Wine Australia for Australian Wine

THE UNIVERSITY OF ADELAIDE AUSTRALIA

SUB CRUCE LUMEN

The development of a low-input under-vine floor management system which improves profitability without compromising yield or quality

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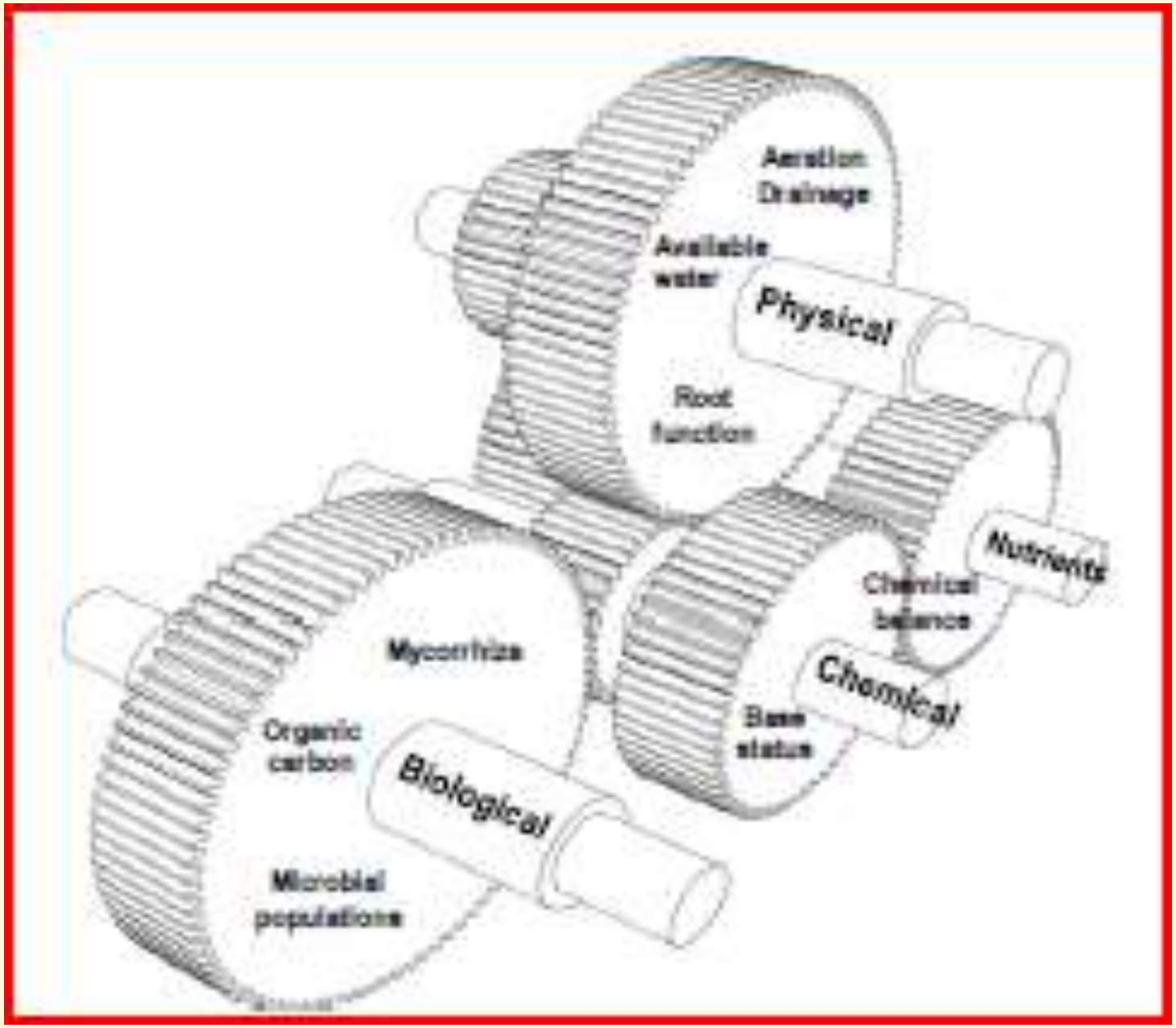


Cass, A. 2010 Australian Wine Industry Technical Conference

Vineyard subsoils

- In duplex soils (Barossa, Sunraysia, MIA), sub-soil structure is generally poor, and cannot decline much further
- Infiltration rates (< 1 mm/hr) and air-filled porosity were low, penetration resistance was high
- Unfavourable to root growth and respiration at field capacity and drier

(Murray et al, 2010)

Soil microbial diversity

Vukicevich et al 2016

Cover crop diversity

Soil microbial diversity

Reduced soil pathogens

Soil microbial diversity (cont.)

- Brassicas suppress fungal pathogens and promote beneficial bacteria
- Native plants may promote beneficial microbiota
- Frequent tillage, herbicide use and copper fungicides can harm beneficial microbes and contribute to crop decline

Super Soils

Cockroft, B. 2012

- The major cause of low productivity is Australia's mediocre soils and the key properties needing to be developed are soil organic matter and biological activity.
- Coalescence causes the soils to go hard restricting root growth and function (soil and water uptake)
- Overcome by planting ryegrass to produce rhizosheaths of soil around the roots

Undervine Cover Cropping – Project Aims

- To reduce or cease the need for herbicide use in the undervine zone
- To improve soil quality undervine
- To grow plants undervine which are beneficial to the grapevine, potentially leading to improved yields and or quality
- To improve vineyard profitability and ecological sustainability

