



CSU Wheat Breeding and Genetics Program Update

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SOIL AND CROP SCIENCES
COLORADO STATE UNIVERSITY



Guardian – exp line CO13D0787

- Antero/Snowmass//Byrd
- Medium height, medium maturity, medium coleoptile length, average straw strength
- Excellent resistance to wheat streak mosaic virus and good resistance to stripe, leaf, and stem rusts
- Excellent test weight and grain protein, very good quality



Fortify SF – exp line CO15SFD107

- Byrd/Bearpaw//Byrd
- Medium height, medium maturity, medium coleoptile length, fair straw strength (e.g., lodging resistance)
- Disease susceptibility similar to Byrd
- Average test weight and milling and baking quality
- Semi-solid stem for partial resistance to the wheat stem sawfly

Guardian – dryland trials

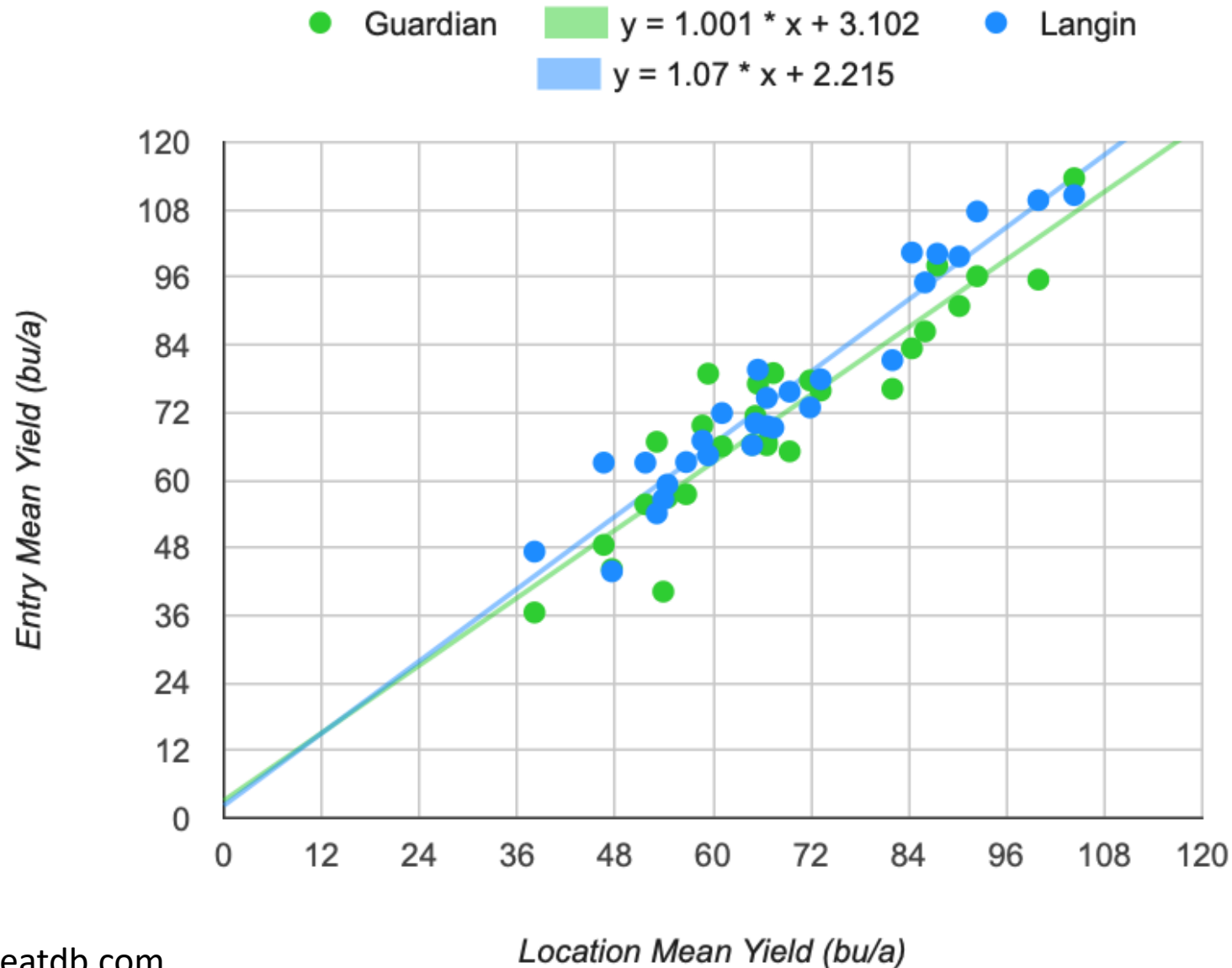
Entry	CSU Elite						UVPT					Combined		Western KS	
	2016 Yield	2017 Yield	2018 Yield	2019 Yield	Avg Yield	Avg TestWt	2017 Yield	2018 Yield	2019 Yield	Avg Yield	Avg TestWt	Avg Yield	Avg TestWt	Avg Yield	Avg TestWt
Langin	82.3	70.2	68.3	81.2	75.8	58.1	77.5	70.5	78.1	75.5	60.2	75.7	59.0	74.5	57.4
Whistler	82.4	74.4	67.8	80.5	76.5	57.5	79.0	67.2	77.3	74.6	59.3	75.7	58.2	75.2	57.4
Avery	78.1	68.3	68.6	78.3	73.6	58.1	73.6	65.5	77.6	72.6	60.1	73.2	58.9	60.3	54.4
Canvas	79.7	71.0	66.7	75.8	73.4	59.0	77.0	64.7	74.7	72.1	61.0	72.9	59.8	78.8	58.3
Guardian	78.5	71.3	63.7	78.6	73.3	59.4	74.7	63.7	76.0	71.7	61.5	72.6	60.2	76.8	58.4
Byrd	79.8	69.8	66.4	76.3	73.2	58.5	75.8	63.1	74.3	71.1	60.4	72.4	59.3	59.4	54.7
Trial Average	78.1	65.1	65.8	76.8	72.8	58.4	67.5	63.6	73.3	69.9	60.3	73.8	59.2	70.8	56.8
Locations	10	10	10	12	42	42	8	9	11	28	28	70	70	5	5

