Effects of Variety and Harvest Management on Burley Tobacco Quality

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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

Commercial Burley Test
Relative Effects of Variety, Location, and Year on Quality
Twenty Independent Trials

Variety	Variety Mean	Location	Location Mean*	Year	Year Mean
KT 210LC	61	LEX	62	2006	68
TN 86LC	61	WC	62	2007	62
TN 97LC	61	HRES	59	2008	59
NC 2002LC	59	TES	59	2009	53
KT 206LC	59			2010	35
TN 90LC	58				
KT 204LC	58				
KY 14 X L8LC	58				
NC 7LC	57				
KT 209LC	57				
Range	4		3		33

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
- **The current study was conducted to evaluate the relative impact of variety versus harvest management on burley tobacco quality**

Effects of Variety and Harvest Management on Burley Quality

Six Varieties	Two Transplant/Harvest Regimes	Pick-up From Field
TN 90LC	Transplant Mid-May	Day of Cutting
KY 14 X L8LC	Harvest 21 - 24 Days	3 Days after Cutting
KT 204LC	After Topping	6 Days after Cutting
KT 206LC	(Mid-August)	10 Days After Cutting
KT 210LC		----------
KTH 2901LC	Transplant Late June	Hang Same Day
	Harvest 35 - 38 Days	
	After Topping	Hang All Plots
	(Late Sept - Early Oct)	10 Days After Cutting

Effects of Variety and Harvest Management on Burley Quality

Study conducted at Lexington, Ky and Greeneville and Springfield, TN

Split Split-Plot block design with three replications

Plot size Four Rows
Total of 120 Plants

	Day 0	Day 3	Day 6	Day 10
On Scaffold	15	15	15	0
Hung in Barn	15	15	15	30

Variety Means Across Harvest Management Treatments
Early Versus Late Season Effect

Entry	Grade Index		Yield (lbs/A)		Income ($/A)	
	Early	Late	Early	Late	Early	Late
TN 90LC	48	43	2905	2784	4418	4285
KY 14 X L8LC	49	45	3091	3149	4830	4951
KT 204LC	48	44	3164	3097	5005	4750
KT 206LC	49	45	3273	2920	5051	4611
KT 210LC	52	47	3154	2866	5109	4576
KTH 2901LC	48	43	3045	2989	4627	4628
Range	4	4	368	365	791	666

Variety Effects

Means Across Harvest Management Treatments

Data for All Treatments

Days in Field	Grade Index	Yield (lbs/A)	Income ($/A)
TN 90LC	46	2844	4352
KY 14 X L8LC	47	3120	4891
KT 204LC	46	3130	4878
KT 206LC	47	3096	4831
KT 210LC	50	3010	4843
KTH 2901LC	46	3017	4627
Range	4	286	539

Variety Effects

Means Across Harvest Management Treatments

Data Only for Treatments Without Rainfall

Days in Field	Grade Index	Yield (lbs/A)	Income ($/A)
TN 90LC	50	2771	4581
KY 14 X L8LC	52	3037	5069
KT 204LC	51	3074	5085
KT 206LC	52	2957	4986
KT 210LC	54	2886	4926
KTH 2901LC	50	2937	4842
Range	4	303	504

Harvest Management Effects

Means Across Varieties

All Trials

Days in Field	Grade Index	Yield (lbs/A)	Income ($/A)
0	56	2986	5110
3	49	3007	4988
6	43	3027	4468
10	39	3126	4381

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

Harvest Management Effects

Means Across Varieties

Early Harvest Trial - Lexington

Days in Field	Barn vs Scaffold	Grade Index	Yield (lbs/A)	Income ($/A)
0 Day	Scaffold	75	2722	5322
0 Day	Barn	75	2734	5372
0.11 inch rain on Day 2				
3 Day	Scaffold	66	2920	5520
3 Day	Barn	66	2801	5304
6 Day	Scaffold	63	2800	5193
6 Day	Barn	70	2797	5423
9 Day	Barn	62	2952	5519

Period Ambient Temp: Max = 86 Min = 64 Avg = 75

All plots left in the field dispayed sunscald

Harvest Management Effects on Leaf Color

Means Across Varieties

Early Harvest Trial - Lexington

Days in Field	Barn vs Scaffold	Grade Index	No. Samples with Inferior Color					
			M	K	G	V	N	NOG
0 Day	Scaffold	75	1			2	1	
0 Day	Barn	75				1		
0.11 inch rain on Day 2								
3 Day	Scaffold	66	2	3	1	4		
3 Day	Barn	66		1	2	5		
6 Day	Scaffold	63	7	6			1	
6 Day	Barn	70				2	1	
9 Day	Barn	62	3	6	1		3	

