

# Nitrogen management for high yielding spring wheat

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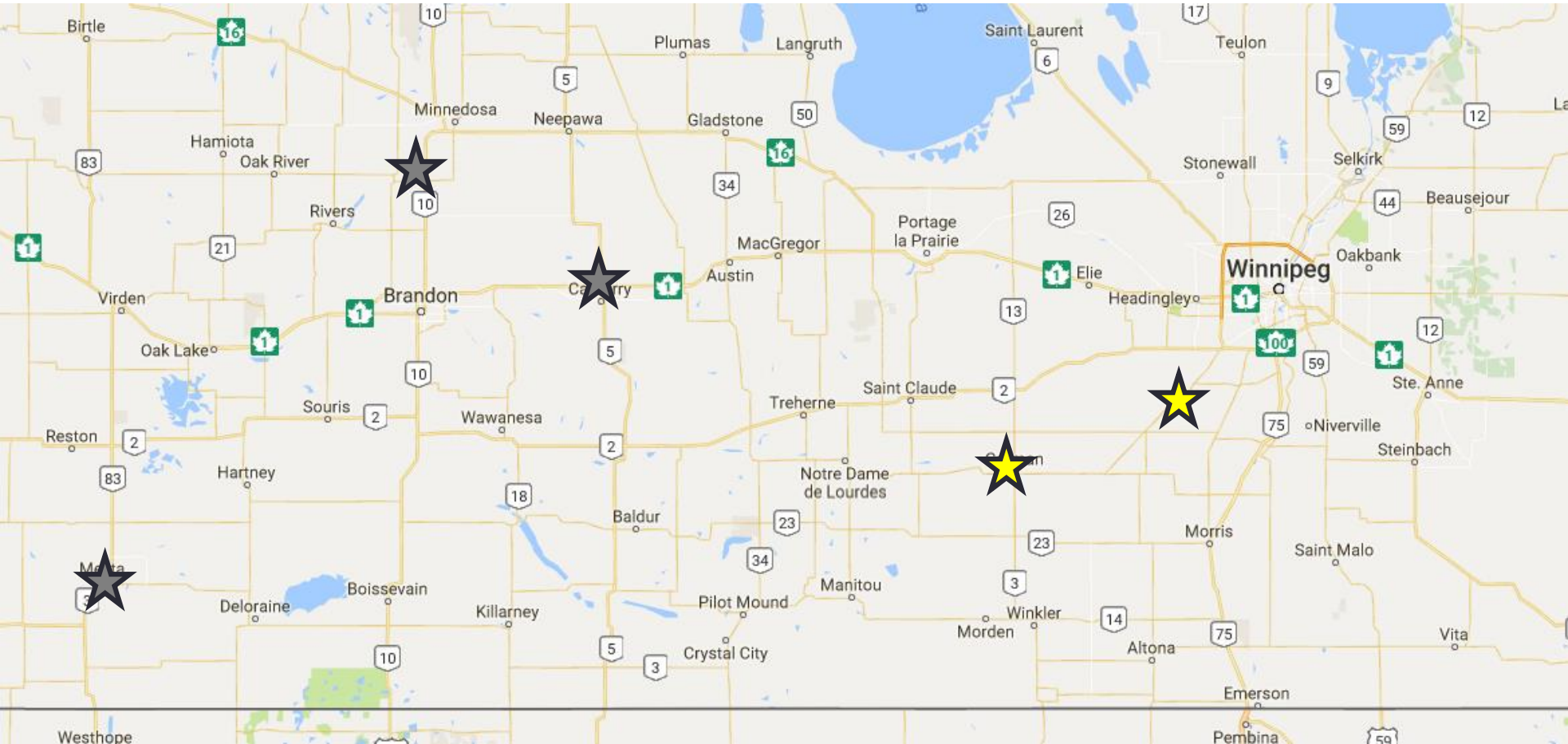
2016 Intensive Small Plot Trials



UNIVERSITY  
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# 2016 Trial Locations







Treatments

Variety	N Rate (lbs. N/ac)		Source		Timing/Placement		
	Spring	In Season	Spring	In Season	Spring	In Season	
Brandon (CWRS) and Prosper (CNHR)	0		Urea (Gold), Agrotain treated urea (Silver)		Midrow band at seeding (Gold), Broadcast after seeding (Silver)		
	50						
	80						
	110						
	140						
	170						
	200						
	80						ESN:Urea (40:40)
	140						ESN:Urea (100:40)
	80	30	Urea, Agrotain treated urea	Agrotain treated urea		Stem elongation, broadcast	
	80	60				Post anthesis, foliar	
	80	30					
	80	60					
	80	30					
	80	30					
	80	30		UAN			
80	30	Urea Sol'n					

# Study #1: Rate Response

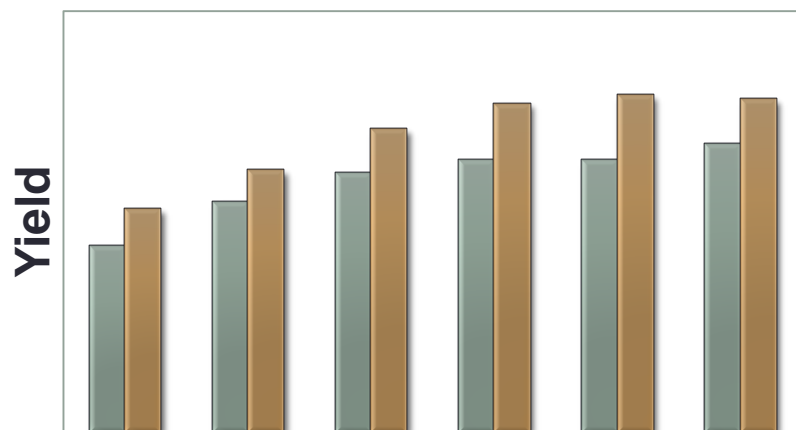
Variety	N Applied (lbs/ac)	Source / Placement
Brandon (CWRS) and Prosper (CNHR)	0	<b>Gold:</b> Urea, midrow banded at seeding  <b>Silver:</b> Agrotain treated urea, broadcast shortly after seeding
	50	
	80	
	110	
	140	
	170	
	200 (Gold Only)	



# Study #2: Rate/Source/Timing

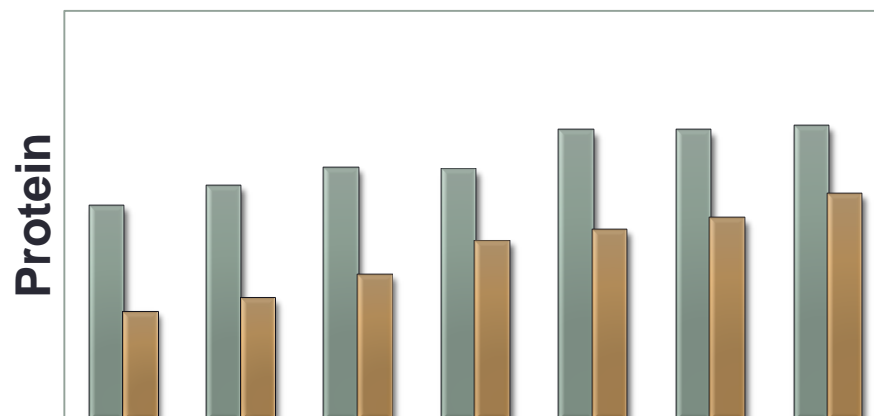
Variety	N Applied (lbs/ac)		Source		Timing / Placement	
	Spring	In Season	Spring	In Season	Spring	In Season
Brandon (CWRS) and Prosper (CNHR)	80		Urea (Gold), Agrotain Treated Urea (Silver)			
	110					
	140					
	80		40:40 ESN:Urea		Midrow banded (Gold), Broadcast (Silver)	
	140		100:40 ESN:Urea			
	80	30	Urea (Gold), Agrotain treated urea (Silver)	Agrotain treated urea		Stem Elongation, broadcast
	80	60				
	80	30				Flag leaf, broadcast
	80	60				
	80	30		UAN		Post-Anthesis, foliar
	80	30		Urea Sol'n		

Grain Yield (Rate Study)				
	Carman	Brunkild	Melita	Carberry
N Rate	<0.0001	<0.0001	<0.0001	0.5382
Variety	<0.0001	0.0002	<0.0001	<0.0001
N Rate * Variety	0.0760	0.0684	0.5088	0.8864



