Evaluation of Maleic Hydrazide Applied at Different Times of Day in Burley Tobacco

Mitchell D. Richmond, Richard Hensley, Bob Pearce

Importance of Axillary Bud (Sucker) Control

- Many studies have documented the relationship between sucker control and yield and leaf quality
- If suckers are not appropriately managed, increases in labor cost will occur
- MH is the only true systemic sucker control available in tobacco production
  - Other products are contact or local-systemic

MH Applications

- MH is absorbed through the leaves and moves to actively growing sucker buds
  - Does not have to be applied directly to the leaf axil

- Currently recommended to apply MH when conditions are overcast or in the morning during hot, clear weather
  - More acreage per grower, less likely to wait on ideal application windows

- Faster absorption has been reported when applying MH in the morning or evening hours compared to the afternoon *(Smith and Stone, 1957; Meyer et al., 1987)*

Fate of MH in Plants

- MH is a very stable molecule in and on plants
  - Stable under ultraviolet irradiation; decomposed at 260°C (WSSA,2010)
    - Sunlight and temperature in the field not likely to influence residues
  - The vapor pressure of MH is nearly zero
    - Insignificant losses to volatilization (Collins and Hawks, 2013)

- High potential for MH residues to be present in and on the surface of cured tobacco leaf
  - MH can become fixed and not believed to be highly metabolized

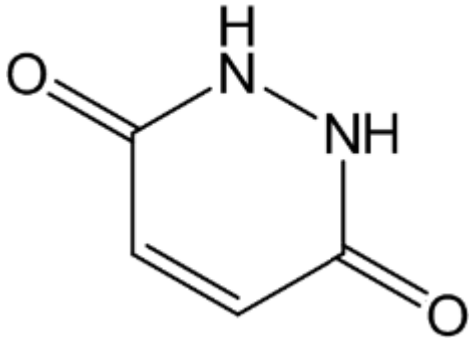
Fate of MH in Plants

- Commonly formulated as a potassium salt of MH, which possesses a high water solubility
  - Two-fold implications:
    - Higher penetration efficiency in the plant
    - Potential for sucker control efficacy and residues to be significantly influenced by rainfall and irrigation

- After entering the plant, currently believed that MH can exist as:
  - Unmodified (free MH)
  - Bound with cell wall components (lignin)
  - Detoxified through formation of glycoside
    - Reported that 10-30% of total MH residues in cured leaf are MH-N-β-D-glucoside

Fate of MH in Plants

- Ultimately, there is potential for high MH residues in cured leaf
  - Considering:
    - Chemical properties of MH
    - Use patterns by tobacco producers
      - Including application rates and methods



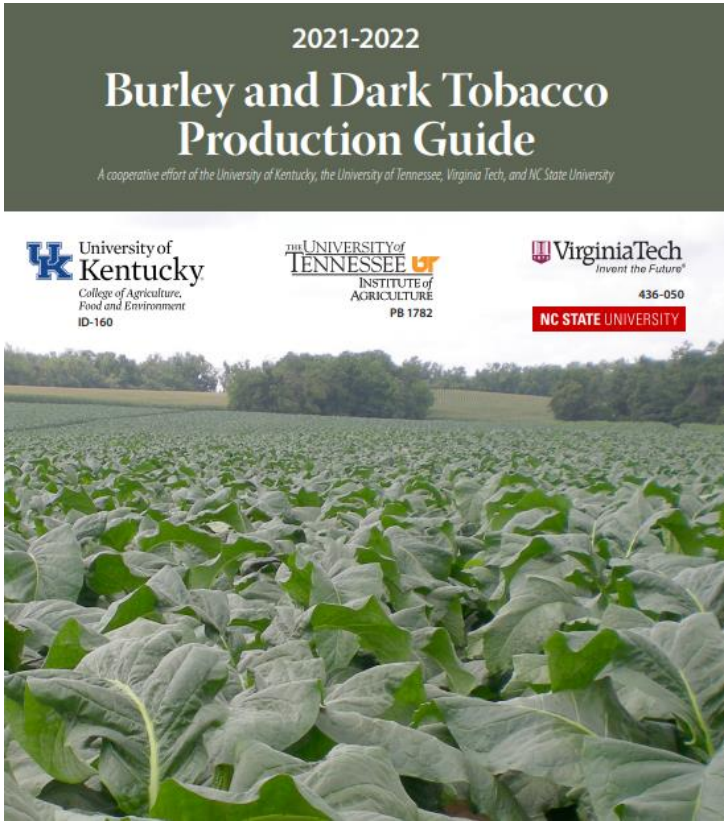
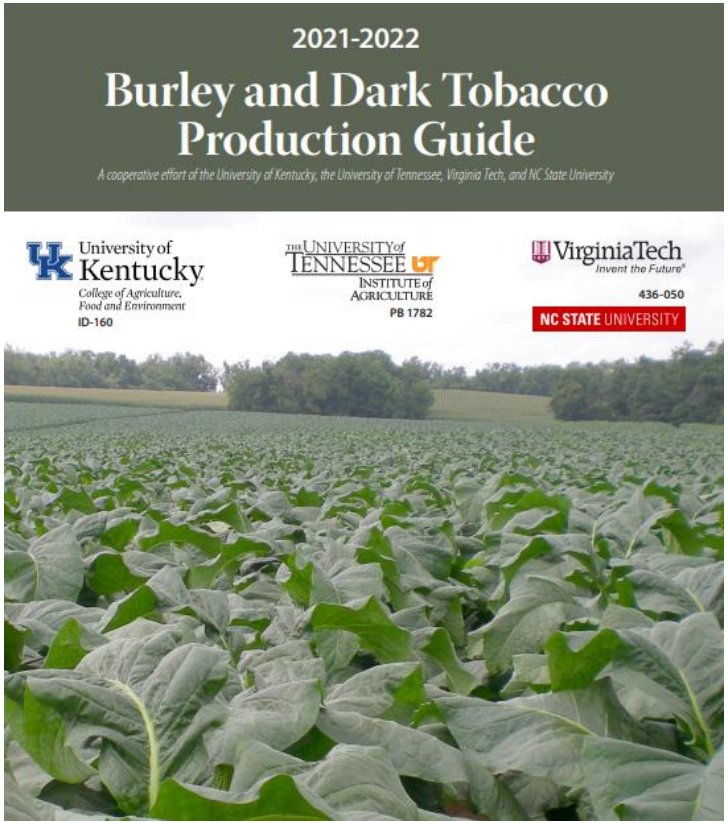


Table 3. Impact of MH rate on cured-leaf MH residues by year and location for selected treatments from the regional burley sucker control trials

MH rate lb ai/A (gal/A)	TN1	VA	NC-LS	NC-R	KY
	Parts per million MH residue on cured leaves (average of all stalk positions)				
2010					
3.00 (2.0)2	75	34	48	129	123
2.25 (1.5)	45	18	25	56	105
1.50 (1.0)	23	10	11	35	42
2011					
3.00 (2.0)	76	26	48	118	--
2.25 (1.5)	56	14	17	64	--
1.50 (1.0)	23	10	15	54	--
2012					
3.00 (2.0)	24	18	40	66	108
2.25 (1.5)	15	14	16	57	50
1.50 (1.0)	10	11	13	20	26

[1] Locations for the regional sucker control trial include Greenville, TN; Glade Spring, VA; Laurel Springs, NC; Reidsville, NC, and Lexington, KY. Application methods differed by location but all were targeted to deliver 50 gallons per acre of sucker control solution.

