



Nitrogen Management for Winter Canola

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Outline

- **N application rate and timing effect on yield and quality**
- **Nutrient uptake during growing season**
- **What we are doing next**





Sites

Year	Site	pH 6"	OM % 6"	Fall Mineral N	In-season ppt (mm)	Cropping zone
2016-17	Hartline WA	6.52	0.9	90.2	298	GF
	Odessa WA	7.21	1.99	43.1	500	Irrigated
	St. John WA	5.14	3.22	89.9	292	ACFT
2017-18	Almira WA	5.58	1.24	91.9	249	GF
	Echo OR	7.41	1	109.0	600	Irrigated
	Endicott WA	5.47	1.6	104.4	380	ACFT
	Latah WA	4.98	2.47	176.5	487	AC



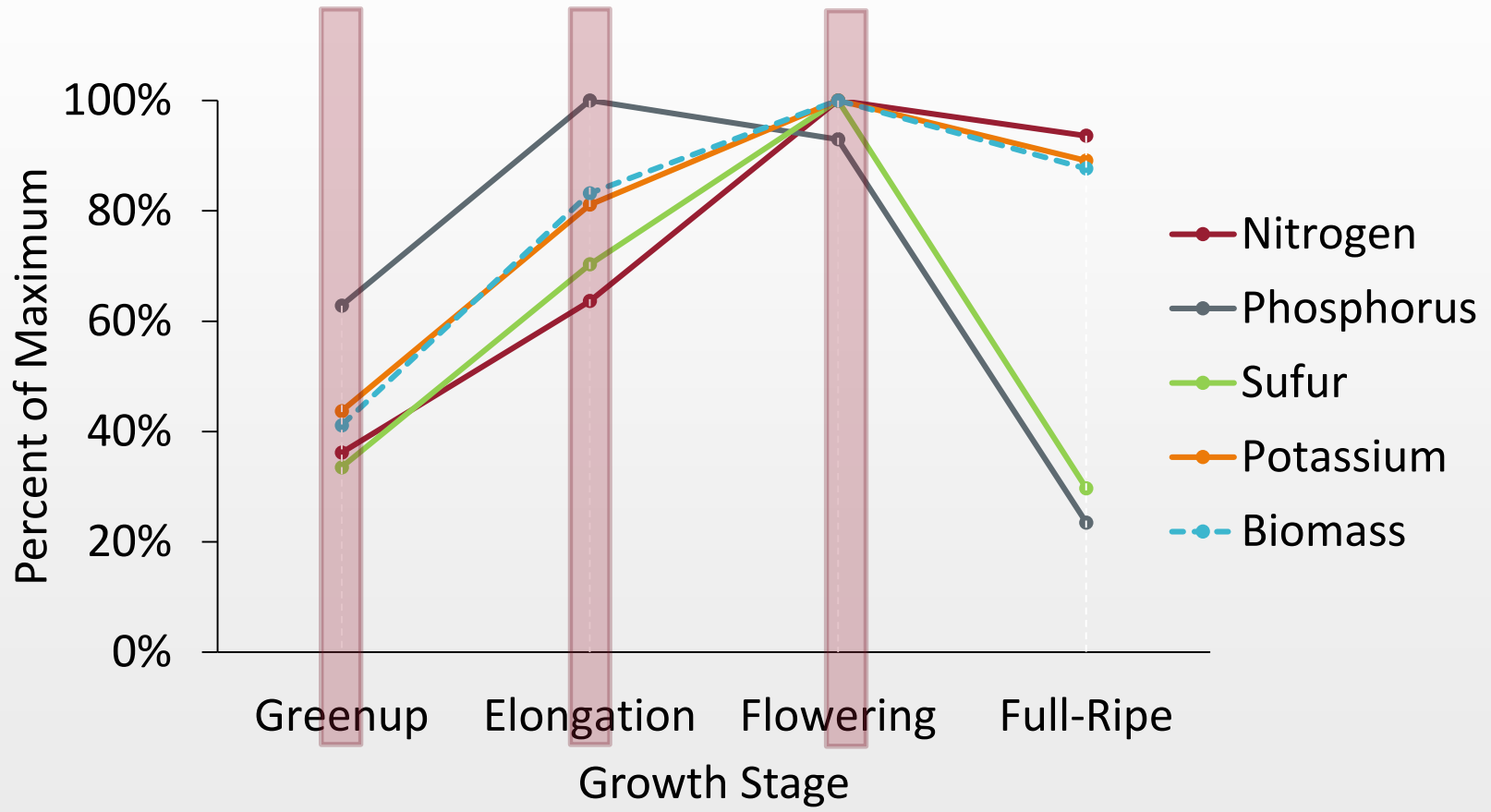
N Scavenger

- N uptake 40% higher than wheat
- Lower Harvest Index
- Removes N to depths of 6 ft
- Heavily influenced by soil moisture





