

# Selecting Burley Tobacco Varieties

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Variety selection is important to minimize disease incidence and severity and to suit the growth characteristics desired by individual producers. With contracting the norm for marketing burley tobacco, the needs of the contracting companies must be considered. Growers need to be aware of the wording specific to their contract and be sure to obtain seed that meets the requirements for seed screening. The seed screening process is intended to help reduce the possible accumulation of tobacco-specific nitrosamines (TSNA) during curing and storage of cured tobacco.

Perhaps the most important consideration when choosing a burley tobacco variety is black shank resistance, given the widespread incidence of this disease throughout the burley growing regions in the U.S. At one time, growers were forced to choose between good resistance and the highest potential yields. This is no longer the case, as variety improvements have resulted in resistant varieties with yields comparable to the best yielding black shank-susceptible varieties. The degree of resistance and the specific type of resistance offered by a variety may make a difference, depending on which race of black shank is predominant in a particular field. In fields where black shank has been observed, it is generally best to assume that both races are present and to choose a variety with a good level of race 1 resistance, unless it is known that only race 0 is active in those areas.

Table 1 shows the relative survival of selected varieties in nurseries heavily affected by both race 0 and race 1 black shank. Note that year-to-year variation in survival and performance can be quite high. Even highly-resistant varieties can suffer significant losses in years when weather is conducive to black shank. In most situations, soil-applied fungicides will be necessary to achieve the best results under heavy black shank pressure (see Pest Management section for best-use guidelines).

In addition to disease resistance, characteristics like handling, stalk diameter, growth habits, yield, and quality are important selection criteria for a variety. Many of the new black shank-resistant varieties are capable of producing high yields (Figure 1, Table 2), and under high rainfall conditions, can produce a large stalk diameter and heavy plants compared to older varieties. Some varieties are said to perform better under stress than others; however, tolerance to drought and excess moisture (wet feet) are difficult to assess, and observations are often skewed by maturity differences at the onset of extreme weather conditions. However, producers must consider that weather patterns change from year to year. Therefore, variety selection should be based mainly on disease history of the site with other characteristics considered secondary.

In recent years, there has been increasing focus on the production of quality tobacco and how it is affected by variety selection. While quality is somewhat subjective, the grade index does provide a quantifiable measure of leaf quality. The grade index is based on the old federal grading system and assigns a value to each of the grades. A higher grade index indicates higher quality. Some may argue that the federal grading system is outdated, but in recent comparisons, the relative differences in grade index were similar to the difference in quality ratings of major tobacco companies.

While there are some differences in varieties with regard to leaf quality, the differences are typically small (Figure 2, Table 2) with a range of only about 8 points on the grade index between varieties over three years of testing at four locations. Five varieties (KT 204LC, KT 206LC, TN 90LC, NC 7LC, and KY 14 x L8LC) were compared for grade index across four different studies at each of two locations in Tennessee. The largest difference in leaf quality was observed between curing locations with a range of 29 points on the grade index. The next most important factor in grade index was management, specifically the date of harvest and location of tobacco within the curing barn with a range of 14 points. Variety had the least influence on grade index with an overall range of 2 points between varieties within a particular management and curing location. It should be noted that in these studies, varieties were harvested at the same time and cured under the same conditions. It is well known that curing conditions for burley normally become less favorable in the late fall as opposed to the early fall. To the extent that later maturing varieties will generally be harvested on farms later than early ones, on average they will have less favorable curing conditions. This is especially true for late-maturing varieties planted in mid-to-late June that are not harvested until October, when cool, dry conditions often prevail. It is important to note that the resulting differences in quality are due to harvest date and curing weather, not direct variety differences.

## Variety Descriptions

The following are descriptions of the newest and most popular burley tobacco varieties. Information on additional

varieties not listed below can be found in Table 3.

