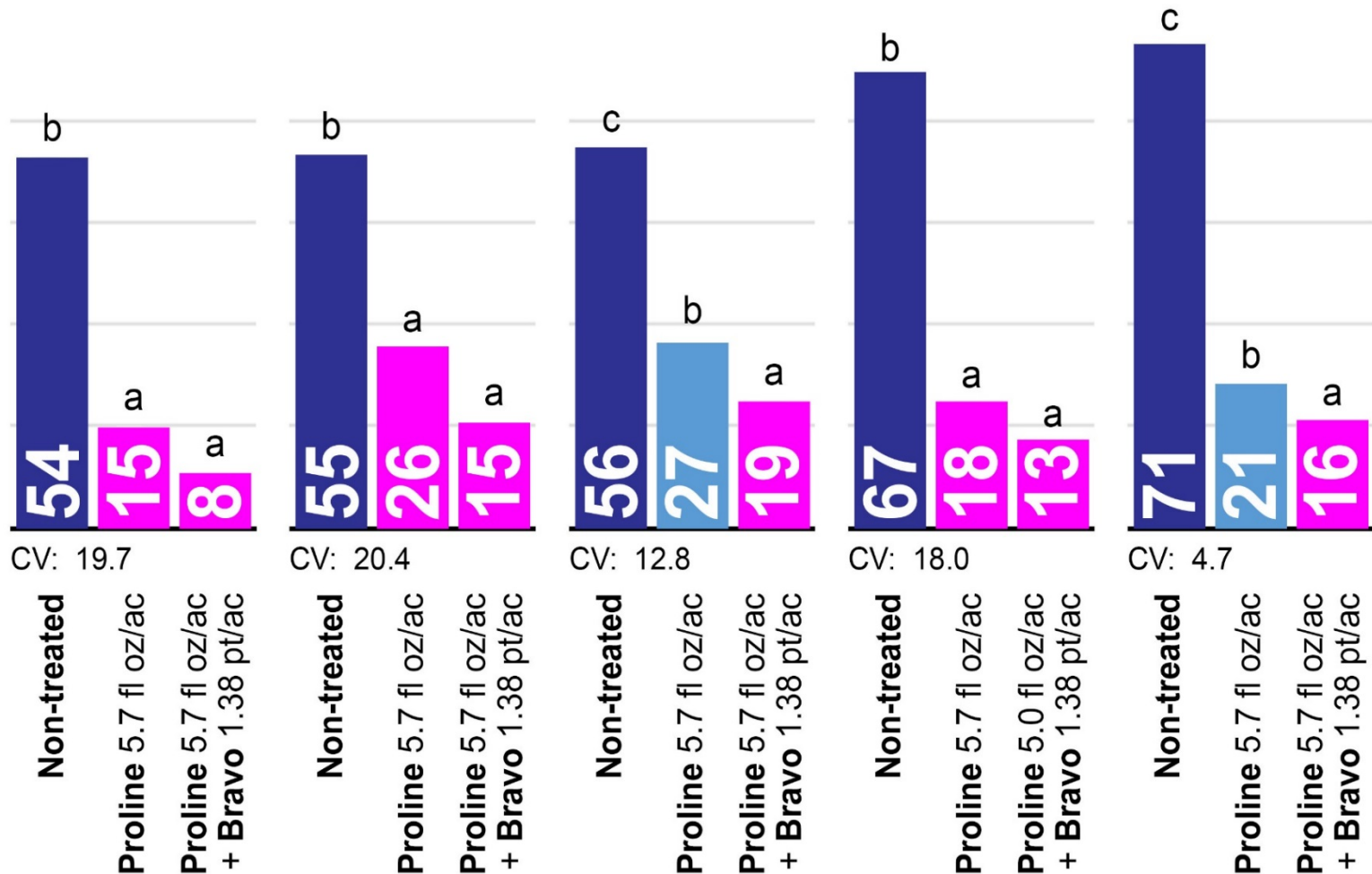
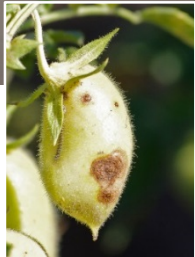
Carrington (2015)
CDC 'Alma'

Five fung. applications
Spray droplets: **fine**

Carrington (2016)
CDC 'Orion'

Six fung. applications
Spray droplets: **fine**

Ascochyta severity (0-100; bloom through maturity)



Spray volume

All studies:
15 gal/ac

Ascochyta management in chickpeas:

Proline (FRAC 3) vs. Proline + Bravo WS (FRAC 3, M)

Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplets: **medium**

Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplets: **medium**

Carrington (2018)
CDC 'Frontier'

