

Evaluation of nitrogen mgmt. schemes for cover cropped vineyards

RUSSELL MOSS, AMANDA STEWART, TONY WOLF



Background (vigor)

- Eastern viticulture = highly vigorous
- Vigorous vines can lead to:
 - Fungal disease
 - Less color and lighter mouthfeel (phenolics)
 - More green aromas (methoxypyrazines)
 - Lower varietal aroma (thiols, terpenes, norisoprenoids)
 - Higher pH
 - Higher K⁺ concentration
 - Higher malic acid



Background (cover crops)

- Cover crops used to combat vigor
- Cover cropping benefits:
 - Vigor depression
 - N & C source
 - Alternative food source for pests
 - Erosion control
 - Less soil compaction
 - Higher H₂O infiltration
 - Weed suppression
 - Increased microbial diversity



Background (cover crops)

- Cover crops are not always awesome
- Cover cropping issues:
 - Yield loss
 - Increased frost risk
 - Lower ester concentration and varietal aroma
 - Competes for nutrients & water

↓ NITROGEN!!!

- Lower YAN, fermentative issues and off aromas



Background (nitrogen)



- Optimal N conc. in juice = 150ppm
- Excessive N (>300ppm) can lead to:
 - Biogenic amine formation (gross)
 - High protein content (haze formation)
 - Overly vigorous fermentation
 - Ethyl carbamate formation (cancer)
 - Increased risk of spoilage microbes
- Low N (<150ppm) can lead to:
 - Hydrogen sulfide (eggy aroma)
 - Stuck/sluggish ferment
 - Less fermentative volatiles
 - Increased higher alcohols



Main goal of the study

- Assess N mgmt. schemes for quality wine production whilst maintaining yield and cover crop benefits

Experimental design

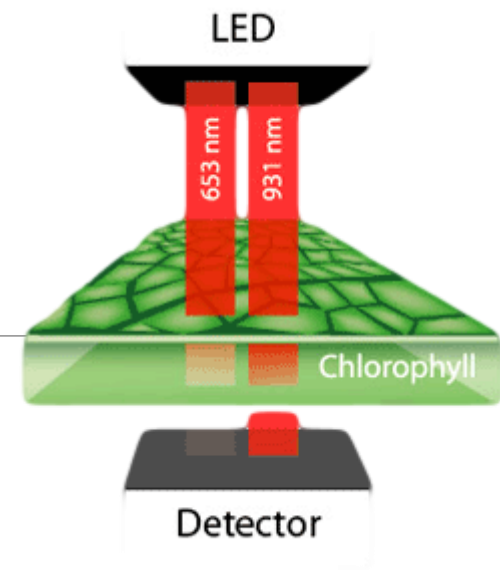


- 4 experiments on 3 vineyards
- Petit Manseng vineyard (AREC)
 - AREC (main) soil N and foliar N + soil N treatments
 - AREC (sub-plot) foliar N and foliar N + S treatments
- Sauvignon blanc vineyard (GMV)
 - Soil N and foliar N treatments
- Vidal blanc vineyard (ISV)
 - Soil and foliar applications
 - Also using clover cover crop for potential rhizodeposition

RESULTS

Chlorophyll Content Index (CCI)

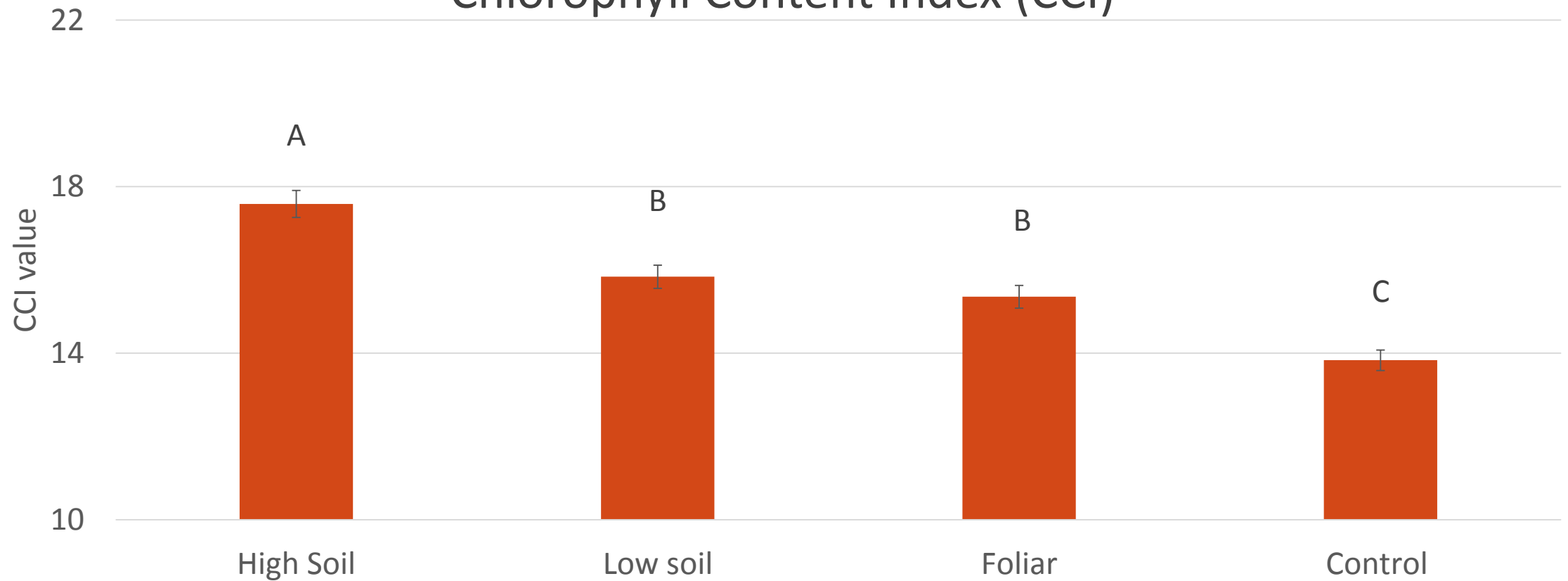
- CCI is a relative measure of chlorophyll content within the leaf
- Measures the transmittance of a red wavelength (max absorbance for chlorophyll) relative to a wavelength that accounts for physical differences in leaf tissue (i.e. thickness)
- Correlates well the more exact/destructive methods
- May relate to photosynthetic efficiency and therefore carbohydrate accumulation



