Agronomic Practices to Reduce Alkaloids in Dark Fire-Cured Tobacco

Ryan Brown; Eric Walker; Andy Bailey

University of Tennessee

University of Kentucky

Dark Fire-Cured

- Firing process

- Used mostly in smokeless products

Dark Fire-Cured

- Health risks appear to be less than risks from smoking

- FDA proposals on future chemistry of tobacco products

- Strong, sustained efforts in TSNA reduction from various disciplines

Introduction

- Agronomic factors affecting alkaloid production:
  - Variety selection
  - Nitrogen rate
  - Topping timing
  - Water availability

Campbell et al, 1982; Gupton, 1982; Maw et al, 1998; Vepraskas and Miner, 1987

Varietal Effects

- Genetics prove to be most influential on both chemical and physical properties of cured leaves

- Varieties have been noted as having the most effect on nicotine production

Campbell et al, 1982; Long, 1983; Terrill et al, 1985

Nitrogen

- Nitrogen is an important nutrient for tobacco production
  - Relatively high N rates for optimum yields

- Increased nitrogen rates could lead to excess nitrogen
  - Nitrosating agent
  - Possibly lead to more TSNAs

Campbell et al, 1982; Bailey, 2014; Drake et al, 2015

Topping

- Topping time and height can affect nicotine

- Topping triggers nicotine production in roots

- Harvest interval is critical to alkaloid levels
  - Longer intervals = higher alkaloids
  - Shorter intervals = fewer alkaloids

Gupton, 1982; Campbell et al, 1982; Terrill et al, 1985

Water Availability

- Rainfall affects production of alkaloids in various ways
  - Drought stress
  - Roots
  - Leaching

- Wetter soil conditions lead to decreased alkaloid production compared to drier conditions due to reduced root mass

Mulchi et al, 1987

Justification for Research

- Harm reduction

- Create an alkaloid profile of LC and LI varieties under certain agronomic factors

- Would there be a market for low alkaloid products if the quality is right?
  - Diet drinks
  - Decaffeinated coffee

Objective

- Evaluate the effects of agronomic practices on a conventional alkaloid dark tobacco variety and a low intermediate dark tobacco variety

Materials & Methods 2016

- Springfield, TN (HRREC)

- 24 Treatments X 4 Replications
    - Split-plot with factorial treatment arrangement

- 2 Varieties:
    - KT D14 LC – normal alkaloid level
    - KT D18 LI – low intermediate alkaloid level

Materials & Methods 2016 cont.

- Nitrogen Fertility
  - 84 kg/ha^{-1}
  - 196 kg/ha^{-1}

- Topping Stages
  - Early button stage
  - Late bloom stage
  - Immediately prior to harvest

- Sucker Control
  - Fatty alcohol
 - Hand-suckered

Materials & Methods 2017

- Springfield, TN and Princeton, KY (UKREC)

