Pulse Crop Breeding and Variety Testing in Montana

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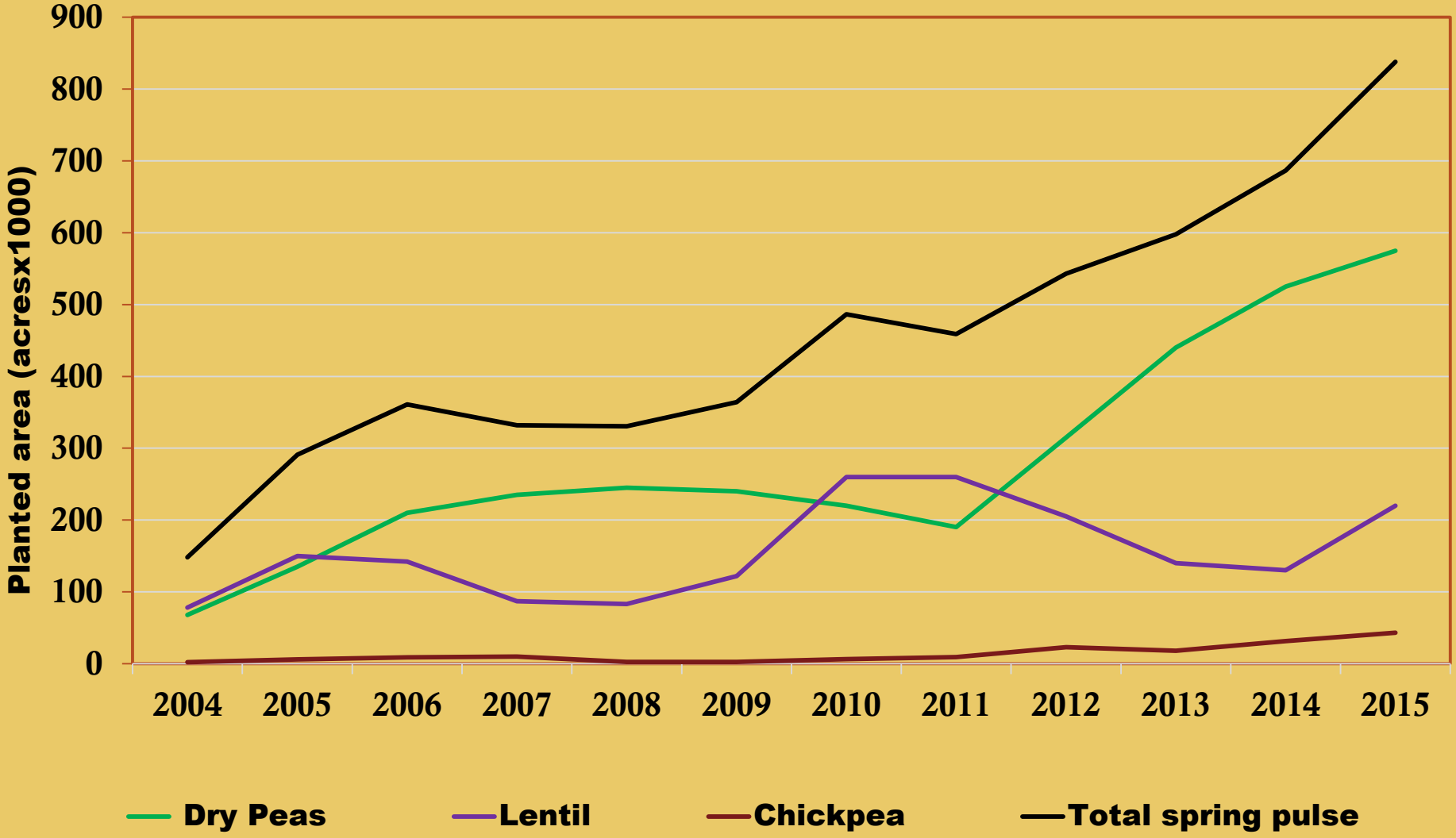
2015 Montana Pulse Day, December 09, 2015. Great Falls, MT

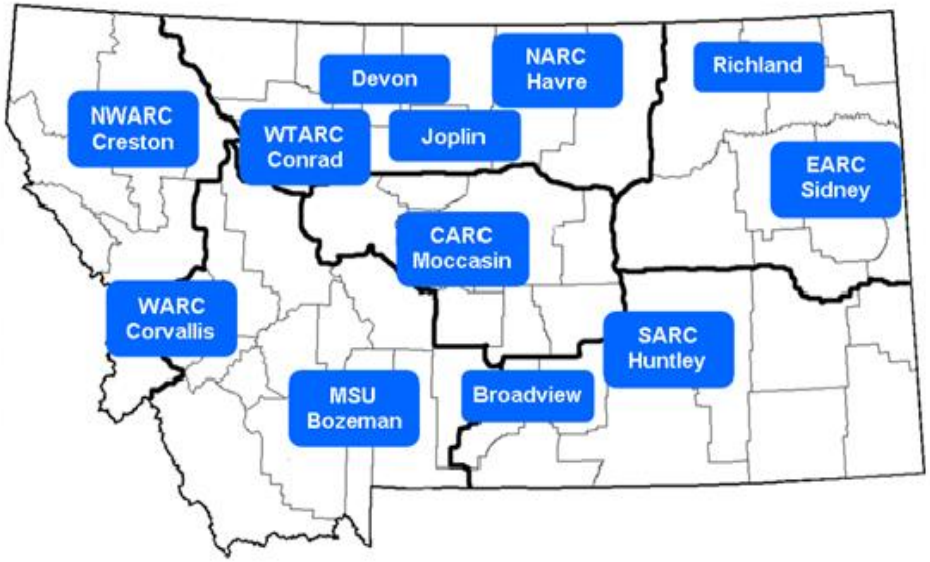
Dry pea, lentil and chickpea acres in Montana (2004 - 2015) (Montana Agricultural Statistics)



Plant breeding and variety selection

- **Breeding programs:**
  - Legume Genetic Lab, Pullman, WA (Rebecca McGee, George Vandemark)
  - NDSU Pulse Breeding Program, Fargo, ND (Kevin McPhee)
  - University of Saskatchewan, Saskatoon, CA (Tom Warkentin)
  - Progene, LLC, Pullman, WA (Kurt Braunwart)
  - Other private breeding programs in Europe and Canada
  - Montana State University, Bozeman, MT (Norm Weeden, Chengci Chen)