Grain yield – similar to Byrd, Avery, Canvas
3 bu/a lower than Langin, Whistler

Test weight – 0.5 lb/bu higher than Canvas
1 lb/bu higher than Byrd, Avery, Langin
2 lb/bu higher than Whistler

Grain Yield Response Comparison

CO -- Northeast, CO -- Southeast



2017 Irrigated Variety Performance Trial (IVPT)

Entry	Haxtun Yield	Haxtun TestWt	Haxtun WSMV
CO13D0787	97.0	58.2	1.3
Canvas	83.2	55.1	3.7
Snowmass 2.0	82.9	57.0	7.7
Monarch	82.5	58.0	6.3
Langin	82.4	57.2	6.7
Whistler	81.1	52.8	2.0
Avery	79.9	54.9	2.0
Antero	79.8	57.1	5.0
Byrd	78.8	56.4	2.3
Breck	78.0	58.3	4.0
Brawl CL Plus	75.4	58.3	7.3
Denali	74.6	55.1	3.3
Sunshine	74.1	55.8	7.3
SY Wolf	74.1	55.8	6.3
SY Sunrise	73.1	59.2	8.0
WB4303	72.0	54.0	7.7
KanMark	68.5	56.3	9.0
Cowboy	67.8	49.7	5.7
WB-Grainfield	67.1	58.4	9.0
WB4458	61.4	54.9	6.7
Larry	60.7	55.1	8.3
Thunder CL	57.9	56.9	8.7
Average	76.1	56.1	
LSD (0.30)	4.2		
Correlation - Yield vs WSMV			-0.61

Experimental line CO13D0787

- Antero/Snowmass//Byrd
- Medium height, medium maturing, fair straw strength
- Carries resistance to wheat streak mosaic virus via two different mechanisms
 - WCM_{T112} gene for resistance to the wheat curl mite (from Byrd)
 - $Wsm2$ gene for virus resistance (from Snowmass)
- Very good resistance to stripe rust (2), leaf rust (3), and stem rust (2)
- Very good test weight, grain protein deviation, and milling/baking quality

2019 Irrigated Variety Performance Trial (IVPT)

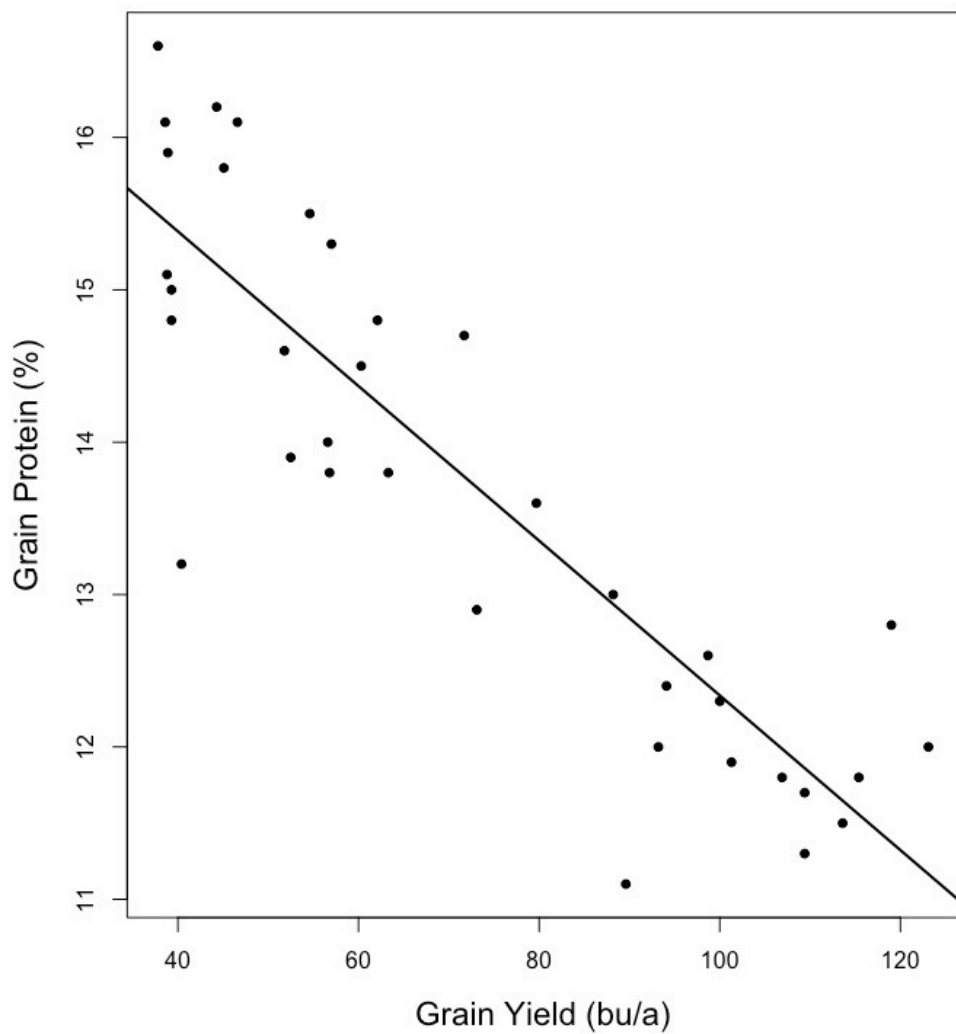
Entry	Burlington Yield	Burlington TestWt	Burlington WSMV
Guardian	91.6	62.2	1.0
CO13D0346	90.6	60.4	1.7
Crescent AX	80.7	60.8	2.3
CO15D098R	78.2	59.4	2.3
Canvas	77.6	59.0	2.3
Breck	74.7	59.0	3.3
Sunshine	73.4	57.9	5.7
Snowmass 2.0	73.0	58.2	6.0
WB4595	71.3	59.2	3.0
SY Sunrise	69.4	57.9	3.7
Monarch	68.8	56.5	3.3
SY Wolverine	68.1	58.6	5.0
Brawl CL Plus	67.0	60.0	4.3
Denali	66.7	55.9	3.0
WB4792	66.1	56.9	3.7
SY Wolf	64.0	57.5	6.3
WB4303	63.0	54.1	5.0
Long Branch	62.9	57.0	4.7
AM Eastwood	57.2	55.7	6.0
WB4418	57.1	55.1	4.3
WB-Grainfield	51.8	58.7	7.7
WB4699	51.6	53.8	3.0
WB4269	42.7	57.4	9.0
Thunder CL	42.3	57.8	8.0
Average	67.1	57.9	4.4
LSD (0.30)	3.6		
Correlation - Yield vs WSMV			-0.79