GMV Sauvignon blanc



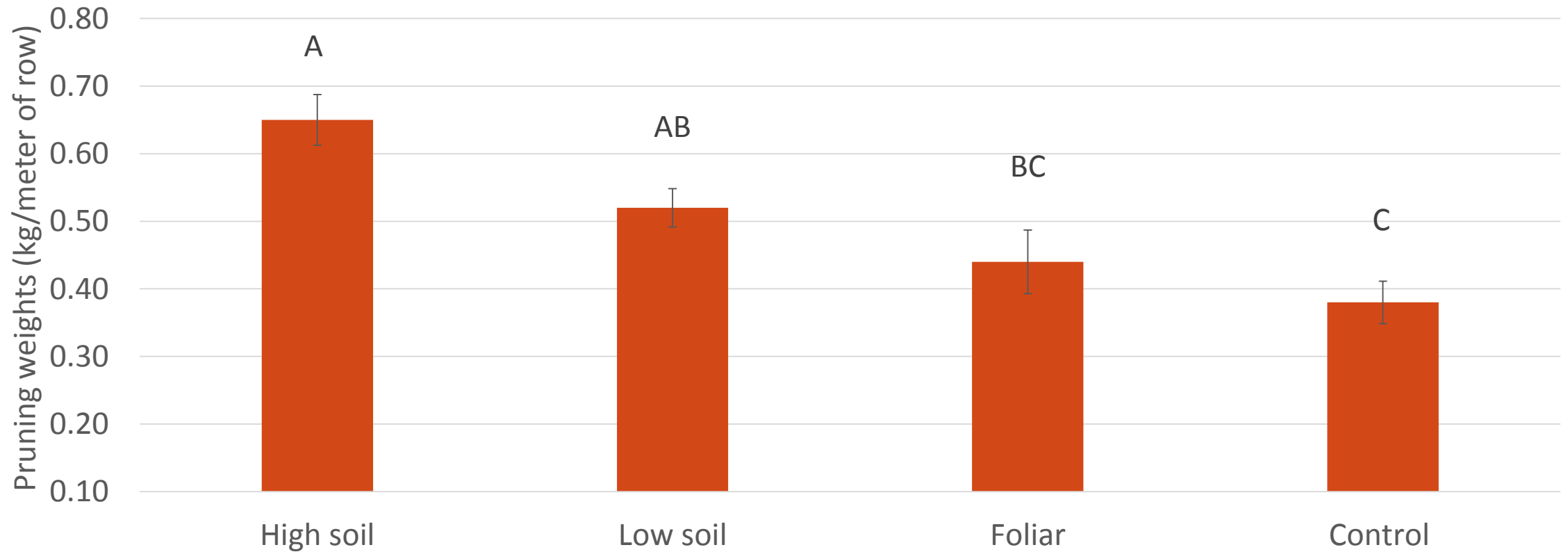
Chlorophyll Content Index (CCI)



GMV Sauvignon blanc



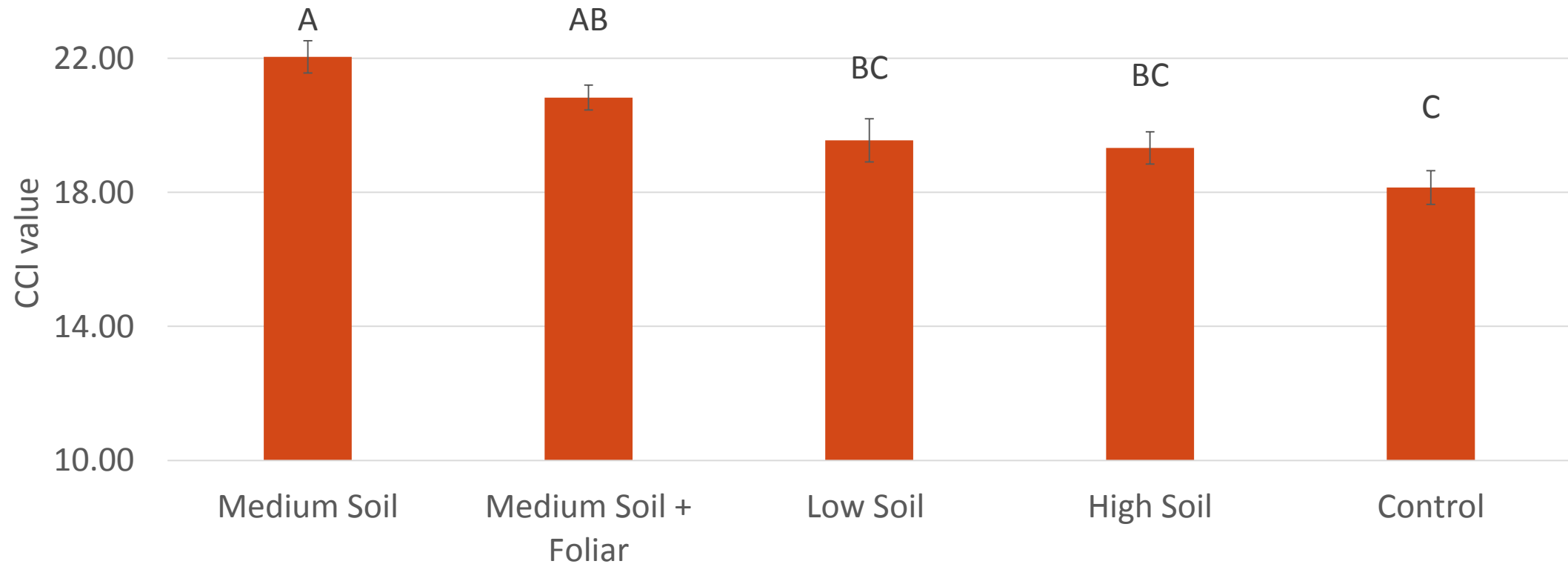
Pruning weights (kg/meter)