N Treatment

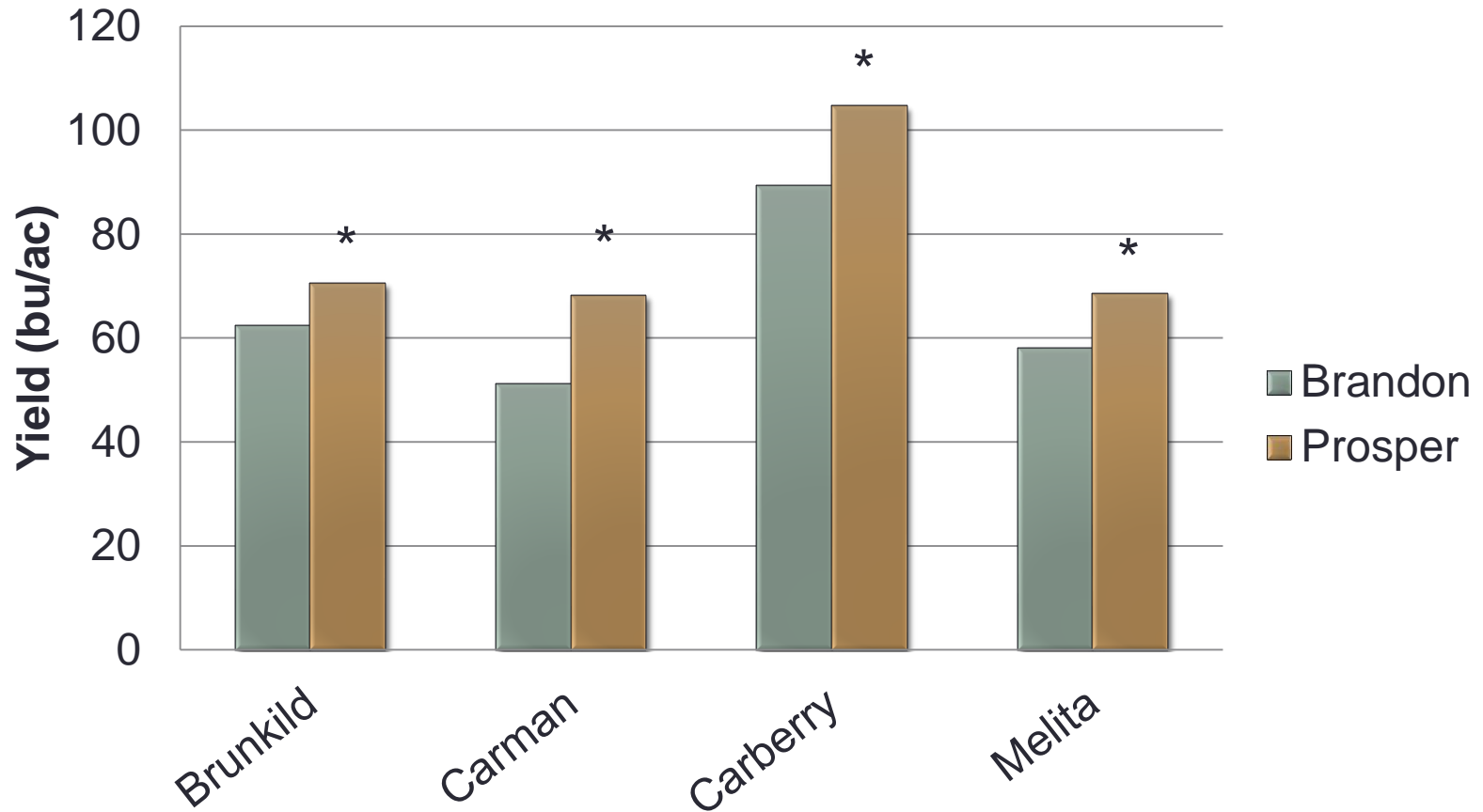
Grain Protein (Rate Study)				
	Carman	Brunkild	Melita	Carberry
N Rate	<0.0001	<0.0001	<0.0001	0.0765
Variety	<0.0001	0.0002	<0.0001	0.0005
N Rate * Variety	0.5869	0.8061	0.0754	0.5693



N Treatment

**No significant interaction between variety and nitrogen for grain yield or protein ...  
ie. varietal differences were consistent across N rates and vice versa**