[2] 3.00 lbs ai/A = 2 gallons per acre regular concentrate; 2.25 lbs ai/A = 1.5 gallons per acre regular concentrate; 1.5 lbs. ai/A = 1 gallon per acre regular concentrate.



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Objective

Evaluate MH applied to burley (NC BH 129) in the morning, midday, and evening

- Sucker Control
- Yield
- Alkaloids and TSNAs
- MH Residues (cured leaf)

Methods

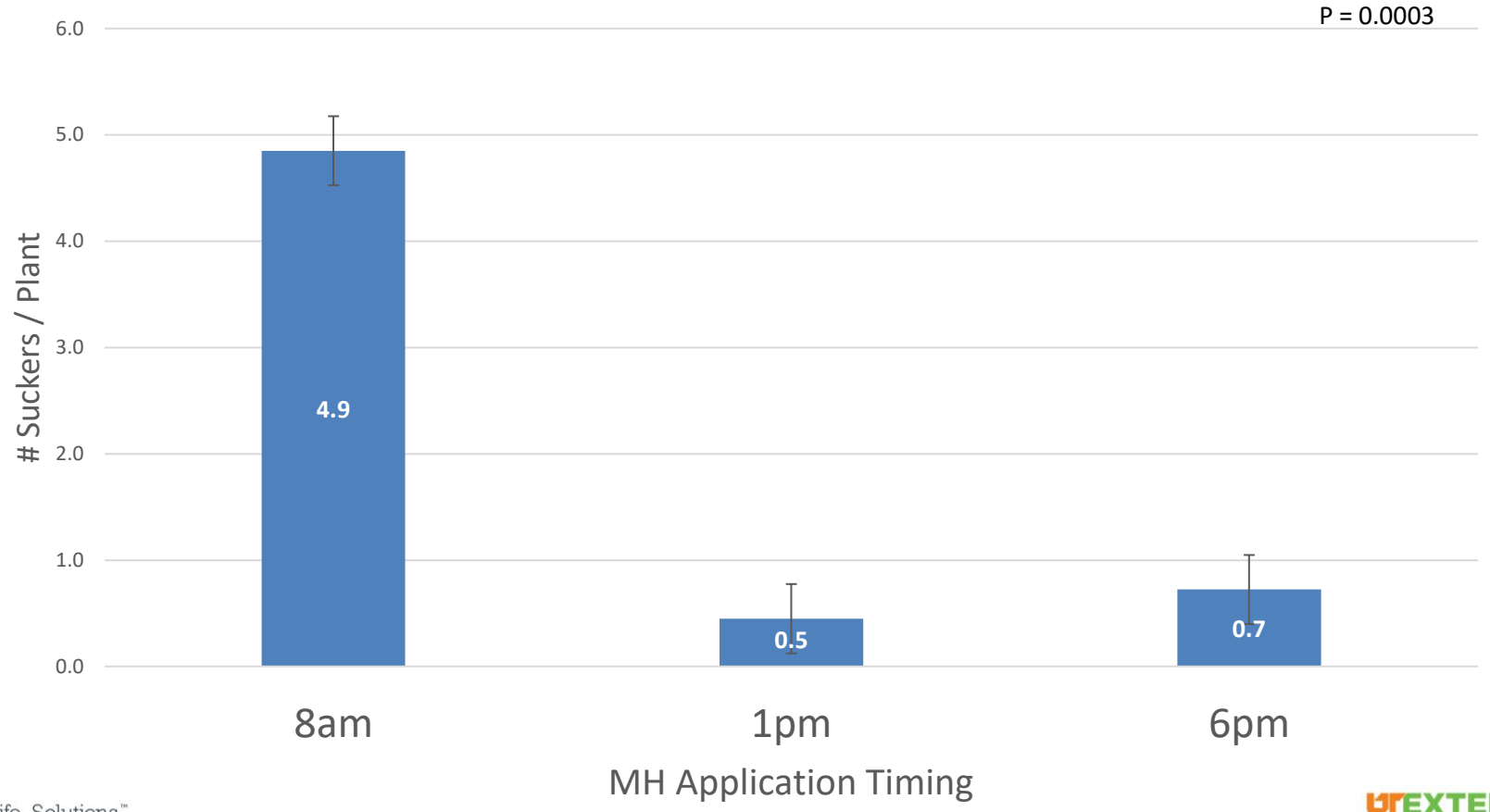
Activity	Date
Transplanted	May 26, 2021
Topped	July 21, 2021
Treatments	July 22, 2021 (8 am; 1 pm; 6 pm)
Harvested	August 19, 2021
Stripped	November 10, 2021

- MH (full rate) and flumetralin (full rate)
- SAS 9.4 (Cary, NC), Proc GLIMMIX, Fisher's LSD, alpha = 0.1

Results

- Sucker control was reduced when MH applied in morning compared to afternoon and evening
- No impact of application timing on total yield
- There was a reduction in total alkaloids associated with the midday and afternoon MH application, no impact on conversion
- No significant differences for timing of application on Total TSNA
- MH residues were significantly reduced with morning MH application in the upper leaf position (leaf and tips)

