

# FLUE CURED TOBACCO VARIETY EVALUATION IN GEORGIA

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## **Introduction**

Tobacco varieties play a pivotal role in yield and quality improvement programs. Moreover, a vital part of any breeding program is the appropriate testing and evaluation of new tobacco varieties. Important characteristics of these varieties are yield, disease resistance, desirable plant qualities, ease of handling, and market acceptability. For a variety to be recommended it must be superlative in one or more and contain a balance of the remainder of the factors. For instance, for a variety to have an excellent yield and poor disease resistance or to yield well and have poor cured quality is unacceptable. In addition, every growing season presents these varieties with new challenges which require documentation so growers can make informed decisions.

As a result, Regional Variety Tests are conducted to obtain data on yield, disease resistance, and quality as judged by physical appearance and chemical analysis. These tests consist of a small plot test and subsequently a farm test where desirable varieties from the small plot test are grown in larger plots and receive additional evaluation. Once this information is analyzed, the desirable varieties and breeding lines from these tests advance to the Official Variety Test for further evaluation under growing and marketing conditions in Georgia.

As in previous years, we have

included data from the Regional Farm Test so that when varieties are released from this test the extension service will have an additional data set to use in making recommendations to growers.

## **Materials and Methods**

The 2013 Official Variety Test and Regional Small Plot Test consisted of 30 and 27 entries respectively while the Farm Test had 16 entries. These tests were conducted at the University of Georgia Bowen Farm on Ocilla loamy coarse sand. All transplants were treated in the greenhouse with imidacloprid (0.8 oz Admire Pro/ 1000 plants) and followed with two field sprays (April 13, May 6) of Actigard applied at 0.5 oz/A for Tomato spotted wilt virus (TSWV). The Official Variety Test was mechanically transplanted on April 10. The Regional Farm and Regional Small Plot Tests followed on April 11. All tests were transplanted with 22-24 plants per field plot and replicated three times. Fertilization consisted of 6 lb/A of 9-45-15 in the transplant water, 500 lbs/acre of 6-6-18 at first cultivation, 600 lbs/acre 6-6-18 at second cultivation, and an additional 120 lbs/acre of 15.5-0-0 at lay-by for a total of 85 lbs/acre of nitrogen.

Cultural practices, harvesting, and curing procedures were uniformly applied and followed the current University of Georgia recommendations. Data collected included plant stand, yield in lbs/A, value/A in dollars, dollars per hundred weight, grade index, number of leaves per plant, plant height in inches, days to flower and percent TSWV. In addition, leaf chemistry determinations consisted of total alkaloids, total soluble sugars, and the ratio of sugar to total alkaloids.

### **Results and Discussion**

The 2013 Official Variety Test and Regional Farm Test produced average yields and quality. All tests benefitted from the application of Telone II, applied at the recommended rate, in October 2012 with good soil conditions which kept nematode pressure to a minimum. In addition, field sprays of Actigard combined with the standard tray drench treatment resulted in a test average of 3.1% TSWV symptomatic plants. Unfortunately, cool early season temperatures and excessive rain throughout the growing season (>56") hampered root development and leached soil nutrients. As a result, the crop matured early and leaf chemistry was negatively affected.

In the Official Variety Test, yield ranged from 2351 lbs/A for NC 2326 to 3403 lbs/A for NC 939. Value of released varieties ranged from 3994 dollars/A for NC 2326 to 5842 dollars/A for NC 939. Both price and grade index data were based on 2012 data due to market fluctuations which would have artificially raised prices for 2013. Price

and grade data were very good for all varieties due to the excessive rain providing a very mature crop. As a result, prices ranged from \$152/cwt for NC 92 at the low end while GF 157 at \$182 had the best price per cwt for the released varieties. Grade index ranged from 76 for NC 92 to 88 for GF 318. Plant heights averaged in the low to mid 40 inches while leaf numbers per plant were close to 20. Rain and clouds accelerated flowering dates 6 or more days sooner than normal with NC 2326 at 62 days. Leaf chemistry was significantly impacted from the wet season with alkaloids consistently below 2% and the percent of sugars averaging in the upper teens. The Official Variety Test data are displayed in Table 1. Two and three year averages for selected varieties are found in Table 2.

