EXTENSION-RESEARCH FLUE-CURED&BURLEY
TOBACCO PATHOLOGY REPORT

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SECTION I

DISEASE LOSSES - 2002 - 2006

Disease loss information for tobacco is available for each year since 1953. This information is useful in identifying major problems and geographical area involved. It can also indicate the relative effectiveness of control methods. Such guidance is needed to make long-range plans for research and extension activities.

Comparison method was used for estimating tobacco disease losses. This method compares losses from a given disease this year to those of the previous year. The percent loss data for each county was provided by county extension personnel. These estimates were summarized for the state. The October estimate was multiplied by 1.14171 to account for the value lost to disease, to obtain the corrected crop value. These data for the past 5 years are presented in Table 1.

The Tobacco Disease Situation

Black shank caused the highest losses in crop value in North Carolina during 2008, with losses reported at 4.66 percent. This was the highest loss ever reported from this disease. Most of the black shank losses reported was in varieties with complete resistance to race 0 of black shank. However black shank occurred also in fields where varieties with complete resistance to race 0 had never or very few times planted in the past. In these cases black shank occurrence was attributed to the prolonged dry conditions and increased stress that the crop was already under. Tomato spotted wilt incidence was rather low this season (2.87 percent). The most severe losses were reported in the eastern and southern areas of the state. Rain in spring followed by dry conditions in early summer were responsible for the Granville wilt high incidence in 2008 (3.32 percent).

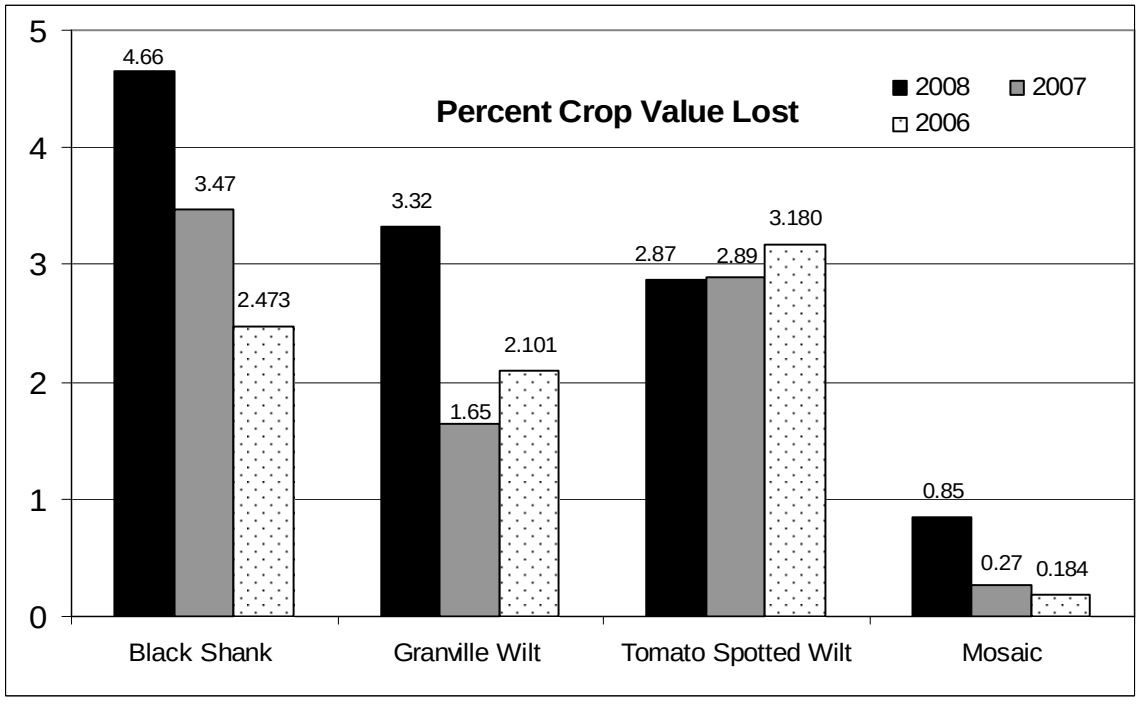


Table 1. FLUE-CURED TOBACCO DISEASE LOSS ESTIMATES - NORTH CAROLINA 2004-2008.[1]

Disease	2004		2005		2006		2007		2008	
	%	$	%	$	%	$	%	$	%	$
Black Shank	1.222	7,672,633	2.854	12,879,387	2.473	13,693,036	3.473	19,270,746	4.659	36,010,470
Granville Wilt	1.952	12,254,429	3.005	13,559,121	2.101	11,633,100	1.650	9,153,537	3.319	25,653,907
Tomato Spotted Wilt	1.237	7,765,619	3.925	17,711,225	3.180	17,604,764	2.890	16,017,711	2.869	22,175,348
Mosaic	0.139	870,964	0.099	448,350	0.184	1,017,567	0.272	1,509,083	0.851	6,579,032
Target Spot	1.384	8,690,436	3.269	14,749,757	1.961	10,856,521	0.776	4,308,562	0.585	4,525,196
Root-Knot Nematodes	0.399	2,505,126	0.354	1,596,452	0.320	1,772,819	0.278	1,542,864	0.530	4,096,321
Pythium Root/Stalk Rot	0.263	1,653,692	0.391	1,765,135	0.539	2,981,845	0.668	3,706,971	0.482	3,729,107
Fusarium Wilt	0.014	87,023	0.025	113,458	0.063	348,334	0.053	294,668	0.265	2,052,005
Barn Rot	0.358	2,250,217	0.626	2,827,008	0.173	957,566	0.162	901,509	0.170	1,315,258
Hollow Stalk	0.447	2,807,265	0.109	489,857	0.150	828,886	0.159	882,228	0.145	1,118,768
Miscellaneous Leaf	0.055	344,300	0.011	47,652	0.013	69,495	0.001	4,616	0.097	751,009
Etch	0.011	68,484	0.003	15,155	0.003	19,265	0.055	303,476	0.056	431,492
Misc. Root Diseases	0.035	218,887	0.031	140,459	0.000	0.000	0.000	0	0.054	417,129
Brown Spot	0.282	1,769,635	0.288	1,299,614	0.117	647,335	0.037	203,985	0.041	316,212
Other Nematodes	0.023	146,297	0.001	2,281	0.096	529,188	0.000	0	0.027	208,612
Weather Fleck	0.099	618,480	0.038	170,080	0.142	784,621	0.034	190,623	0.009	69,111
Angular Leafspot	0.018	109,876	0.536	2,416,765	0.219	1,209,790	0.073	402,628	0.006	43,087
Bacterial Soft Rot			0.078	353,274	0.119	656,584	0.050	277,086	0.003	20,871
Vein-Banding	0.000	3,002	0.000	1,021	0.004	22,238	0.000	0	0.003	19,926
Blue Mold	0.016	99,402	0.004	17,349	0.000	0.000	0.000	0	0.000	0
Ringspot	0.003	18,527	0.003	15,016	0.000	0.000	0.000	0	0.000	0
Botrytis	0.002	14,113	0.001	6,531	0.000	0.000	0.000	0.000	0.000	0.000
Totals	7.959	49,968,407	15.651	70,624,947	11.857	65,632,954	10.631	58,970,293	14.171	109,532,861
Greenhouse[2]										
Pythium Root Rot	0.440	91,307	0.947	156,953	1.165	174,015	1.249	193,758	5.443	1,001,675
Rhizoctonia Damping-Off or Stem Rot	0.600	124,458	1.564	259,419	0.906	135,397	1.179	182,821	1.764	324,677
Collar Rot (Sclerotinia)	0.361	74,806	2.378	394,306	0.806	120,336	0.674	104,579	0.857	157,734
Botrytis	0.006	1,156	0.010	1,665	0.017	2,609	0.019	3,000	0.023	4,290
Tobacco Mosaic Virus	0.006	1,309	0.008	1,359	0.016	2,405	0	0	0.095	17,400
Target Spot	0.080	16,647	0.116	19,183	0.014	2,084	0.201	31,172	0.837	154,100
Bacterial Soft Rot	0.030	6,241	0.052	8,649	0.012	1,839	0.091	14,082	0.212	39,065
Blue Mold	0.003	586	0.000	0.000	0.000	0.000	0.000	0.000	0.011	1,950
Totals	1.525	316,511	5.075	841,534	2.936	438,685	3.413	529,412	9.242	1,700,891

[1]The 2004-2008 crop values are October estimates corrected for disease loss. Crop values: 2008: $772,937,562; 2007: $554,905,474; 2006: $553,677,340

2005: $451,252,556; 2004: $627,751,293

[2] The 2004-2008 seedling value was estimated at: 2008: $18,404,397; 2007: $15,507,762; 2006: $14,938,515; 2005: $16,582,050; 2004: $20,750,573

SECTION II

USAGE OF DISEASE MANAGEMENT PRACTICES

Trends in disease control methods provide information valuable for all segments of the industry and are used in planning research, education, and development programs by both university and industry. Results from these surveys (Table 2, Figures 2-4) are also useful in determining reasons for damage levels and for successful production.

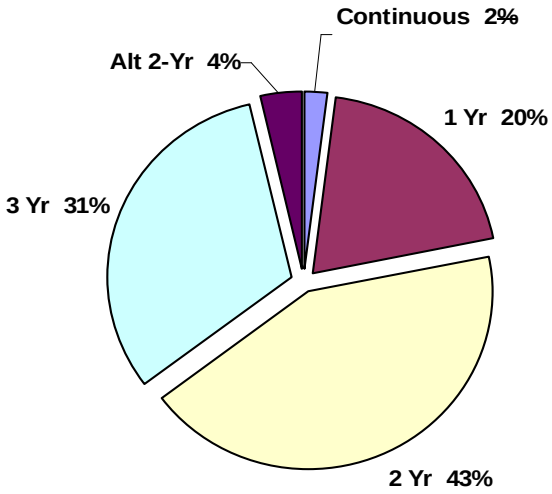
Extension agents assigned to flue-cured tobacco provided estimates of disease control treatment usages for their county. This information was obtained by observation, contract with dealers, distributors, and growers.

Usage estimates for chemical, cropping systems, and varieties were based on acres planted. Greenhouse fungicide preventative program usage was based on the percentage of acres transplanted from treated greenhouses. These surveys represent 71% of the 172,000 planted acres.

