National Hay Agronomy; producing export quality oaten hay in different seasons

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Australian Agronomy Conference – Albany
21-24 October 2024

National Hay Agronomy project

AgriFutures Investment, PRJ-011029:
$2.25m, July 2018 – June 2022

Objectives

1. Improve agronomic guidelines to maximise oaten hay production and quality and decrease risk

2. Clarify the potential for growth regulators in oaten hay production

3. Update disease management guidelines for oaten hay crops

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Oaten hay agronomy core trial

Core trial series: 12 trials - WA, SA, Vic, NSW

2 sowing times * 9 varieties * 3-6 N rates

Varieties: Yallara (Q), Mulgara (Q), Wintaroo (M)

N rates: 0, 30, 60, 90, 120, 150 kg N/ha

DP rate of fertiliser banded below the seed at sowing

To manage N rates:

urea top-dressed at sowing to supply 2/3 N

remaining 1/3 N applied at early tillering

Wallup, Victoria 2021

TOS 1: late April/early May

TOS 2: late May/early June

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The sites

Trial year	Location		Soil type	Soil available N at sowing (kg N/ha)	
2019	WA	Muresk	Loamy duplex	Low	
2020					
2021					
2019	SA	Hart	Clay loam	26	60 cm
2020				53	
2021				70	
2019	Vic	Kalkee	clay loam	30	100 cm
2020		Rupanyup	clay	70	
2021		Wallup	clay	71	

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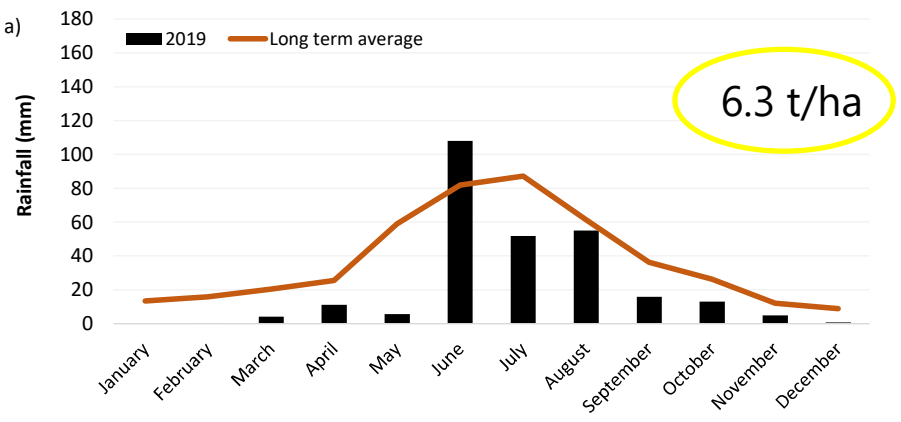
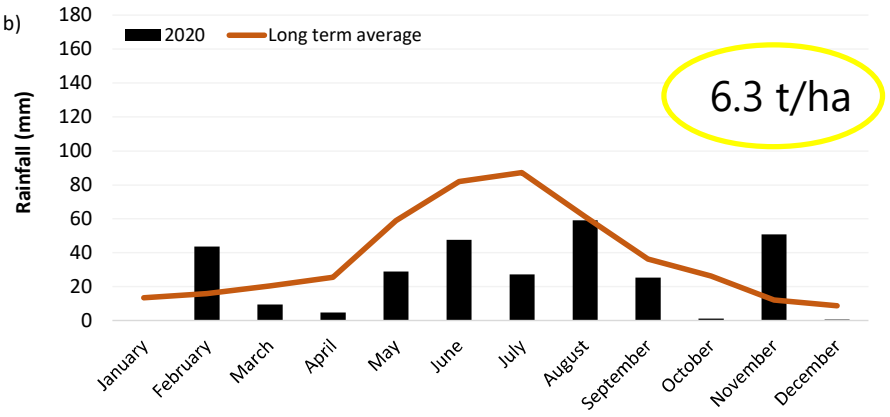
WA


a)
2019
Long term average
6.3 t/ha
Rainfall (mm)
0
20
40
60
80
100
120
140
160
180
January
February
March
April
May
June
July
August
September
October
November
December


b)
2020
Long term average
6.3 t/ha
Rainfall (mm)
0
20
40
60
80
100
120
140
160
180
January
February
March
April
May
June
July
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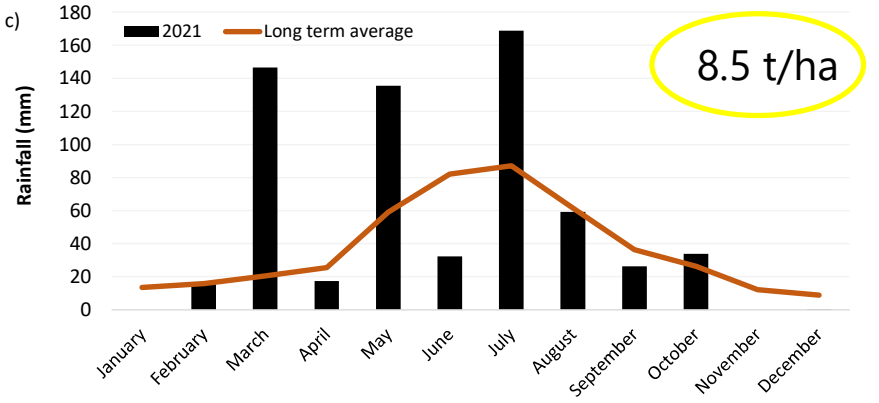
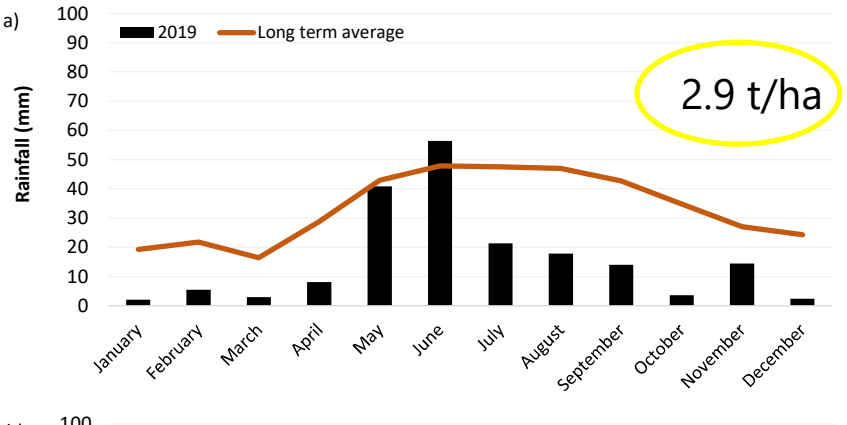
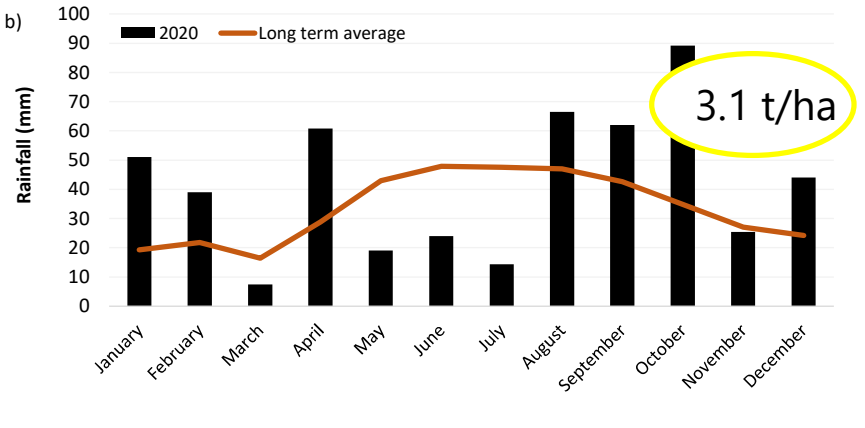
September
October
November
December