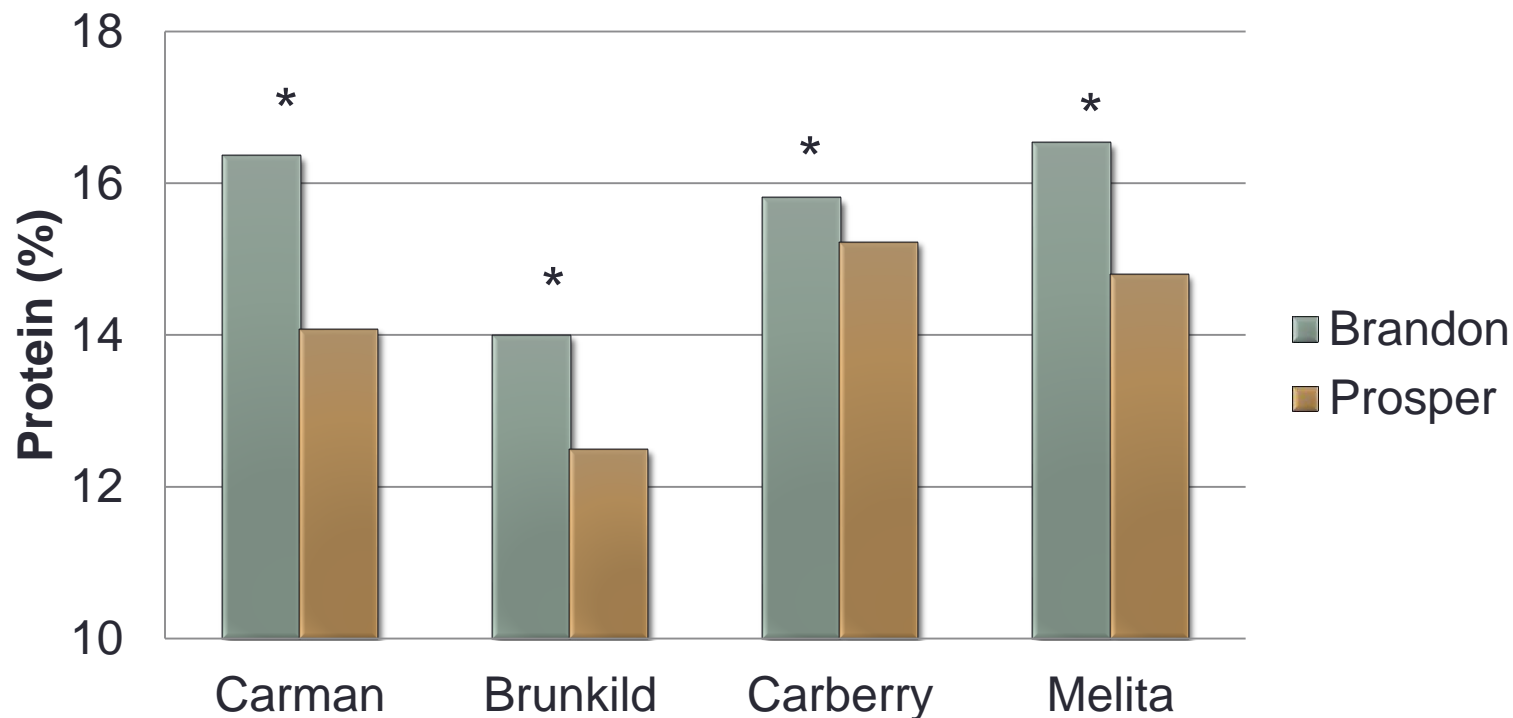
## Variety Effect: Yield, 2016



Prosper yielded **7.6 – 16.3 bu/ac** over Brandon



# Variety Effect: Protein, 2016

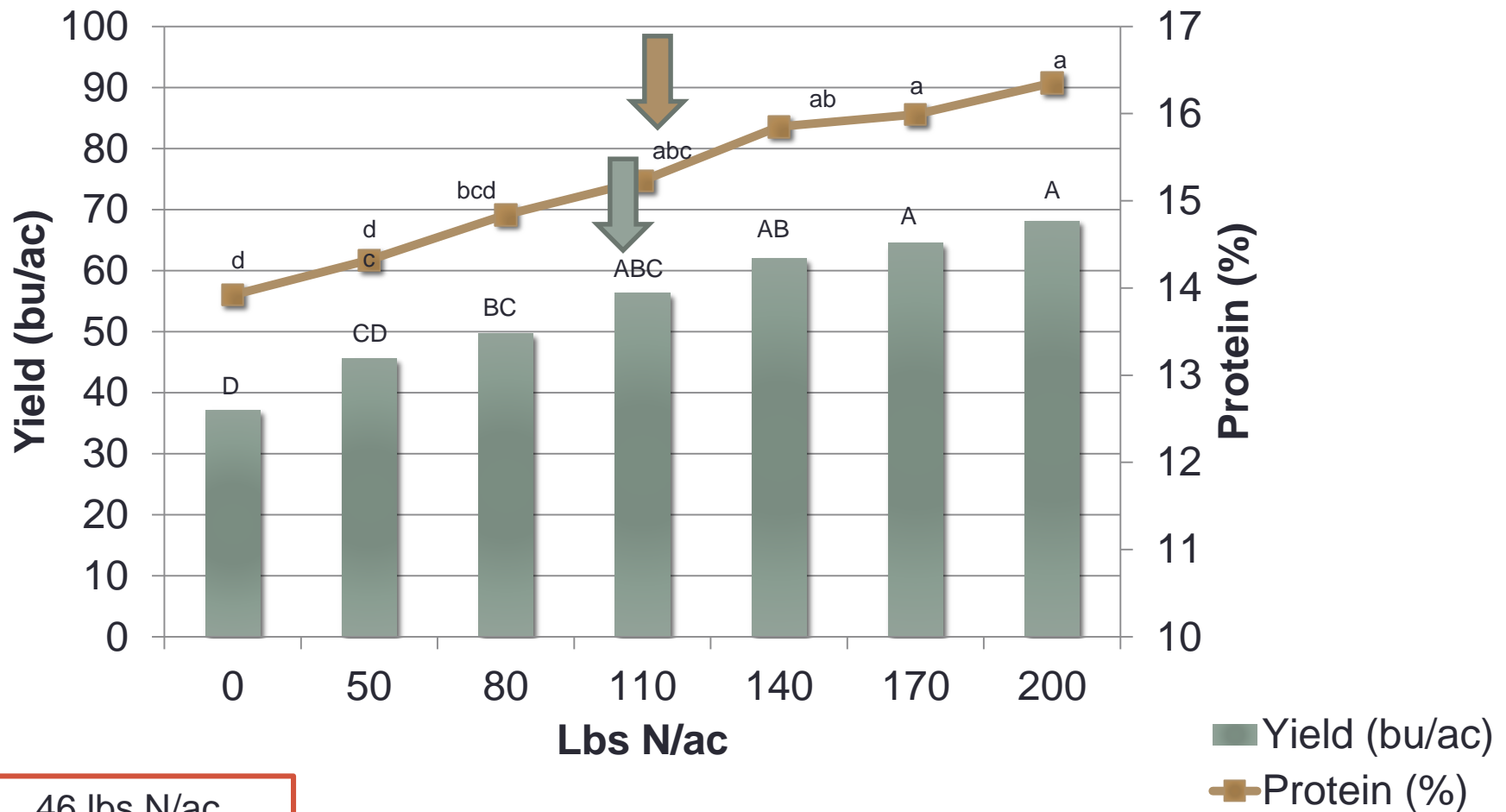


Brandon protein **0.92 – 2.24 %** over Prosper

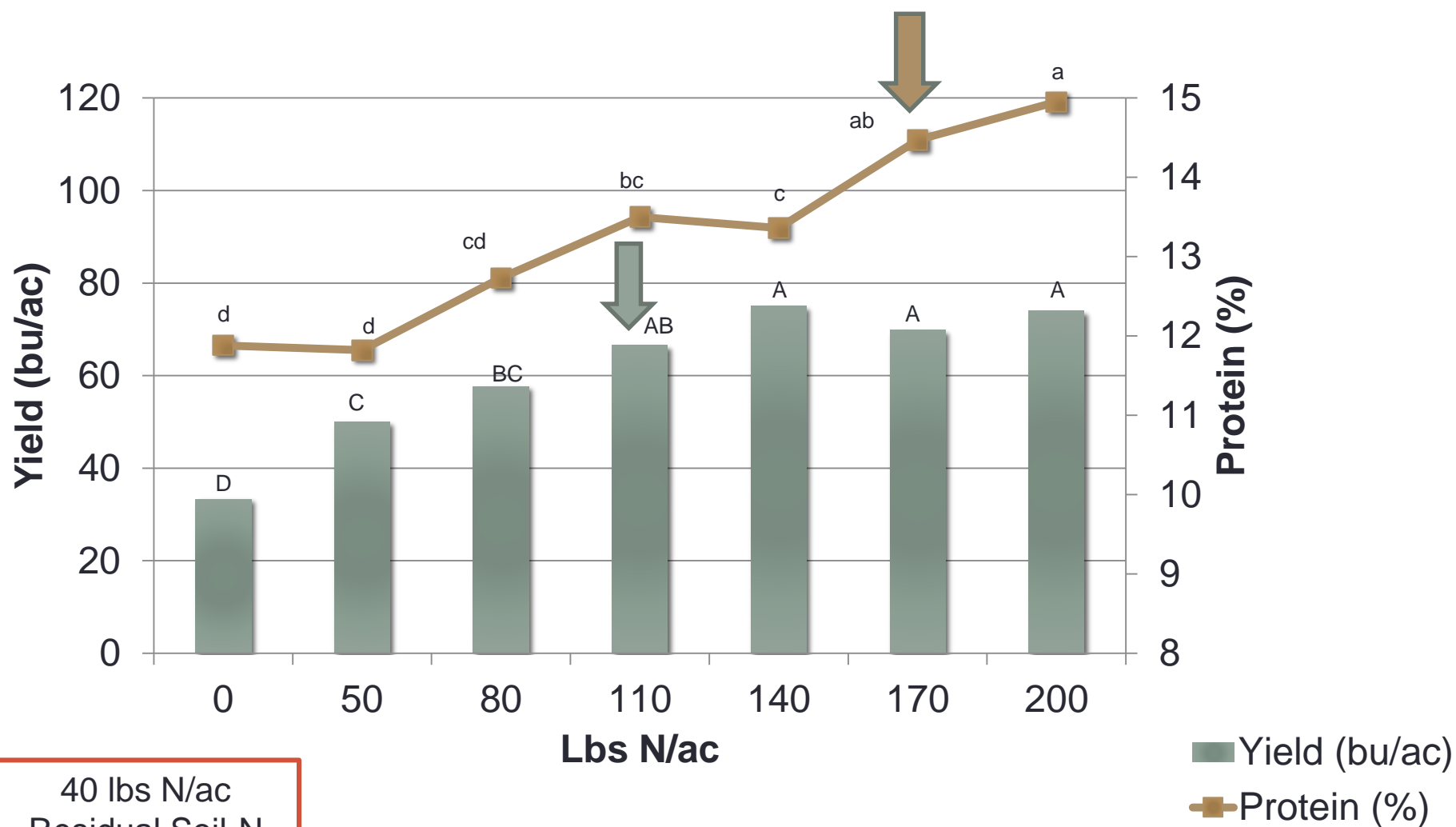
# Nitrogen Rate Response

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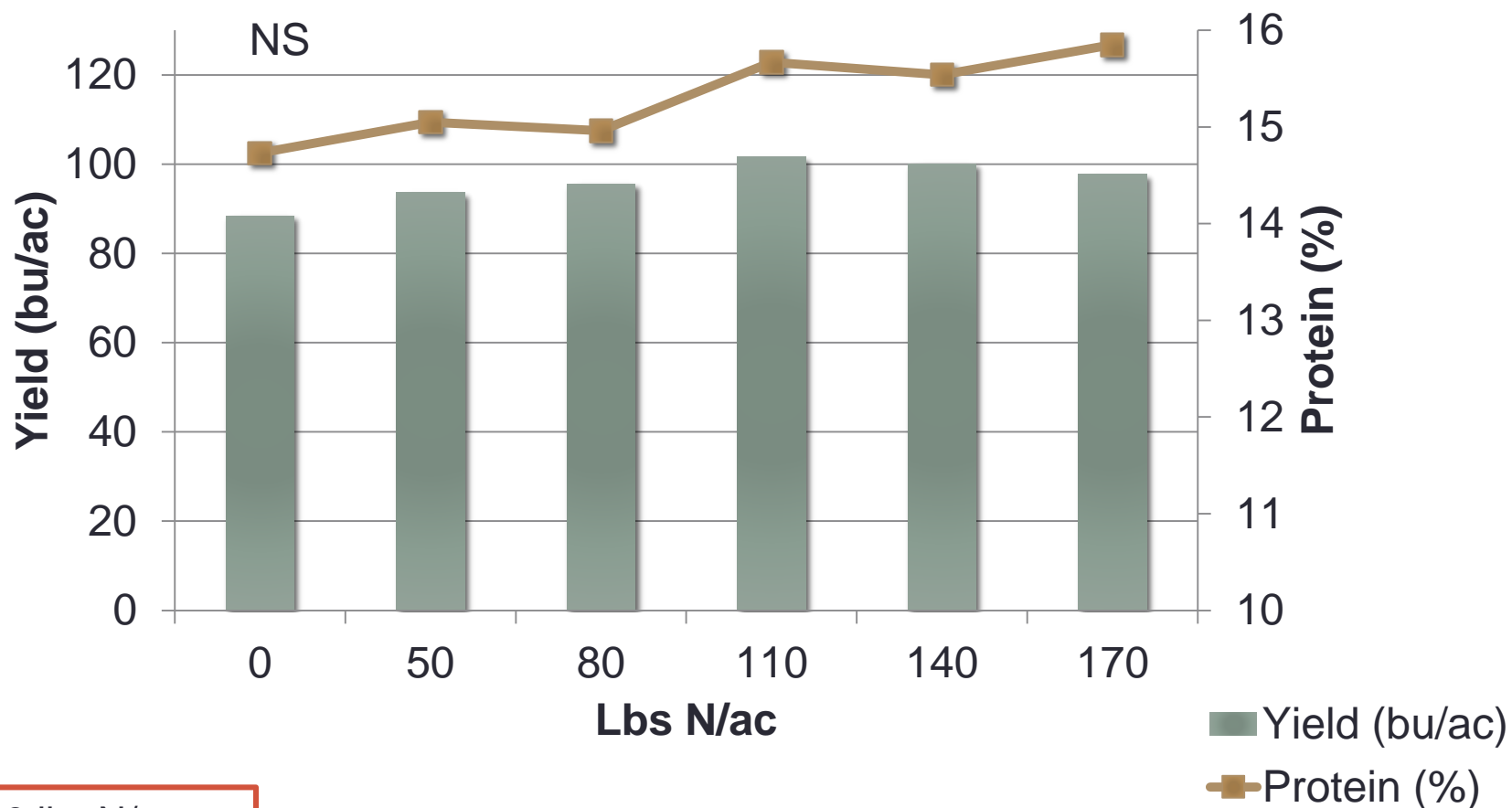
# Nitrogen Rate Response, Carman 2016