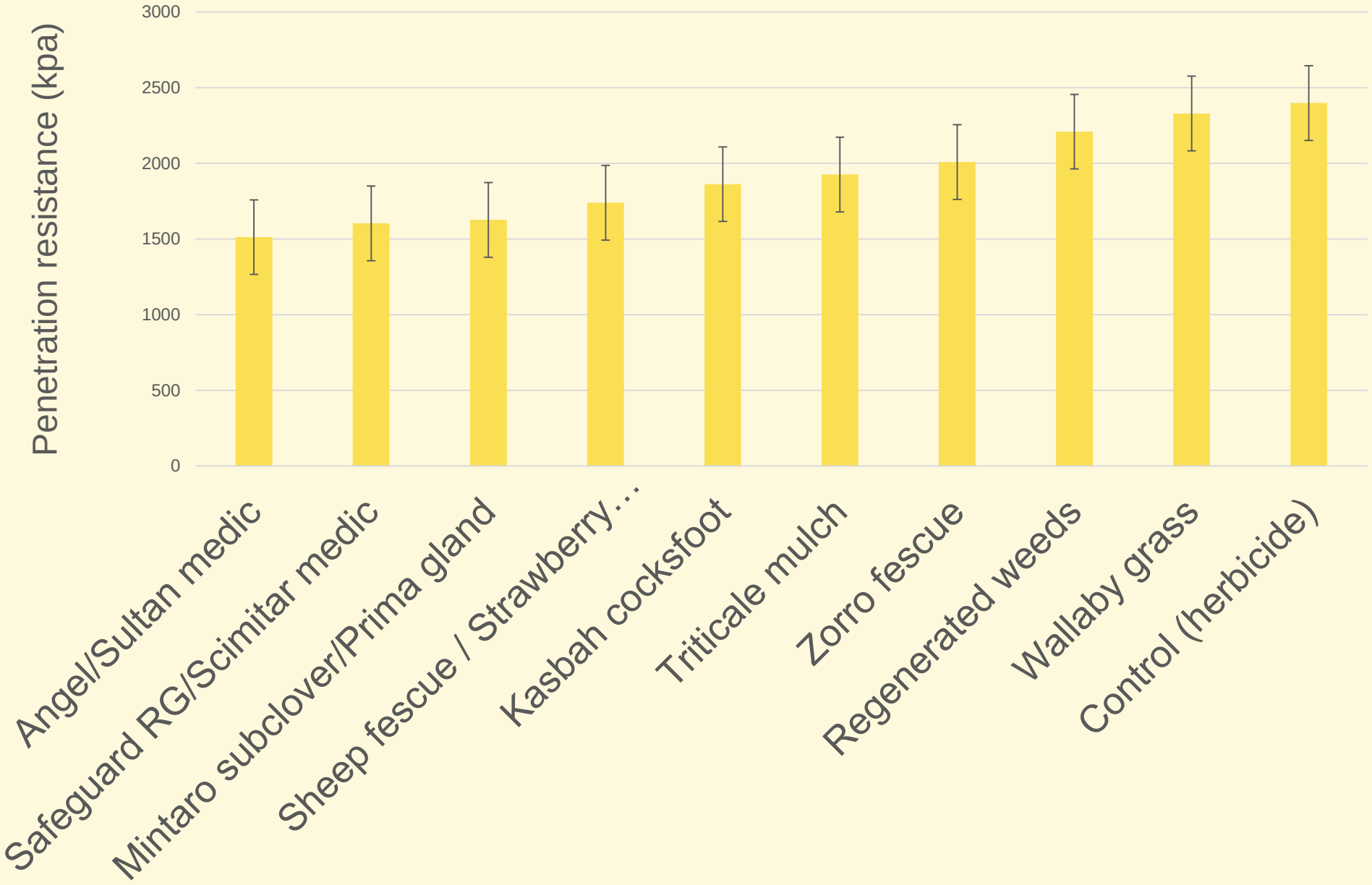
Undervine cover cropping – Barossa species

Triticale mulch	
Kasbah cocksfoot	
wallaby (A. geniculata)	
Zorro fescue	
Regenerated sward	
Angel strand / Sultan barrel medic	
Safeguard ryegrass /Scimitar burr medic	
Sheep fescue/Bartollo Bladder Clover	
Mintaro sub-clover / Prima gland	
Control (herbicide)	

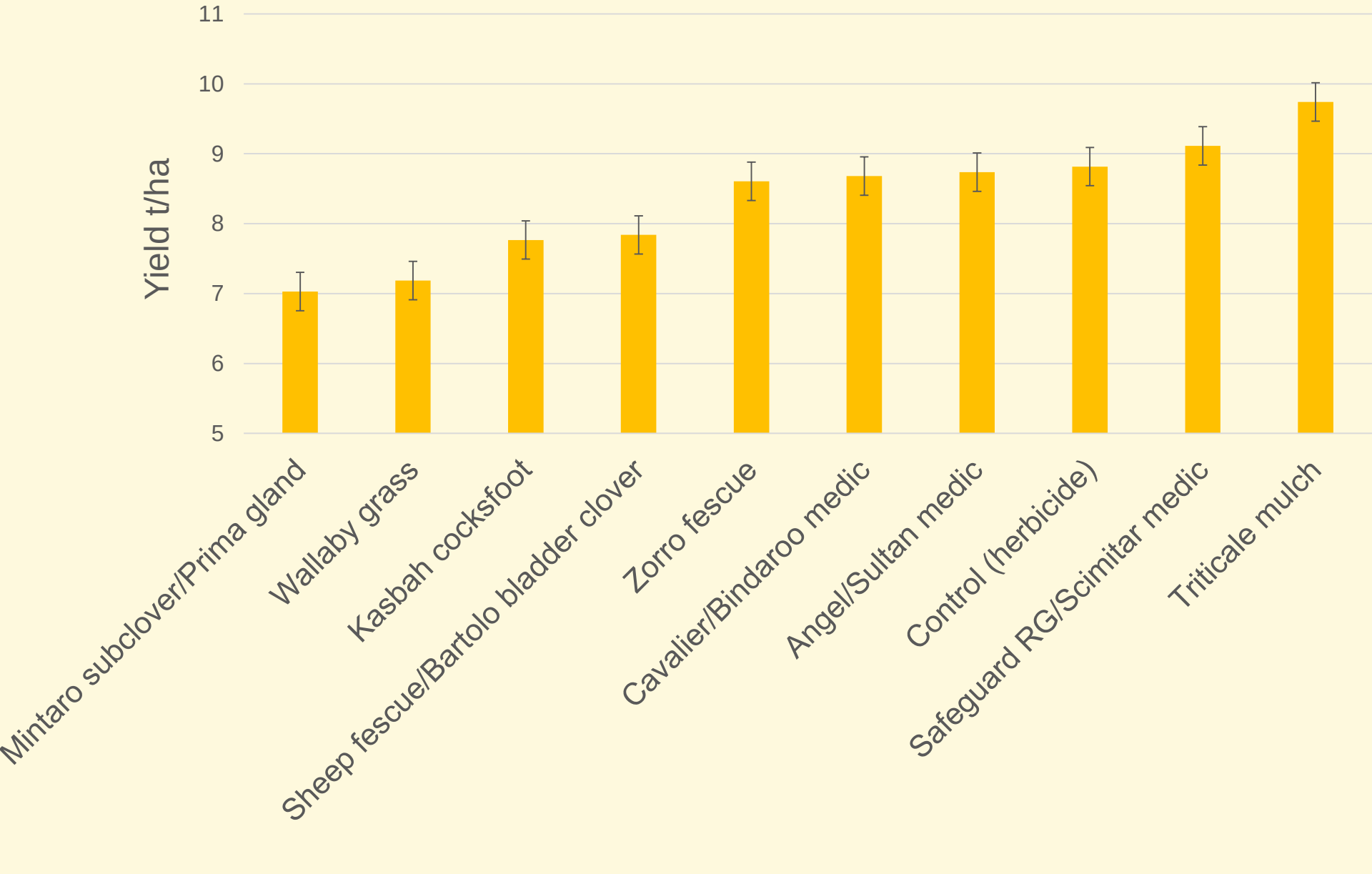
Trial Site Locations

- Nuriootpa Research Station
- Oxford Landing (Yalumba)
- Eden Valley (Eden Hall)
- Langhorne Creek (CMV Farms)
- Coonawarra (TWE)
- McLaren Vale (Gemtree)
- Charleston (Australian Vintage)