1. Variety Selection and Testing for Yield and Adaptation



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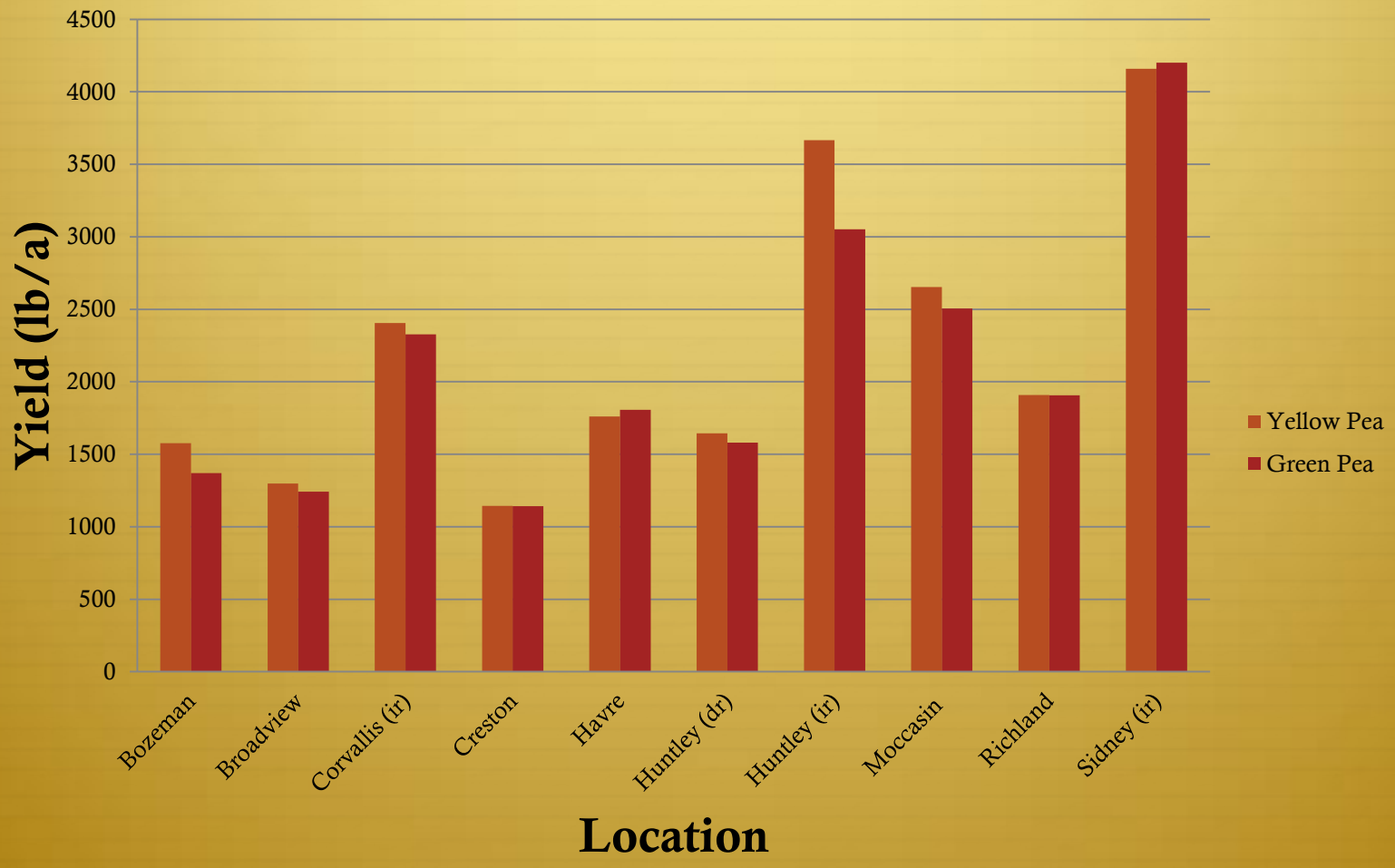
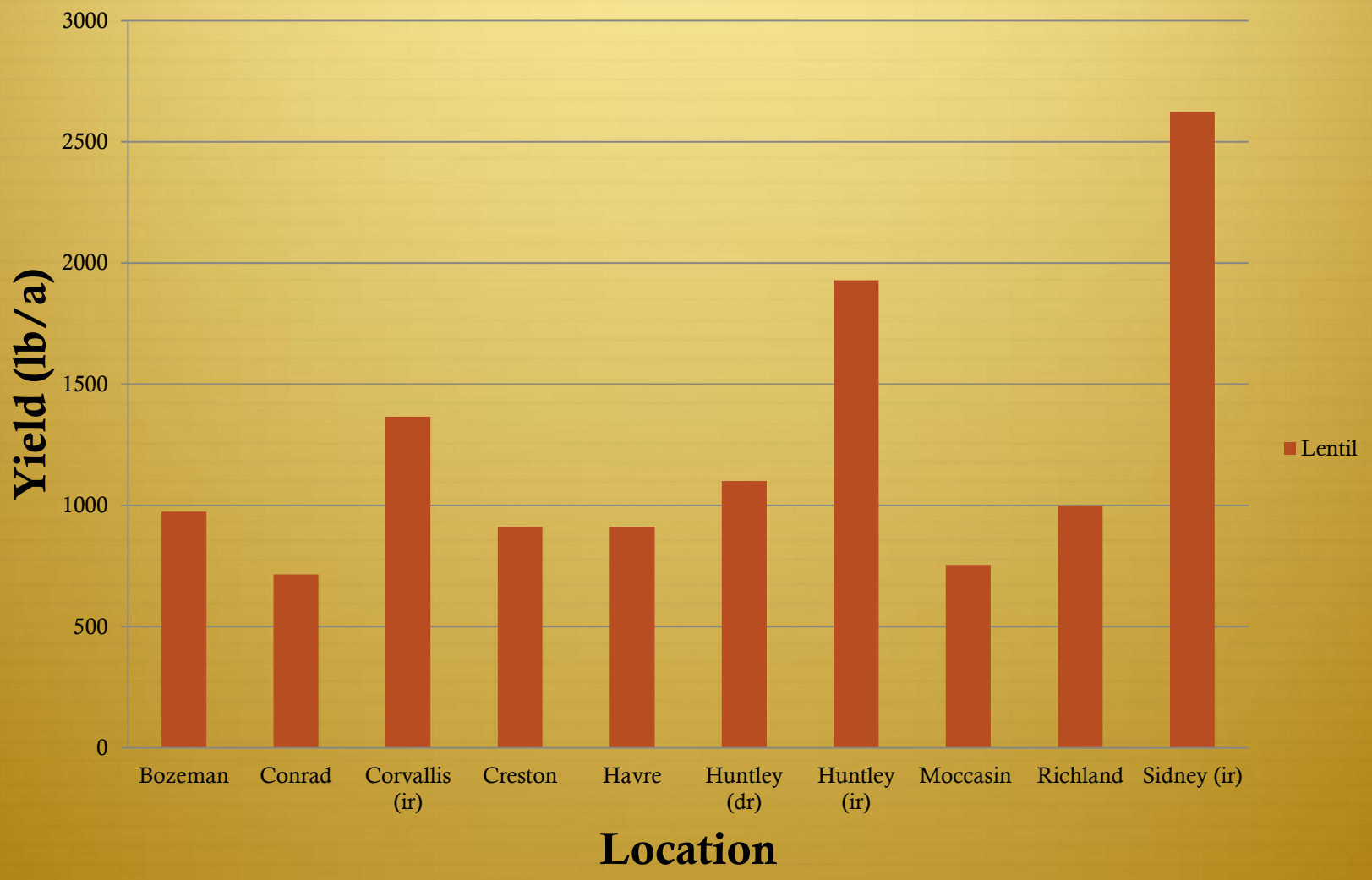
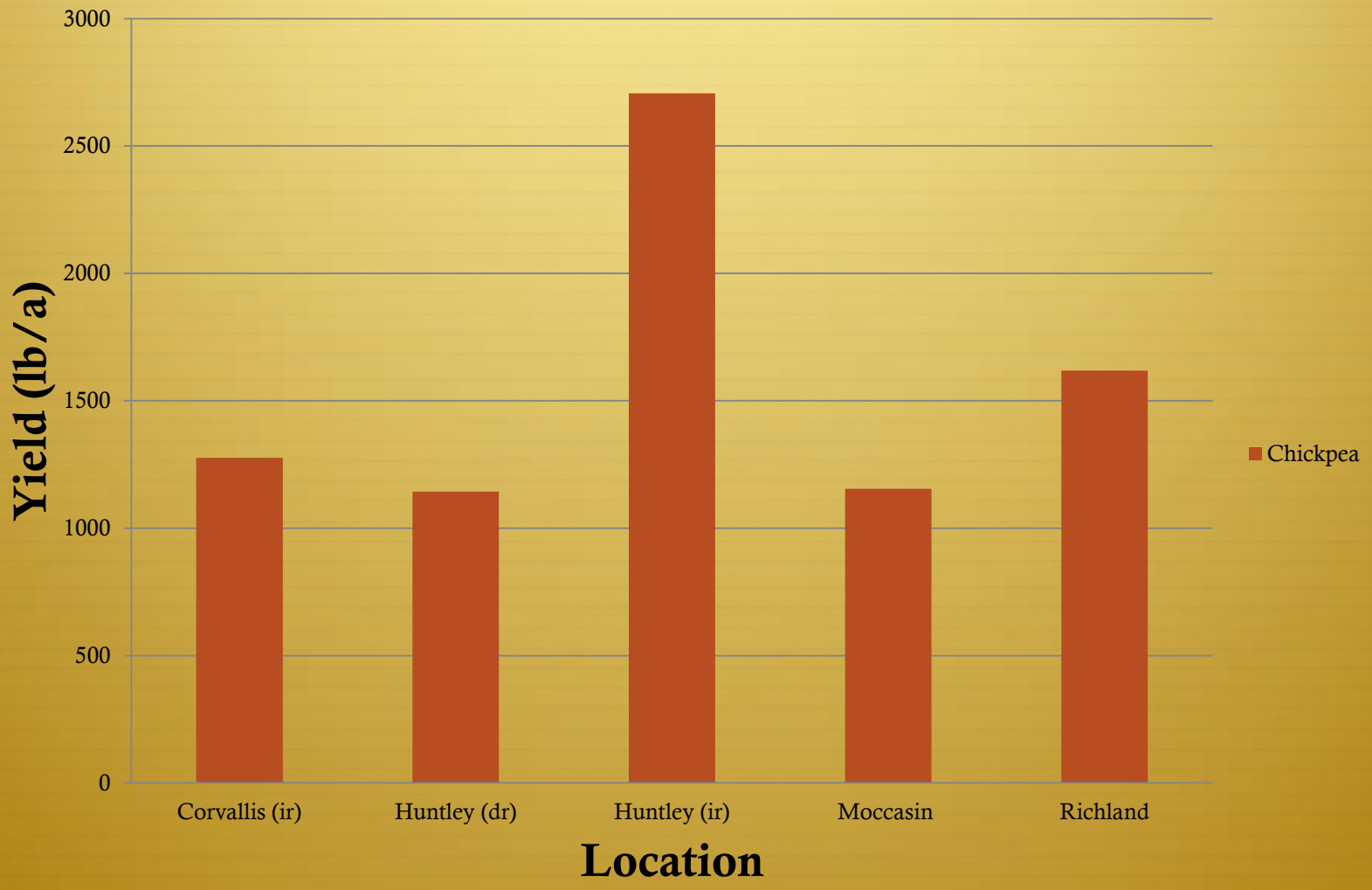
2015 Pea Yields in Montana