The 2013 Regional Farm Test yielded and graded similar to the other tests. In the Farm Test (Table 3), NC EX 61 had the lowest yield at 2325 lb/A. GL EX 398 yielded the highest at 3456 lbs/A. Value followed the same trend with 3939 dollars/A for NC EX 61 to 6127 dollars/A for GL EX 398. NC EX 59 graded the best bringing in \$178/cwt and having a grade index of 88. The lowest, NC 95 had a grade index of 80 with a price of \$160/cwt. Generally, leaf chemistry was similar to the Official Variety Test, with sugars in the upper teens and alkaloids below 2%.

### **Acknowledgments**

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Table 1. Yield, Value, Price Index, Grade Index, and Agronomic Characteristics of Released Varieties Evaluated in the 2013 Official Flue-Cured Variety Test at the University of Georgia, Tifton, GA.

Variety	Yield lb/A	Value \$/A	Price Index <sup>1</sup> \$/CWT	Grade Index <sup>2</sup>	Leaves/ Plant (number)	Plant Ht. in	Days to Flower	Total Alkaloids %	Reducing Sugars %	Ratio RS/TA
NC2326	2352	3994	170	86	17	41.9	62	1.92	17.0	8.82
NC 95	2661	4369	164	83	18	45.0	70	1.93	17.3	8.99
K 326	2912	4862	167	84	20	42.0	66	1.82	17.9	9.83
K 346	3047	5171	169	81	20	44.9	65	1.89	17.7	9.33
NC 71	2965	4949	167	84	20	41.6	68	1.60	18.3	11.42
NC 72	2962	5223	175	86	20	45.3	73	1.77	17.6	9.98
NC 92	3213	4882	152	76	20	44.4	69	1.97	16.8	8.51
NC 196	2793	4649	166	83	21	46.0	70	1.60	17.9	11.14
NC 297	2925	4890	166	83	22	45.3	68	1.78	18.8	10.58
NC 925	2806	4545	162	81	18	39.8	66	1.77	16.4	9.26
NC 938	2848	4512	161	80	18	40.7	64	1.55	16.4	10.56
NC 939	3403	5842	172	85	20	43.5	69	1.58	17.9	11.33
CC 13	2864	4873	171	83	20	45.4	65	1.46	18.3	12.53
CC 27	3020	5139	170	82	20	44.5	73	1.56	16.3	10.48
CC 33	2848	4692	164	79	21	44.9	68	1.37	18.4	13.37
CC 35	2798	4524	162	79	20	47.7	80	1.52	16.5	10.88
CC 37	3173	5195	164	81	19	43.0	69	1.65	15.3	9.30
CC 67	2957	5232	178	88	20	44.3	65	1.68	16.6	9.86
CC 700	3239	5428	167	83	20	43.3	65	1.67	16.6	9.94
CC 1063	2677	4507	169	83	19	42.4	67	1.89	17.5	9.24
PVH 1452	3115	5456	175	86	20	43.1	67	1.80	15.1	8.41
PVH 2110	3107	5172	167	84	22	49.7	72	1.55	19.1	12.33
PVH 2254	3073	5377	173	83	20	46.1	69	1.56	17.1	11.01
PVH 2275	2822	5082	180	88	20	42.7	69	1.71	16.5	9.64
SP 168	3113	5207	167	83	18	39.2	74	1.87	18.3	9.77
GL 338	3107	5432	175	87	19	44.1	66	1.66	17.5	10.56
GL 362	3036	5309	176	86	20	41.5	66	1.89	15.8	8.34
GL 395	2904	4658	164	81	20	45.2	68	1.78	16.2	9.12
GF 157	2753	5008	182	87	20	46.5	67	1.73	16.2	9.37
GF 318	3263	5804	177	88	20	46.6	66	1.68	18.4	10.95
LSD - 0.05	592.1	1065.3	16.95	8.48						

<sup>1</sup>Price Index based on two year average (2011-2012) prices for U.S. government grades.