**KT 212LC** is an early-maturing, high-yielding variety. On a scale of 0 to 10 with 10 being complete resistance, it has a rating of 10 to race 0 black shank and medium resistance (rating of 4) to race 1. It is the only commercially available variety with early maturity, high yield potential and a significant level of resistance to race 1 black shank. In university variety trials, KT 212LC flowers at about the same time as KY 14 x L8LC. It has high resistance to black root rot, wildfire, and tobacco mosaic virus, but is not resistant to the virus complex. It has medium resistance to Fusarium wilt. Cured leaf quality has been good. This variety will be a good choice for growers who would like to have an early-maturing variety for early harvest, but can't successfully grow KY 14 x L8LC or other early- to medium-maturing varieties because of race 1 black shank. However, it is very important to remember that this variety has only medium resistance to race 1, and will not perform nearly as well as KT 209LC, KT 206LC, or KT 210LC in fields with high race 1 pressure. Much like TN 90LC, it will perform well in race 1-infested fields only if good rotation practices are followed and soil fungicides are used.

**KT 210LC** is a late-maturing, high-yielding variety with good black shank resistance and moderate resistance to Fusarium wilt. It has a race 0 resistance of 10 and a race 1 resistance of 7. Fusarium resistance is thought to be about a 5, which is comparable to NC 7LC and KY 14 x L8LC. Fusarium wilt is a soilborne fungal disease that is present in some tobacco-producing regions, primarily along river bottoms. The problem is particularly severe for growers who have both Fusarium wilt and race 1 black shank present in their soils (see Pest Management section). KT 210LC is the first burley variety with moderate-to-high race 1 black shank resistance and moderate Fusarium wilt resistance. It also has high resistance to black root rot, wildfire, and tobacco mosaic virus, but it is susceptible to the virus complex. This variety can get very tall and produce a large number of leaves if topped in mid to late bloom. Topping in the bud or very early bloom stage is recommended for this KT 210LC. Cured leaf quality has been good.

**KT 209LC** is a medium-late-maturing, high-yielding variety with superior black shank resistance. It has the highest available resistance to both races of black shank. It has a race 0 resistance of 10 and a race 1 resistance of 8. Note that even though the resistance to black shank is relatively high in KT 209LC, it is not immune to race 1 (Table 1). In areas with heavy race 1 black shank pressure, fungicides are still recommended for KT 209LC. (see Pest Management section). It also has high resistance to black root rot, wildfire, tobacco mosaic virus, and tobacco etch virus. It lacks the blue mold tolerance of KT 206LC and has no resistance to Fusarium wilt. Yield potential, stalk size, growth habit, and maturity are similar to KT 206LC and KT 204LC. Cured leaf quality is comparable to TN 90LC.

**KT 206LC** is a medium-late-maturing variety with high yield potential (Figure 1) and a good overall disease package including good resistance to both races of black shank. It has a 10 level resistance to race 0 of the black shank pathogen and a 7 level resistance to race 1. With most burley growing regions now reporting the presence of race 1 in combination with race 0, KT 206LC performs well in a variety of black shank situations, but not as well as KT 209LC under the most severe infestations. KT 206LC also has more resistance to blue mold (3 level) than any other black shank resistant variety, but has no resistance to Fusarium wilt and may perform poorly in areas where this disease has become established. This variety can grow quite large and produces a large stalk, making it difficult for some crews to handle at harvest time. Some growers have expressed concern about the cured leaf color of KT 206LC; however, it must be recognized that the two curing seasons following its release were very dry, leading to a situation of quick curing and a tendency for bright-colored leaf regardless of the variety grown. Like any other variety, cured leaf quality of KT 206LC will improve when adequate moisture is available during the curing season. Results from university variety trials show little difference in quality between KT 206LC and older varieties when harvested at the same time and cured under the same conditions (Figure 2, Table 2).