# Nitrogen Rate Response, Brunkild 2016



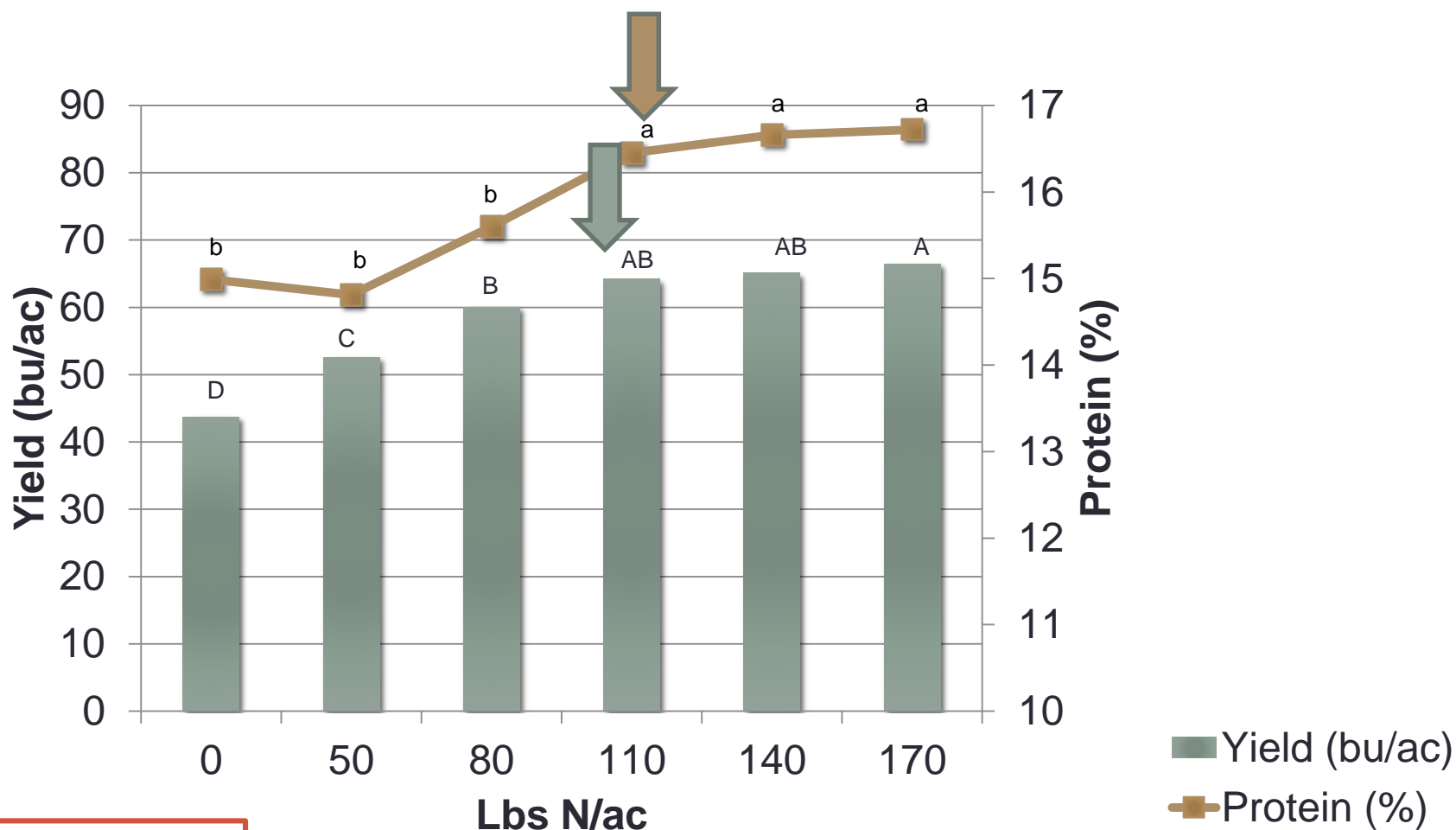
# Nitrogen Rate Response, Carberry 2016



89 lbs N/ac  
Residual Soil-N



# Nitrogen Rate Response, Melita 2016



# Rate Response Summary

Site	Variety	Total N for max yield	Bu/ac	Lbs. N/bu
Carman	Brandon	156	50	3.1
	Prosper		64	2.5
Brunkild	Brandon	150	63	2.4
	Prosper		71	2.1
Carberry	Brandon	89	93	1.1
	Prosper		104	0.9
Melita	Brandon	153	58	2.6
	Prosper		70	2.2