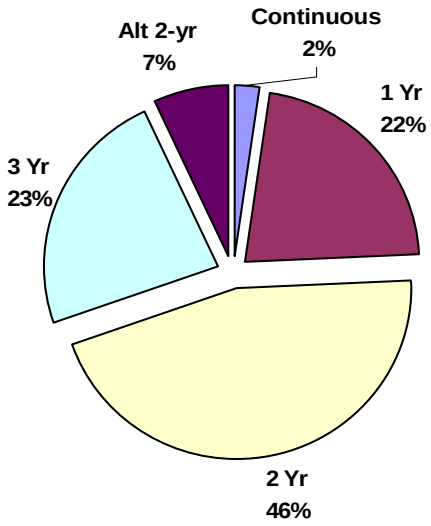
Summary

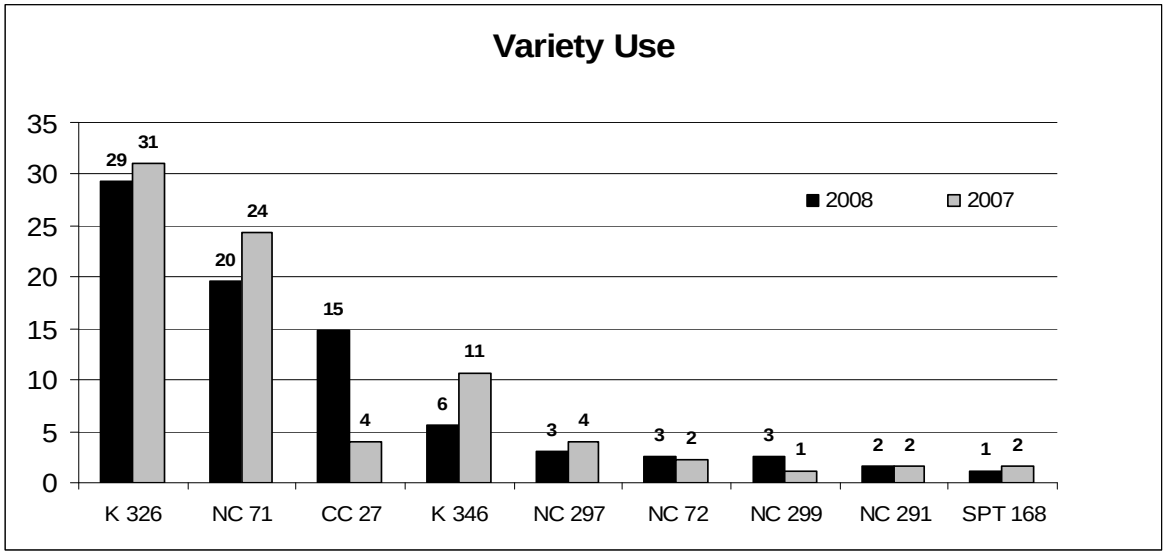
Most growers selected control treatments and combinations based on major disease problem(s) and production methods. Varieties with the ph gene for complete resistance to race 0 black shank were planted on 47% of the acreage and those with high resistance to Granville wilt on 15.2%. Chemical soil treatment continued to be a popular method of disease control with usage on 71.4% of the planted acreage. Cropping systems that involved rotation continued to be popular and were used on 98% of the planted acreage.

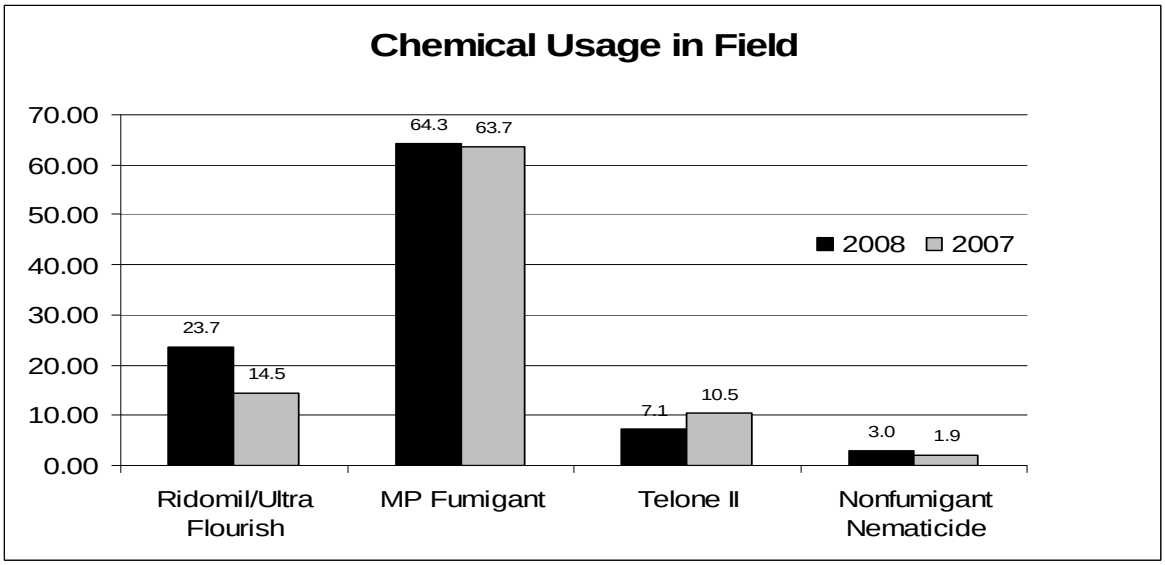
2007 Rotations



2008 Rotations




Variety Use
35
30
25
20
15
10
5
0
29
31
20
24
15
4
6
11
3
4
3
2
3
1
2
2
1
2
2008
2007
K 326
NC 71
CC 27
K 346
NC 297
NC 72
NC 299
NC 291
SPT 168


Chemical Usage in Field
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
23.7
14.5
64.3
63.7
7.1
10.5
3.0
1.9
2008
2007
Ridomil/Ultra Flourish
MP Fumigant
Telone II
Nonfumigant Nematicide

RESULTS FROM SURVEY OF COUNTY AGENTS ON DISEASE MANAGEMENT PRACTICES

Cropping Systems (% Acres Planted)

Continuous Culture	2.08
1-Year Rotation	20.99
2-Year Rotation	43.93
3-Year Rotation	22.40
Alternating 2-yr	6.54

Field Chemical Disease Control (% Acres treated)

None	12.51
Mefenoxam Alone	10.57
Telone C-17	31.57
Telone C-17 + Mefenoxam	7.46
Chlor-O-Pic 100	20.47
Chlor-O-Pic 100 + Mefenoxam	4.78
Telone II	6.43
Telone II + Mefenoxam	0.66
Temik (15lbs Alone & w soil insect.)	2.79
Temik 15lbs + Mefenoxam	0.21

Varieties (% Acres planted)

COKER 371-GOLD	0.54
K 149	0.52
K 326	29.23
K 346	5.63
NC 55	0.47
NC 71	19.57
NC 72	2.59
NC 102	0.16
NC 196	7.46
NC 291	1.65
NC 297	3.09
NC 299	2.57
NC 606	0.79
CC 27	14.83
CC 37	2.97
SPT 168	1.13
SPT 227	1.56
Others	5.23

Greenhouse Chemical Disease Control

No Chemical Treatment	3.23
Terramaster	25.43
Average number of applications	1.40
Dithane	9.38
Average number of applications	1.89
Mefenoxam (Ridomil Gold)	8.45
Average number of applications	1.17
Streptomycin/Agromycin	1.97
Average number of applications	1.22
Admire or generic imidacloprid	74.72
Actigard	0.90
Other Chemicals	1.89

Tobacco Tray Sanitation

Wash trays with water, do not fumigate	6.25
Wash trays with Chlorox solution, do not fumigate	15.88
Wash trays with Detergent or soap, do not fumigate	7.74
Wash trays with water, and Fumigate trays	30.84
Wash trays with Chlorox or Detergent and Fumigate	31.98
Use Disposable Trays	0.29
Steam Trays	5.97
Other Method	0.27

Foliar Fungicides

Acrobat 50WP	2.45
Average number of applications	1.33
Actigard	1.35
Average number of applications	1.00
Quadris	8.34
Average number of applications	1.10
Dithane DF	2.08
Average number of applications	1.33

TOBACCO, FLUE CURED (*Nicotiana tabacum L*)
Pythium Root Rot; *Pythium spp*.

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Control of pythium root rot in flue cured tobacco seedlings, 2008.

This trial was established in the NC State University greenhouses at Method Road. The trial was a randomized complete block design with three replications. Plots were polystyrene trays (192 cells per tray of 35 cm x 50 cm) filled with a soil-less potting mix and seeded with pelletized tobacco seeds of cultivar k 326 on 23 May. Seeded trays were then placed into 12 L black plastic trays and filled with water to simulate the float-tray system used by tobacco growers in greenhouses. Water soluble fertilizer (Peter's 20-20-20) was added 7 days after seeding to bring the float solution to 150 ppm of N and it was increased by an additional 50 ppm of N at 21 days after seeding. There were 4 treatments. Tobacco trays were inoculated when plants were 22 days old on 13 Jun, and then again on 19 and 25 Jun, and 3 Jul. Inoculation was done by placing 1 piece of fescue leaf infected with *P. volutum*, and 1 piece of fescue leaf infected P. *myriotylum* into the float water of each plastic tray. Fescue leaves were infested by placing pieces of sterile fescue leaves into Petri dishes that had deionized water, CMA pieces of an active growing colony of *P. volutum*, or *P. myriotylum* and incubated for 7 days. Seedlings were grown in the greenhouse for 60 days. Plants were clipped weekly starting at 30 days after seeding. Root samples were taken from seedlings on 19 Jul to isolate *Pythium.* Pecentage of foliage yellowing, root discoloration incidence, rood discoloration severity, foliage height (FH), Root Length (RL), foliage weight per plant (FW), and percentage of usable plants were evaluated 60 days after seeding.

Pythium spp. were isolated only from the nontreated inoculated trays. A significant discoloration was observed 1 to 2 days after the Terramaster 4EC application but new roots began to grow immediately and plants recovered quickly. Root discoloration was generally low in all treatments but the non treated inoculated control. Saponins applied 2 times had the shortest roots due to the fact that saponins prune the roots. However this problem was overcome when 100 ppm of saponins where applied with 0.7 fl oz of T 4EC. Combination with 100 ppm saponins with 0.7 fl oz of T 4EC was equal good as 2 applications of 0.7 fl oz of T 4EC as this was indicated by the fresh weight, height, and root length.

Material, rate per 100 gal of water, timing	Percent of Yellowing	Percent of Root Discoloration
Non treated, Inoculated	56.7a*	90a
Non treated, Non inoculated	0.0b	0b
Saponins, 100 pm, 1 wk after seed + 3 wks after seed	13.33b	2b
Saponins, 100 ppm, 1 wk after seed +	20.00b	0b
Terramaster 4EC, 0.7 fl oz, 3 wks after seed		
Terramaster 4EC, 0.7 fl oz, 1, and 3 wks after seed	13.33b	7b

* Means within columns followed by the same letter do not significantly differ ($P = 0.05$).

Material, rate per 100 liter of water	Root Length (mm)	Height (mm)	Fresh Weight per Plant (g)
Non treated, Inoculated	79.8b*	75.7a	1.95c
Non treated, Non inoculated	98.0a	80.2a	3.20a
Saponins, 100 pm, 1 wk after seed + 3 wks after seed	46.7c	78.8a	2.59b
Saponins, 100 ppm, 1 wk after seed +	90.7ab	81.3a	2.86ab
Terramaster 4EC, 0.7 fl oz, 3 wks after seed			
Terramaster 4EC, 0.7 fl oz, 1 and 3 wks after seed	97.5a	78.8a	3.01a

* Means within columns followed by the same letter do not significantly differ ($P = 0.05$).

TOBACCO, FLUE CURED (*Nicotiana tabacum L*)
Pythium Root Rot; *Pythium spp*.