**KT 204LC** is a medium-late-maturing, high-yielding variety with good black shank resistance. It quickly became a popular variety when it was released in 2004, because it offered improvements in disease resistance and quality compared to older varieties, but it should not be expected to perform as well as KT 209LC against black shank, especially if race 0 is present in high levels. KT 204LC has no resistance to Fusarium wilt. It is not as tolerant to blue mold as KT 206LC or TN 90LC, but not as susceptible as Hybrid 404LC. KT 204LC tends to grow slowly early in the season, which may discourage producers initially, but its growth in the latter part of the season generally makes up for the slow start. This characteristic can make this variety more susceptible to late season drought.

**TN 90LC**, a medium-maturing variety with moderately high yield potential, has dropped in popularity due to increases in the use of the new "KT" varieties. Released in 1990, TN 90LC offers a broad range of important characteristics. TN 90LC became a popular variety due to a good disease resistance package, including moderate resistance to black shank, some tolerance to blue mold, black root rot resistance, and resistance to common virus diseases. TN 90LC still has a small but loyal following due to its agronomic characteristics, including small stalk diameter, upright growth (ease of handling), and good cured-leaf color. Though it does not have the yield potential

of some of the new varieties, TN 90LC can produce relatively high yields (Figure 2). Some growers prefer the smaller size and ease of handling with TN 90LC and are willing to accept lower yield potential. In addition to blue mold tolerance, it has level 4 resistance to both races of black shank and high root rot resistance. Its lack of Fusarium wilt resistance is a concern in areas where Fusarium has become widely established.

**KY 14 x L8LC** continues to decline in popularity due to improvements in new varieties, increased incidence of race 1 black shank, and the extra management required to produce high yields and good quality. It is an early-maturing, short, spreading type of tobacco. Leaves droop to the extent that leaf breakage can be excessive under certain conditions. In addition, leaves appear to be more brittle than most varieties, making KY 14 x L8LC a poor choice for mechanical harvest or for farmers using unskilled laborers for harvest. It has fewer leaves than most varieties, but compensates by producing larger leaves. Stalk diameter is small to medium. Yields are high in fields with no race 1 black shank. Quality can be excellent under proper management. KY 14 x L8LC initiates sucker growth sooner than most other varieties, making early topping a must. Delayed topping increases sucker development and may make sucker control more difficult. Best results are achieved when KY 14 x L8LC is harvested three to four weeks after topping. Delayed harvest may increase sucker control problems and reduce cured leaf quality. KY 14 x L8LC has high resistance to race 0 (10 level) of the black shank pathogen, but no resistance to race 1. The presence of race 1 in many areas has forced producers to abandon KY 14 x L8LC in favor of varieties with resistance to both races. Damage by the virus complex can be severe where virus pressure is high. KY 14 x L8LC may yield poorly if planted in an area with high black root rot pressure. KY 14 x L8LC does have moderate resistance to Fusarium wilt; however, many tobacco growers have realized that KY 14 x L8LC no longer serves their needs as it once did.

**HB 04PLC** is a variety from F.W. Rickard Seed Inc. with high yield potential in fields free of black shank. HB 04PLC is resistant to black root rot and mosaic virus, but has no resistance to black shank. It has medium-early maturity, large leaves, and an average-sized stalk diameter. Cured leaf quality is generally good. It is a good choice for growers who have no black shank and need a high-yielding variety that matures earlier than the "KT" varieties.

**HB 3307PLC**, a variety from F.W. Rickard Seed, is a late-maturing variety with a good yield potential and quality. It has high resistance to race 0 black shank and medium resistance to race 1. HB 3307PLC is resistant to black root rot, but has been found to be susceptible to tobacco mosaic virus. Yield potential of this variety is high, but perhaps not quite as high as HB 04PLC or Hybrid 404LC in fields free of black shank. It does not have as large of a stalk and plant size as some of the other new varieties.

**HB4488PLC** is a new variety from F.W. Rickard Seed. It is a late-maturing variety with a high yield potential and quality at least equal to other popular burley varieties. It has high resistance to race 0 black shank and medium resistance to race 1. Field observations indicate a moderately large plant with relatively heavy bodied leaves and a spreading growth habit that is not as upright as "KT" varieties.