Period Ambient Temp: Max = 86 Min = 64 Avg =75

All Plots left in the field dispayed sunscald

Harvest Management Effects on Leaf Quality

Means Across Varieties

Early Harvest Trial - Lexington

Days in Field	Barn vs Scaffold	Grade Index	Leaf Quality of Farm Grades*				
			Flyings	Cutters	Leaf	Tips	Avg
0 Day	Scaffold	75	4.2	3.3	2.3	4.4	3.6
0 Day	Barn	75	4.2	3.3	2.5	4.3	3.6
0.11 inch rain on Day 2							
3 Day	Scaffold	66	4.4	3.7	2.8	4.6	3.9
3 Day	Barn	66	4.4	3.4	2.8	4.6	3.8
6 Day	Scaffold	63	4.7	3.8	3.2	4.6	4.1
6 Day	Barn	70	4.4	3.8	2.7	4.4	3.8
9 Day	Barn	62	4.6	4.2	3.2	4.6	4.2

Period Ambient Temp: Max = 86 Min = 64 Avg = 75

All Plots left in the field dispayed sunscald

*Nondescript = 6 No-Grade = 8

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

Harvest Management Effects

Means Across Varieties

Early Harvest Trial - Greeneville

Days in Field	Barn vs Scaffold	Grade Index	Yield (lbs/A)	Income ($/A)
0 Day	Scaffold	62	3804	7089
0 Day	Barn	50	3666	6221
0.81 inch rain on Day 1, 0.82 inch rain on Day 2				
3 Day	Scaffold	28	3681	5874
3 Day	Barn	33	3681	5187
6 Day	Scaffold	32	3990	5646
6 Day	Barn	31	3853	5434
0.51 inch rain on Day 7				
10 Day	Barn	30	3982	4674

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

All plots left in the field dispayed sunscald

Harvest Management Effects on Leaf Color

Means Across Varieties

Early Harvest Trial - Greeneville

Days in Field	Barn vs Scaffold	Grade Index	No. Samples with Inferior Color					
			M	K	G	V	N	NOG
0 Day	Scaffold	62		7		6		
0 Day	Barn	50		25		3		
0.81 inch rain on Day 1, 0.82 inch rain on Day 2								
3 Day	Scaffold	28		40	14		1	
3 Day	Barn	33		51			7	
6 Day	Scaffold	32		54			1	
6 Day	Barn	31		52	3		1	
0.51 inch rain on Day 7								
10 Day	Barn	30		22			27	

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

All Plots left in the field dispayed sunscald

Harvest Management Effects on Leaf Quality

Means Across Varieties

Early Harvest Trial - Greeneville

Days in Field	Barn vs Scaffold	Grade Index	Leaf Quality of Farm Grades*				
			Flyings	Cutters	Leaf	Tips	Avg
0 Day	Scaffold	62	4.5	4.3	3.4	4.2	4.1
0 Day	Barn	50	4.4	4.2	3.7	4.2	4.1
0.81 inch rain on Day 1, 0.82 inch rain on Day 2							
3 Day	Scaffold	28	5.2	4.7	4.3	4.7	4.7
3 Day	Barn	33	6.1	4.6	4.3	4.7	4.9
6 Day	Scaffold	32	5.1	4.6	4.3	4.7	4.7
6 Day	Barn	31	4.9	4.6	4.6	4.9	4.8
0.51 inch rain on Day 7							
10 Day	Barn	30	6.6	5.4	5.9	6.8	6.2

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

All Plots left in the field dispayed sunscald

*Nondescript = 6 No-Grade = 8

Harvest Management Study

Early Harvest - Springfield, TN

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	Yes
6	Aug. 16	Aug. 22	Aug. 22	1.2 Aug. 20	Yes
10	Aug. 16	Aug. 25	Aug. 25	1.2 Aug. 20	Yes

Period Air Temperature: Max = 95 , Min = 60, Avg = 79

Harvest Management Effects

Means Across Varieties

Early Harvest Trial - Springfield

Days in Field	Barn vs Scaffold	Grade Index	Yield (lbs/A)	Income ($/A)
0 Day	Scaffold	67	2612	4988
0 Day	Barn	71	2656	5179
3 Day	Scaffold	61	2642	4943
3 Day	Barn	57	2606	4676
1.2 inces of rain on Day 4				
6 Day	Scaffold	18	2631	1611
6 Day	Barn	23	2650	2126
10 Day	Barn	22	2706	2334