- Eliminated hand-suckered treatments
  - All other variables were same as 2016

- 12 Treatments X 4 Replications
  - Randomized complete block with factorial treatment arrangement
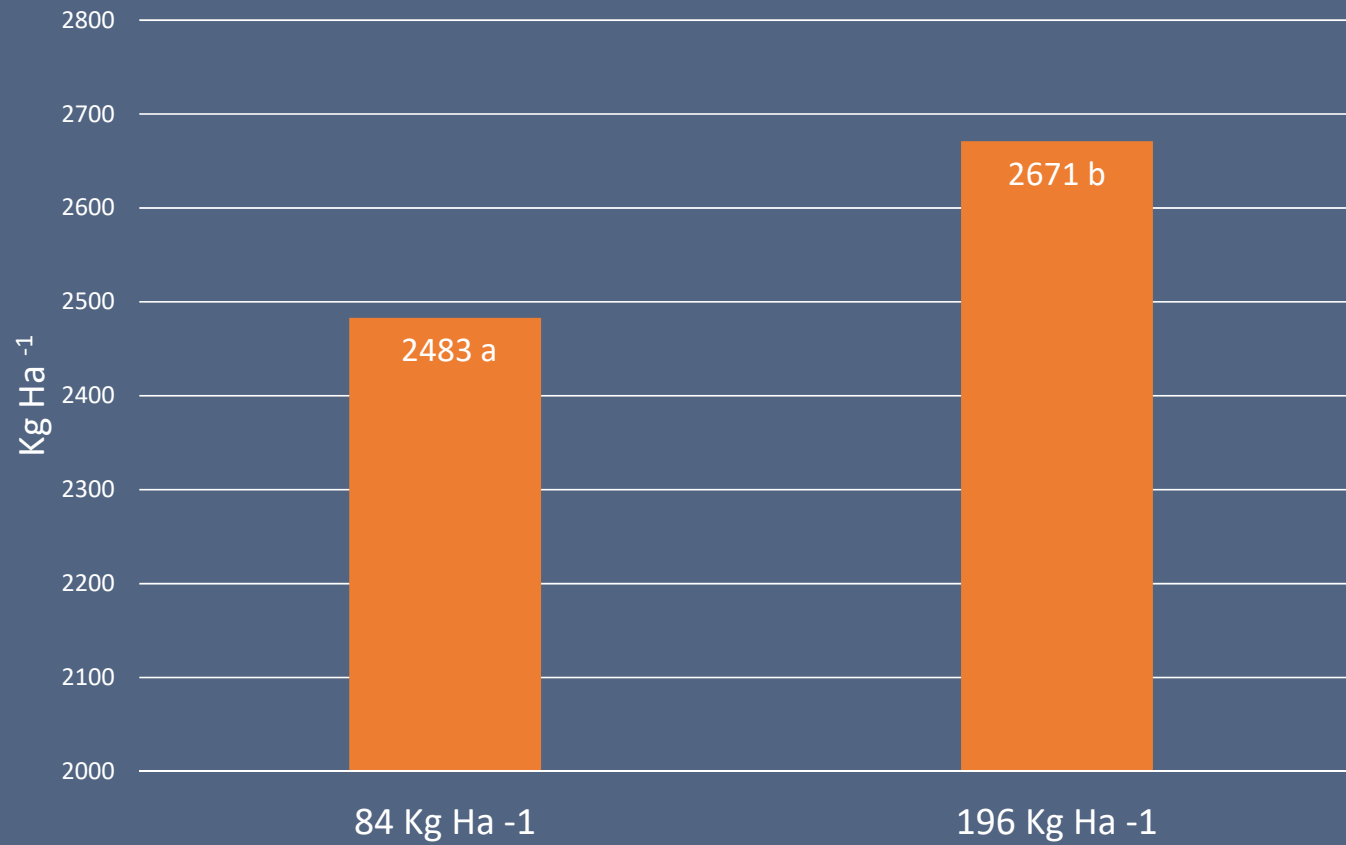
Data Collected