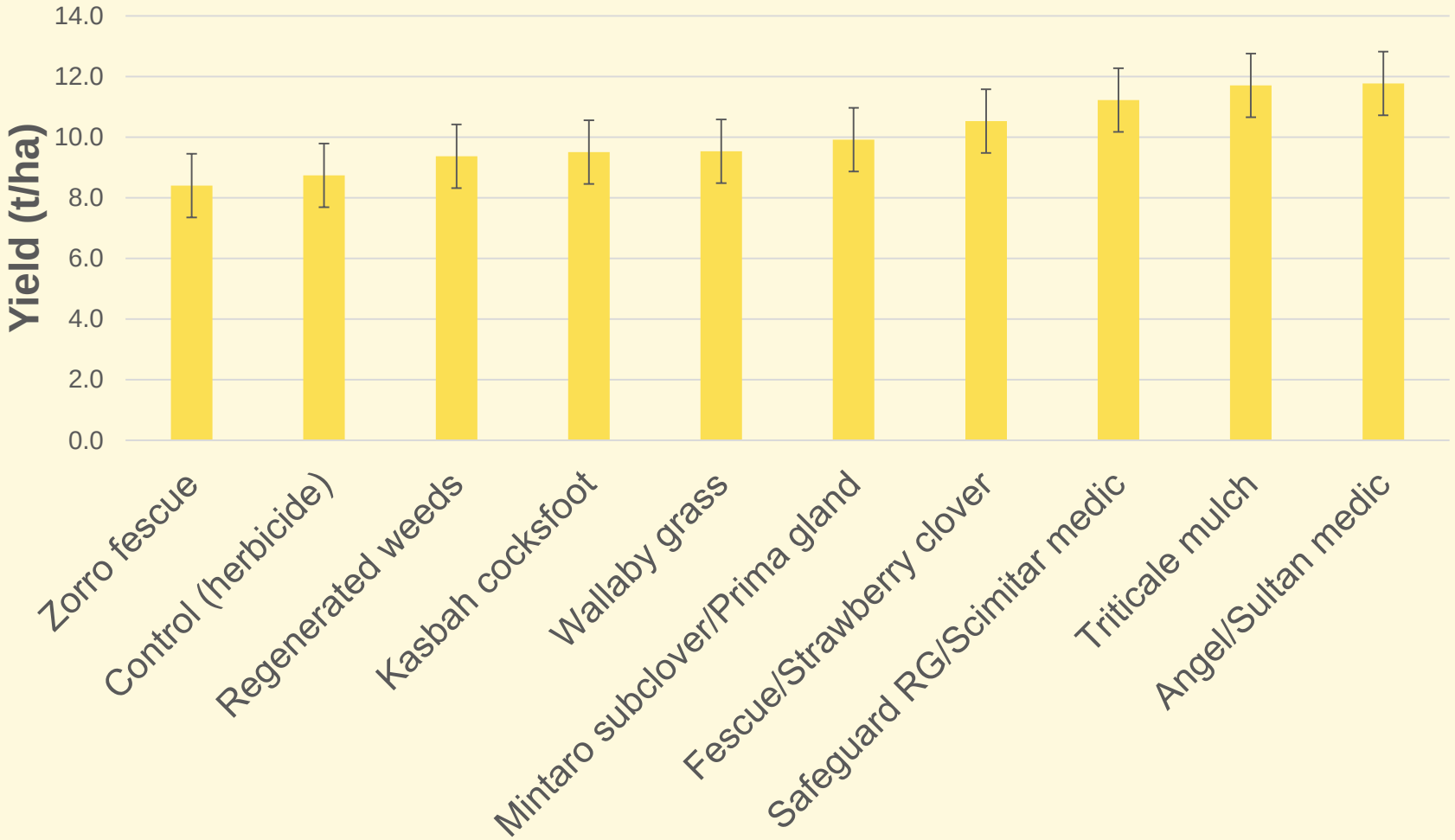
Penetration Resistance 10-20 cm, Nuriootpa, 2016

