Fungicide efficacy – Ascochyta blight

chickpeas and field peas

With the development of resistance to the QoI fungicides, **four primary fungicide modes of action are available for managing Ascochyta blight**.

DMI (FRAC 3): Proline; premix fungicides Aprovia TOP and Miravis TOP

SDHI (FRAC 7): Endura, Vertisan, and premix fungicides Aprovia TOP, Miravis TOP, and Miravis NEO

FRAC 29: Omega (chickpeas only)

MULTI-SITE ACTIVITY (FRAC M): principally chlorothalonil (Bravo Weatherstik, Echo 720, etc.)

Managing QoI-resistant Ascochyta in chickpeas

Pathogen: *Ascochyta rabiei*

TIMELINE:

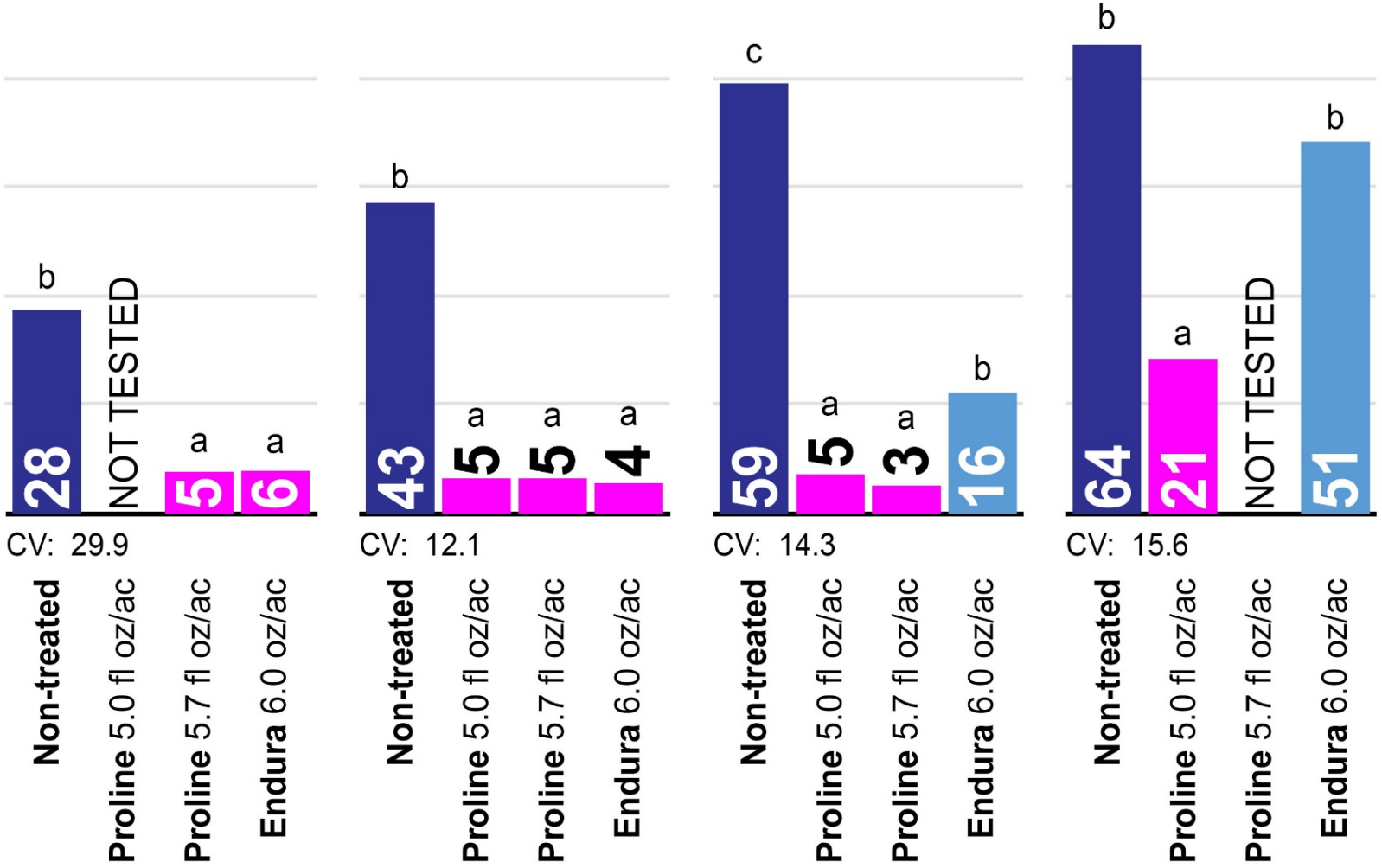
2007: laboratory confirmation of QoI resistance

2008: loss of efficacy in Carrington field trials

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

Hofflund (**2013**) CDC **'Frontier'**	Carrington (**2010**) **'Sierra'**	Carrington (**2009**) **'Sierra'**	Minot (**2011**) CDC **'Xena'**
Three fungicide applications	Four fungicide applications	Three fungicide applications	Four fungicide applications
Spray droplet size: **fine**	Spray droplet size: **very fine**	Spray droplet size: **fine**	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

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

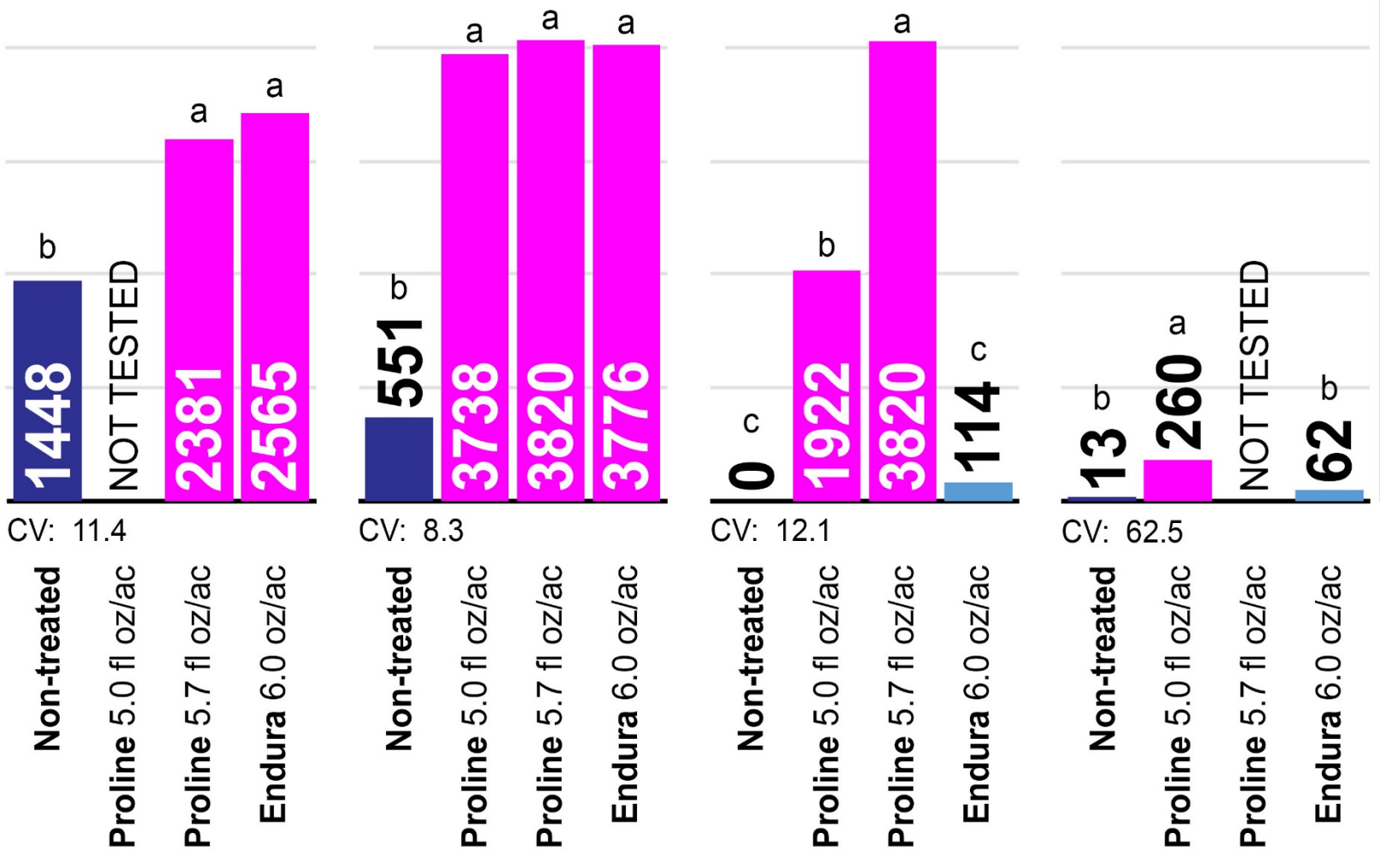
Hofflund (**2013**)
CDC **'Frontier'**
Three fungicide applications
Spray droplet size: **fine**

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**

Chickpea yield (pounds/acre; 13.5% moisture)



Spray volume:

2013 Hofflund:
20 gal/ac

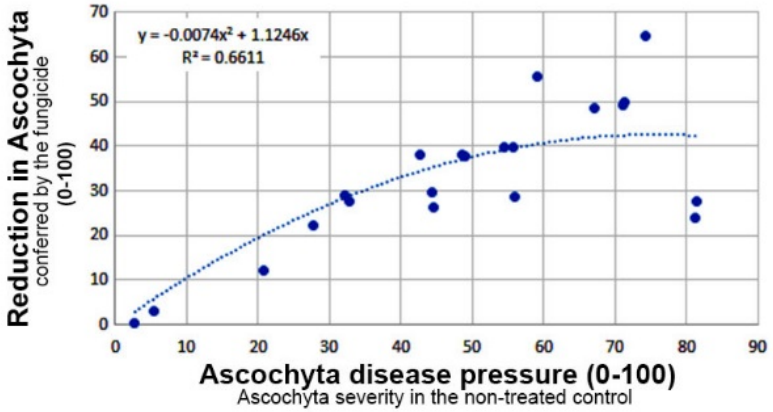
2011 Minot:
17.5 gal/ac

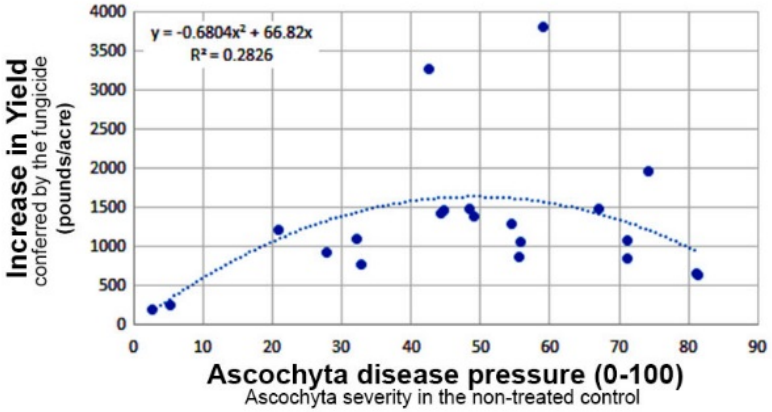
2009, 2010:
17 gal/ac

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

Proline
5.7 fl oz/ac

Yield response maximized when Ascochyta disease pressure = **49.1**.
(0 to 100 scale)