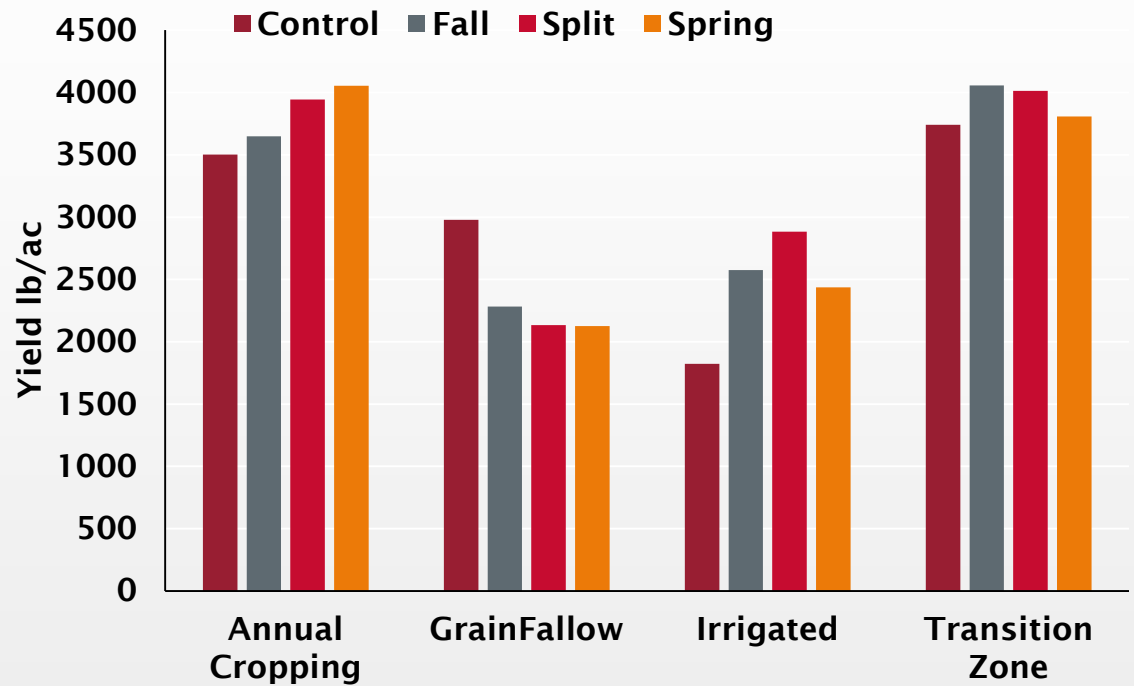
Nutrient uptake through growing season measured in above ground biomass excluding seeds at harvest



St. John, WA 2016-17



Yield response to timing of N application in different rainfall zones



Zone	Timing of N
Grain Fallow	Fall
Transition	Split
Annual Cropping	Spring
Irrigated	Split

- If planted into fallow, do not need fall applied N
- Excess N promotes fall vegetative growth, can reduce winter survival. Low plant N concentrations increase hardiness



Soil residual N before/at planting

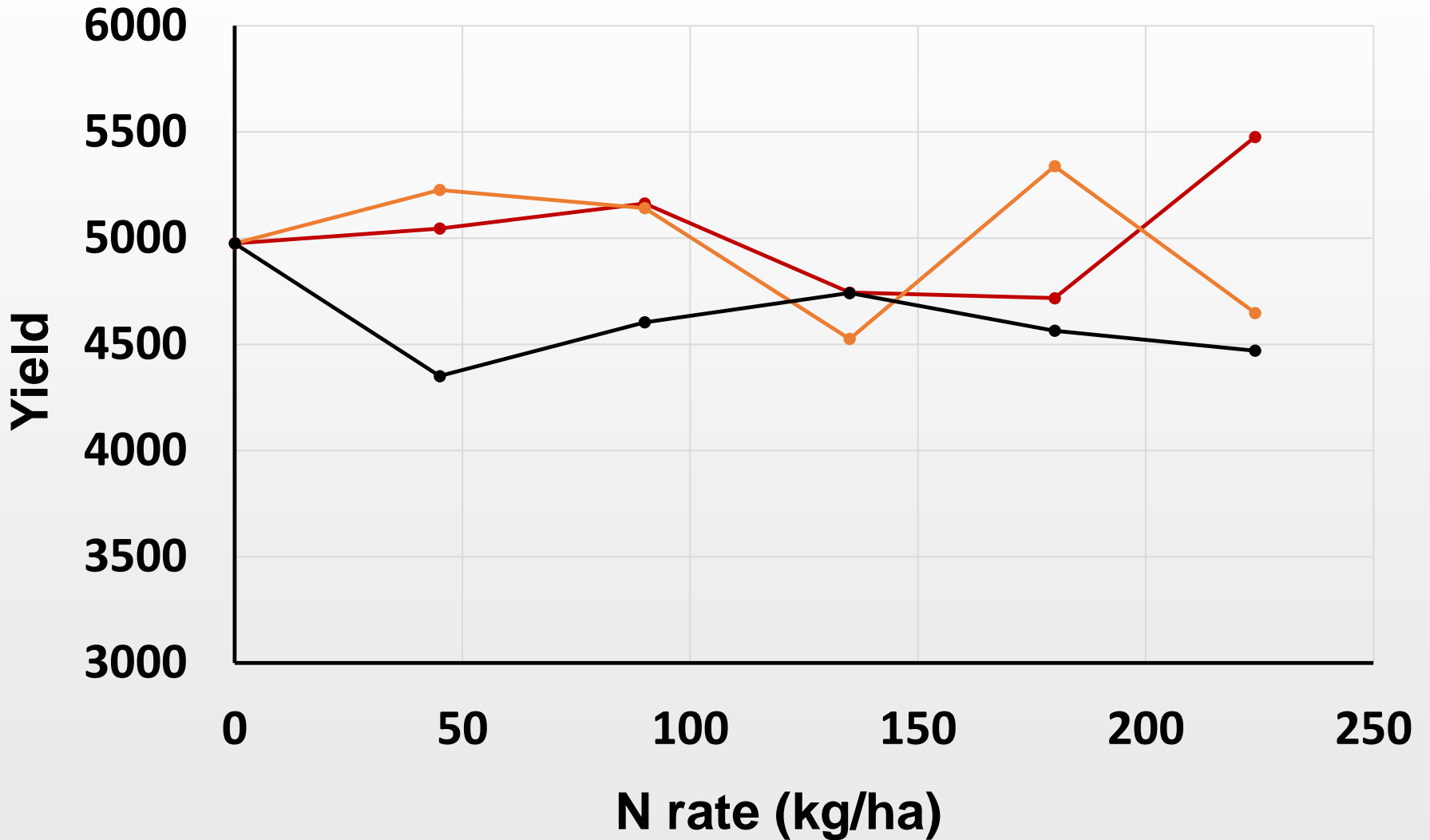
	Fall N supply lb/ac	Yield of Control (0 N applied)
Odessa	75	1380
Almira	110	2136
Echo	125	3151
St.John	140	3435
Latah	212	3502
Endicott	128	4428