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Control of collar rot and rhizoctonia diseases in tobacco greenhouses with *S. griseoviridis*, and *T. viridea*, 2008.

This trial was established in the NC State University greenhouses at Method Road. The trial was a randomized complete block design with three replications. Plots were polystyrene trays (192 cells per tray of 35 cm x 50 cm) filled with a soil-less potting mix and seeded with pelletized tobacco seeds of cultivar k 326 on 23 May. For the biological agents *S. griseoviridis*, and *T. viridea* 2g of the biofungicides Mycostop® and PlantShield® were mixed in 765L of soil-less mix. Seeded trays were then placed into 12 L black plastic trays and filled with water to simulate the float-tray system used by tobacco growers in greenhouses. Water soluble fertilizer (Peter's 20-20-20) was added 7 days after seeding to bring the float solution to 150 ppm of N and it was increased by an additional 50 ppm of N at 21 days after seeding. Tobacco trays were inoculated when plants were 22 days old on 13 Jun. For rhizoctonia, 24 randomly selected plants per tray were inoculated by placing two pieces of infested with *R. solani* AG4 (damping-off) vermiculite at the basis of the seedling stem. For collar rot two 1 cm-diam mycelial discs from a colony of *S. sclerotiorum* growing on CMA and several clippings collected from the tobacco leaves were placed at each of the 24 inoculum sites per tray. Rovral was sprayed 5 days after inoculation (when symptoms first appeared in the untreated control) in a volume of water equivalent of 25 gal/ 1000 sq ft. To increase humidity and enhance collar rot or rhizoctonia development plastic covers were placed on the top of the trays right after inoculation and kept them on trays for 7 days. Plants were clipped weekly starting at 30 days after seeding. Trays were observed every 3 days for disease development until 23 days after inoculation. Percentage of dead or infected plants at the inoculum sites (IS) and percentage of dead or infected plants per inoculum site (PIS) (plants that are in the cells around the inoculum sites). Data were subjected to analysis of variance and significant differences were determined by LSD ($P = 0.05$).

The method of inoculation used in the test resulted in severe and moderate development of collar rot and rhizoctonia respectively at the inoculation sites in the untreated control. Rovral was effective in controlling damping off or collar rot of tobacco seedlings resulting in the fewer dead or infected plants at the inoculation sites or the plants in the cells around the inoculum sites. Both bio-fungicides suppressed significantly the incidence of collar rot and they were numerically better than the non treated control in the case of damping off; however they provided only moderate control when compared to Rovral. Additional research should be conducted to determine if application of bio-fungicides in the soil-less potting mix can initially slow down the development of collar rot and rhizoctonia diseases in tobacco greenhouses and then supplemented by lower rates of fungicides, leading to reduced usage of chemicals in the greenhouse tobacco production.

Treatment, rate	Rhizoctonia diseases*		Collar rot	
	IS	PIS	IS	PIS
Non treated	17.5a	6.7a	52.7a	36.2a
S.griseoviridis (Mycostop®)	9.7ab	10.0a	29.0b	0.0b
T.viridea (PlantShield®)	9.7ab	17.5a	22.2b	3.5b
Rovral 4F, 4 oz.	1.3b	0.0a	5.3c	1.0b

* All treatments were inoculated with *R. solani* AG4 (damping off).
* Means within columns followed by the same letter do not significantly differ ($P = 0.05$).

SUMMARY - GENERAL INFORMATION FOR ON FARM TESTS

				Nematodes/500 cc Soil			
Test Type	**Location - Grower**	**Black shank MAJOR race**	**pH**	**Root Knot**	**Lesion**	**Spiral**	**Stunt**
Black shank	Forsyth - Weavil	1	6.1	10	--	160	40
Black shank	Iredell - Renager	0&1	6	2880	30	--	120
Black shank	Rockingham - Baker	0	5.8		no report		
Black shank	Rockingham - Herbin	1	5.7		no report		
Black shank	Surry - Badgette	1	6.9	--	20	40	40
Black shank	Yadkin - Brown	1	6.4	--	--	80	40
Black shank	Martin - Edmundson	0&3	6.4	--	--	--	--
Black shank	Johnston - Edwards	-	5.4	--	60	760	240
Granville wilt	Caswell - Blackard	-	7.1		no report		
Granville wilt	Duplin - Bell	-	5.4	100	--	--	--
Granville wilt	Franklin - May	-	5.9	--	10	320	200
Granville wilt	Edgecombe - Lancaster	-	6	--	80	--	120
Granville wilt	Johnston - Holloman	-	4.7	--	--	--	200

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Granville Wilt; *Ralstonia solanacearum*

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Chemical and variety controls for Granville wilt in flue cured tobacco, 2008.

This trial was established in a naturally infested field in Duplin County, NC in a Norfolk loamy sand soil series with a pH of 5.4. The trial design was a split-plot arranged in a randomized complete block consisting of one 46 in. wide row 50 ft in length with four replications. Factors were assigned as follows: factor A = variety, factor B = chemical treatment. Fumigant was applied in alternating rows 28 Mar. The row-applied material (Chloropicrin 100 3 gal/a) was injected from a single outlet on a single shank 8 in. below the soil surface while a ridge was being formed, resulting in a final depth of 14 in. The site was transplanted on 1 May and normal cultural practices were employed throughout the season. Disease incidence was evaluated on 12, 27 Jun and 10, 31 Jul. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was collected at this site.

Disease pressure in this field was high. Weather conditions were favorable for Granville wilt with rainy conditions in spring followed by hot weather in early summer. Granville wilt symptoms showed in early June; some of the varieties had over 10 percent incidence. Chloropicrin significantly reduced Granville wilt incidence but for CC 65 where incidence was higher for the treated than the untreated plots. Chloropicrin provided an extra 40 to 70 % control for 16 of the 30 cultivars planted. XP 596 and NC 196 had the lowest disease indices with or without chloropicrin. K394, RJR 15, and RJR 75 had the highest index.

	Percent Disease										**Percent**	
Variety/Fumigant	6/12/2008		6/27/2008		7/10/2008		7/31/2008		**Disease Index**		**Control**	
CC 13											55.0	abc
Untreated	7.2	a-e	35.6	e-n	57.1	a-g	68.5	a-h	42.1	a-i		
Chloropicrin 100	1	ef	7.2	rs	9.2	p-s	34.2	g-p	12.9	q-u		
CC 27											42.2	abc
Untreated	3.3	c-f	10.7	o-s	20.4	l-s	26.9	j-p	15.3	m-u		
Chloropicrin 100	0	f	5.4	rs	5.4	rs	19.7	nop	7.6	tu		
CC 33											35.6	abc
Untreated	3.2	c-f	41.8	c-j	47.2	c-k	60.4	a-l	38.1	a-l		
Chloropicrin 100	1	ef	25.9	g-r	25.9	j-s	44.6	c-o	24.4	g-t		
CC 35											25.0	abc
Untreated	11.6	a	56	a-f	71.8	abc	83.2	ab	55.6	abc		
Chloropicrin 100	3	c-f	26.7	g-r	34.8	g-p	60	a-l	31.1	e-r		
CC 37											46.7	abc
Untreated	4.3	b-f	24.2	h-r	32.6	g-q	41.3	d-p	25.6	g-t		
Chloropicrin 100	0	f	10.6	p-s	10.6	o-s	22.6	l-p	11	r-u		
CC 65											11.9	bc
Untreated	1.1	ef	40.9	d-j	47.3	c-k	57	a-n	36.6	b-l		
Chloropicrin 100	6.3	a-f	64.2	ab	74.3	ab	86.2	ab	57.7	a		
CC 67											27.3	abc
Untreated	1	ef	22	i-s	30.2	h-r	41.2	d-p	23.6	h-t		
Chloropicrin 100	2	def	17.2	l-s	17.2	l-s	44.2	c-p	20.1	k-u		

*Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.

**Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

Variety/Fumigant	Percent Disease 6/12/2008		6/27/2008		7/10/2008		7/31/2008		Disease Index		Percent Control	
CC 700											43.9	abc
Untreated	3.1	c-f	31.3	g-p	54.9	a-i	54.9	a-o	36	b-m		
Chloropicrin 100	1	ef	17.8	k-s	20.9	l-s	41.8	d-p	20.4	j-u		
GF 318											37.4	abc
Untreated	11	ab	41.6	c-j	67.7	abc	69.9	a-h	47.5	a-f		
Chloropicrin 100	4	b-f	31.3	g-p	35.5	f-o	53.6	a-o	31.1	e-r		
GF 52											64.8	a
Untreated	4.4	b-f	46.2	b-h	61.3	a-f	67.3	a-h	44.8	a-g		
Chloropicrin 100	0	f	16.4	m-s	16.4	l-s	25.9	j-p	14.7	o-u		
K 346											25.1	abc
Untreated	11.5	a	37.9	d-m	40	e-l	49.4	b-o	34.7	d-p		
Chloropicrin 100	3	c-f	17	m-s	22	k-s	36.3	g-p	19.6	k-u		
K 394											23.0	abc
Untreated	3.1	c-f	58.5	a-d	71.2	abc	89.1	a	55.5	a-d		
Chloropicrin 100	1	ef	18	k-s	35.1	g-p	67	a-h	30.3	e-s		
NC 102											26.8	abc
Untreated	9.5	abc	42	b-i	52.2	a-i	61.2	a-k	41.2	a-j		
Chloropicrin 100	5	a-f	21.7	i-s	30.9	h-r	43.5	c-p	25.3	g-t		
NC 196											37.3	abc
Untreated	2.1	def	22	i-s	22	k-s	40.9	d-p	21.7	i-u		
Chloropicrin 100	2.1	def	16.7	m-s	17.7	l-s	26	j-p	15.6	m-u		
NC 299											63.6	ab
Untreated	4.3	b-f	38.6	d-m	66.3	a-d	84.1	ab	48.3	a-f		
Chloropicrin 100	2.1	def	21.7	i-s	21.7	k-s	32	h-p	19.4	k-u		
NC 471											43.1	abc
Untreated	7.3	a-e	57.7	a-e	64.8	a-e	71.9	a-g	50.4	a-e		
Chloropicrin 100	0	f	17.8	k-s	17.8	l-s	37.5	f-p	18.2	l-u		
NC 810											27.2	abc
Untreated	0	f	17	m-s	21.1	l-s	24.3	k-p	15.6	m-u		
Chloropicrin 100	2.2	def	5.4	rs	7.6	qrs	23.6	k-p	9.7	stu		
NC 92											23.0	abc
Untreated	4.5	b-f	40.5	d-j	50	b-j	56.3	a-o	37.8	a-l		
Chloropicrin 100	0	f	11.4	o-s	22.3	k-s	45.1	c-o	19.7	k-u		
NCEX 07											16.7	abc
Untreated	7.2	a-e	38.3	d-m	41.4	d-l	44.6	c-o	32.9	e-q		
Chloropicrin 100	5	a-f	30	g-q	34	g-p	51.2	b-o	30.1	e-s		

*Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher

indices reflect more disease.
**Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