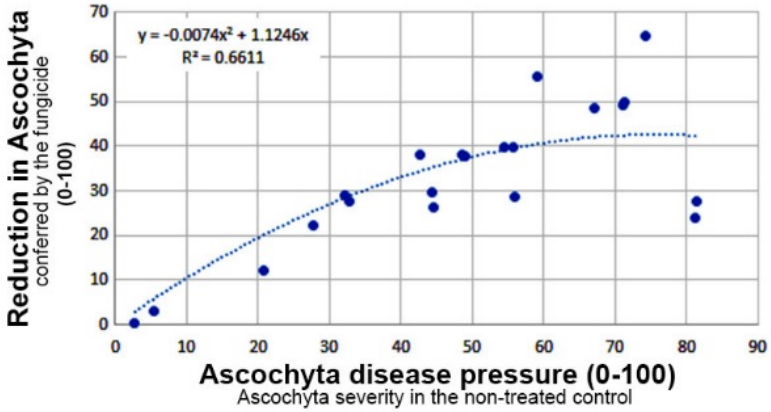


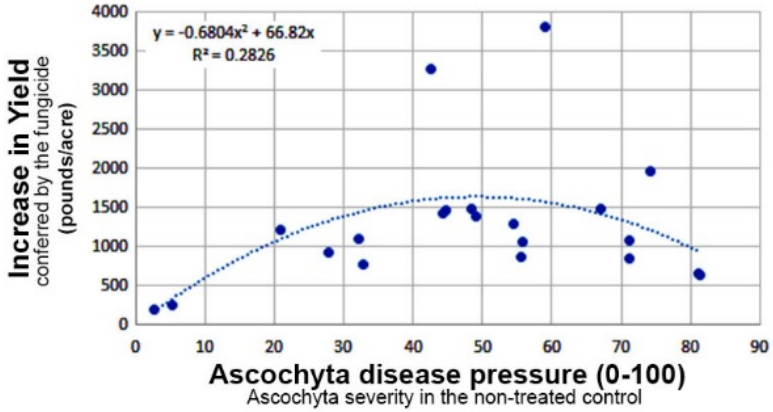


Proline (FRAC 3) vs. Endura (FRAC 7)

Proline
5.7 fl oz/ac

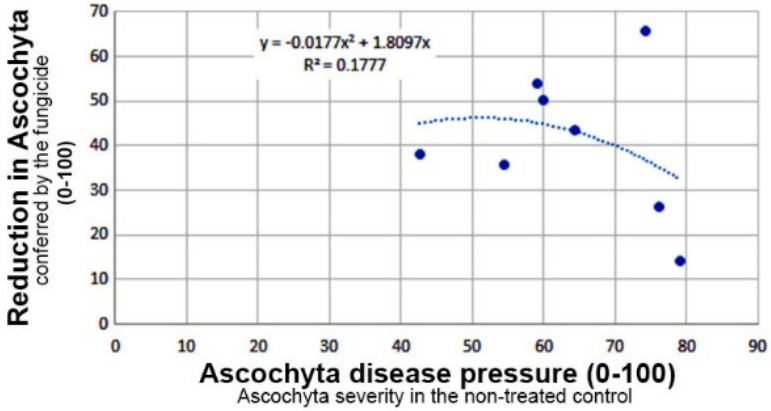
Yield response maximized when Ascochyta disease pressure = **49.1**.
(0 to 100 scale)

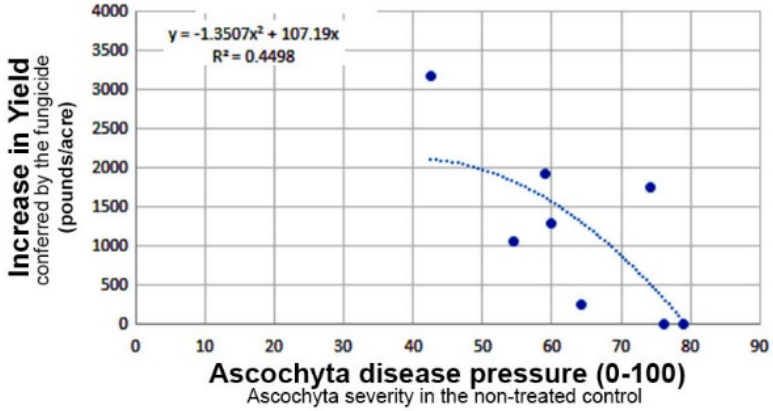




Proline
5.0 fl oz/ac

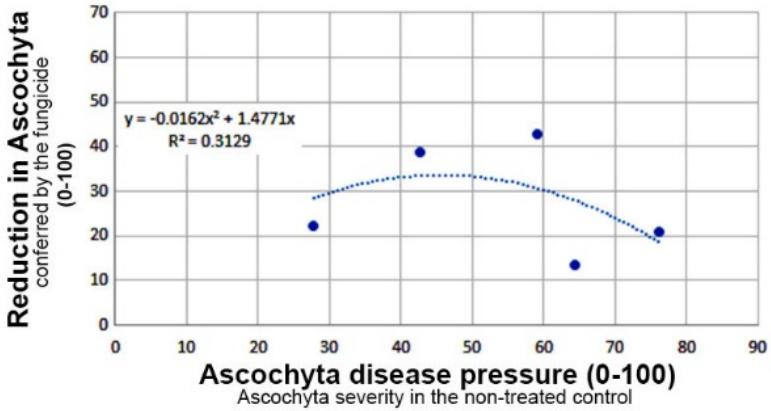
Yield response maximized at Ascochyta disease pressure = **39.7**.
(0 to 100 scale)

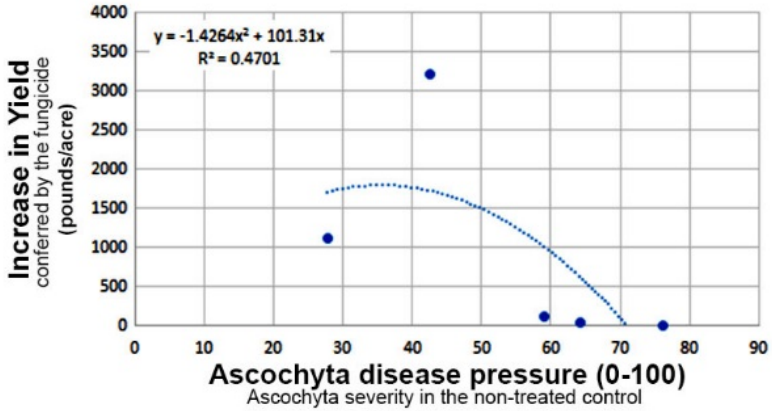




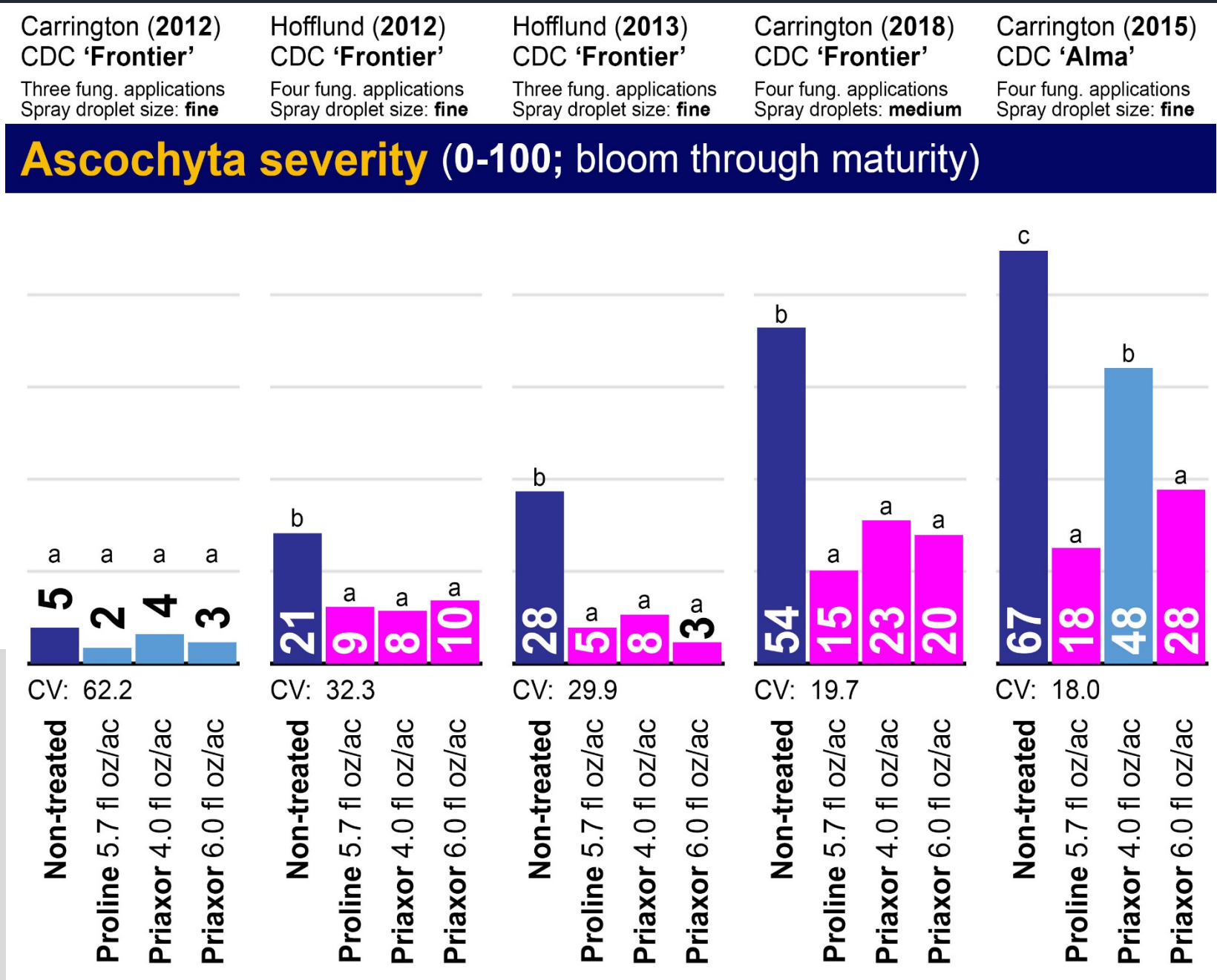
Endura
6.0 oz/ac

Yield response maximized when Ascochyta disease presure = **35.5**
(0 to 100 scale)