Lodging Carberry - July 20

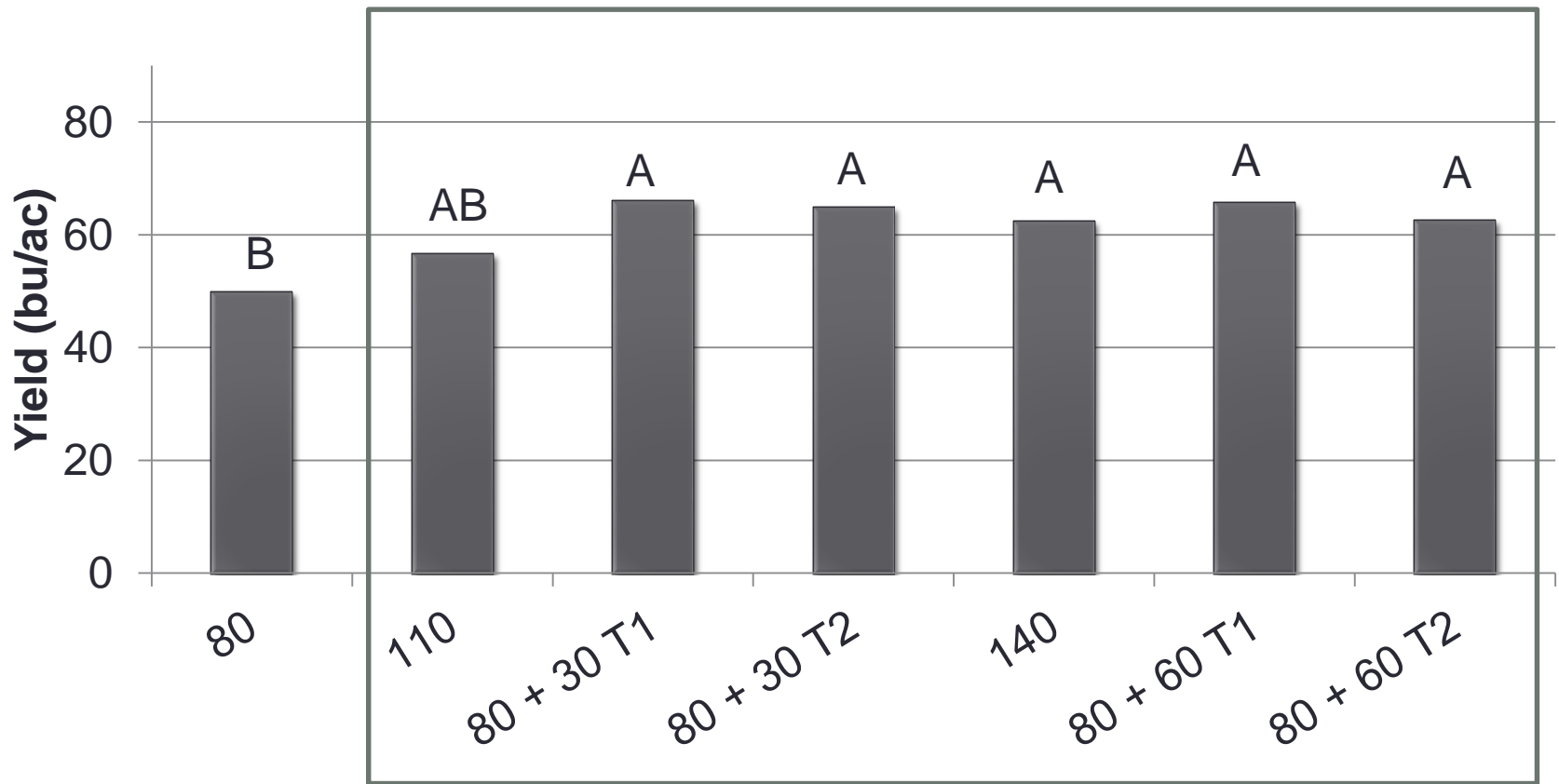


Prosper check vs 200 lbs Brunkild 2016

# Nitrogen Application Timing

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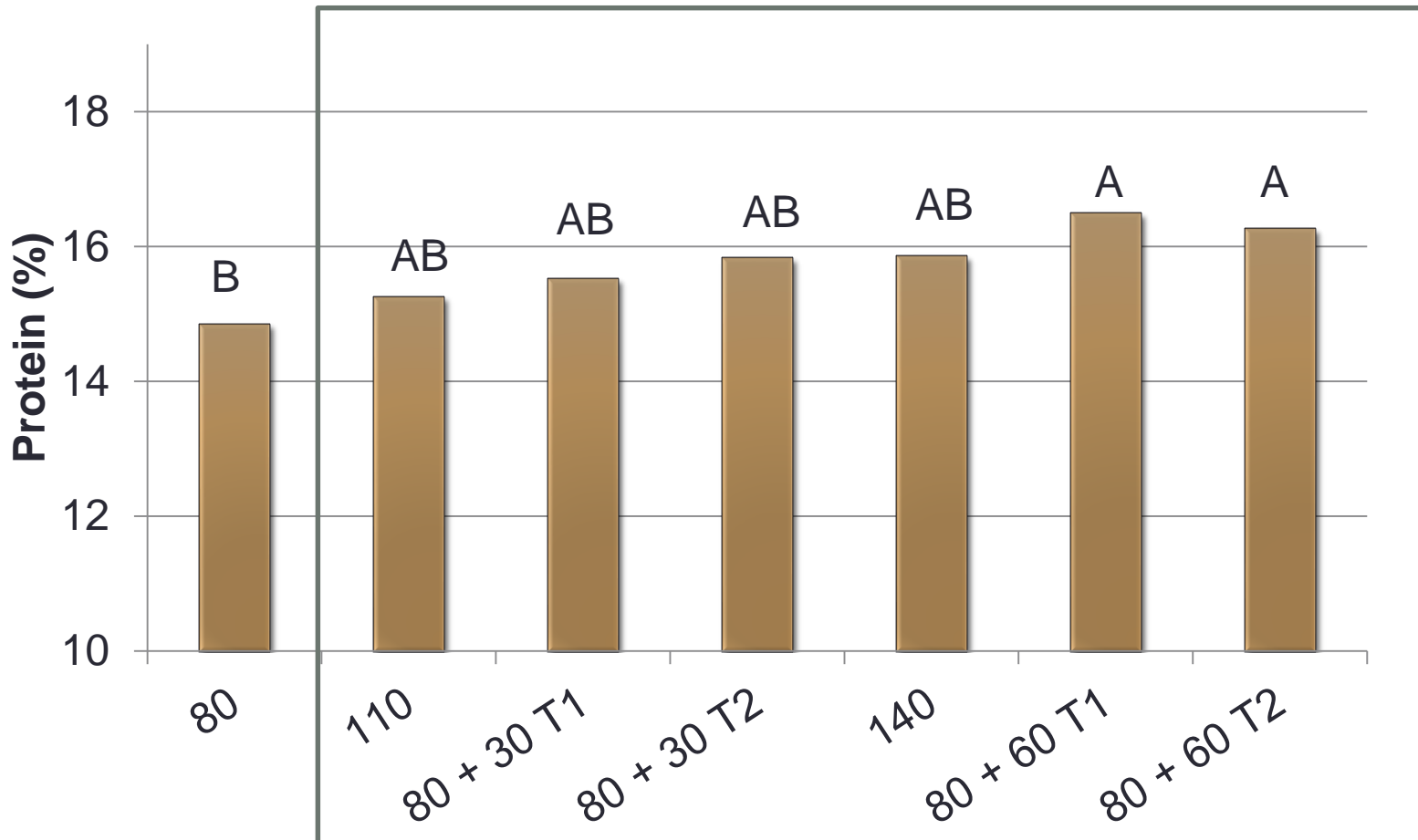
# N Application Timing, Carman 2016, Yield