**Only saw significant yield response to applied N
when soil N supply below 100 lb/ac before/at planting**



Endicott

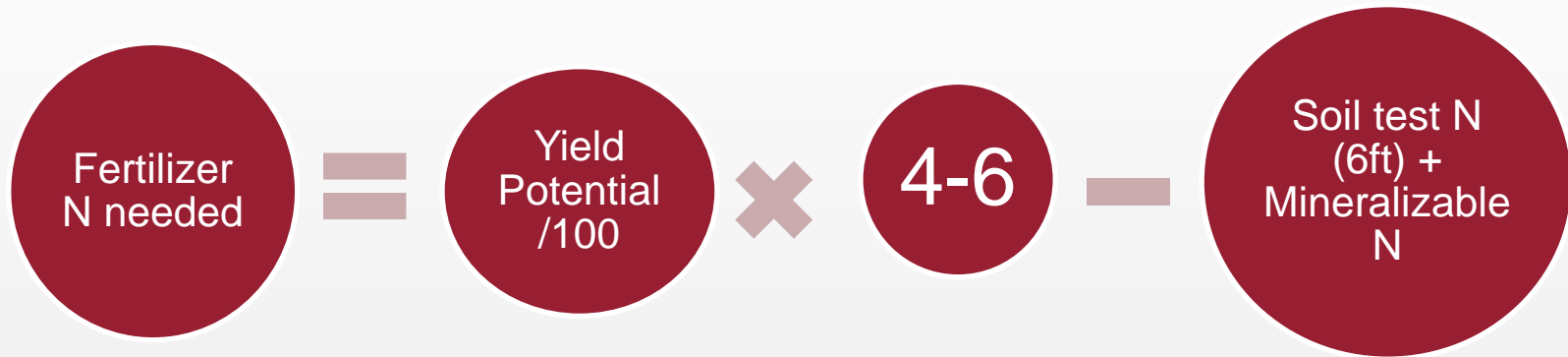