Period Ambient Temp: Max = 95 Min = 60 Avg = 79

All Plots left in the field dispayed sunscald

Harvest Management Effects on Leaf Color

Means Across Varieties

Early Harvest Trial - Springfield

Days in Field	Barn vs Scaffold	Grade Index	No. Samples with Inferior Color					
			M	K	G	V	N	NOG
0 Day	Scaffold	67	10 (F)	4	1			
0 Day	Barn	71	1 (F)	1				
3 Day	Scaffold	61	9	2	5			
3 Day	Barn	57	1	9	4	2		
1.2 Inches of rain on day 4								
6 Day	Scaffold	18	6	4	2		4	39
6 Day	Barn	23	16	7		1		37
10 Day	Barn	22	17	8	2		4	32

Period Ambient Temp: Max = 95 Min = 60 Avg = 79

All Plots left in the field dispayed sunscald

Harvest Management Effects on Leaf Quality

Means Across Varieties

Early Harvest Trial - Springfield

Days in Field	Barn vs Scaffold	Grade Index	Leaf Quality of Farm Grades*				
			Flyings	Cutters	Leaf	Tips	Avg
0 Day	Scaffold	67	4.4	4.0	3.3	3.9	3.9
0 Day	Barn	71	4.1	3.6	3.3	3.7	3.7
3 Day	Scaffold	61	4.3	4.1	3.6	4.1	4.0
3 Day	Barn	57	4.4	4.1	3.7	4.2	4.1
1.2 Inches of rain on day 4							
6 Day	Scaffold	18	4.8	5.8	7.7	7.8	6.5
6 Day	Barn	23	4.6	5.1	7.1	8.0	6.2
10 Day	Barn	22	5.0	5.2	7.0	7.8	6.3

Period Ambient Temp: Max = 95 Min = 60 Avg = 79

All Plots left in the field dispayed sunscald

*Nondescript = 6 No-Grade = 8

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

Harvest Management Effects

Means Across Varieties

Late Harvest Trial - Lexington

Days in Field	Barn vs Scaffold	Grade Index	Yield (lbs/A)	Income ($/A)
0 Day	Scaffold	44	2639	4092
0 Day	Barn	50	2566	4149
3 Day	Scaffold	46	2616	4087
3 Day	Barn	47	2842	4627
6 Day	Scaffold	43	2560	3954
6 Day	Barn	49	2622	4282
10 Day	Barn	39	2914	4214

Period Ambient Temp: Max = 74 Min = 51 Avg = 63

No sunscald, no rain

Harvest Management Effects on Leaf Color

Means Across Varieties

Late Harvest Trial - Lexington

Days in Field	Barn vs Scaffold	Grade Index	No. Samples with Inferior Color					
			M	K	G	V	N	NOG
0 Day	Scaffold	44		34	1		11	
0 Day	Barn	50		23	1	2	15	
3 Day	Scaffold	46	2	27	1		13	
3 Day	Barn	47		33			6	
6 Day	Scaffold	43	1	39			9	
6 Day	Barn	49		30			9	
10 Day	Barn	39	4	38			18	

Period Ambient Temp: Max = 74 Min = 51 Avg = 63

No sunscald, no rain

Harvest Management Effects on Leaf Quality

Means Across Varieties

Late Harvest Trial - Lexington

Days in Field	Barn vs Scaffold	Grade Index	Leaf Quality of Farm Grades*				
			Flyings	Cutters	Leaf	Tips	Avg
0 Day	Scaffold	44	5.6	4.1	3.4	4.2	4.3
0 Day	Barn	50	5.7	4.2	3.2	4.1	4.3
3 Day	Scaffold	46	5.7	4.3	3.4	4.1	4.4
3 Day	Barn	47	5.3	4.1	3.2	4.5	4.3
6 Day	Scaffold	43	5.5	4.3	3.3	4.4	4.4
6 Day	Barn	49	5.3	4.3	3.3	4.1	4.3
10 Day	Barn	39	5.6	4.9	4.2	4.9	4.9

Period Ambient Temp: Max = 74 Min = 51 Avg = 63

No sunscald, no Rain

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

Harvest Management Effects

Means Across Varieties

Late Harvest Trial - Greeneville

Days in Field	Barn vs Scaffold	Grade Index	Yield (lbs/A)	Income ($/A)
0 Day	Scaffold	28	4211	5861
0 Day	Barn	29	4258	5833
3 Day	Scaffold	36	4237	6387
3 Day	Barn	36	4148	6101
6 Day	Barn	34	3920	5695
10 Day	Barn	33	4108	5903

Period Ambient Temp: Max = 77 Min = 32 Avg = 57

No sunscald, no rain

Harvest Management Effects on Leaf Color

Means Across Varieties

Late Harvest Trial - Greeneville

Days in Field	Barn vs Scaffold	Grade Index	No. Samples with Inferior Color					
			M	K	G	V	N	NOG
0 Day	Scaffold	28		24	27			
0 Day	Barn	29		19	39			
3 Day	Scaffold	36		41	2	1		
3 Day	Barn	36		49	3			
6 Day	Scaffold	36		45	1			
6 Day	Barn	34		45				
10 Day	Barn	33		53				