- Yield
- Grade
- Total Alkaloids
- TSNAs

- Data subjected to analysis of variance (SAS)
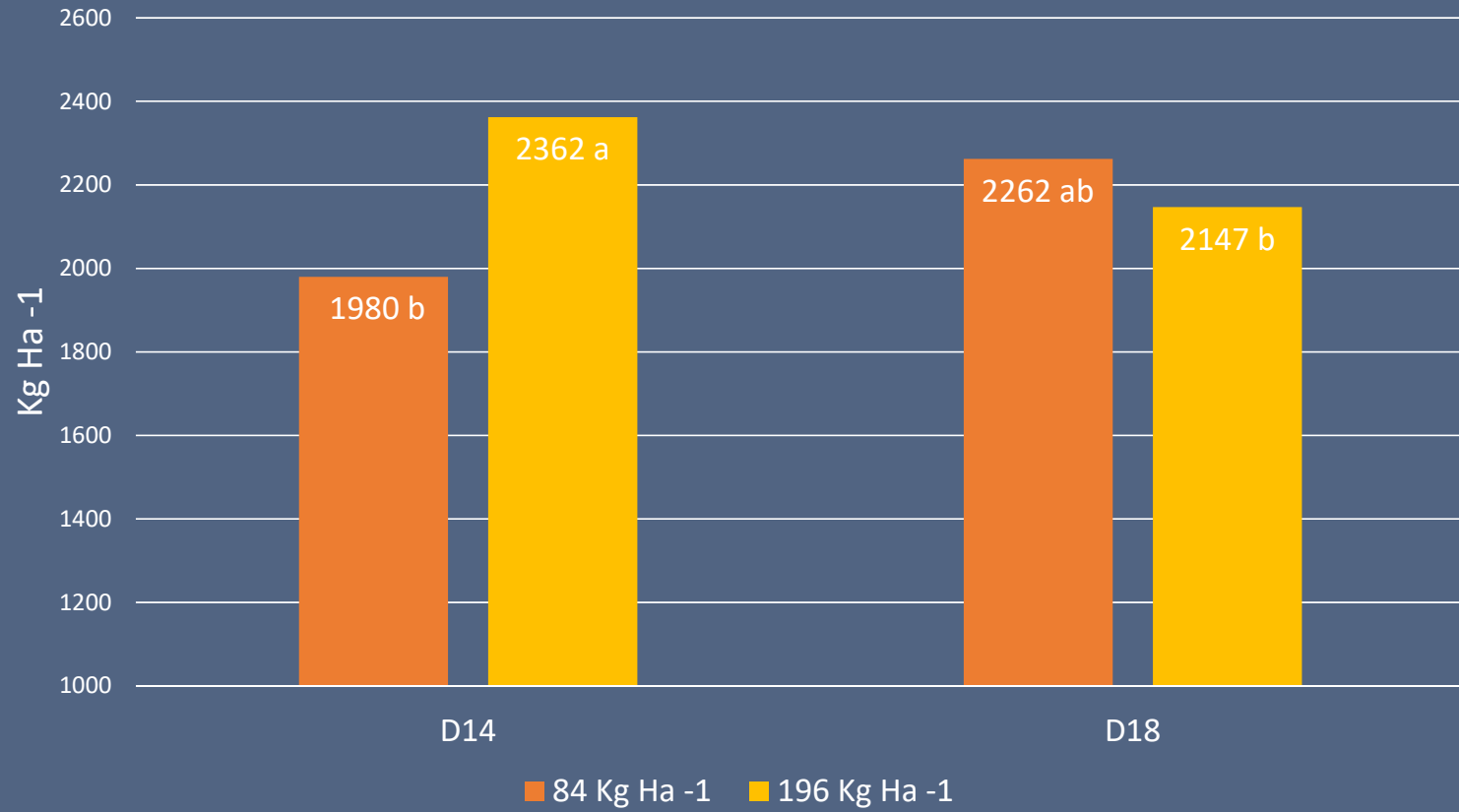 - 5% level of significance