2015 Lentil Yields in Montana



2015 Chickpea Yields in Montana



Peas are sensitive to environment conditions

Table 4. AMMI analysis of variance for grain yield of dry pea and lentil evaluated statewide in Montana from 2009-2011.

Source	Dry pea			Lentil		
	df	P value	% SS explained	df	P value	% SS explained
Environment (E)	20	0.00	93.1	17	0.00	89.1
Genotype (G)	7	0.00	0.7	11	0.00	3.6
Replication	57	0.00		49	0.00	
G×E	140	0.00	6.2	187	0.00	7.3
PC 1	26	0.00	36.3	27	5.03E-12	31.3
PC 2	24	0.00	28.2	25	6.01E-09	24.5
PC 3	22	0.00	23.8	23	1.74E-05	17.0
PC 4	20	0.13	10.3	21	4.19E-04	13.3
Residual	48	1.00	1.5	91	9.99E-01	14.0
Overall error	399			527		
C.V.	12.6			19.3		
R^2	0.92			0.91		

2015 Variety Ranking*

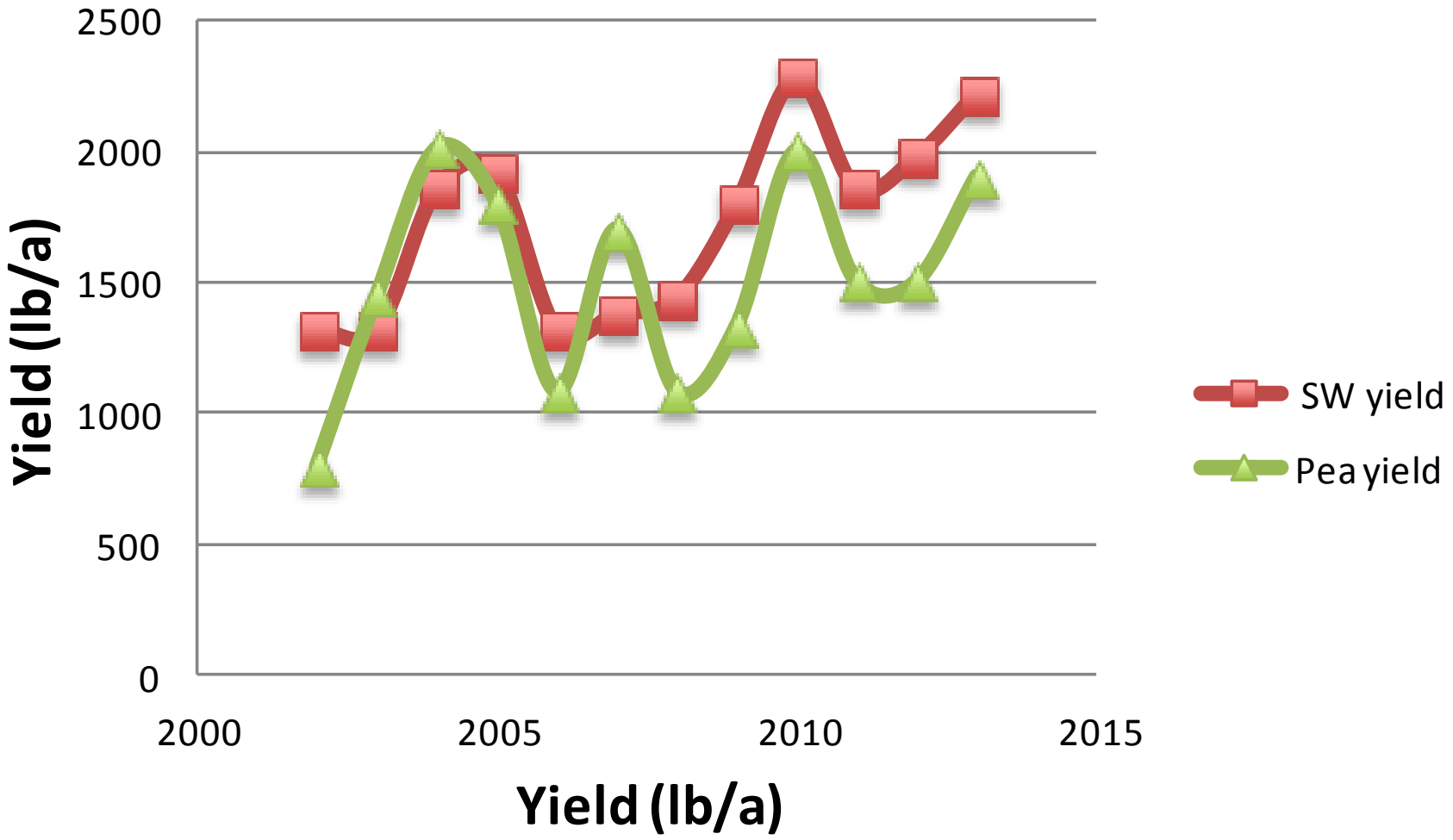
	Bozeman	Broadview	Corvallis	Creston	Havre
1	Earlystar	Abarth	Admiral	Nette 2010	MT632
2	Meadow	Admiral	Earlystar	Saffron	Pro133-6243
3	AAC Carver	Korando	Meadow	Jeset	Yellowstone
4	Nette 2010	Jeset	Saffron	Treasure	MT290
5	Abarth	Admiral/Meadow	Delta	Earlystar	Nette 2010
Y	MT290	MT460	MT632		
G	MT076	MT190	MT457	MT499	

2015 Variety Ranking*

	Huntley (d)	Huntley (i)	Moccasin	Richland	Sidney (i)
1	Pro822	Abarth	LL1404	Pro133-6243	Durwood
2	Navarro	Nette 2010	Yellowstone	Earlystar	SW Midas
3	Abarth	Admiral	Abarth	MT632	Nette2010
4	Earlystar	Pro133-6243	LL1408	Vegas	AAC Carver
5	Jeset	Korando	Earlystar/ MT460	Meadow	Trapez
USDA lines	PS07100925	PS08100950	PS08101004	PS0810122	
	PS03101445	PS05100840	PS07100470	PS08100133	Hampton

Average Yield of Dry Peas and Spring Wheat in Montana

(Montana Agricultural Statistics)



