Impact of Genotype and Management to Nicotine Concentration in Burley Tobacco

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Project Background & Objectives

- Renewed US-FDA effort to reduce nicotine to non-addictive levels
  - 0.3 – 0.5 mg g^{-1}
- Current burley varieties cannot meet the proposed standard
- Research has identified genes and practices that can reduce nicotine
  - Negative consequences commonly identified
- Evaluate four different burley genotypes, produced under two unique management systems
  - Quantify differences among genotypes
  - Quantify the impacts of certain cultural practices

Genotypes

- HB4488PLC
- TN90LC
- ITB5101LA
- MSTN90LA

Cultural Practices

- Local Standard Practices:
  - 17,784 plants ha^{-1}
  - 224 kg N ha^{-1}
  - Topped at early flower
- Low Nicotine Practices:
  - 24,898 plants ha^{-1}
  - 112 kg N ha^{-1}
  - No topping

Methods & Materials

- RCBD w/split-plot treatment arrangement
  - 4 replications
  - 1 growing environments
- Mechanically transplanted
- Two-row plots
  - 1.22 m × 10 m
- Basal fertilizer applied just before or immediately after transplanting
  - Sidedress N (28 % UAN) applied 4 weeks after transplanting

Data Collection & Analysis

- Pre-Harvest:
  - SPAD
  - N concentration
- Post-Harvest:
  - Yield (kg ha^{-1})
  - Visual Quality
  - Speciated alkaloids
- Data Analysis:
  - PROC GLIMMIX (SAS 9.4)
    - Treatment = fixed effect
    - Replication and Environment = random effect
  - Figures created in Microsoft Excel

SPAD & Total Nitrogen

Table 1. The influence of burley genotype and management program to SPAD measurements and total nitrogen concentration.[a]

Main Effect	SPAD			Total N	
Genotype	**4 WAT**	**8 WAT**	**At Harvest**	**4 WAT (%)**	**8 WAT (%)**
HB4488	29.8	34.3 c	15.3 b	6.05	5.82
TN90	31.0	37.5 b	16.8 b	6.16	5.83
ITB5101	31.5	39.3 a	16.9 b	5.96	5.62
MSTN90	35.1	36.8 b	20.8 a	6.06	5.75
Management					
Standard	31.3	37.3	16.5	6.03	6.12 a
Low Nicotine	32.4	36.6	18.3	6.09	5.39 b

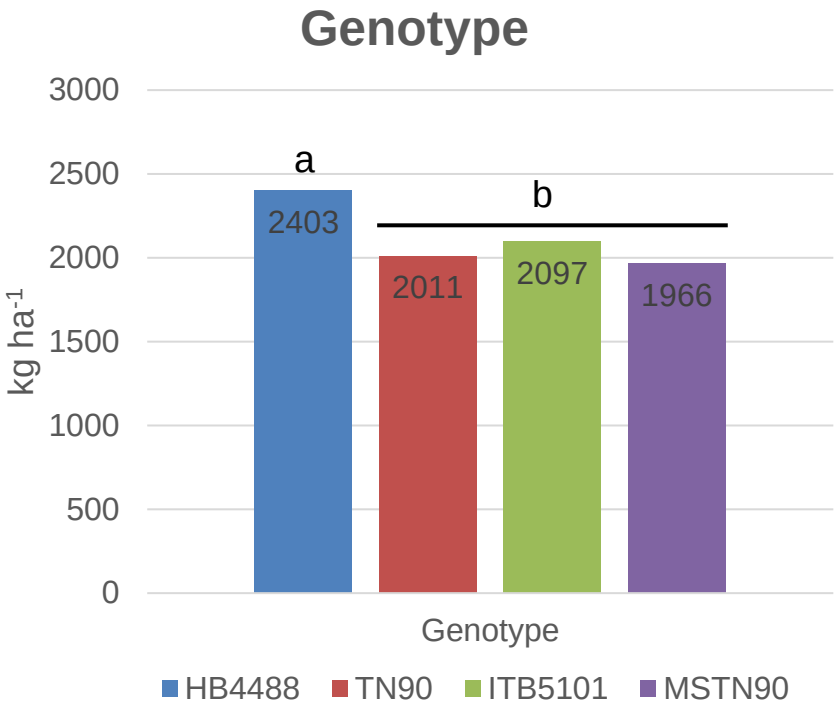
[a] Treatment means followed by the same lower or uppercase letter within the same column and main effect are not significantly different at the α=0.05 level.