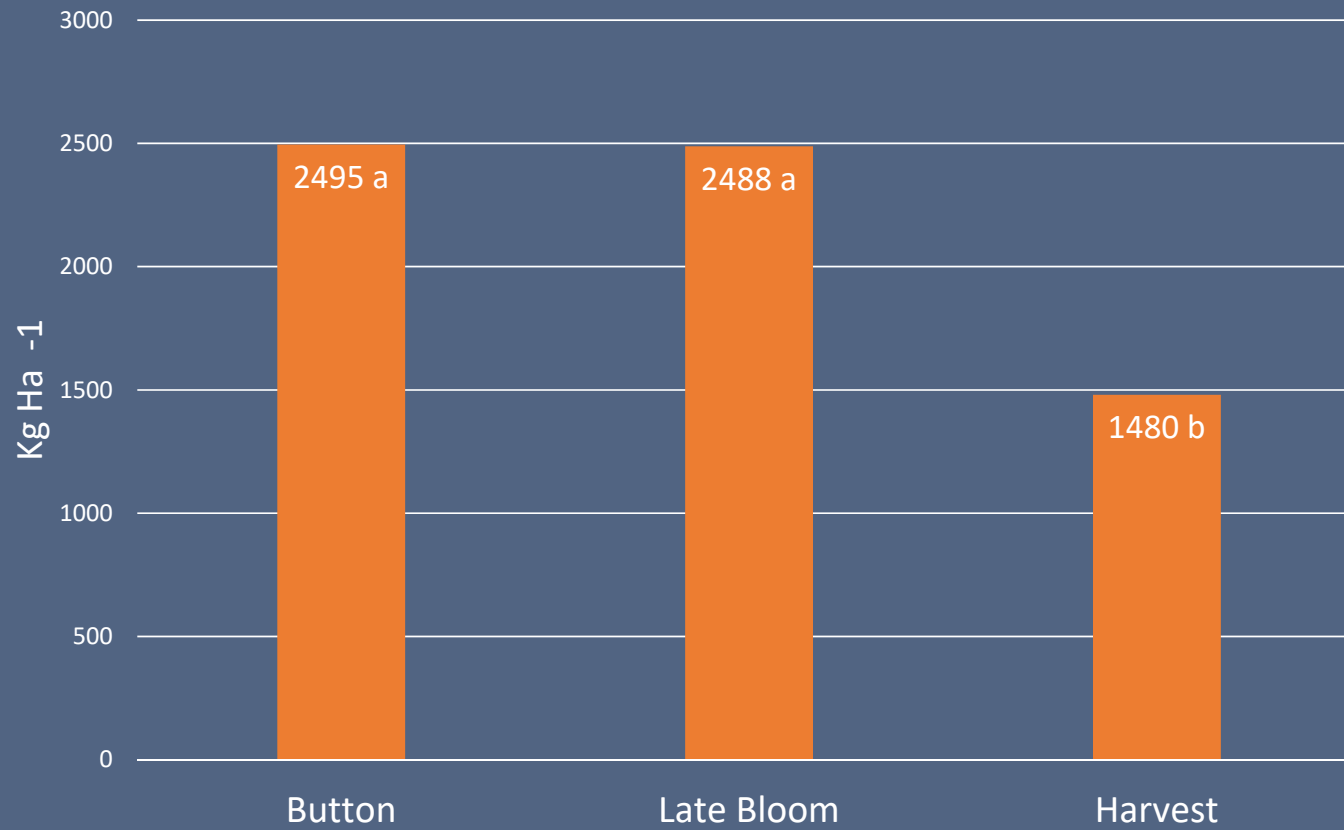Cured Leaf Yield by Variety*Topping Stage – HRREC 2016