**Hybrid 404LC**, is a medium-maturing variety from Clay's Seed Inc. It has a high yield potential similar to Hybrid 403LC, but it also has black root rot resistance, making it more suitable than Hybrid 403LC for second-year tobacco or in rotation behind legume crops. Hybrid 404LC does not have black shank resistance or virus complex resistance, so it should only be grown in fields that are known to be free of black shank. It appears to have generally good quality.

**N 7371LC**, released by Newton Seed Inc., has demonstrated fair resistance to black shank early in the season in some areas, but tests indicate that the resistance does not hold up later in the season. However, this variety will perform well under low black shank pressure. Growers planning to use this variety in fields with a black shank history should plan on also using fungicides. N 7371LC is a very late-maturing variety with a high number of long but narrow leaves and good quality. Topping may be slower than comparable varieties due to the smaller upright leaves in the top of the plant at topping time.

**NC 2002LC** is a medium-late maturing blue mold-resistant variety. It has very little resistance to other major diseases like black shank or black root rot. It is a higher yielding variety than NC 2000, but does not have the yield potential of high-yielding varieties like Hybrid 404, NC 7, HB 04PLC, or the "KT" varieties. It has very little disease resistance of any kind except to blue mold.

**NC 7LC** is a late-maturing variety with high resistance to race 0 black shank, and low-to-medium resistance to race 1. Otherwise, NC 7LC has a good disease resistance package, including resistance to black root rot, Fusarium wilt, tobacco mosaic virus, and wildfire. It has a big, robust growth habit with a large stalk diameter. Handling may be difficult under conditions that increase plant size (plant populations under 7,500 plants/A). NC 7 is unique among the burley varieties listed here in that it has resistance to root knot nematode and tobacco cyst nematode. Nematode problems are rare in the U. S. burley growing areas and tend to occur on sandy soils. Yields are expected to be high under ideal conditions, and quality is expected to be good. Avoid areas where race 1 incidence is high. NC 7LC may be a good solution where Fusarium wilt incidence is high. However, if race 1 black shank pressure is also ex-

pected to be high, KT 210LC is a better choice due to higher race 1 resistance .

Figure 1. Three-year (2011-2013) average yield (11 total location/years) of selected burley tobacco varieties grown in the absence of black shank pressure. Varieties are listed in order from highest to lowest yield.