Experimental line CO13D0787

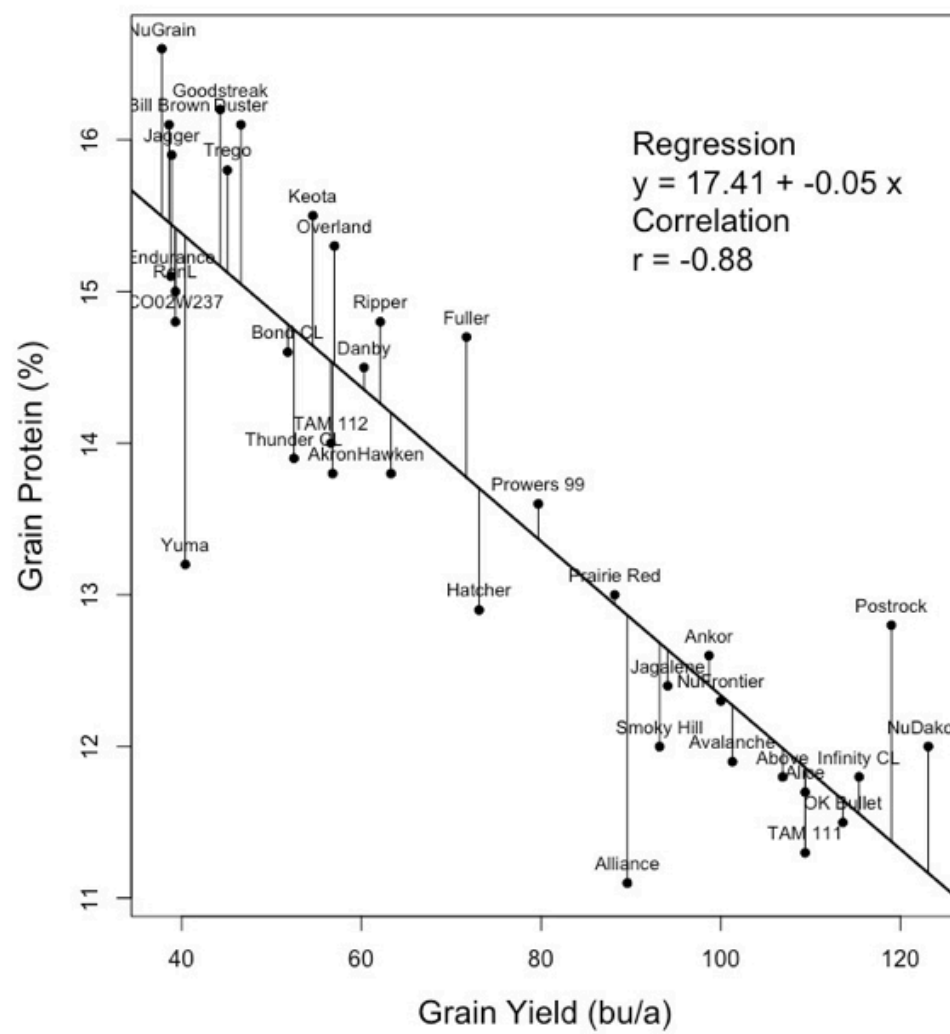
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Grain Protein Deviation