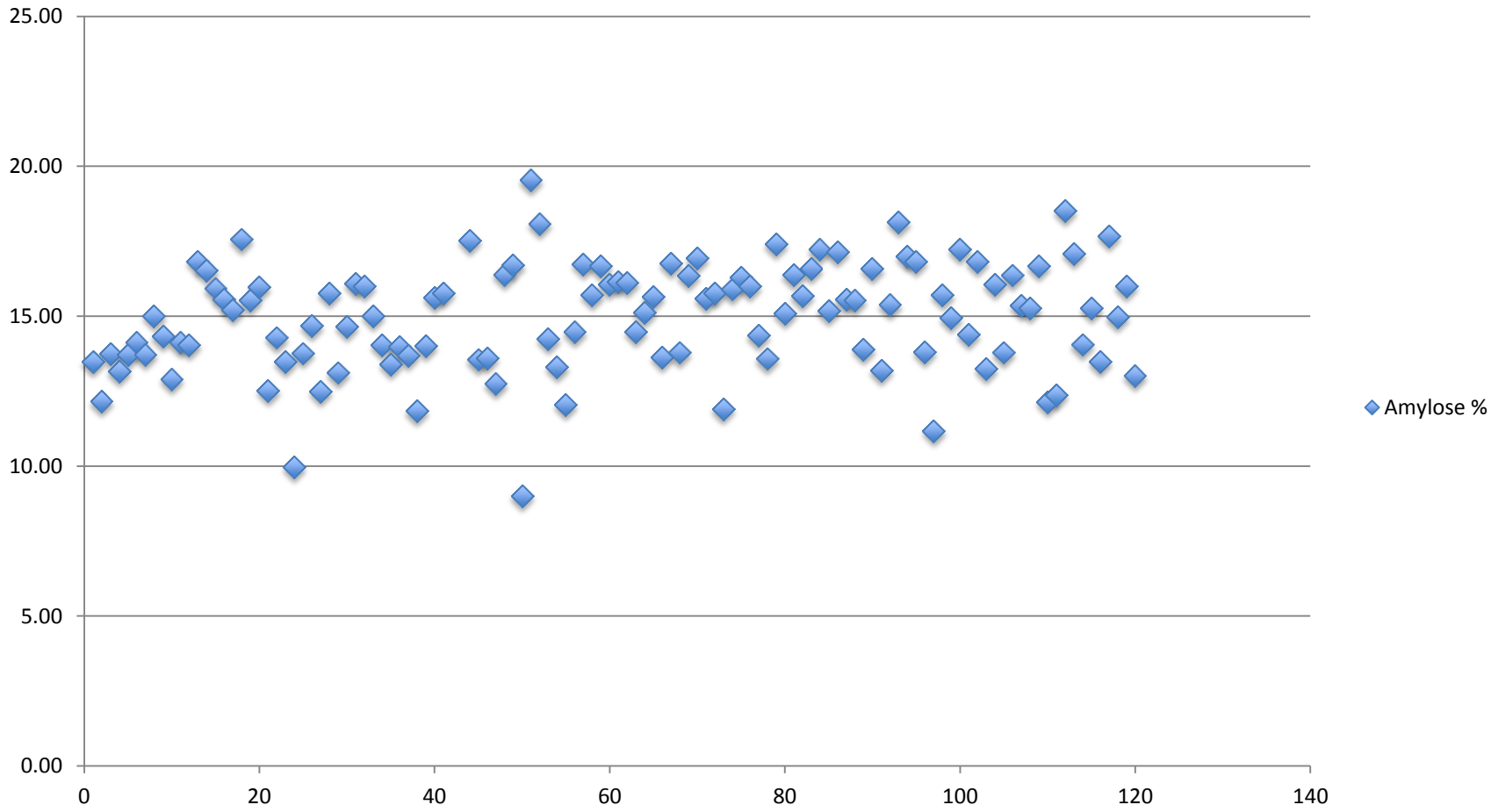
Take home message

- Peas and lentils are sensitive to environmental conditions.
- No super cultivars that can produce high yield at all locations in all years, especially in dryland.
- Some new varieties did show site-specific adaptations.
- A few old common grown varieties, such as Delta, Admiral, Majoret, and Richlea, showed wide adaptations.

