



Biological control of *Sclerotinia* head rot in confection sunflowers with honeybee-vectored *Clonostachys rosea*

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Preliminary testing – Oilseed sunflowers, bumble-vectored *Clonostachys rosea*

Non-replicated studies. Sunflowers exposed to bees were spatially separated from identically managed sunflowers not exposed to bees.

Langdon, ND (2016, 2017)



Langdon
2016
NuSun '306'

Langdon
2017
NuSun '306'

Sclerotinia head rot incidence (% of plants)

no bees
exposed to bees

39

26

35

16

Sunflowers were inoculated twice:

- Once at approx. R5.4-R5.6
- Once at approx. R5.5-R5.9

To each head, 15,000 ascospores were applied per head per inoculation (delivered with a hand-held spray bottle calibrated to deliver 5,000 spores per spray).

Sunflower yield (pounds/acre)

bagged heads
unbagged heads

1880

2053

1981

1761

Preliminary testing – Non-oil sunflowers, honeybee-vectored *Clonostachys rosea*

Replicated studies (4-5 reps). Bees were excluded from sunflower heads in the non-treated control by placing perforated pollination bags over heads. Heads were bagged from bloom initiation to R7.
Carrington, ND (2017, 2019)



Carrington
2018
NuSeed 'Jaguar'

Carrington
2019
NuSeed 'Jaguar'

Sclerotinia head rot incidence (% of plants)

bagged heads	70	b	93	a
unbagged heads	34	a	69	a
	CV: 16.0		CV: 9.4	

INOCULATIONS:

- Sunflowers were inoculated twice in 2018 (at R5.5 and R5.8-R5.9) and once in 2019 (at R5.7-R5.9).
- To each head, 15,000 ascospores were applied per head per inoculation (delivered with hand-held spray bottle calibrated to deliver 5,000 spores / spray).

POLLINATION BAGS:

18 x 16 inch (length x width) pollination bags made of fine mesh fabric with 1 mm x 1 mm holes (Lawson Bags; Northfield, IL)

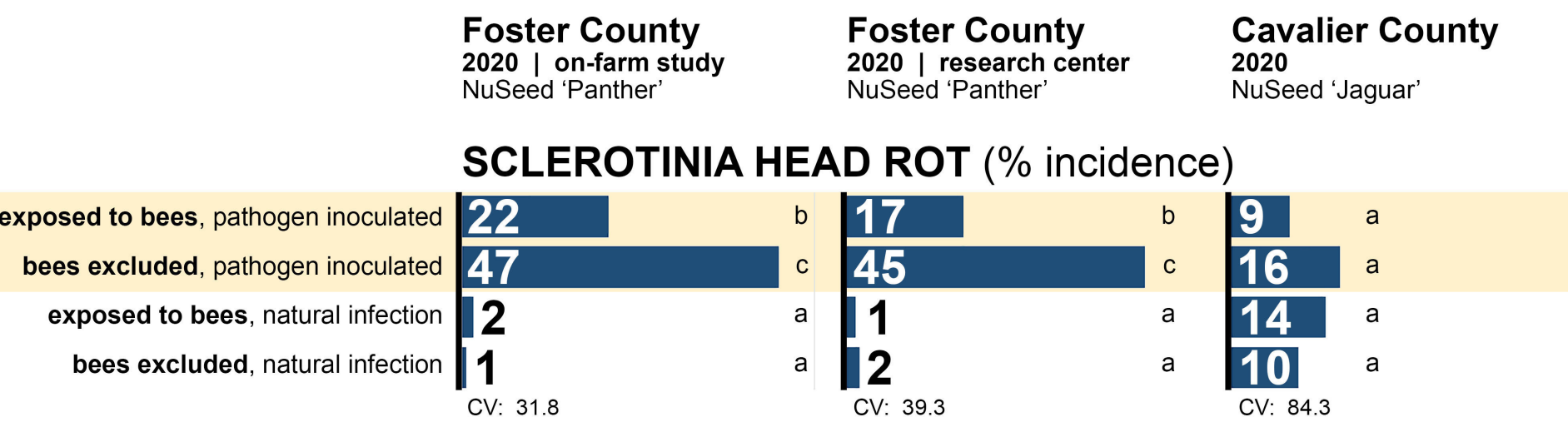
Sunflower yield (pounds/acre)

bagged heads	635	b	NO DATA
unbagged heads	1607	a	
	CV: 9.4		

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip.

Year #1: Foster and Cavalier Counties, ND (2020)



PLOT SIZE: Approx. 100 plants/plot across 3 or 4 rows. HIVES: 4 hives at each location, 100% of hives equipped with dispensers of the biological control agent at studies conducted in Foster County; 25% of hives equipped with dispensers at the study conducted in Cavalier County.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.8. To each head, 15,000 ascospores were applied per head.

POLLINATION BAGS: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open; Midco Global; Kirkwood, MO.