AREC (main) Petit Manseng



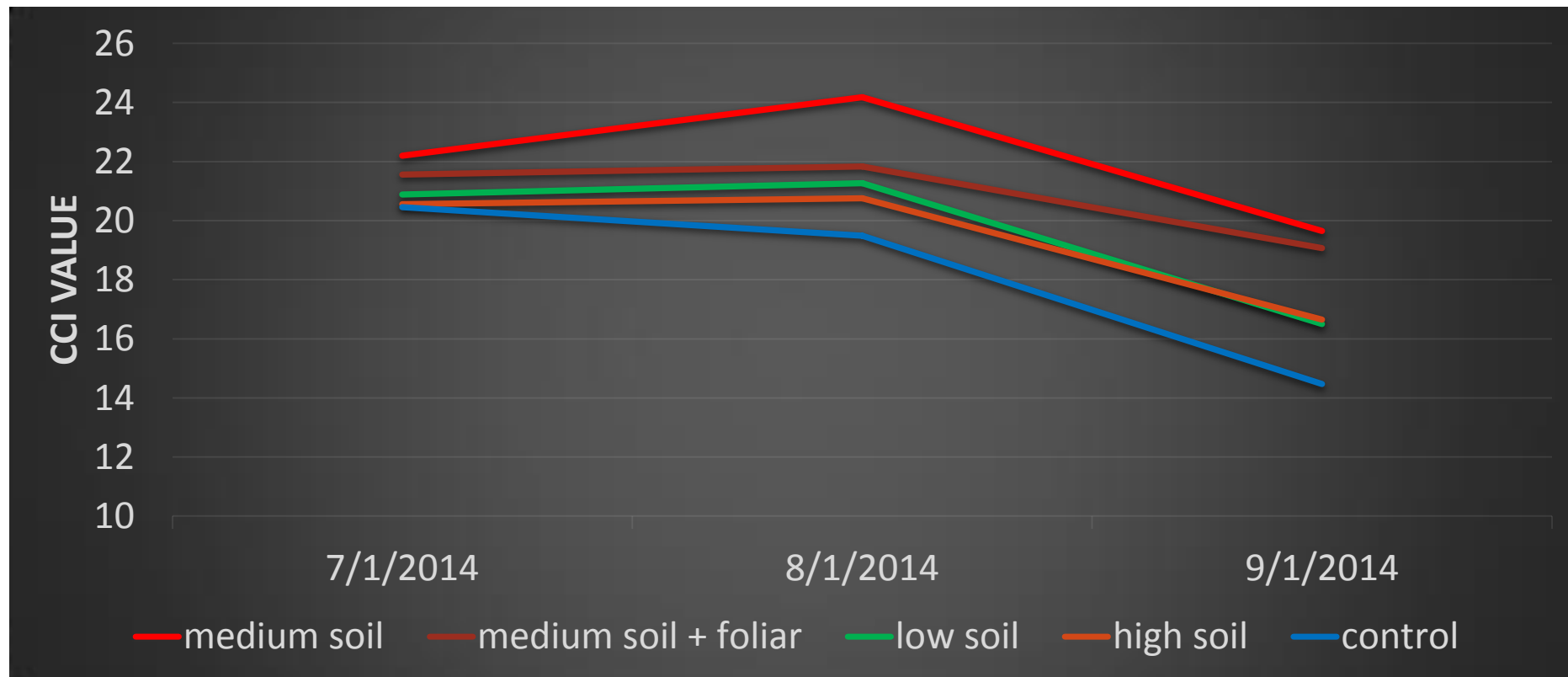
Chlorophyll Content Index (CCI)