MH Time of Day – Sucker Control as Number of Suckers/Plant



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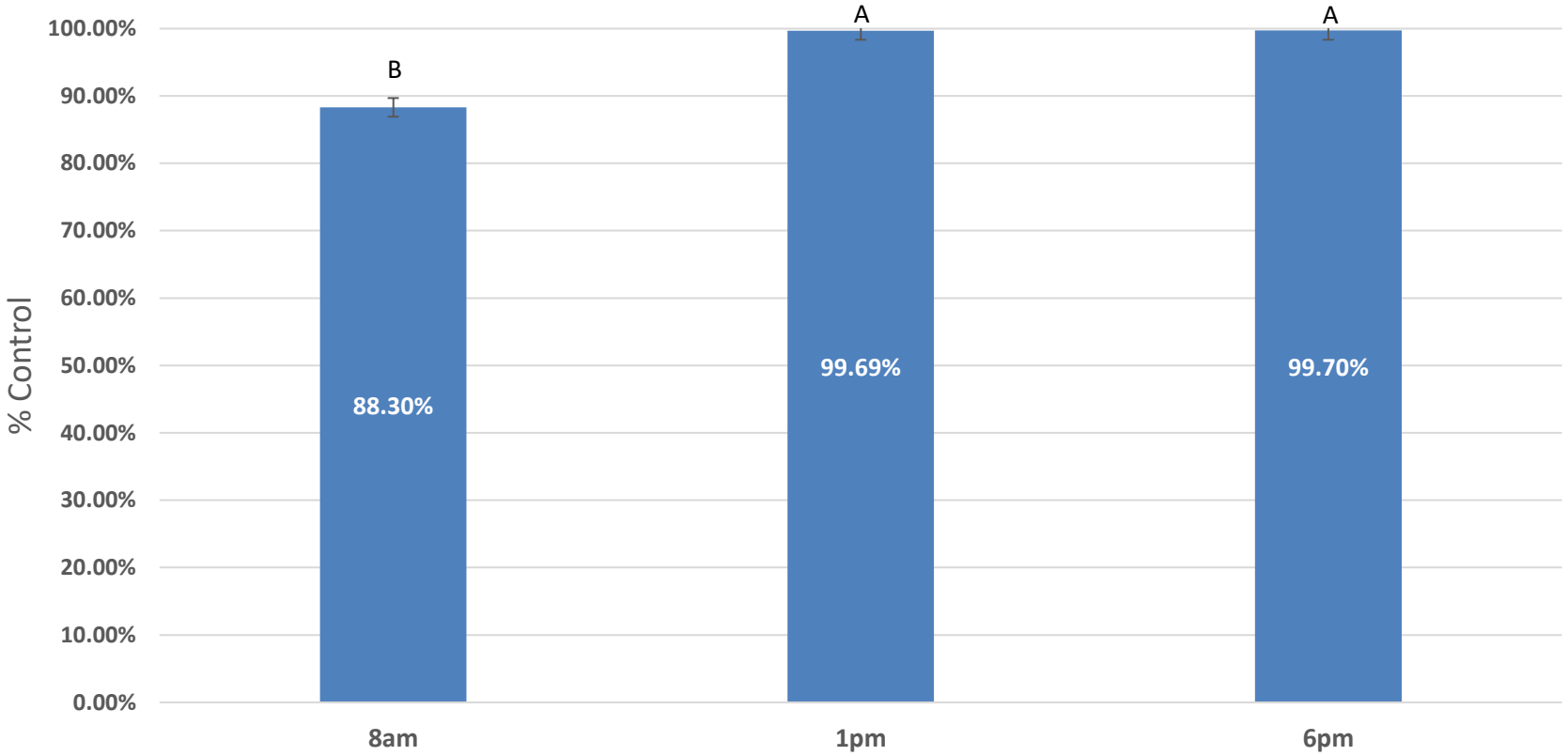
MH Time of Day - Percent Sucker Control as Weight of Suckers/Plant

P = 0.0005



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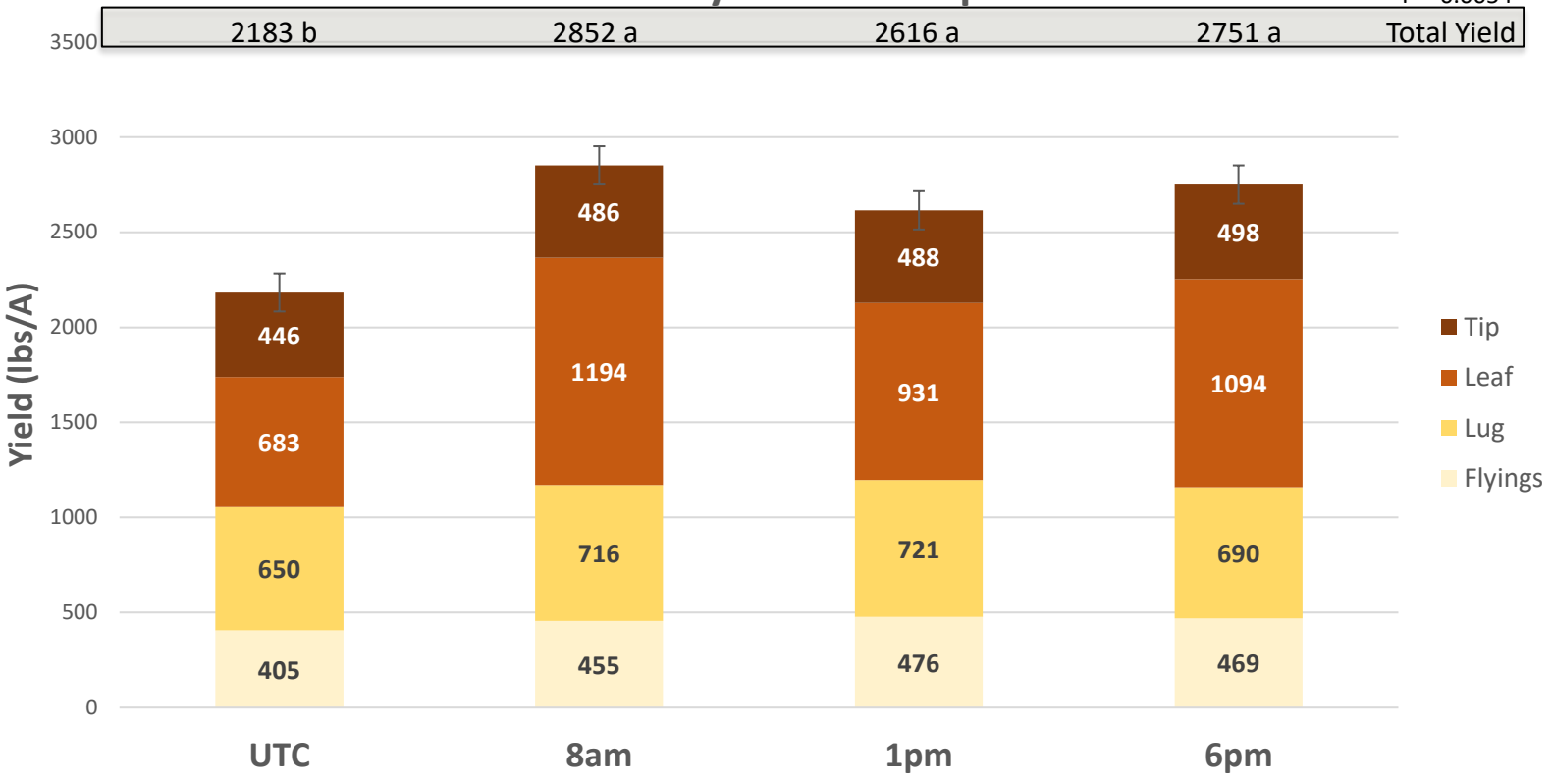
MH Time of Day - Yield Components