<sup>2</sup>Numerical values ranging from 1-99 for flue-cured tobacco based on equivalent government grades - higher the number, higher the grade.

Table 2. Comparison of Certain Characteristics for Released Varieties Evaluated in the 2013 Official Flue-Cured Tobacco Variety Test at the University of Georgia, Tifton, GA.

Variety	Yield lb/A	Value \$/A	Price Index <sup>1</sup> \$/CWT	Grade Index <sup>2</sup>	Leaves/ Plant (number)	Plant Ht. in	Days	Total Alkaloids %	Reducing Sugars %	Ratio RS/TA
							to Flower			
3 Year Average 2011, 2012 and 2013										
NC2326	2293	2971	129	65	17	37.0	64	2.46	16.2	6.79
NC 95	2777	4089	148	74	18	41.5	73	2.76	15.7	6.18
K 326	3001	4898	163	81	19	38.2	73	2.08	16.8	8.24
K 346	2845	3881	137	69	19	39.9	73	2.24	16.9	7.74
NC 71	2953	4431	148	77	19	38.4	75	2.06	17.5	8.84
NC 72	3020	4270	142	73	19	39.8	76	2.10	16.9	8.46
NC 92	3201	3752	118	61	20	41.7	75	2.53	16.9	7.05
NC 196	2977	4330	149	75	20	40.8	77	2.14	18.0	8.92
NC 297	2999	4214	141	72	20	38.9	74	2.40	17.4	7.80
CC 27	2970	4202	142	71	19	40.0	74	2.07	15.4	8.11
CC 37	3135	4262	137	69	19	40.3	76	1.93	17.2	8.94
CC 67	2839	4296	150	76	19	40.4	71	2.04	16.6	8.46
CC 700	3193	4926	154	78	19	40.0	71	2.26	16.4	7.92
PVH 1452	3092	4659	152	77	20	39.9	73	2.26	16.5	7.42
SP 168	3144	4615	147	75	19	38.2	76	2.07	17.3	8.47
GL 338	3005	4549	153	74	19	39.6	70	2.24	17.2	8.03
GL 395	2884	4276	150	77	20	40.5	73	2.07	15.8	7.80
GF 318	3290	4996	152	71	20	41.1	72	2.02	18.6	9.39
2 Year Average 2012-2013										
NC2326	2363	3332	141	70	17	38.4	65	2.40	17.4	7.50
NC 95	2804	3926	142	70	19	43.1	73	2.81	16.6	6.64
K 326	2965	4662	157	77	20	39.8	72	1.96	18.4	9.42
K 346	2711	4238	154	76	20	42.5	70	2.05	18.0	8.83
NC 71	2758	4453	156	80	19	40.0	73	1.87	18.6	10.15
NC 72	2917	4625	157	78	18	42	75	1.82	18.4	10.08
NC 92	3019	4050	133	67	19	42	73	2.19	18.2	8.30
NC 196	2646	4293	163	80	20	42	75	1.82	18.8	10.41
NC 297	2839	4275	149	74	20	41	72	2.02	18.0	9.11
NC 925	2799	4290	153	77	18	40	70	2.10	17.5	8.44
CC 27	2824	4357	153	75	19	41.9	76	1.70	16.6	9.85
CC 33	2787	4611	165	80	20	42.1	73	1.83	18.2	10.62
CC 35	2881	4559	158	77	20	44.0	81	1.84	17.4	9.70
CC 37	2913	4394	149	73	19	40.6	74	1.82	17.1	9.38
CC 67	2789	4752	170	84	20	42.1	69	2.10	15.6	7.83
CC 700	3112	5185	165	82	19	41.3	71	1.81	17.2	9.52
CC 1063	2638	4342	164	81	19	40.2	72	2.15	17.8	8.39
PVH 1452	2901	4888	168	83	20	41.4	72	2.05	16.4	8.06
PVH 2110	2917	5012	172	85	21	44.9	77	1.75	17.9	10.44

Table 2. Comparison of Certain Characteristics for Released Varieties Evaluated in the 2013 Official Flue-Cured Tobacco Variety Test at the University of Georgia, Tifton, GA (*continued*).