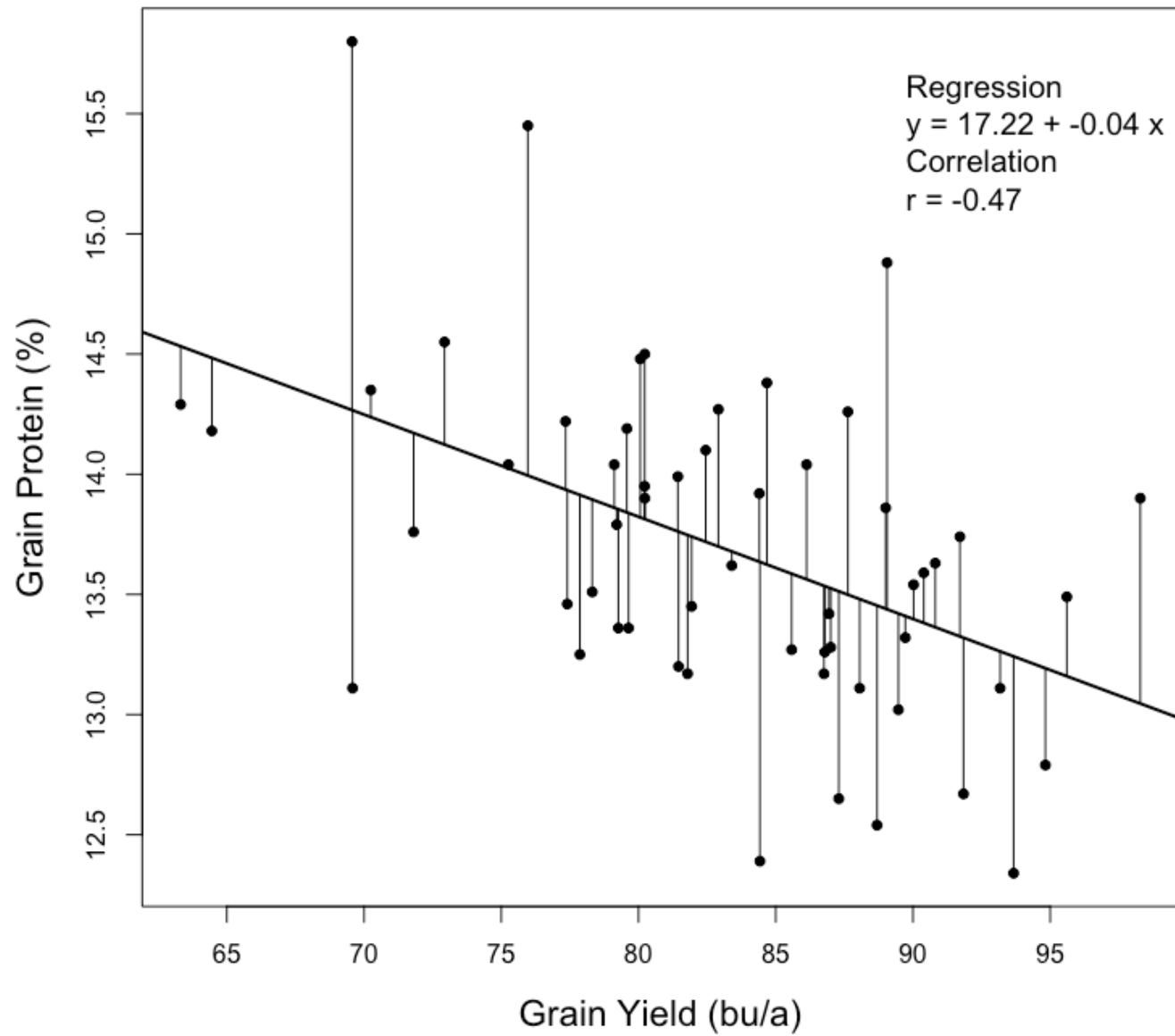
2007 Julesburg UVPT
Grain Yield vs Grain Protein



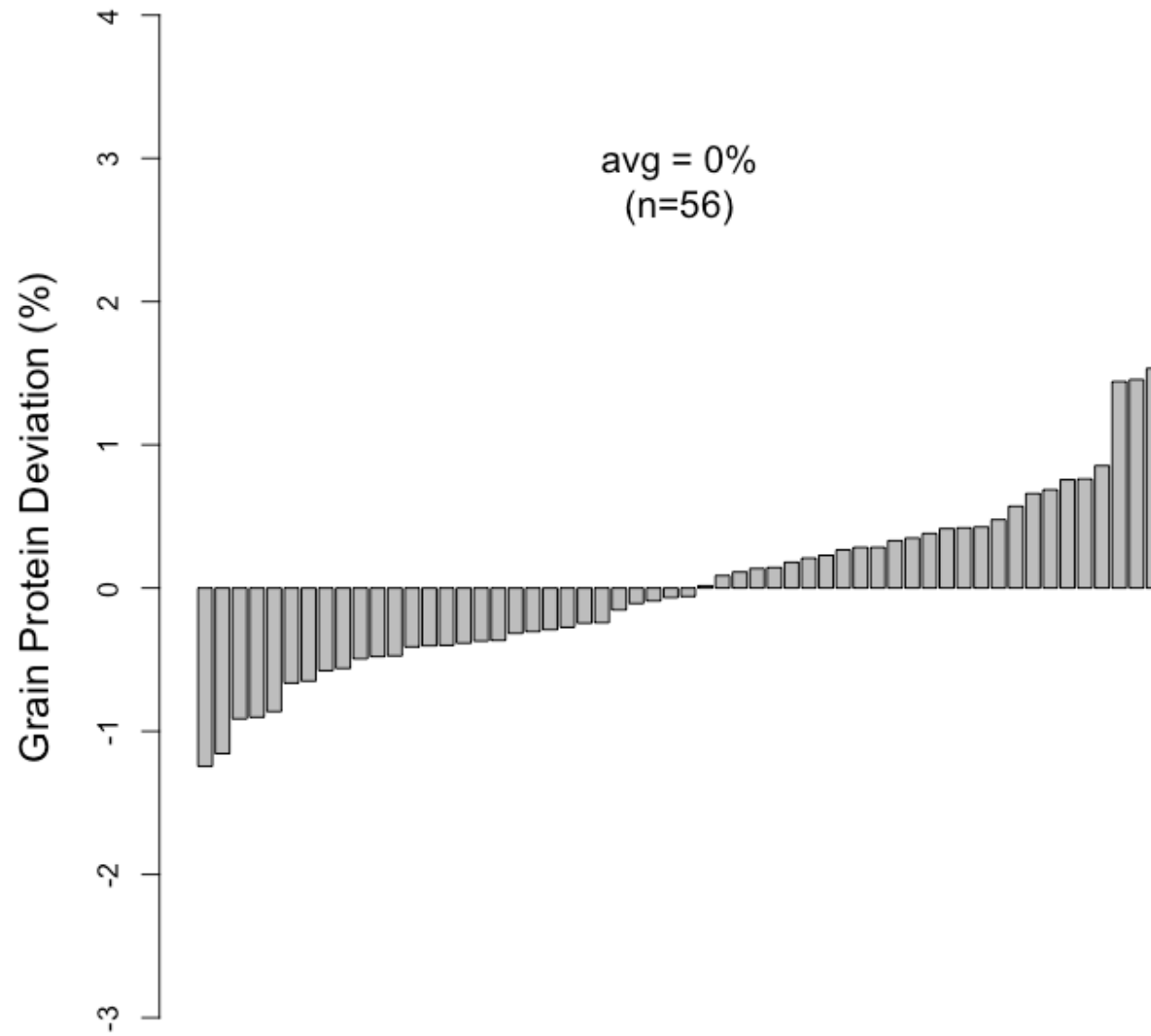
2007 Julesburg UVPT
Grain Yield vs Grain Protein