Variety/Fumigant	Percent Disease 6/12/2008		6/27/2008		7/10/2008		7/31/2008		Disease Index		Percent Control	
NCEX 08											47.7	abc
Untreated	2.1	def	32.9	g-o	41.3	d-l	54.8	a-o	32.8	e-q		
Chloropicrin 100	2.1	def	19.6	j-s	20.6	l-s	28.8	i-p	17.8	l-u		
NCEX 09											55.4	abc
Untreated	2	def	37.2	d-n	40.3	e-l	77.3	a-e	39.2	a-k		
Chloropicrin 100	0	f	19.9	i-s	21.8	k-s	40.2	e-p	20.5	j-u		
NC 471											43.1	abc
Untreated	7.3	a-e	57.7	a-e	64.8	a-e	71.9	a-g	50.4	a-e		
Chloropicrin 100	0	f	17.8	k-s	17.8	l-s	37.5	f-p	18.2	l-u		
NC 810											27.2	abc
Untreated	0	f	17	m-s	21.1	l-s	24.3	k-p	15.6	m-u		
Chloropicrin 100	2.2	def	5.4	rs	7.6	qrs	23.6	k-p	9.7	stu		
NC 92											23.0	abc
Untreated	4.5	b-f	40.5	d-j	50	b-j	56.3	a-o	37.8	a-l		
Chloropicrin 100	0	f	11.4	o-s	22.3	k-s	45.1	c-o	19.7	k-u		
NCEX 07											16.7	abc
Untreated	7.2	a-e	38.3	d-m	41.4	d-l	44.6	c-o	32.9	e-q		
Chloropicrin 100	5	a-f	30	g-q	34	g-p	51.2	b-o	30.1	e-s		
NCEX 08											47.7	abc
Untreated	2.1	def	32.9	g-o	41.3	d-l	54.8	a-o	32.8	e-q		
Chloropicrin 100	2.1	def	19.6	j-s	20.6	l-s	28.8	i-p	17.8	l-u		
NCEX 09											55.4	abc
Untreated	2	def	37.2	d-n	40.3	e-l	77.3	a-e	39.2	a-k		
Chloropicrin 100	0	f	19.9	i-s	21.8	k-s	40.2	e-p	20.5	j-u		
PVH 1118											14.1	abc
Untreated	9.6	abc	46.5	b-g	56	a-h	62.3	a-j	43.6	a-h		
Chloropicrin 100	1	ef	20.4	i-s	29.8	i-r	58.8	a-m	27.5	f-t		
PVH 2110											42.4	abc
Untreated	6.3	a-f	42.1	b-i	57.7	a-g	66.7	a-h	43.2	a-h		
Chloropicrin 100	8.1	a-d	34.7	f-n	38.7	f-m	55.7	a-o	34.3	e-p		
RJR 15											8.3	c
Untreated	10.4	ab	69.1	a	72.2	abc	78.5	a-d	57.5	a		
Chloropicrin 100	4	b-f	41.9	c-i	57	a-g	75.4	a-f	44.6	a-g		
RJR 75											56.4	abc
Untreated	6.4	a-f	63.5	abc	76.3	a	80.6	abc	56.7	ab		
Chloropicrin 100	0	f	5.1	rs	12	n-s	38.6	f-p	13.9	p-u		

*Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
**Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

	Percent Disease										Percent	
Variety/Fumigant	6/12/2008		6/27/2008		7/10/2008		7/31/2008		Disease Index		Control	
SP 220											43.1	abc
Untreated	7.4	a-e	39.6	d-k	39.6	e-l	55.7	a-o	35.6	c-n		
Chloropicrin 100	1.3	def	22	i-s	24.2	j-s	33.4	h-p	20.2	k-u		
SP 227											60.0	abc
Untreated	3.3	c-f	39.3	d-l	40.4	d-l	65.2	a-i	37.1	a-l		
Chloropicrin 100	1	ef	8	qrs	10.1	o-s	28.3	i-p	11.9	r-u		
SP 234											46.6	abc
Untreated	2.2	def	36.5	d-n	39.5	e-l	62.3	a-j	35.1	c-o		
Chloropicrin 100	0	f	11.6	o-s	12.6	n-s	35.1	g-p	14.8	n-u		
SP 236											57.2	abc
Untreated	2.1	def	31.3	g-p	37.4	f-n	43.6	c-p	28.6	f-s		
Chloropicrin 100	1.1	ef	10.8	o-s	13.1	m-s	21.9	m-p	11.7	r-u		
XP 596											63.5	ab
Untreated	0	f	15.6	n-s	18.8	l-s	18.8	op	13.3	q-u		
Chloropicrin 100	0	f	1.2	s	2.3	s	6.6	p	2.5	u		

*Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
**Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Granville Wilt; *Ralstonia solanacearum*

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Variety evaluation for resistance to Granville wilt in flue-cured tobacco, 2008.

This study was established in a naturally infested field located in Caswell County, NC. The soil type was a Cecil sandy loam soil series with a pH of 7.1. There were 17 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft long one-row plots with four replications. Chloropicrin was applied by the grower at 3 gal/A early pretransplant in the row. The tobacco was transplanted on 6 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 8, 28 July, 12, 26 Aug and 19 Sep. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

Disease pressure in this field was moderate but very uneven. Most of the disease was located at the lower front part of the field. Weather conditions were favorable for Granville wilt with rainy conditions in spring followed by hot weather in early summer. Granville wilt symptoms showed in early July; most varieties had 4 to 7 percent incidence. Disease indices ranged between 7 and 36. K394 had the highest disease index. NC 299 and SP 220 had the lowest index. There were no statistical differences among disease indices due to the fact that Granville wilt distribution in the field was very uneven (i.e. replicate was a statistically significant factor).

	Percent Disease										**Disease Index***	
Variety	7/8/2008		7/28/2008		8/12/2008		8/26/2008		9/19/2008			
NC 299	1.2	a**	8.9	a	8.9	a	8.9	a	8.9	a	7.4	a
SP 220	0	a	14.8	a	14.8	a	16.1	a	17.4	a	12.6	a
GL 939	0	a	13.6	a	14.9	a	17.3	a	22.3	a	13.6	a
NC 606	0	a	7.7	a	20.3	a	20.3	a	24.1	a	14.5	a
SP 210	0	a	13.9	a	13.9	a	13.9	a	31.3	a	14.6	a
CC 27	0	a	16	a	18.6	a	18.6	a	21.1	a	14.9	a
SP 225	7.7	a	10.3	a	16.8	a	19.4	a	21.9	a	15.2	a
SP 227	3.7	a	13.6	a	21	a	21	a	21	a	16	a
CC 37	1.2	a	20.9	a	23.4	a	24.6	a	27.1	a	19.5	a
NC 810	0	a	16.3	a	23.8	a	27.2	a	38.2	a	21.1	a
SP 234	2.5	a	14.9	a	29.9	a	29.9	a	29.9	a	21.4	a
NC 471	4.9	a	24.7	a	27.2	a	27.2	a	27.2	a	22.3	a
NC 196	5.3	a	28	a	29.3	a	29.3	a	30.6	a	24.5	a
K 149	3.7	a	22.6	a	28.7	a	28.7	a	46.2	a	26	a
K 346	16.7	a	32.9	a	32.9	a	32.9	a	35.9	a	30.2	a
NC 102	9.2	a	32.8	a	36.6	a	36.6	a	41.6	a	31.4	a
K 394	16	a	36	a	39.7	a	42.1	a	46.1	a	36	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Granville Wilt; *Ralstonia solanacearum*

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Variety evaluation for resistance to Granville wilt in flue-cured tobacco, 2008.

This study was established in a naturally infested field located in Edgecombe County, NC. The soil type was a Norfolk loamy sand soil series with a pH of 6.0. There were 30 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft. long one-row plots with four replications. The tobacco was transplanted on 6 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 3, 18, 30 Jul and 19 Aug. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

Disease pressure in this field was high. Weather conditions were favorable for Granville wilt with rainy conditions in spring followed by hot weather in early summer. Granville wilt symptoms showed in early July; some of the varieties had 4 to 7 percent incidence. Disease indices ranged between 5 and 25 for most cultivars. K394, RJR 75, RJR 15, CC 65, and CC 35 had the highest disease indices. XP 596 and NC 196 had the lowest ones.

	Percent Disease									
Variety	7/3/2008		7/18/2008		7/30/2008		8/19/2008		**Disease Index**	
XP 596	1.1	a	1.1	c	1.1	k	2	l	1.3	k
NC 196	2.8	a	2.8	c	2.8	jk	4.7	kl	3.3	jk
CC 67	0	a	1.9	c	5.8	h-k	7.7	jkl	3.8	ijk
NC 810	0	a	1.1	c	3.1	jk	12.5	h-l	4.2	ijk
SP 234	1.1	a	1.1	c	5.3	h-k	10.7	i-l	4.5	ijk
NC 299	1	a	2	c	7	h-k	10	i-l	5	ijk
CC 27	2	a	2	c	5.9	h-k	12.7	h-l	5.6	h-k
CC 37	1.9	a	4.8	c	5.8	h-k	9.8	i-l	5.6	h-k
K 346	0	a	2.9	c	8.8	h-k	11.7	h-l	5.8	g-k
SP 220	0	a	2	c	7	h-k	17	g-l	6.5	f-k
NC 92	1.9	a	2.8	c	9.5	g-k	12.3	h-l	6.6	f-k
SP 227	1	a	1	c	4.9	ijk	20.4	f-l	6.8	f-k
GF 318	2	a	5	c	7.8	h-k	15.6	g-l	7.6	e-k
PVH 2110	1.9	a	5.7	c	10.3	f-k	18.7	f-l	9.2	d-k
NC 471	1	a	3.8	c	9.6	g-k	23.1	e-k	9.4	d-k
CC 13	2.8	a	7.7	c	11.6	f-k	24	d-k	11.5	d-j
CC 700	1	a	3.9	c	15.5	e-i	26.2	d-j	11.7	d-j
SP 236	3.1	a	4.1	c	12	f-k	28.5	c-i	11.9	d-i
PVH 1118	4.9	a	7.8	c	13.7	e-j	28.3	c-i	13.7	d-h
NC 102	3.8	a	7.7	c	15.5	e-i	28.2	c-i	13.8	d-h
NCEX 08	2.9	a	6.7	c	16.1	e-h	30.5	c-h	14	d-g
NCEX 09	3.9	a	6.8	c	20.5	d-g	25.4	d-j	14.1	d-g
GF 52	4	a	7	c	14.9	e-i	33.5	b-g	14.9	def
NCEX 07	0	a	3.9	c	21.3	def	37.7	b-f	15.7	de
CC 33	3	a	8.5	bc	24.6	cde	34.1	b-g	17.6	cd
RJR 75	3.8	a	16.3	ab	27.4	bcd	52.5	ab	25	bc
RJR 15	4	a	22.2	a	31.1	bcd	43.1	bcd	25.1	bc
CC 65	5	a	20.8	a	33.8	bc	42.5	b-e	25.5	bc
CC 35	2.9	a	22.4	a	35.8	b	47.5	abc	27.1	ab
K 394	7.7	a	18.3	a	47.1	a	64.4	a	34.4	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Granville Wilt; *Ralstonia solanacearum*

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Variety evaluation for resistance to Granville wilt in flue-cured tobacco, 2008.