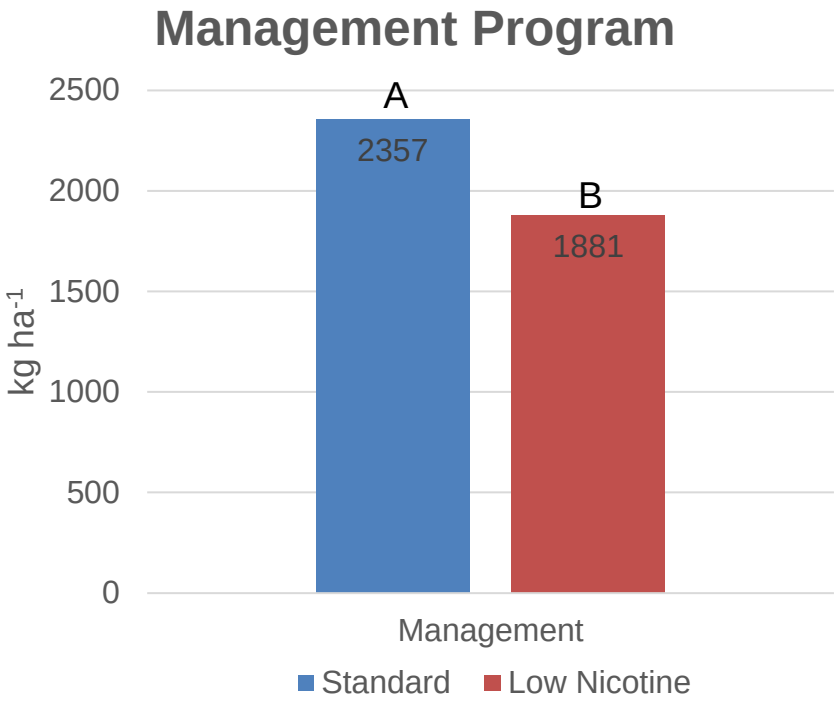
TN90 MSTN90 ITB5101 HB4488 TN90 MSTN90 ITB5101 HB4488

