

***Effects of Variety and
Harvest Management on
Cured Leaf Quality and TSNA Content of
Burley Tobacco***

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INTRODUCTION

- **The Fair and Equitable Tobacco Reform Act of 2004 has resulted in numerous changes in burley tobacco production practices:**
 - **Fewer growers with larger acreages**
 - **Shift from traditional growing regions**
 - **Expansion of the growing season**
 - **Harvesting during adverse weather conditions**
 - **Majority of the crop comprised of only a few varieties**

INTRODUCTION

- **In recent years, a decline in leaf quality has been observed in some markets**
- **While quality issues are likely related to changes in production practices and adverse weather conditions during curing, some growers and buyers have questioned the leaf quality of recently released varieties**

INTRODUCTION

- In recent years, a decline in leaf quality has been observed in some markets
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- **The current study was conducted to evaluate the relative impact of variety versus harvest management on burley tobacco quality and TSNA content**

Effects of Variety and Harvest Management on Burley Quality

Six Varieties	Two Transplant/Harvest Regimes	Pick-up From Field
<p>TN 90LC KY 14 X L8LC KT 204LC KT 206LC KT 210LC KT 212LC</p>	<p>Transplant Mid-May Harvest 21 - 24 Days After Topping (Mid-August)</p> <p>Transplant Late June Harvest 35 - 38 Days After Topping (Late Sept - Early Oct)</p>	<p>Day of Cutting 3 Days after Cutting</p> <p>-----</p> <p>6 Days after Cutting 10 Days After Cutting</p>

Effects of Variety and Harvest Management on Burley Quality

Samples chosen from Lexington, Ky and Greeneville, TN

Split Split-Plot block design with three replications

		Day 0	Day 3	Day 6	Day 10
Plot Size Two Rows	Hung in Barn	0	30	15	15
Total of 60 Plants					

Variety Effects

Means Across Harvest Management Treatments

Data for All Treatments

Entry	Grade Index	Yield (lbs/A)	Income (\$/A)	Avg. Price (\$/Lb)	Usability Score
TN 90LC	45	2645	3739	1.44	3.2
KY 14 X L8LC	47	2831	4082	1.46	3.2
KT 204LC	46	2833	4029	1.45	3.1
KT 206LC	47	2771	3988	1.46	3.2
KT 210LC	50	2820	4176	1.51	3.0
KT 212LC	46	2766	4046	1.47	3.2
Range	4	188	437	0.07	0.2

Harvest Management Effects Means Across Varieties Early Harvest Trial - Greenville

Days in Field	Grade Index	Yield (lbs/A)	Income (\$/A)	Avg. Price (\$/Lb)	Usability Score
0 Day	50	2833	4250	1.50	3.7
0.81 inch rain on Day 1, 0.82 inch rain on Day 2					
3 Day	33	2839	3864	1.36	3.9
6 Day	31	2990	2332	0.78	4.8
0.51 inch rain on Day 7					
10 Day	30	3105	1615	0.52	4.9
Range	20	272	2635	0.98	1.2

Cut August 12, 21 days after topping

Period Ambient Temp: Max = 90 Min = 75 Avg = 83

All plots left in the field displayed sunscald

Early Versus Late Season Effect

Harvest Management Means Across Varieties

Data without Significant Rainfall

Days in Field	<u>Grade Index</u>		<u>Avg. Price</u>		<u>Avg. Usability</u>	
	Early	Late	Early	Late	Early	Late
0 Day	67	44	1.63	1.52	2.4	3.0
3 Day	62	47	1.68	1.57	2.8	3.1
6 Day	66	46	1.69	1.59	2.5	2.8
10 Day	62	41	1.66	1.56	2.9	2.8
Mean	64	45	1.67	1.56	2.6	2.9

Summary of Quality Effects

Varieties had minimal effect on cured leaf quality

Rainfall occurring on tobacco left in the field drastically reduced quality

In the absence of rainfall, there was no negative impact from leaving tobacco in the field for up to six days; quality declined after ten days in field

Late harvested tobacco was inferior to early harvested tobacco when rainfall was not a factor

What is the impact of harvest management on TSNA?