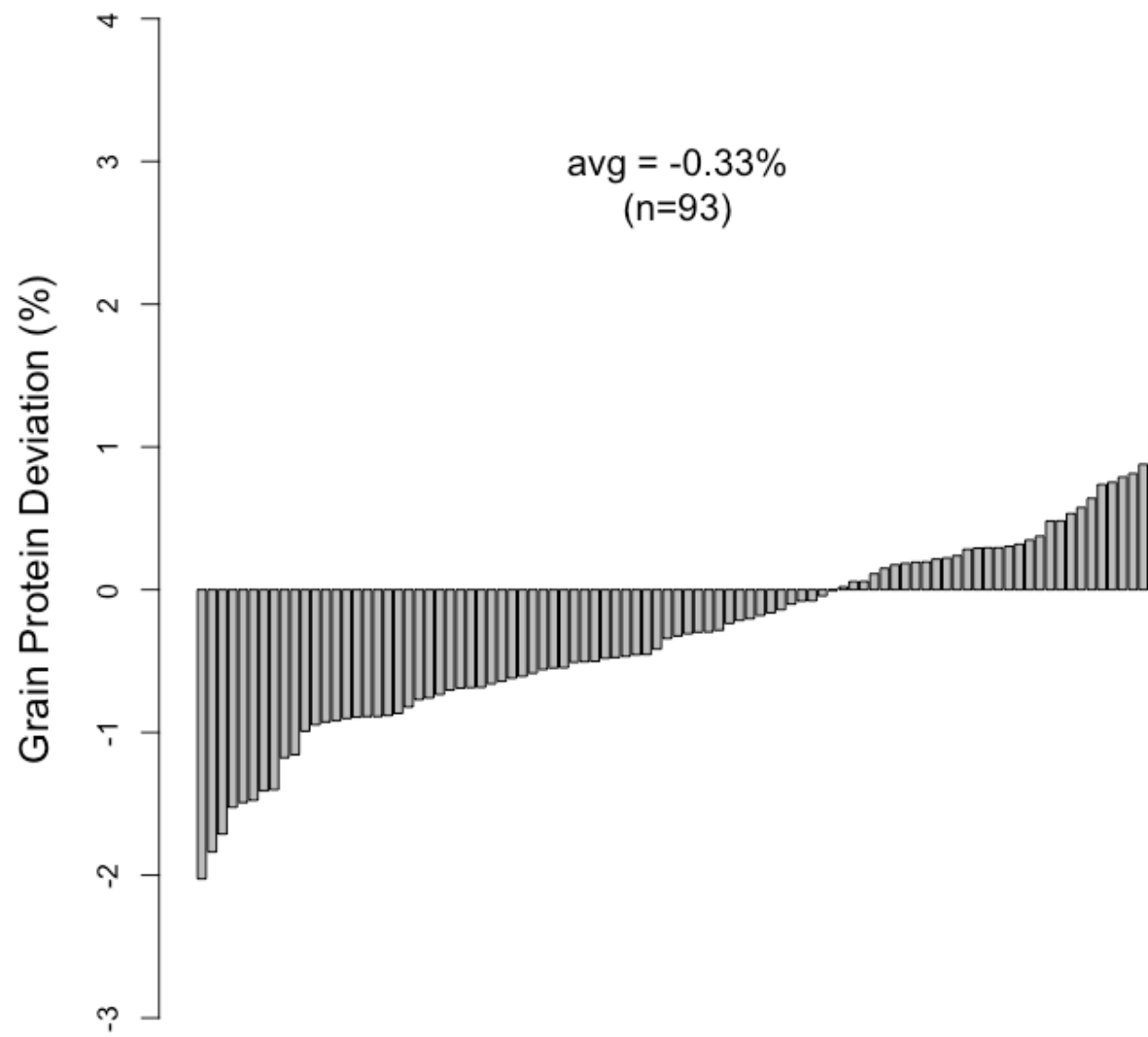
Burlington 2018 UVPT Grain Yield vs Grain Protein