Proline (FRAC 3) vs. Priaxor (FRAC 7, 11)



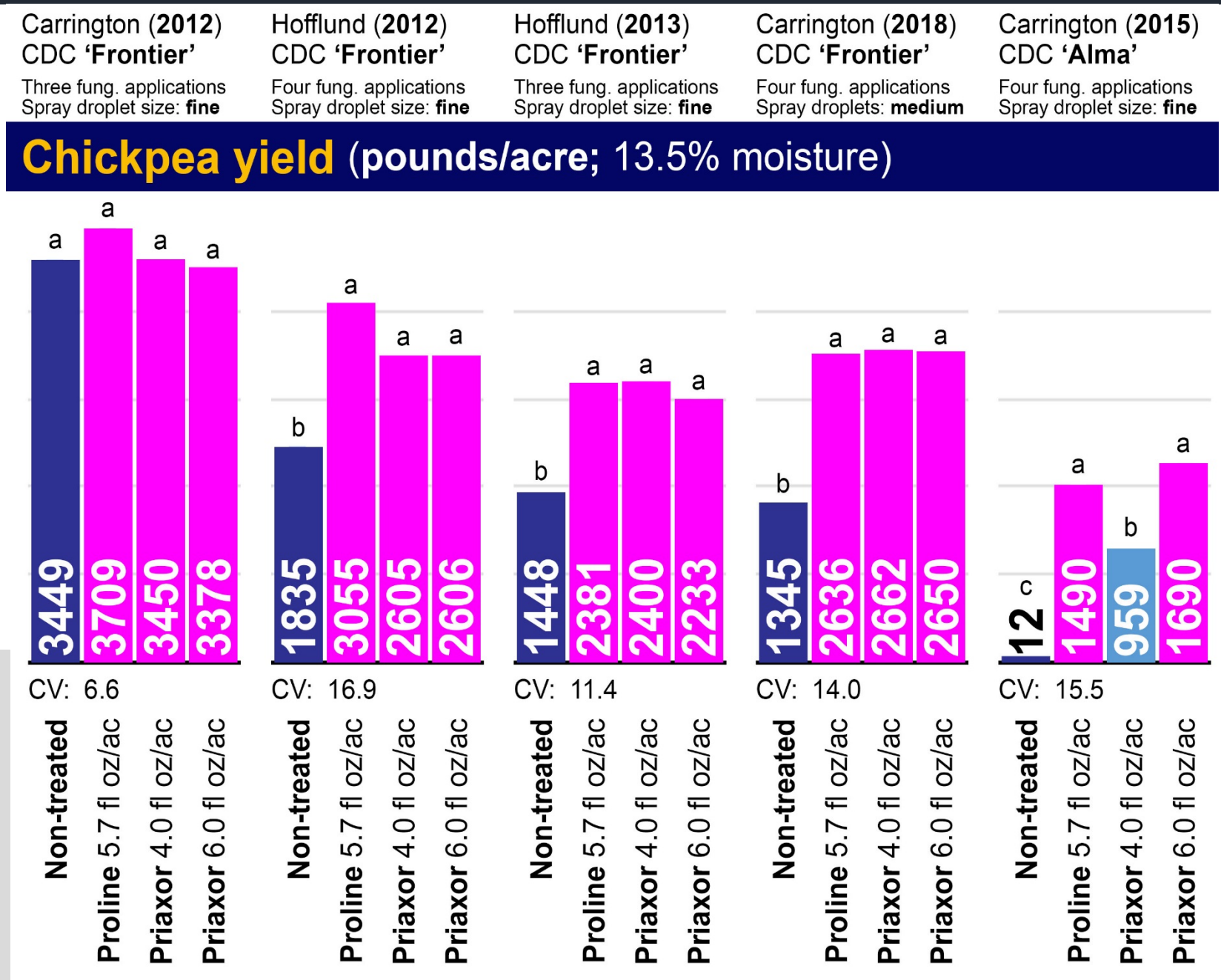
Spray volume:

2012, 2013 Hofflund:
20 gal/ac

2012 Carrington:
17.5 gal/ac

2015, 2018:
15 gal/ac

Proline (FRAC 3) vs. Priaxor (FRAC 7, 11)



Spray volume:

2012, 2013 Hofflund:
20 gal/ac

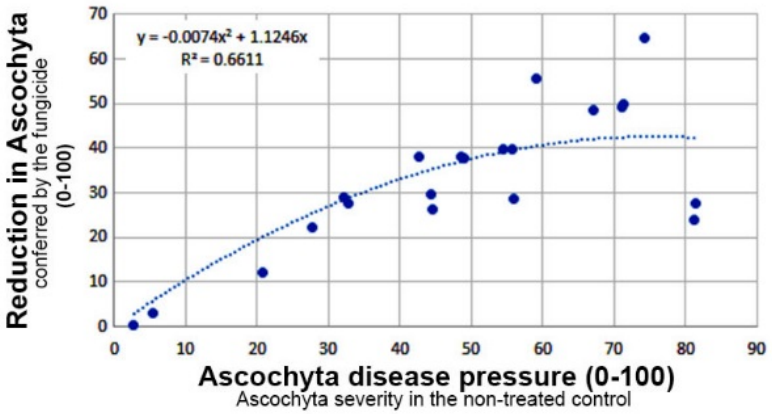
2012 Carrington:
17.5 gal/ac

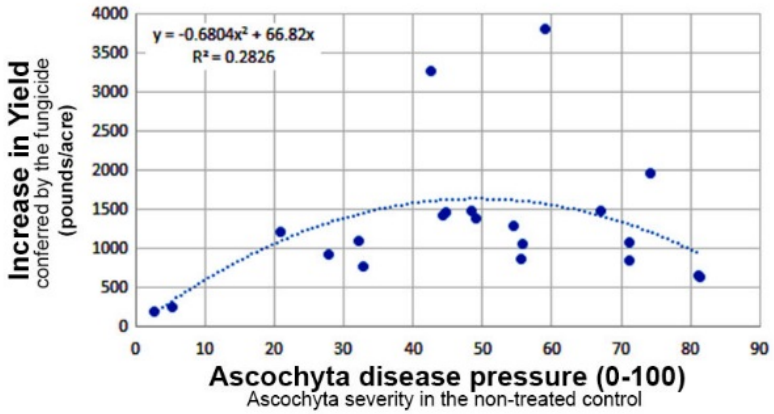
2015, 2018:
15 gal/ac

Proline (FRAC 3) vs. Priaxor (FRAC 7, 11)

Proline
5.7 fl oz/ac

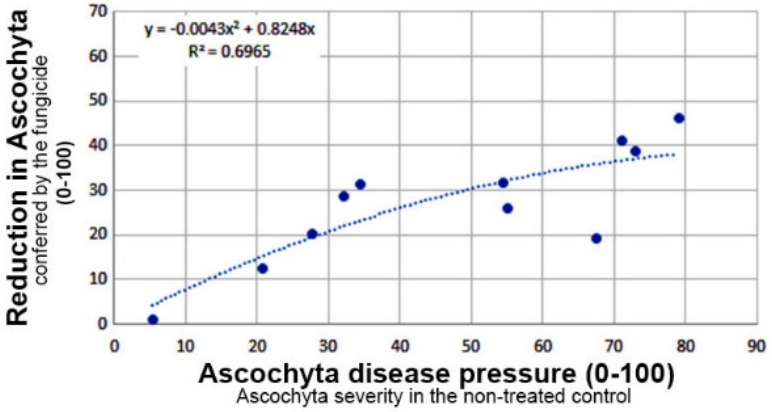
Yield response maximized when Ascochyta disease pressure = **49.1**.
(0 to 100 scale)

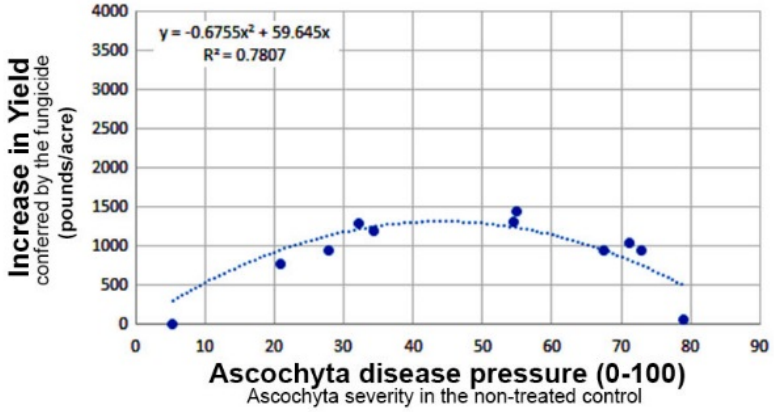




Priaxor
4.0 fl oz/ac

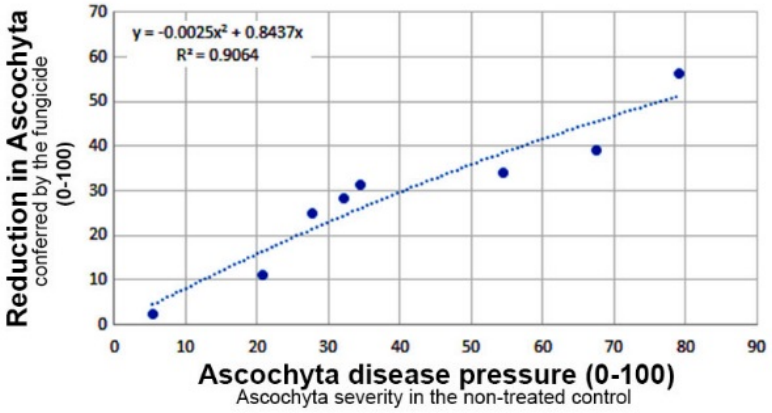
Yield response maximized when Ascochyta disease pressure = **44.1**.
(0 to 100 scale)