Standard Management

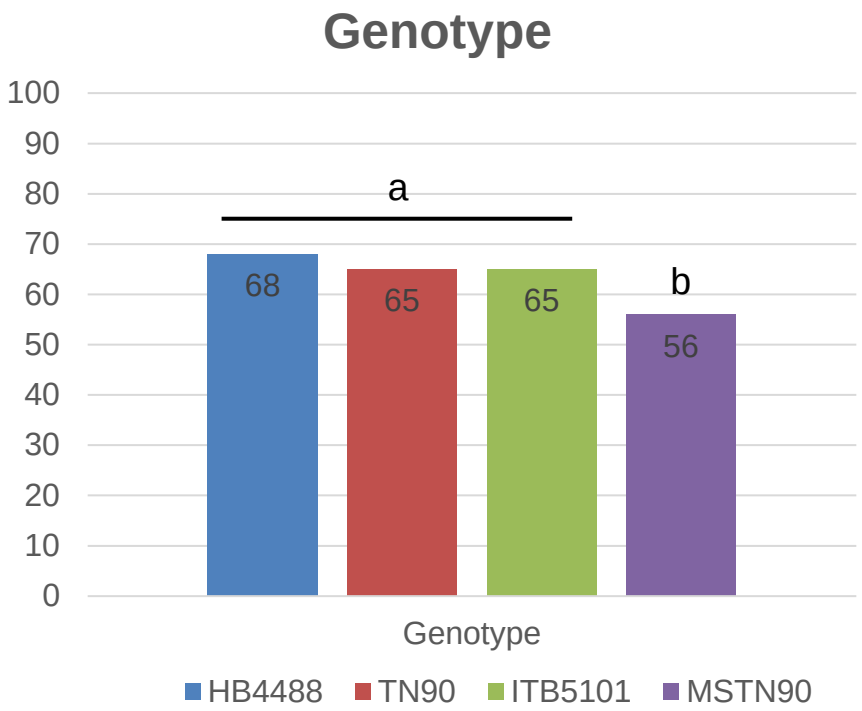
Low Nicotine Management

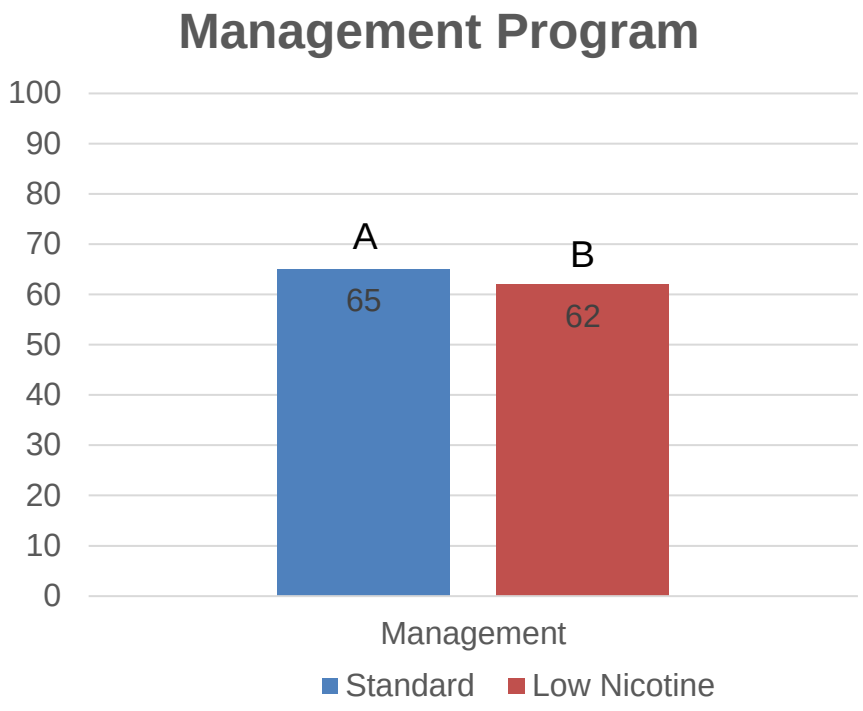
Cured Leaf Yield





Cured Leaf Visual Quality





Cured Leaf Chemistry – Composite

Table 2. Cured leaf alkaloid concentrations as influenced by the interaction of genotype and management program.[a] Data are pooled across two growing environments.

Management	Genotype	Nicotine	Nornicotine	Anatabine	Anabasine
		mg g^{-1}			
Standard	HB4488	35.80 b	1.13 b	2.57 b	0.25 b
Standard	TN90	49.55 a	2.18 a	3.64 a	0.34 a
Standard	MSTN90	4.14 d	0.15 c	0.30 d	0.04 d
Standard	ITB5101	0.98 d	0.15 c	0.10 d	0.02 de
Low Nicotine	HB4488	10.69 c	0.52 bc	0.85 c	0.11 c
Low Nicotine	TN90	11.76 c	0.62 bc	0.96 c	0.12 c
Low Nicotine	MSTN90	1.28 d	0.06 c	0.06 d	0.02 de
Low Nicotine	ITB5101	0.51 d	0.07 c	0.03 d	0.01 e

[a] Treatment means followed by the same lower or uppercase letter within the same column and main effect are not significantly different at the α=0.05 level.

Conclusions

- HB4488 generally the best genotype evaluated
  - Overlapping results for TN90, MSTN90, and ITB5101
- Low nicotine management may result in ↓ yield and quality
- Low nicotine management practices can may ↓ nicotine in conventional varieties
  - Not enough to meet new standards
- The same practices less effective with low nicotine genotypes
  - 0.51 mg nicotine g^{-1} w/ITB5101

Acknowledgements

- Funding: Altria Client Services
- Upper Mountain Research Station
- Tobacco Analytical Laboratory