AREC (main) Petit Manseng



Chlorophyll Content Index (CCI) season-long trend

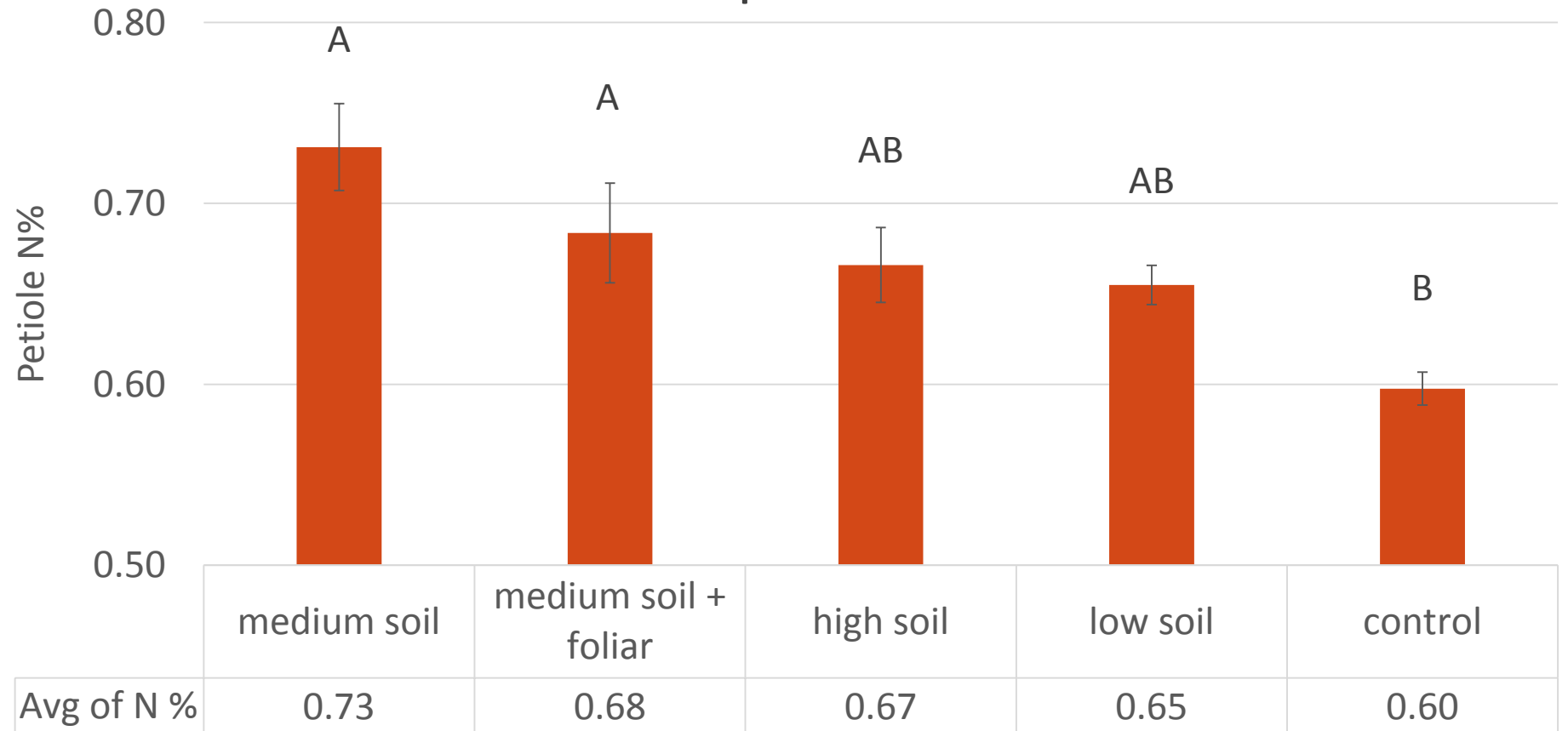


AREC (main) Petit Manseng

Petioles collected at
veraison

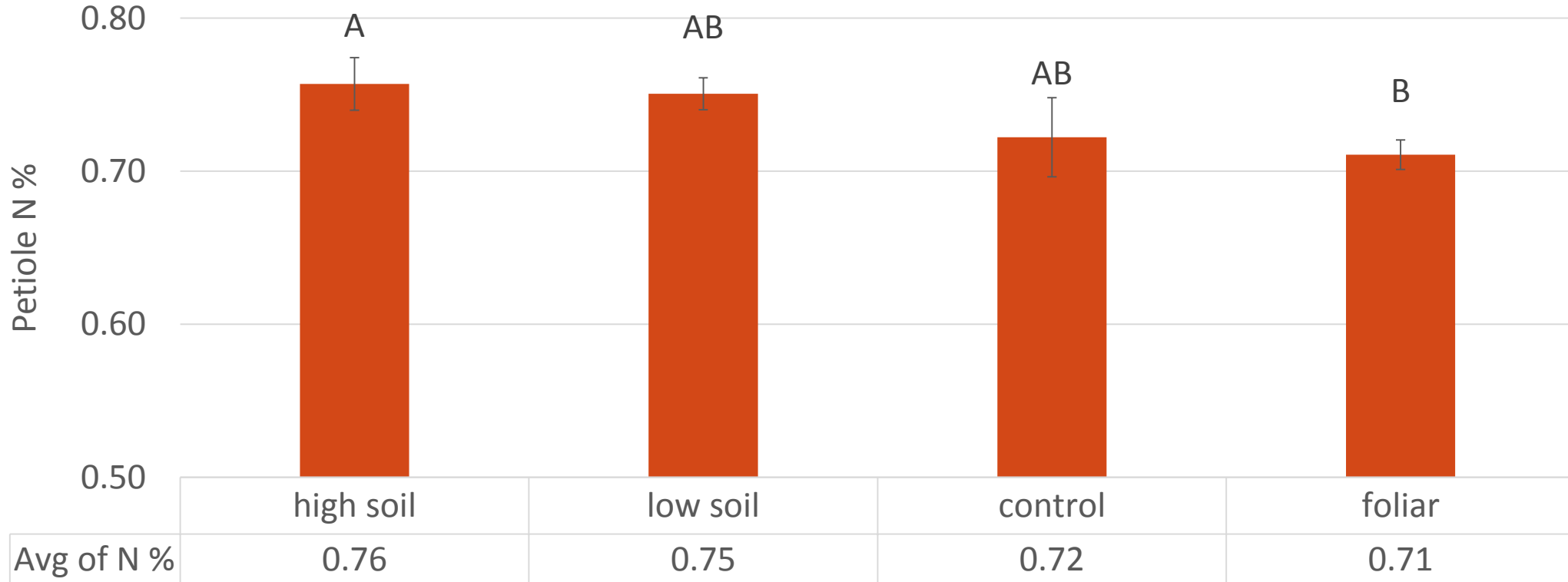
Recommended petiole N%
at veraison: 0.8 – 1.2%