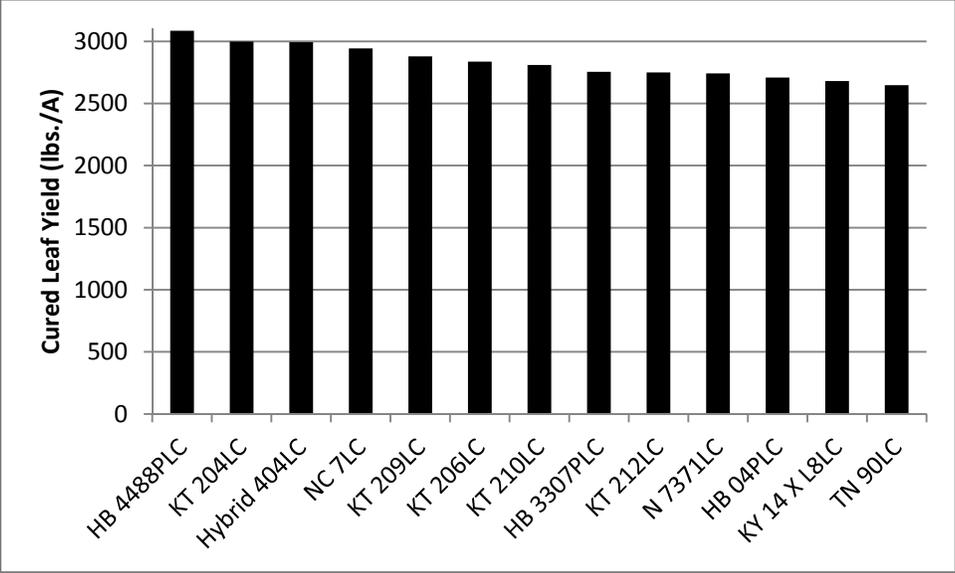
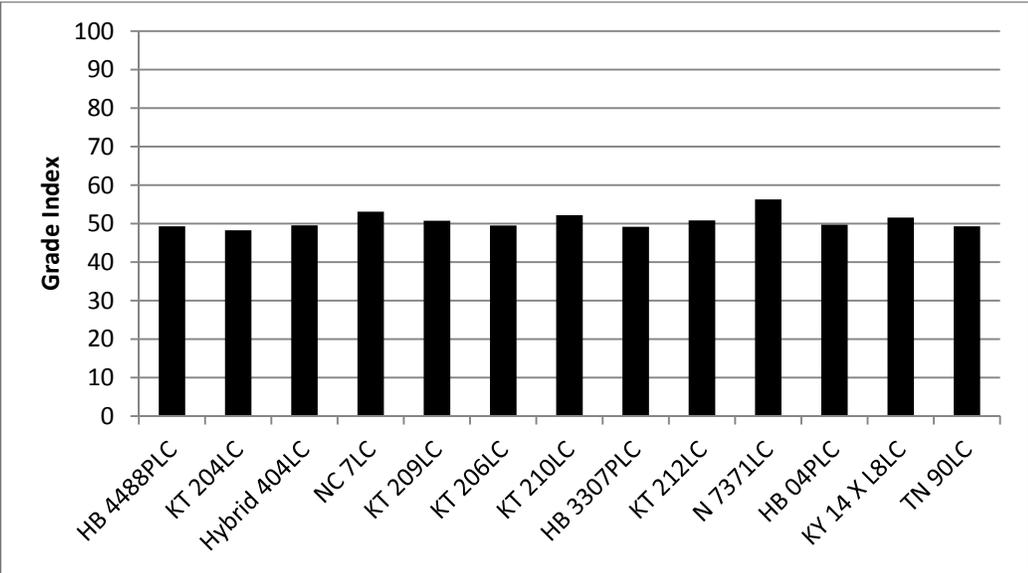


Figure 2. Three-year average (2011-2013) of Grade Index (9 total location/years) for selected burley tobacco varieties. Grade index is a numerical ranking of quality based on the federal grading system, a higher grade index indicates better quality.



**Table 1.** Survival of selected burley tobacco varieties in fields heavily infested with race 0 and race 1 black shank (2012-2014).

Variety	Black Shank			
	% Survival			
	2012	2013	2014	Mean
KT 209LC	91	90	86	<b>89</b>
KT 210LC	83	86	92	<b>87</b>
KT 204LC	79	87	73	<b>80</b>
KT 206LC	70	75	74	<b>73</b>
HP 3307PLC	44	77	59	<b>60</b>
N 7371LC	39	64	53	<b>52</b>
TN 90LC	47	63	44	<b>51</b>
HB 4488PLC	44	58	36	<b>46</b>
NC 7LC	39	60	39	<b>46</b>
KT 212LC	31	46	46	<b>41</b>
HB 04PLC	18	18	14	<b>17</b>
Hybrid 404LC	14	5	14	<b>11</b>
KY 14 X L8LC	2	1	8	<b>4</b>
<b>Seasonal Avg.</b>	<b>46</b>	<b>56</b>	<b>49</b>	

**Table 2. Performance of Commercial Varieties in the North Carolina Official Variety Test at Individual Locations from 2010-2013.**