c)
2021
Long term average
8.5 t/ha
Rainfall (mm)
0
20
40
60
80
100
120
140
160
180
January
February
March
April
May
June
July
August
September
October
November
December

SA


a)
2019
Long term average
2.9 t/ha
Rainfall (mm)
0
10
20
30
40
50
60
70
80
90
100
January
February
March
April
May
June
July
August
September
October
November
December


b)
2020
Long term average
3.1 t/ha
Rainfall (mm)
0
10
20
30
40
50
60
70
80
90
100
January
February
March
April
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July
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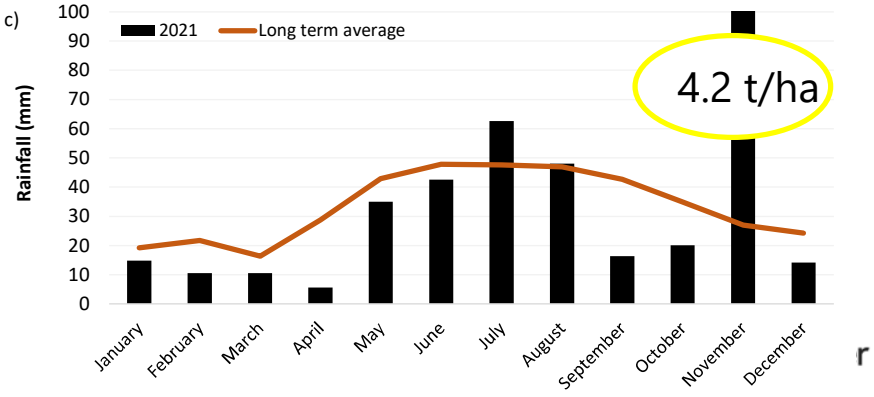
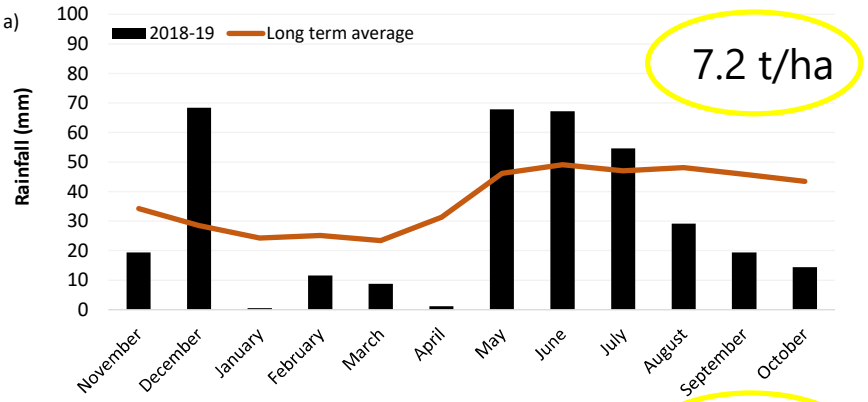
September
October
November
December


c)
2021
Long term average
4.2 t/ha
Rainfall (mm)
0
10
20
30
40
50
60
70
80
90
100
January
February
March
April
May
June
July
August
September
October
November
December