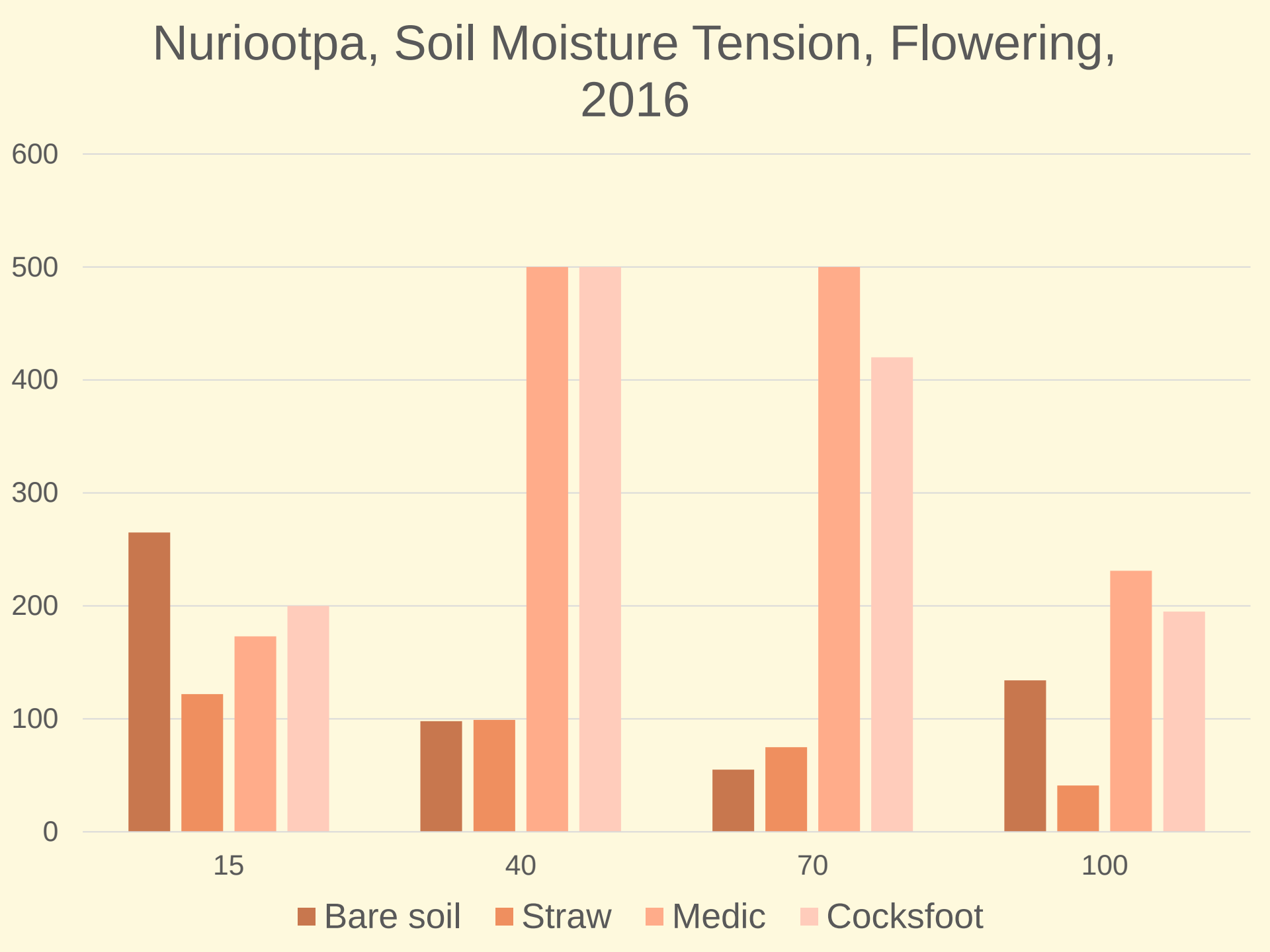


Undervine cover cropping, Nuriootpa, Shiraz yield 2016

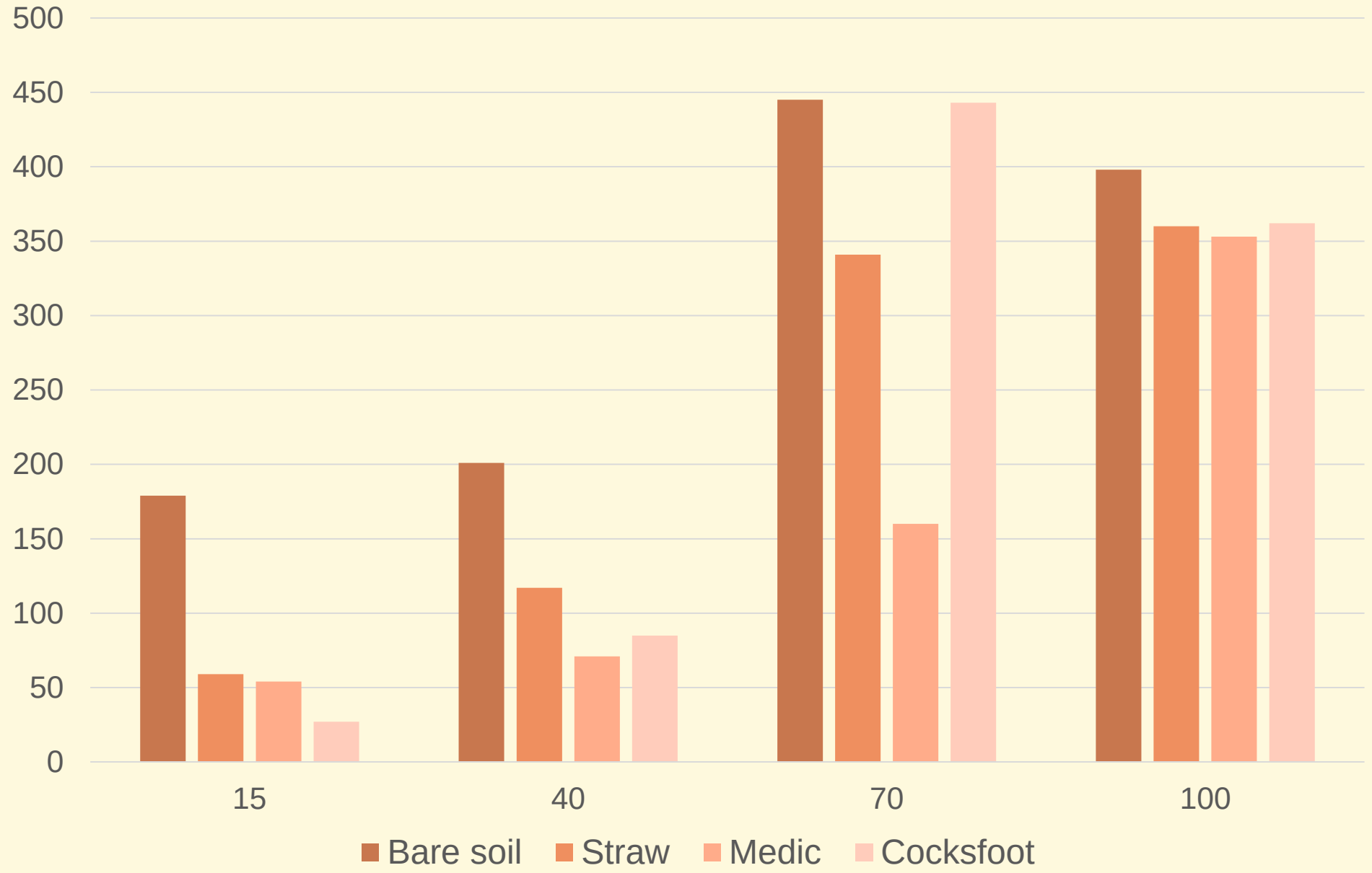


Nuriootpa Harvest Yields, 2017

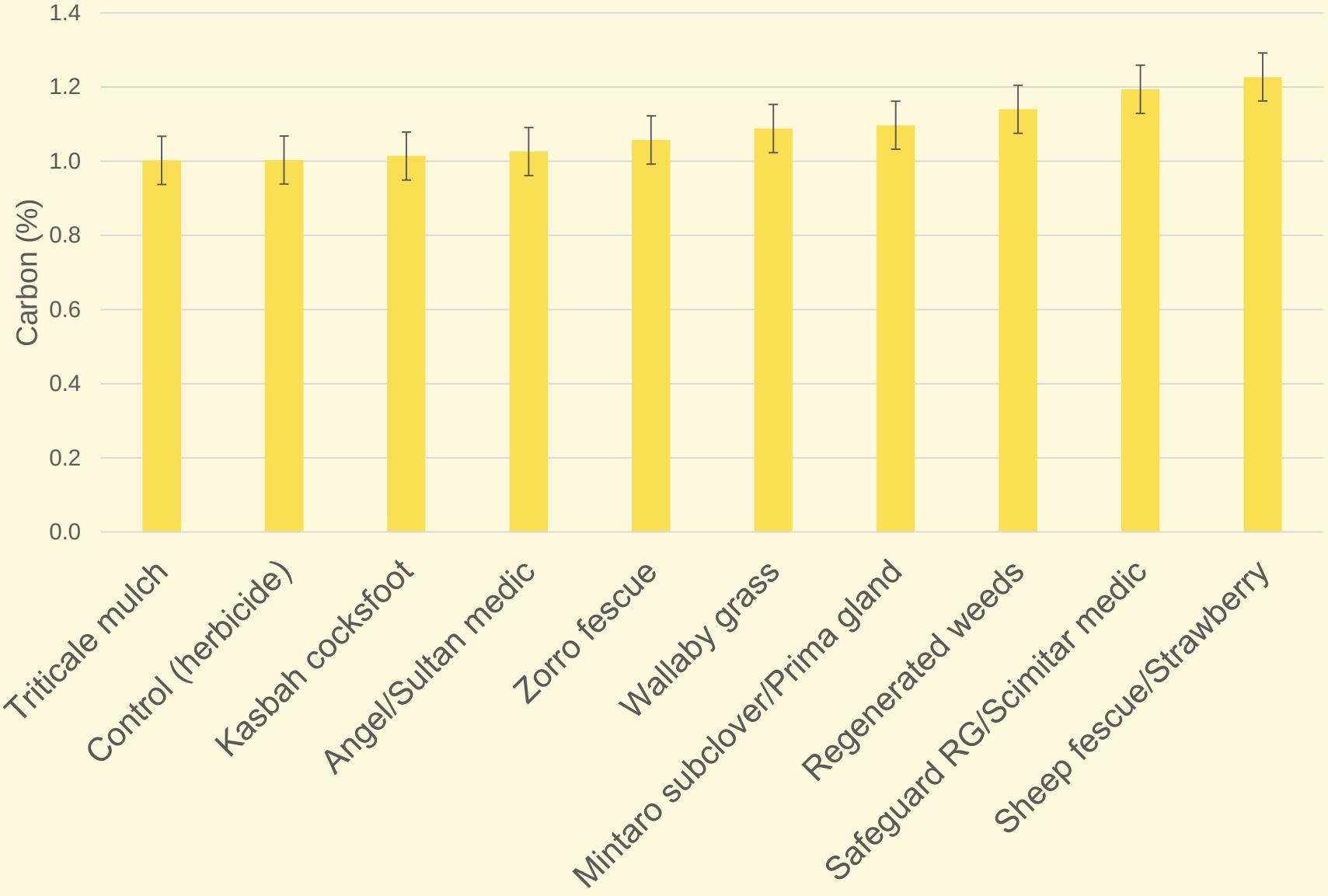