This study was established in a naturally infested field located in Johnston County, N.C. The soil type was a Norfolk loamy sand soil series with a pH of 4.7. There were 30 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft long one-row plots with four replications. The tobacco was transplanted on 14 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 20 Jun, 7, 31 Jul and 11 Aug. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

Disease pressure in this field was very high. This field had severe Granville wilt incidence in 2007. In 2008, weather conditions were favorable for Granville wilt with rain in spring followed by hot weather in early summer. Granville wilt symptoms showed in late Jun; some of the varieties had as high incidence as 16 to 18 percent. Almost all cultivars had disease indices higher than 25. K394, RJR 75, RJR 15, CC 65, and PVH 1118 had the highest disease indices.

	Percent Disease								**Disease Index**	
Variety	6/20/2008		7/7/2008		7/31/2008		8/11/2008			
XP 596	1.9	a	8.4	a	15.4	i	33.5	fg	14.8	i
SP 234	4.1	a	7	a	24.1	hi	32	g	16.8	hi
NC 810	5.5	a	7.7	a	14.3	i	44.9	efg	18.1	hi
CC 33	6.6	a	9.4	a	31.9	e-i	48.2	d-g	24	ghi
NC 471	5	a	12.6	a	26.9	f-i	57.8	b-g	25.6	f-i
CC 67	8.3	a	14.2	a	25.6	ghi	60.1	b-g	27.1	e-i
CC 37	7.8	a	15.7	a	31.1	f-i	58.7	b-g	28.3	d-i
K 346	9.8	a	14.7	a	29.2	f-i	59.7	b-g	28.4	d-i
SP 236	9.9	a	18.8	a	32.2	d-i	54.2	c-g	28.8	d-i
SP 220	7.9	a	16.1	a	25.9	ghi	68.6	a-e	29.6	c-i
SP 227	11.8	a	12.8	a	34.3	c-i	61.9	b-g	30.2	c-i
NC 196	5.2	a	16	a	33.1	d-i	70.1	a-e	31.1	c-i
CC 27	5.8	a	15.3	a	40.4	b-i	63.6	b-f	31.3	c-i
NC 102	12.5	a	15.5	a	33.7	c-i	65.9	b-e	31.9	b-i
NC 92	13.1	a	15.9	a	27.6	f-i	76.6	a-d	33.3	b-i
CC 13	16.1	a	22.8	a	40.8	b-i	62.7	b-f	35.6	a-h
NC 299	10.6	a	18.4	a	42.4	a-i	70.9	a-e	35.6	a-h
NCEX 09	8.2	a	16	a	51.8	a-h	78.2	a-d	38.5	a-g
GF 52	12.2	a	22.2	a	55.5	a-f	64.7	b-e	38.6	a-g
PVH 2110	6.7	a	15.2	a	56	a-f	80.5	abc	39.6	a-g
NCEX 07	11.7	a	21.2	a	53.9	a-g	79	abc	41.5	a-g
NCEX 08	15.3	a	22.7	a	61.5	a-d	74.1	a-e	43.4	a-f
CC 700	15	a	22.8	a	60.9	a-e	78.4	a-d	44.3	a-f
GF 318	16.5	a	19.3	a	63	abc	78.6	a-d	44.3	a-f
CC 35	13.6	a	20	a	69.3	ab	77.6	a-d	45.1	a-e
PVH 1118	14.7	a	20.7	a	67.5	ab	77.4	a-d	45.1	a-e
RJR 15	7	a	27	a	71	a	82.7	abc	46.9	a-d
RJR 75	13	a	23.4	a	68.3	ab	86.9	ab	47.9	abc
K 394	10.4	a	24.8	a	67.9	ab	99	a	50.5	ab
CC 65	18.1	a	40.5	a	70.9	a	88	ab	54.4	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

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TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Granville Wilt; *Ralstonia solanacearum*
Black Shank; *Phytophthora parasitica* var *nicotianae*

Variety evaluation for resistance to Granville wilt and Black Shank in flue-cured tobacco, 2008.

This study was established in a naturally infested field located in Franklin County, N.C. The soil type was a Wedowee sandy loam soil series with a pH of 5.9. There were 30 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft one-row plots with four replications. The tobacco was transplanted on 24 Apr and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 17 Jun. and 3, 17 Jul. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

Both black shank and Granville wilt were present in this field, with black shank more prevalent than wilt. Varieties such as RJR 75, that have shown little resistance to wilt but good resistance to black shank in other on farm tests had very low index. Symptoms showed in late June; most varieties had very low incidence. At the end, disease indices ranged between 13 and 50 for most cultivars. RJR 75 and RJR 15 had the lowest ones. K 394 that is very susceptible to wilt had a medium range index, implying that this field had more black shank than wilt problem.

	Percent Disease			
Variety	6/17/2008	7/3/2008	7/17/2008	**Disease Index***
RJR 75	0 a	0 h	1.3 i	0.4 h
RJR 15	0 a	0 h	6.7 i	2.2 h
CC 65	0 a	1.2 h	6.9 i	2.7 gh
CC 35	0 a	1 h	10.4 hi	3.8 gh
CC 33	0 a	14.5 gh	25.7 ghi	13.4 fgh
SP 227	0 a	14.2 gh	27.3 f-i	13.8 e-h
NC 810	0 a	13.2 gh	29.6 e-i	14.3 e-h
CC 700	1.1 a	18.5 fgh	29.4 e-i	16.4 d-h
K 346	1.2 a	24.5 fgh	44.5 d-h	23.4 d-g
PVH 2110	1.1 a	30.3 efg	48.7 b-g	26.7 c-f
NCEX 09	2.4 a	27 fgh	53.3 a-g	27.5 c-f
SP 220	2.2 a	34.4 c-g	45.6 c-g	27.5 c-f
NC 471	0 a	23.7 fgh	60 a-g	27.9 c-f
NCEX 07	1.3 a	30.7 efg	54.9 a-g	29 b-f
K 394	1 a	31.8 efg	54.7 a-g	29.2 b-f
NC 299	2.3 a	30.9 efg	55 a-g	29.4 b-f
NCEX 08	0 a	38.4 b-g	51.1 a-g	29.9 b-f
CC 13	2.2 a**	35.2 c-g	53.7 a-g	30.4 b-f
NC 196	1.1 a	33.4 d-g	56.5 a-g	30.4 b-f
SP 236	0 a	33.8 d-g	60.9 a-f	31.6 b-f
XP 596	3 a	39.3 b-g	53.1 a-g	31.9 b-f
SP 234	0 a	43.3 b-f	55.2 a-g	32.9 b-f
CC 37	6 a	42.9 b-f	53.6 a-g	34.3 b-e
PVH 1118	0 a	43.1 b-f	60 a-g	34.4 b-e
GF 318	1 a	43 b-f	63.6 a-e	35.9 bcd
CC 67	1.1 a	58.3 a-e	72.9 a-d	44.2 abc
GF 52	1 a	60.1 a-d	70.9 a-d	44.2 abc
NC 92	0 a	62.4 abc	79.3 abc	47.4 abc
NC 102	0 a	63.4 ab	82.6 ab	48.8 ab
CC 27	5.4 a	78.7 a	85.2 a	56.7 a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Variety evaluation for resistance to black shank in Flue-cured tobacco, 2008.

This study was established in a naturally infested field located in Iredell County, N.C. in a Congrave soil series with a pH of 6.0. There were 30 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft long one-row plots with four replications. The tobacco was transplanted on 22 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 9, 29 Jul and 14, 27 Aug. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

There was prolonged dry weather in this location especially early in the season. Also there was high root knot infestation in this field that likely predisposed root system to black shank infection. Disease pressure in this field was moderate. Based on the disease incidence on NC 1071 and L8, the *P. parasitica* population in the field is a mixture of race 0 and 1. Several cultivars had a disease index less than 10, such as RJR 75, SP 227, CC 65 and NC 471. A number of cultivars, some of them with the *ph* gene, conferring resistance to race 0 black shank had a disease index higher than 10 such as NC 196, CC37, RJR 15, and PVH 1118.

	Percent Disease								**Disease Index**	
Variety	7/9/2008		7/29/2008		8/14/2008		8/27/2008			
XP 596	0	b	0.9	e	2.7	fg	7	g	2.6	g
CC 35	0	b	0	e	4.3	efg	6.9	g	2.8	g
SP 227	0	b	0.9	e	1.7	g	13.1	d-g	3.9	fg
CC 65	0	b	0.8	e	6.8	efg	10.2	fg	4.4	fg
SP 236	0	b	1.7	e	7.5	efg	11.7	fg	5.2	fg
RJR 62	0	b	1.7	e	7.1	efg	14.4	d-g	5.8	fg
CC 67	0	b	0.9	e	4.3	efg	19.2	c-g	6.1	fg
NC 102	0	b	1.7	e	6	efg	19.8	c-g	6.9	fg
RJR 75	0	b	5	de	10	d-g	12.6	efg	6.9	fg
RJR 225	0	b	2.5	e	6.8	efg	23.5	c-g	8.2	efg
NC 471	0	b	2.7	e	9.1	d-g	21.7	c-g	8.4	efg
ULT 142	0	b	2.6	e	15.3	c-g	21.2	c-g	9.8	d-g
PVH 1118	0	b	4.8	de	13.2	d-g	31.5	b-g	12.4	d-g
GF 318	0	b	5.4	de	11.3	d-g	35.9	b-g	13.1	c-g
CC 13	0	b	6.7	de	17	c-g	28.8	b-g	13.2	c-g
NCEX 08	0	b	4.5	de	18.9	c-g	30.7	b-g	13.5	c-g
NC 196	0	b	3.4	de	16.3	c-g	37	b-g	14.2	c-g
NC 92	0	b	7.4	de	20	c-g	33.9	b-g	15.3	c-g
NCEX 07	0	b	7.6	de	16.6	c-g	39.1	b-g	15.8	c-g
NCEX 09	0	b	8.8	cde	18.3	c-g	36.8	b-g	16	c-g
CC 37	0.9	b	7	de	22.7	b-g	34.1	b-g	16.2	c-g
XP 275	0	b	4.9	de	25.3	b-g	35	b-g	16.3	c-g
CC 33	0	b	6.9	de	19.9	c-g	46.8	a-d	18.4	b-g
PVH 2110	0	b	4.7	de	26.5	a-f	46.4	a-e	19.4	b-g
RJR 15	0	b	12.1	b-e	27.8	a-e	42.4	a-f	20.6	b-f
GF 52	0	b	16.6	bcd	28.7	a-e	52	abc	24.3	a-e
CC 507	0.8	b	12.2	b-e	32.6	a-d	58.4	ab	26	a-d
CU 109	0.9	b	22	abc	39.4	abc	58.7	ab	30.2	abc
1071	5.3	a	22.1	ab	50.6	a	58.8	ab	34.2	ab
L8	6.2	a	34.7	a	47.3	ab	76.2	a	41.1	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Variety evaluation for resistance to black shank in flue-cured tobacco, 2008.