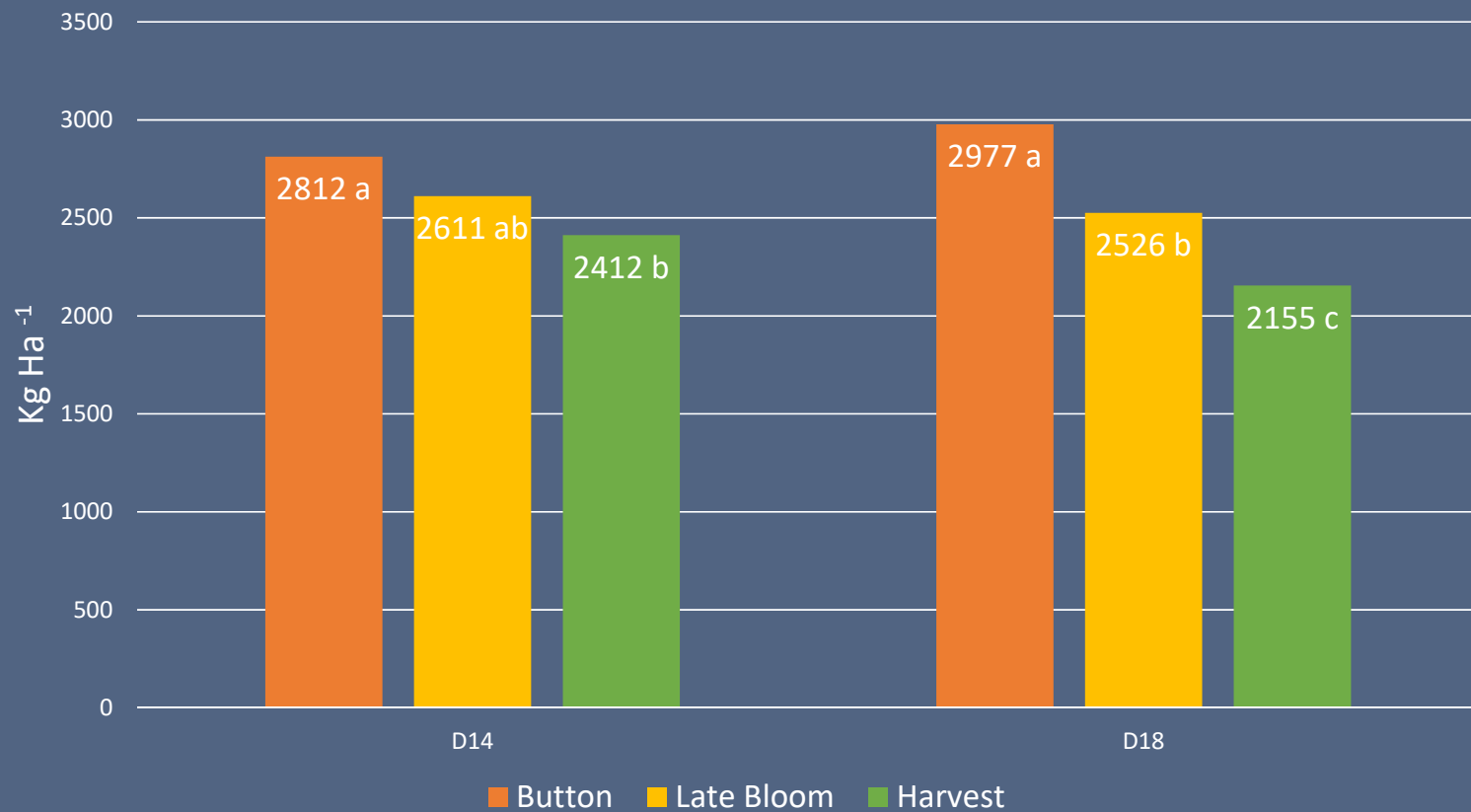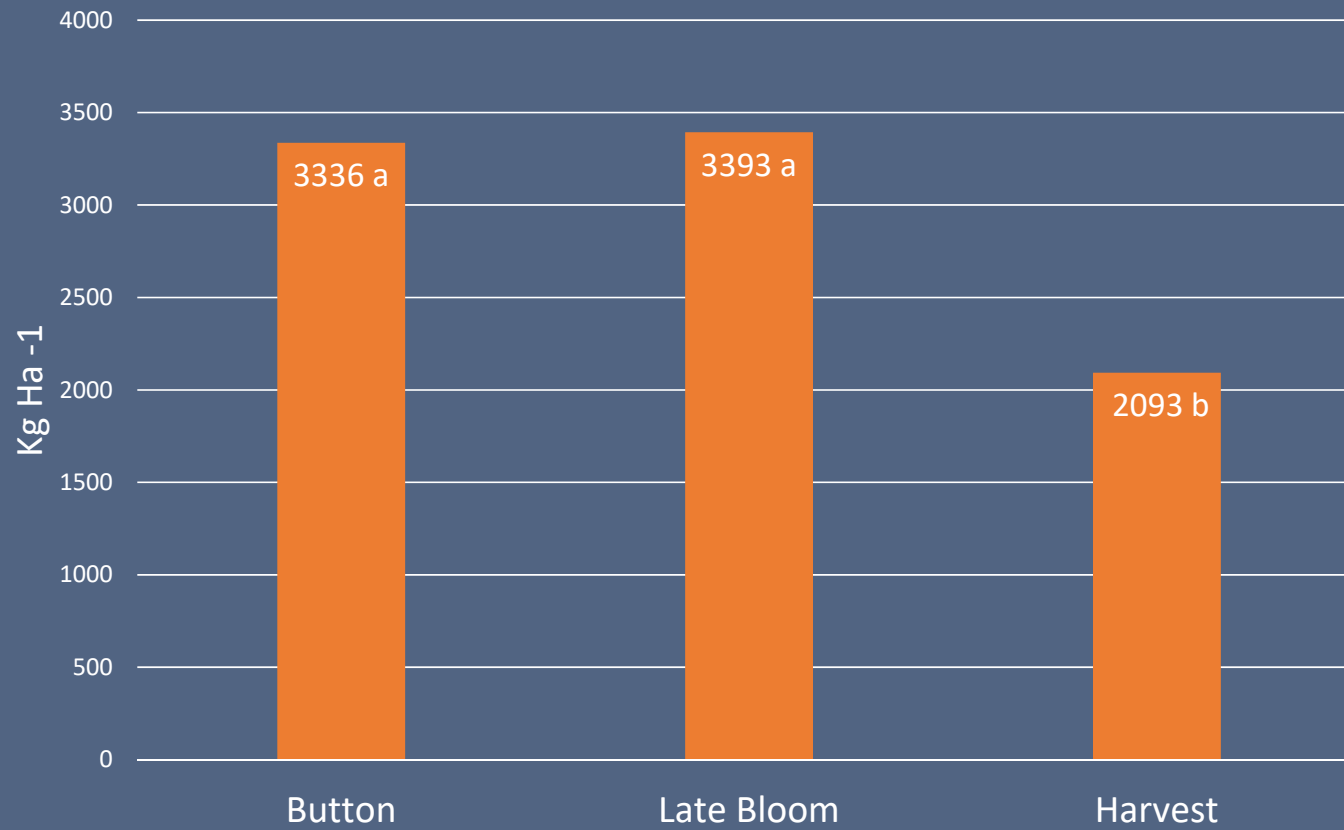
Cured Leaf Yield by Nitrogen Rate – HRREC 2016