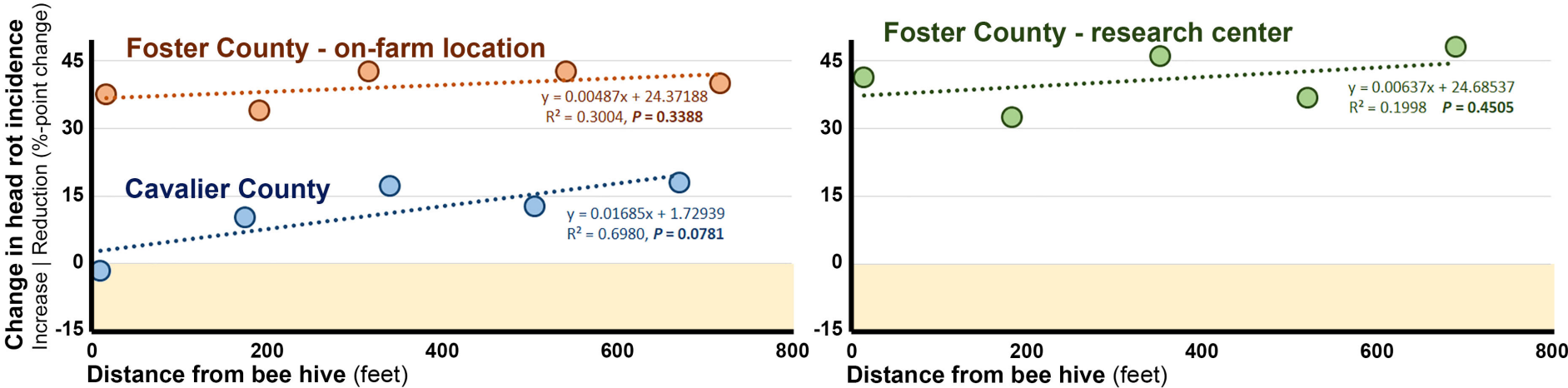
Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip.

Year #1: Foster and Cavalier Counties, ND (2020)

Impact of bee-vectored *C. rosea* relative to distance from bee hive: reduction in *Sclerotinia* head rot incidence

Sunflowers inoculated with laboratory-grown ascospores of *S. sclerotiorum*.
Honeybees excluded from sunflowers in the control treatment with perforated pollination bags



PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

HIVES: 4 hives at each location, 100% of hives equipped with dispensers of the biological control agent at studies conducted in Foster County; 25% of hives equipped with dispensers at the study conducted in Cavalier County.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.8. To each head, 15,000 ascospores were applied per head.

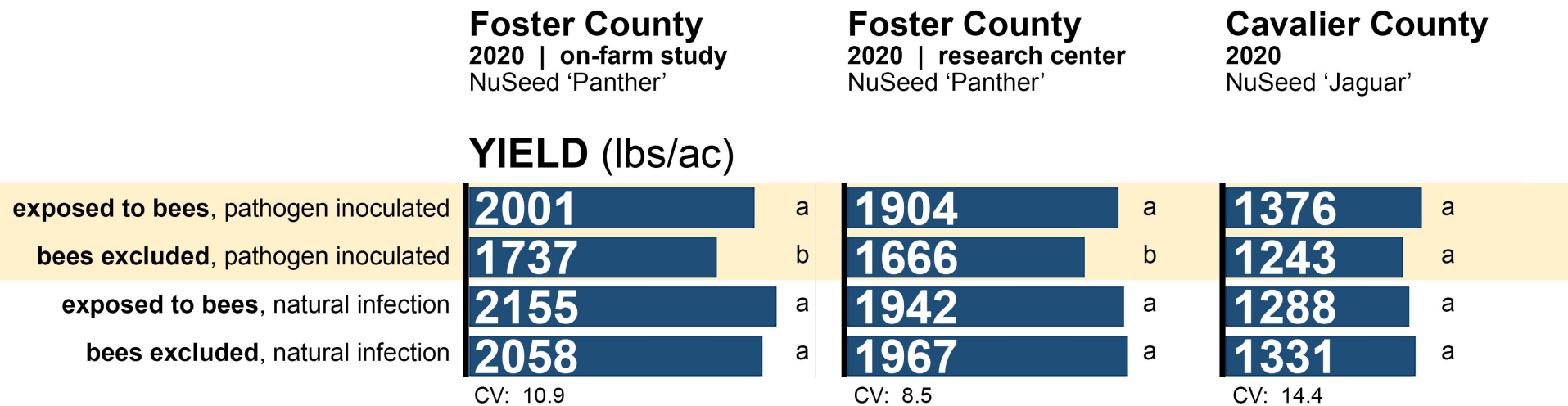
POLLINATION BAGS: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open; Midco Global; Kirkwood, MO.

	Foster County 2020 on-farm study NuSeed 'Panther'		Foster County 2020 research center NuSeed 'Panther'		Cavalier County 2020 NuSeed 'Jaguar'	
SCLEROTINIA HEAD ROT (% incidence)						
exposed to bees, pathogen inoculated	22	b	17	b	9	a
bees excluded, pathogen inoculated	47	c	45	c	16	a
exposed to bees, natural infection	2	a	1	a	14	a
bees excluded, natural infection	1	a	2	a	10	a
	CV: 31.8		CV: 39.3		CV: 84.3	

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip.

Year #1: Foster and Cavalier Counties, ND (2020)



PLOT SIZE: Approx. 100 plants/plot across 3 or 4 rows. HIVES: 4 hives at each location, 100% of hives equipped with dispensers of the biological control agent at studies conducted in Foster County; 25% of hives equipped with dispensers at the study conducted in Cavalier County.