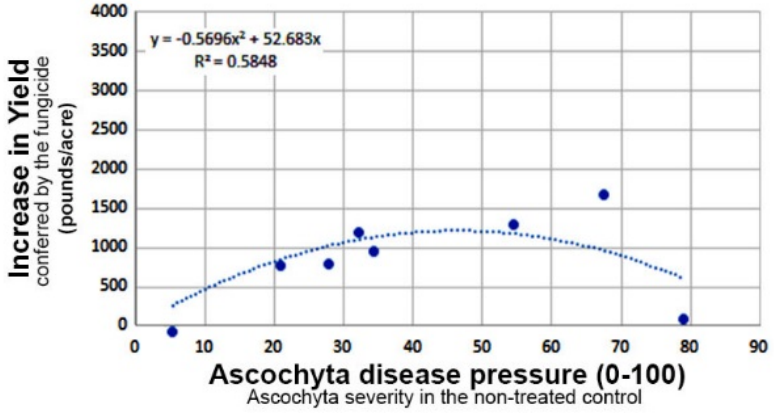




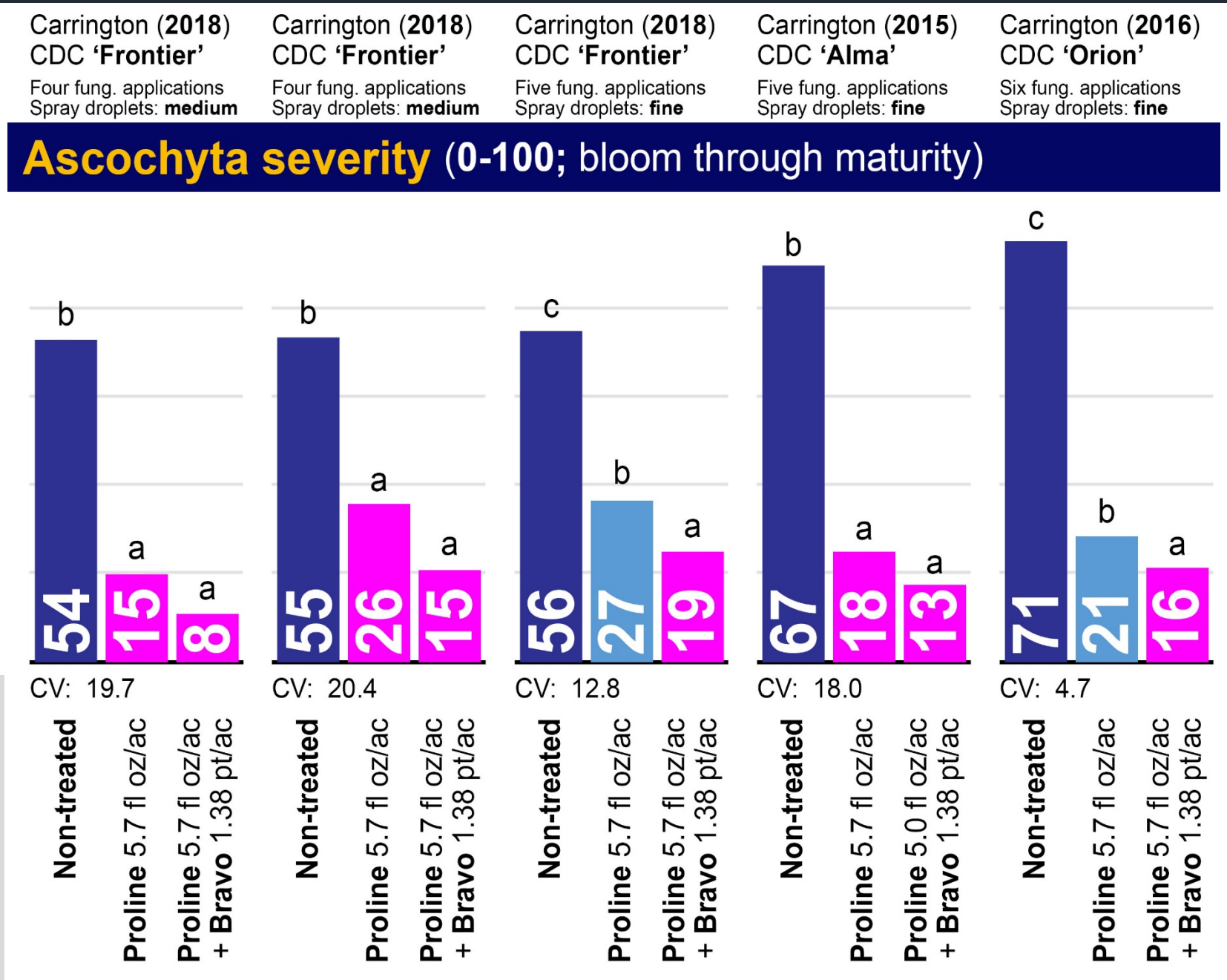
Priaxor
6.0 fl oz/ac

Yield response maximized when Ascochyta disease pressure = **46.2**
(0 to 100 scale)





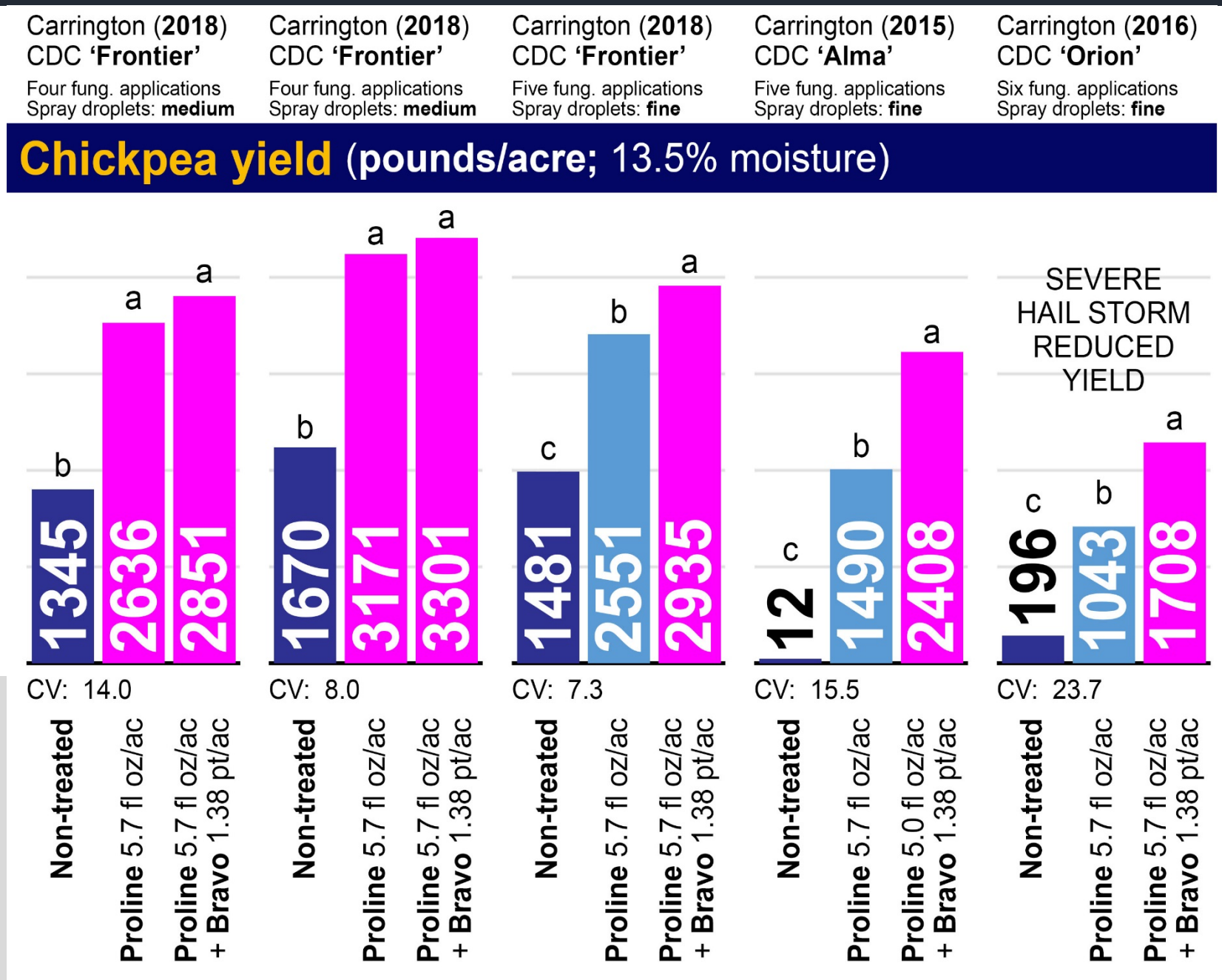
Proline (FRAC 3) vs. Proline + Bravo WeatherStik (FRAC 3, M)