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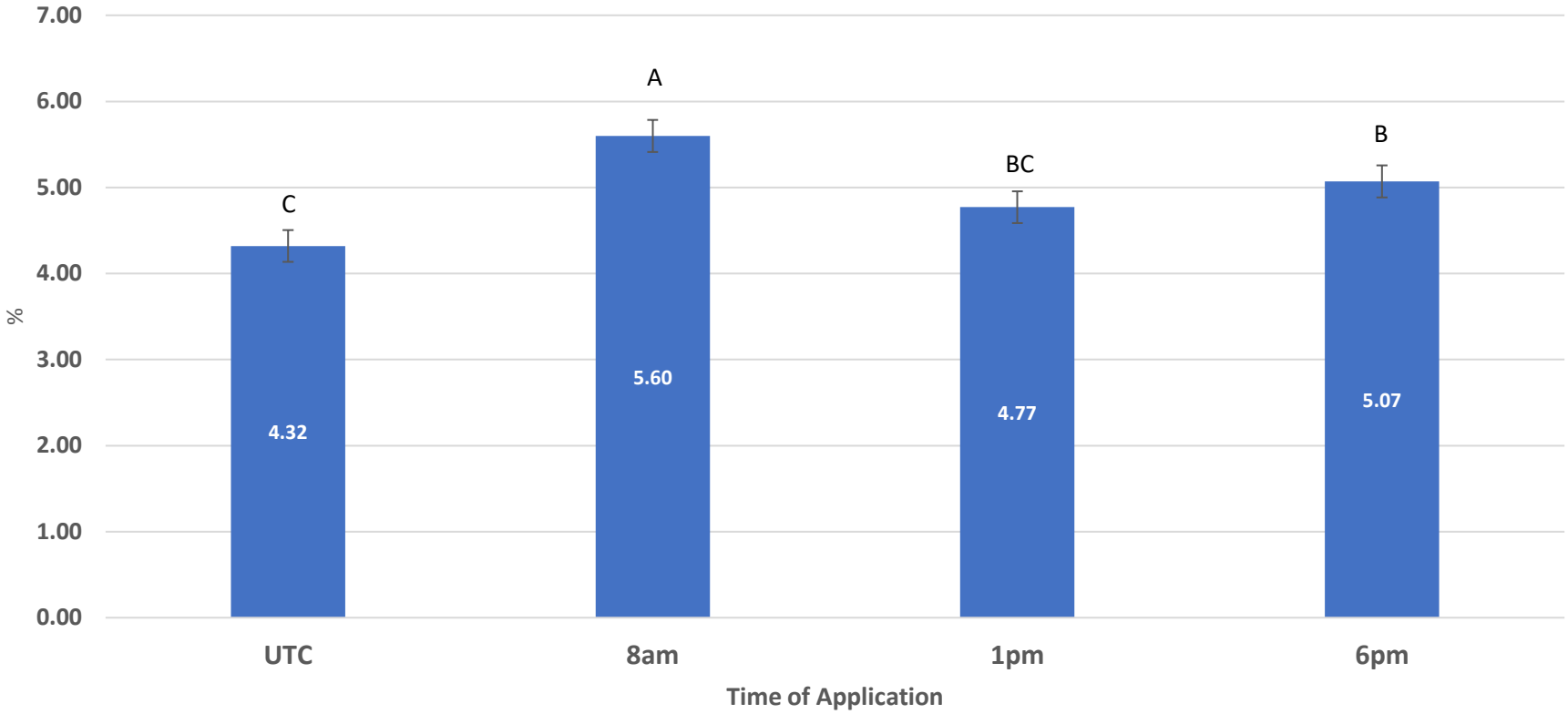
MH Time of Day - Total Alkaloids

P = 0.0028



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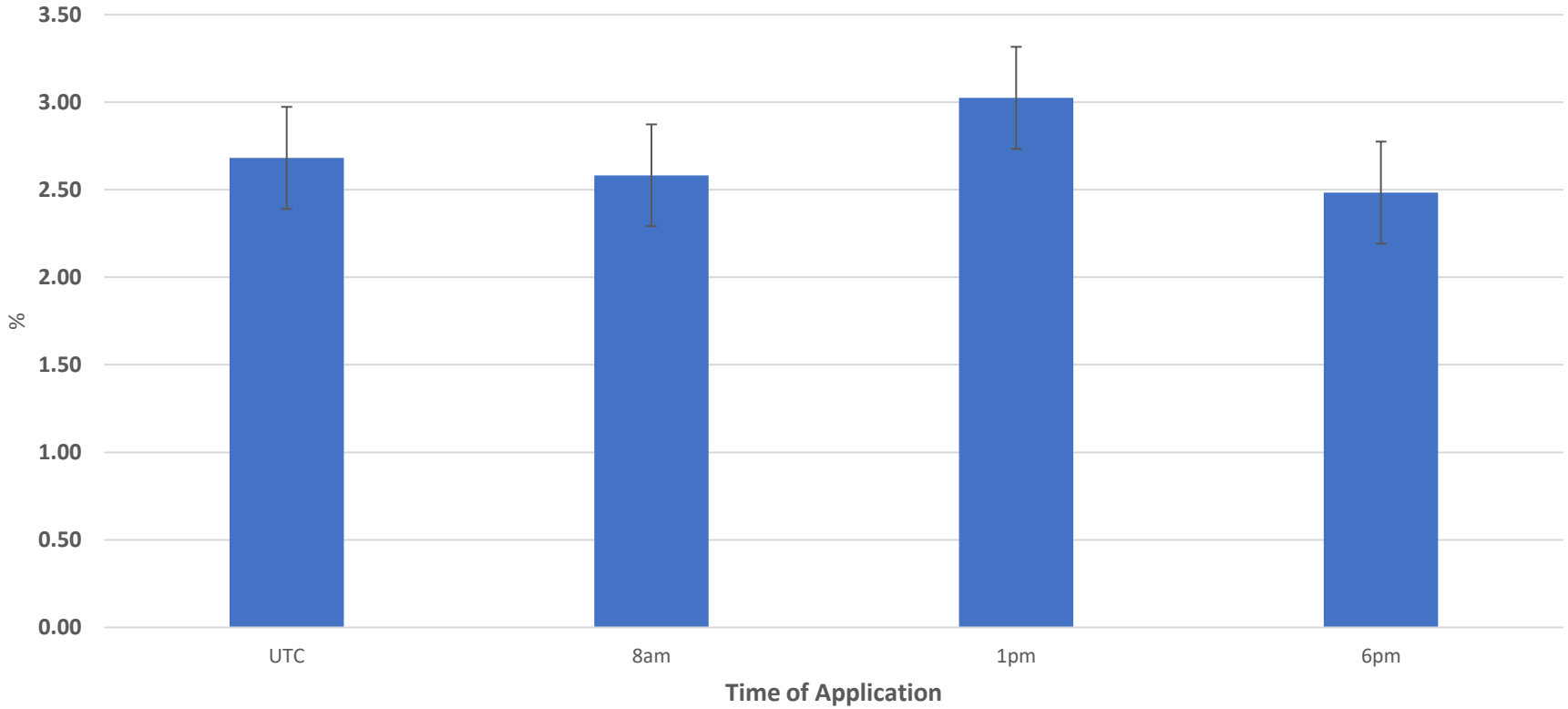
MH Time of Day - Conversion