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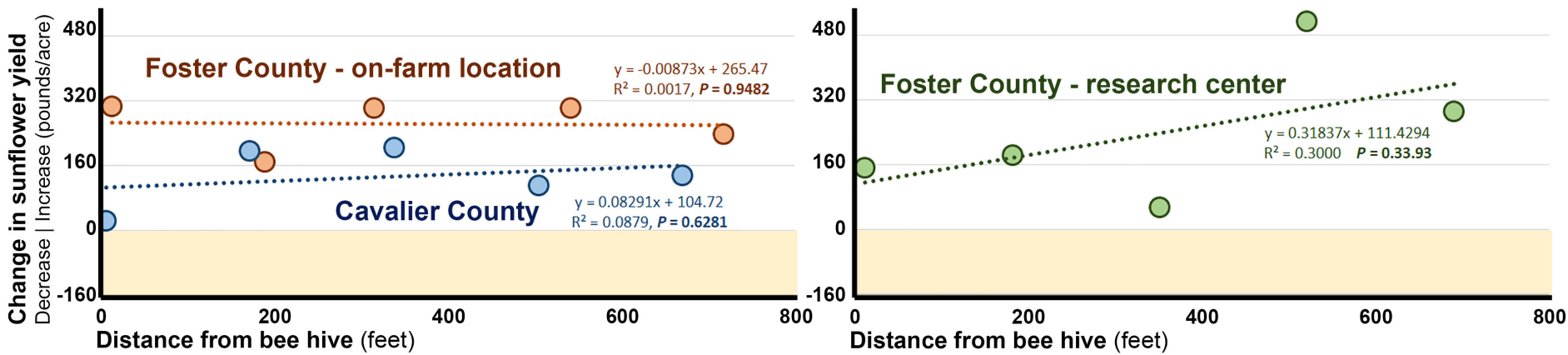
Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip.

Year #1: Foster and Cavalier Counties, ND (2020)

Impact of bee-vectored *C. rosea* relative to distance from bee hive: increase in sunflower yield (lbs/ac)

Sunflowers inoculated with laboratory-grown ascospores of *S. sclerotiorum*.
Honeybees excluded from sunflowers in the control treatment with perforated pollination bags



PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

HIVES: 4 hives at each location, 100% of hives equipped with dispensers of the biological control agent at studies conducted in Foster County; 25% of hives equipped with dispensers at the study conducted in Cavalier County.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.8. To each head, 15,000 ascospores were applied per head.

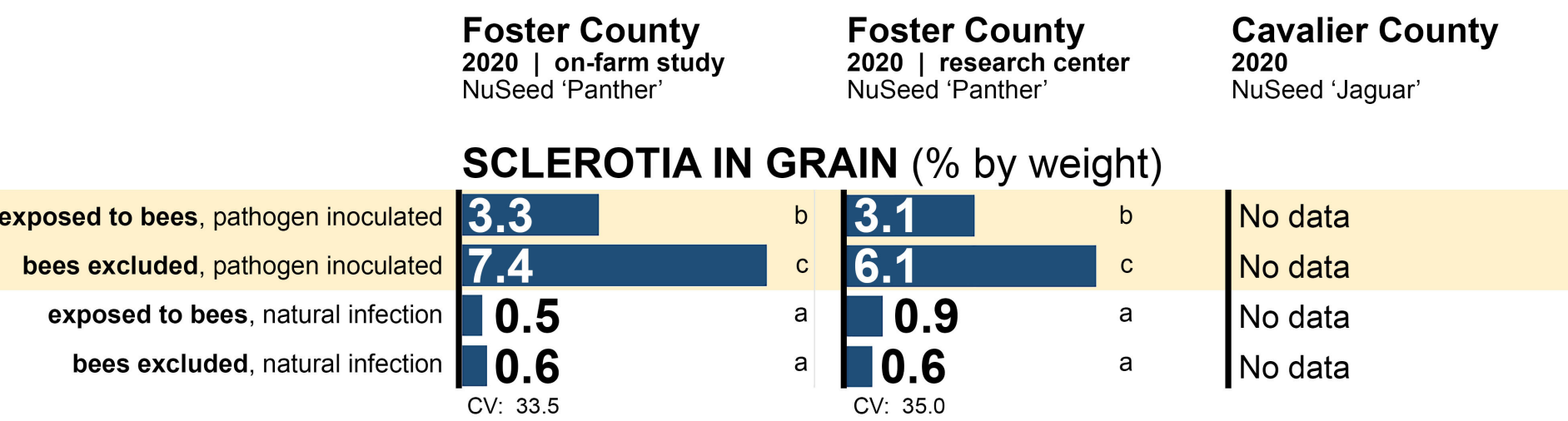
POLLINATION BAGS: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open; Midco Global; Kirkwood, MO.

	Foster County 2020 on-farm study NuSeed 'Panther'	Foster County 2020 research center NuSeed 'Panther'	Cavalier County 2020 NuSeed 'Jaguar'
YIELD (lbs/ac)			
exposed to bees, pathogen inoculated	2001	1904	1376
bees excluded, pathogen inoculated	1737	1666	1243
exposed to bees, natural infection	2155	1942	1288
bees excluded, natural infection	2058	1967	1331
	CV: 10.9	CV: 8.5	CV: 14.4

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip.

Year #1: Foster and Cavalier Counties, ND (2020)



PLOT SIZE: Approx. 100 plants/plot across 3 or 4 rows. HIVES: 4 hives at each location, 100% of hives equipped with dispensers of the biological control agent at studies conducted in Foster County; 25% of hives equipped with dispensers at the study conducted in Cavalier County.