***A Subset of Samples were Chosen
for TSNA Analyses***

Effects of Variety and Harvest Management on Burley Quality

Six Varieties	Two Transplant/Harvest Regimes	Pick-up From Field
<p>TN 90LC KY 14 X L8LC KT 204LC</p>	<p>Transplant Mid-May Harvest 21 - 24 Days After Topping (Mid-August)</p> <p>Transplant Late June Harvest 35 - 38 Days After Topping (Late Sept - Early Oct)</p>	<p>Day of Cutting 3 Days after Cutting</p> <p>-----</p> <p>6 Days after Cutting 10 Days After Cutting</p>

Harvest Management Study

Early Harvest - Lexington

Cut 21 days after Topping

Treatment	Cut	Pick-up	Hang	Rainfall	Sunscald
0	Aug. 16	Aug. 16	Aug. 19	0	No
3	Aug. 16	Aug. 19	Aug. 19	0.11 Aug 18	Yes
6	Aug. 16	Aug. 22	Aug. 22	0.11 Aug 18	Yes
9	Aug. 16	Aug. 25	Aug. 25	0.11 Aug 18	Yes

Period Air Temperature: Max = 86, Min = 64, Avg = 75

Variety Effects

Means Across Harvest Management Treatments

Early Season - Lexington

Variable	Variety				
	TN 90LC	ms KY14XL8LC	KT 204LC	PR>F	LSD _{.05}
Grade Index	64	70	69	0.19	ns
Price (\$/lb)	1.71	1.70	1.70	0.77	ns
Yield (lb/A)	2712 b	2663 b	2979 a	0.001	155
Revenue (\$/A)	4637 b	4524 b	5062 a	0.003	290
NNN (ug/g)	0.40 b	0.71 a	0.38 b	0.0001	0.09
NAT (ug/g)	0.39 b	0.84 a	0.34 b	0.0001	0.12
NNK (ug/g)	0.03 b	0.11 a	0.03 b	0.0001	0.03
TSNA (ug/g)	0.82 b	1.68 a	0.75 b	0.0001	0.20

Harvest Management Treatment Effects Means Across Varieties

Early Season - Lexington

Variable	Days between Cutting and Housing					
	0	3	6	10	PR>F	LSD. ₀₅
Grade Index	74 a	64 b,c	71 a,b	63 c	0.02	7
Price (\$/lb)	1.76 a	1.68 b	1.71 b	1.66 b	0.008	0.05
Yield (lb/A)	2816	2747	2701	2875	0.18	ns
Revenue (\$/A)	4961	4620	4606	4778	0.07	ns
NNN (ug/g)	0.23 c	0.52 b	0.74 a	0.51 b	0.0001	0.09
NAT (ug/g)	0.29 c	0.52 b	0.75 a	0.52 b	0.01	0.22
NNK (ug/g)	0.02 c	0.03 b,c	0.08 a,b	0.09 a	0.03	0.05
TSNA (ug/g)	0.53 c	1.08 b	1.59 a	1.13 b	0.002	0.34

Harvest Management Study
Early Harvest - Greeneville
Cut 21 days after Topping

Treatment	Cut	Pick-up	Hang	Rainfall	Sunscald
0	Aug. 12	Aug. 12	Aug. 15	0	No
3	Aug. 12	Aug. 15	Aug. 15	0.81 Aug 13 0.81 Aug 14	Yes
6	Aug. 12	Aug. 18	Aug. 18	0.81 Aug 13 0.81 Aug 14	Yes
10	Aug. 12	Aug. 22	Aug. 22	0.81 Aug 13 0.81 Aug 14 0.51 Aug 19	Yes

Period Air Temperature: Max = 90, Min = 75, Avg = 83

Variety Effects

Means Across Harvest Management Treatments

Early Season - Greeneville

Variable	Variety				
	TN 90LC	ms KY14XL8LC	KT 204LC	PR>F	LSD _{.05}
Grade Index	32	32	39	0.20	ns
Price (\$/lb)	0.99	1.05	0.97	0.63	ns
Yield (lb/A)	2701 b	2952 a	3037 a	0.02	253
Revenue (\$/A)	2673	3099	2946	0.40	ns
NNN (ug/g)	0.54	0.64	0.61	0.65	ns
NAT (ug/g)	0.24	0.40	0.33	0.12	ns
NNK (ug/g)	0.05	0.10	0.04	0.25	ns
TSNA (ug/g)	0.83	1.14	0.98	0.32	ns

Harvest Management Treatment Effects Means Across Varieties

Early Season - Greeneville

Variable	Days between Cutting and Housing					
	0	3	6	10	PR>F	LSD. ₀₅
Grade Index	49 a	31 b	28 b	29 b	0.001	7
Price (\$/lb)	1.47 a	1.34 a	0.74 b	0.46 b	0.001	0.31
Yield (lb/A)	2786 b	2749 b	2853 b	3201 a	0.006	206
Revenue (\$/A)	4106 a	3680 a	2011 b	1499 b	0.002	1041
NNN (ug/g)	0.45	0.71	0.57	0.64	0.17	ns
NAT (ug/g)	0.37	0.32	0.26	0.36	0.16	ns
NNK (ug/g)	0.04	0.04	0.04	0.14	0.17	ns
TSNA (ug/g)	0.86	1.07	0.87	1.14	0.34	ns