Variety	Yield lb/A	Value \$/A	Price Index <sup>1</sup> \$/CWT	Grade Index <sup>2</sup>	Leaves/ Plant (number)	Plant Ht. in	Days		Total Alkaloids %	Reducing Sugars %	Ratio RS/TA
							to Flower	Flower			
2 Year Average 2012-2013											
PVH 2254	2882	5025	173	84	20	42.7	74	1.76	19.4	11.04	
PVH 2275	2706	4597	169	83	19	40.7	72	2.01	16.7	8.47	
SP 168	2968	4710	159	79	18	39.0	77	2.12	17.7	8.47	
GL 338	2954	4108	142	68	18	37.3	72	2.54	17.1	6.76	
GL 395	2675	4257	161	80	20	41.8	71	1.91	16.2	8.55	
GF 157	2559	4265	165	80	25	42.5	71	1.99	15.7	8.05	
GF 318	3119	5090	162	81	20	43.2	70	1.88	18.6	10.02	

<sup>1</sup>Price Index based on two year average prices for U.S. government grades.

<sup>2</sup>Numerical values ranging from 1-99 for flue-cured tobacco based on equivalent government grades - higher the number, higher the grade.

Table 3. Yield, Value, Price Index, Grade Index and Agronomic Characteristics of Varieties Evaluated in the 2013 Regional Farm Test at the University of Georgia, Tifton, GA.

Variety	Yield lb/A	Value \$/A	Price Index <sup>1</sup> \$/CWT	Grade Index <sup>2</sup>	Leaves/ Plant (number)	Plant Ht. in	Days		Total Alkaloids %	Reducing Sugars %	Ratio RS/TA
							to Flower	Flower			
NC 2326	2658	4430	167.4	82	18	45.2	62	1.92	17.0	8.8	
NC 95	2718	4327	159.6	80	20	47.7	70	1.93	17.3	9.0	
K 326	2819	4623	163.3	81	20	42.5	71	1.82	17.9	9.8	
CU 171	2735	4464	164.1	83	19	44.7	70	1.56	18.3	11.7	
AOV 212	3241	5610	172.9	86	21	47.3	76	1.79	16.1	9.0	
CU 186	2731	4641	169.2	84	21	45.1	76	1.59	18.4	11.6	
CU 159	3039	5132	169.1	84	21	46.8	72	1.74	17.4	10.0	
NC EX 61	2325	3939	170.1	85	20	41.7	74	1.85	15.1	8.2	
GL EX 398	3456	6127	177.1	87	22	49.1	75	1.71	19.0	11.1	
PXH 1	2879	4834	167.4	84	23	46.1	75	1.70	17.2	10.1	
NC EX 60	3106	5090	163.9	83	23	47.2	73	1.77	15.3	8.6	
GL EX 328	2994	5266	176.4	87	22	44.3	70	1.66	19.7	11.8	
NC EX 59	2974	5305	178.4	88	19	39.3	66	1.57	18.2	11.6	
PXH 7	3008	5100	169.7	84	20	45.1	75	1.89	13.9	7.4	
NC EX 58	3081	5492	177.6	88	20	45.9	72	1.61	17.1	10.6	
PXH 13	2821	4948	175.2	85	20	42.3	68	1.63	17.8	10.9	
LSD -0.05	343.7	694.5	9.77	4.45							

<sup>1</sup>Price Index based on two year average (2011-2012) prices for U.S. government grades.

<sup>2</sup>Numerical values ranging from 1-99 for flue-cured tobacco based on equivalent government grades - higher the number, higher the grade.