Leaf petiole N%



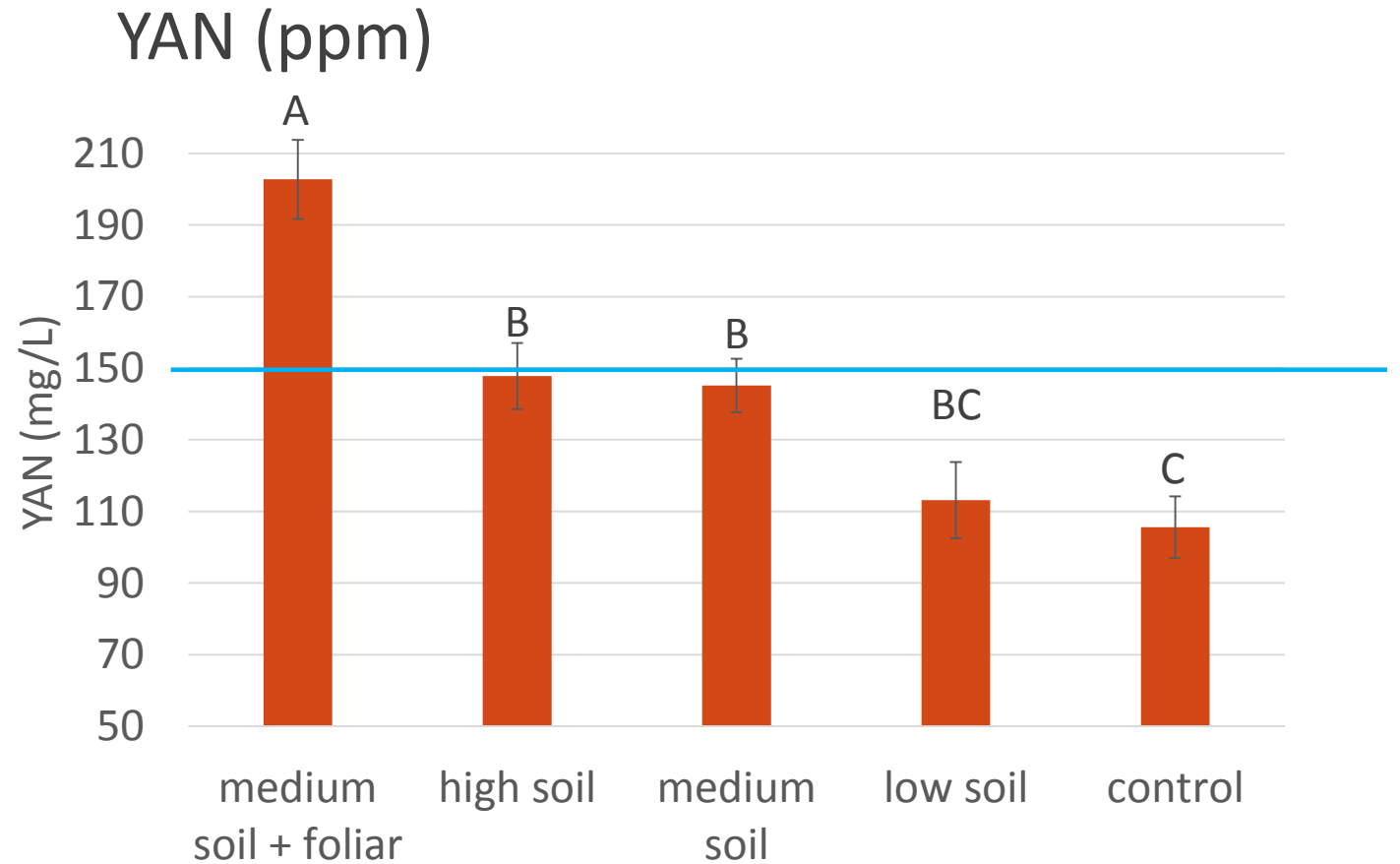
GMV Sauvignon blanc

Leaf petiole N%



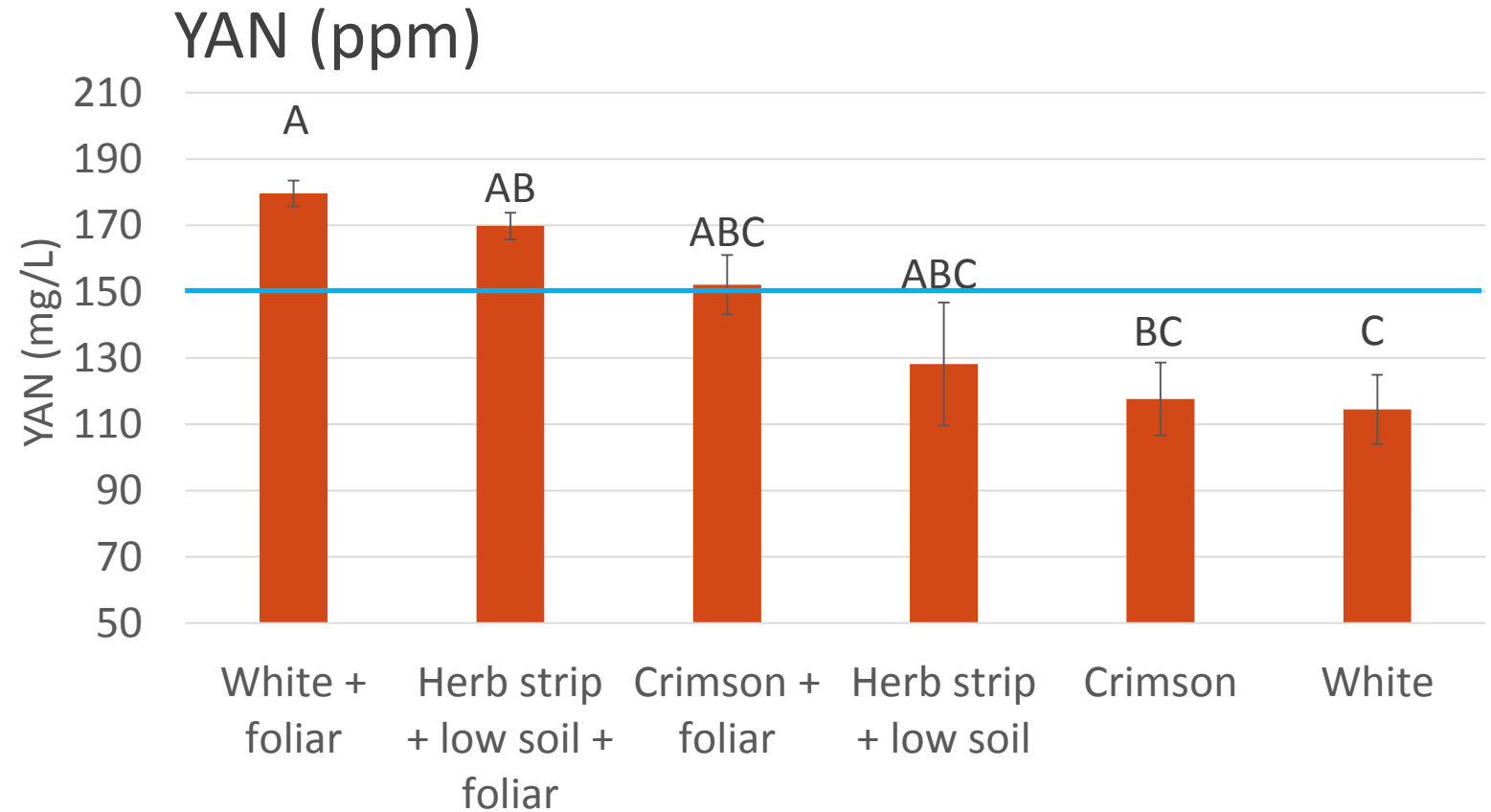
AREC (main) Petit Manseng

Treatment	YAN
medium soil + foliar	202.74a
high soil	147.79b
medium soil	145.15b
low soil	113.18bc
control	105.61c
Significance	<0.001



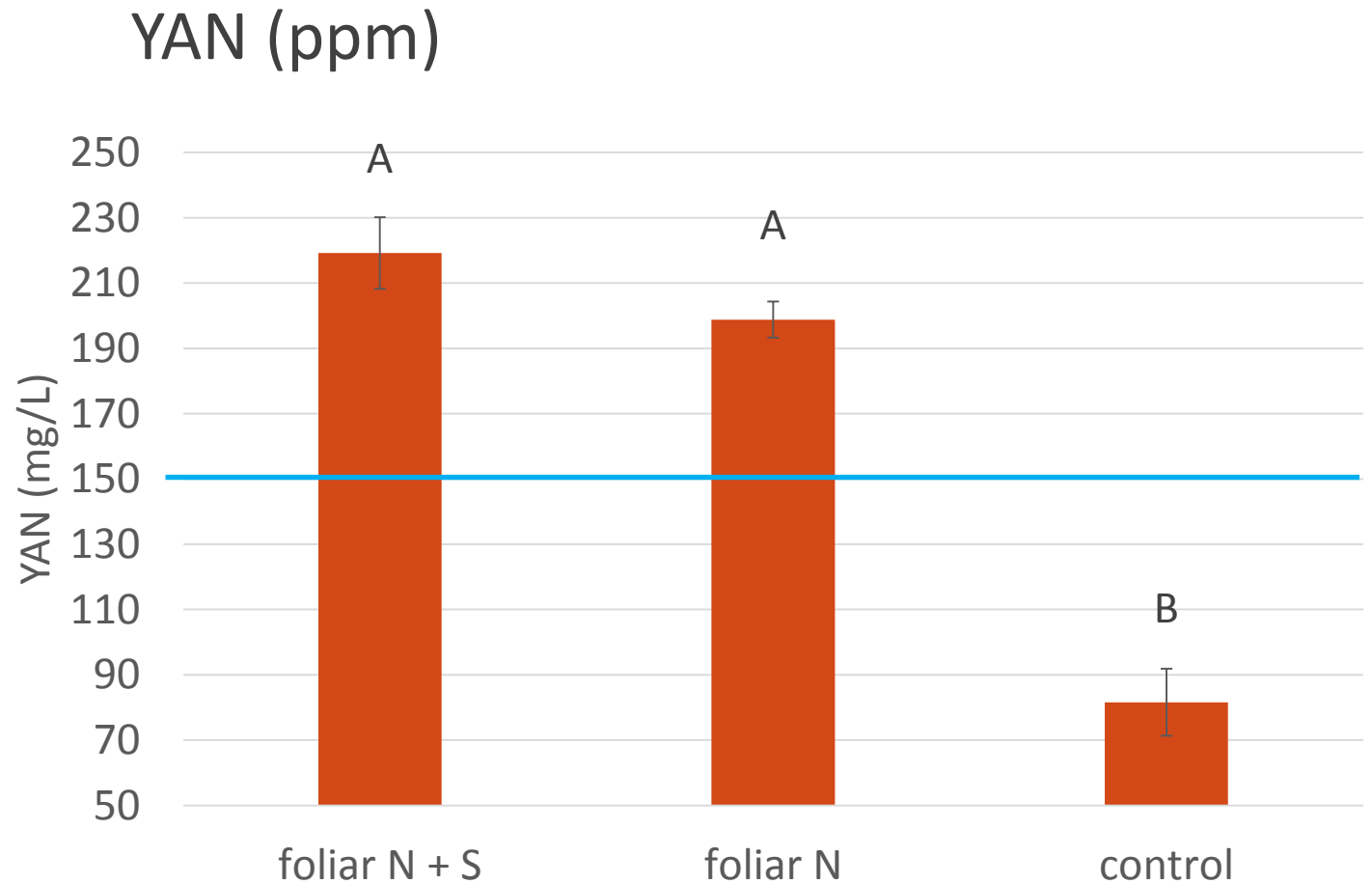
Indian Springs Vidal blanc

Treatment	YAN
White + foliar	179.64 a
Herb strip + low soil + foliar	169.79 ab
Crimson + foliar	152.05 abc
Herb strip + low soil	128.15 abc
Crimson	117.61 bc
White	114.43 c