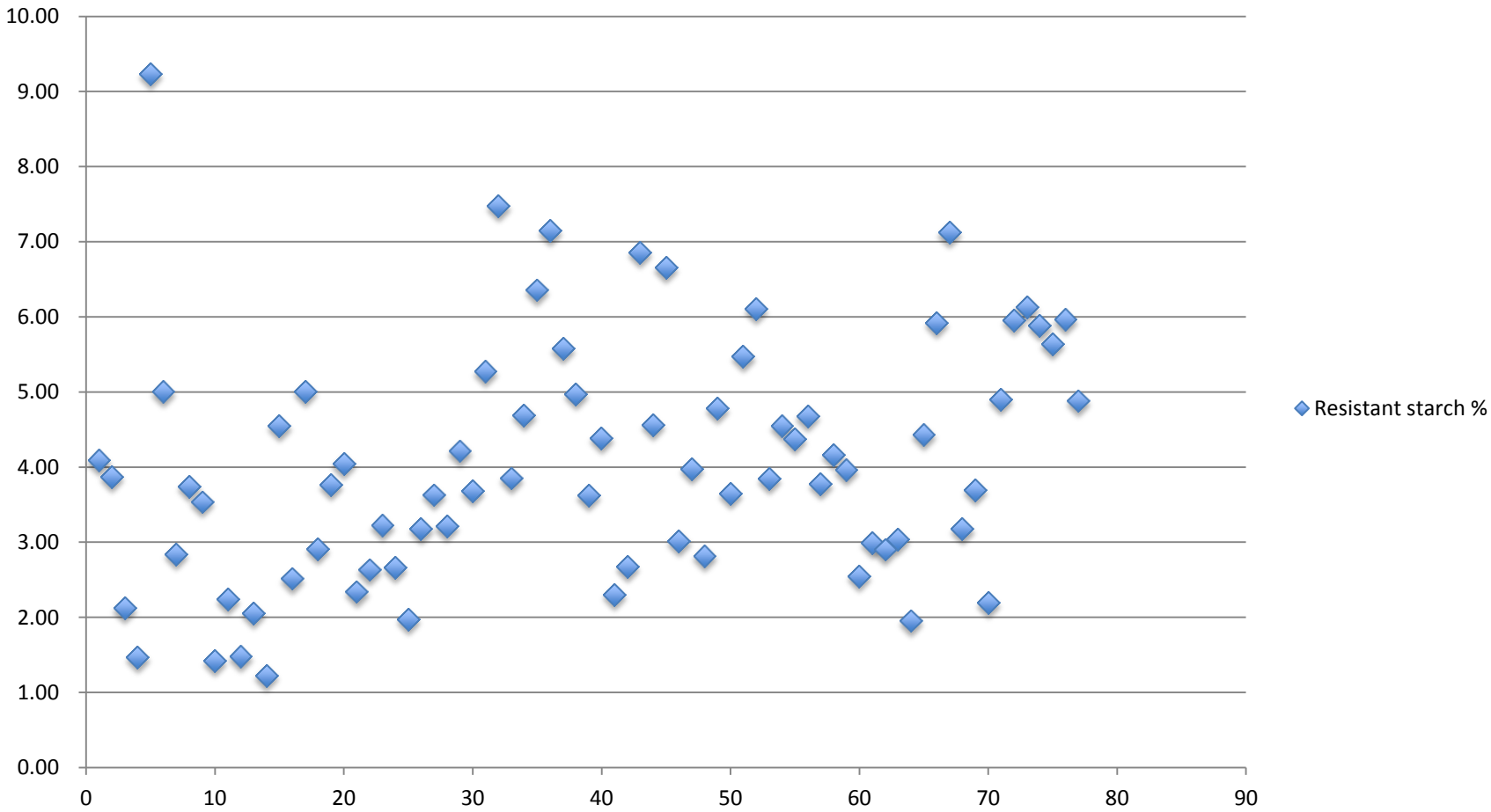
2. Variety Selection for Qualities

- Seed physical qualities
- Amylose, resistant starch, and total starch contents and properties
- Protein contents

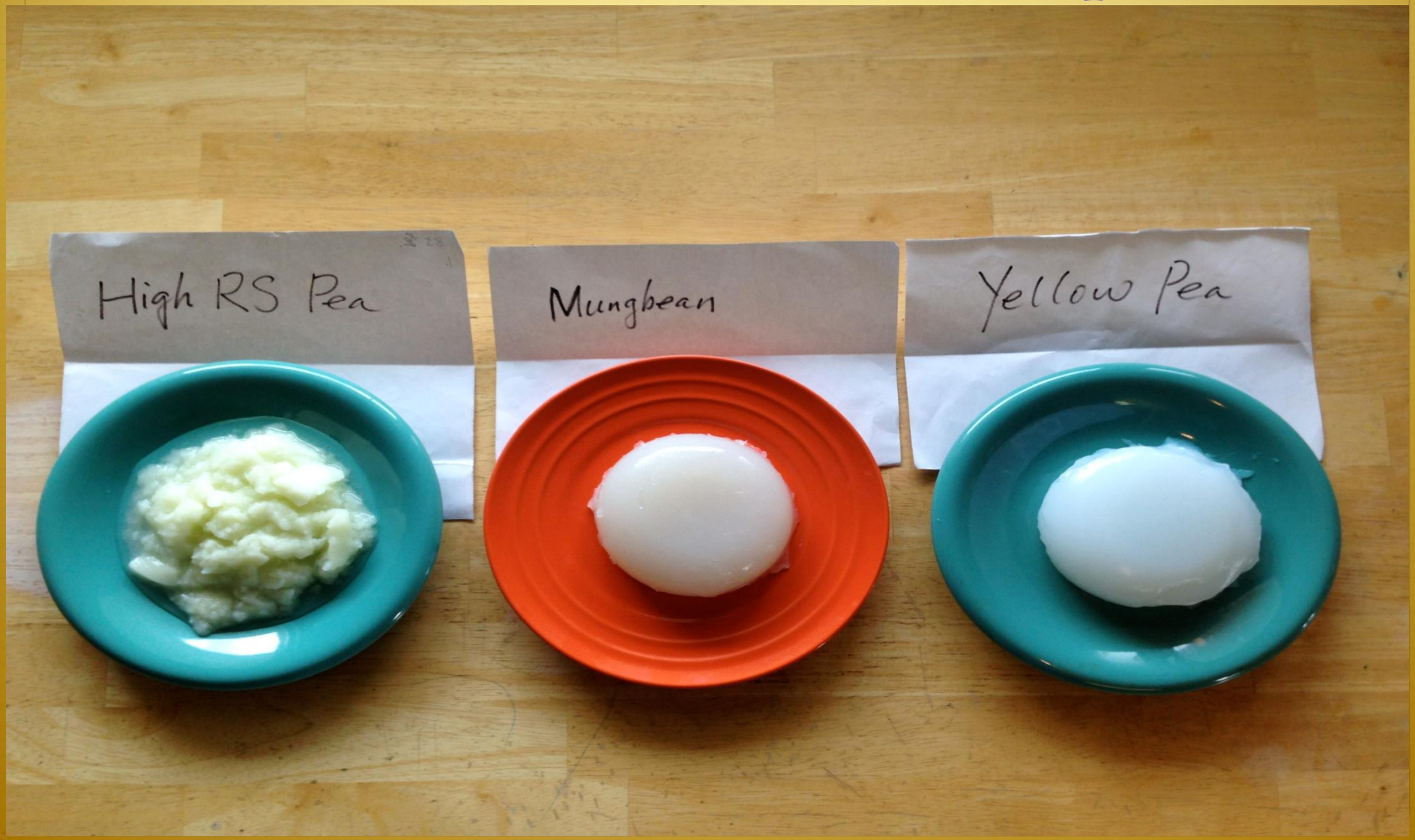
Amylose contents of different pea collections