**Table 1. Variety, Pedigree, Sponsor and Disease Resistance of the 2013 Released Variety Test (commercially available varieties), Roosevelt & Travis Dicks Farm, Columbia County, Florida. N 31o 30' 4.4" W 83o 31' 11.1",**

**Mace Bauer, Extension Agent, Columbia County, FL  
and Chris Vann, Extension Agent, Lafayette County, FL.**

Trt No	VARIETY	PEDIGREE	SPONSOR	Disease Resistance					
				BS	GW	FW	RK	BSp	Virus
1.	GL 338	F1 Hybrid	Gold Leaf Seed Co	R	R				
2.	GL 395	F1 Hybrid	Gold Leaf Seed Co	R	R		R		
3.	NC 196	F1 Hybrid	Gold Leaf Seed Co	R	L		R		
4.	GF 318	F1 Hybrid	Raynor	R	R		R		<i>TMV?</i>
5.	CC 13	F1 Hybrid	Cross Creek Seed	R	R		MjR		
6.	CC 35	F1 Hybrid	Cross Creek Seed	H	L		R		
7.	CC 33	F1 Hybrid	Cross Creek Seed	M	L		R		
8.	CC 700	F1 Hybrid	Cross Creek Seed	R	R		TCN /R		
9.	NC 92	F1 Hybrid	F.W. Rickard	R	R		TCN /R		
10.	NC 71	F1 Hybrid	F.W. Rickard	H	R		R		
11.	PVH 2275	F1 Hybrid	F.W. Rickard	H	L		R		TMV PVY
12.	NC 925	F1 Hybrid	F.W. Rickard	R	R		MjA		

<sup>1</sup>Resistance: H - High; M - Moderate; L - Low; R- Resistant; T - Tolerant; SU – Susceptible Diseases:  
BS - Black shank; GW - Granville Wilt; FW - Fusarium Wilt; RK - Root Knot; R1&3-*Meloidogyne Incognita* Race1 & Race3; Bn. Sp. - Brown spot; TMV - Tobacco Mosaic Virus; PVY - Potato Virus ‘Y’;  
TSWV – Tomato Spotted Wilt Virus; TCN - Tobacco Cyst Nematode; TEV - Tobacco Etch Virus;

Sponsor: AOI-Alliance One; Clemson-Clemson University; CC-Cross Creek Seed Co; GL-Gold Leaf Seed Company; Gwynn Farms; NCSU-NC State University; RJR- RJ Reynolds Tobacco Company; Rickard-F.W. Rickard Seed Co; SPT-Speight Seed Farms; ULT-Universal Leaf Tobacco Co

Seeded: 1/22/13

**Table 2. Yield, Grade Index, Price Index, and Value per Acre of the 2013 Released Variety Test (commercially available varieties), Roosevelt & Travis Dicks Farm, Columbia County, Florida.**

Trt	VARIETY	PEDIGREE		Yield	Grade Index	Price Index	Value
				lb/A	1-99	\$/cwt	\$/A
1.	GL 338	F1 Hybrid	Gold Leaf Seed Co	2552	90.0	185.00	4,721
2.	GL 395	F1 Hybrid	Gold Leaf Seed Co	2979	76.1	146.60	4,349
3.	NC 196	F1 Hybrid	Gold Leaf Seed Co	2596	89.5	182.30	4,723
4.	GF 318	F1 Hybrid	Raynor	3225	89.4	182.20	5,870
5.	CC 13	F1 Hybrid	Cross Creek Seed	3009	87.7	179.90	5,413
6.	CC 35	F1 Hybrid	Cross Creek Seed	2703	84.8	175.50	4,757
7.	CC 33	F1 Hybrid	Cross Creek Seed	2915	89.2	181.20	5,276
8.	CC 700	F1 Hybrid	Cross Creek Seed	2503	84.6	175.10	4,380
9.	NC 92	F1 Hybrid	F.W. Rickard	2792	89.5	182.70	5,100
10.	NC 71	F1 Hybrid	F.W. Rickard	2881	64.5	129.20	3,722
11.	PVH 2275	F1 Hybrid	F.W. Rickard	2643	76.2	146.80	3,880
12.	NC 925	F1 Hybrid	F.W. Rickard	3315	93.4	198.90	6,594

Grade Index is a numerical value ranging from 1-99 for flue-cured tobacco based on equivalent grades - the higher the number the higher the grade.

Price Index is based on a two year floating average (2011-2012) price for U. S. government grades.