Spray volume

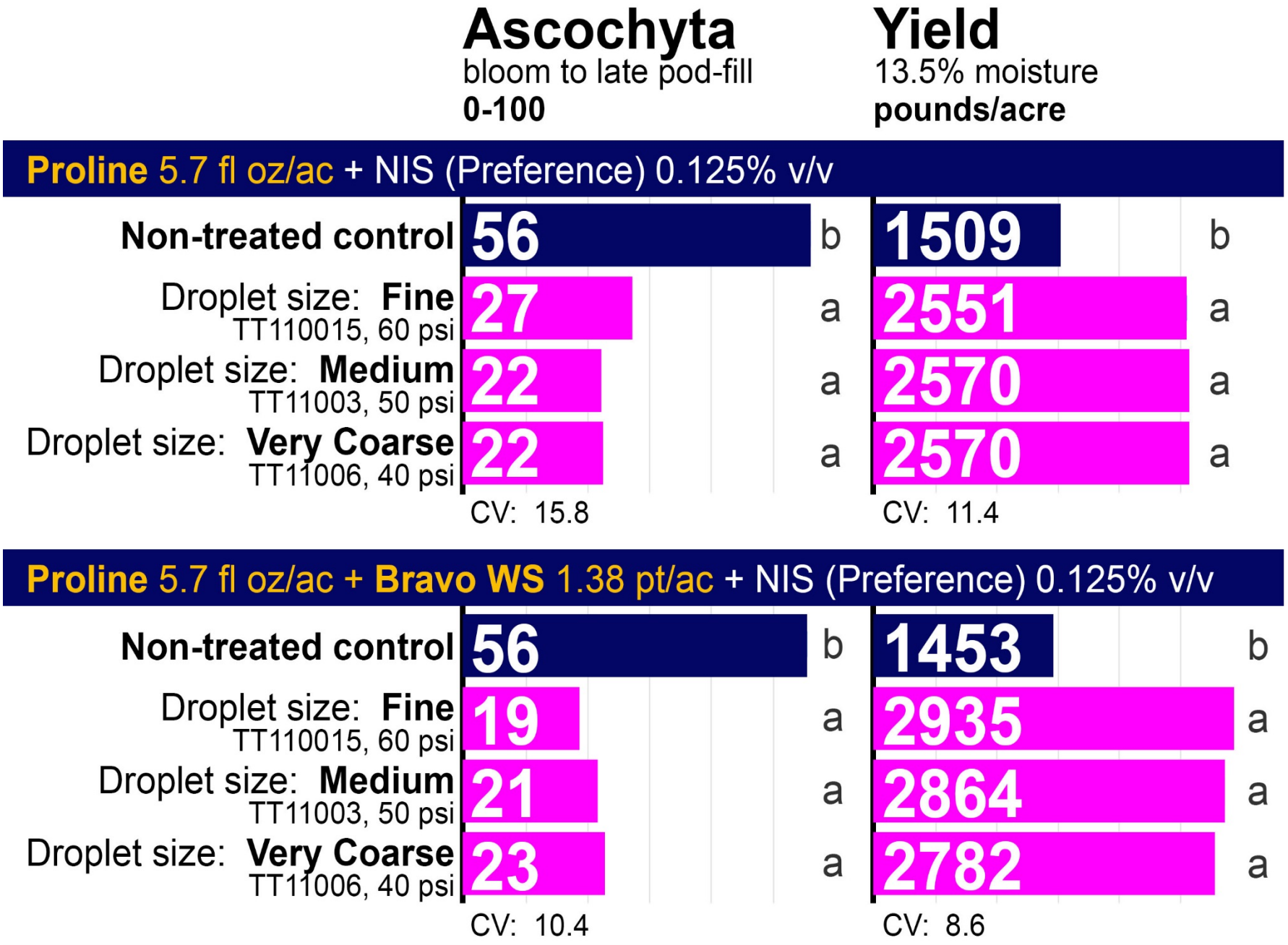
All studies:
15 gal/ac

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



Spray volume

All studies:
15 gal/ac


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
Non-treated control
56
b
1509
b
Droplet size: Fine
TT110015, 60 psi
27
a
2551
a
Droplet size: Medium
TT11003, 50 psi
22
a
2570
a
Droplet size: Very Coarse
TT11006, 40 psi
22
a
2570
a
CV: 15.8
CV: 11.4
Proline 5.7 fl oz/ac + Bravo WS 1.38 pt/ac + NIS (Preference) 0.125% v/v
Non-treated control
56
b
1453
b
Droplet size: Fine
TT110015, 60 psi
19
a
2935
a
Droplet size: Medium
TT11003, 50 psi
21
a
2864
a
Droplet size: Very Coarse
TT11006, 40 psi
23
a
2782
a
CV: 10.4
CV: 8.6
Driving speed: 3.6 mph Spray volume: 15 gal/ac
Calibrated pulse widths: TT110015 = 100%; TT11003 = 42%; TT11006 = 24%

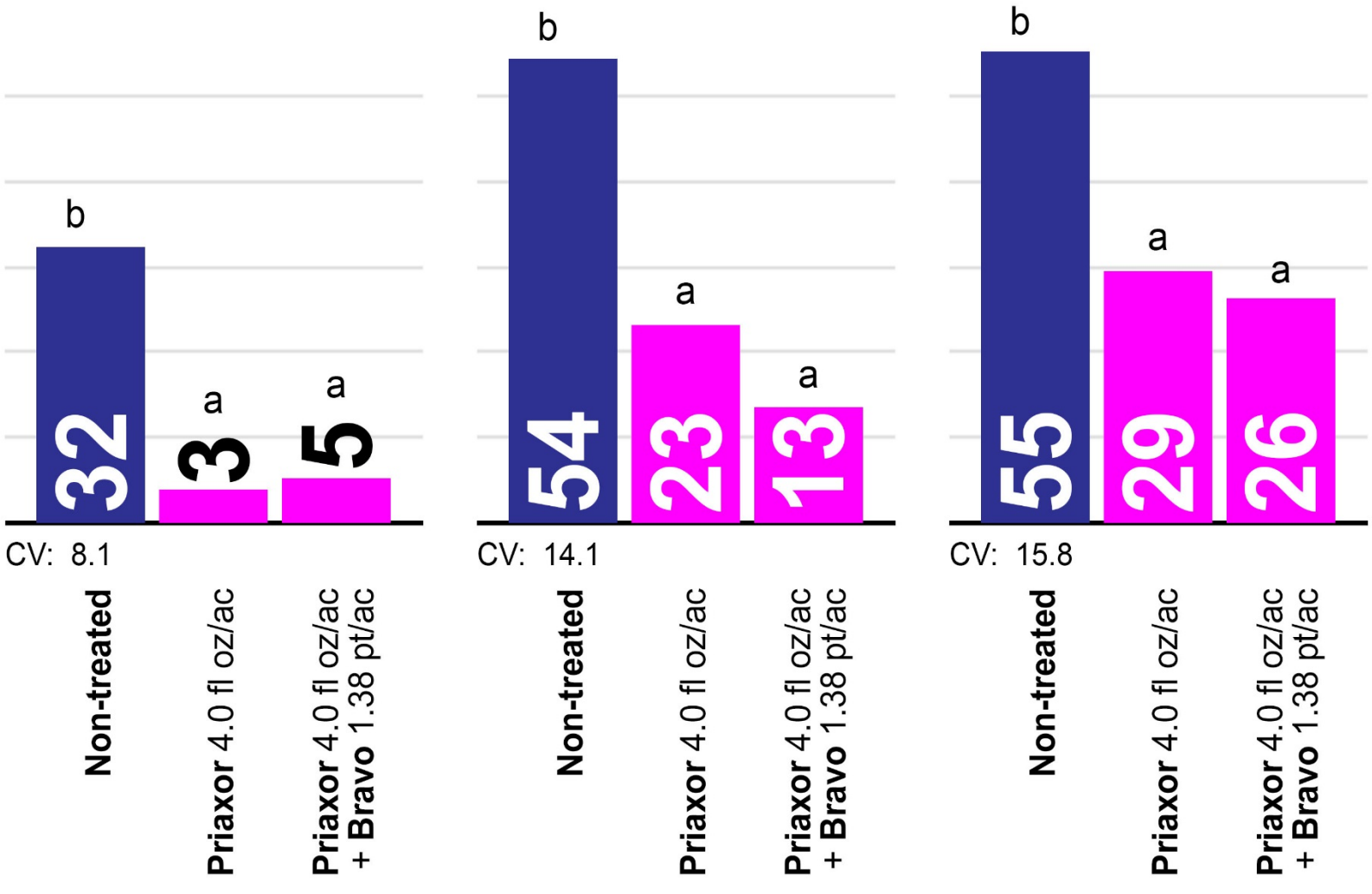
Priaxor (FRAC 7,11) vs. Priaxor + Bravo WeatherStik (FRAC 7, 11, M)

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

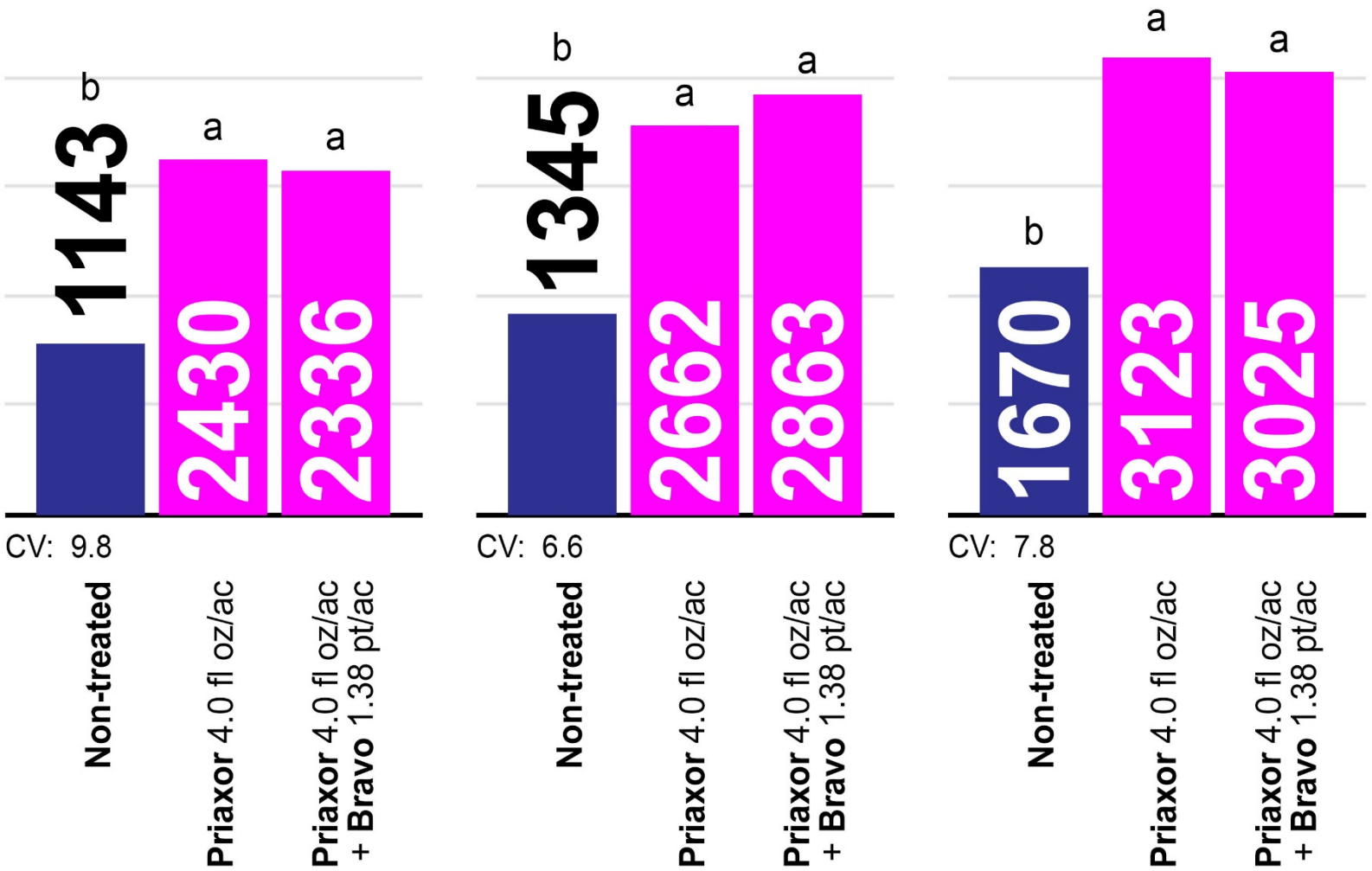
Priaxor (FRAC 7,11) vs. Priaxor + Bravo WeatherStik (FRAC 7, 11, M)