This study was established in a naturally infested field located in Martin County, NC in a Norfolk loamy fine sand soil series with a pH of 6.4. There were 30 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft long one-row plots with four replications. The tobacco was transplanted on 7 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 3, 17, 30 Jul and 19 Aug. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

This field was planted for the first time with tobacco (variety K 326) in 2007 and all died from black shank. Given that the ph gene was never implemented in this location before 2008, when an on farm variety test was planted in the same field, race 0 was the predominant black shank race in this field and the only one recovered in our bioassays. In 2008 disease pressure in this field was moderate to high. Based on the disease incidence on NC 1071 and L8, the *P. parasitica* population in the field is a mixture of race 0 and 1 with race 0 being the predominant one. Several cultivars had a disease index less than 10, such as RJR 75, SP 227, CC 65, CC 37 and NC 196. A number of cultivars, some of them with the *ph* gene, conferring resistance to race 0 black shank had a disease index higher than 10 such as NC 471, CC35, RJR 15, and PVH 1118. The most important conclusion from this on farm variety test was that it may take only one season of *ph* gene implementation to increase the portion of race 1 in a field.

	Percent Disease								
Variety	7/3/2008		7/17/2008		7/30/2008		8/19/2008		**Disease Index**	
RJR 75	0	c	0	f	0	f	0	e	0	f
SP 227	0	c	0	f	0	f	0	e	0	f
XP 275	0	c	0	f	0	f	0.9	e	0.2	f
RJR 62	0	c	0	f	0	f	1.3	e	0.3	f
CC 507	0	c	0	f	0	f	2.6	de	0.7	ef
XP 596	0	c	0	f	1.9	ef	1.9	de	0.9	ef
CU 109	0	c	0	f	1	ef	3	de	1	def
1071	0	c	0.9	ef	3.6	def	12.8	cde	4.3	def
CC 37	2.4	c	2.4	ef	8.4	def	8.4	de	5.4	def
GF 318	1	c	1	ef	4.9	def	14.7	b-e	5.4	def
NC 92	0	c	3.6	ef	6.4	def	13	cde	5.8	def
NC 196	0.9	c	2.8	ef	8.4	def	12	cde	6	def
NCEX 09	0	c	7.1	ef	7.1	def	12.5	cde	6.7	def
NCEX 08	0	c	5.7	ef	11.3	def	16	b-e	8.3	def
CC 65	0	c	7.2	ef	12.6	def	21.8	b-e	10.4	c-f
NC 471	1.3	c	8.8	ef	15.6	def	19.3	b-e	11.2	c-f
CC 35	1.2	c	9.3	ef	13.3	def	22.3	b-e	11.5	c-f
CC 67	0	c	14.8	def	17.7	c-f	22.2	b-e	13.7	c-f
SP 236	1.8	c	10.4	ef	17.8	c-f	32.5	b-e	15.6	c-f
PVH 1118	1	c	12.5	def	21.3	c-f	30	b-e	16.2	c-f
GF 52	2.7	c	17	def	26.3	c-f	28.1	b-e	18.5	c-f
NC 102	0.9	c	15.7	def	26.9	c-f	30.6	b-e	18.5	c-f
ULT 142	0.8	c	22.1	def	29.9	c-f	32.6	b-e	21.4	c-f
RJR 15	0	c	13.9	def	30.6	cde	44.6	bc	22.3	cde
NCEX 07	0	c	23.8	de	32.2	cd	34.6	bcd	22.7	cd
RJR 225	0	c	34.8	cd	46.6	bc	46.6	b	32	bc
CC 33	8.8	b	47.5	bc	74.4	ab	80.1	a	52.7	ab
CC 13	9.7	b	62.8	ab	84.3	a	96.3	a	63.3	a
PVH 2110	21.9	a	78.3	a	91.5	a	100	a	72.9	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.

** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Variety evaluation for resistance to black shank in Flue-cured tobacco, 2008.

This study was established in a naturally infested field located in Yadkin County, NC in a Cecil gravelly fine sandy loam soil series with a pH of 6.4. There were 30 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft long one-row plots with four replications. The tobacco was transplanted on 15 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 9 Jul and 1, 14, 27 Aug and 18 Sep. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

There was prolonged dry weather in this location especially early in the season. Disease pressure in this field was moderate. Based on the disease incidence on NC 1071 and L8, the *P. parasitica* population in the field is a mixture of race 0 and 1. Several cultivars had a disease index less than 10, such as RJR 75, SP 227, CC 65, CC 13 and NC 471. Two of these varieties, CC 65 and CC 13, do not have the *ph* gene. A number of cultivars, some of them with the *ph* gene, conferring resistance to race 0 black shank had a disease index higher than 10 such as NC 196, CC37, and PVH 1118.

	Percent Disease											
Variety	7/9/2008		8/1/2008		8/14/2008		8/27/2008		9/18/2008		**Disease Index**	
RJR 75	0	a	0	c	0	e	0	f	1.9	f	0.4	f
CC 35	0	a	1	c	1	e	1	ef	1	f	0.8	ef
SP 236	0	a	0	c	1.1	e	1.1	ef	3.1	ef	1.1	ef
RJR 62	0	a	0	c	1	e	3	def	4	ef	1.6	def
SP 227	0.9	a	1.9	c	1.9	e	1.9	ef	1.9	f	1.7	def
CC 65	1	a	1.9	c	2.9	e	2.9	def	5.8	def	2.9	def
CC 507	0	a	3.4	c	3.4	de	3.4	def	6.5	def	3.4	def
RJR 225	0	a	3.9	c	4.9	de	6.9	def	9.9	def	5.1	def
CC 13	1	a	4.1	c	7.1	de	9.1	def	10.3	def	6.3	def
NC 471	0	a	3.7	c	6.5	de	6.5	def	18.1	c-f	6.9	def
RJR 15	0	a	6.7	c	8.6	de	9.5	def	14.3	c-f	7.8	def
ULT 142	1.3	a	3.8	c	13.5	cde	13.5	def	19.5	c-f	10.3	def
XP 596	1	a	8.2	c	11.3	de	12.3	def	19.6	c-f	10.5	def
NCEX 09	0	a	7.9	c	11	de	15.9	c-f	26.6	b-f	12.3	c-f
NCEX 07	0	a	10.7	c	14.5	cde	15.5	c-f	24.2	c-f	13	c-f
CC 33	0	a	7.5	c	20.6	cde	23.4	c-f	24.7	c-f	15.2	c-f
CC 67	3.4	a	14.8	bc	18.2	cde	18.2	c-f	22.4	c-f	15.4	c-f
NCEX 08	3.1	a	10.8	c	14.9	cde	19.7	c-f	28.7	b-f	15.4	c-f
GF 52	0.9	a	11.6	c	11.6	de	21.9	c-f	32.6	b-f	15.8	c-f
NC 92	2	a	14.7	bc	21.5	cde	21.5	c-f	33.4	b-f	18.6	c-f
CC 37	0.9	a	15.9	bc	25.5	b-e	30.3	b-f	32.3	b-f	21	c-f
NC 196	0	a	18.0	abc	24.7	b-e	28.9	b-f	35.1	b-f	21.3	b-f
NC 102	1.9	a	19.1	abc	24.3	b-e	27.4	c-f	39.6	a-d	22.5	b-f
PVH 1118	3.6	a	18.2	abc	26.5	b-e	27.4	c-f	41	a-d	23.3	b-f
CU 109	15.7	a	24.1	abc	24.1	b-e	24.1	c-f	37.4	a-e	25.1	b-f
PVH 2110	7.4	a	18.6	abc	32.6	bcd	34.5	a-d	34.5	b-f	25.5	b-e
GF 318	5	a	21.4	abc	26.1	b-e	31.9	b-e	46.3	abc	26.1	bcd
XP 275	4.1	a	36.8	ab	42	abc	47.2	abc	49.3	abc	35.9	abc
1071	20.4	a	36.6	ab	52	ab	59.6	ab	61.5	ab	46	ab
L8	31	a	41.2	a	66	a	66	a	72.6	a	55.4	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.

** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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North Carolina official variety test for black shank resistance, 2008.

This trial was conducted in a black shank nursery at the Upper Coastal Plain Research Station near Rocky Mount, NC. The soil type was a Goldsboro Fine Sandy Loam with a pH of 5.9. Plots were one row of 22 plants replicated three times and arranged in a randomized complete block design. The tobacco was transplanted 06 May. Telone II at 10 gal/a broadcast was applied early pretransplant for nematode control. Other management practices were customary for commercial production in the area. Disease incidence was evaluated on 3, 17, 30 July. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

Disease pressure in this field was high. The majority of *P. parasitica* in the field is race 1. Almost all cultivars had a disease index higher than 10 and several of them were above 20. A number of cultivars with the *ph* gene, conferring resistance to race 0 black shank had a disease index higher than 20, which is a result of high disease pressure and predominance of race 1 in this field. Several cultivars, some of which have the *ph* gene, showed high levels of black shank incidence as early as early July.

	Percent Disease							
Variety	7/3/2008		7/17/2008		7/30/2008		**Disease Index***	
RJR 238	0	k**	0	D	1.5	H	0.5	T
RJR 151	0	k	3	BCD	9.1	E-H	4	RST
CU 92	0	k	4.5	A-D	7.6	FGH	4	RST
SP 236	0	k	0	D	15.2	B-H	5	P-T
NC 606	0	k	4.5	A-D	13.6	C-H	6	P-T
SP 225	0	k	3	BCD	15.2	B-H	6	P-T
CC 35	1.5	jk	9.1	y-D	16.7	B-H	9.1	M-T
RJR 239	3	ijk	7.6	y-D	18.2	A-H	9.6	M-T
K 149	0	k	9.1	y-D	22.7	z-H	10.6	L-T
K 394	1.5	jk	6.1	z-D	28.8	x-G	12.1	K-T
SP NF3	1.5	jk	9.1	y-D	28.8	x-G	13.1	J-T
K 399	0	k	4.5	A-D	36.4	t-D	13.5	I-T
RJR 739	0	k	6.1	z-D	34.8	u-E	13.6	I-T
NC 196	6.1	h-k	13.6	w-D	24.2	y-H	14.6	H-T
K 346	0	k	12.1	w-D	31.8	w-F	14.6	H-T
SP 227	1.5	jk	15.2	v-D	28.8	x-G	15.2	H-T
CC 13	1.5	jk	10.6	x-D	34.8	u-E	15.6	G-T
CU 95	1.5	jk	12.1	w-D	33.3	v-F	15.6	G-T
NCTG 156	1.5	jk	16.7	u-D	28.8	x-G	15.7	G-T
CU 110	3	ijk	13.6	w-D	33.3	v-F	16.6	G-T
RG 17	0	k	12.1	w-D	39.4	r-C	17.1	F-T
NC 810	3	ijk	15.2	v-D	33.3	v-F	17.2	F-T
CC 319	3	ijk	13.6	w-D	37.9	s-D	18.1	E-T
GF 27	3	ijk	15.2	v-D	39.4	r-C	19.2	D-T
SP 168	4.5	ijk	21.2	s-D	36.4	t-D	20.7	B-S
CC 318	1.5	jk	16.7	u-D	43.9	p-A	20.7	B-S
NC 471	3	ijk	16.7	u-D	43.9	p-A	21.2	A-S
SP 220	3	ijk	18.2	t-D	45.5	o-z	22.2	y-R
SP 210	6.1	h-k	15.2	v-D	50	m-y	23.7	w-R
CU 100	1.5	jk	15.2	v-D	54.5	k-x	23.7	w-R
GL 390	3	ijk	16.7	u-D	53	l-x	24.2	w-Q
CC 65	7.6	g-k	30.3	n-A	43.9	p-A	27.3	t-N
NC 299	6.1	h-k	22.7	r-D	54.5	k-x	27.7	t-M
SP H-20	4.5	ijk	21.2	s-D	57.6	i-w	27.7	t-M

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.