T1 = Stem Elongation  
T2 = Flag Leaf

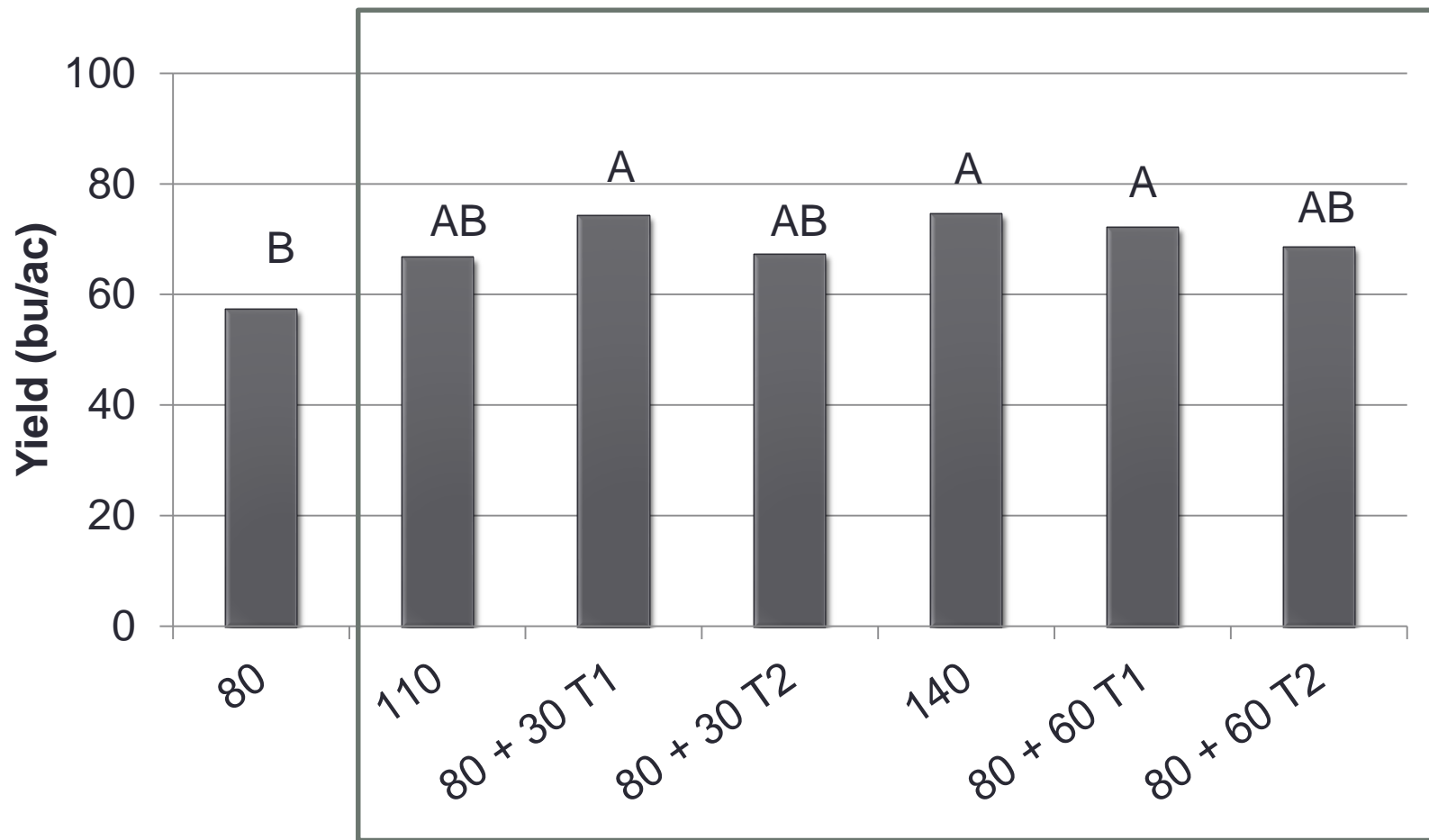


# N Application Timing, Carman 2016, Protein



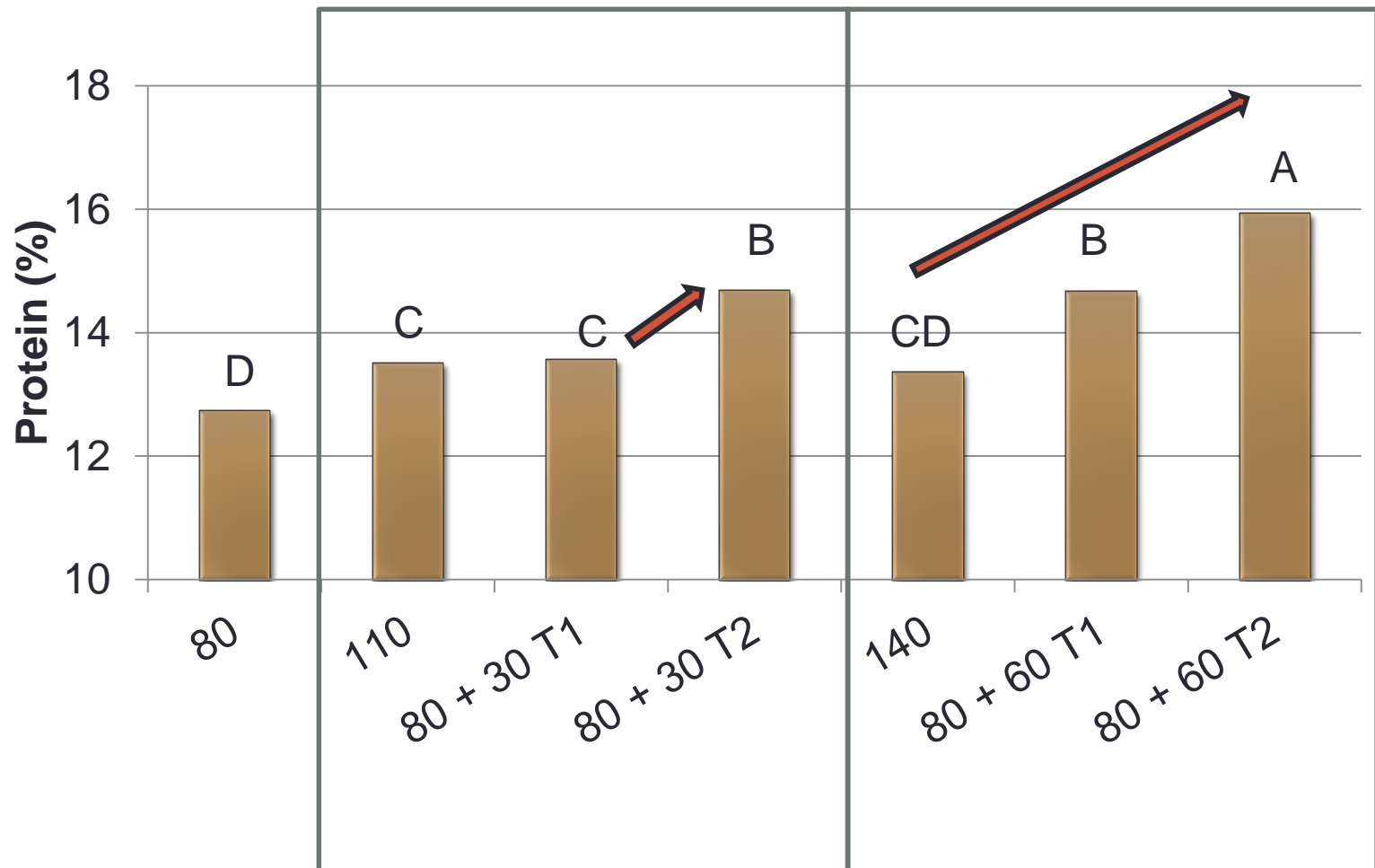
T1 = Stem Elongation  
T2 = Flag Leaf

# N Application Timing, Brunkild 2016, Yield



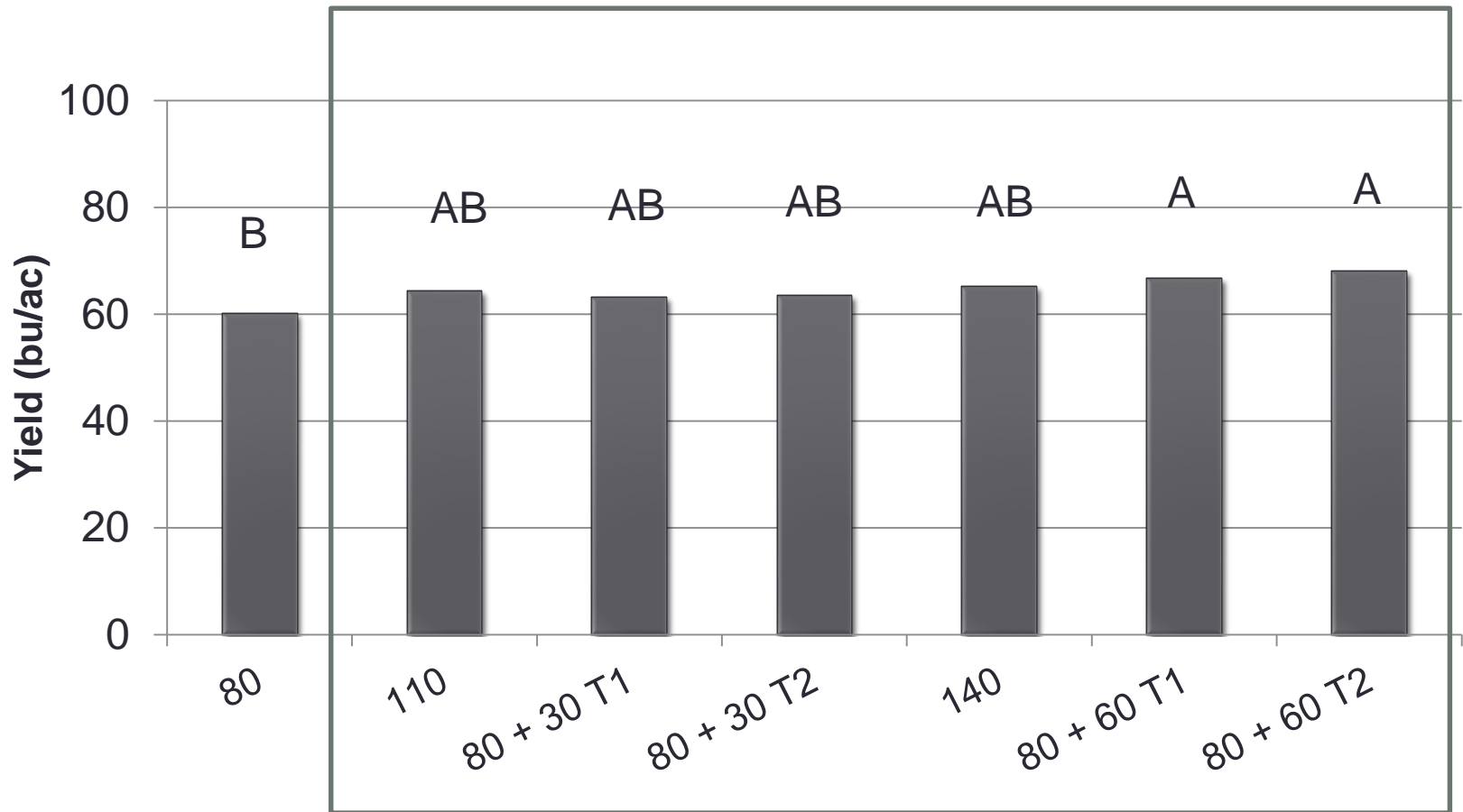
T1 = Stem Elongation  
T2 = Flag Leaf

# N Application Timing, Brunkild 2016, Protein



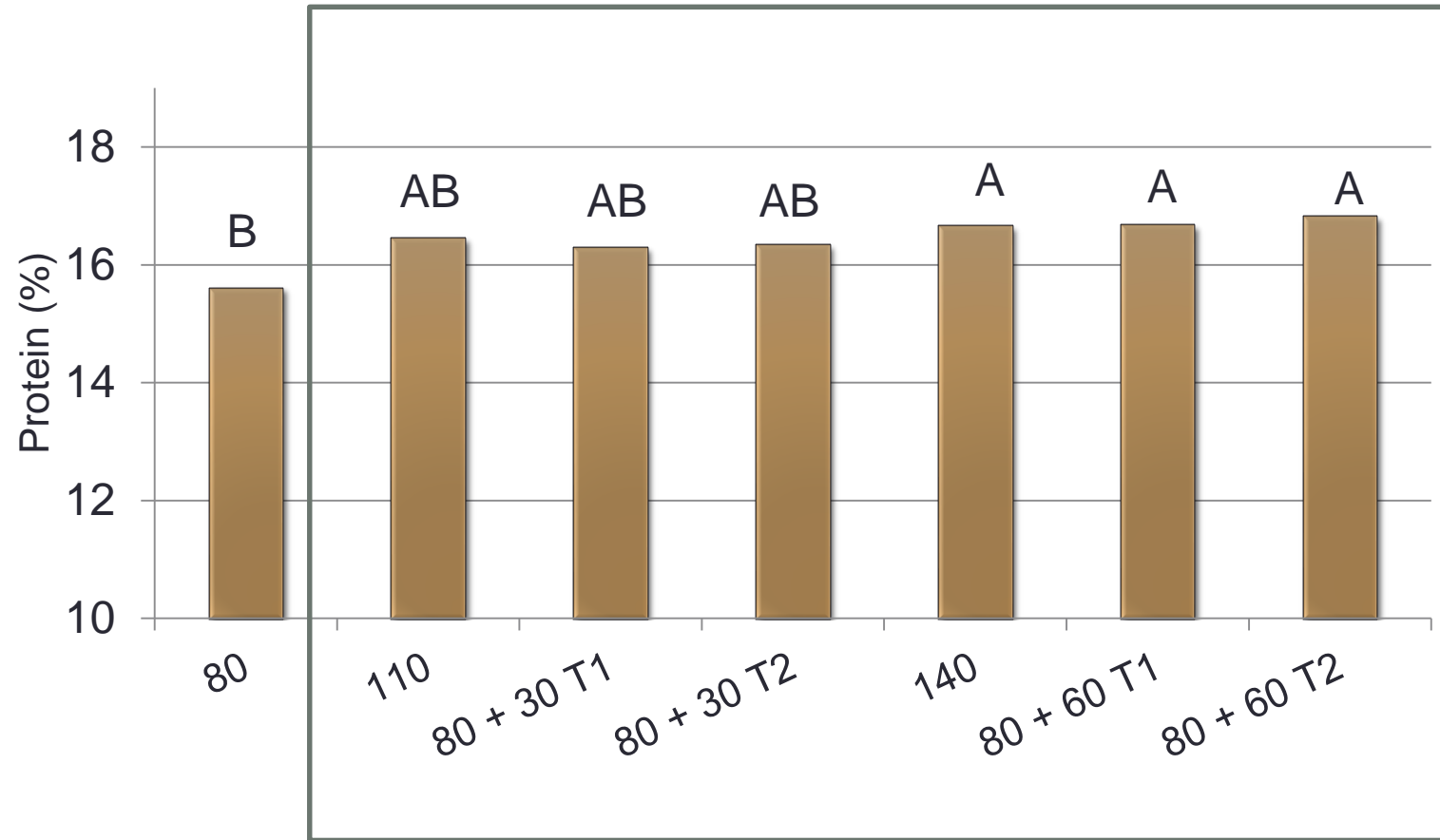
T1 = Stem Elongation  
T2 = Flag Leaf

# N Application Timing, Melita 2016, Yield



T1 = Stem Elongation  
T2 = Flag Leaf

# N Application Timing, Melita 2016, Protein

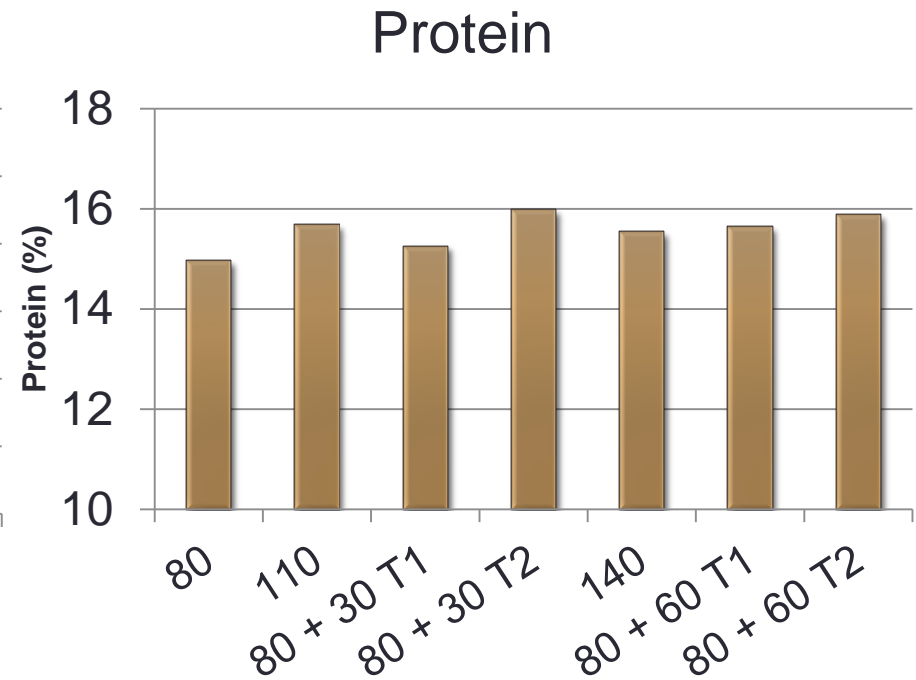
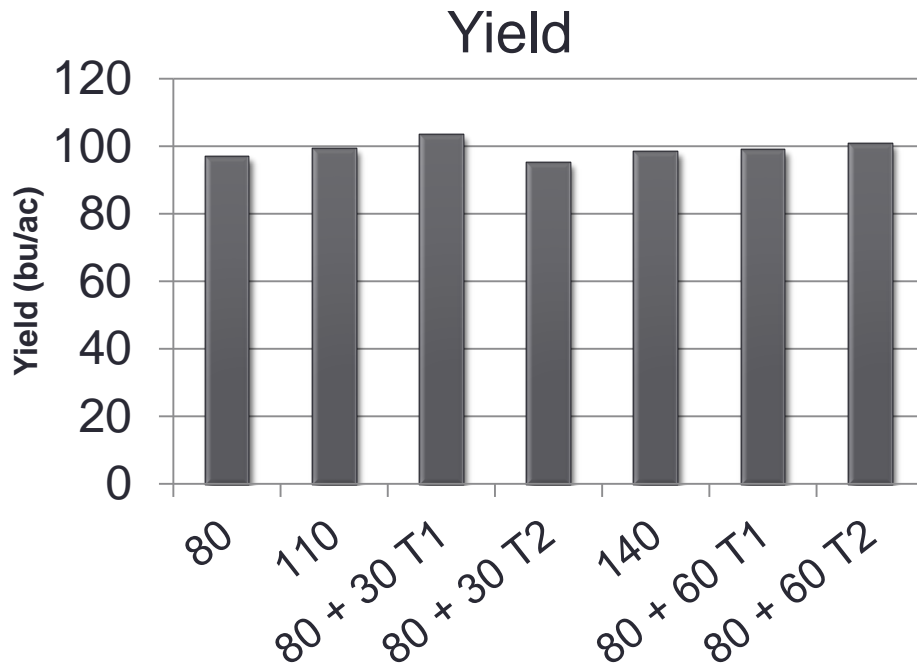


T1 = Stem Elongation  