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)

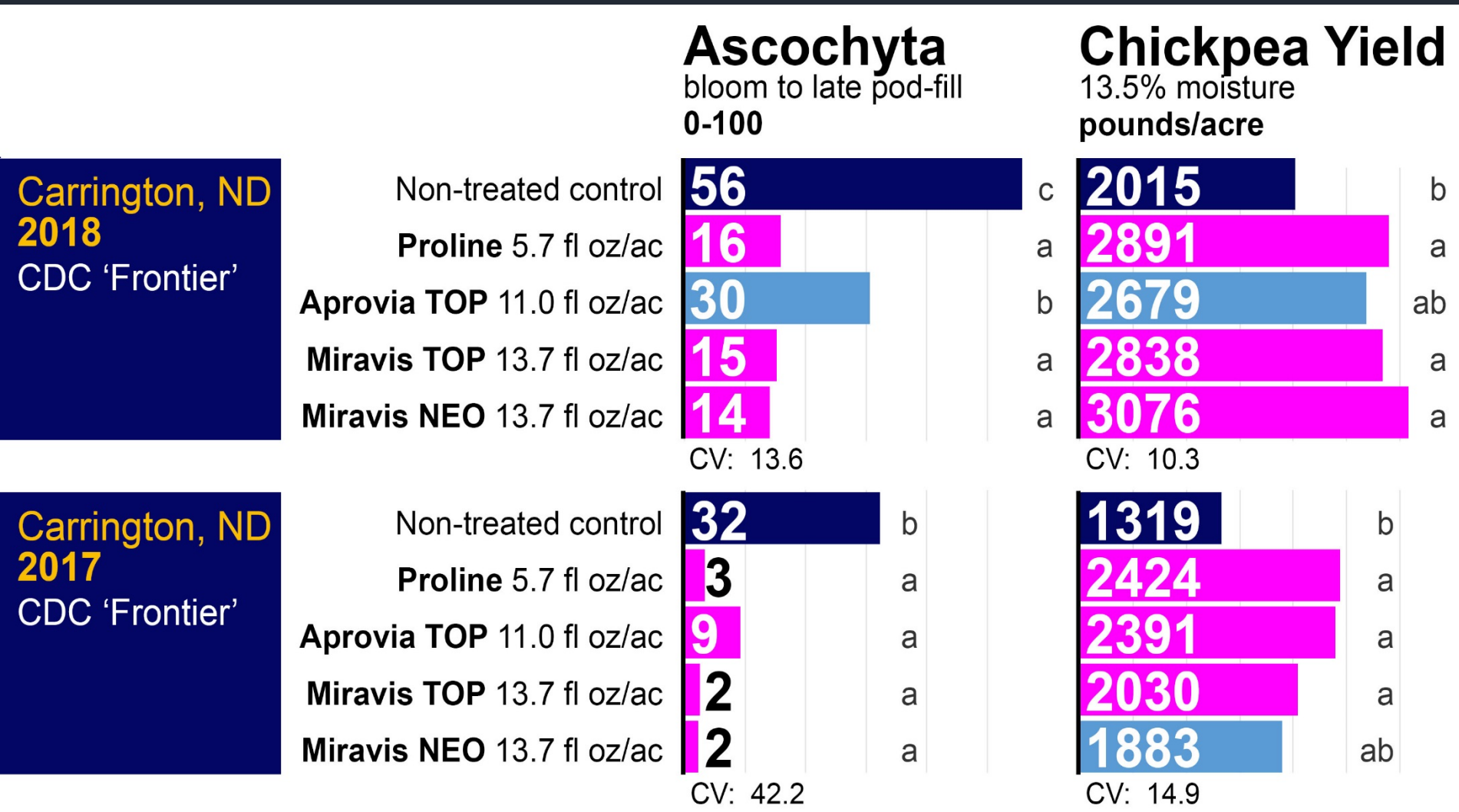


Spray volume

All studies:
15 gal/ac

NEW FUNGICIDES

Aprovia TOP (FRAC 7, 3)
Miravis TOP (FRAC 7, 3)
Miravis NEO (FRAC 7, 3, 11)



Spray volume: 15 gal/ac **Nozzles:** DGXR110015, 35 psi (medium droplet size) **Proline:** prothioconazole (FRAC 3; 4.0 lb ai/gal)
Aprovia TOP: benzovindiflupyr (FRAC 7, 0.65 lb ai/gal) + difenoconazole (FRAC 3, 0.97 lb ai/gal)
Miravis TOP: pydiflumetofen (FRAC 7, 0.63 lb ai/gal) + difenoconazole (FRAC 3, 1.04 lb ai/gal)
Miravis NEO: pydiflumetofen (FRAC 7, 0.63 lb ai/gal) + azoxystrobin (FRAC 11, 0.83 lb ai/gal) + propiconazole (FRAC 3, 1.04 lb ai/gal)

Managing QoI-resistant Ascochyta in field peas

Pathogen: *Ascochyta pinodes*

TIMELINE:

2010:	laboratory confirmation of QoI 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 QoI resistance – North Dakota

FUNGICIDE EFFICACY, 2010-2018:

Headline

(FRAC 11)