Nuriootpa, Soil Moisture Tension, Flowering, 2016
600
500
400
300
200
100
0
15
40
70
100
Bare soil
Straw
Medic
Cocksfoot

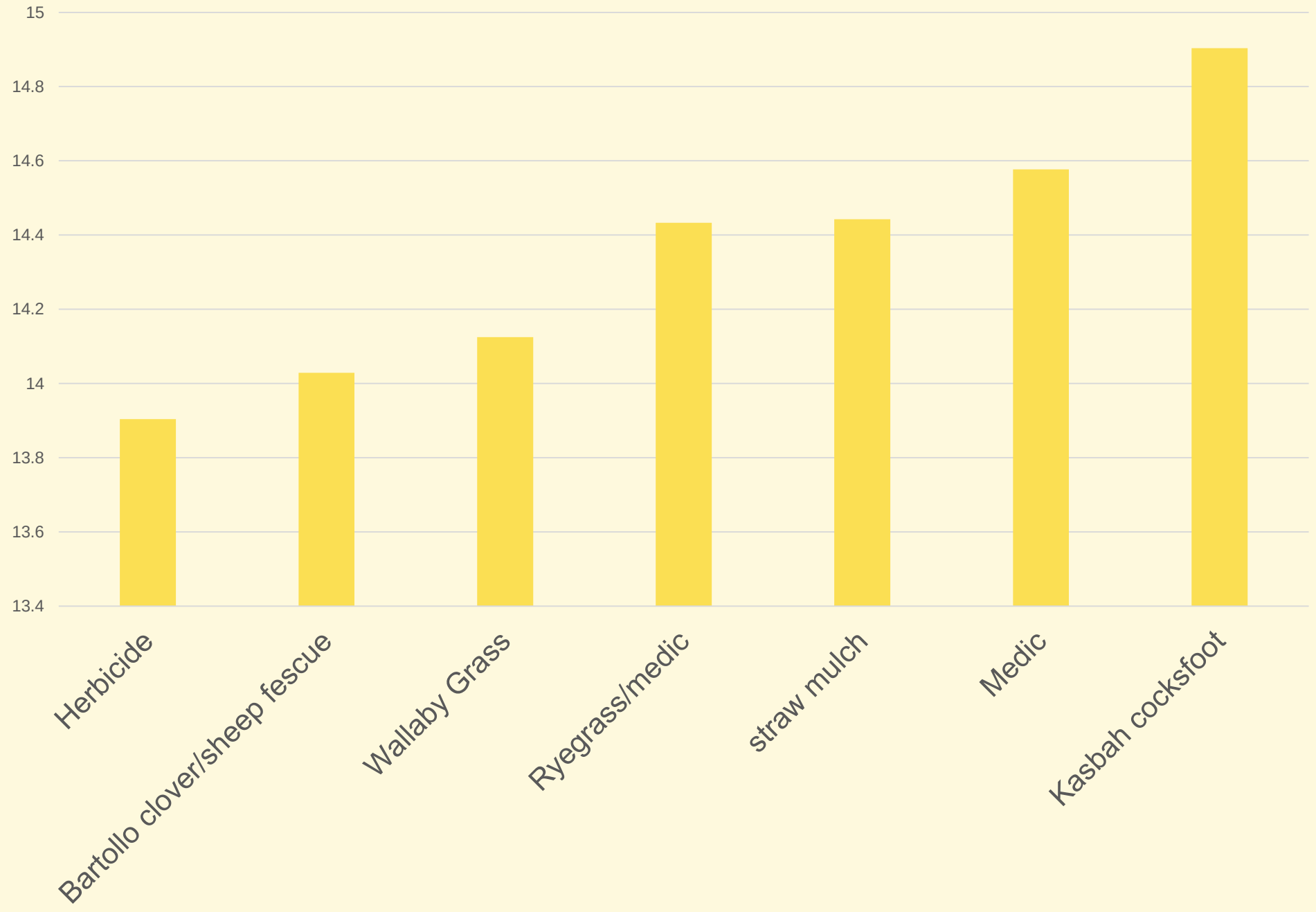
Nuriootpa, Soil Moisture Tension, Harvest, 2017



