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The Effects of Variety, Harvest Management, and Curing Environment On Cured Leaf Quality of Burley Tobacco

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Extremely dry weather and low humidity during the 2008 curing season resulted in low quality tobacco in much of the burley crop grown in Kentucky and Tennessee. Often the poor quality leaf was associated with newly released burley varieties. In particular, concern was expressed that KT 204LC and KT 206LC (grown commercially for the first time in 2008) may produce undesirable leaf quality. If this were the case, it would significantly impact burley production in Kentucky and Tennessee since KT 206LC and KT 204LC comprised over 50 percent of the 2008 crop.

During their development, KT 204LC and KT 206LC were evaluated in numerous trials in Kentucky and Tennessee and quality was determined to be satisfactory. Prior to commercial release all prospective burley tobacco varieties are extensively evaluated in trials grown in Kentucky, Tennessee, North Carolina, and Virginia to ensure that they meet industry usability and smoking standards. Both KT 204LC and KT 206LC performed well in these trials and were judged to be acceptable by all companies purchasing burley in the United States.

Although it appeared unlikely that the poor quality experienced by some growers in 2008 was due to the burley variety used to produce the crop, an evaluation was conducted to compare the quality of five leading varieties grown during 2008. Four separate variety trials that included ms KY 14 X L8LC, TN 90LC, KT 204LC, KT 206LC, and NC 7LC were grown at each of four locations (Lexington and Versailles, KY and Greeneville and Springfield, TN), as part of the Kentucky-Tennessee tobacco breeding program. All varieties were replicated three times within each trial and all four trials were grown at each location; thus 48 individual plots of each variety were available for quality evaluation.

At stripping, each plot was stripped into farm grades of flyings, cutters, leaf, and tips. All samples were coded to ensure unbiased quality analyses. Tobacco graders from the USDA–ARS marketing service, commonly referred to as federal graders, graded the tobacco using the support price grades used prior to the tobacco buy-out. The federal grades are converted to a grade index using a formula that gives a lower score for less desirable grades that include off color leaf. For the Kentucky trials the same samples were evaluated for usability by graders from two companies buying burley tobacco at Kentucky receiving stations.

The results from the quality evaluations among the five varieties are presented in Table 1. Neither Company A nor Company B detected any substantial differences among the five varieties for usability, with both companies rating the usability of all varieties as “marginal to poor”. For the 2008 samples, the federal grades suggested that the quality of NC 7LC may have been slightly better than that of the other

four varieties. However, the opposite was found in similar trials conducted in 2006 and 2007. When the average grade indices for all tests conducted in 2006, 2007, and 2008 were calculated, the quality of all five varieties was essentially the same.

Table 1. Effect of Variety on Quality of Burley Tobacco

Variety	2008 Industry Usability		2008 Grade Ind. (48 Reps)	2006-2007 Grade Ind. (24 Reps)	2006-2008 Grade Index (72 Reps)**
	Company A (24 Reps)	Company B (24 Reps)			
TN 90LC	3.4	3.9	57	65	60
KT 204LC	3.5	3.9	57	66	60
KT 206LC	3.5	3.9	58	64	60
KY 14 X L8LC	3.4	3.8	59	63	60
NC 7LC	3.3	3.6	62	62	62

*Industry Usability Score: 1 = Good; 2 = Fair; 3 = Marginal; 4 = Poor; 5 = Very Poor

** Represents 288 Federal Grades for each variety

Scale of 1 - 94, with higher score indicating better overall quality

Although all four tests at any location were housed in the same barn, the actual management of the tests varied as to the day of topping, day of hanging, and location within the barn in which each test was hung. Although these management differences had little effect on the usability by Companies A or B, they actually had more effect on the federal grade index than did the varieties (Table 2). The quality differences among the four tests were most evident at the Greeneville, TN location, which was in an exceptional drought throughout 2008. The four tests were harvested over a two week period, leading to a 23 point difference in grade index among the tests. A 15 point difference in grade index was detected between Tests A and C although they were harvested and housed on consecutive days. The difference in quality was due primarily to hanging location within the barn. Test A was hung on the southwest side of the barn where quality was affected most by high temperature and low humidity; test C was hung on the northeast side of the barn, where temperature and humidity effects were mitigated by the surrounding green tobacco. A similar difference in grade index due to harvest management practices can be seen at Versailles, Kentucky. Tests A and C were harvested on the same day, but an average grade index of 15 points was observed between the two tests. Some sunscald was observed in all of the Versailles tests, so the differences in grade index among the tests may be due to differing degrees of sunscald before the tests were hung in the barn. However, it is likely that much of the difference in quality observed between tests A and C was due to hanging location within the barn.

By far the most significant factor affecting burley tobacco quality was the overall curing environment (Table 3). In 2008, the maximum difference among locations was 2.0 for industry usability and 29 points for federal grade index. The two Tennessee locations are located 280 miles apart, and are approximately 250 and 210 miles from the Kentucky locations. Because the weather conditions were much different between the two Tennessee locations, and between Tennessee and Kentucky, the location effects can be used to estimate the differences that can be expected among seasons at any given location. The worst quality was observed at Greeneville, which was in the midst of an exceptional drought.