6.0 fl oz/ac

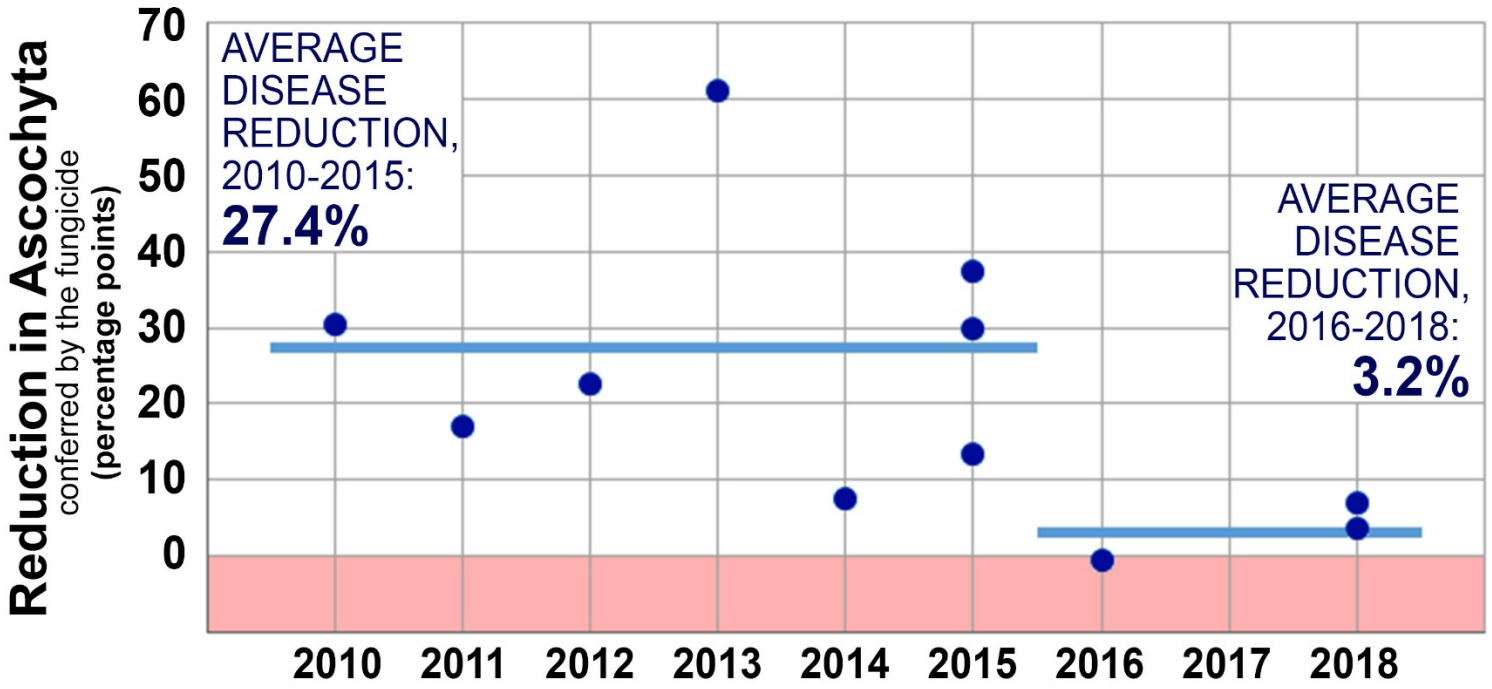
Spray volume

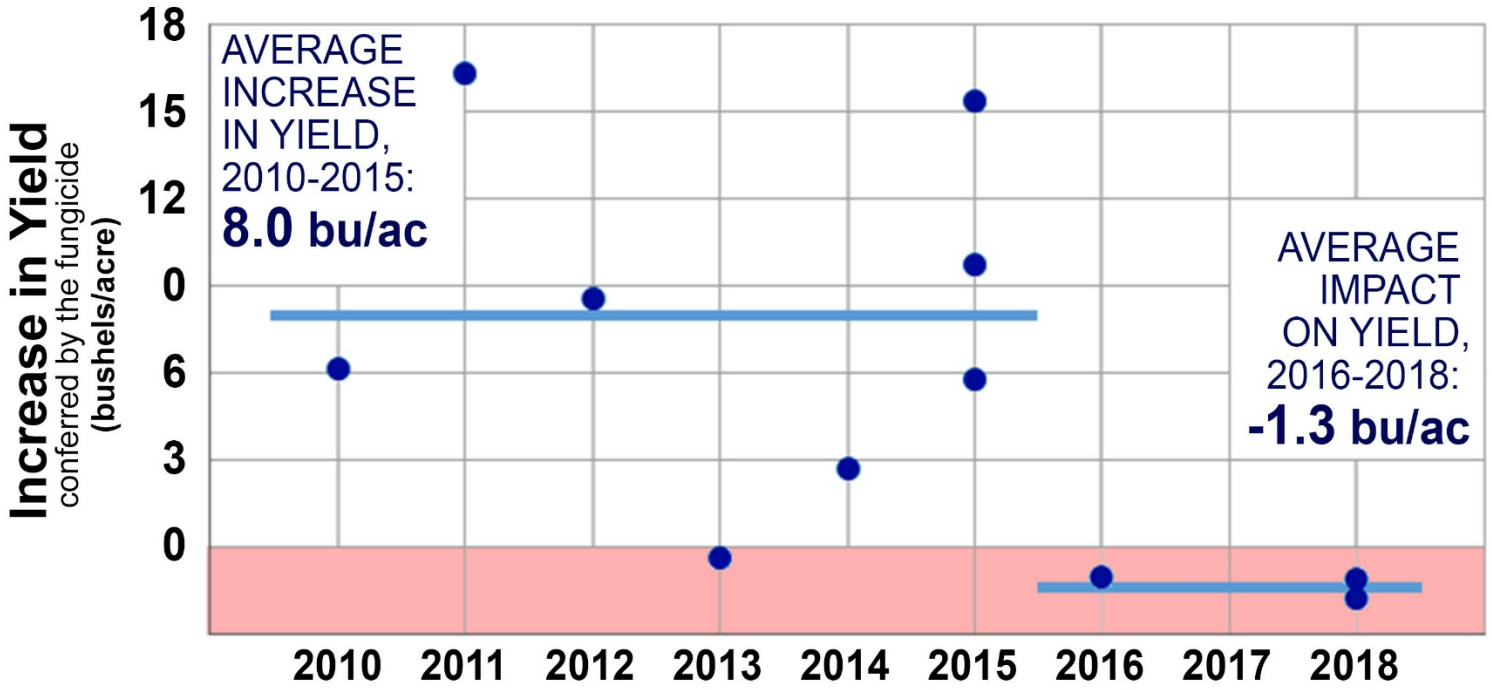
2010:
17 gal/ac

2011-2013:
17.5 gal/ac

2014-2018:
15 gal/ac

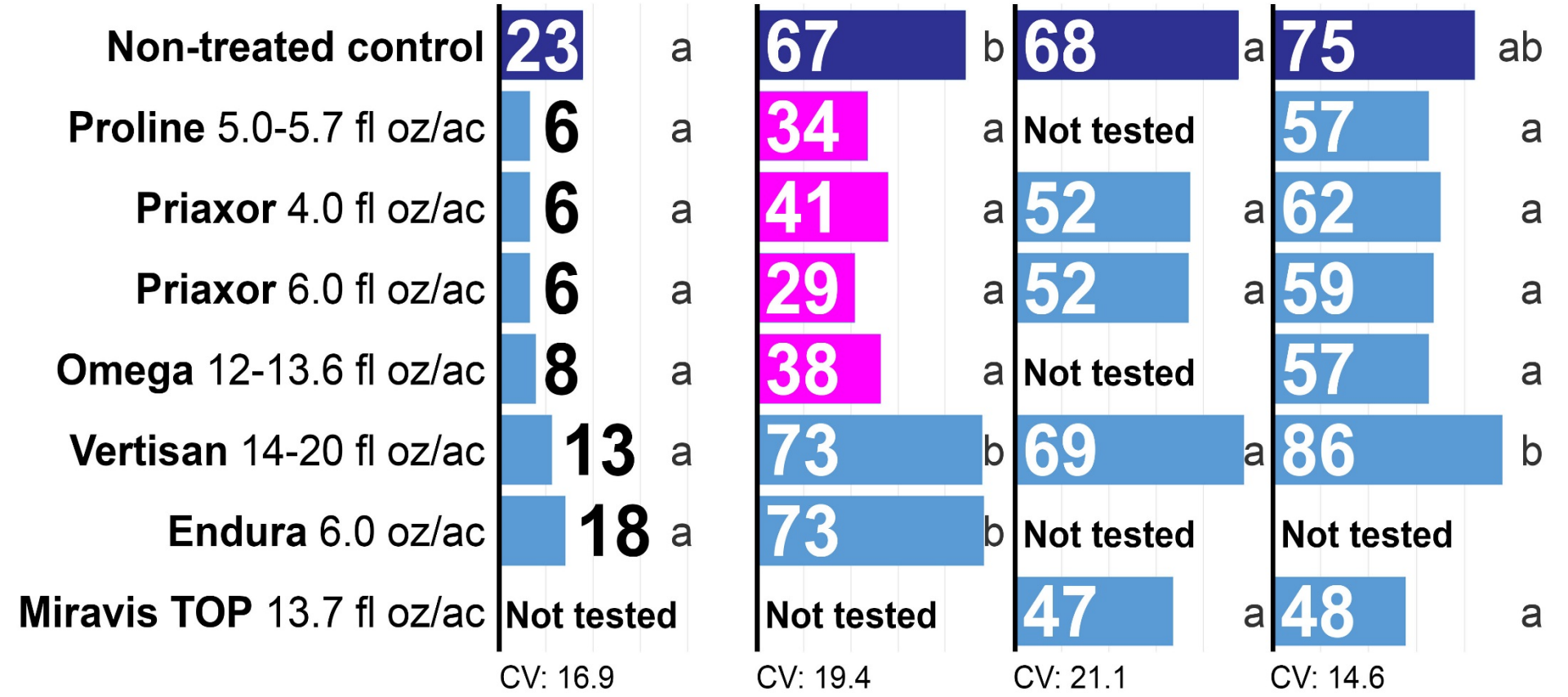
Study locations:
2011-2018:
Carrington, ND
2010:
Newburg, ND





2011 'DS Admiral'	2012 'DS Admiral'	2011 'Viper'	2018 'DS Admiral'
Proline: 5.7 fl oz	**Proline:** 5.0 fl oz		**Proline:** 5.7 fl oz
Omega: 13 fl oz	**Omega:** 12 fl oz		**Omega:** 13.6 fl oz
Vertisan: 20 fl oz	**Vertisan:** 20 fl oz	**Vertisan:** 14 fl oz	**Vertisan:** 20 fl oz

Ascochyta severity (percent; late pod-fill)

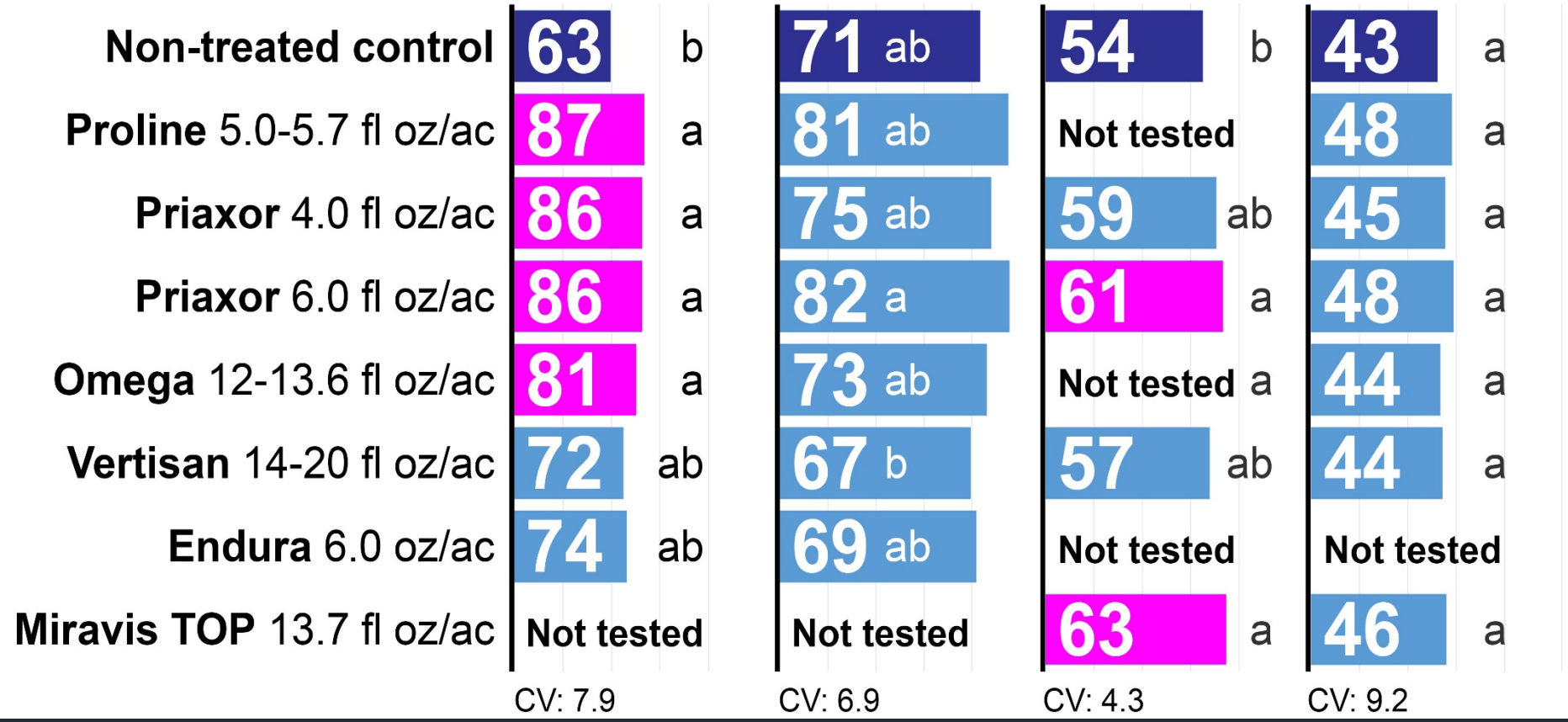


Priaxor (FRAC 7, 11), Omega (FRAC 29), Vertisan (FRAC 7), Miravis TOP (FRAC 7, 3), Endura (FRAC 7), Proline (FRAC 3)