P = 0.6077



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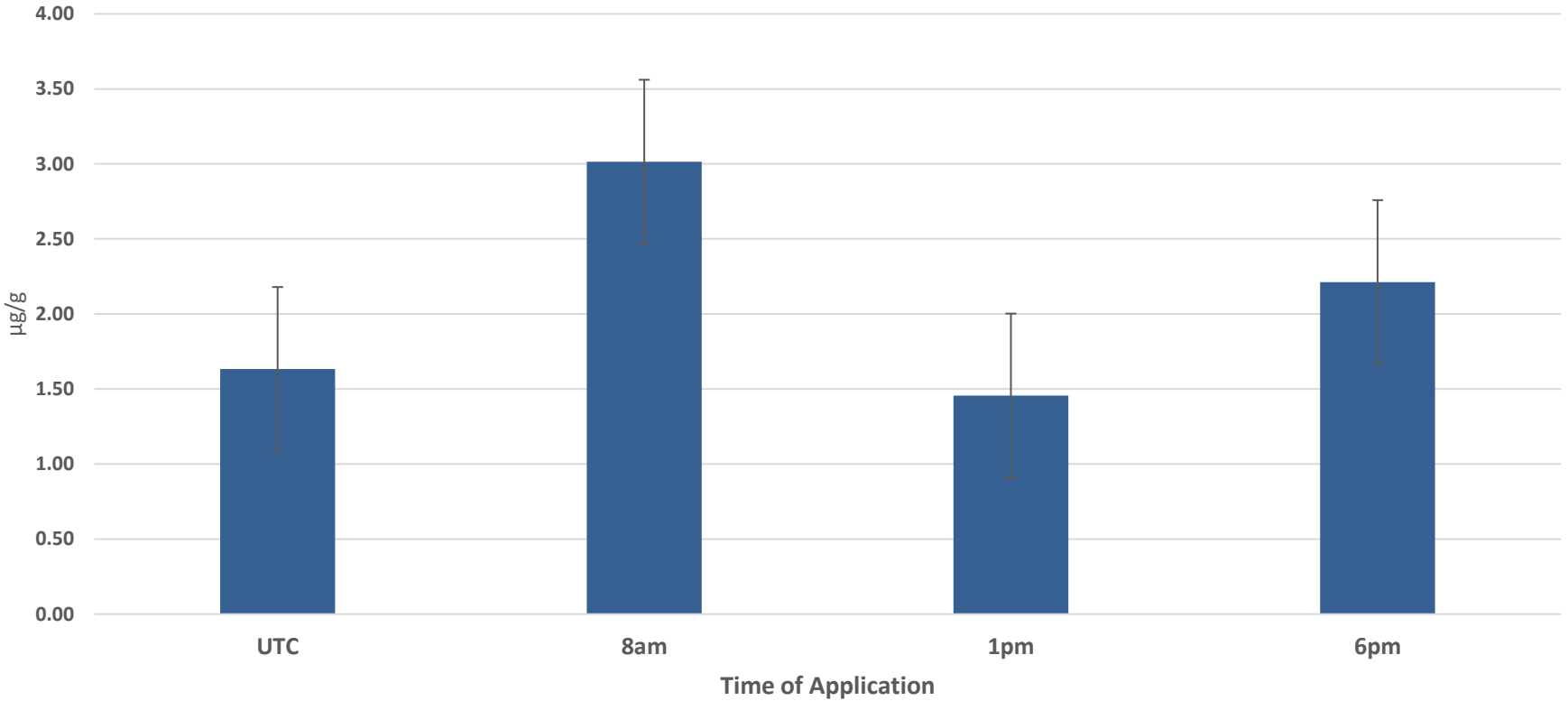
MH Time of Day - Total TSNA

P = 0.2297



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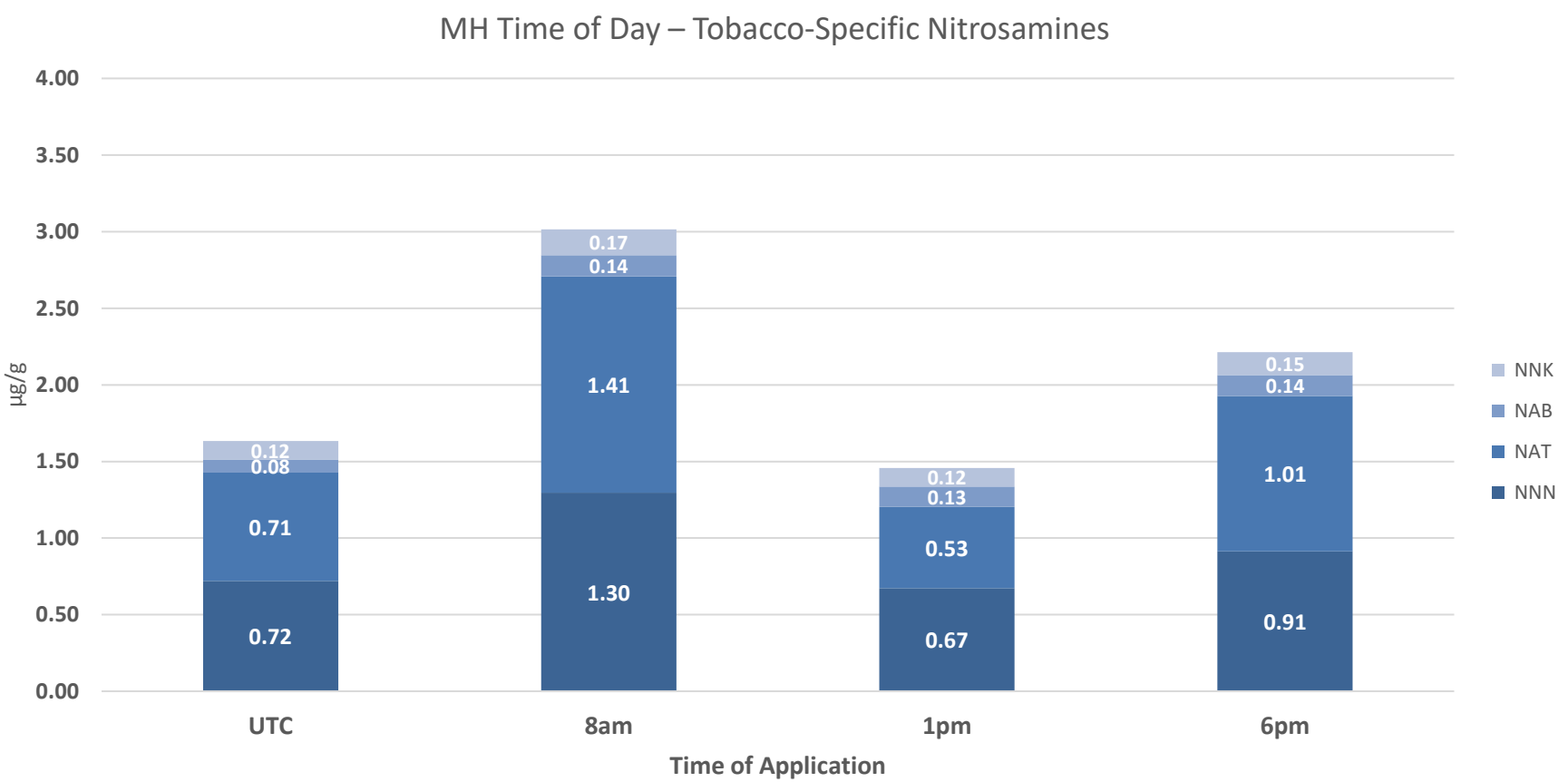