● Fall ● Split ● Spring





Nitrogen Rate

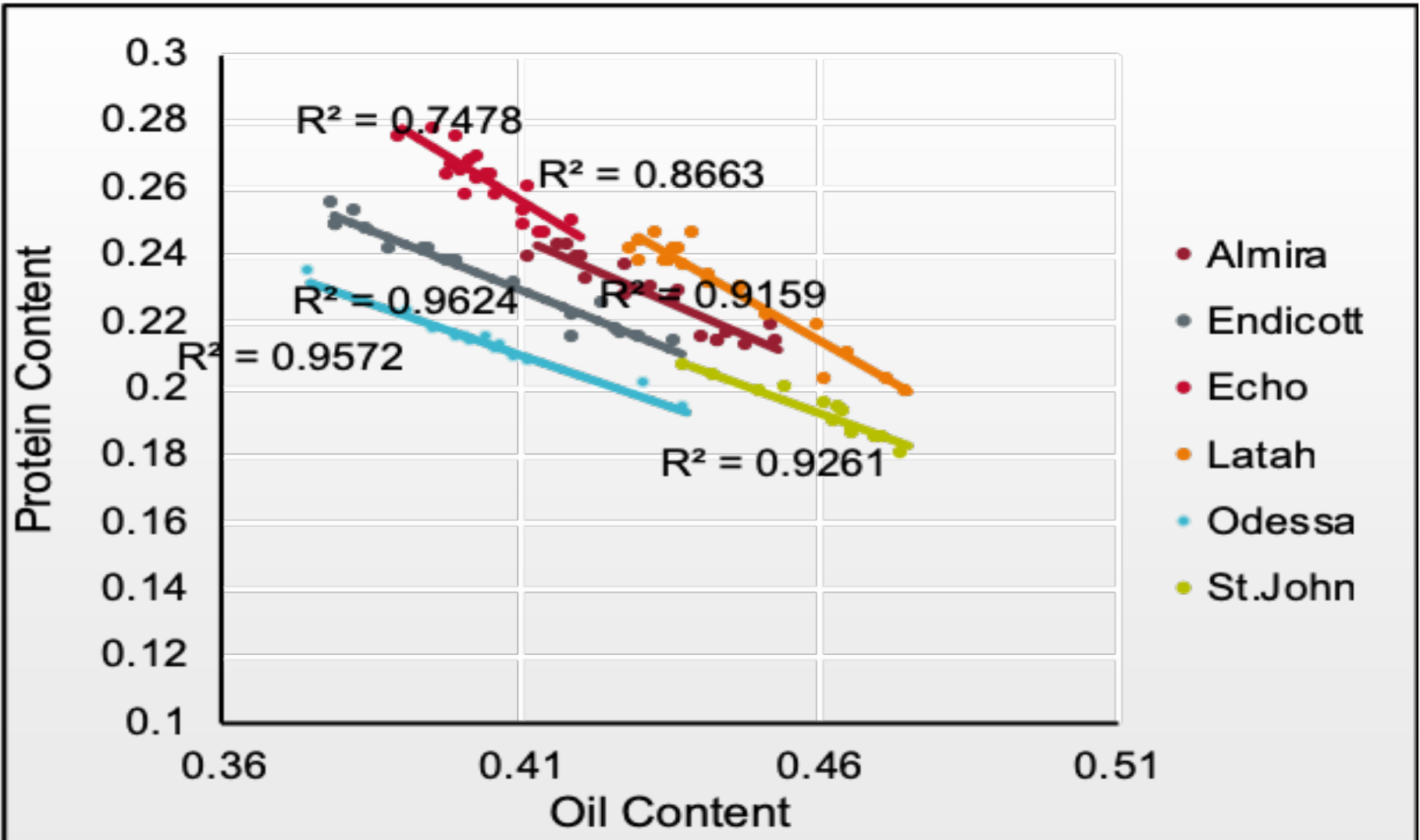
4 to 6 lb N per 100 lb grain



Adjusted by N loss potential