The importance of barn management during adverse curing conditions can be inferred by comparing the quality differences between the Versailles and Lexington locations. These locations are approximately 20

miles apart and therefore had similar weather patterns during the 2008 curing season. However, the floor of the barn used at Lexington is covered with 3-4 inches of limestone gravel. Water was repeatedly applied to the floor and the barn doors and ventilators were closed to increase humidity in the barn. Minimal barn management was done at Versailles. The average industry usability at Lexington was 2.8 compared to 4.4 for Versailles, while the grade index was 72 at Lexington and 60 at Versailles, demonstrating the importance of barn management.

Table 2. Effect of Harvest Management on Quality of Burley Tobacco

Averaged Across Five Varieties for Each Test

Industry Usability Scale of 1 - 5

Lexington, KY				Versailles, KY			
Company A Usability (15 Reps)				Company A Usability (15 Reps)			
Test A	Test B	Test C	Test D	Test A	Test B	Test C	Test D
Aug. 19	Aug. 20	Aug. 22	Aug. 25	Aug. 18	Aug. 18	Aug. 18	Aug. 20
2.6	**2.7**	**2.7**	**2.7**	**4.2**	**4.2**	**4.0**	**4.1**
Lexington, KY				**Versailles, KY**			
Company B Usability (15 Reps)				Company B Usability (15 Reps)			
Test A	Test B	Test C	Test D	Test A	Test B	Test C	Test D
Aug. 19	Aug. 20	Aug. 22	Aug. 25	Aug. 18	Aug. 18	Aug. 18	Aug. 20
2.7	**3.1**	**2.9**	**3.0**	**4.5**	**4.9**	**4.6**	**4.9**
Federal Grade Index Scale of 1 - 100							
Greeneville, TN				**Springfield, TN**			
Federal Grade Index (15 Reps)				Federal Grade Index (15 Reps)			
Test A	Test B	Test C	Test D	Test A	Test B	Test C	Test D
Sept. 2	Sept. 8	Sept. 3	Sept. 11	Sept. 17	Sept. 16	Sept. 16	Sept. 16
43	**38**	**58**	**35**	**61**	**62**	**61**	**56**
Lexington, KY				**Versailles, KY**			
Federal Grade Index (15 Reps)				Federal Grade Index (15 Reps)			
Test A	Test B	Test C	Test D	Test A	Test B	Test C	Test D
Aug. 19	Aug. 20	Aug. 22	Aug. 25	Aug. 18	Aug. 18	Aug. 18	Aug. 20
78	**70**	**68**	**71**	**52**	**62**	**67**	**71**

For a given location, all tests were cured in the same barn. Management differences among tests include time of cutting, time of housing, and location in the barn.

Table 3. Effect of Curing Environment on Quality of Burley Tobacco

Values Averaged Across 5 Varieties and 4 Tests at Each Location

Industry Usability Scale of 1 - 5

1 = Good, 2 = Fair, 3 = Marginal, 4 = Poor, 5 = Very Poor

Company A Usability (24 Reps)		Company B Usability (24 Reps)	
Lexington KY	Versailles KY	Lexington KY	Versailles KY
2.7	4.1	2.9	4.7

Quality Index based on Federal Grades

Scale of 1 - 100, with higher values indicating better overall quality

Federal Grade Index (48 Reps)			
Greeneville TN	Springfield TN	Lexington KY	Versailles KY
43	60	72	60

Although subtle differences can be detected among varieties, these differences are not necessarily consistent from year to year (Table 1) and have a minimal effect on cured leaf quality in comparison to harvest management and curing environment. In 2008, the maximum difference in grade indices due to varieties, harvest management, and curing environment were 5, 23, and 29, respectively. In choosing a variety, growers should consider first the disease resistance needed for the site, and then the yield potential. There are numerous varieties available that can be expected to produce high yields, acceptable quality, and industry usability during most growing seasons. However, if black shank is a known or potential problem, the level of black shank resistance should be the most important factor considered when choosing a burley tobacco variety (Tables 4 and 5). Once the choices have been narrowed down by disease resistance and yield potential then growers may wish to consider other factors such as maturity, leaf quality, and handling characteristics. The annual "Guide to Burley Tobacco Varieties" produced by the University of Kentucky and the University of Tennessee is an excellent source of information on variety characteristics.

Table 4. Relative Effect of Variety on Black Shank Survival*

Variety	2008 % Survival (6 Reps)	2006-2007 % Survival (10 Reps)	2006-2008 % Survival (16 Reps)
TN 90LC	49	38	42
KT 204LC	87	76	80
KT 206LC	89	83	85
KY 14 X L8LC	5	0	2

* Trials conducted in fields with heavy Race 1 Black Shank infestations.

Table 5. The Relative Effect of Black Shank Resistance on Yield among Burley Tobacco Varieties*

Mean of Three Black Shank Trials in 2008

Entry	Black Shank Rating†	Percent Survival (12 Reps)	Yield (Lbs/A) (12 Reps)
KT 206LC	10 - 7	63	1568
KT 204LC	7 - 7	59	1235
TN 90LC	4 - 4	35	662
NC 7LC	10 - 4	32	656

† 0 - 10 scale for Race 0 - Race 1; 0 = no resistance, 10 = immunity

* Trials conducted in fields with heavy Race 1 Black Shank infestations.