Five fung. applications
Spray droplets: **fine**

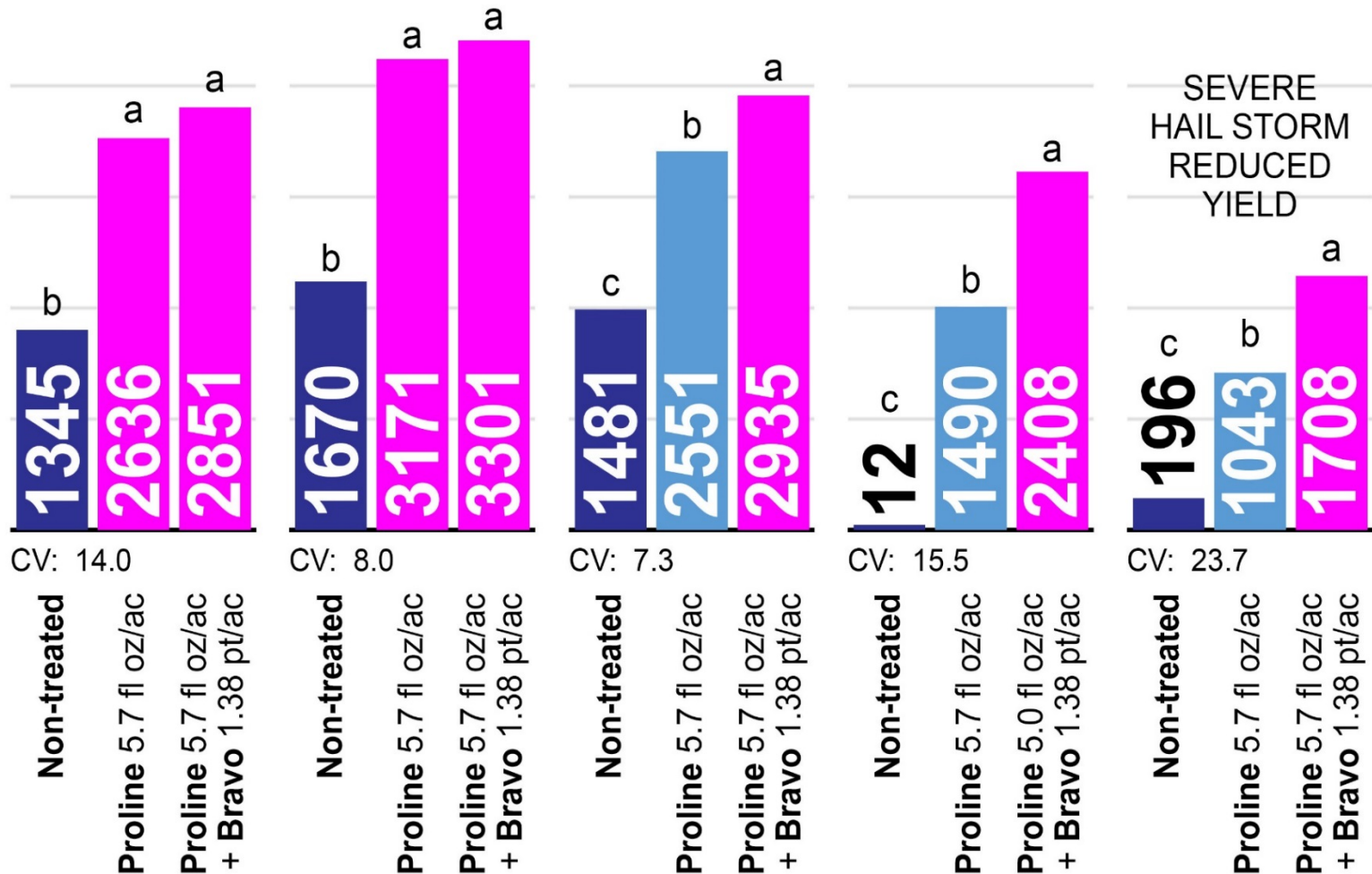
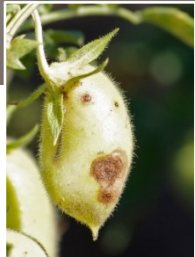
Carrington (2015)
CDC 'Alma'

Five fung. applications
Spray droplets: **fine**

Carrington (2016)
CDC 'Orion'

Six fung. applications
Spray droplets: **fine**

Chickpea yield (pounds/acre; 13.5% moisture)



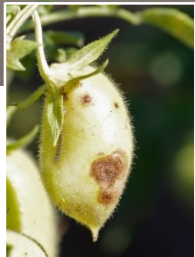
SEVERE HAIL STORM
REDUCED
YIELD

Spray volume

All studies:
15 gal/ac

Ascochyta management in chickpeas:

Proline (FRAC 3) vs. Proline + Bravo WS (FRAC 3, M)



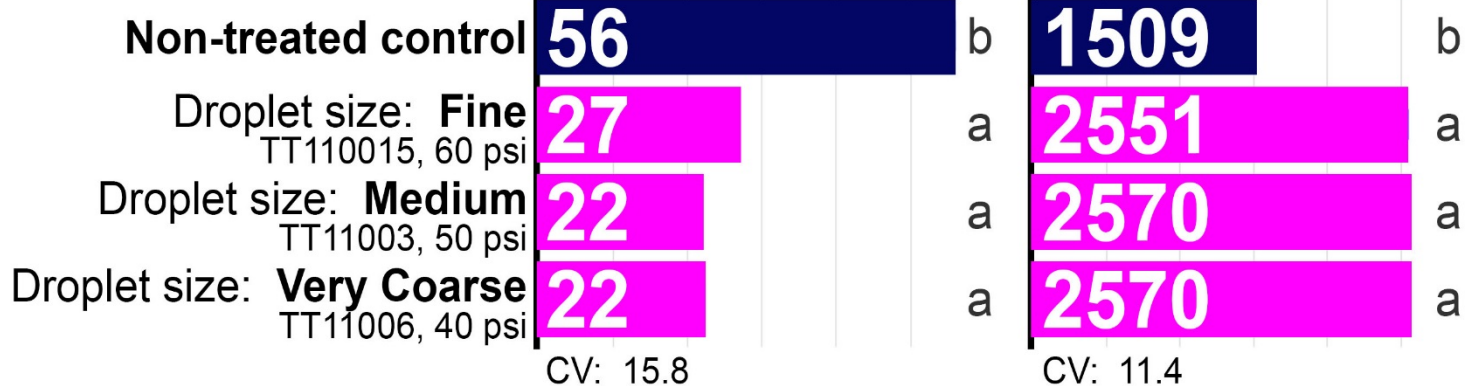
Ascochyta

bloom to late pod-fill
0-100

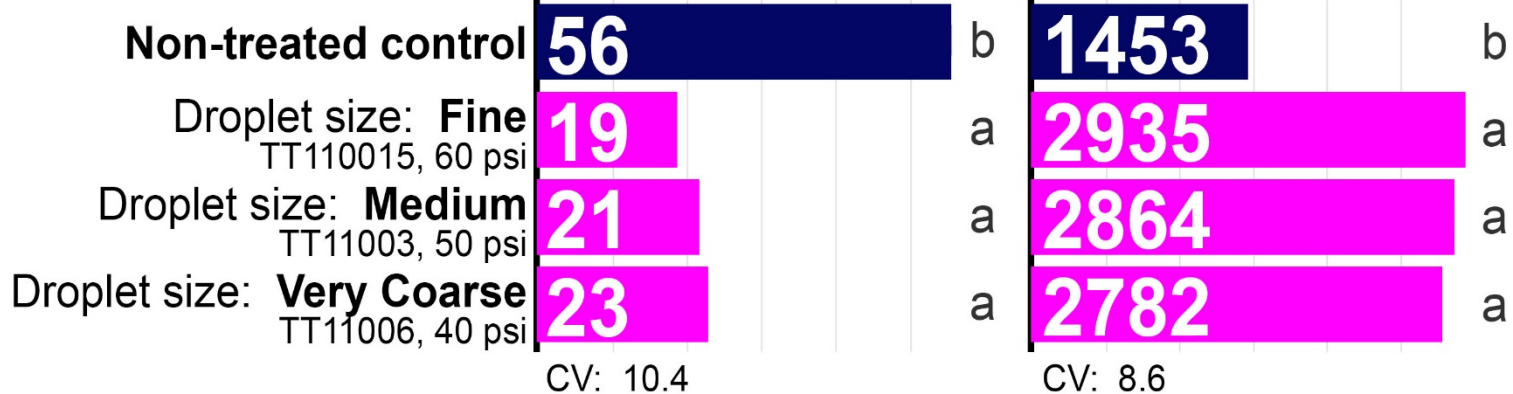
Yield

13.5% moisture
pounds/acre

Proline 5.7 fl oz/ac + NIS (Preference) 0.125% v/v



Proline 5.7 fl oz/ac + Bravo WS 1.38 pt/ac + NIS (Preference) 0.125% v/v



Driving speed: 3.6 mph Spray volume: 15 gal/ac

Calibrated pulse widths: TT110015 = 100%; TT11003 = 42%; TT11006 = 24%

Ascochyta management in chickpeas:

Priaxor (FRAC 7,11) vs. Priaxor + Bravo WS (FRAC 7, 11, M)

Carrington (2017)
CDC 'Frontier'

Five fung. applications
Spray droplet size: **medium**

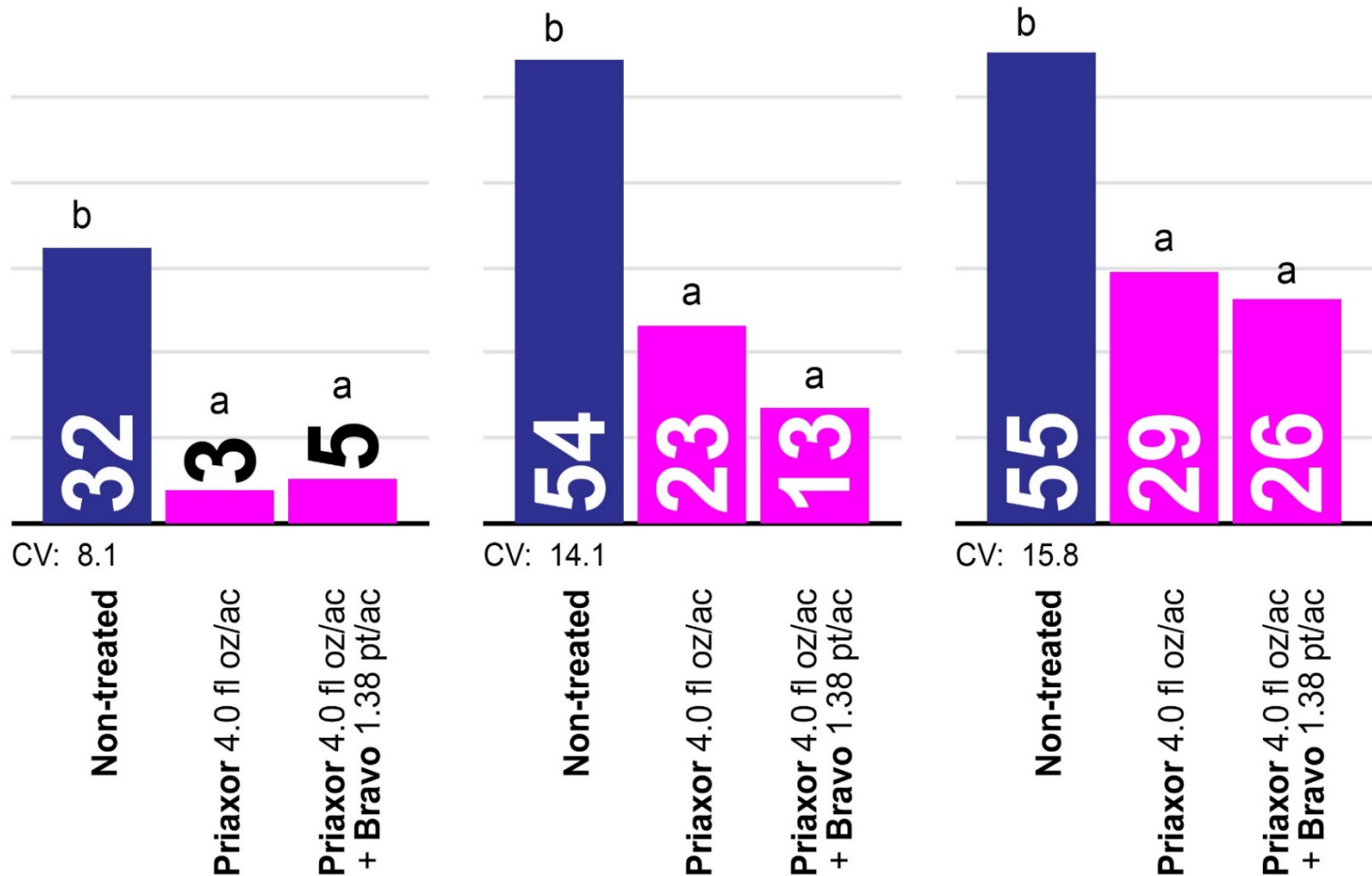
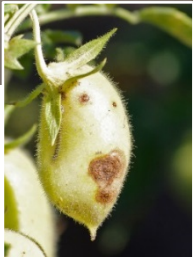
Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplet size: **medium**

Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplet size: **medium**

Ascochyta severity (0-100; bloom through maturity)



Spray volume

All studies:
15 gal/ac

Ascochyta management in chickpeas:

Priaxor (FRAC 7,11) vs. Priaxor + Bravo WS (FRAC 7, 11, M)

Carrington (2017)
CDC 'Frontier'