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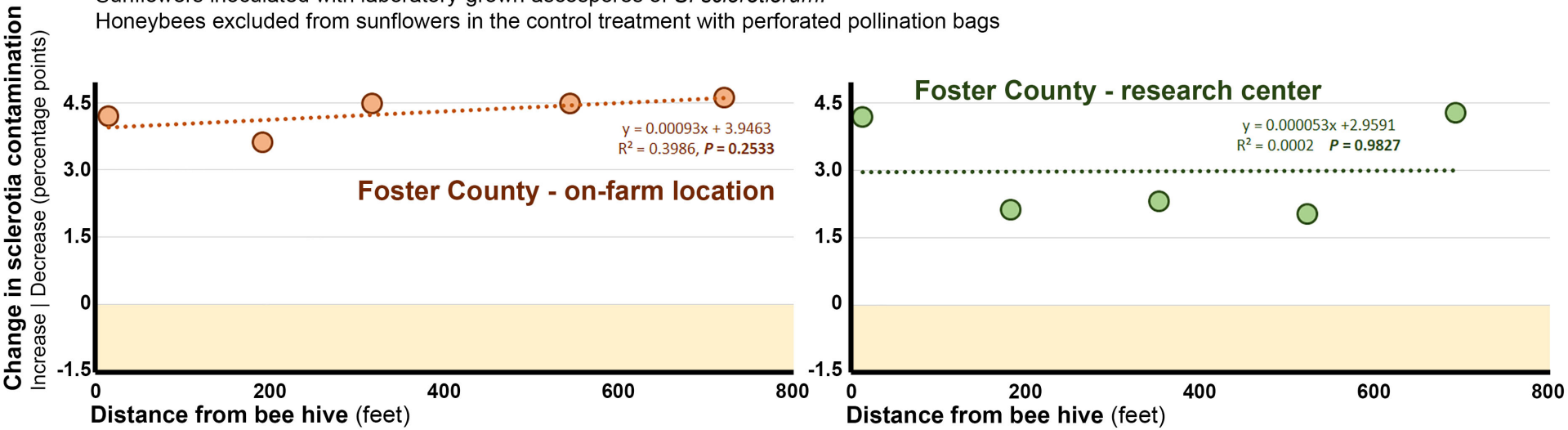
Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

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Year #1: Foster and Cavalier Counties, ND (2020)

Impact of bee-vectored *C. rosea* relative to distance from bee hive: **reduction in sclerotia contamination of the grain (percent by weight)**

Sunflowers inoculated with laboratory-grown ascospores of *S. sclerotiorum*.
Honeybees excluded from sunflowers in the control treatment with perforated pollination bags



PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

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POLLINATION BAGS: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open; Midco Global; Kirkwood, MO.

	Foster County 2020 on-farm study NuSeed 'Panther'	Foster County 2020 research center NuSeed 'Panther'	Cavalier County 2020 NuSeed 'Jaguar'
SCLEROTIA IN GRAIN (% by weight)			
exposed to bees, pathogen inoculated	3.3	3.1	No data
bees excluded, pathogen inoculated	7.4	6.1	No data
exposed to bees, natural infection	0.5	0.9	No data
bees excluded, natural infection	0.6	0.6	No data
	CV: 33.5	CV: 35.0	

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip. **Year #2: Foster, Wells and Cavalier Counties, ND (2021)**

Facilitating *Sclerotinia* head rot pressure under severe drought:

- Water was hauled to site in 1200-gal tank and pumped through mist system.
- Sunflowers inoculated in morning.
- Irrigation delivered continuously until dark.



Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip. **Year #2: Foster, Wells and Cavalier Counties, ND (2021)**

	Wells County 2021 NuSeed 'Panther'	Foster County 2021 NuSeed 'Panther'	Cavalier County 2021 NuSeed 'LD5009'
SCLEROTINIA HEAD ROT (% incidence)			
exposed to bees , pathogen inoculated	23b	4b	27b
bees excluded , pathogen inoculated	70c	8b	41b
exposed to bees , natural infection	0a	0a	4a
bees excluded , natural infection	0a	0a	0a
	CV: 12.9	CV: 64.0	CV: 32.7



PLOT SIZE: Approx. 100 plants/plot across 3 or 4 rows.

HIVES: 4 or 6 hives at each location, 50 to 100% of hives equipped with dispensers of the biological control.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.9. To each head, 15,000 ascospores were applied per head.