and uptake efficiency

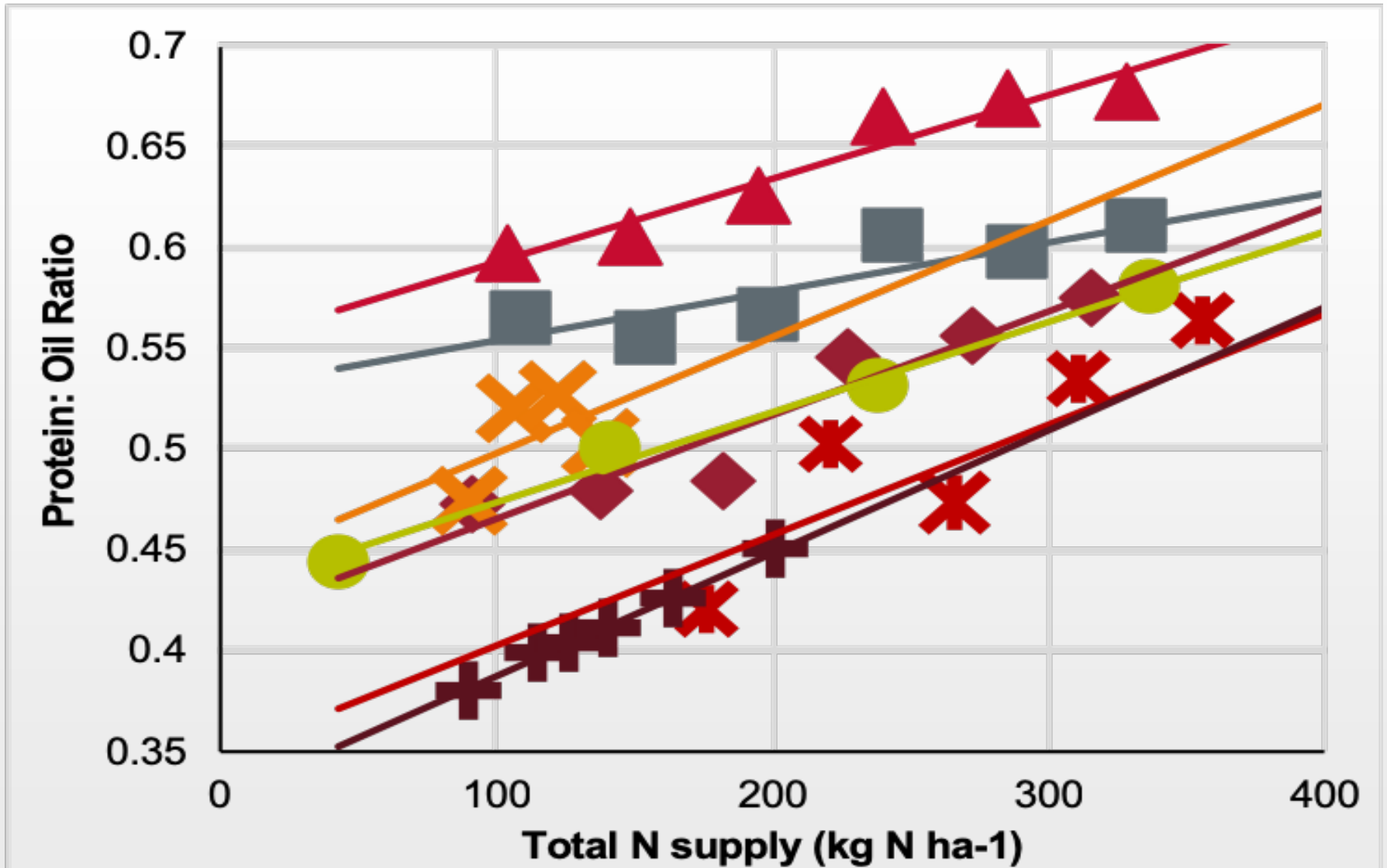


Relationship between seed protein/oil content



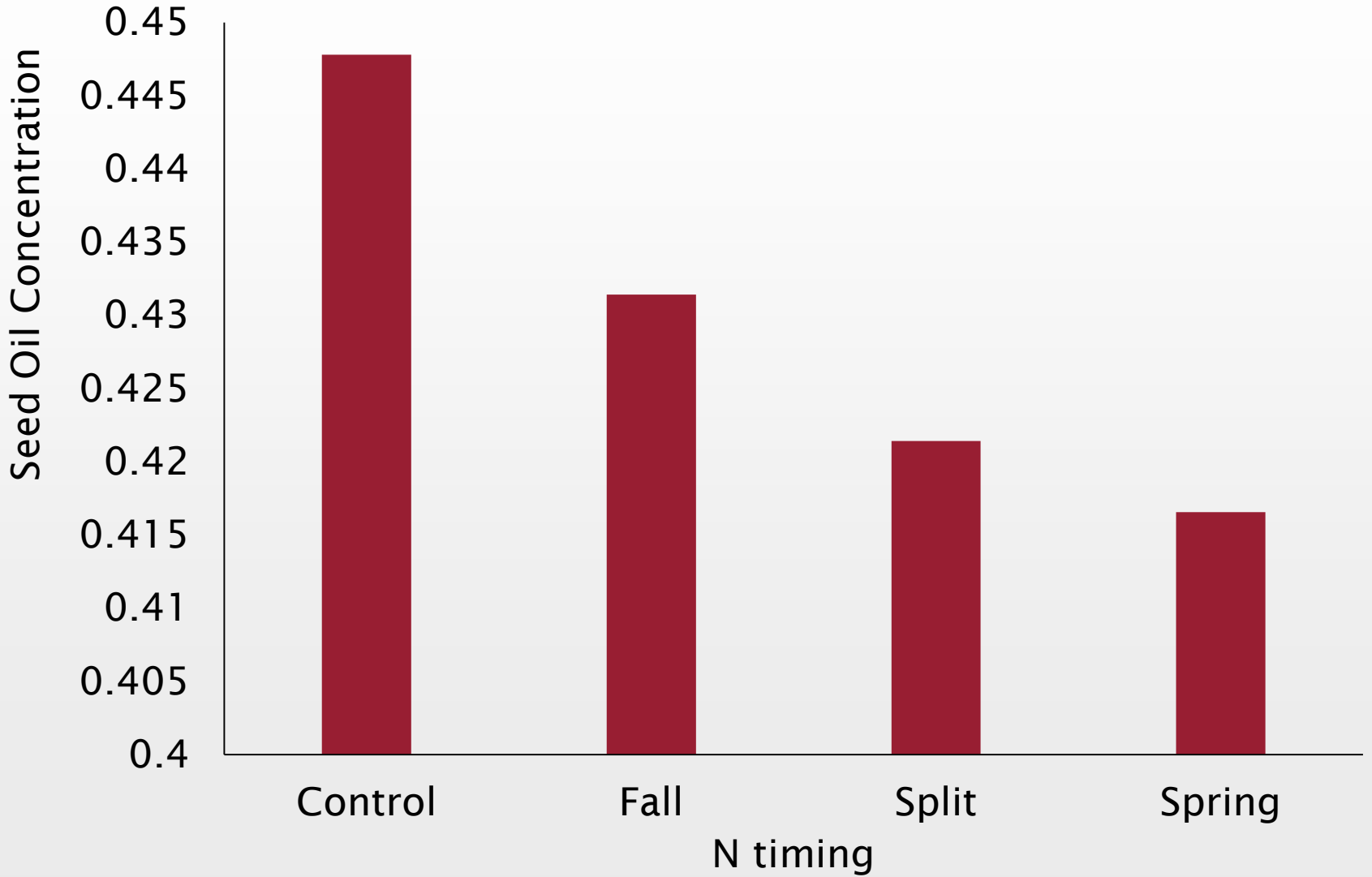