Variety	Rocky Mount		Reidsville <sup>a</sup>		Laurel Springs <sup>b</sup>	
	Yield ---lbs/A---	Quality Index	Yield ---lbs/a---	Quality Index	Yield ---lbs/a---	Quality Index
NC 5 LC	2277	69	2254	73	3233	75
NC 6 LC	2221	69	2190	72	3415	77
NC 7 LC	2249	69	2087	73	3297	76
KT 200 LC	2273	71	1974	71	3146	76
KT 204 LC	2168	68	2212	71	3384	75
KT 206 LC	2174	72	2011	70	3686	75
KT 209 LC	2162	70	2005	74	3518	75
KT 210 LC	2110	72	2149	74	3267	75
KT 212 LC <sup>c</sup>	2209	76	2066	66	--	--
TN 90 LC	2095	70	2195	72	2948	74
TN 97 LC	2084	69	2031	73	3382	75
HB 3307 LC	2198	69	2287	77	3294	74
HB 4488 LC <sup>c</sup>	2237	72	2280	68	--	--
R 610 LC	2234	73	2238	73	3246	77
R 630 LC	2162	73	2092	72	3122	76

<sup>a</sup>2012 results not included.

<sup>b</sup>2013 results not included.

<sup>c</sup>One year of results, varieties added in 2013.

**Table 3.** 2013 New and Selected<sup>§</sup> Burley Tobacco Varieties - Relative Disease Resistance, Yield Scores, and Maturity.

VARIETY	BLACK SHANK		VIRUS COMPLEX	BLACK ROOT ROT	TMV	FUSARIUM WILT	RELATIVE YIELD SCORE <sup>⊠</sup>	MATURITY
	RACE 0	RACE 1						
ms KY 14 X L8LC	10	0	S	M	R	6	8	Early
KY 907LC	2	2	R	H	R	1	8	Med-Late
KT 200LC	6	6	R	H	R	0	8	Late
KT 204LC	7	7	R	H	R	1	9	Med-Late
KT 206LC <sup>#</sup>	10	7	R	H	R	1	9	Med-Late
KT 209LC	10	8	R	H	R	1	9	Med-Late
KT 210LC	10	7	S	H	R	5	8	Late
KT 212LC	10	4	S	H	R	5	8	Early
NC BH 129LC	1	1	S	H	R	1	7	Med-Early
NC 3LC <sup>**</sup>	2	2	R	H	R	1	7	Med-Late
NC 7LC <sup>**</sup>	10	4	R	H	R	5	8	Late
NC 2000LC <sup>&amp;</sup>	0	0	S	L	R	1	4	Late
NC 2002LC <sup>&amp;</sup>	0	0	R	M	R	0	5	Medium
TN 86LC	4	4	R	H	S	0	6	Late
TN 90LC <sup>#</sup>	4	4	R	H	R	0	5	Medium
TN 97LC	4	4	R	H	R	0	6	Med-Late
HYBRID 403LC	0	0	S	M	R	6	9	Medium
HYBRID 404LC	0	0	S <sup>*</sup>	H <sup>*</sup>	R <sup>*</sup>	4	9	Medium
HYBRID 501LC	5	5	S	H	R	4	5	Med-Early
N 126LC	0	0	S	M	R	3	8	Medium
N 777LC	2	2	S	M	S	0	3	Med-Late
N 7371LC	4	4	-	-	-	<b>5</b>	7	Late
NBH 98LC	2	2	S	M	R	3	5	Medium
HB04PLC	0	0	S	H	R	0	9	Med-Early
HB3307PLC	10	4	R <sup>*</sup>	H <sup>*</sup>	S	<b>3</b>	8	Late
HB4488PLC	10	4	-	-	-	<b>3</b>	9	Late
R 610LC	4	4	S	M	-	3	5	Medium
R 630LC	3	3	R	M	R	4	5	Early
R7-12LC	0	0	S	H	R	4	8	Late

<sup>§</sup> For an extensive list of varieties go to <http://www.uky.edu/Ag/Tobacco>

<sup>⊠</sup> Relative yield scores are based on growth under disease-free conditions.

<sup>\*</sup> Based on a limited number of field tests and subject to change.

<sup>\*\*</sup> Resistant to root knot nematode (*Meloidogyne incognita*, Races 1 and 3).

<sup>#</sup> Low resistance to blue mold (*Peronospora tabacina*).

<sup>&</sup> Medium resistance to blue mold (*Peronospora tabacina*).

- Resistance not rated for this disease