T2 = Flag Leaf



# N Application Timing, Carberry 2016

No Significant Effect of Nitrogen Treatments



T1 = Stem Elongation  
T2 = Flag Leaf

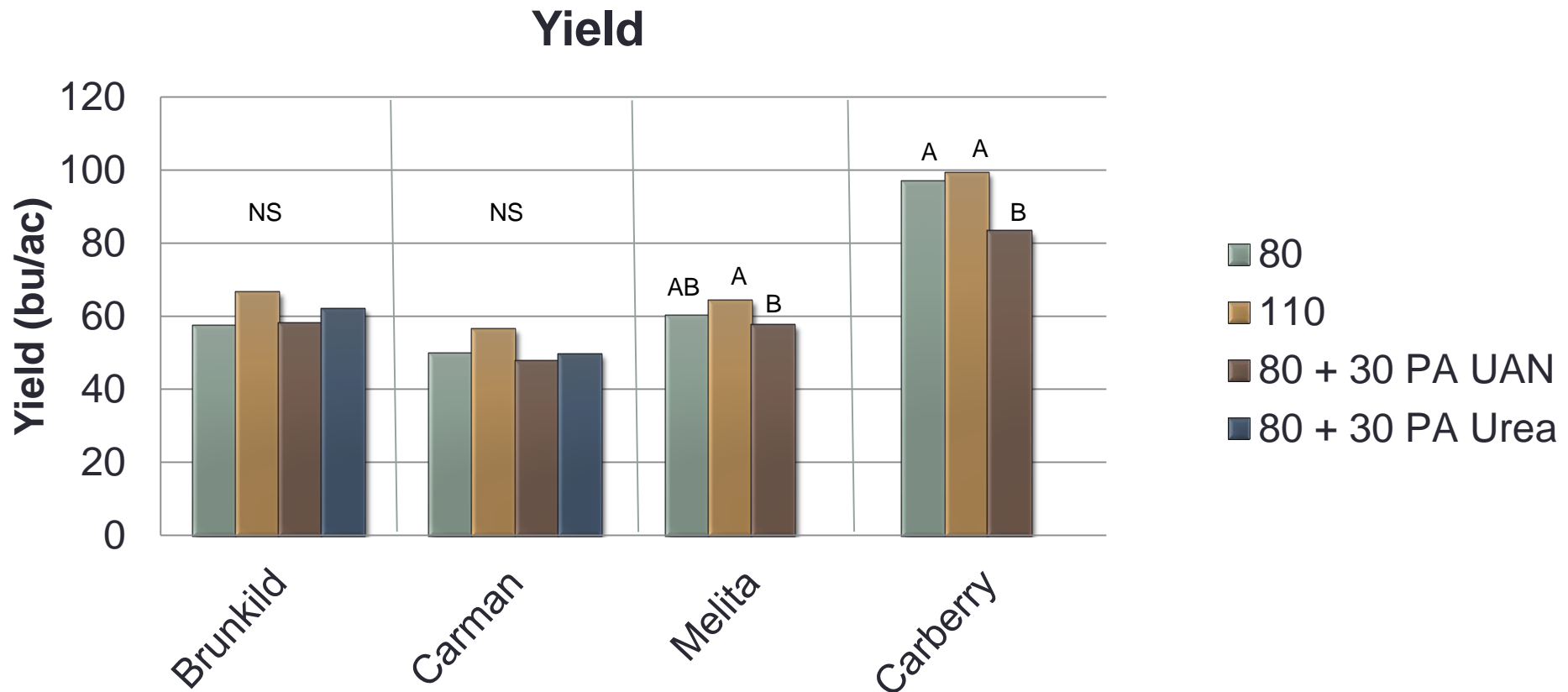
# Nitrogen Timing Summary

- Yield and protein content for all split N applications were similar to those for equivalent rates of N applied at seeding at Carman, Carberry, and Melita
- At Brunkild, protein content was increased by splitting N applications between seeding and flag leaf (both rates) and stem elongation (high rate only); yields were similar for all equivalent rates of N

# Post-Anthesis Nitrogen

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# Post-Anthesis Nitrogen, 2016