Spray volume: **2011-2012:** 17.5 gal/ac **2018:** 15 gal/ac **Study location (all):** Carrington, ND

	2011 'DS Admiral'	2012 'DS Admiral'	2011 'Viper'	2018 'DS Admiral'
	Proline: 5.7 fl oz **Omega:** 13 fl oz **Vertisan:** 20 fl oz	**Proline:** 5.0 fl oz **Omega:** 12 fl oz **Vertisan:** 20 fl oz	**Vertisan:** 14 fl oz	**Proline:** 5.7 fl oz **Omega:** 13.6 fl oz **Vertisan:** 20 fl oz

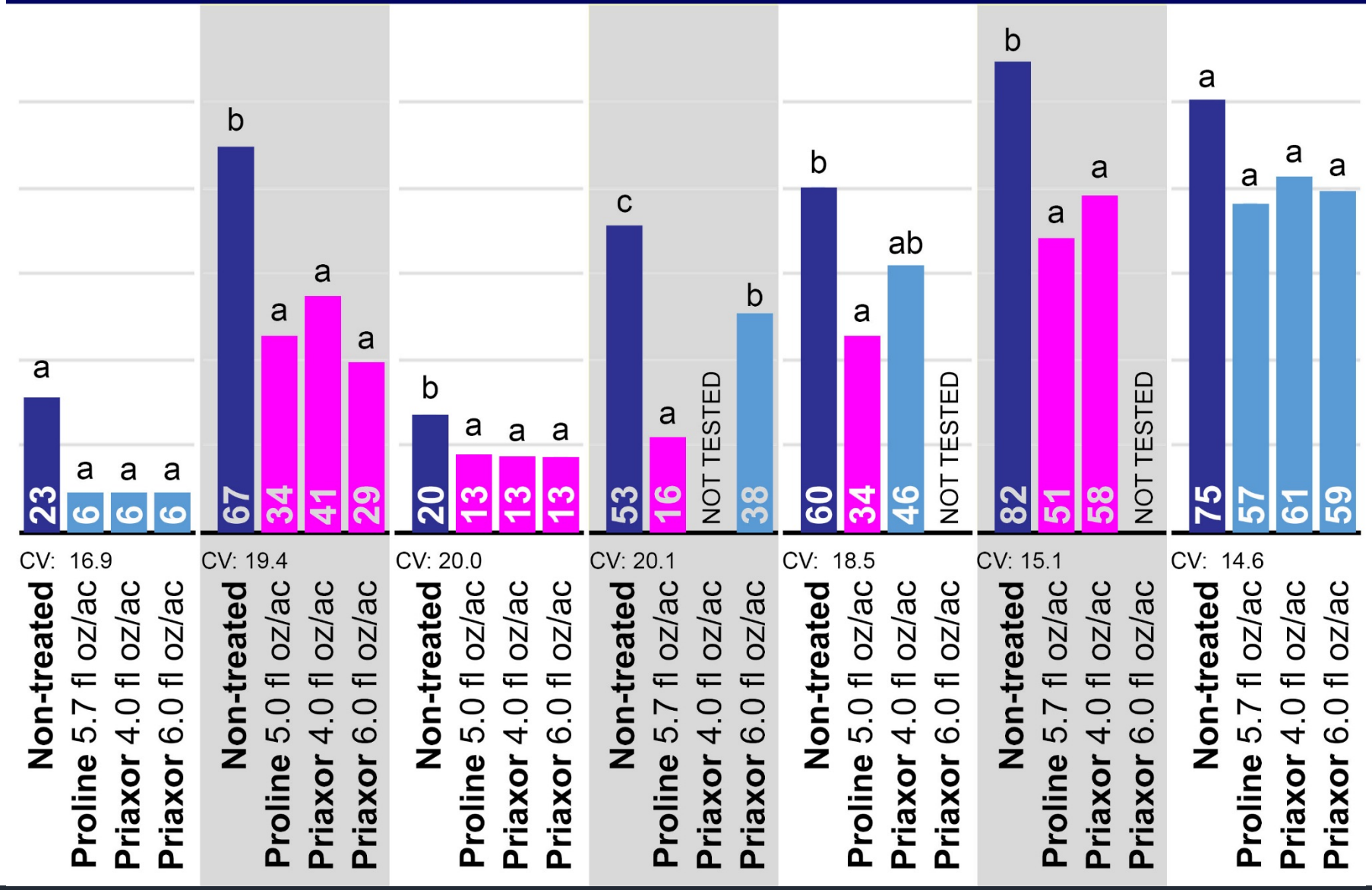
Field pea yield (bushels/acre; 13.5% moisture)



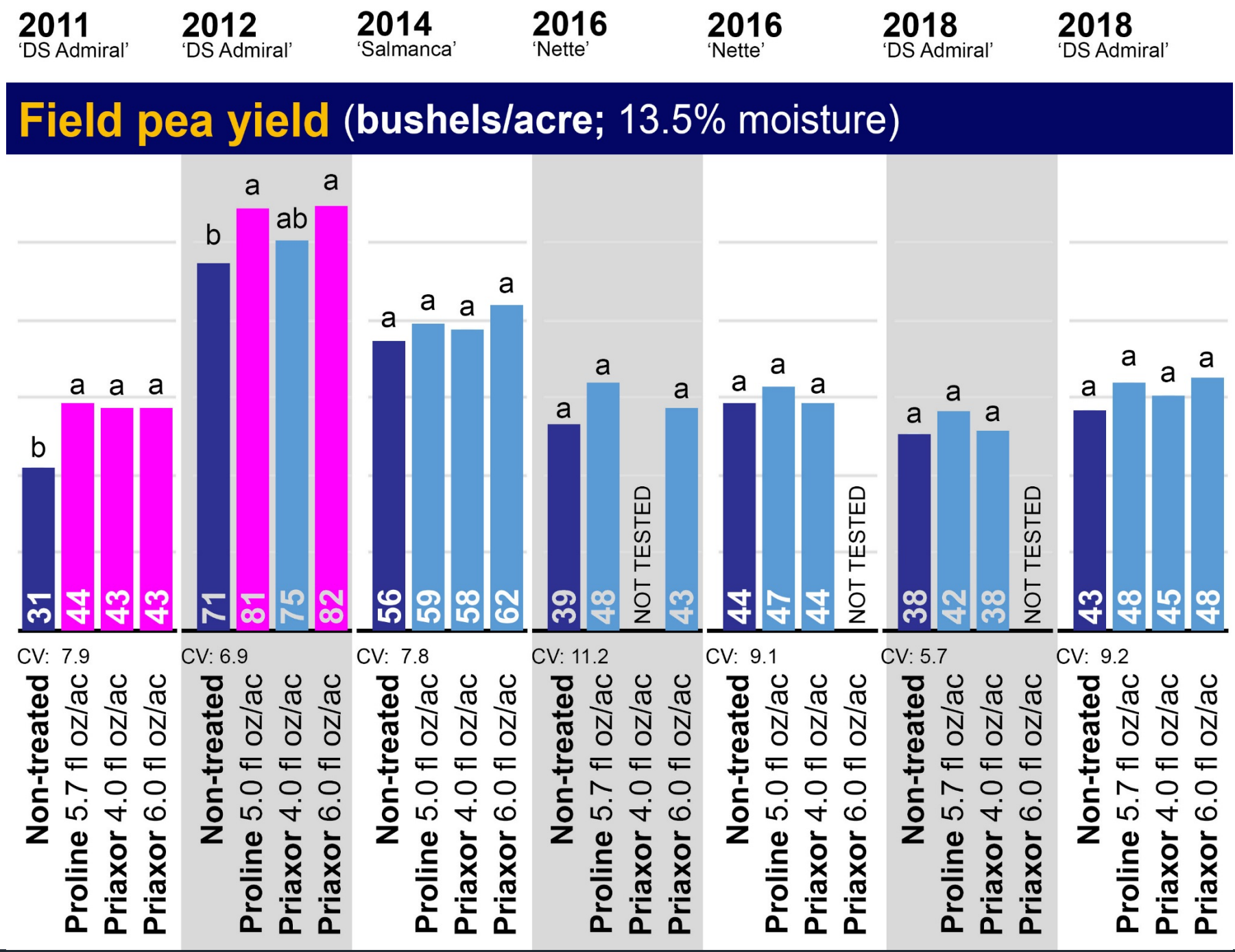
Priaxor (FRAC 7, 11), Omega (FRAC 29), Vertisan (FRAC 7), Miravis TOP (FRAC 7, 3), Endura (FRAC 7), Proline (FRAC 3)

Spray volume: **2011-2012:** 17.5 gal/ac **2018:** 15 gal/ac **Study location (all):** Carrington, ND

Ascochyta severity (percent; late pod-fill)



Spray volume: **2011-2012:** 17.5 gal/ac **2014-2018:** 15 gal/ac **Study location (all):** Carrington, ND


2011
'DS Admiral'
2012
'DS Admiral'
2014
'Salmanca'
2016
'Nette'
2016
'Nette'
2018
'DS Admiral'
2018
'DS Admiral'
Field pea yield (bushels/acre; 13.5% moisture)
b
a
a
a
31
44
43
43
CV: 7.9
Non-treated
Proline 5.7 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac
b
a
ab
a
71
81
75
82
CV: 6.9
Non-treated
Proline 5.0 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac
a
a
a
a
56
59
58
62
CV: 7.8
Non-treated
Proline 5.0 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac
a
a
NOT TESTED
a
39
48
43
CV: 11.2
Non-treated
Proline 5.7 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac
a
a
a
NOT TESTED
44
47
44
CV: 9.1
Non-treated
Proline 5.0 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac
a
a
a
NOT TESTED
38
42
38
CV: 5.7
Non-treated
Proline 5.7 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac
a
a
a
a
43
48
45
48
CV: 9.2
Non-treated
Proline 5.7 fl oz/ac
Priaxor 4.0 fl oz/ac
Priaxor 6.0 fl oz/ac
Spray volume: 2011-2012: 17.5 gal/ac 2014-2018: 15 gal/ac
Study location (all): Carrington, ND

Thank you!

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