Five fung. applications
Spray droplet size: **medium**

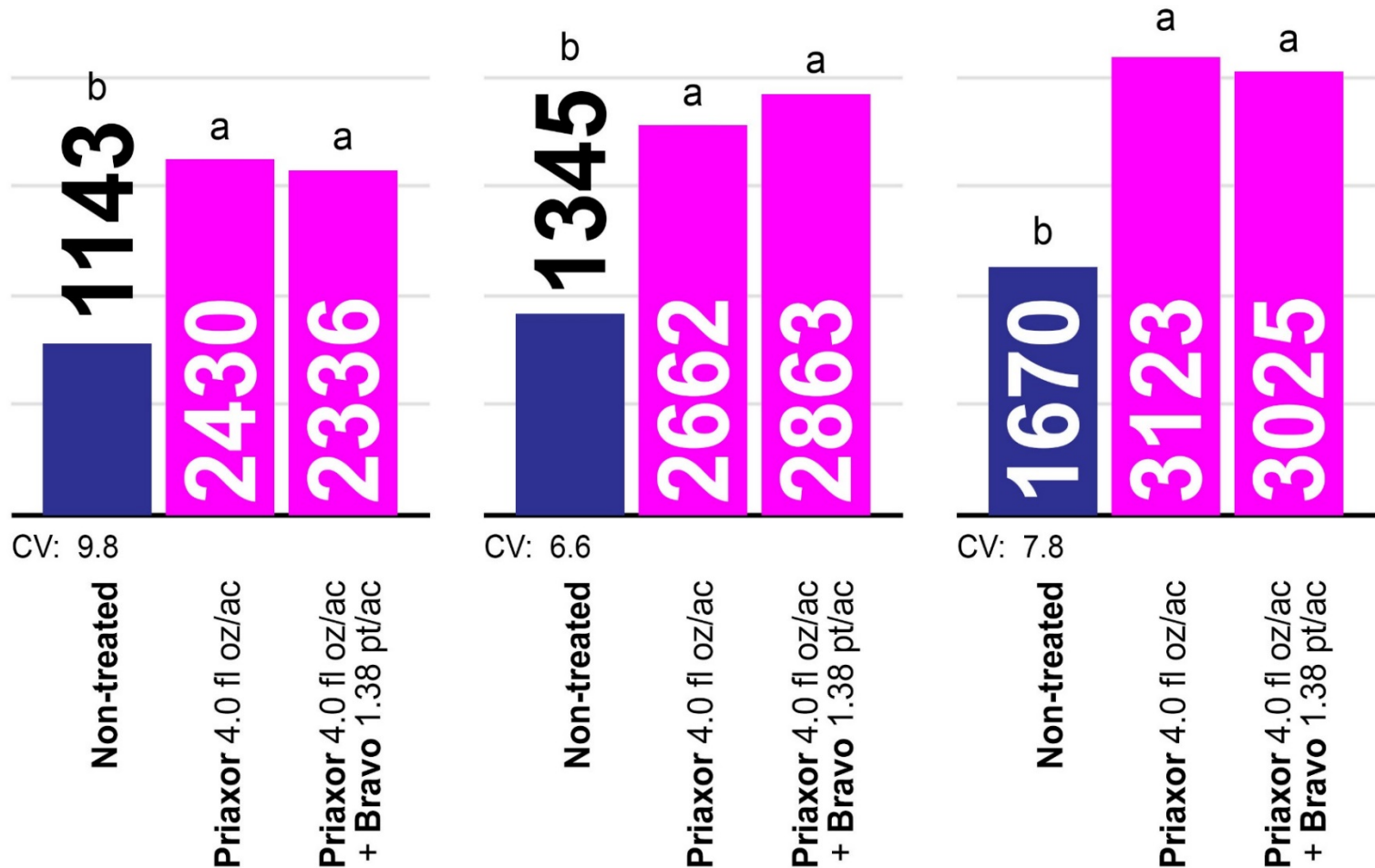
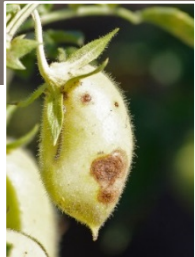
Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplet size: **medium**

Carrington (2018)
CDC 'Frontier'

Four fung. applications
Spray droplet size: **medium**

Chickpea yield (pounds/acre; 13.5% moisture)



Spray volume

All studies:
15 gal/ac



Managing Qol-resistant *Ascochyta* in field peas

Pathogen: *Ascochyta pinodes*

TIMELINE:

- 2010:** laboratory confirmation of Qol resistance - Canada
- 2016:** loss of efficacy in Carrington field trials
- 2017:** first report of a loss of efficacy, commercial production – North Dakota
- 2018:** laboratory confirmation of Qol resistance – North Dakota



Ascochyta blight of field peas: QoI resistance

FUNGICIDE EFFICACY, 2010-2018:

Headline
(FRAC 11)