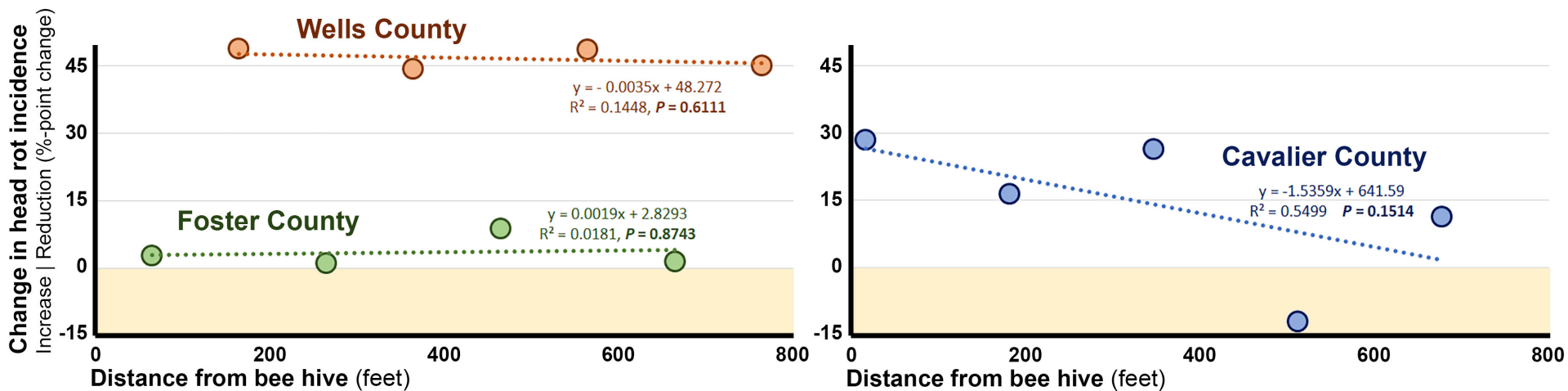
POLLINATION BAGS: *Rep 3 of Wells County study:* 18 x 16 inch (length x width), fine mesh fabric with 1 mm x 1 mm holes (Lawson Bags; Northfield, IL)
Remainder of studies: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of surface open (Midco Global; Kirkwood, MO)

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

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Impact of bee-vectored *C. rosea* relative to distance from bee hive: reduction in *Sclerotinia* head rot incidence

Sunflowers inoculated with laboratory-grown ascospores of *S. sclerotiorum*.
Honeybees excluded from sunflowers in the control treatment with perforated pollination bags.



PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

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Wells County
2021
NuSeed 'Panther'

Foster County
2021
NuSeed 'Panther'

Cavalier County
2021
NuSeed 'LD5009'

SCLEROTINIA HEAD ROT (% incidence)

exposed to bees, pathogen inoculated	23	b	4	b	27	b
bees excluded, pathogen inoculated	70	c	8	b	41	b
exposed to bees, natural infection	0	a	0	a	4	a
bees excluded, natural infection	0	a	0	a	0	a
	CV: 12.9		CV: 64.0		CV: 32.7	

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip. **Year #2: Foster, Wells and Cavalier Counties, ND (2021)**

	Wells County 2021 NuSeed 'Panther'		Foster County 2021 NuSeed 'Panther'		Cavalier County 2021 NuSeed 'LD5009'	
	YIELD (lbs/ac)					
exposed to bees, pathogen inoculated	2872	a	1313	a	1892	b
bees excluded, pathogen inoculated	2295	b	1267	a	1637	b
exposed to bees, natural infection	2967	a	1426	a	2793	a
bees excluded, natural infection	2869	a	1320	a	2458	a
	CV: 10.6		CV: 10.2		CV: 23.0	



PLOT SIZE: Approx. 100 plants/plot across 3 or 4 rows.

HIVES: 4 or 6 hives at each location, 50 to 100% of hives equipped with dispensers of the biological control.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.9. To each head, 15,000 ascospores were applied per head.

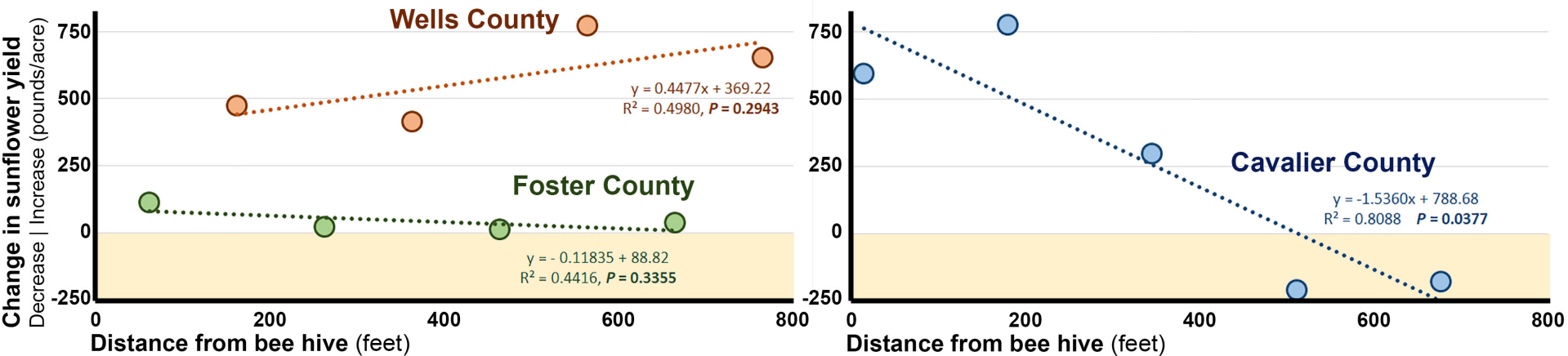
POLLINATION BAGS: *Rep 3 of Wells County study:* 18 x 16 inch (length x width), fine mesh fabric with 1 mm x 1 mm holes (Lawson Bags; Northfield, IL)
Remainder of studies: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of surface open (Midco Global; Kirkwood, MO)

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip. **Year #2: Foster, Wells and Cavalier Counties, ND (2021)**

Impact of bee-vectored *C. rosea* relative to distance from bee hive: change in sunflower yield (lbs/ac)

Sunflowers inoculated with laboratory-grown ascospores of *S. sclerotiorum*.
Honeybees excluded from sunflowers in the control treatment with perforated pollination bags



PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

HIVES: 4 or 6 hives at each location, 50 to 100% of hives equipped with dispensers of the biological control.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.8. To each head, 15,000 ascospores were applied per head.