Resistant starch of different pea collections

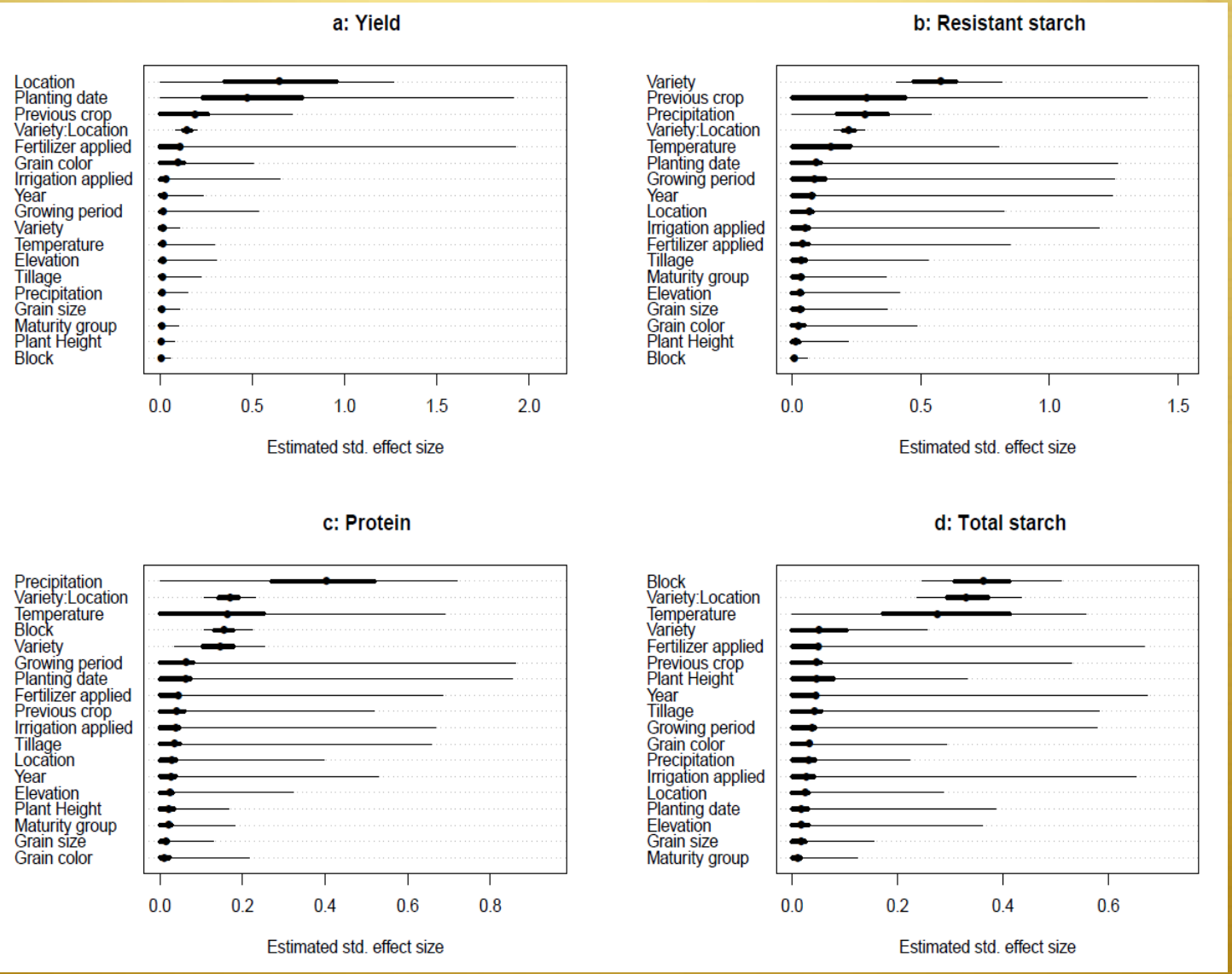


Physical properties of high RS pea, mungbean, and common yellow pea gels

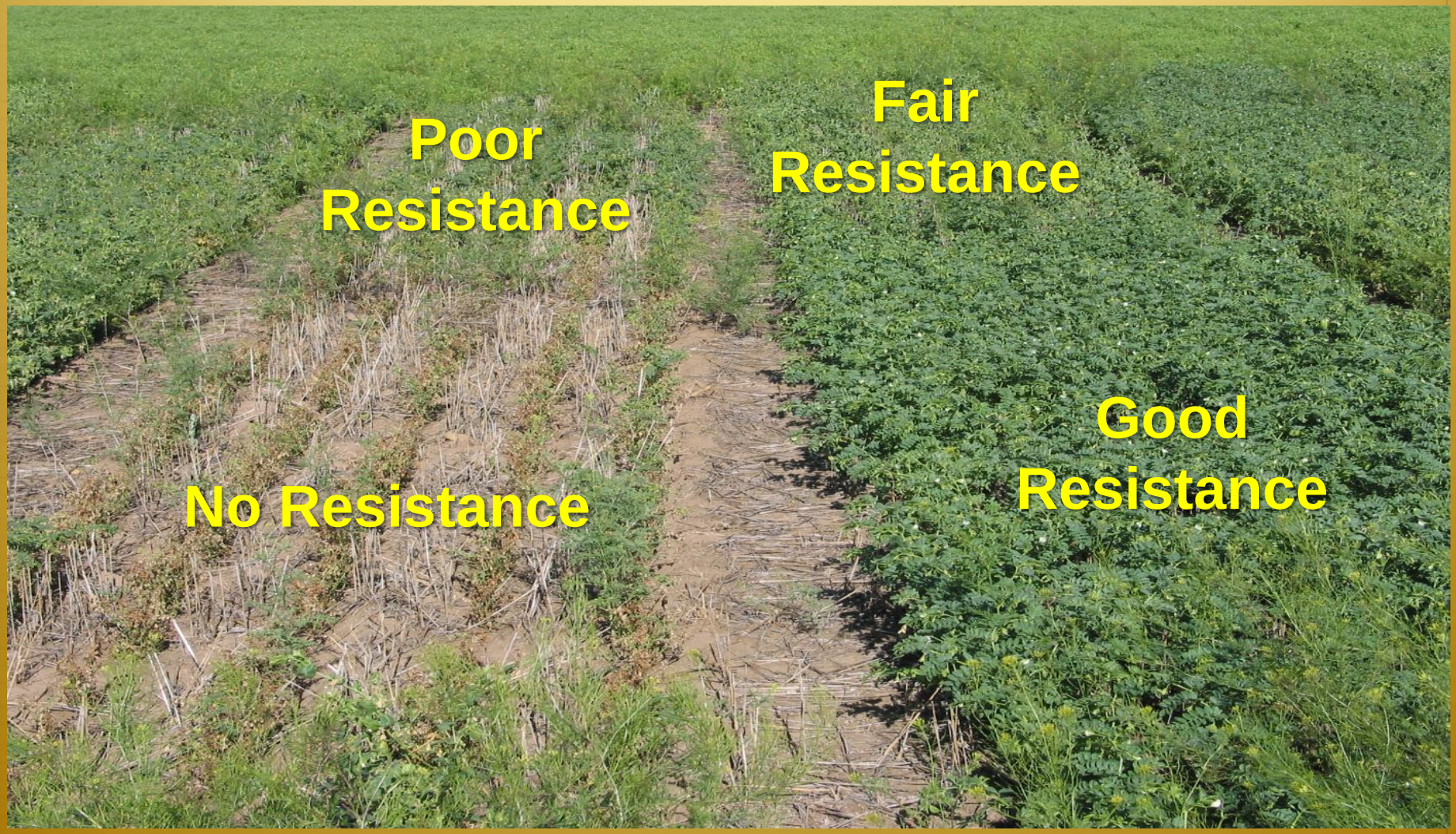


Location/ Genotype	2013 Yield kg ha^{-1}	2013 RS %	2013 TS %	2013 Protein %	2014 Yield kg ha^{-1}	2014 RS %	2014 TS %	2014 Protein %
Location								
Conrad	1972	1.8	45.7	21.3	2785	2.5	52.1	17.5
Creston	4574	1.7	45.1	24.5	5206	3.3	48.9	23.7
Havre	2137	1.9	48.1	21.9	2325	2.4	51.4	17.0
Huntley	2869	1.4	45.9	24.0	1241	2.5	50.0	22.4
Moccasin	1920	2.8	51.0	19.6	2317	2.5	50.9	21.3
Tukey value	*380*	*0.2*	*3.4*	*0.9*	*174*	*0.4*	*3.5*	*1.8*

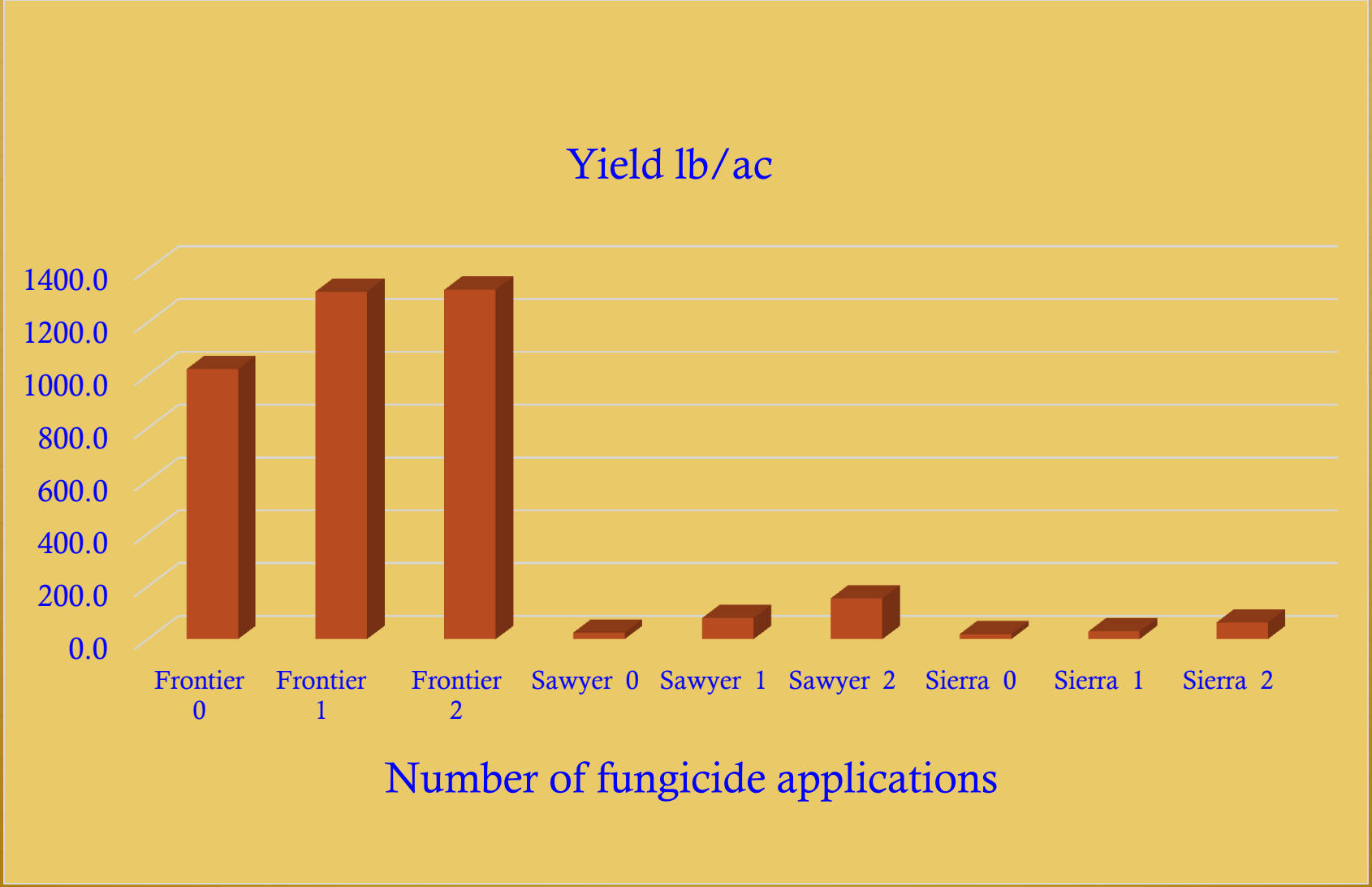
Factors affecting yield, starch, and protein



3. Variety Selection for Disease Resistance



2015 Chickpea fungicide study at Sidney, MT



4. Variety Selection For Fall Seeding (Winter Peas and Lentils)

Grazing of Winter Pea/Lentil

2015 Winter pea yield at Moccasin, MT

Winter pea variety	Variety code	Yield (lb/ac)		Rank
		Mean	Std Dev	
1234-273-0	3	2533	423	1
Windham	11	2432	516	2
MTWP980962	20	2210	472	3
X09MP012-0-1-W-MT	12	2187	.	4
12WIL10-0	8	2113	290	5
12WIL11-0	9	2112	279	6
PS03101150	27	1972	393	7
12WIL04-0	6	1931	161	8
PS9830F011	35	1910	151	9
PS0530083	34	1887	184	10
12WIL17-0	10	1863	410	11
X09RP040-0-1-1-MT	17	1832	406	12
12WIL01-0	4	1826	261	13
X09MP021-0-1-1-MT	15	1813	.	14
PS05300180W	29	1766	623	15
MTWP980961	19	1746	132	16
12WIL07-0	7	1744	179	17
12WIL02-0	5	1730	301	18
MTWP98106BE	24	1714	110	19
PS0017018	25	1710	290	20

Questions?

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