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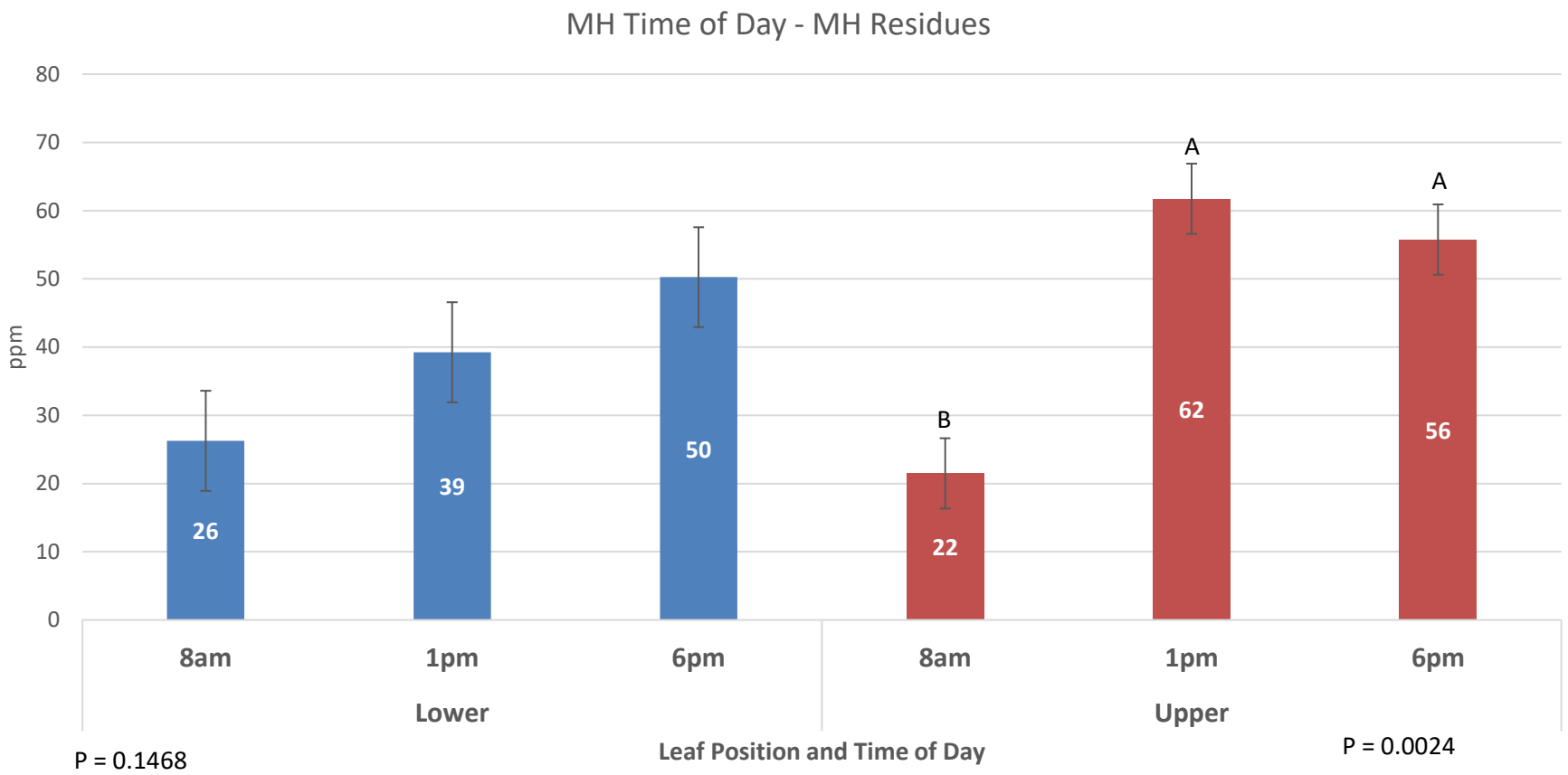

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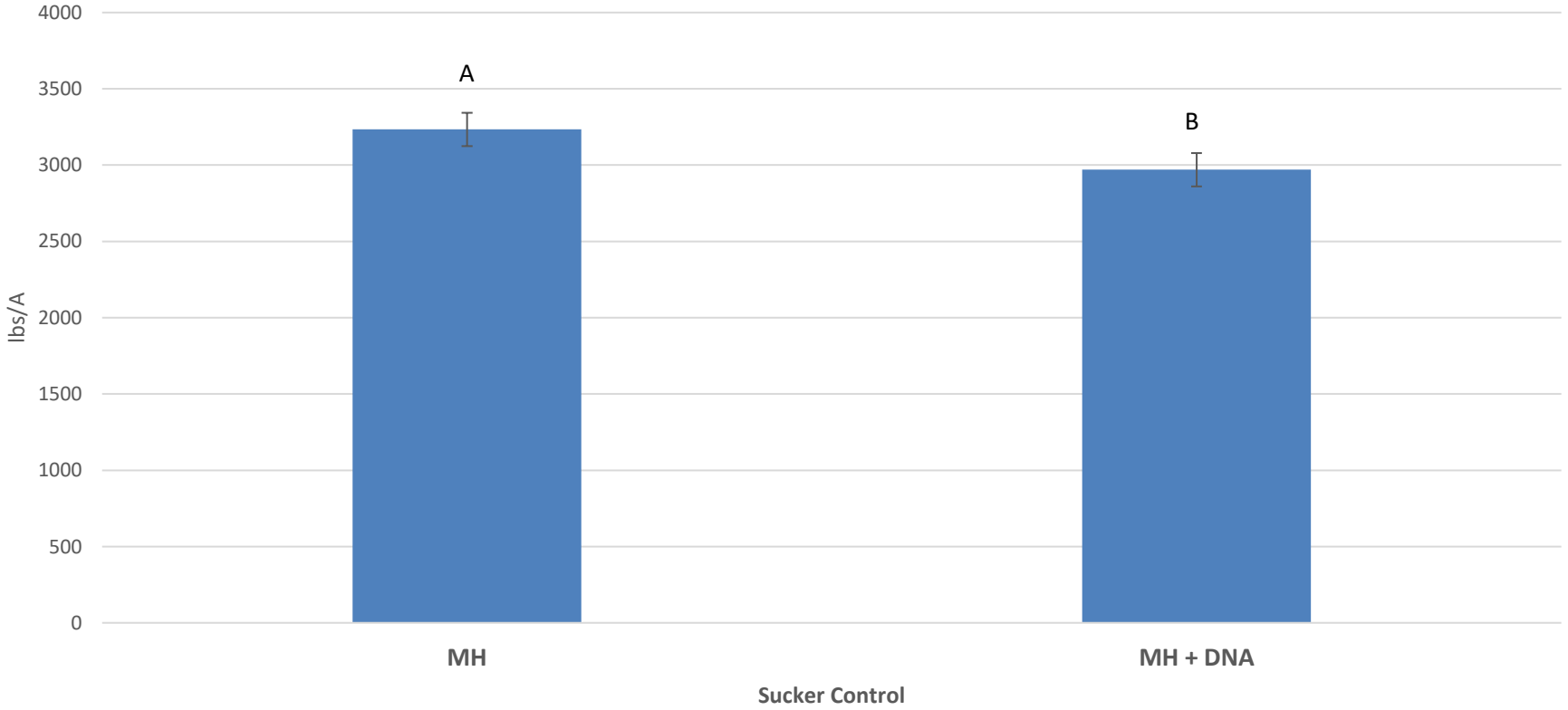
University of Kentucky – MH Time of Day Trial