POLLINATION BAGS:

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Remainder of studies: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open (Midco Global; Kirkwood, MO)

Wells County
2021
NuSeed 'Panther'

Foster County
2021
NuSeed 'Panther'

Cavalier County
2021
NuSeed 'LD5009'

YIELD (lbs/ac)

exposed to bees, pathogen inoculated	2872	a	1313	a	1892	b
bees excluded, pathogen inoculated	2295	b	1267	a	1637	b
exposed to bees, natural infection	2967	a	1426	a	2793	a
bees excluded, natural infection	2869	a	1320	a	2458	a
	CV: 10.6		CV: 10.2		CV: 23.0	

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip. **Year #2: Foster, Wells and Cavalier Counties, ND (2021)**

	Wells County 2021 NuSeed 'Panther'	Foster County 2021 NuSeed 'Panther'	Cavalier County 2021 NuSeed 'LD5009'
SCLEROTIA IN GRAIN (% by weight)			
exposed to bees, pathogen inoculated	2.3b	0.6b	0.8a
bees excluded, pathogen inoculated	9.3c	0.6b	7.9b
exposed to bees, natural infection	0.3a	0.2ab	0.7a
bees excluded, natural infection	0.4a	0.1a	0.4a
	CV: 34.3	CV: 107.3	CV: 86.7



PLOT SIZE: Approx. 100 plants/plot across 3 or 4 rows.

HIVES: 4 or 6 hives at each location, 50 to 100% of hives equipped with dispensers of the biological control.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.9. To each head, 15,000 ascospores were applied per head.

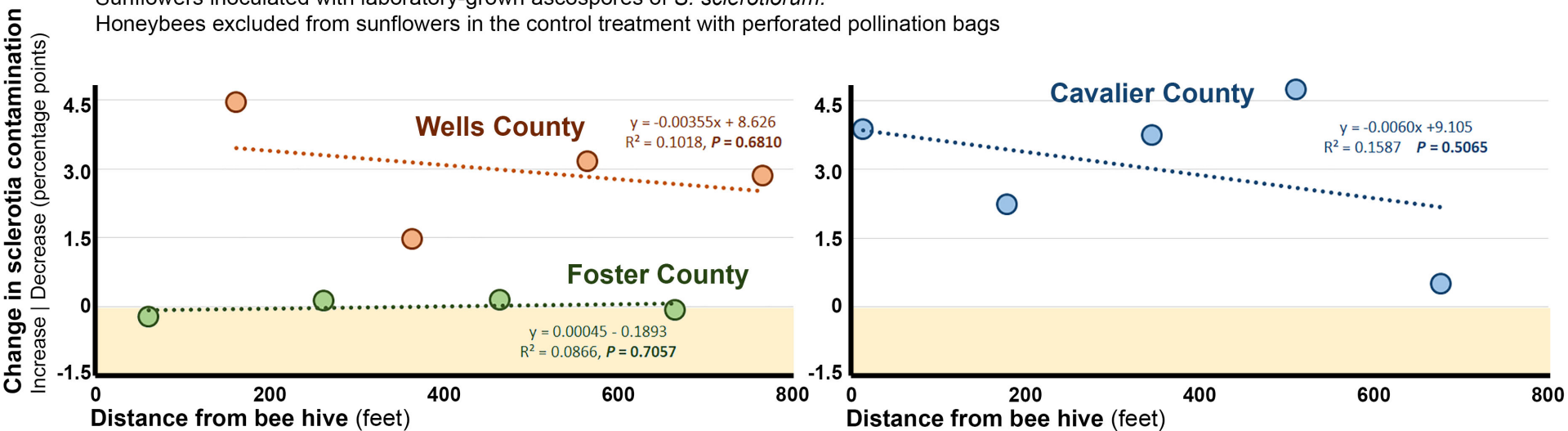
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Remainder of studies: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of surface open (Midco Global; Kirkwood, MO)

Efficacy of honeybee-vectored *Clonostachys rosea* relative to distance from the bee hive

Replicated studies (3 reps). Sunflowers were established in a strip 60 to 110 feet wide by half-mile long. Bee hives were placed at one end and two-thirds the distance along the strip. **Year #2: Foster, Wells and Cavalier Counties, ND (2021)**

Impact of bee-vectored *C. rosea* relative to distance from bee hive: **reduction in sclerotia contamination of the grain (percent by weight)**

Sunflowers inoculated with laboratory-grown ascospores of *S. sclerotiorum*.
Honeybees excluded from sunflowers in the control treatment with perforated pollination bags



PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

HIVES: 4 or 6 hives at each location, 50 to 100% of hives equipped with dispensers of the biological control.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.8. To each head, 15,000 ascospores were applied per head.

POLLINATION BAGS:

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Remainder of studies: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open (Midco Global; Kirkwood, MO)

Wells County
2021
NuSeed 'Panther'

Foster County
2021
NuSeed 'Panther'

Cavalier County
2021
NuSeed 'LD5009'

SCLEROTIA IN GRAIN (% by weight)

exposed to bees, pathogen inoculated	2.3	b	0.6	b	0.8	a
bees excluded, pathogen inoculated	9.3	c	0.6	b	7.9	b
exposed to bees, natural infection	0.3	a	0.2	ab	0.7	a
bees excluded, natural infection	0.4	a	0.1	a	0.4	a
	CV: 34.3		CV: 107.3		CV: 86.7	

Efficacy of honeybee-vectored *Clonostachys rosea* relative to sunflower hybrid

Replicated studies (3 reps).