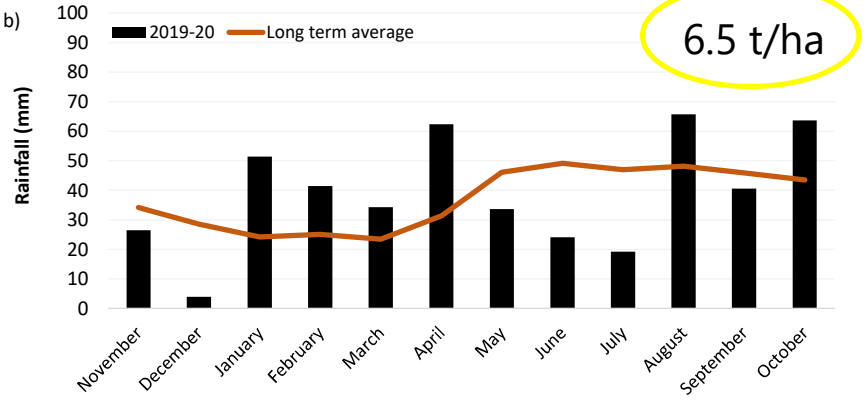
VIC

2019



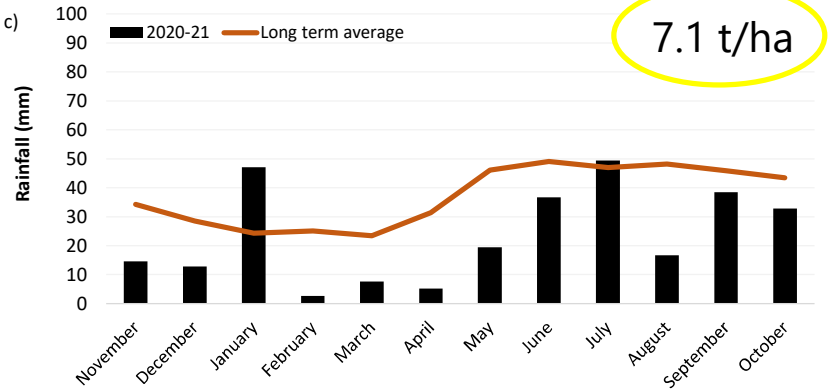
7.2 t/ha

2020



6.5 t/ha

2021



7.1 t/ha

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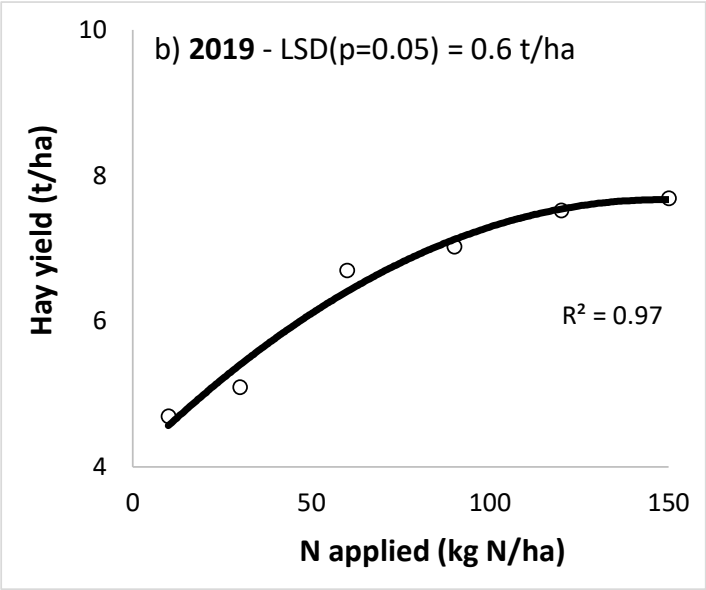
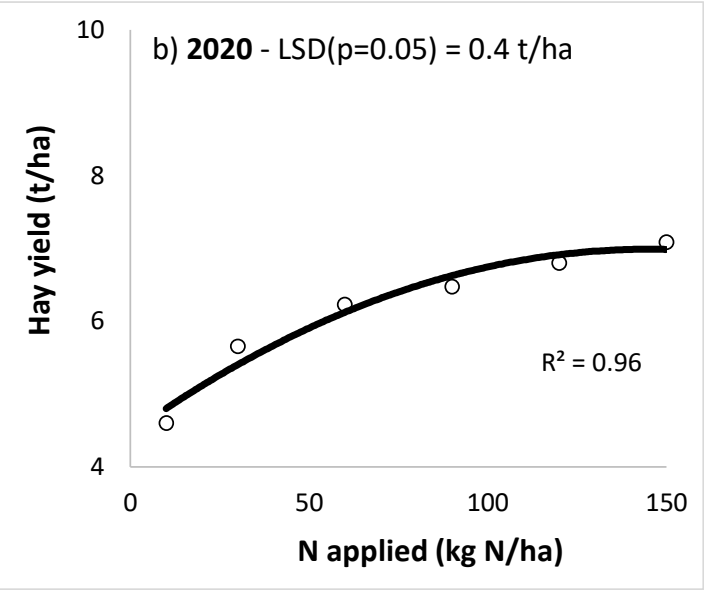
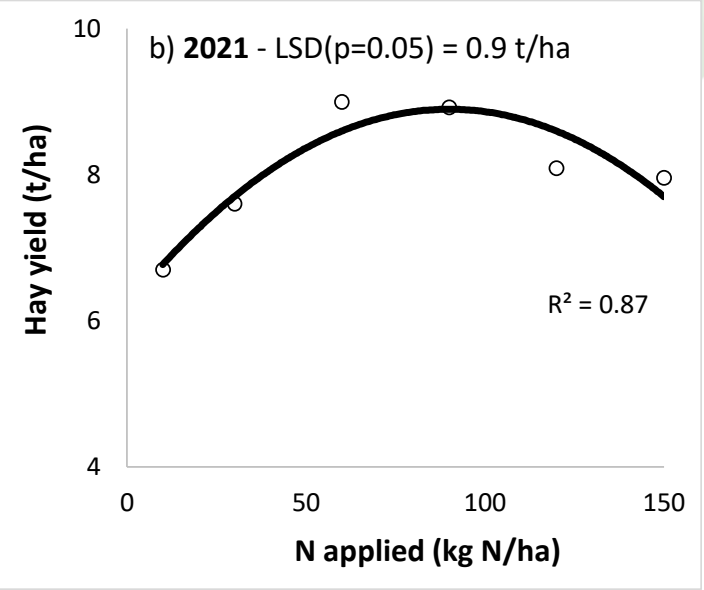
Hay yield response to increasing N - WA







Muresk, WA - 2019 and 2020: **120 N**, 2021: **60 N** (low soil N)