** Means within columns followed by the same letter do not significantly differ (P=0.05).

	Percent Disease							
Variety	7/3/2008		7/17/2008		7/30/2008		**Disease Index**	
NC 71	3	ijk	22.7	r-D	57.6	i-w	27.7	t-M
CC 314	3	ijk	27.3	p-C	53	l-x	27.8	t-M
NCEX 19	7.6	g-k	30.3	n-A	45.5	o-z	27.8	t-M
CC 700	0	k	27.3	p-C	57.6	i-w	28.3	s-M
NCTG 158	12.1	e-k	27.3	p-C	47	n-z	28.8	s-M
NC 72	3	ijk	33.3	m-y	53	l-x	29.8	r-L
PVH 1118	6.1	h-k	28.8	o-B	54.5	k-x	29.8	r-L
CC 27	6.1	h-k	30.3	n-A	56.1	j-w	30.8	q-K
PVH 2110	6.1	h-k	27.3	p-C	60.6	g-u	31.3	p-K
CC 37	1.5	jk	36.4	l-x	57.6	i-w	31.9	p-J
GL 939	6.1	h-k	36.4	l-x	56.1	j-w	32.9	o-I
NCEX 21	7.6	g-k	25.8	q-D	66.7	c-q	33.3	o-I
RGH 4	6.1	h-k	31.8	n-z	63.6	e-s	33.8	n-H
CC 317	7.6	g-k	37.9	k-w	59.1	h-v	34.9	m-G
SP 234	7.6	g-k	31.8	n-z	66.7	c-q	35.3	l-G
NC 291	12.1	e-k	42.4	i-u	54.5	k-x	36.4	k-F
RGH 51	4.5	ijk	30.3	n-A	75.8	a-m	36.8	k-F
NCTG 138	12.1	e-k	36.4	l-x	63.6	e-s	37.4	k-E
NCEX 18	9.1	f-k	42.4	i-u	62.1	f-t	37.9	k-D
NC 55	15.2	d-k	43.9	h-t	57.6	i-w	38.9	k-C
K 326	13.6	d-k	43.9	h-t	74.2	a-m	43.9	g-v
NC 102	3	ijk	43.9	h-t	84.8	a-h	43.9	g-v
NC 297	18.2	c-i	47	g-s	78.8	a-l	48	e-s
NC 92	22.7	b-g	53	d-p	71.2	a-o	49	d-r
NCEX 20	25.8	b-e	50	e-q	72.7	a-n	49.5	d-r
K 326	18.2	c-i	53	d-p	80.3	a-k	50.5	b-p
NCTG 157	36.4	b	50	e-q	65.2	d-r	50.5	b-q
NC 95	15.2	d-k	59.1	c-m	86.4	a-g	53.6	b-m
GF 52	18.2	c-i	66.7	a-j	93.9	ab	59.7	b-j
CU 108	36.4	b	63.6	c-k	83.3	a-i	61.1	b-i
NC 2326	18.2	c-i	72.7	a-g	97	a	62.7	b-g
NCEX 22	28.8	bcd	83.3	abc	92.4	abc	68.3	a-d
NCEX 17	59.1	a	92.4	a	97	a	82.9	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.

** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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North Carolina regional farm test variety test for black shank resistance, 2008.

This trial was conducted in a black shank nursery at the Upper Coastal Plain Research Station near Rocky Mount, NC. The soil type was a Goldsboro Fine Sandy Loam with a pH of 5.9. Plots were one row of 22 plants replicated three times and arranged in a randomized complete block design. The tobacco was transplanted 06 May. Telone II at 10 gal/a broadcast was applied early pretransplant for nematode control. Other management practices were customary for commercial production in the area. Disease incidence was evaluated on 3, 17, 30 July. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

Disease pressure in this field was high. The majority of *P. parasitica* in the field is race 1. All cultivars but one had a disease index higher than 10 and most of them were above 20. Cultivars such as RJR 15 (that does not have the *ph* gene, conferring immunity to race 0) and GF 318 showed high levels of black shank incidence as early as early July.

	Percent Disease							
Variety	7/3/2008		7/17/2008		7/30/2008		**Disease Index***	
RJR 75	1.5	jk**	9.1	y-D	12.1	D-H	7.6	N-T
XP 596	4.5	ijk	9.1	y-D	22.7	z-H	12.1	K-T
CC 33	1.5	jk	15.2	v-D	43.9	p-A	20.2	C-T
CC 67	1.5	jk	18.2	t-D	45.5	o-z	21.7	z-S
NCEX 07	1.5	jk	24.2	q-D	47	n-z	24.2	v-P
NCEX 08	7.6	g-k	21.2	s-D	50	m-y	26.2	u-O
RJR 15	18.2	c-i	47	g-s	54.5	k-x	40	j-B
NCEX 09	6.1	h-k	36.4	l-x	80.3	a-k	40.9	j-A
GF 318	9.1	f-k	43.9	h-t	75.8	a-m	42.9	h-w
NC 95	10.6	e-k	60.6	c-l	90.9	a-d	54.1	b-m
NC 2326	16.7	d-j	90.9	ab	95.5	a	67.9	a-d

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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North Carolina regional small plot variety test for black shank resistance, 2008.

This trial was conducted in a black shank nursery at the Upper Coastal Plain Research Station near Rocky Mount, NC. The soil type was a Goldsboro Fine Sandy Loam with a pH of 5.9. Plots were one row of 22 plants replicated three times and arranged in a randomized complete block design. The tobacco was transplanted 06 May. Telone II at 10 gal/a broadcast was applied early pretransplant for nematode control. Other management practices were customary for commercial production in the area. Disease incidence was evaluated on 3, 17, 30 July. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

Disease pressure in this field was high. The majority of *P. parasitica* in the field is race 1. Almost all cultivars had a disease index higher than 10 and several of them were above 20. A number of cultivars showed high levels of black shank incidence as early as early July. Among them there were cultivars such as CU 109, NCEX 16, NCEX 13 and XP 275.

	Percent Disease							
Variety	7/3/2008		7/17/2008		7/30/2008		**Disease Index***	
RJR 651	0	k**	1.5	CD	4.5	GH	2	ST
CU 90	0	k	0	D	13.6	C-H	4.5	Q-T
OX 2047	0	k	6.1	z-D	13.6	C-H	6.6	O-T
RJR 251	0	k	12.1	w-D	16.7	B-H	9.6	M-T
EXP 806	0	k	7.6	y-D	21.2	z-H	9.6	M-T
RJR 225	1.5	jk	10.6	x-D	33.3	v-F	15.1	H-T
CU 94	1.5	jk	12.1	w-D	43.9	p-A	19.1	D-T
RJR 62	1.5	jk	16.7	u-D	40.9	q-B	19.7	C-T
XP 324	4.5	ijk	25.8	q-D	37.9	s-D	22.8	x-R
NCEX 14	1.5	jk	25.8	q-D	56.1	j-w	27.8	t-M
CU 75	4.5	ijk	28.8	o-B	65.2	d-r	32.8	p-J
ULT 142	4.5	ijk	30.3	n-A	66.7	c-q	33.8	n-H
K 326	7.6	g-k	37.9	k-w	68.2	b-p	37.9	k-D
RJR 25	7.6	g-k	43.9	h-t	62.1	f-t	37.9	k-D
CC 507	10.6	e-k	47	g-s	57.6	i-w	38.5	k-D
CU 61	7.6	g-k	40.9	j-v	74.2	a-m	40.9	j-z
NCEX 15	10.6	e-k	33.3	m-y	81.8	a-j	41.8	i-y
NCEX 10	16.7	d-j	36.4	l-x	74.2	a-m	42.4	h-x
XP 156	3	ijk	56.1	d-n	72.7	a-n	44.1	g-u
EXP 305	21.2	b-h	48.5	f-r	68.2	b-p	46	f-t
XP 254	12.1	e-k	56.1	d-n	81.8	a-j	50.1	c-q
XP 274	13.6	d-k	54.5	d-o	89.4	a-e	52.5	b-o
ULT 112	15.2	d-k	62.1	c-l	81.8	a-j	53.1	b-n
NC 95	7.6	g-k	68.2	a-i	87.9	a-f	54.7	b-l
AOV 708	16.7	d-j	69.7	a-h	78.8	a-l	55.2	b-k
EXP 803	24.2	b-f	65.2	b-j	89.4	a-e	59.7	b-j
NC 2326	13.6	d-k	74.2	a-f	97	a	61.7	b-h
CU 109	25.8	b-e	74.2	a-f	93.9	ab	64.7	a-f
NCEX 16	33.3	bc	78.8	a-d	84.8	a-h	65.8	a-e
NCEX 13	34.8	b	75.8	a-e	97	a	69.3	abc
XP 275	36.4	b	78.8	a-d	93.9	ab	69.8	ab

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, BURLEY (*Nicotiana tabacum L*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Variety evaluation for resistance to black shank in Burley tobacco, 2008.

This study was established in a naturally infested field located Yadkin County, NC in a Cecil gravelly fine sandy loam soil series with a pH of 6.4. There were 10 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft long one-row plots with four replications. The tobacco was transplanted on 15 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 9 Jul, 1, 14, 27 Aug and 18 Sep. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

There was prolonged dry weather in this location especially early in the season that resulted in significant stand count losses on burley; some plots had only 15 to 18 plants a few weeks after transplanting. Disease pressure in this field was moderate (i.e only 1 varieties had over 40% disease at the last evaluation in early September) although in previous years the same field experienced high levels of disease incidence. Based on the disease incidence on L8 and KY14xL8 *P. parasitica* in the field is mixture of race 0 and 1. KTH 2406 and KT 204 were among the varieties with the least disease at the end of the season and the lowest disease index followed by 8B12 and B1224, experimental lines. L8 and Ky14xL8 had the highest indices. **Disease index was calculated as for the flue-cured varieties. Thus disease indices for flue cured and burley cultivars are directly comparative.**

	Percent Disease				
Variety	8/1/2008	8/14/2008	8/27/2008	9/18/2008	**Disease Index***
TN 90	0 b**	0 b	0 b	0 a	0 b
KT 204	0 b	2 b	3 b	3 a	1.6 b
KTH 2406	0 b	0 b	0 b	11.8 a	2.4 b
B1224	1 b	3.2 b	3.2 b	5.3 a	2.6 b
8B12	0 b	3.1 b	4.1 b	8.2 a	3.1 b
TN 86	2.3 b	3.4 b	3.4 b	21.9 a	6.2 b
KT 206	3.9 b	7.7 b	7.7 b	13 a	6.5 b
NC 4	16.3 ab	21.9 ab	23.9 ab	27.9 a	18.2 ab
L8	14 b	14 b	40.7 a	38.2 a	21.4 ab
KY14xL8	38.1 a	42.1 a	42.1 a	42.1 a	35.6 a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, BURLEY (*Nicotiana tabacum L*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Variety evaluation for resistance to black shank in Burley tobacco, 2008.