Sunflowers were established in plots 15 to 215 feet from each set of bee hives (Foster and Wells County study sites) and 615 to 815 from each set of bee hives (Foster County only).

Foster and Wells Counties, ND (2021)

PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

HIVES: 4 hives at each location, 50 to 100% of hives equipped with dispensers of the biological control.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.8. To each head, 15,000 ascospores were applied per head.

POLLINATION BAGS: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open (Midco Global; Kirkwood, MO)

		Sclerotinia head rot incidence (%)			
		Foster County 2021		Wells County 2021	
CHS 'RH396'	unbagged	<div><div></div>13</div>	ab	<div><div></div>4</div>	a
	bagged	<div><div></div>35</div>	bc	<div><div></div>16</div>	bc
NuSeed 'Panther'	unbagged	<div><div></div>5</div>	a	<div><div></div>20</div>	bcd
	bagged	<div><div></div>7</div>	a	<div><div></div>68</div>	e
SunOpta 'SC09'	unbagged	<div><div></div>8</div>	a	<div><div></div>10</div>	ab
	bagged	<div><div></div>19</div>	abc	<div><div></div>62</div>	de
SunOpta 'SC19'	unbagged	<div><div></div>8</div>	a	<div><div></div>29</div>	b-e
	bagged	<div><div></div>38</div>	bc	<div><div></div>61</div>	de
NuSeed 'Jaguar'	unbagged	<div><div></div>8</div>	a	<div><div></div>23</div>	bcd
	bagged	<div><div></div>20</div>	abc	<div><div></div>69</div>	e
CHS '8015'	unbagged	<div><div></div>16</div>	abc	<div><div></div>42</div>	cde
	bagged	<div><div></div>40</div>	c	<div><div></div>84</div>	e
		CV: 70.6		CV: 12.3	

Efficacy of honeybee-vectored *Clonostachys rosea* relative to sunflower hybrid

Replicated studies (3 reps).

Sunflowers were established in plots 15 to 215 feet from each set of bee hives (Foster and Wells County study sites) and 615 to 815 from each set of bee hives (Foster County only).

Foster and Wells Counties, ND (2021)

PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

HIVES: 4 hives at each location, 50 to 100% of hives equipped with dispensers of the biological control.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.8. To each head, 15,000 ascospores were applied per head.

POLLINATION BAGS: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open (Midco Global; Kirkwood, MO)

		Sunflower yield (pounds/acre)			
		Foster County 2021		Wells County 2021	
CHS ‘RH396’	unbagged	975	a	3358	a
	bagged	1423	bc	2790	bc
NuSeed ‘Panther’	unbagged	1450	bcd	2715	bcd
	bagged	1375	e	2243	e
SunOpta ‘SC09’	unbagged	1306	ab	2518	ab
	bagged	948	de	1394	de
SunOpta ‘SC19’	unbagged	1371	b-e	2436	b-e
	bagged	1052	de	1379	de
NuSeed ‘Jaguar’	unbagged	1532	bcd	2808	bcd
	bagged	1285	e	1437	e
CHS ‘8015’	unbagged	1293	cde	2184	cde
	bagged	729	e	1049	e
		CV: 24.3		CV: 20.0	

Efficacy of honeybee-vectored *Clonostachys rosea* relative to sunflower hybrid

Replicated studies (3 reps).

Sunflowers were established in plots 15 to 215 feet from each set of bee hives (Foster and Wells County study sites) and 615 to 815 from each set of bee hives (Foster County only).

Foster and Wells Counties, ND (2021)

PLOT SIZE: ~100 plants/plot across 3 or 4 rows.

HIVES: 4 hives at each location, 50 to 100% of hives equipped with dispensers of the biological control.

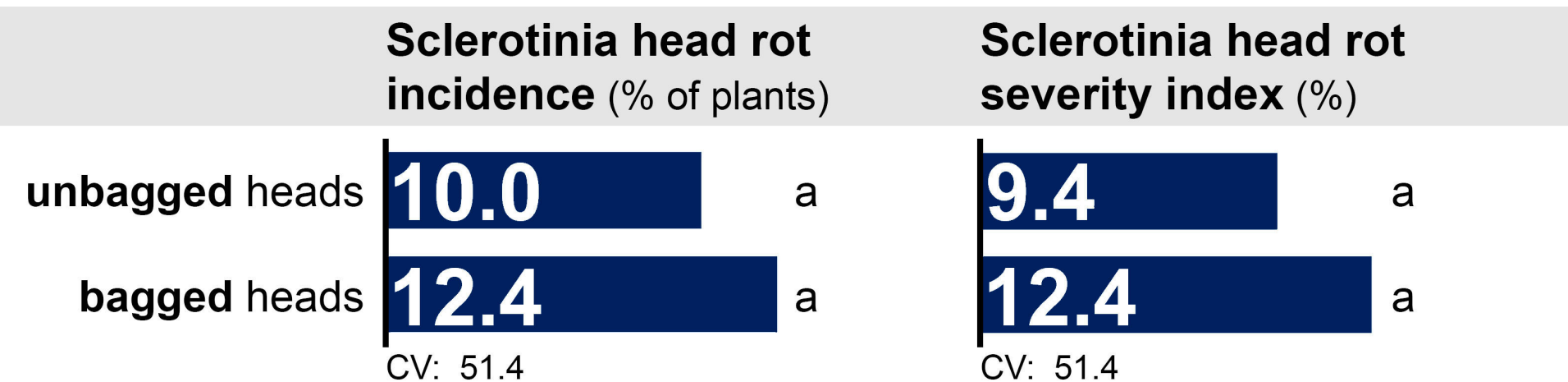
INOCULATIONS: Sunflowers were inoculated once at approx. R5.4-R5.8. To each head, 15,000 ascospores were applied per head.