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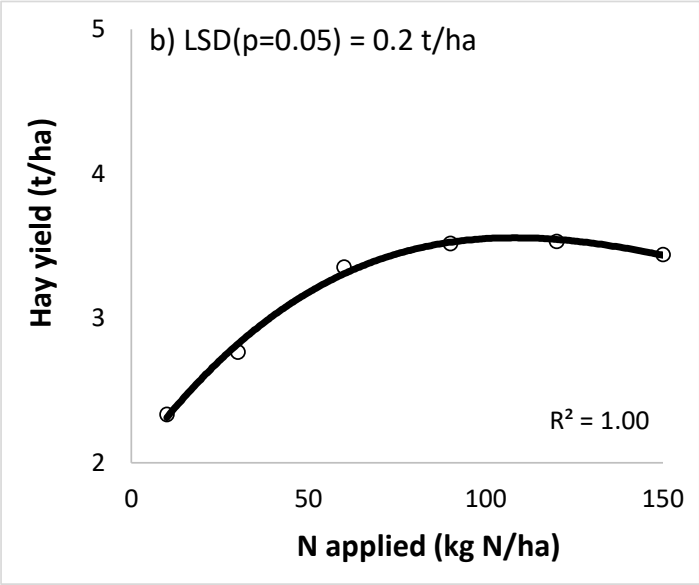
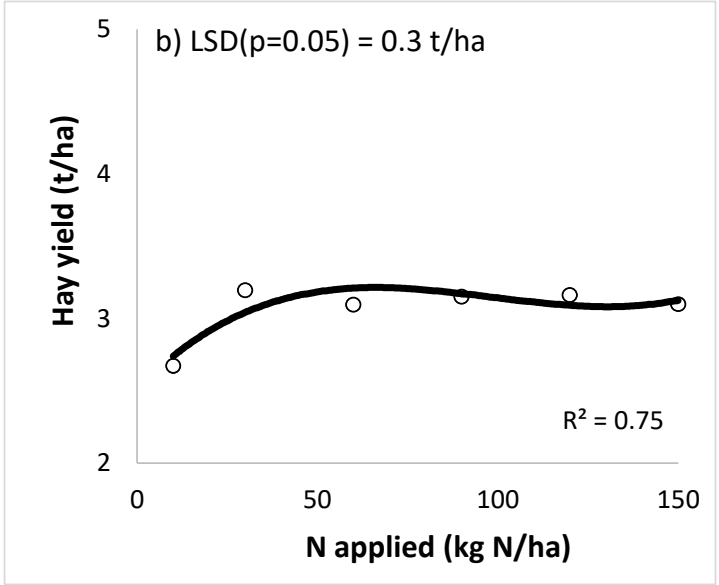
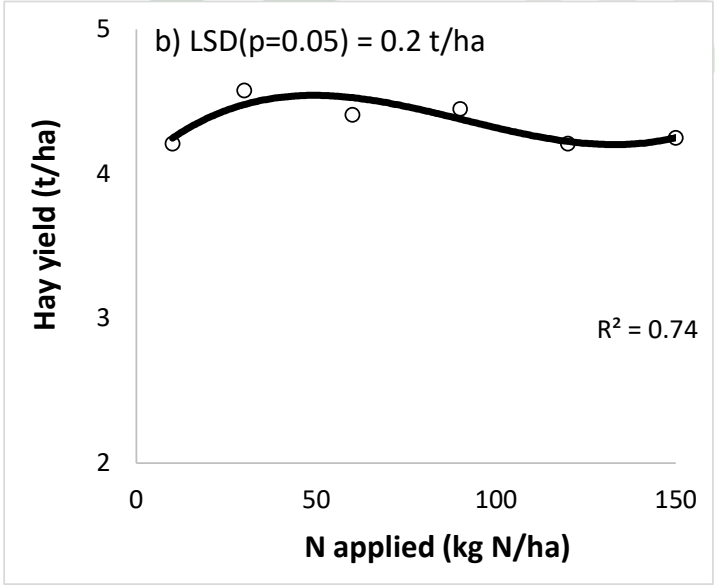
Hay yield response to increasing N - SA







Hart, SA - 2019: **90 N**, 2020 and 2021: **30 N** (soil N 26, 53, 89 kg/ha respectively)

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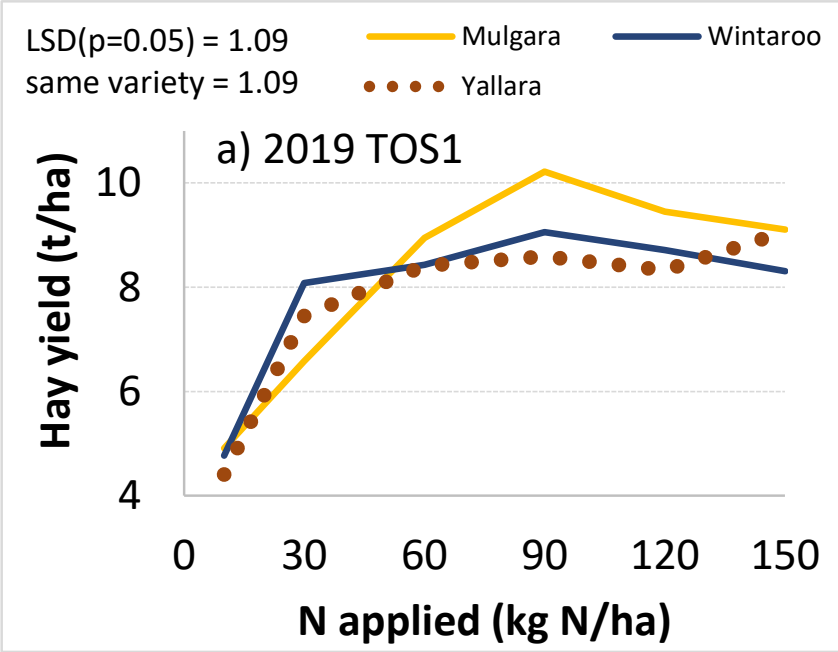
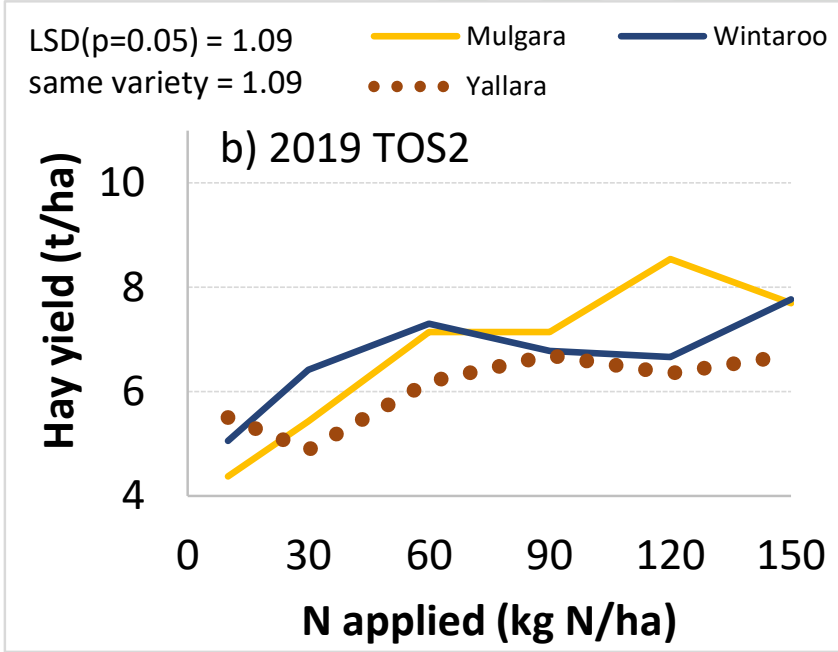
Hay yield response to increasing N – Vic 2019





Kalkee Vic - 2019: TOS 1: Yallara **60 N,** Wintaroo and Mulgara **90 N** (soil N 30 kg/ha)