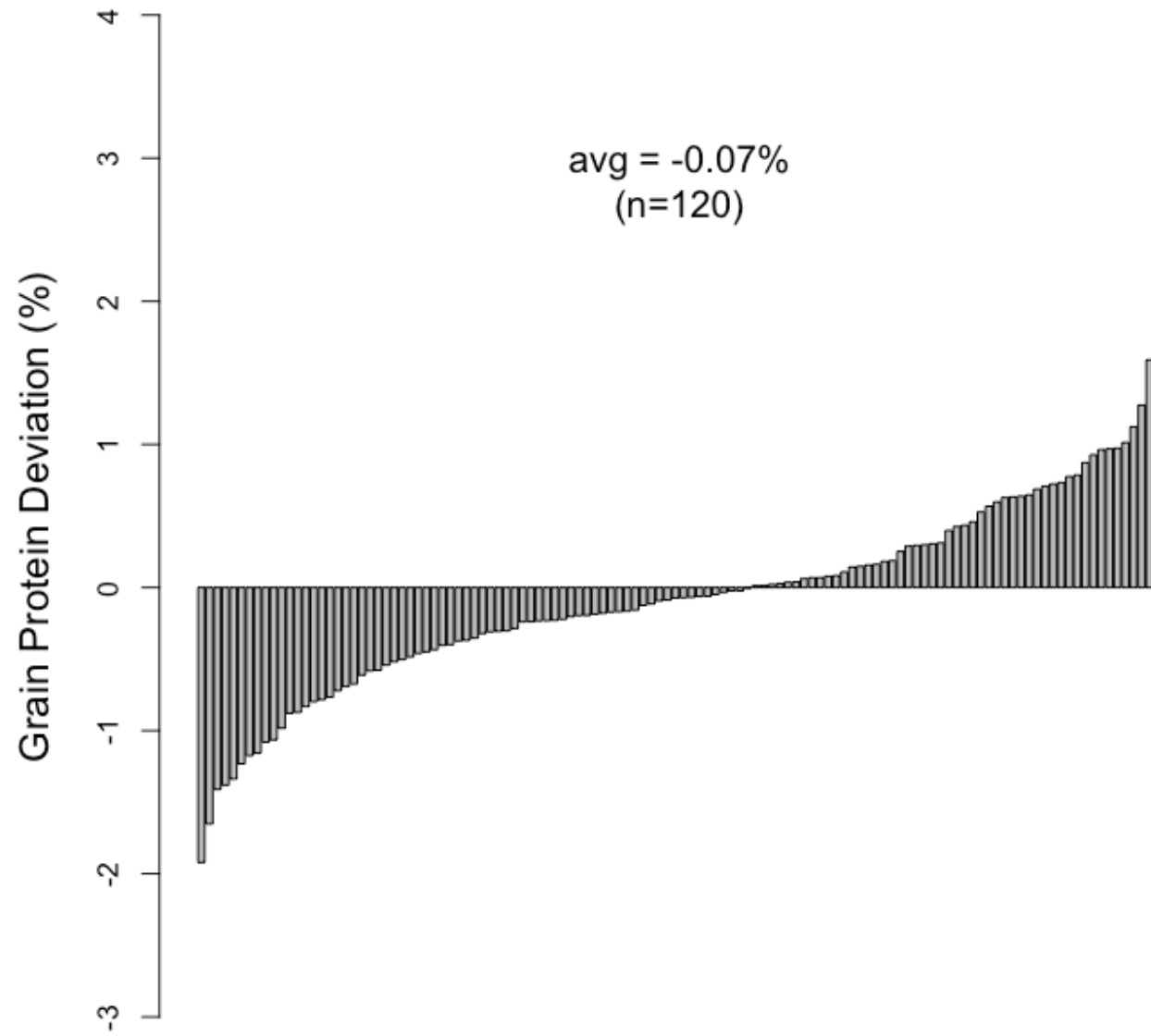
Grain Protein Deviation Burlington 2018 UVPT