POLLINATION BAGS: 16x18" (40.64 x 45.72 cm) HDPE plastic with 336-micron pore diameter; 24% of the surface open (Midco Global; Kirkwood, MO)

		Sclerotia in grain (% by weight)			
		Foster County 2021		Wells County 2021	
CHS ‘RH396’	unbagged	<div><div></div></div> 1.6	a	<div><div></div></div> 1.6	a
	bagged	<div><div></div></div> 2.6	bc	<div><div></div></div> 3.6	ab
NuSeed ‘Panther’	unbagged	<div><div></div></div> 0.9	bcd	<div><div></div></div> 1.5	a
	bagged	<div><div></div></div> 0.6	e	<div><div></div></div> 12	abc
SunOpta ‘SC09’	unbagged	<div><div></div></div> 2.0	ab	<div><div></div></div> 2.1	a
	bagged	<div><div></div></div> 2.1	de	<div><div></div></div> 20	bc
SunOpta ‘SC19’	unbagged	<div><div></div></div> 0.7	b-e	<div><div></div></div> 7	abc
	bagged	<div><div></div></div> 5.0	de	<div><div></div></div> 22	bc
NuSeed ‘Jaguar’	unbagged	<div><div></div></div> 1.2	bcd	<div><div></div></div> 4.0	ab
	bagged	<div><div></div></div> 2.2	e	<div><div></div></div> 27	c
CHS ‘8015’	unbagged	<div><div></div></div> 1.6	cde	<div><div></div></div> 7	abc
	bagged	<div><div></div></div> 4.3	e	<div><div></div></div> 30	c
		CV: 74.6		CV: 28.3	

What impact do pollination bags have on Sclerotinia head rot disease pressure?

Replicated study (5 reps; average 34 plants/plot).
Foster County, ND (2021)



- Pollination bags were associated with a modest, but not statistically significant, increase in head rot pressure
- Increase in head rot pressure was less than that observed in the bee-vectoring studies

PLOT SIZE: Average 34 plants/plot (max = 46 plants, min = 28 plants).

NO BEE HIVES. Study was conducted nearly 1 mile from the bee-vectoring study.

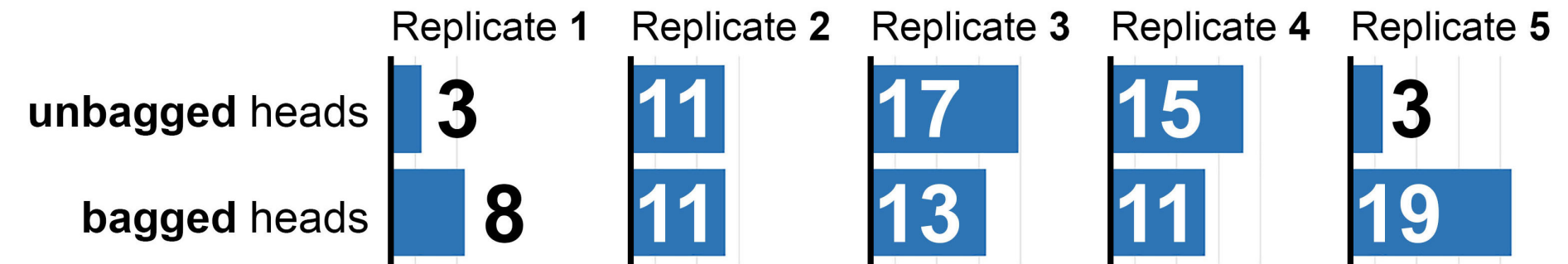
INOCULATIONS: Sunflowers were inoculated once at approx. R5.5-R5.8. To each head, 15,000 ascospores were applied per head.

POLLINATION BAGS: 18 x 16 inch (length x width), fine mesh fabric with 1 mm x 1 mm holes (Lawson Bags; Northfield, IL)

What impact do pollination bags have on *Sclerotinia* head rot disease pressure?

Replicated study (5 reps; average 34 plants/plot).
Foster County, ND (2021)

Sclerotinia head rot incidence by experimental replicate



Follow-up testing is needed.

- Very high variability in results was observed across replicates.
- Two brands of pollination bags were utilized, and the impact of the pollination bag on head rot may differ across brands.

PLOT SIZE: Average 34 plants/plot (max = 46 plants, min = 28 plants).

NO BEE HIVES. Study was conducted nearly 1 mile from the bee-vectoring study.

INOCULATIONS: Sunflowers were inoculated once at approx. R5.5-R5.8. To each head, 15,000 ascospores were applied per head.

POLLINATION BAGS: 18 x 16 inch (length x width), fine mesh fabric with 1 mm x 1 mm holes (Lawson Bags; Northfield, IL)



Thank you!

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