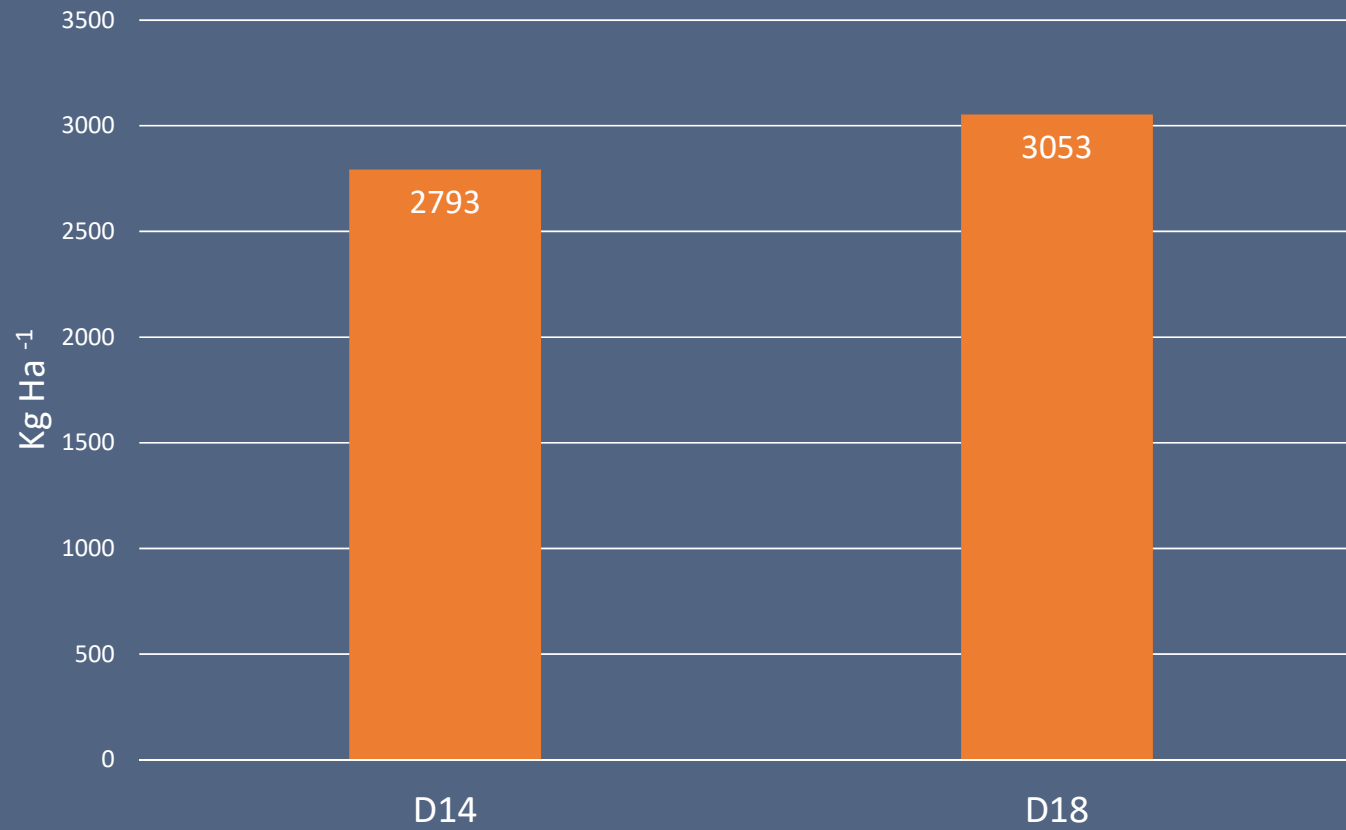## Cured Leaf Yield by Variety*Nitrogen Rate – HRREC 2017