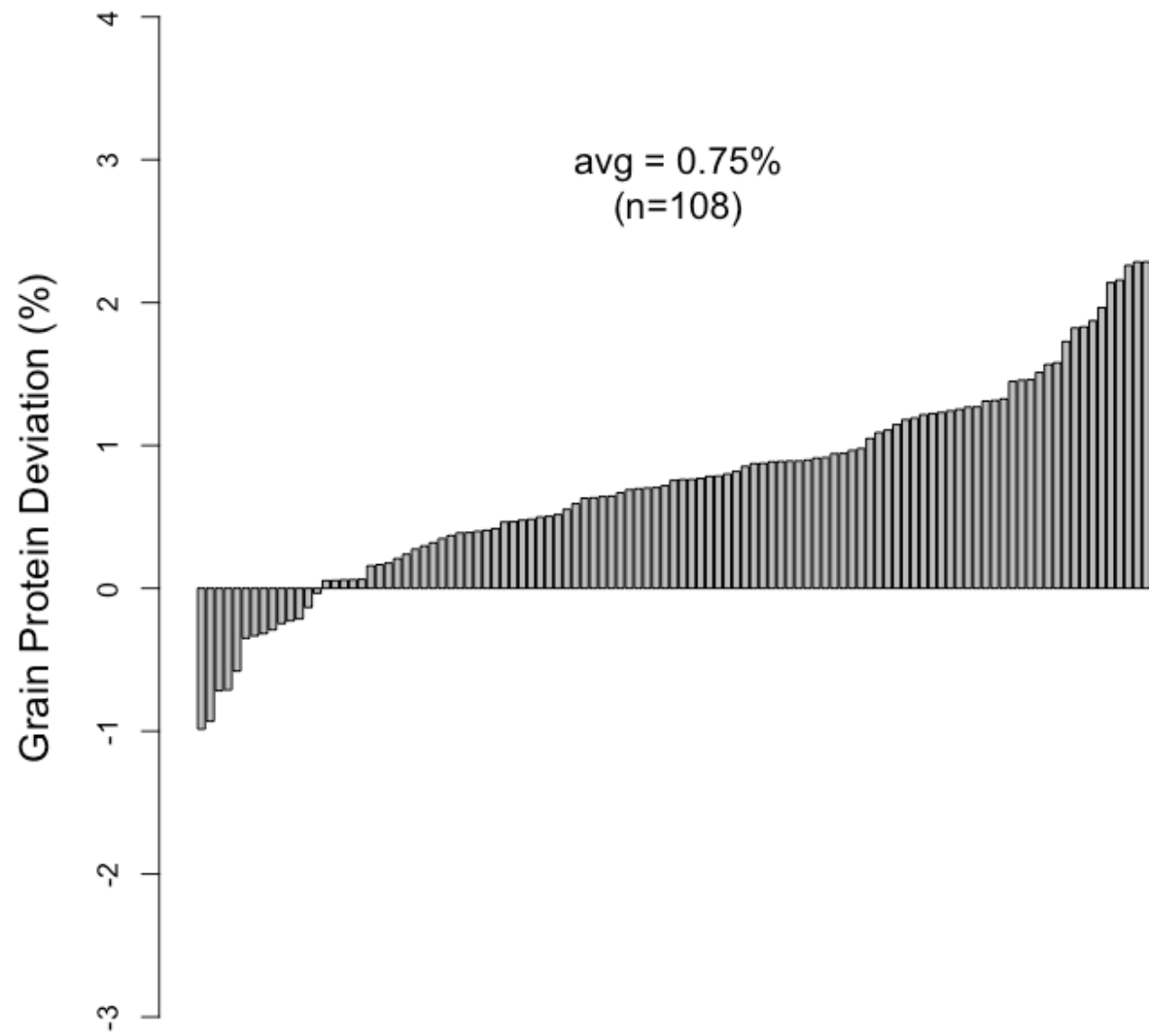
Grain Protein Deviation Hatcher



Grain Protein Deviation Byrd



Grain Protein Deviation Brawl CL Plus

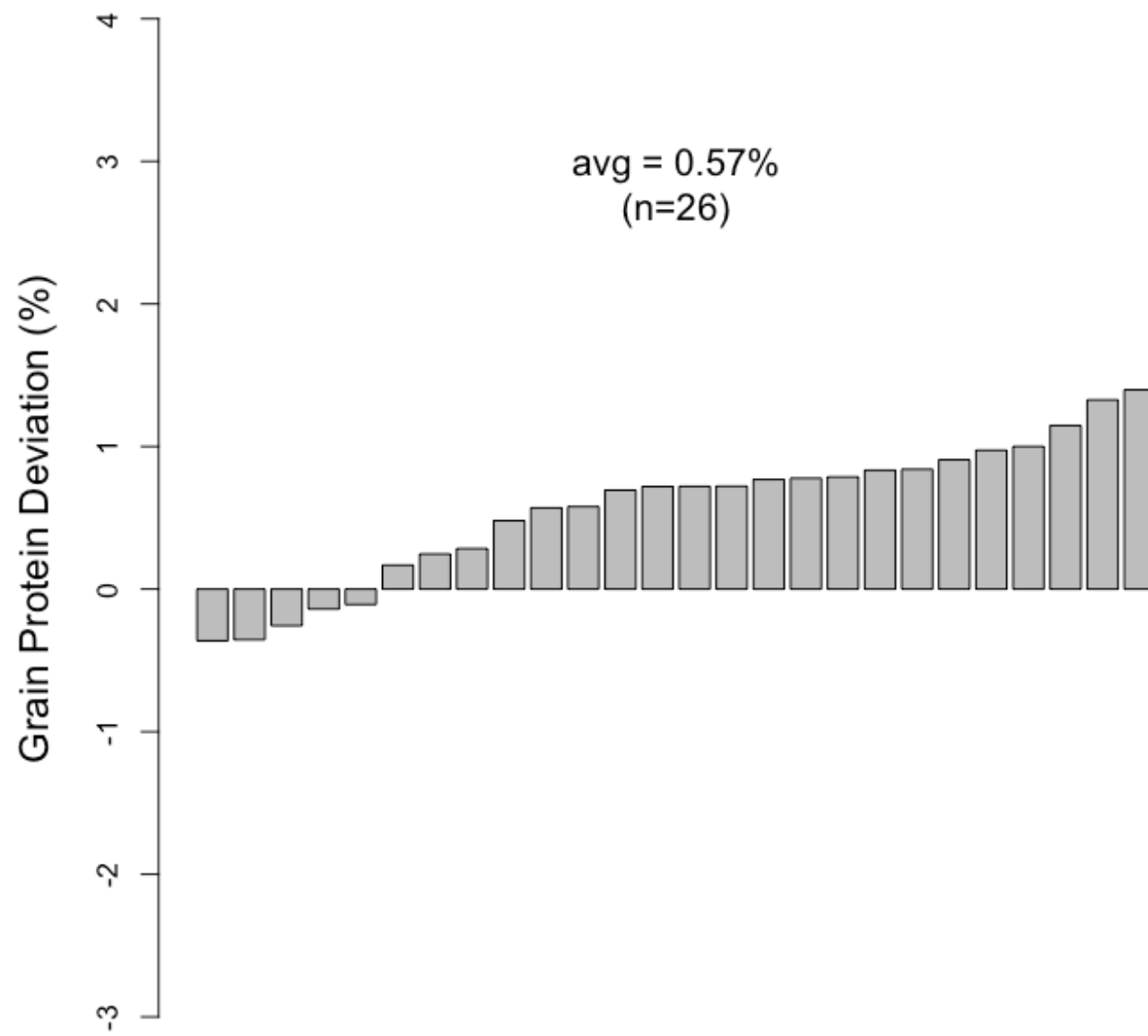


Grain Protein Deviation (%)

avg = -0.4%
(n=29)

avg = -0.4%
(n=29)

