

Nitrogen Fertilization, Yield and TSNA's in Tobacco

Paul Denton

Nitrogen in Tobacco

- **Most responsive nutrient**
- **Most expensive nutrient**
- **Rates not based on soil test**
- **Based on soils, weather, cropping system**

What Affects N Response ??

- Residual N in Soil
- Yield Potential
- Early Season Rainfall
- Soil Drainage
- ??????????

Costs of Excessive N

- **Increased Cost Of Fertilizer**
- **Blue Mold Susceptibility**
- **Slow Ripening Tobacco**
- **Slow Curing, Higher Moisture**
- **Difficulty in Sucker Control**
- **Higher TSNA Content**

What are TSNAs?

- **Tobacco Specific Nitrosamines**
- **Nitrogen containing compounds known to be potentially carcinogenic**
- **Formed during curing**
- **Increase during storage of cured leaf**

Major Factors Influencing TSNA Accumulation

- Curing conditions
- Storage conditions
- Nitrogen fertilization
- Varietal differences – **nornicotine**
 - high nornicotine increases chance of high TSNA

Formation of TSNA in Curing Leaves

Alkaloid + NO_2^- + Moisture =
TSNA

N Rates for Burley

Extension Recommendations

- TN – 150 to 200**
- VA – 175 to 200**
- NC – 150 to 200**
- KY – 150 to 350**

UK Recommended Nitrogen Rates

	1 st Yr Tobacco	2nd + Yr. Tobacco
Poorly Drained or Sandy Soils; Poor Sod	250 -300	300 – 350
Well / Mod. Well Drained Soil, Good Sod	200 - 250	250 – 300
Legume Sod or Legume Cover Crop	150 - 200	200 - 250

Nitrogen Loss From Soil

- **Leaching**
 - Coarser soils
 - Rarely a problem in TN
- **Denitrification**
 - Wetter soils, wet springs
 - Often more important than leaching

Replacing Lost N

- TN – “25 to 50 lbs with heavy early season rainfall ”
- KY – “In years of excessive rainfall, an additional application may be sidedressed”

TN – VA – KY Nitrogen Rate and Timing Study

Danny Peek

Paul Denton

Bob Pearce

TN - VA – KY Burley N Study

- **Preplant N – 80, 160, 240 lbs/ac**
- **Sidedress N – 0, 50, 100 lbs/ac**
- **Locations**
 - **Greeneville and Glade Spring, VA in 2004**
 - **Add Springfield and Lexington KY in 2005**

TN - VA – KY Burley N Study

Data collected

- **Measure soil nitrate N at sidedressing**
 - **Possible tool for adjusting for loss**
- **Leaf reflectance (Greenseeker)**
 - **Possible tool for determining sufficiency**
- **Determine yield, quality and TSNA content**

Pre-Sidedressing Soil Nitrate-N

Location	Preplant N (lbs/ac)		
	80	160	240
	-----Soil Nitrate-N (ppm)-----		
Greeneville 04	29	36	----
Glade Spr. 04	21	29	46
Greeneville 05	60	93	99
Glade Spr. 05	81	99	109
High. Rim 05	43	60	97

Yield by N Rate – Glade Spring 2004

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	-----Leaf Yd (lbs/ac)-----		
0	2108 bc*	2016 c*	2269 ab
50	2171 abc	2225 abc	2243 ab
100	2239 abc	2334 ab	2362 a

* Sig diff from highest yield, 90 % prob

Yield by N Rate – Greeneville 2004

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	-----Leaf Yd (lbs/ac)-----		
0	2183 c	2052 c	2477 a
50	2312 abc	2335 ab	2570 a
100	2400 ab	2395 ab	2385 ab

* Yields followed by same letter not sig diff.

Yield by N Rate – 2004

Two Locations

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	-----Leaf Yd (lbs/ac)-----		
0	2145	2034	2373
50	2241	2280	2406
100	2320	2364	2373

Leaf Lamina TSNA by N Rate Glade Spring 2004

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	----- Total TSNA (ppm) -----		
0	0.9	0.5	1.4
50	1.5	1.3	4.0
100	1.6	3.7	9.6*

* Mean greatly increased by one high value

Leaf Lamina TSNA by N Rate Greeneville 2004

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	----- Total TSNA (ppm) -----		
0	0.38	0.45	1.34
50	0.53	0.55	0.83
100	0.91	1.14	1.27

N Rates for Dark Tobacco

Andy Bailey 2003-2004

N Rate	Fire-cured 5 NS Tests	Fire-cured 1 Sig Test	Air Cured 2 tests
(lbs/ac)	-----Leaf Yd (lbs/ac)-----		
150	2732	3597	2866
300	2680	4285	2840
500	2838	4395	3044
1000	2747	4353	3046

SUMMARY

- Recommended nitrogen rates usually give optimum yield
- Splitting nitrogen was beneficial for burley in a wet year
- Additional sidedressing not needed when higher rates used, even in a wet year
- Response to N may have been reduced by rotation with sod
- TSNA content was increased by higher N rates