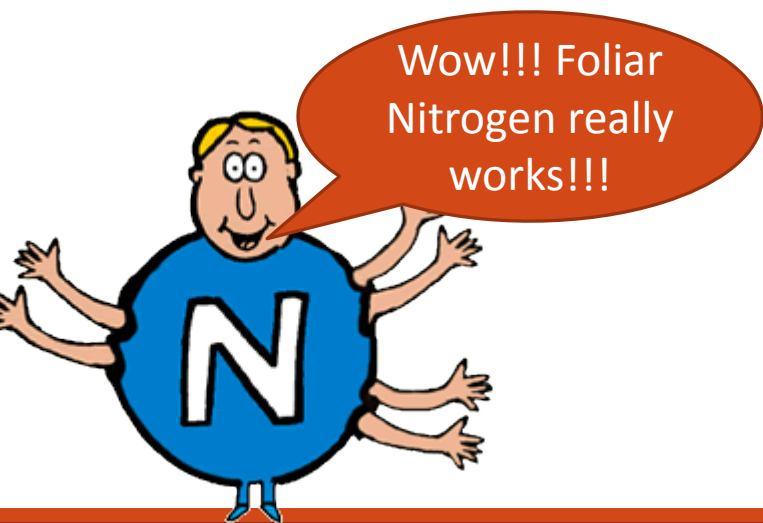
AREC (sub) Petit Manseng

Treatment	YAN
foliar N + S	219.2a
foliar N	198.8a
control	81.6b
significance	<0.0001

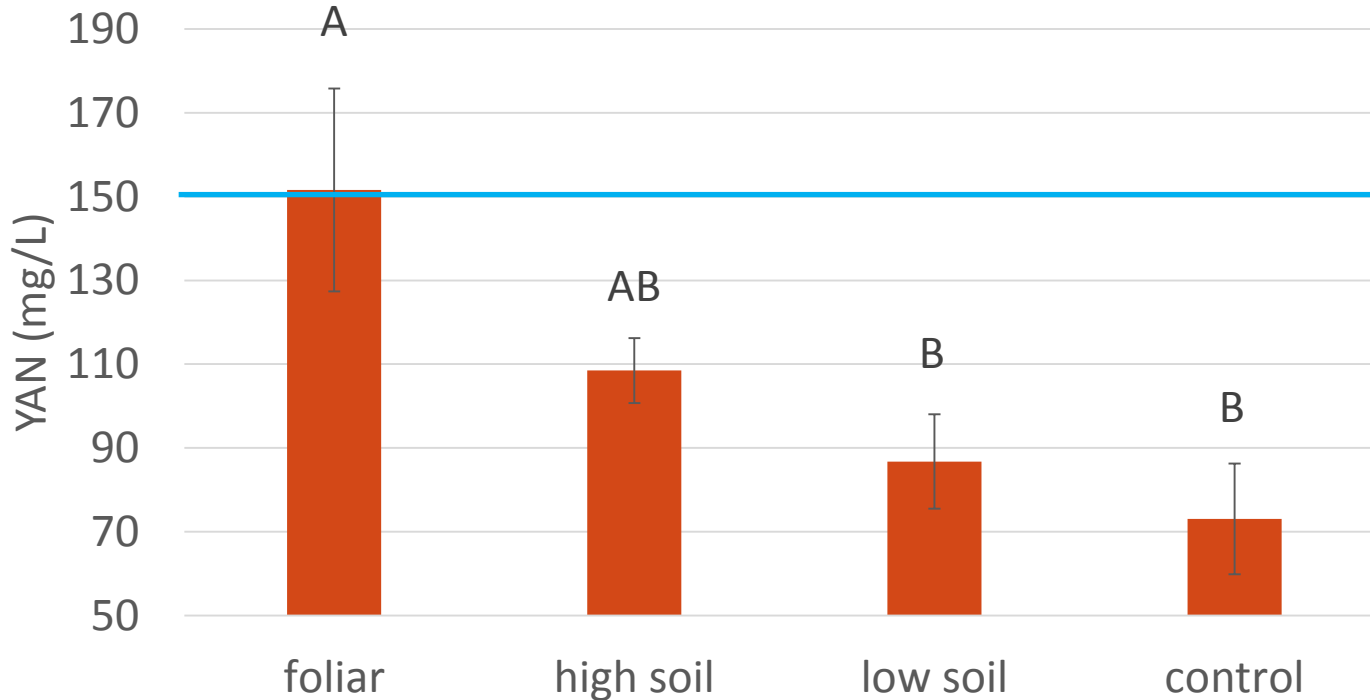


Glen Manor Sauvignon blanc

Treatment	YAN
Foliar	151.58a
High Soil	108.48ab
Low Soil	86.76b
Control	73.05b
Significance	0.0095



YAN (ppm)



Cost of winery N addition vs. urea spray

\$/1000 litres				
Treatment	GMV (Sauvignon blanc)	ISV (Vidal blanc)	AREC-main (Petit Manseng)	AREC-sub (Petit Manseng)
DAP	4.39	3.13	6.14	8.69
Foliar	9.7	1.69	6.77	9.58

Practical foliar urea spraying

- Apply around veraison
 - 2 weeks before to 2 weeks after
- Apply at low doses
 - no more than 6.7 lb/acre at one time
- Apply in early morning or late afternoon
 - Avoid sunburn
- Use high water rates
 - Water should be dripping
- Monitor for disease
 - Specifically botrytis
- May want to follow up with an approved botrycide