- Field Study – 2017 and 2018
  - Included:
    - MH applied in morning and afternoon
    - MH + DNA applied in morning and afternoon
  - Collected yield, sucker control, and MH residues
  - Analyzed PROC GLIMMIX, SAS 9.4, alpha =0.1, Fisher's LSD

UK - MH Time of Day Trial - Main Effect of Product on Total Yield

P = 0.0994



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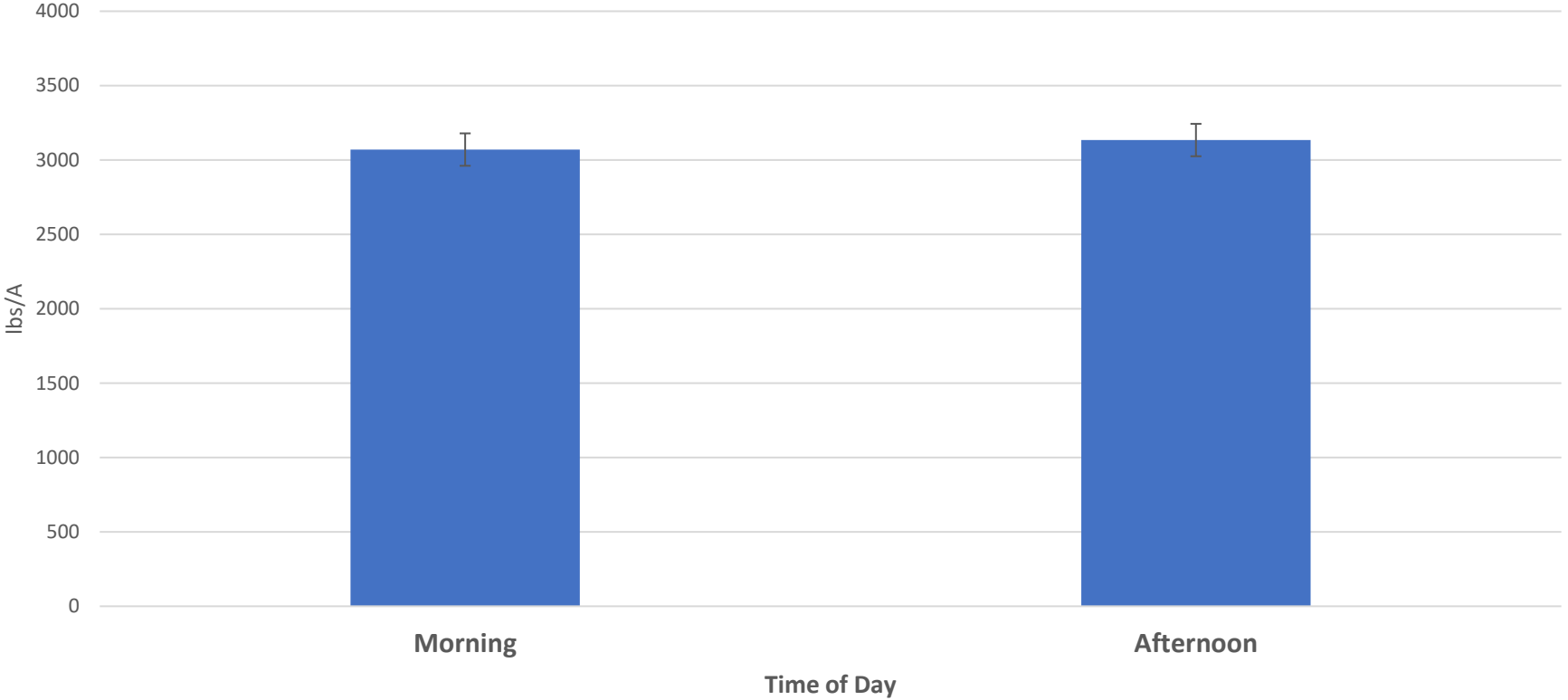
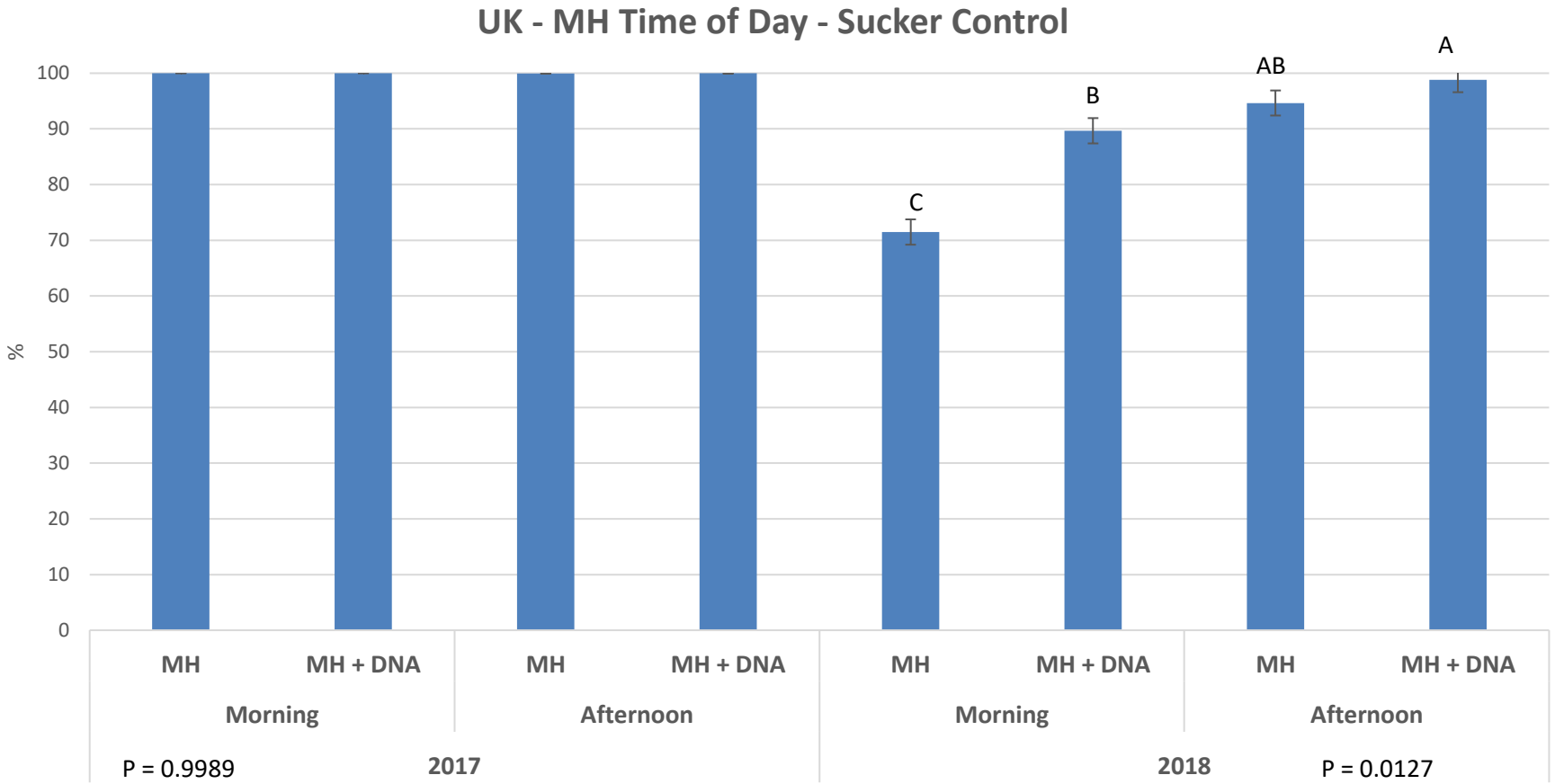
UK - MH Time of Day - Impact on Total Yield