TOS 2: Mulgara and Yallara **60 N,** Wintaroo **30 N**

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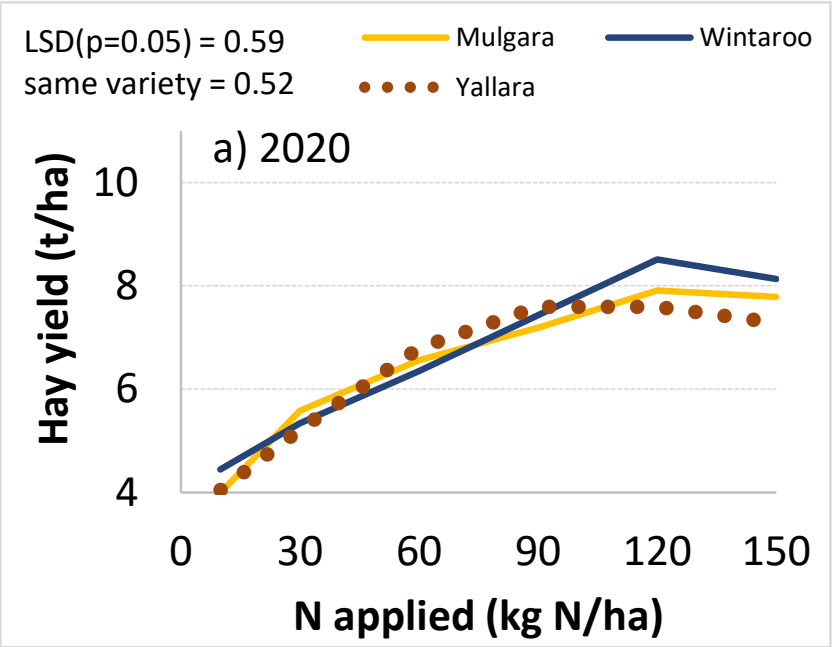
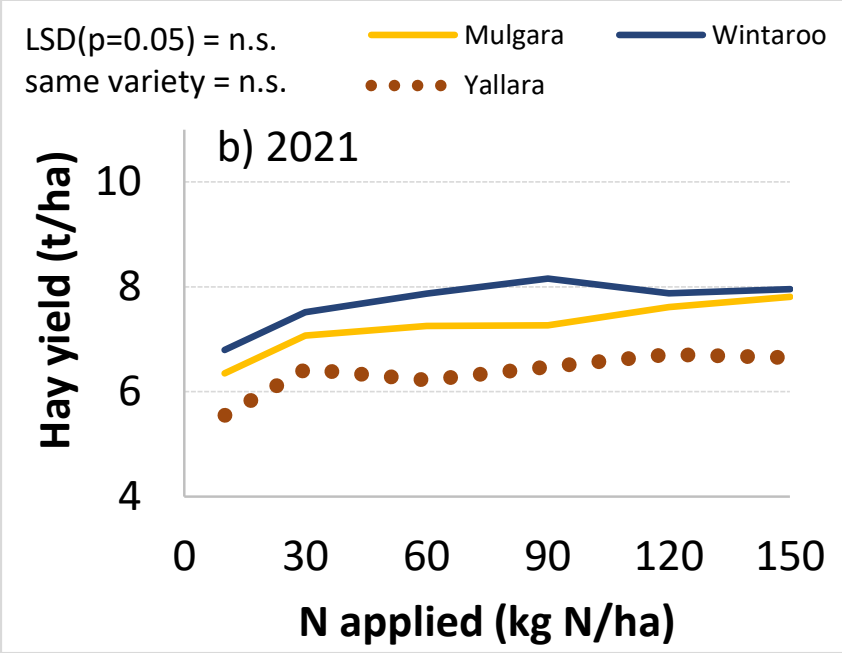
Hay yield response to increasing N – Vic 2020 and 2021





Rupanyup 2020: Yallara **90 N,** Mulgara and Wintaroo **120 N** (soil N 70 kg/ha)

Wallup 2021: all varieties **60-90 N** (soil N 71 kg/ha)

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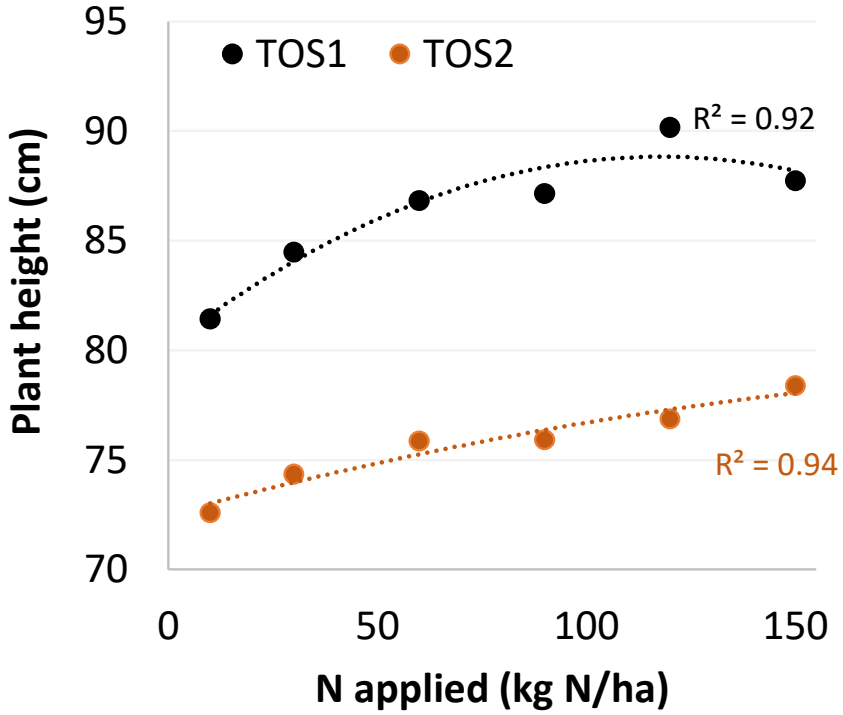
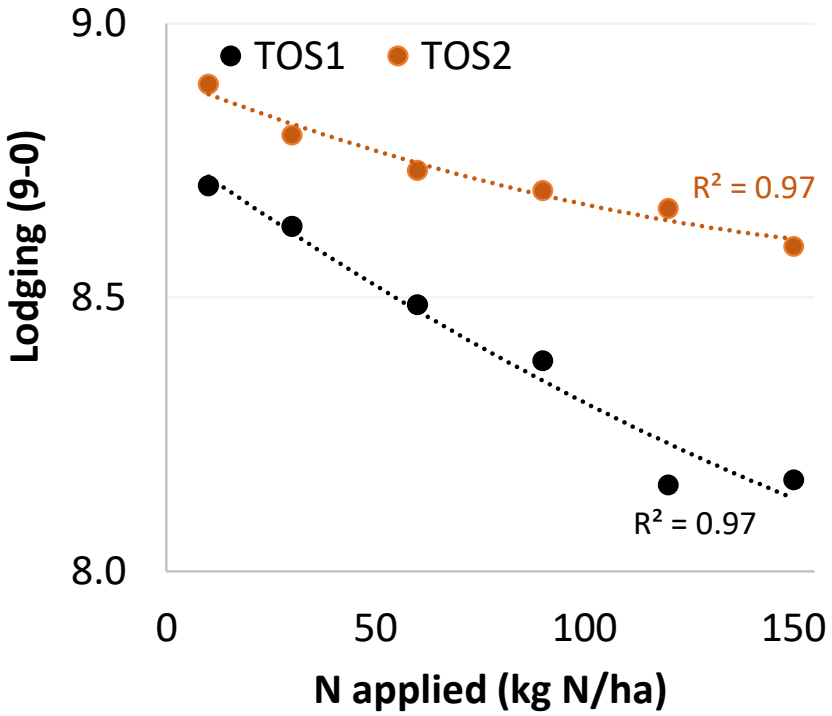
Plant height and straw strength response to increasing N