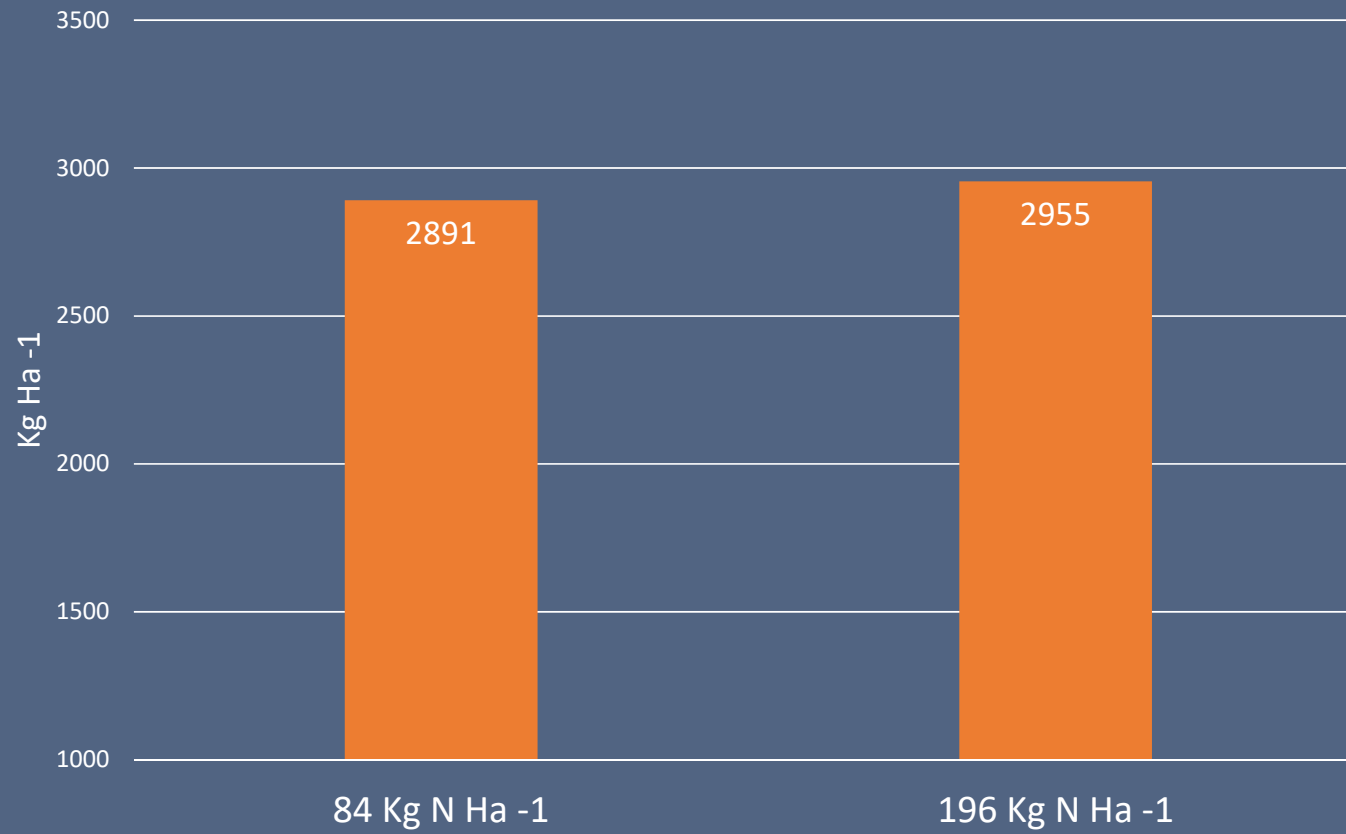Cured Leaf Yield by Topping Stage – HRREC 2017

Cured Leaf Yield by Topping Stage – UKREC 2017

Cured Leaf Yield by Variety – UKREC 2017

Cured Leaf Yield by Nitrogen Rate – UKREC 2017

Grade Index – HRREC 2016

Variety	
D14	**D18**
35	41

Grade Index – HRREC 2016

Topping Stage		
Button	**Late Bloom**	**Harvest**
41 a	43 a	30 b

Grade Index – HRREC 2017

Variety*Topping Stage		
	D14	**D18**
Button	65 a	58 a
Late Bloom	63 a	59 a
Harvest	36 c	48 b

Grade Index – UKREC 2017

Variety	
D14	**D18**
43	38

Grade Index – UKREC 2017

Topping Stage		
Button	Late Bloom	Harvest
48 a	40 ab	33 b

Summary

- D18 yields and grades are comparable to D14

- 2017 samples are being ground for processing

- Leaf chemistry analysis to be performed by Altria Client Services

Future Work

- Studies will be repeated in 2018 for dark fire-cured

- Beginning similar studies for burley tobacco in 2018

Acknowledgements

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