# Leaf Burn: UAN vs Urea Solution



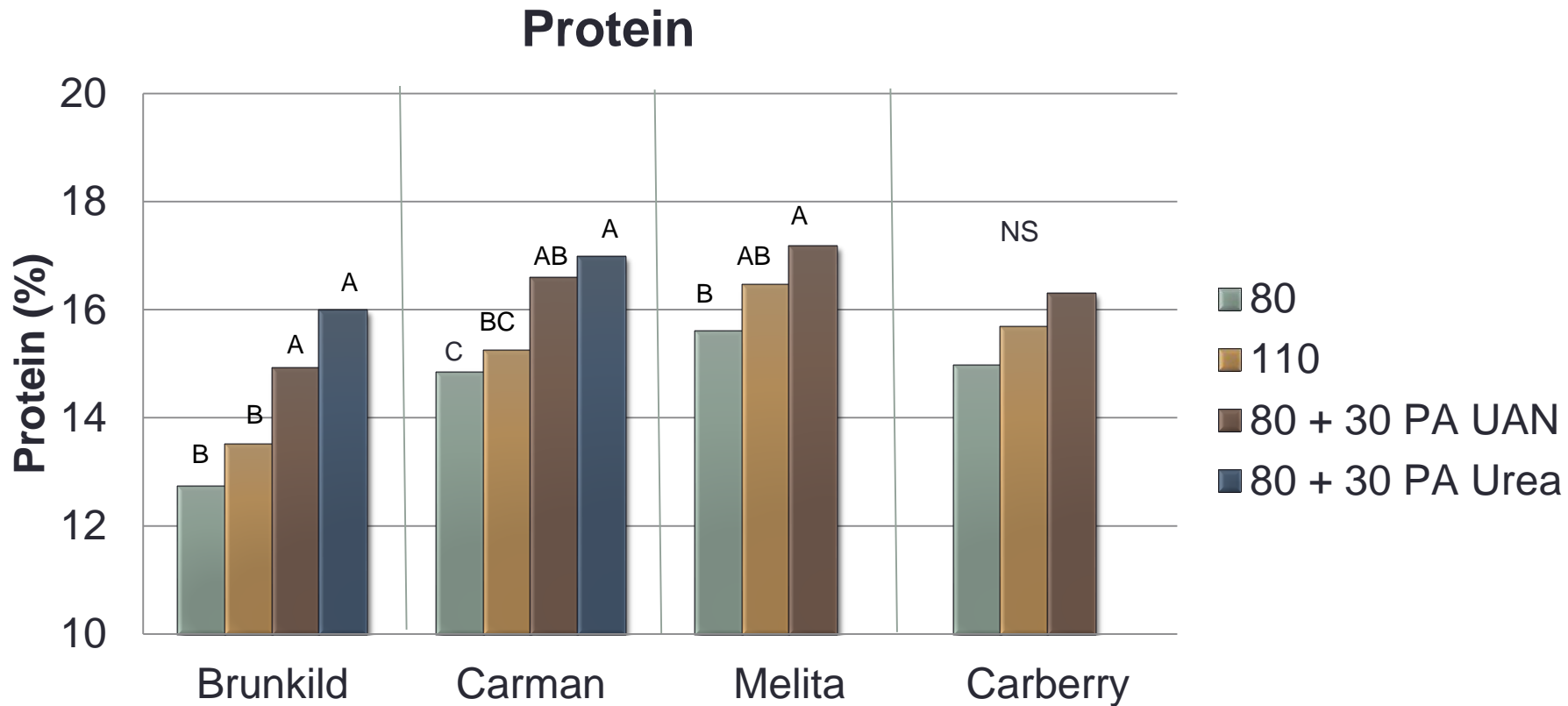
Carman



Brunkild



# Post-Anthesis Nitrogen, 2016



# Post-Anthesis N Summary

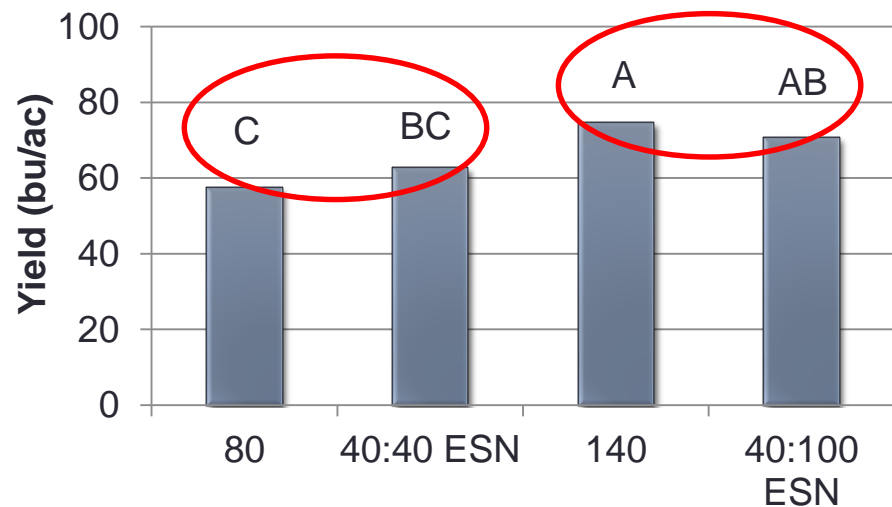
- significantly lowered yield at two sites compared to equivalent rates of N at planting.
- significantly increased grain protein content at three sites, compared to equivalent rates of N at planting
- urea solution numerically increased protein content over UAN when applied post anthesis at Brunkild but yields for the two sources were similar. Grain yield and protein content were similar for both sources at Carman.

# ESN Blends

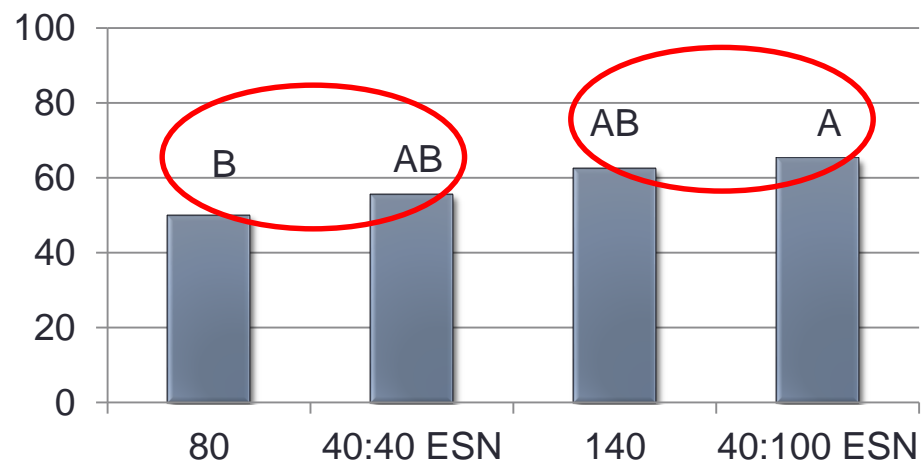
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# ESN Blends, 2016, Yield

Brunkild

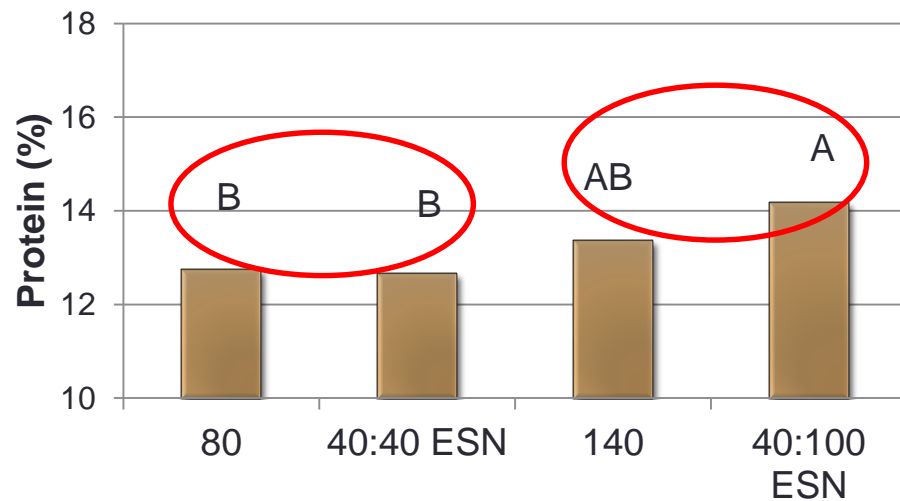


Carman

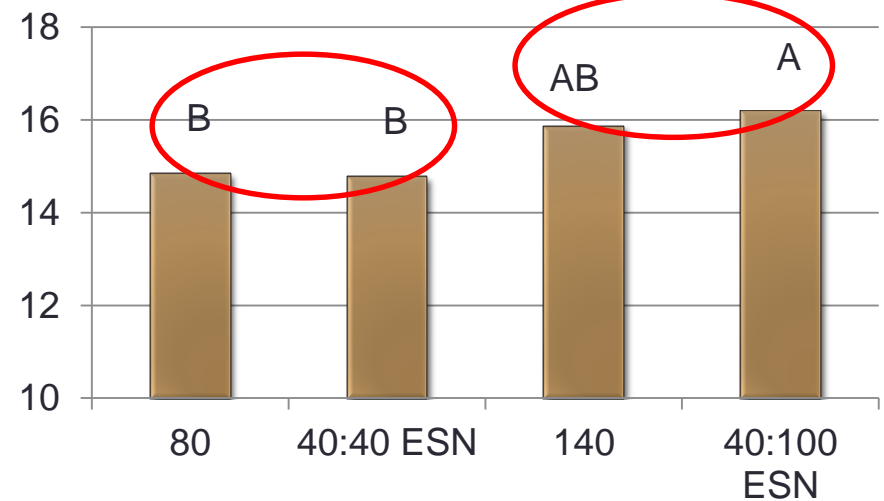


# ESN Blends, 2016, Protein

Brunkild



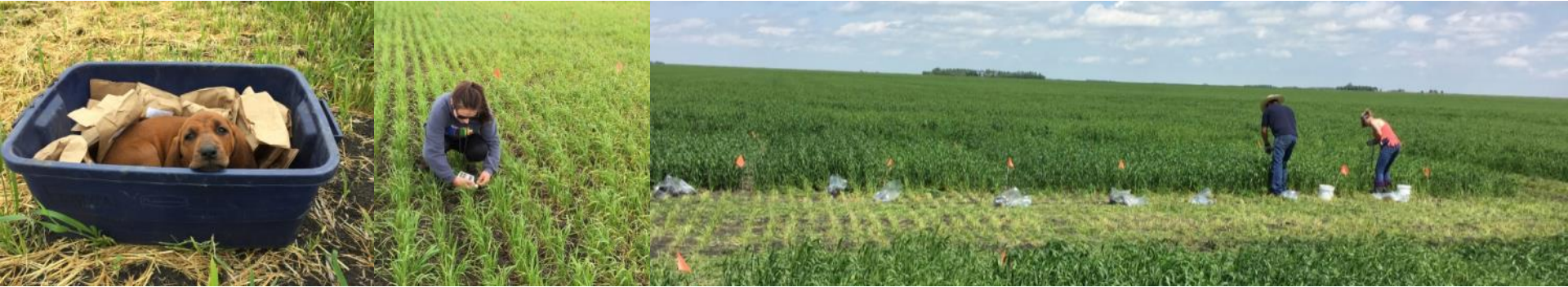
Carman



# ESN Blends Summary

- grain yields and protein content for ESN blends were similar to those for equivalent rates of conventional urea when applied at planting

# Data Still to Come...



- Soil Nitrogen Mineralization Tests
- Growing season changes in deep soil nitrate-N
- In Season N Measurements: GreenSeeker, SPAD, Flag Leaf N, Soil Samples
- Biomass Nitrogen: Nitrogen Uptake, Nitrogen Use Efficiency
- Complete Economic Analysis



# Acknowledgments



- Manitoba Wheat and Barley Growers Association
- John Heard and colleagues in Manitoba Agriculture
- Crop Diversification Centres (WADO, CMCDC, PESAI)
- U of M Ian Morrison Research Station at Carman
- David Laudin and Adam Gurr
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- Koch Fertilizer
- AGVISE Laboratories
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