Period Ambient Temp: Max = 77 Min = 32 Avg = 57

No sunscald, no rain

Harvest Management Effects on Leaf Quality

Means Across Varieties

Late Harvest Trial - Greeneville

Days in Field	Barn vs Scaffold	Grade Index	Leaf Quality of Farm Grades*				
			Flyings	Cutters	Leaf	Tips	Avg
0 Day	Scaffold	28	4.7	4.4	4.3	4.9	4.6
0 Day	Barn	29	4.3	4.2	4.0	4.3	4.2
3 Day	Scaffold	36	4.1	4.8	4.2	4.3	4.4
3 Day	Barn	36	4.3	4.4	4.1	4.1	4.2
6 Day	Scaffold	36	4.4	4.6	4.1	4.3	4.4
6 Day	Barn	34	4.6	4.9	4.3	4.6	4.6
10 Day	Barn	33	4.8	4.5	4.5	4.4	4.6

Period Ambient Temp: Max = 77 Min = 32 Avg = 57

No sunscald, no Rain

Harvest Management Study

Late Harvest - Springfield, 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 = 83, Min = 38, Avg = 61

Harvest Management Effects

Means Across Varieties

Late Harvest Trial - Springfield

Days in Field	Barn vs Scaffold	Grade Index	Yield (lbs/A)	Income ($/A)
0 Day	Scaffold	58	1944	3619
0 Day	Barn	57	2017	3595
3 Day	Scaffold	56	1923	3470
3 Day	Barn	58	1989	3674
6 Day	Scaffold	56	2098	3812
6 Day	Barn	60	2126	4011
10 Day	Barn	50	2091	3643

Period Ambient Temp: Max = 83 Min = 38 Avg = 61

No sunscald, no rain

Harvest Management Effects on Leaf Color

Means Across Varieties

Late Harvest Trial - Springfield

Days in Field	Barn vs Scaffold	Grade Index	No. Samples with Inferior Color					
			M	K	G	V	N	NOG
0 Day	Scaffold	58		5			7	
0 Day	Barn	57		7			9	
3 Day	Scaffold	56		4			9	
3 Day	Barn	58		4			9	
6 Day	Scaffold	56		7			8	
6 Day	Barn	60		1			4	
10 Day	Barn	50		15			5	

Period Ambient Temp: Max = 83 Min = 38 Avg = 61

No sunscald, no rain

Harvest Management Effects on Leaf Quality

Means Across Varieties

Late Harvest Trial - Springfield

Days in Field	Barn vs Scaffold	Grade Index	Leaf Quality of Farm Grades*				
			Flyings	Cutters	Leaf	Tips	Avg
0 Day	Scaffold	58	5.3	4.7	4.1	4.2	4.6
0 Day	Barn	57	5.5	4.6	4.2	4.2	4.6
3 Day	Scaffold	56	5.5	4.9	4.2	4.3	4.7
3 Day	Barn	59	5.5	4.8	4.2	4.3	4.7
6 Day	Scaffold	56	5.4	4.8	4.4	4.3	4.7
6 Day	Barn	60	5.2	4.9	4.2	4.2	4.6
10 Day	Barn	50	5.4	4.8	4.3	4.4	4.7

Period Ambient Temp: Max = 83 Min = 38 Avg = 61

No sunscald, no Rain

Early Versus Late Season Effect
Harvest Management Means Across Varieties
All Data

Days in Field	Grade Index		Yield (lbs/A)		Income ($/A)	
	Early	Late	Early	Late	Early	Late
0 Day	67	44	3032	2939	5695	4525
3 Day	52	47	3055	2959	5251	4724
6 Day	39	46	3120	2934	4239	4698
10 Day	38	41	3214	3038	4176	4587
Mean	49	45	3105	2968	4840	4634

Significant Rainfall

Early Versus Late Season Effect
Harvest Management Means Across Varieties
Data without Significant Rainfall

Days in Field	Grade Index		Yield (lbs/A)		Income ($/A)	
	Early	Late	Early	Late	Early	Late
0 Day	67	44	3032	2939	5695	4525
3 Day	62	47	2742	2959	5111	4724
6 Day	66	46	2799	2934	5308	4698
10 Day	62	41	2952	3038	5519	4587
Mean	64	45	2881	2968	5408	4634

Summary

Varieties had minimal effect on cured leaf quality

Rainfall occuring on tobacco left in the field drastically reduced quality

In the absence of rainfall, there was a relatively small 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?

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