6.0 fl oz/ac

Spray volume

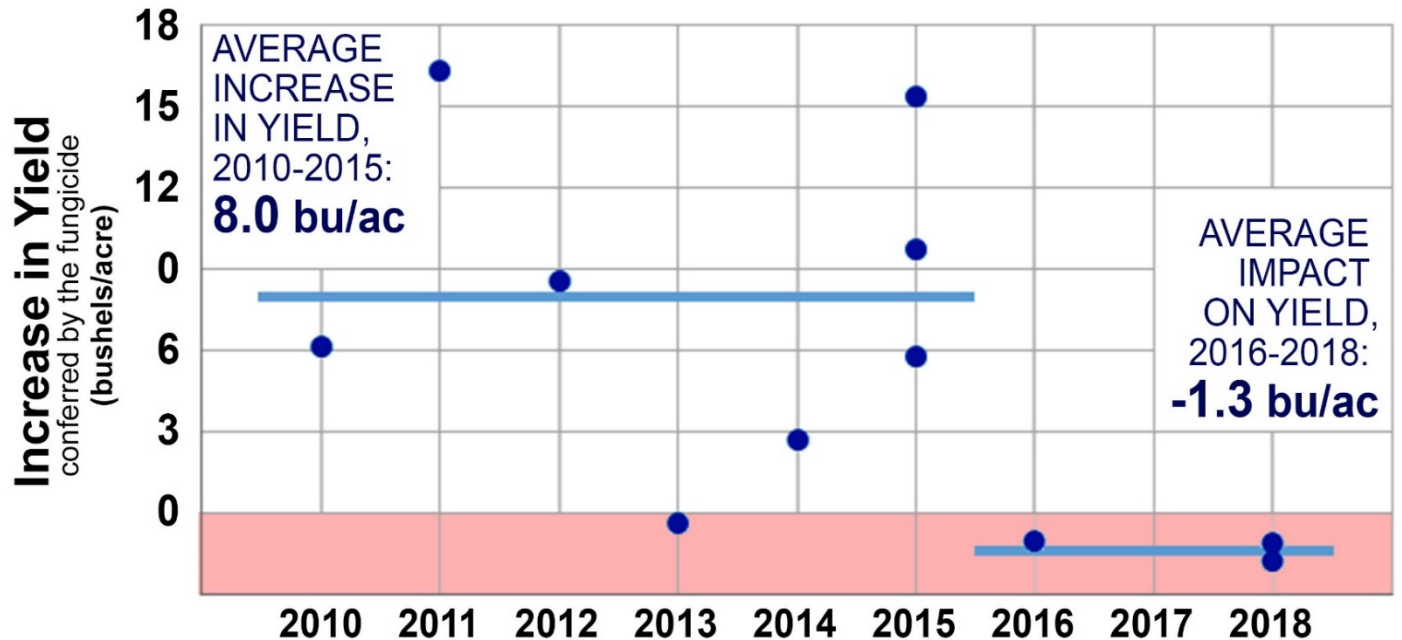
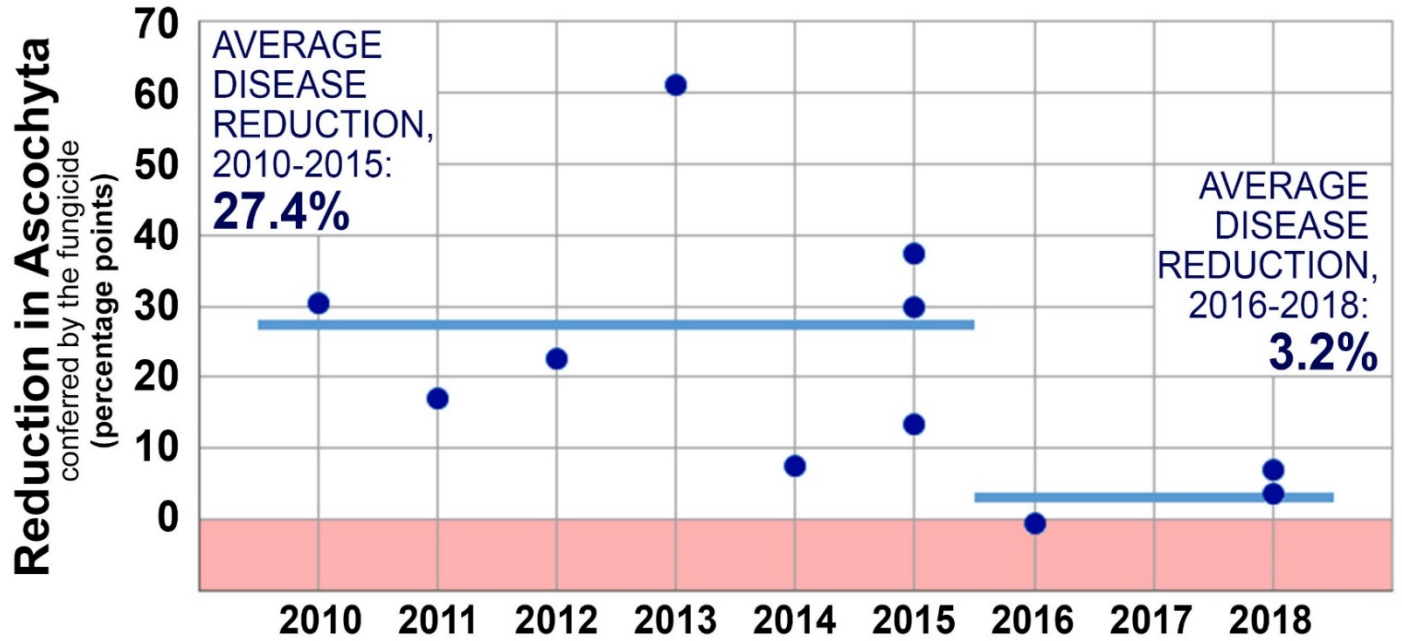
2010:
17 gal/ac

2011-2013:
17.5 gal/ac

2014-2018:
15 gal/ac

Study locations:

2011-2018:
Carrington, ND
2010:
Newburg, ND

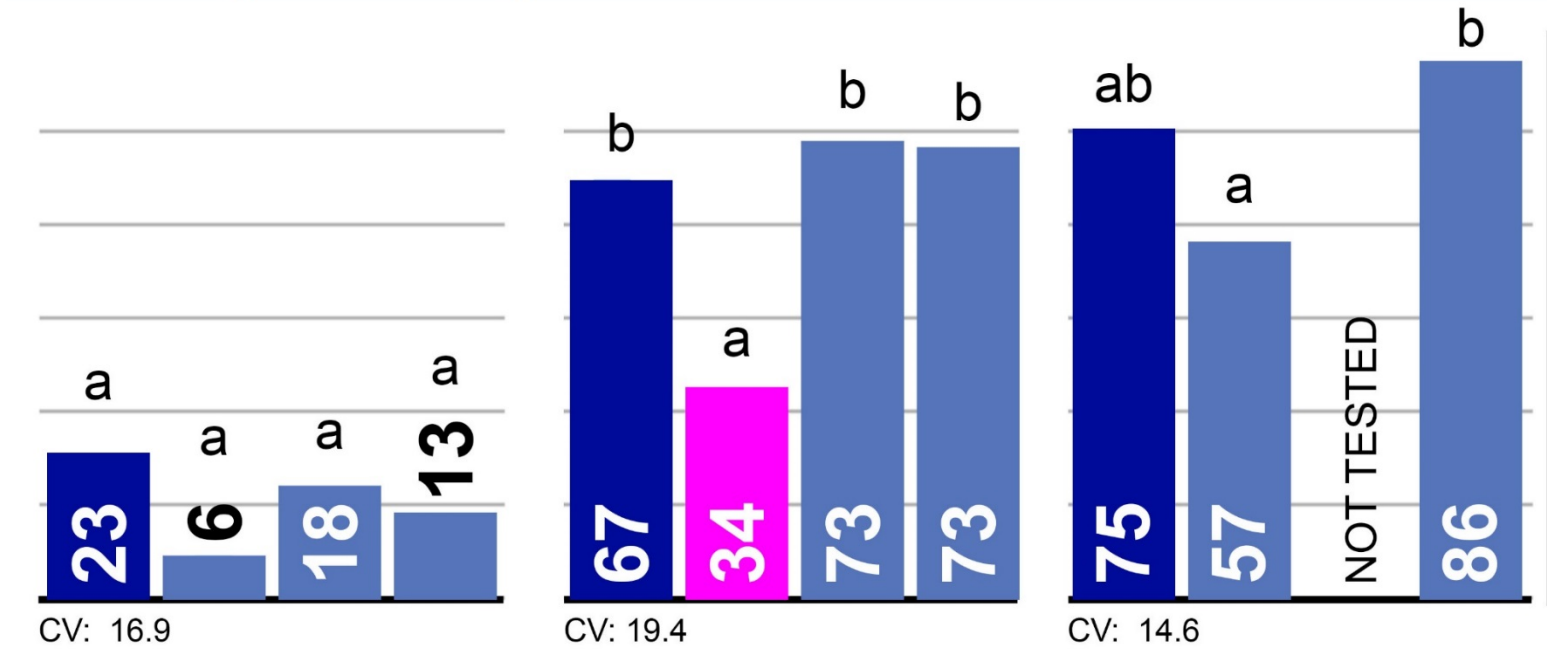




Ascochyta management in field peas: Proline (FRAC 3) vs. Endura, Vertisan (FRAC 7)