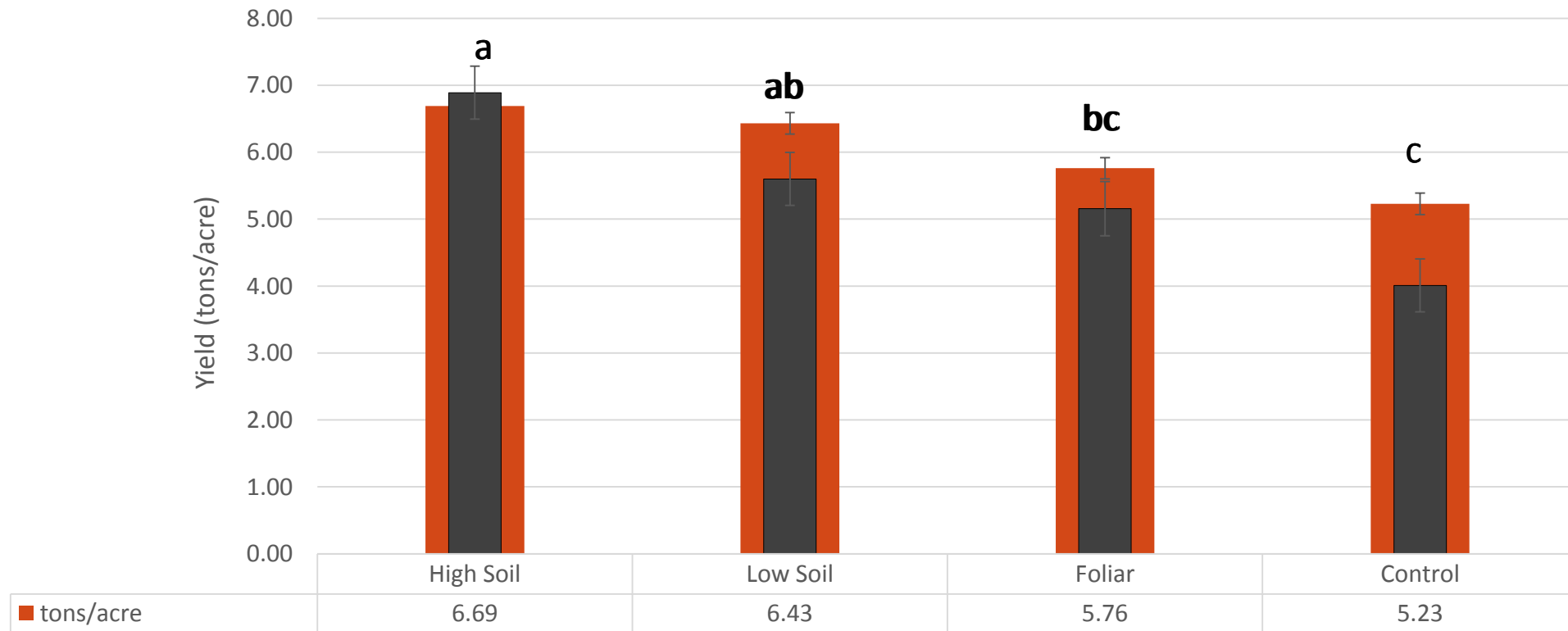
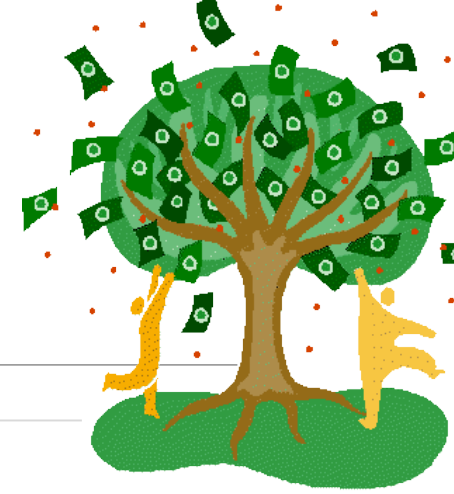
YAN take home messages

- Foliar applied nitrogen was more efficient at raising berry YAN than soil applied nitrogen
- Foliar urea applications may be more expensive than DAP if not incorporated with regular fungicide spray
- Higher berry YAN has been shown to produce wines of greater aromatic intensity¹

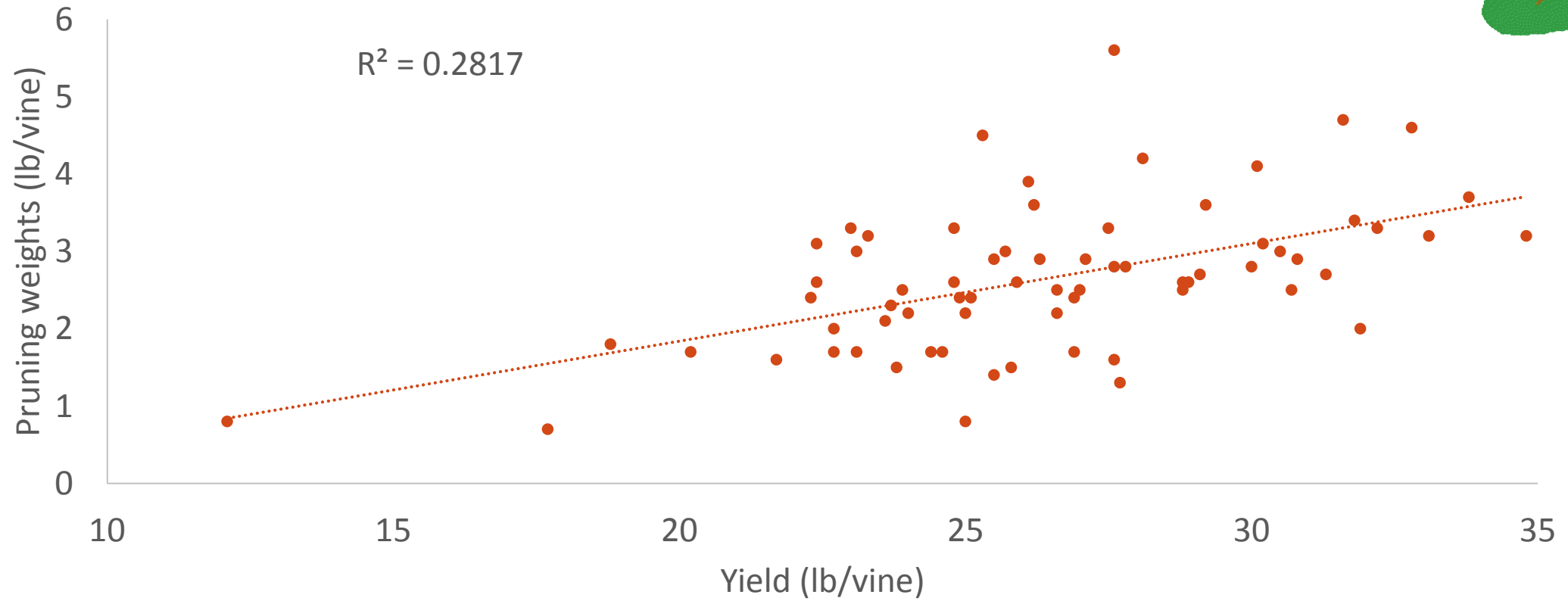
¹Kelly, M., Zoecklein, B. (2013). Enology Note #167. Retrieved from Virginia Tech web site: <http://www.apps.fst.vt.edu/extension/enology/downloads/EnologyNotes167.pdf>