Grain Protein Deviation Guardian



Wheat Stem Sawfly

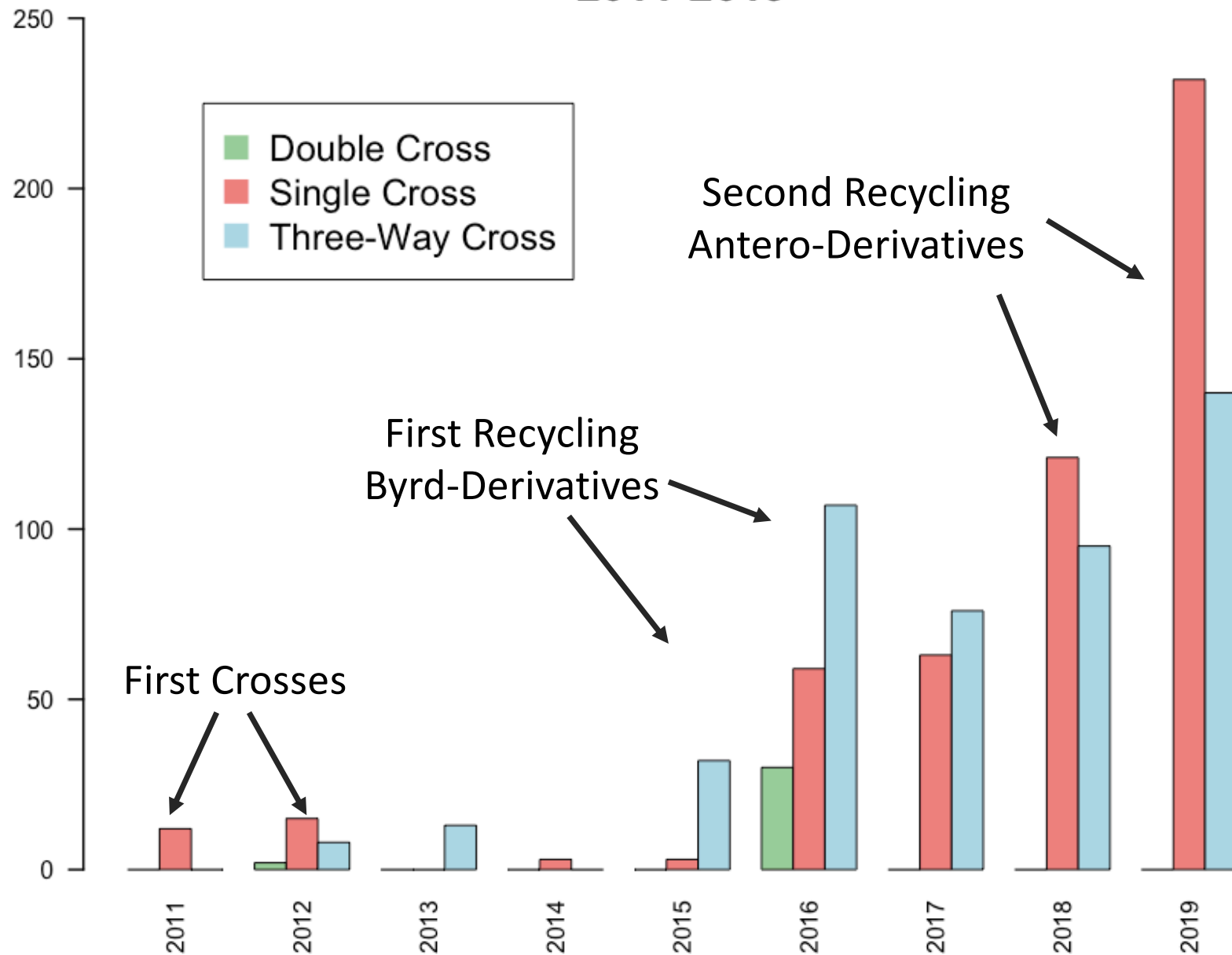


Photo - R.K.D. Peterson, MT State

Cephus cinctus

- Serious and expanding US wheat production problem
 - Early 1900s – spring wheat region
 - 1980s – Montana winter wheat
 - 2000s – Wyoming winter wheat
 - 2011 – Colorado winter wheat
- Nature of the damage
 - Inhibits translocation to grain, reduces yield and test weight
 - Cuts stem, reduces harvest efficiency
 - Affects wheat residue persistence
- Management
 - Insecticides – not effective
 - Parasitoids – not effective yet
 - Cropping – partially effective
 - Variety resistance – partially effective

Number of Breeding Program Crosses 2011-2019



WSS Resistance Evaluation



Stem solidness

- 5 internodes x 20 tillers
- 5 (hollow) to 25 (solid)



Plot combine – yield, test weight



Stem cutting

- 1 = no cutting (<10%)
- 9 = complete cutting (>90%)

Fortify SF – dryland trials

Entry	CSU Elite 2017-2019				UVPT 2018-2019				Avg Cutting	Avg Stem Solidness
	Avg Yield w/o WSS	Avg Yield w/ WSS	Avg TestWt w/o WSS	Avg TestWt w/ WSS	Avg Yield w/o WSS	Avg Yield w/ WSS	Avg TestWt w/o WSS	Avg TestWt w/ WSS		
Whistler	78.9	56.1	57.8	57.4	75.0	53.0	59.3	61.8	7.1	5.2 (n=2)
Snowmass 2.0	77.5	55.9	58.8	58.0	74.5	51.3	60.7	62.0	5.8	5.9 (n=11)
Langin	77.4	57.9	58.4	58.6	77.1	53.5	60.1	61.8	6.9	5.9 (n=22)
Guardian	76.0	52.9	59.9	57.8	72.7	49.9	61.5	63.3	7.4	n/a
Avery	75.7	56.9	58.2	58.6	74.7	49.4	59.9	62.0	7.1	5.9 (n=7)
Canvas	75.7	52.9	59.4	57.8	72.9	46.2	61.0	62.5	7.6	6.6 (n=3)
Breck	75.0	55.3	60.7	59.8	74.4	48.7	62.0	63.1	7.6	7.1 (n=7)
*Monarch	74.9	57.9	58.4	58.8	73.8	47.8	60.5	62.4	5.6	5.5 (n=2)
Byrd	74.8	55.5	58.7	58.6	71.2	51.5	60.3	62.4	7.5	6.6 (n=25)
Byrd CL Plus	74.5	58.2	57.8	58.4	73.7	56.1	60.1	62.2	5.7	5 (n=1)
Fortify SF	71.0	56.4	58.8	59.1	68.9	56.4	60.8	63.1	2.1	12.9 (n=28)
Snowmass	70.6	52.9	58.5	56.6	66.5	39.8	60.9	62.1	7.3	5.5 (n=6)
Brawl CL Plus	68.2	53.0	59.1	58.8	66.5	54.3	61.2	62.7	7.4	5.1 (n=1)
Average	74.6	55.5	58.9	58.4	72.5	50.4	60.8	62.5	6.5	--
Locations/Observations	26	6	26	6	18	2	18	2	18	--

Without sawfly – yield 3+ bu/a less than trial average
test weight at trial average

Fortify SF – dryland trials

Entry	CSU Elite 2017-2019				UVPT 2018-2019				Avg Cutting	Avg Stem Solidness
	Avg Yield w/o WSS	Avg Yield w/ WSS	Avg TestWt w/o WSS	Avg TestWt w/ WSS	Avg Yield w/o WSS	Avg Yield w/ WSS	Avg TestWt w/o WSS	Avg TestWt w/ WSS		
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Snowmass 2.0	77.5	55.9	58.8	58.0	74.5	51.3	60.7	62.0	5.8	5.9 (n=11)
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Locations/Observations	26	6	26	6	18	2	18	2	18	--

With sawfly – yield 1 bu/a over trial average
 test weight ~ 1 lb/bu over trial average
 significantly improved standability

Acknowledgements



Colorado Wheat
Administrative Committee



Colorado
State
University



Nourishing what's next.™



Questions?