Seed oil content decreases as N rate increases





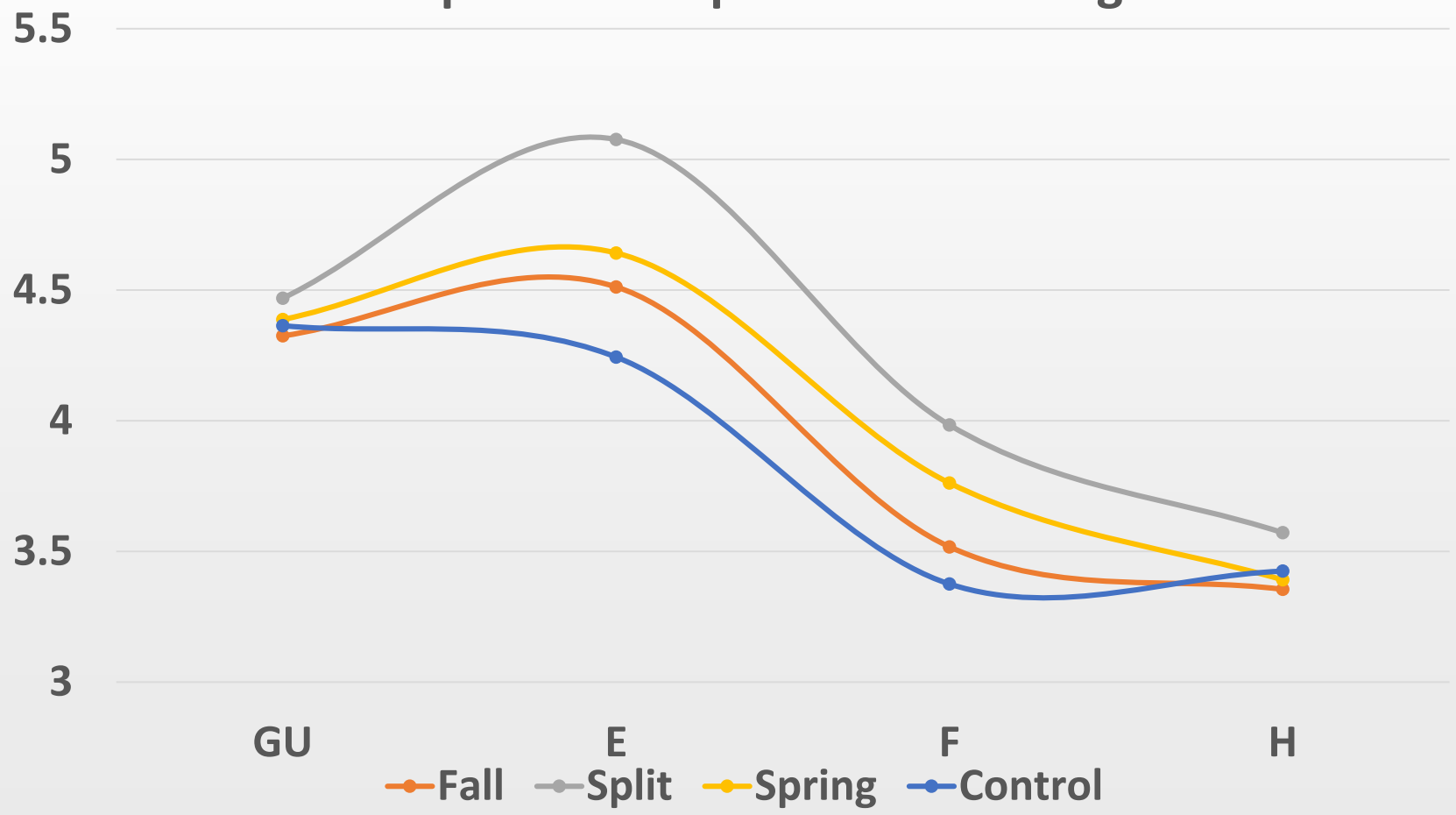
Timing of N application effect seed oil content