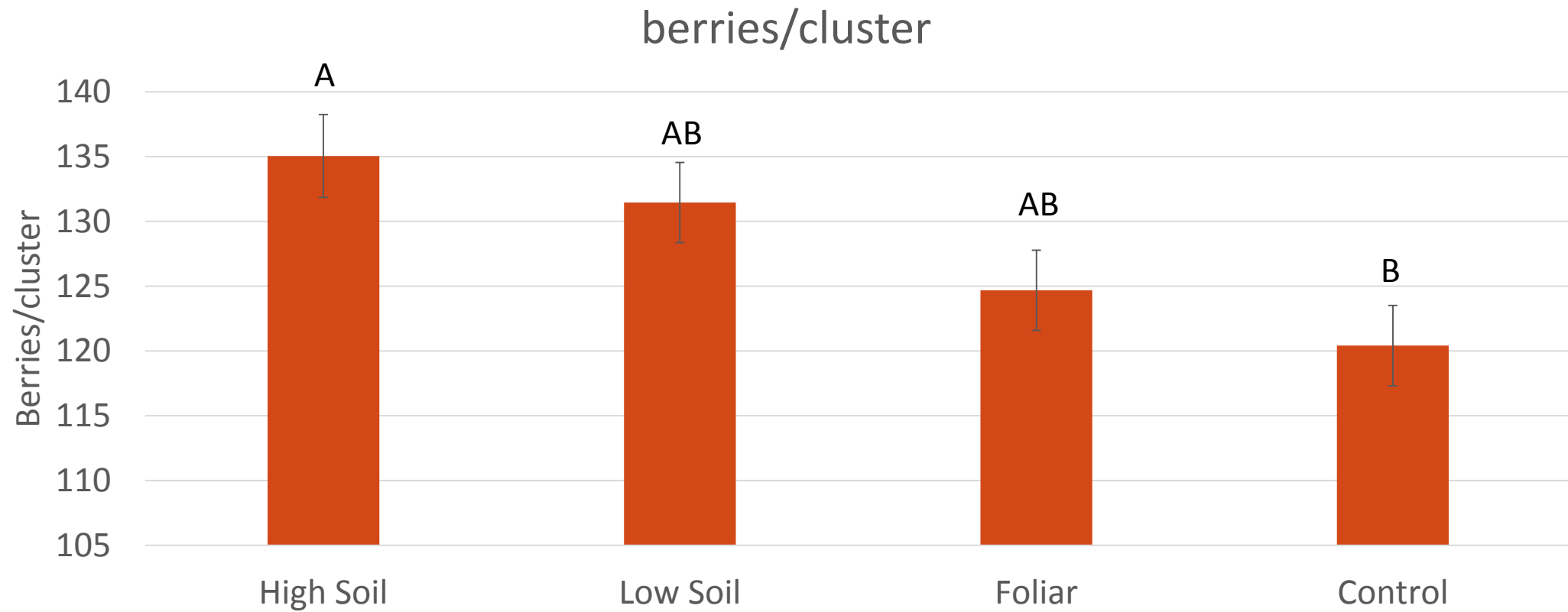
GMV Sauvignon blanc



GMV Sauvignon blanc



GMV Sauvignon blanc



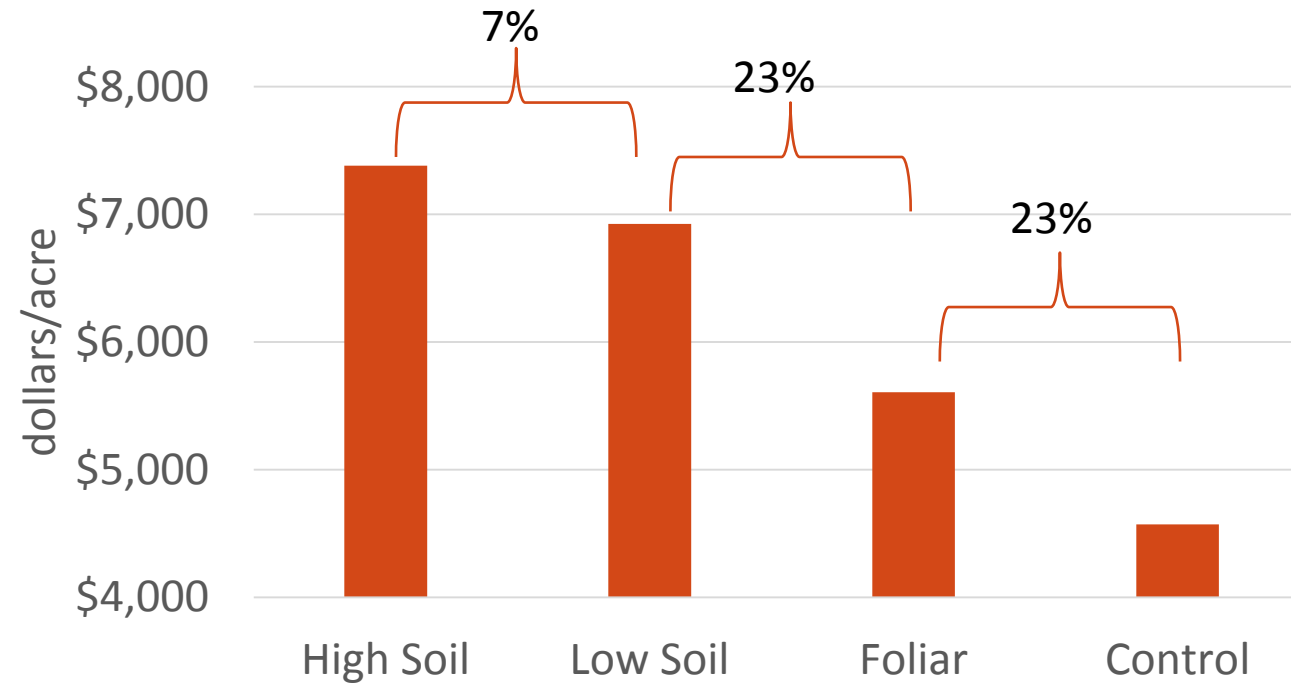
GMV Sauvignon blanc

Benefit - Cost ratios

Treatment	B:C ratio
Control	-
Low Soil	37
High Soil	23
Foliar	28

GMV Sauvignon blanc

Profit potential by treatment



CONCLUSION

- Soil + foliar application may be the optimal way to supply sufficient vine nitrogen and adequate YAN coming into the winery
 - Potential for greater aromatic intensity
- Foliar applications should be done at beginning of veraison
 - split/small doses
- Soil applied N will be assimilated primarily into the vegetative components of the vine
- Foliar applied N will be assimilated primarily by fruit



Secondary goal

Assess impact of N mgmt. upon varietal thiols

- Responsible for guava, passionfruit and gooseberry aroma in Sauvignon blanc and Petit Manseng

WINES & VINES



😊 THANK YOU 😊