Carrington (2011) 'DS Admiral' Carrington (2012) 'DS Admiral' Carrington (2018) 'DS Admiral'

Ascochyta severity (percent; late pod-fill)



Spray volume

2011-2012:
17.5 gal/ac

2018:
15 gal/ac

Non-treated PROLINE 5.7 fl oz/ac ENDURA 6.0 oz/ac VERTISAN 20.0 fl oz/ac

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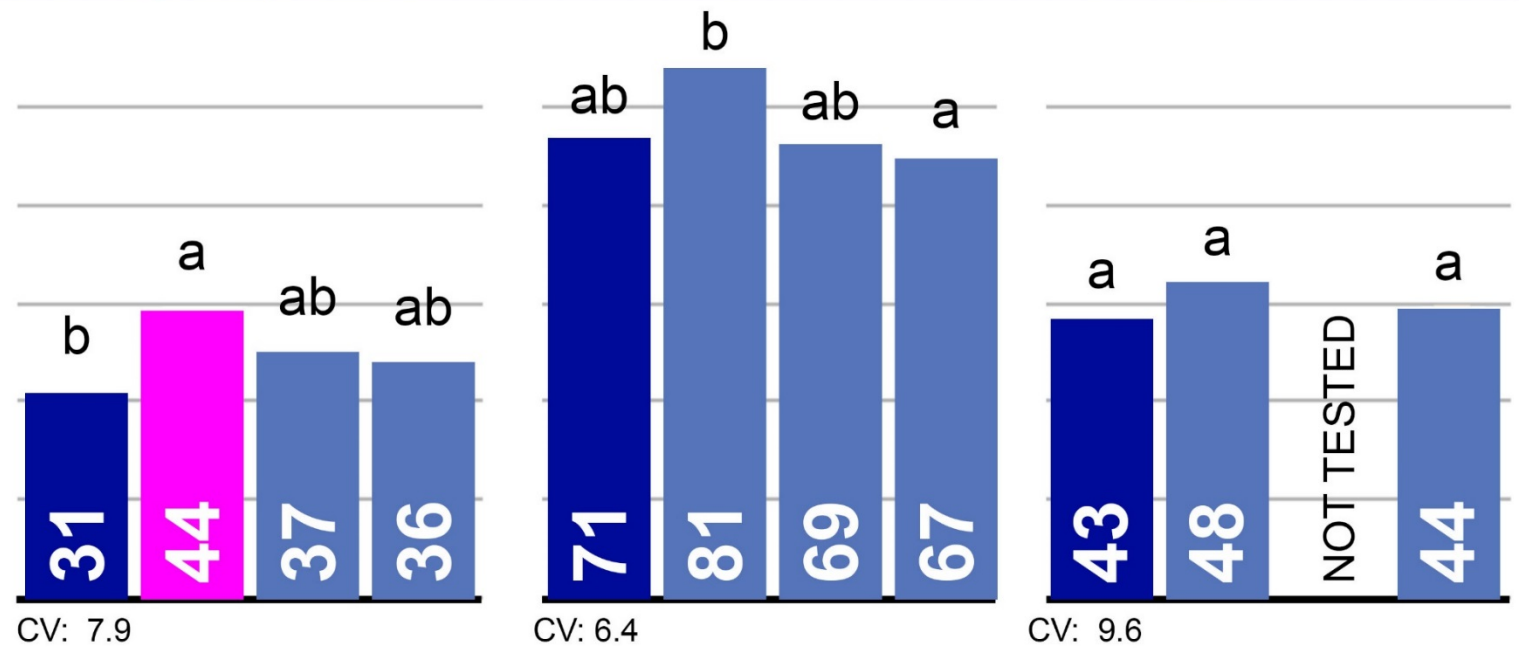
Ascochyta management in field peas: Proline (FRAC 3) vs. Endura, Vertisan (FRAC 7)

Carrington (2011)
'DS Admiral'

Carrington (2012)
'DS Admiral'

Carrington (2018)
'DS Admiral'

Field pea yield (bushels/acre; 13.5% moisture)



Spray volume

2011-2012:
17.5 gal/ac

2018:
15 gal/ac

Non-treated
PROLINE
5.7 fl oz/ac
ENDURA
6.0 oz/ac
VERTISAN
20.0 fl oz/ac

Non-treated
PROLINE
5.7 fl oz/ac
ENDURA
6.0 oz/ac
VERTISAN
20.0 fl oz/ac

Non-treated
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5.7 fl oz/ac
ENDURA
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VERTISAN
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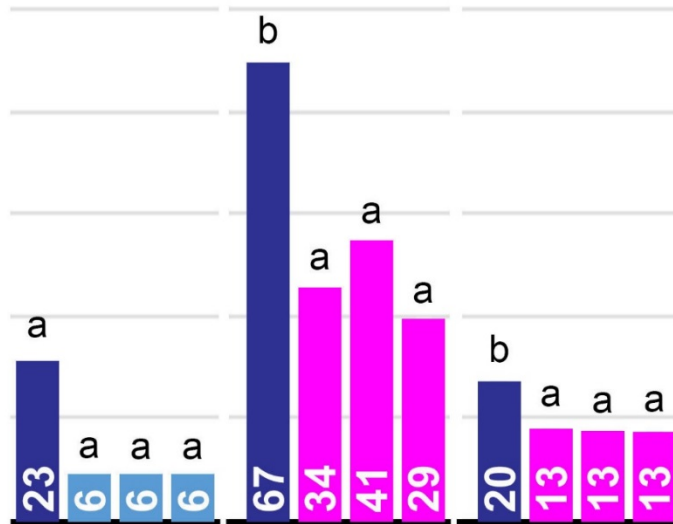


Ascochyta management in field peas:

Proline (FRAC 3) vs. Priaxor (FRAC 7,11) - prior to QoI resistance

Carrington 2011 'DS Admiral' Carrington 2012 'DS Admiral' Carrington 2014 'Salamanca'