P = 0.6842





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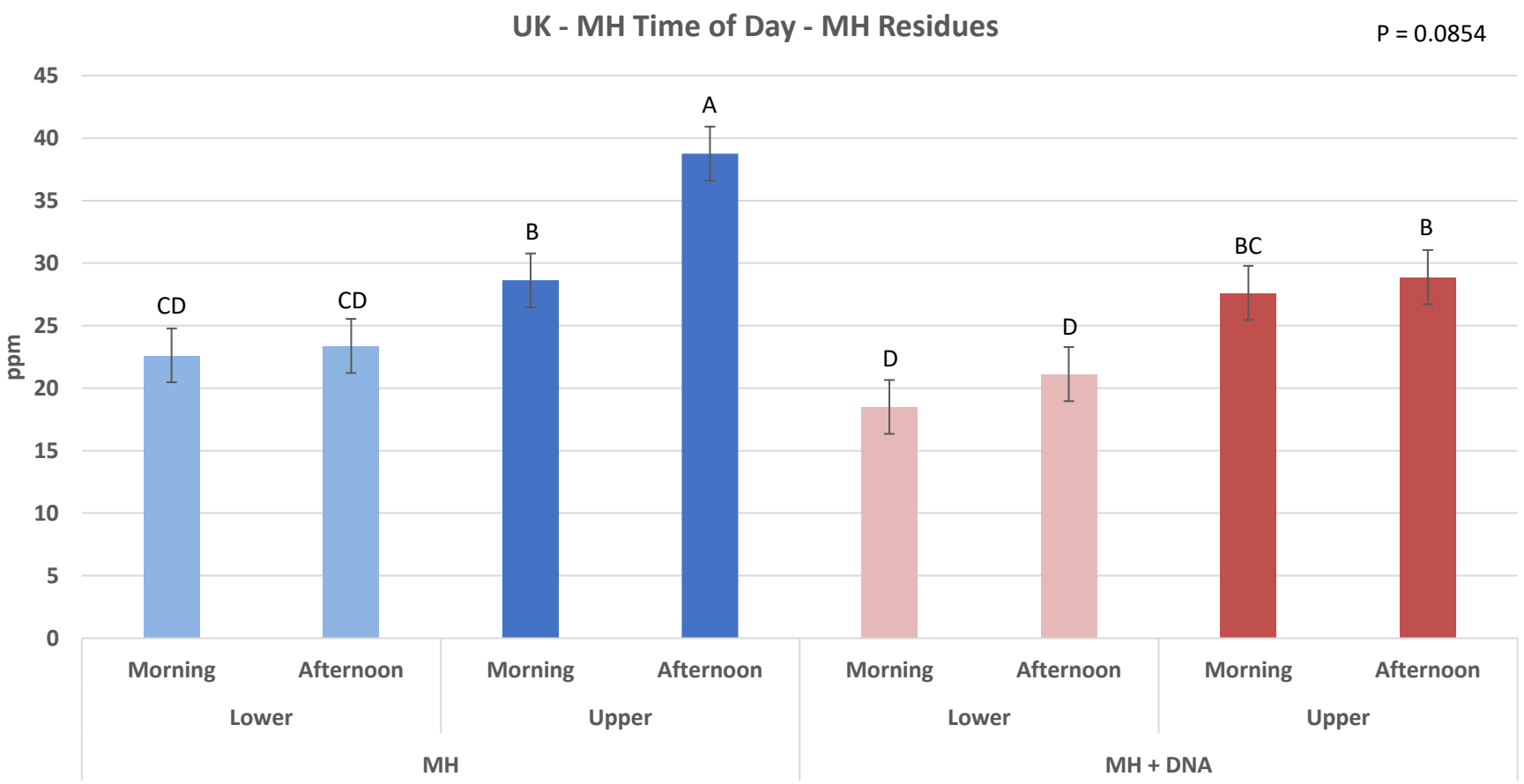

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Conclusions

- MH applied in the morning:
  - Reduction in sucker control (UT and UK)
  - Significantly higher total alkaloids (UT)
  - Reduction in MH residues in upper stalk positions (UT and UK)

- If applying in the morning, adding DNA increases sucker control (UK)

- No impact of MH application time on yield (UT and UK)

Thanks for the support!

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Thank you for your time!