TOS 1: 90 N, TOS 2: 150 N



Leaning 6-9, plot collapse <6

Data averaged across varieties and locations

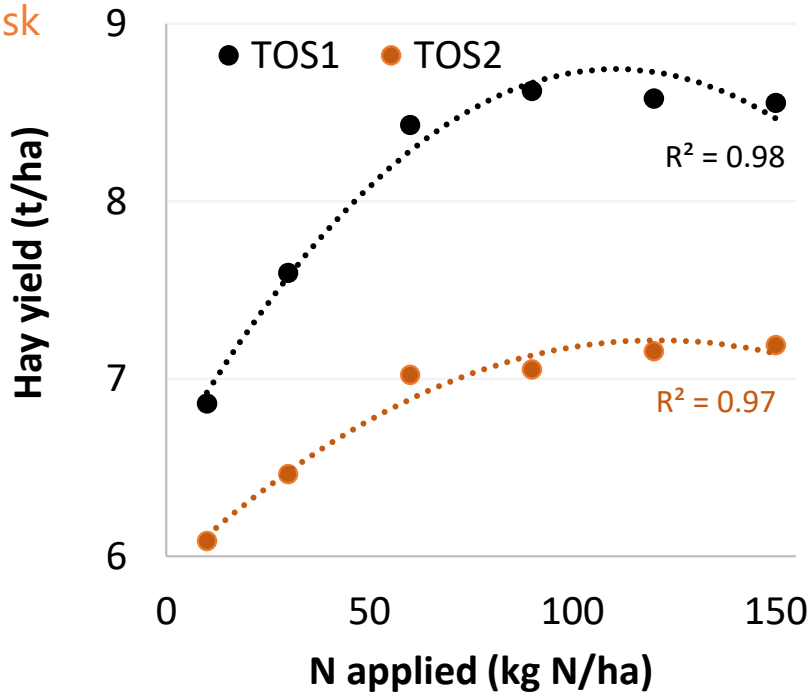
Hay yield response to increasing N

N drives more biomass, taller plants and increases lodging risk

- Varieties responded the same to increasing N rates, across a range of seasons.

- On average, peak yield was achieved with 90N across Australia.

  Although 60 N/ha was adequate (SA and Vic) when
  - ➢ sites received below average rain during critical periods, or
  - ➢ when soil N was >70-80 kg N/ha.



Data averaged across varieties and locations

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Hay quality response to increasing N

Several hay quality parameters responded to increasing N, but were not variety specific.

Greenness (SPAD):

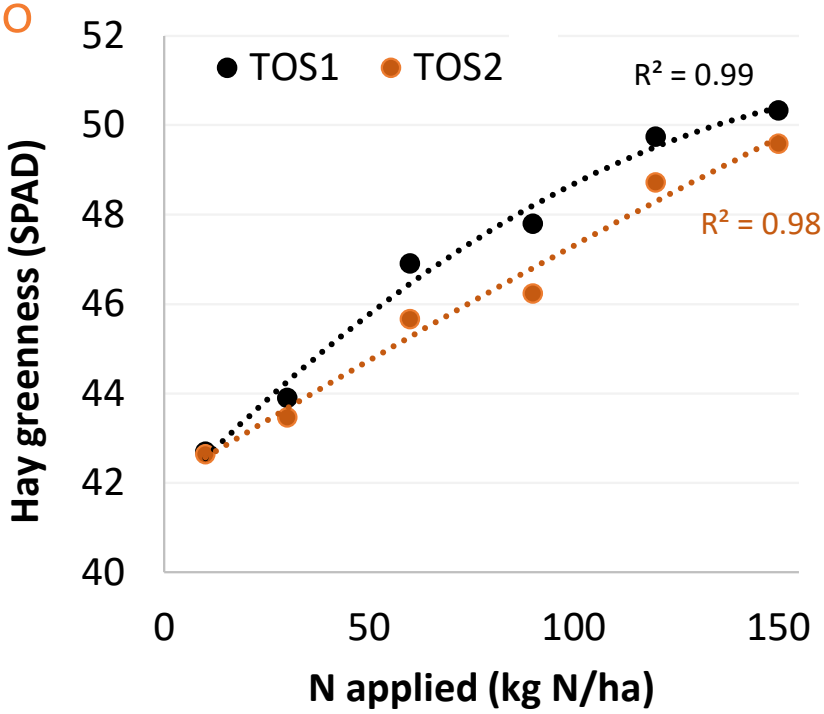
Increased with increasing N supply. No TOS effect.

The greenness benefit was present while hay yield was plateauing.

Stem diameter (<6mm):

The impact was generally small, < 0.5 mm.

N was not a major driver of problems with stem diameter.