S content in above ground biomass

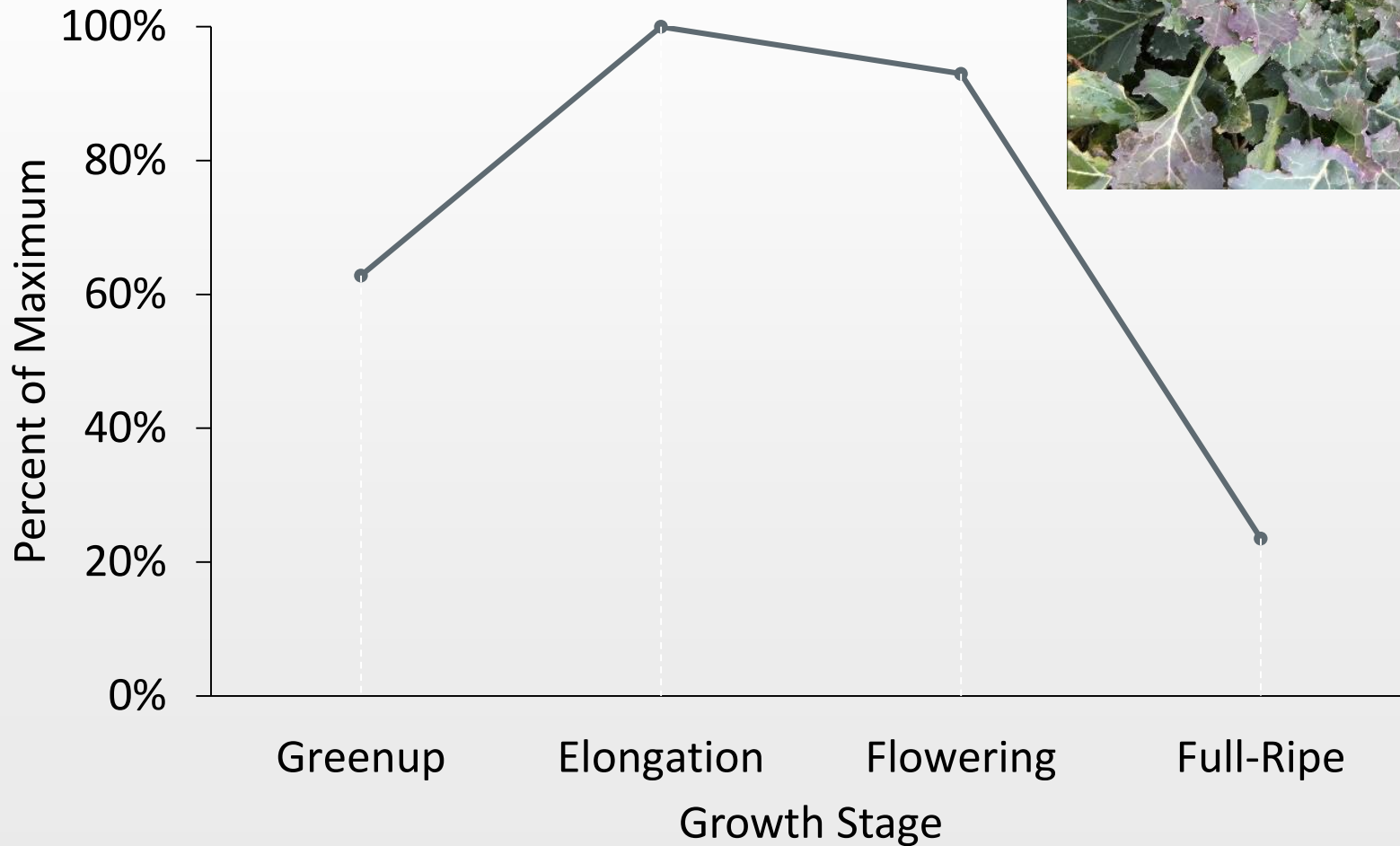
Sulfur uptake in response to N timing





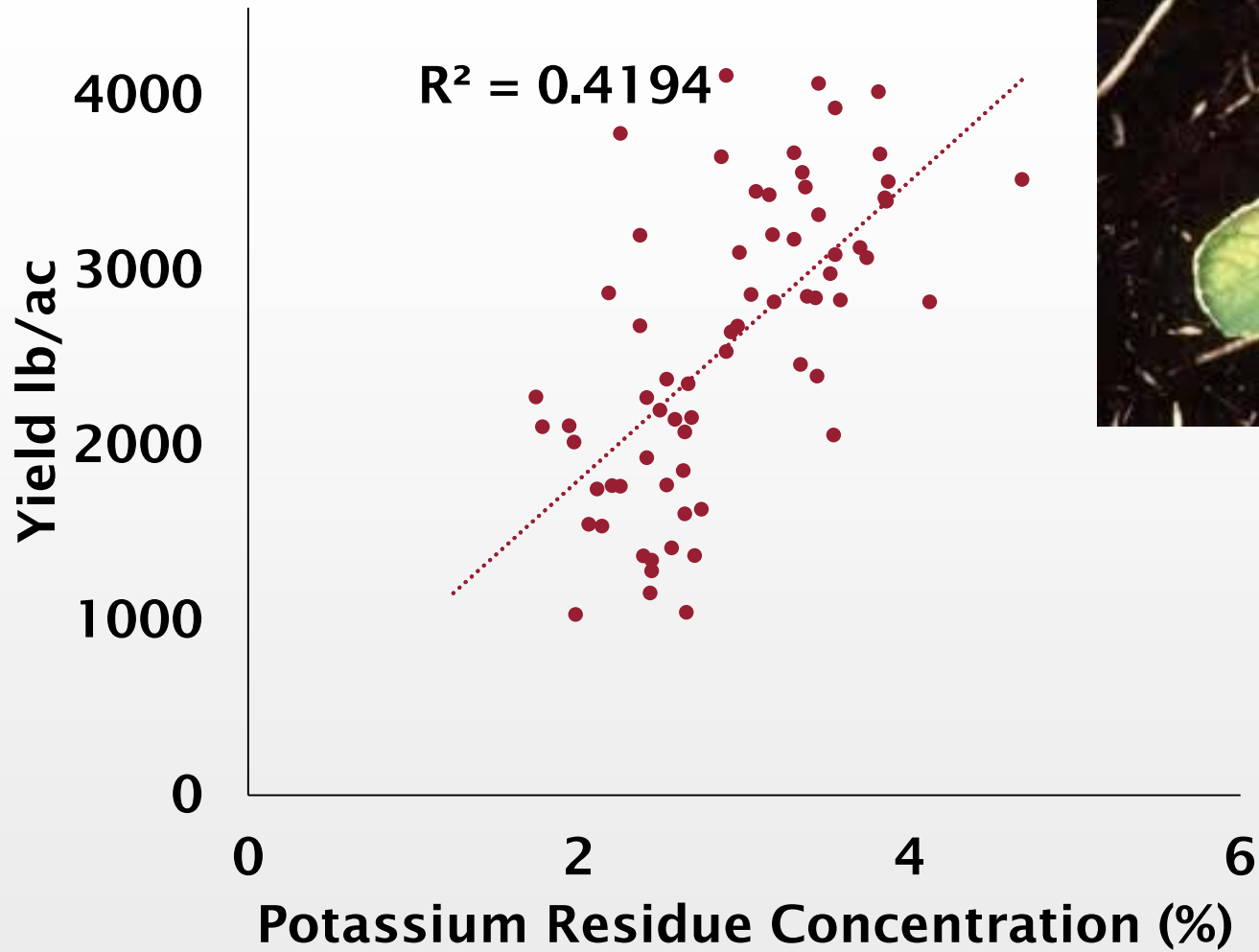
Phosphorous

- Needed by plant 2 to 6 weeks after germination



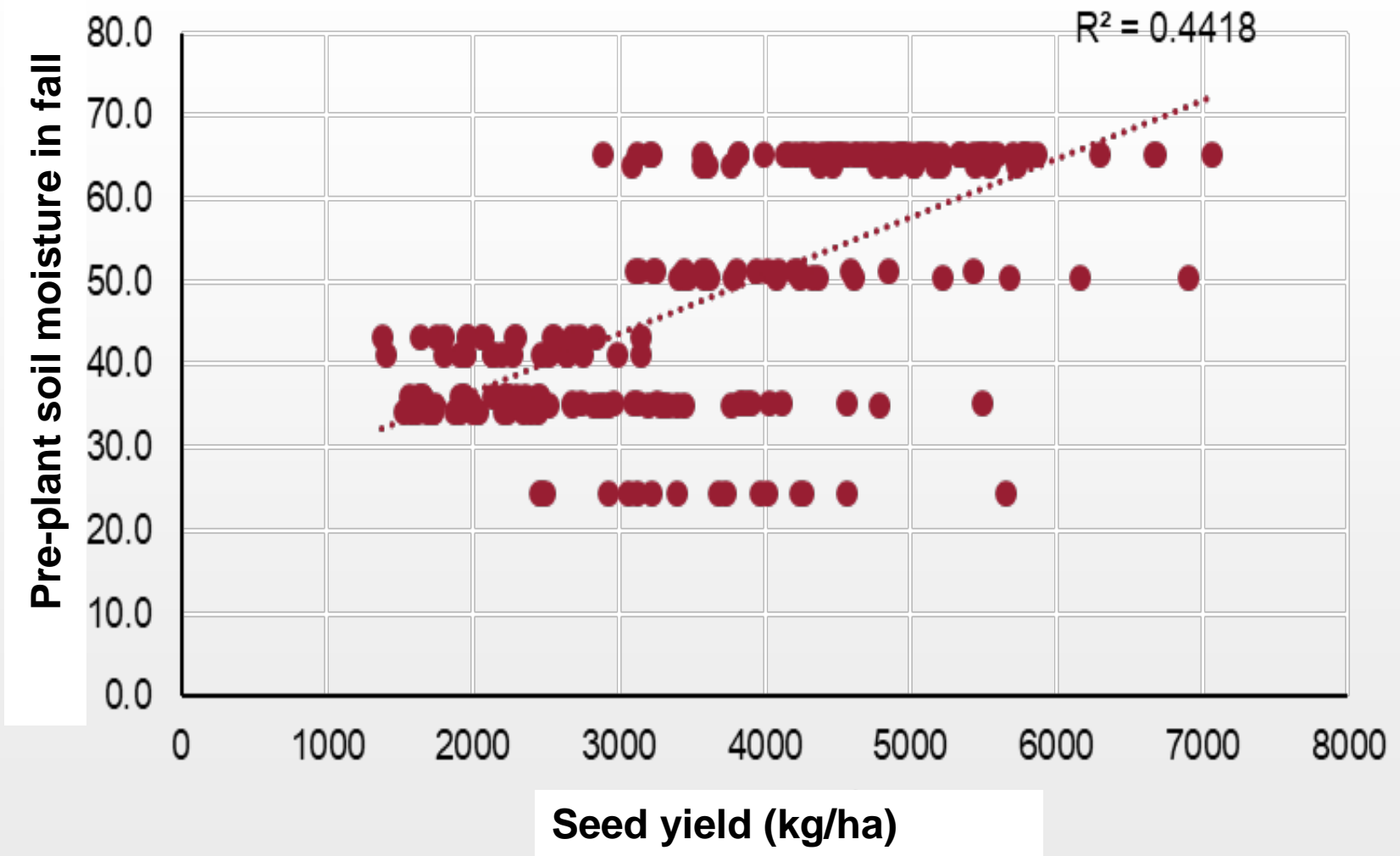


Potassium





Yield response to soil moisture in fall





Conclusions

- **When residual soil N is above 100 lbs/acre, its is not recommended to apply additional N fertilizer**
- **N application when soil test is above 100 lbs/acre, especially in spring, will increase protein and reduce oil content of seeds**
- **Unit N requirement of 4-6 lbs N per 100g yield**



What's next

- N production function
- Optimum N rate in different rainfall zones

- Field research on P

Funding: Washington State Oilseeds Commission

- Uptake of micronutrients
- Relationship between micronutrients and yield and quality



Publications

In preparation

- One extension publication on canola nutrient management
- Two journal articles
- Graduate student will graduate in April



Thank You!