Harvest Management Study
Late Harvest - Lexington, KY
Cut 35 days after Topping

Treatment	Cut	Pick-up	Hang	Rainfall	Sunscald
0	Oct. 4	Oct. 4	Oct. 7	0	No
3	Oct. 4	Oct. 7	Oct. 7	0	No
6	Oct. 4	Oct. 10	Oct. 10	0	No
10	Oct. 4	Oct. 13	Oct. 13	0	No

Period Air Temperature: Max = 74, Min = 51, Avg = 63

Variety Effects

Means Across Harvest Management Treatments

Late Season - Lexington

Variable	Variety				
	TN 90LC	ms KY14XL8LC	KT 204LC	PR>F	LSD _{.05}
Grade Index	41	45	44	0.53	ns
Price (\$/lb)	1.53	1.64	1.69	0.18	ns
Yield (lb/A)	2480	2680	2582	0.23	ns
Revenue (\$/A)	3769	4386	4354	0.09	ns
NNN (ug/g)	0.20	0.19	0.18	0.87	ns
NAT (ug/g)	0.18	0.22	0.14	0.25	ns
NNK (ug/g)	0.01	0.03	0.01	0.44	ns
TSNA (ug/g)	0.40	0.44	0.34	0.49	ns

Harvest Management Treatment Effects Means Across Varieties

Late Season - Lexington

Variable	Days between Cutting and Housing					
	0	3	6	10	PR>F	LSD. ₀₅
Grade Index	47	44	47	35	0.32	ns
Price (\$/lb)	1.65	1.63	1.70	1.50	0.21	ns
Yield (lb/A)	2516	2504	2673	2629	0.26	ns
Revenue (\$/A)	4150	4080	4550	3899	0.21	ns
NNN (ug/g)	0.12	0.15	0.24	0.27	0.15	ns
NAT (ug/g)	0.16	0.17	0.19	0.20	0.38	ns
NNK (ug/g)	0.01	0.01	0.01	0.03	0.13	ns
TSNA (ug/g)	0.28	0.33	0.44	0.51	0.13	ns

Harvest Management Study
Late Harvest - Greeneville, TN
Cut 35 days after Topping

Treatment	Cut	Pick-up	Hang	Rainfall	Sunscald
0	Sept. 27	Sept. 27	Sept. 30	0	No
3	Sept. 27	Sept. 30	Sept. 30	0	No
6	Sept. 27	Oct. 3	Oct. 3	0	No
10	Sept. 27	Oct. 7	Oct. 7	0	No

Period Air Temperature: Max = 77, Min = 32, Avg = 57

Variety Effects

Means Across Harvest Management Treatments

Late Season - Greeneville

Variable	Variety				
	TN 90LC	ms KY14XL8LC	KT 204LC	PR>F	LSD _{.05}
Grade Index	33 a,b	35 a	31 b	0.01	3
Price (\$/lb)	1.44 a,b	1.50 a	1.38 b	0.04	0.09
Yield (lb/A)	3127	3472	3195	0.11	ns
Revenue (\$/A)	4501 b	5203 a	4427 b	0.03	594
NNN (ug/g)	0.24	0.23	0.23	0.96	ns
NAT (ug/g)	0.14 b	0.25 a	0.12 b	0.001	0.06
NNK (ug/g)	0.06	0.01	0.01	0.34	ns
TSNA (ug/g)	0.44	0.48	0.36	0.19	ns

Harvest Management Treatment Effects Means Across Varieties

Late Season - Greeneville

Variable	Days between Cutting and Housing					
	0	3	6	10	PR>F	LSD. ₀₅
Grade Index	29	34	35	32	0.47	ns
Price (\$/lb)	1.33	1.50	1.48	1.45	0.42	ns
Yield (lb/A)	3301	3349	3125	3283	0.39	ns
Revenue (\$/A)	4429	5024	4615	4773	0.57	ns
NNN (ug/g)	0.16	0.21	0.26	0.29	0.08	ns
NAT (ug/g)	0.16	0.18	0.18	0.16	0.42	ns
NNK (ug/g)	0.01	0.00	0.07	0	0.47	ns
TSNA (ug/g)	0.33	0.40	0.46	0.51	0.22	ns

Summary of Chemistry Effects

KY 14 X L8 tended to have higher TSNA, primarily NAT; however, the difference was significant for only the early Lexington trial

For early season trials, tobacco picked up from the field on the day of harvest displayed better quality

Tobacco picked up on the day of harvest tended to have the lowest TSNA content; this was significant only for the early Lexington trial

Rainfall occurring while the tobacco remained in the field following harvest did not appear to substantially increase TSNA content

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