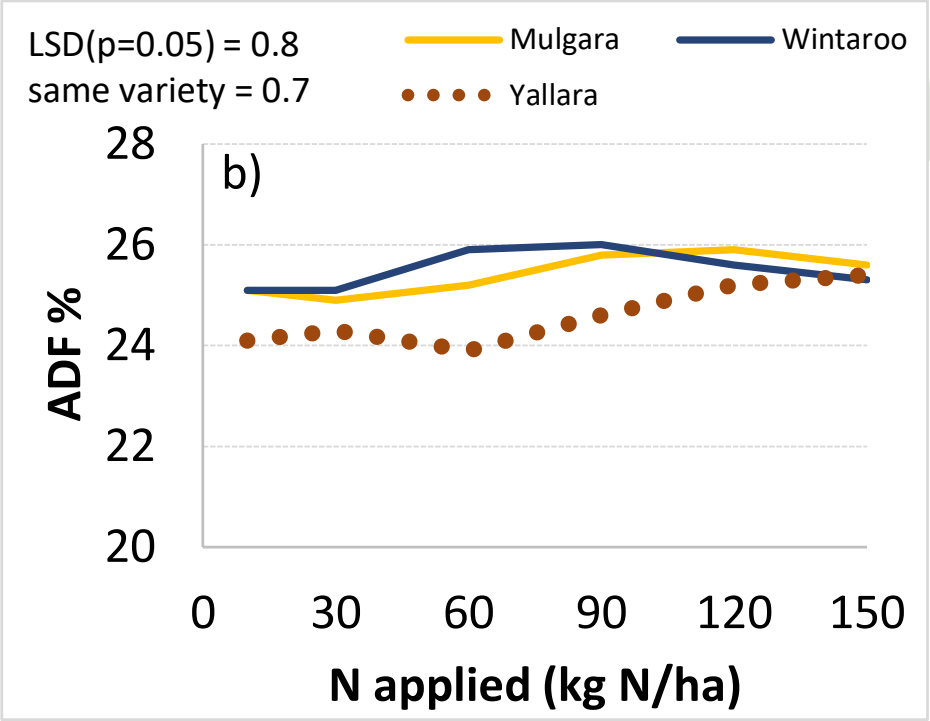


Hay quality response to increasing N

ADF (<32%):

Little change across varieties and locations with increasing N supply.

N is not a major driver of higher fibre (as ADF) levels in oaten hay.



Kalkee, Victoria, 2019

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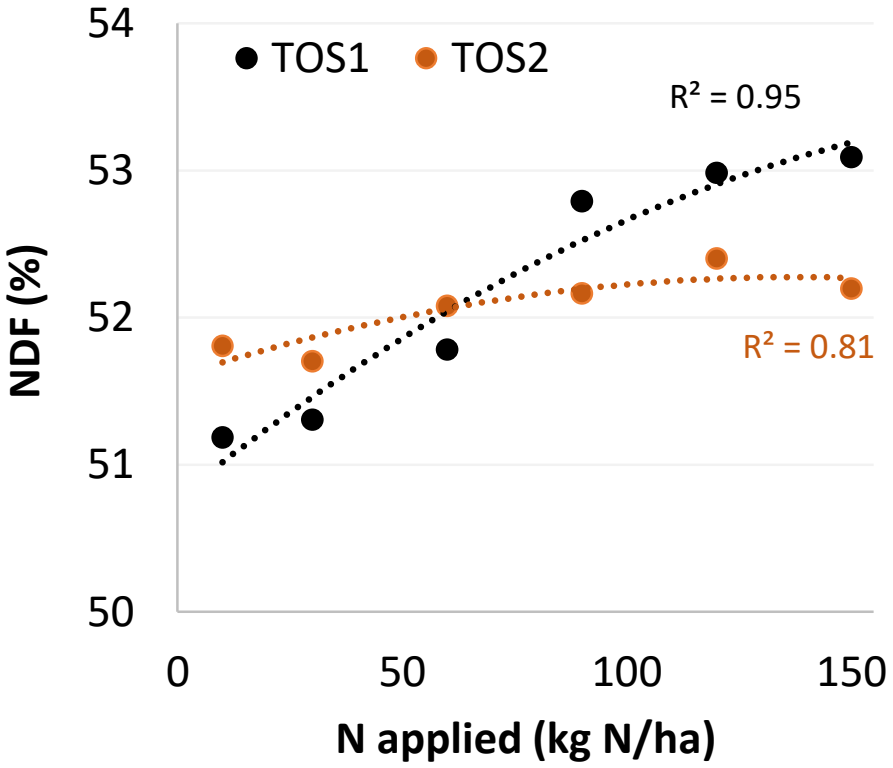
Hay quality response to increasing N

NDF (<55%):

2% increase at the first planting date, but no change at the second.

N may slightly influence NDF with early planting, but does not appear to be a major driver of higher fibre (as ADF).



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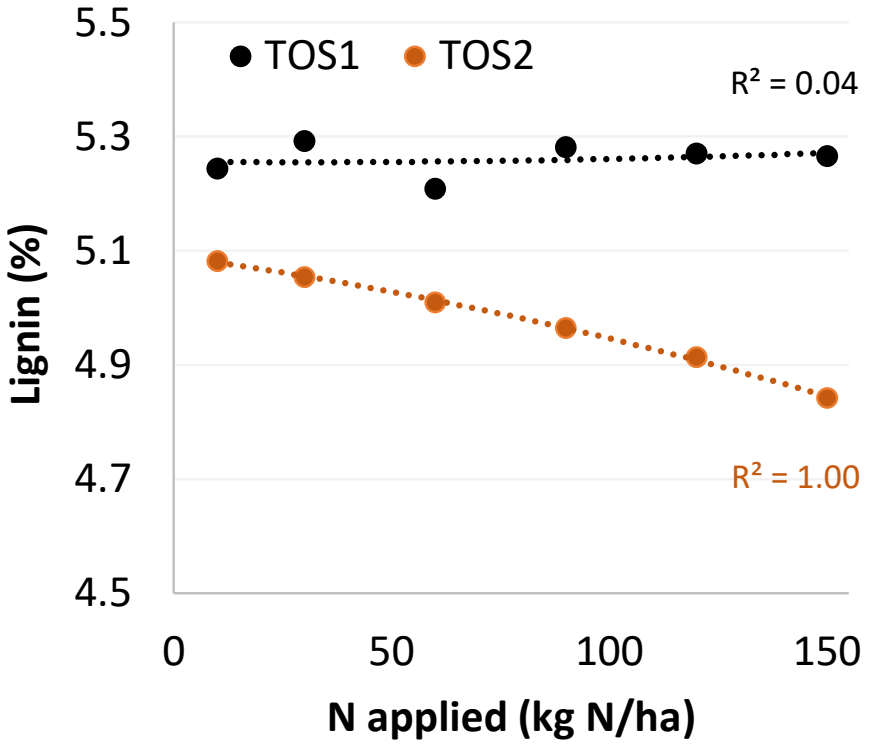
Hay quality response to increasing N

Lignin:

No change across varieties and locations with earlier planting.