Ascochyta severity (%)



CV: 16.9

CV: 19.4

CV: 20.0

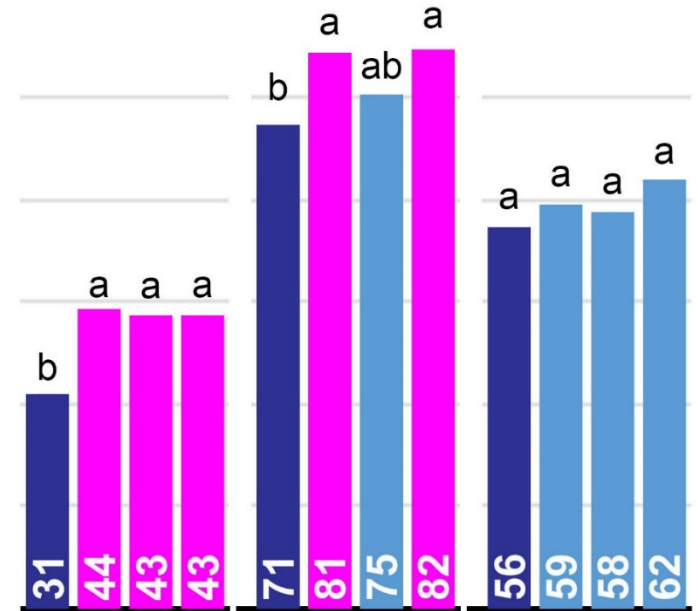
Non-treated
Proline 5.7 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac

Non-treated
Proline 5.0 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac

Non-treated
Proline 5.0 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac

Carrington 2011 'DS Admiral' Carrington 2012 'DS Admiral' Carrington 2014 'Salamanca'

Field pea yield (bu/ac)



CV: 7.9

CV: 6.9

CV: 7.8

Non-treated
Proline 5.7 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac

Non-treated
Proline 5.0 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac

Non-treated
Proline 5.0 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac

Spray volume

2011-2012:
17.5 gal/ac

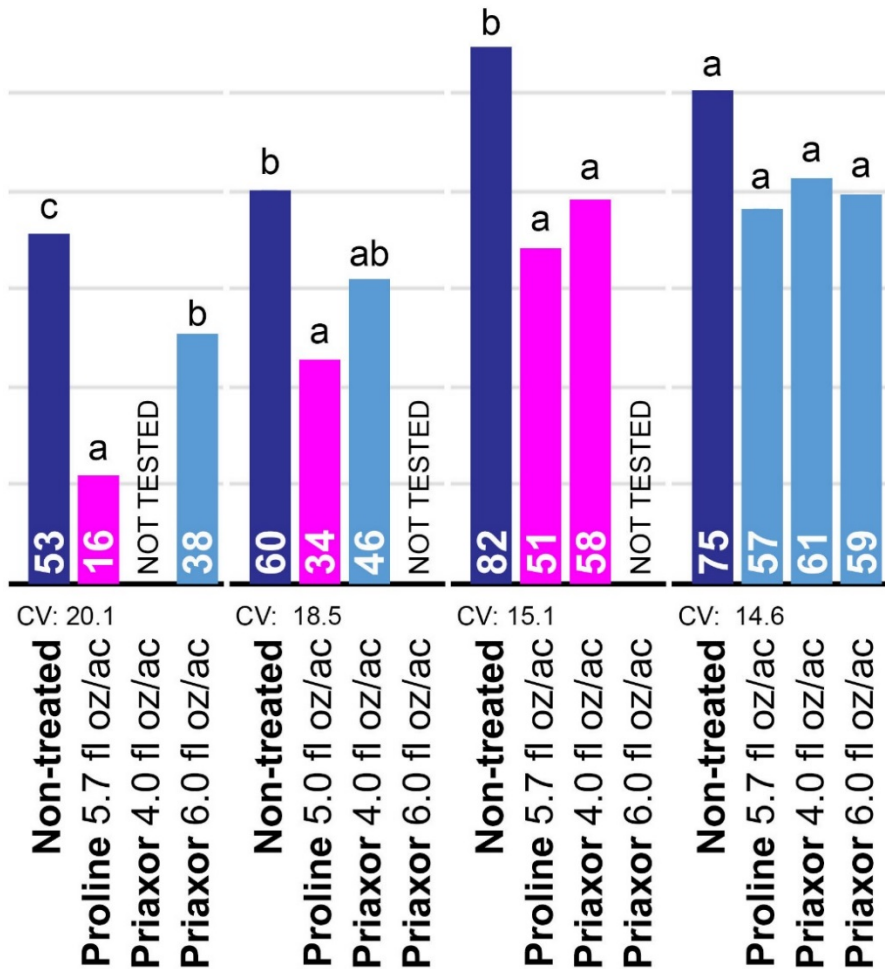
2014:
15 gal/ac

Ascochyta management in field peas:

Proline (FRAC 3) vs. Priaxor (FRAC 7,11) – **after QoI resistance**

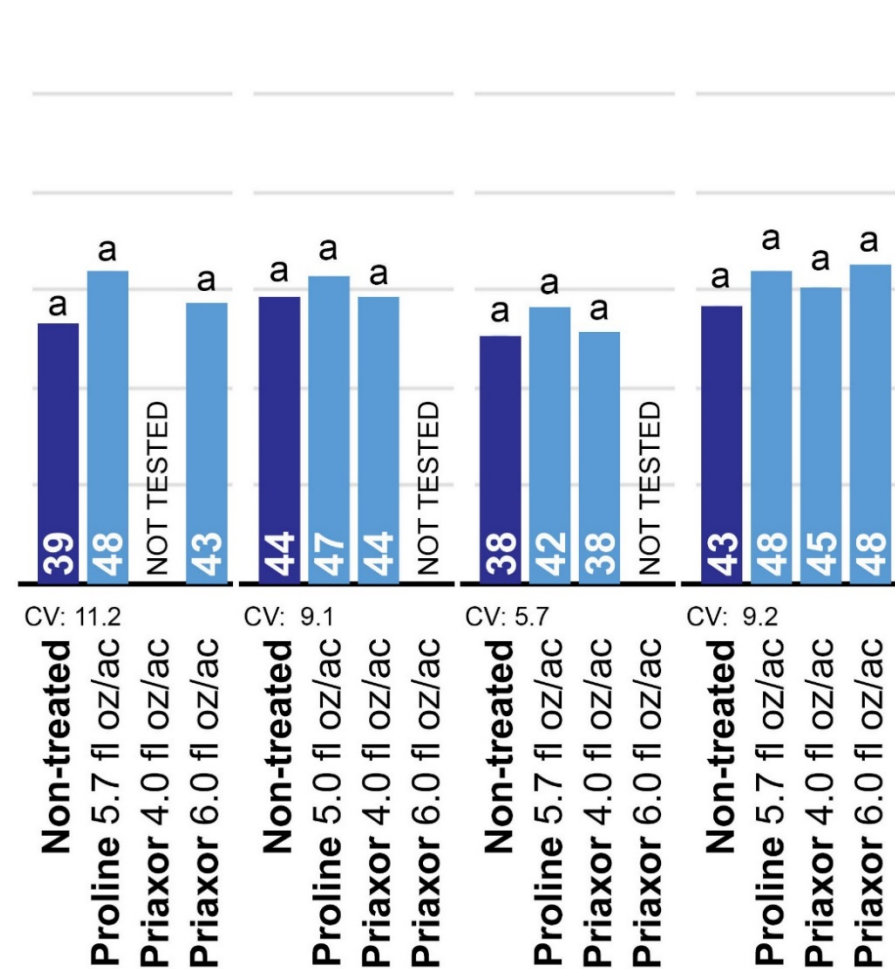
Carrington 2016 'Nette' Carrington 2016 'Nette' Carrington 2018 'DS Admiral' Carrington 2018 'DS Admiral'

Ascochyta severity (%)



Carrington 2016 'Nette' Carrington 2016 'Nette' Carrington 2018 'DS Admiral' Carrington 2018 'DS Admiral'

Field pea yield (bu/ac)



Spray volume - All studies: 15 gal/ac



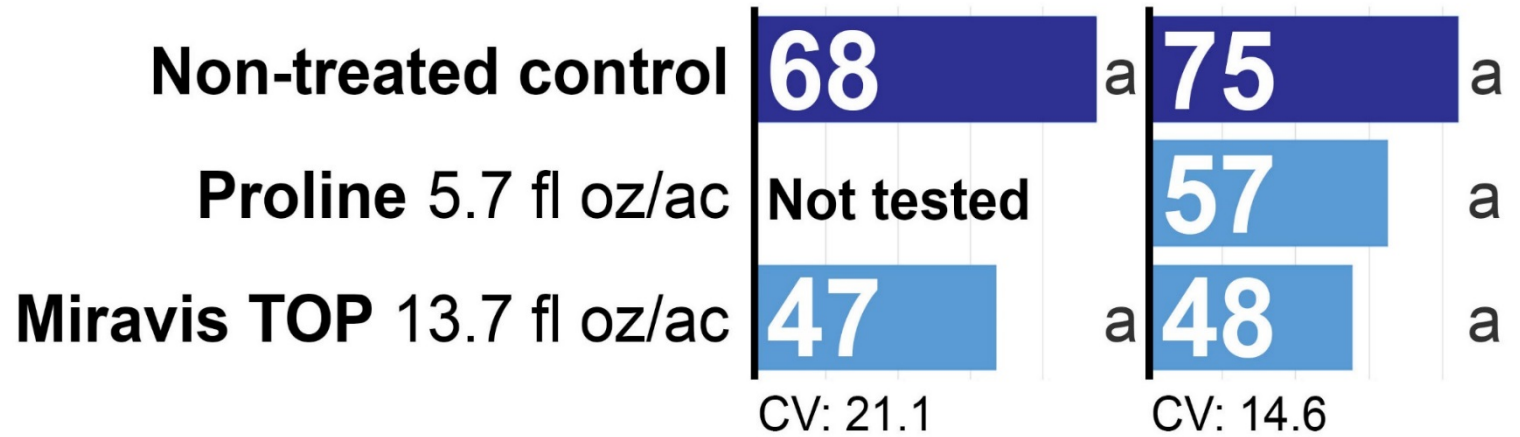
Ascochyta management in field peas:

Proline (FRAC 3) vs. Miravis TOP (FRAC 7, 3)

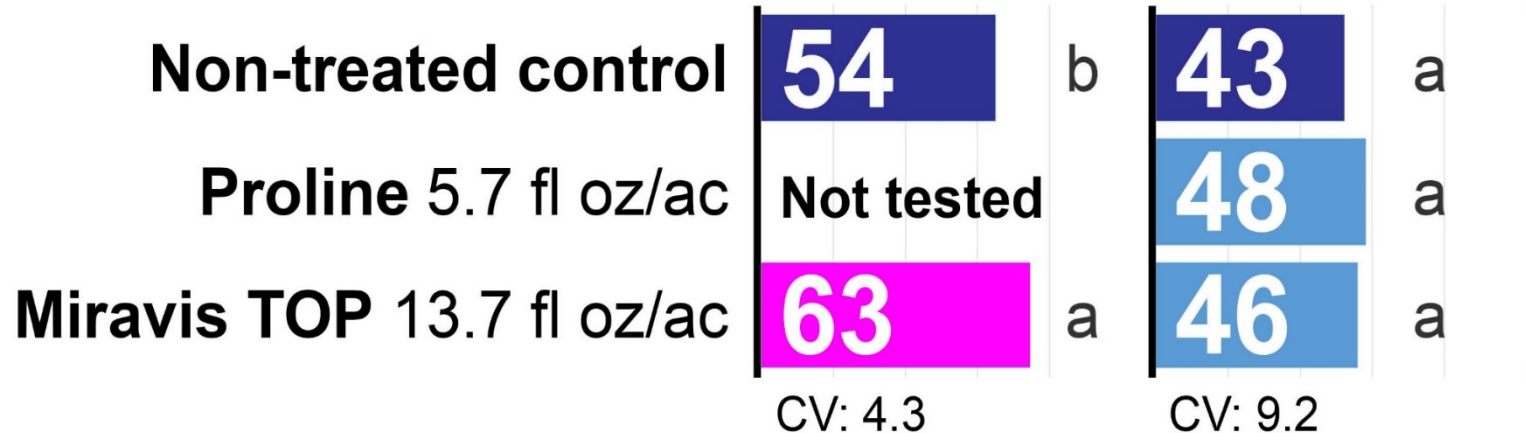
Carrington (2015)
'Viper'

Carrington (2018)
'DS Admiral'

Ascochyta (% of canopy)



Yield (bushels/acre)



Spray volume

Both studies:
15 gal/ac