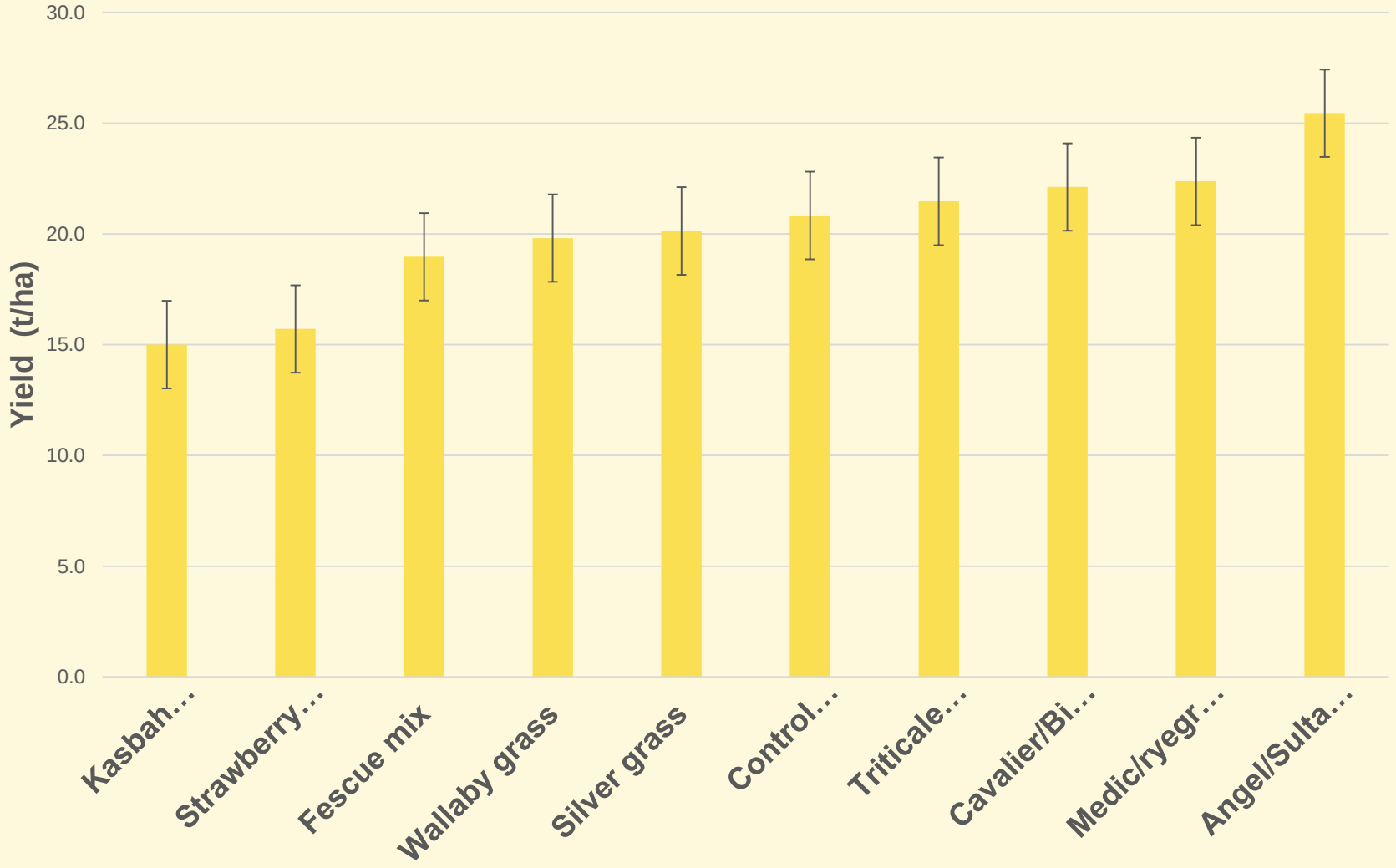
Soil total carbon, Nuriootpa, 2017



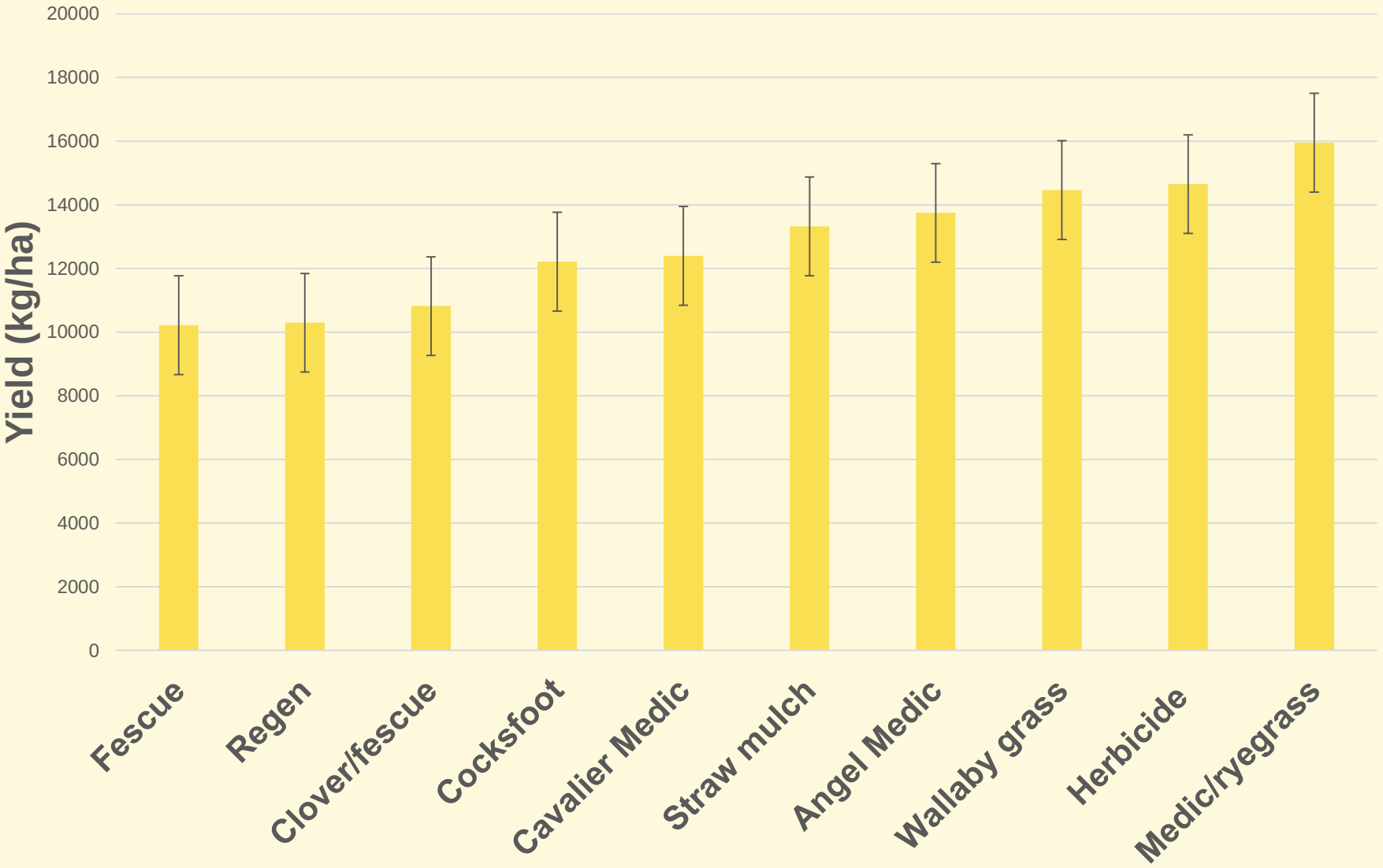
Wine scores, Barossa Shiraz, 2016

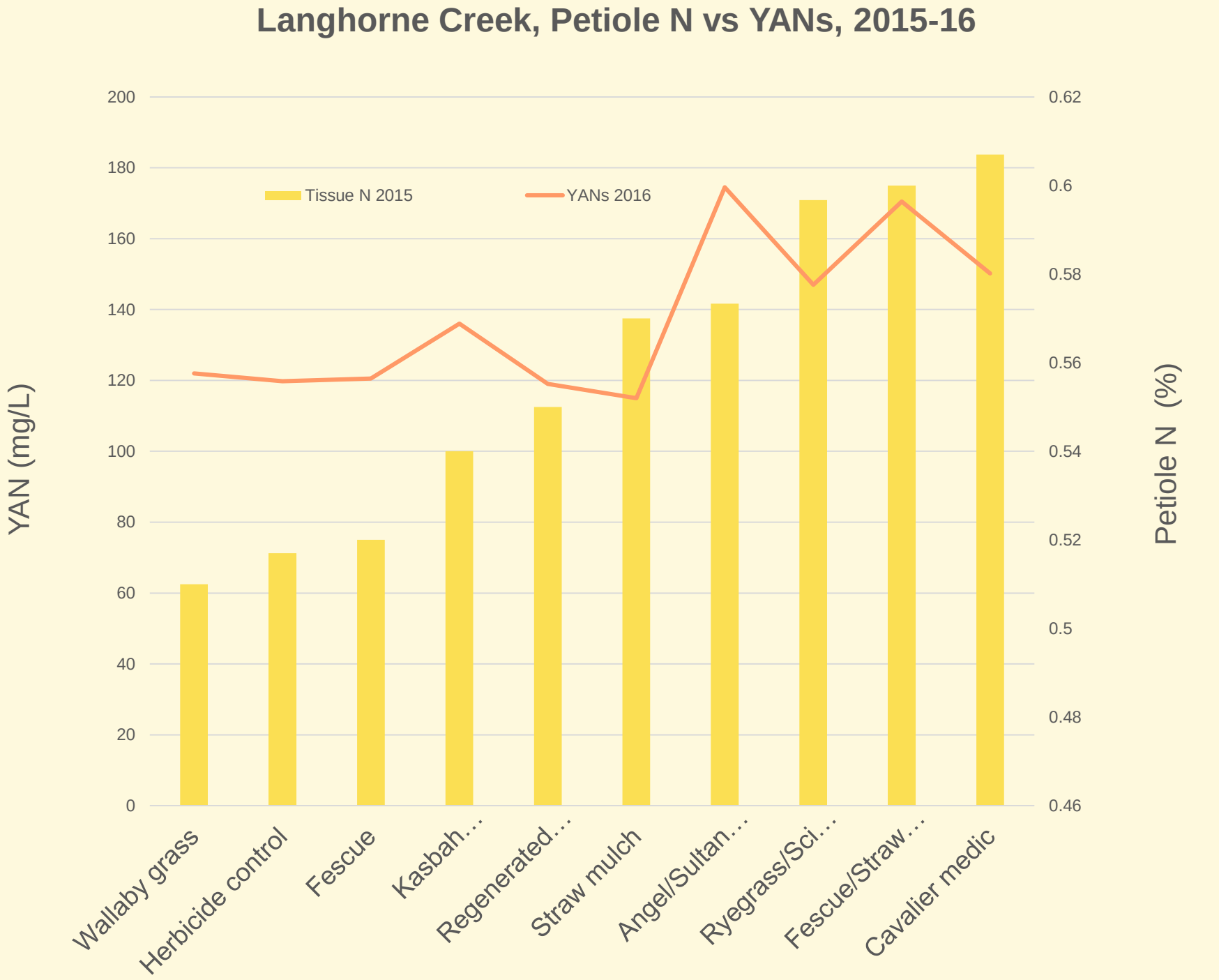


Langhorne Creek Harvest, 2016

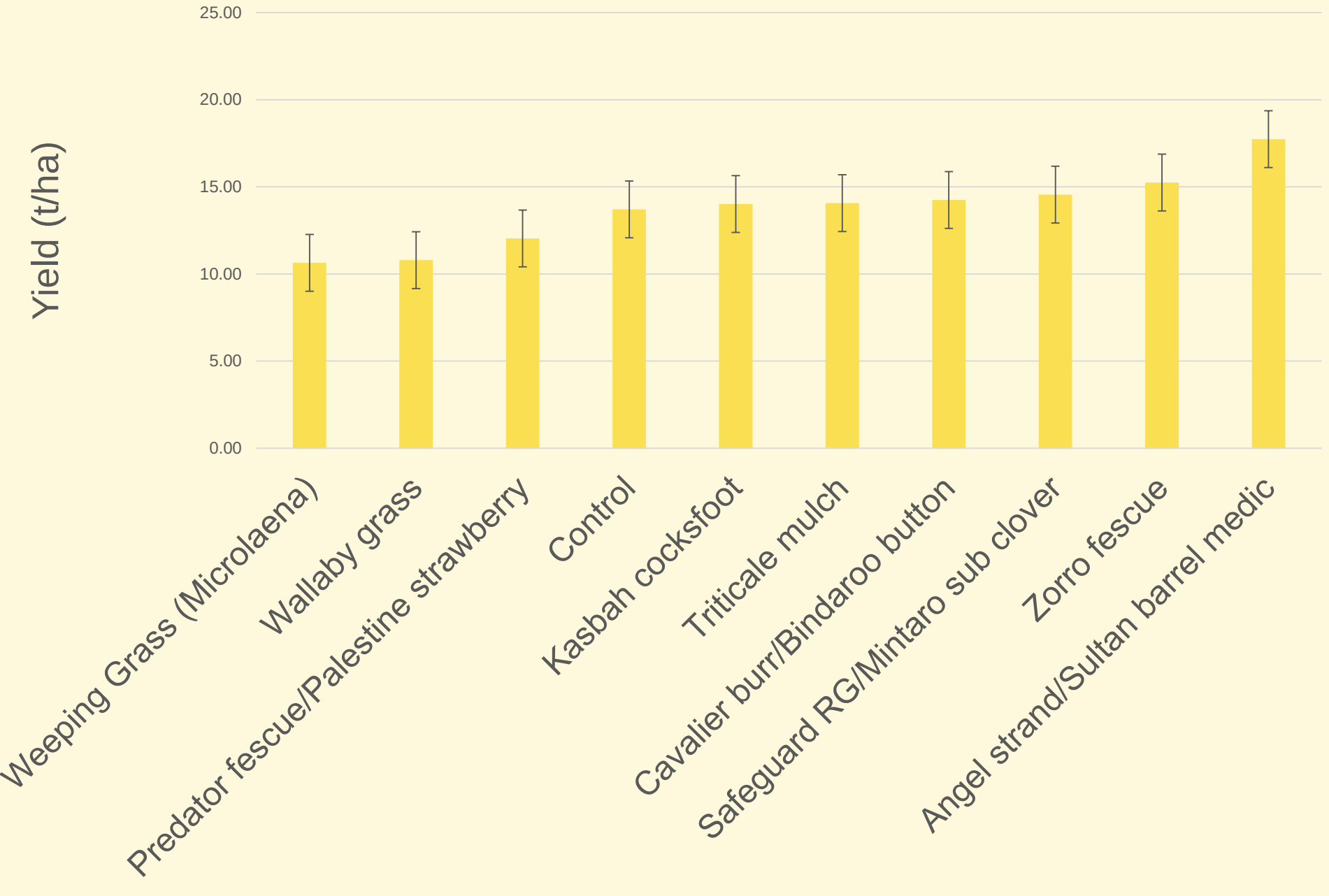


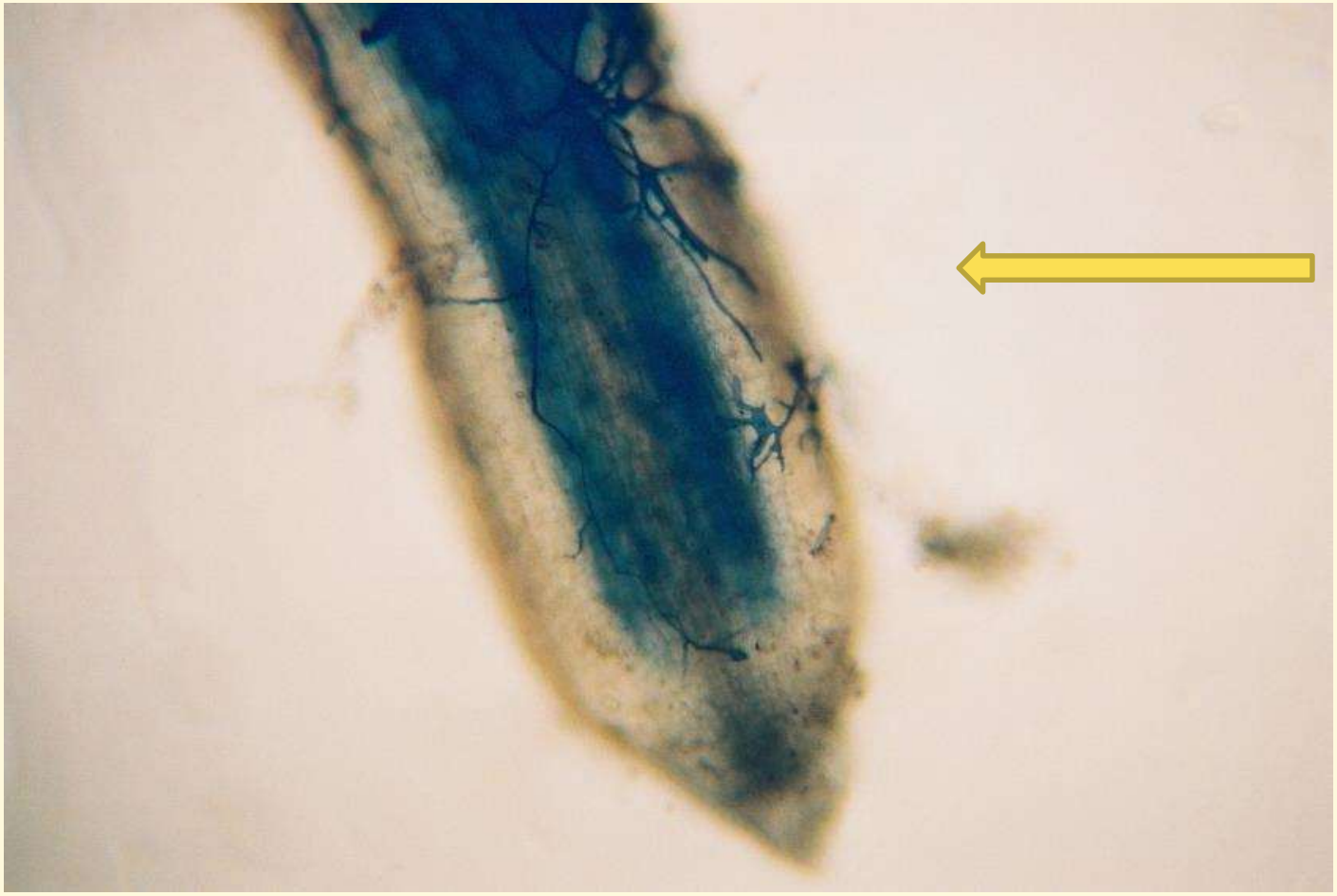
Langhorne Creek Harvest, 2017




Langhorne Creek, Petiole N vs YANs, 2015-16
YAN (mg/L)
Petiole N (%)
Tissue N 2015
YANs 2016
200
180
160
140
120
100
80
60
40
20
0
0.62
0.6
0.58
0.56
0.54
0.52
0.5
0.48
0.46
Wallaby grass
Herbicide control
Fescue
Kasbah…
Regenerated…
Straw mulch
Angel/Sultan…
Ryegrass/Sci…
Fescue/Straw…
Cavalier medic

Eden Valley Harvest 2017





Root tip with high arbuscular mycorrhizal fungi (AMF) colonisation

Weckert, 2016

AM fungi are important
for plants such as grapevines with coarse and poorly branched root systems.

In grapevines, AM fungi allow direct nutrient transfer from cover crops to grapevines via AM fungal links.

AM fungi improve grapevine:

- Photosynthesis
- Nutrient uptake (phosphate and nitrogen)
- Water relations (more efficient in the uptake of water)
- Shoot and root growth
- Disease inhibition

Conclusions

- Growing desirable species undervine may not be to the detriment of yield or quality
- Grazing and mowing options are yet to be investigated
- Plant roots and their associated mycorrhizae may improve soil and wine quality
- Future research over the next 5 years will generate a lot of information on soil/water/vine and wine interactions