N may slightly influence lignin with later planting,

but does not appear to be a significant driver of higher fibre (as lignin) levels.



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Hay quality response to increasing N

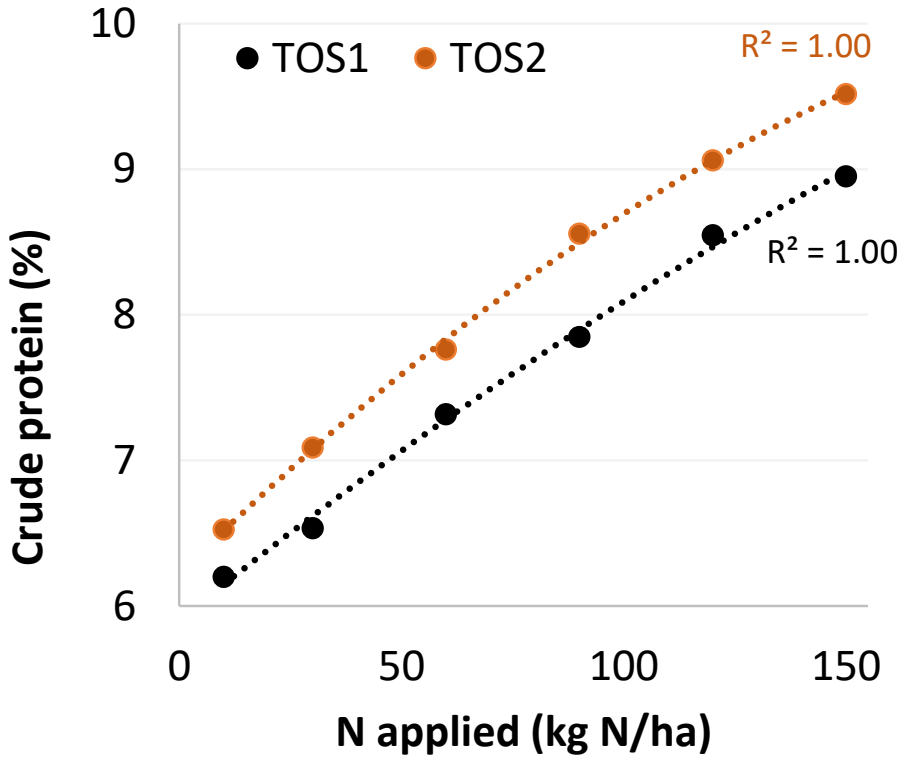
N is a major driver for:

Crude protein (>4%):

Increased with increasing N supply

Later sown crop slightly higher in crude protein (associated with a lower hay yield)

Similar response to N across sowing dates



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Hay quality response to increasing N

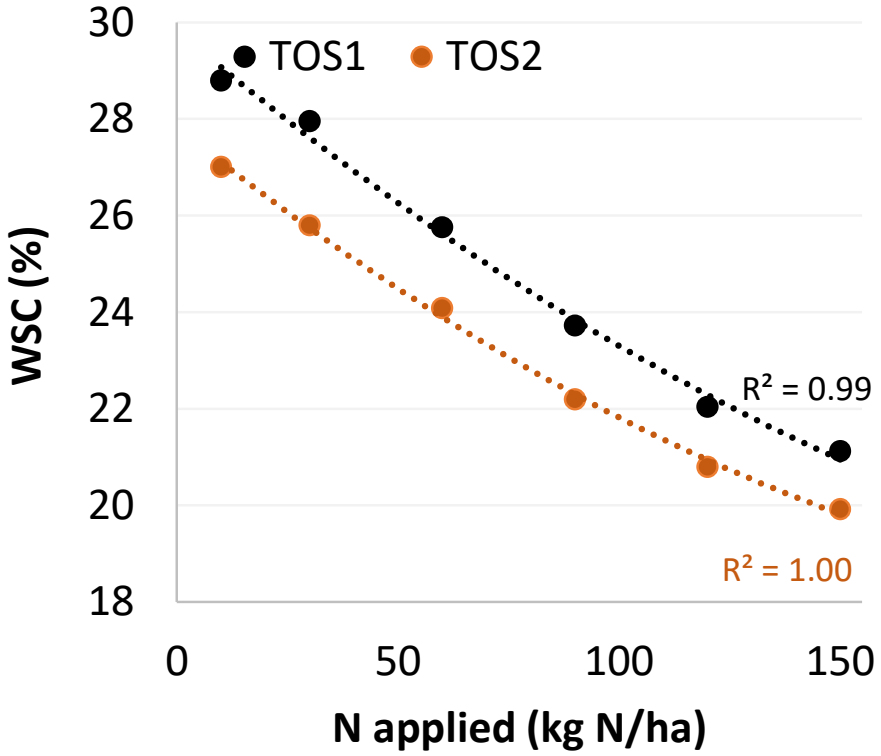
WSC (>22%):

Decreased with rising N rate in all years, across varieties.

>90 kg N/ha increased the risk of <22% WSC.

WA: 2019, 2021 SA: 2021

Yallara measured highest WSC across the 12 national trials.



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Key messages

- N is a major driver of biomass, and taller and greener plants
- Peak hay yield was achieved with 90 kg N/ha when averaged across varieties and locations

  but target N was lower when below-average rainfall was received during critical periods

  or soil N was higher, above 70-80 kg N/ha

Rupanyup, Victoria 2020

- Season and variety were generally a larger factor determining hay quality than the rate of N applied
- Higher rates of N could be applied without driving quality down
  – understand soil N and moisture at sowing. Rule of thumb: budget 120-130 kg N in total

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Key messages

Kinnabulla, Victoria 2023

- N was not a major driver of hay quality defects thick stems or fibre (ADF, NDF and lignin)
- N was a major driver of crude protein which increased,

  and WSC which decreased, as applied N increased
- Applying >90 kg N/ha increased the risk of exceeding the low WSC limit for premium hay set at 22%.
- Varieties responded similarly to increasing N for hay quality traits.

  Key N management advantage between varieties:

  more N can be applied to varieties with higher genetic levels of WSC before they drop a grade.

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Acknowledgements

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Growers who hosted trial sites

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Primary Industries and
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