This study was established in a naturally infested field located Surry County, NC in a Fairview sandy clay loam soil series with a pH of 6.9. There were 10 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft long one-row plots with four replications. The tobacco was transplanted on 23 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 15, 29 Jul, 14 Aug and 3 Sep. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

Disease pressure in this field was moderate (i.e only 3 varieties had over 40% disease at the last evaluation in early September) although in previous years the same field experienced high levels of disease incidence. Based on the disease incidence on L8 and KY14xL8 *P. parasitica* in the field is mixture of race 0 and 1. KTH 2406 had the least disease at the end of the season and the lowest disease index followed by 8B12, an experimental line. KT 204 and TN 86 had among the highest indices. **Disease index was calculated as for the flue-cured varieties. Thus disease indices for flue cured and burley cultivars are directly comparative.**

	Percent Disease							
Variety	7/15/2008		7/29/2008		8/14/2008		9/3/2008		**Disease Index***	
KTH 2406	0	a**	0	c	0	c	0	d	0	d
8B12	0	a	0	c	0	c	5.8	d	1.5	d
KY 14xL8	1.1	a	1.1	c	3.1	c	8.1	d	3.3	cd
B1224	0	a	1	c	4.2	c	8.4	d	3.4	cd
KT 206	1	a	3.1	bc	6.2	c	11.3	d	5.4	cd
NC 4	0	a	5.1	bc	10.4	bc	13.4	cd	7.2	bcd
TN 90	1.1	a	9.4	bc	19.9	bc	27.4	bcd	14.4	bcd
TN 86	0	a	12.5	bc	30.1	ab	44.6	ab	21.8	bc
KT 204	3.1	a	21.2	ab	32.2	ab	42.4	abc	24.7	ab
L8	8.1	a	36.5	a	53.6	a	66.4	a	41.2	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, BURLEY (*Nicotiana tabacum L*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Variety evaluation for resistance to black shank in Burley tobacco, 2008.

This study was established in a naturally infested field located in Iredell County, NC in a Congrave soil series with a pH of 6.0. There were 10 varieties arranged as a randomized complete block design consisting of 46 in. wide by 50 ft long one-row plots with four replications. The tobacco was transplanted on 22 May and normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 23 Jun, 9, 29 Jul, and 14, 27 Aug. The disease index was calculated from all disease incidence evaluations, and earlier evaluations were more heavily weighted. No yield data was obtained from this location.

There was prolonged dry weather in this location especially early in the season. Disease pressure in this field was moderate to high (i.e only 4 varieties had over 40% disease at the last evaluation in late Aug) although in previous years the same field experienced high levels of disease incidence. Based on the disease incidence on L8 and KY14xL8 *P. parasitica* in the field is mixture of race 0 and 1. KTH 2406, KT 206 and KT 204 had the least disease at the end of the season and the lowest disease index followed by 8B12, an experimental line. L8 and Ky14xL8 had the highest indices. **Disease index was calculated as for the flue-cured varieties. Thus disease indices for flue cured and burley cultivars are directly comparative.**

	Percent Disease									
Variety	7/9/2008		7/29/2008		8/14/2008		8/27/2008		**Disease Index***	
KTH 2406	0	b**	0.8	c	0.8	d	7.7	b	1.9	c
KT 206	0	b	0	c	2.6	d	14.1	b	3.3	c
KT 204	0	b	0.8	c	6	d	18.3	b	5	c
8B12	0.9	b	1.7	bc	6.8	cd	21.4	b	6.2	c
TN 90	0.8	b	5.1	bc	8.5	bcd	26.6	b	8.2	c
B1224	0	b	4.2	bc	10.2	bcd	39.5	ab	10.8	c
TN 86	4.3	b	10.2	bc	16	bcd	26.2	b	12.2	bc
NC 4	0	b	15.7	bc	35.3	b	41.5	ab	18.5	bc
L8	11	ab	21.7	b	34.4	bc	74.1	a	28.2	ab
KY14xL8	18.9	a	53.6	a	65.9	a	75.5	a	42.8	a

* Disease index reflects both disease incidence (%) as well as the time of the season that the disease appeared. Higher indices reflect more disease.
** Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Chemical and variety controls for Black Shank in flue cured tobacco, 2008.

This trial was established in a naturally infested field in Forsyth County, NC in a Pacolet clay loam soil series with a pH of 6.1. The trial design was a split-plot arranged in a randomized complete block consisting of one 46 in. wide row 50 ft in length with alternating skip-rows and four replications. Factors were assigned as follows: factor A = variety, factor B = chemical treatment. Three flue-cured cultivars (K 326, NC 71 and NC 196) were transplanted 23 May. At transplant materials (attran) were applied at 0.25 pt/a using a cup-on method on the transplant date. Soil directed 1st cultivation materials (1stcult) were applied at 0.67 pt/a, 1 pt/a and 1.5 pt/a on 15 June in a 24 in. band on one side of the row then cultivated to incorporate. Soil directed layby materials (layby) were applied at 0.67 pt/a and 1pt/a on 15 July in a 24 in. band on both sides of the row then cultivated to incorporate. All normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 29 Jul, 14 Aug and 3, 18 Sep. The percent of control was calculated from the percent disease. No yield data was collected at this site.

K 326 had the highest disease incidence in late September followed by NC 196 and NC 71. This field has a history of black shank and the *ph* gene has been planted before. Thus the population of *P. nicotianea* is a mixture of race 0 and 1. All treatments provided very high disease control. Control in most cases ranged from 70 to 95 percent and in most cases were not statistically significant different to each other. Worse percent control was achieved in NC 71 with 0.67 or 1 pt/a of RG at first cultivation and layby. This test re-enforces our recommendation that calls for application of Ridomil early in the season before black shank symptoms are visually present in the field.

				Percent Disease								
Material, rate, timing				7/29/2008		8/14/2008		9/3/2008		9/18/2008		Percent Control
K 326												
Untreated Control				12	a*	25.7	a	43.6	a	53.6	a	0.0 d
Ridomil Gold	0.25	pt/a	attran	0	c	0	d	2.8	cd	2.8	de	95.0 ab
	1	pt/a	1stcult									
	1	pt/a	Layby									
Ridomil Gold	0.25	pt/a	attran	1	bc	1	cd	1.9	cd	2.8	de	95.5 ab
	0.67	pt/a	1stcult									
	0.67	pt/a	Layby									
Ridomil Gold	1	pt/a	1stcult	0	c	0	d	3.8	cd	6.7	cde	81.4 abc
	1	pt/a	Layby									
Ridomil Gold	0.67	pt/a	1stcult	0	c	0	d	2.7	cd	2.7	de	91.8 ab
	0.67	pt/a	Layby									
Ridomil Gold	1.5	pt/a	1stcult	0	c	1	cd	4.8	cd	5.8	cde	87.6 abc
NC 71												
Untreated Control				1	bc	9.6	bc	13.2	bcd	20.1	bc	0.0 d
Ridomil Gold	0.25	pt/a	attran	0	c	0	d	1	d	1	de	72.8 abc
	1	pt/a	1stcult									
	1	pt/a	Layby									
Ridomil Gold	0.25	pt/a	pretran	0	c	0	d	0	d	1	de	72.6 abc
	0.67	pt/a	1stcult									
	0.67	pt/a	Layby									
Ridomil Gold	1	pt/a	1stcult	1	bc	2	cd	2.9	cd	3.9	de	56.0 bc
	1	pt/a	Layby									
Ridomil Gold	0.67	pt/a	1stcult	1	bc	8.3	cd	16.6	bc	16.6	bcd	47.7 c
	0.67	pt/a	Layby									
Ridomil Gold	1.5	pt/a	1stcult	0	c	0	d	1.9	cd	1.9	de	64.9 abc

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

Material, rate, timing				Percent Disease 7/29/2008		8/14/2008		9/3/2008		9/18/2008		Percent Control	
NC 196													
Untreated Control				3.8	b*	17.6	ab	25.8	b	29.4	b	0.0	d
Ridomil Gold	0.25	pt/a	attran	0	c	0	d	1.9	cd	1.9	de	88.4	abc
	1	pt/a	1stcult										
	1	pt/a	Layby										
Ridomil Gold	0.25	pt/a	attran	0	c	0	d	0	d	0	e	100.0	a
	0.67	pt/a	1stcult										
	0.67	pt/a	Layby										
Ridomil Gold	1	pt/a	1stcult	1	bc	1	cd	1	d	1	de	98.0	ab
	1	pt/a	Layby										
Ridomil Gold	0.67	pt/a	1stcult	0	c	1	cd	6.7	cd	6.7	cde	72.3	abc
	0.67	pt/a	Layby										
Ridomil Gold	1.5	pt/a	1stcult	0	c	0.9	cd	4.7	cd	4.7	cde	78.3	abc

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Chemical and variety controls for Black Shank in flue cured tobacco, 2008.

This trial was established in a naturally infested field in Rockingham County, North Carolina in a Cecil sandy clay loam soil series with a pH of 5.8. The trial design was a split-plot arranged in a randomized complete block consisting of one 46 in. wide row 50 ft in length with alternating skip-rows and four replications. Factors were assigned as follows: factor A = variety, factor B = chemical treatment. Three flue-cured cultivars (SP 227, NC 196 and K 326) were transplanted 20 May. At transplant materials (attran) were applied at 0.25 pt/a in the row using transplant water on the transplant date. Soil directed 1st cultivation materials (1stcult) were applied at 1 pt/a on 10 June in a 24 in. band on one side of the row then cultivated to incorporate. Soil directed layby materials (layby) were applied at 1pt/a on 8 July in a 24 in. band on both sides of the row then cultivated to incorporate. All normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 8, 28 Jul and 12, 26 Aug, 19 Sep and 3 Oct. No yield data was collected at this site.

The field was planted in the past with K 326. Thus the majority of the *P. nicocianea* in this field is race 0. K 326 had the highest incidence in mid Aug followed by NC 196 and SP 227. This field has a history of low black shank incidence. No Ridomil was necessary if SP 227 or NC 196 was planted. These varieties have the *ph* gene that confers resistance to race 0. All treatments provided very high disease control. For K 326 and TN 90 the best numerical control was provided with a total of 2.25 pt/A applied at attran, 1st cultivation and layby. 0.25 pt/a at transplant provided control significantly different than doing nothing; however it was numerically lower than the total of 2.25 pt/A applied at 3 different times. Good control was also provided by 0.25 pt/a at transplant and 1 pt/a at 1st cultivation, but in case of K 326 statistically different than the total of 2.25 pt/A applied at attran, 1st cultivation and layby. This study re-enforces our previous recommendation that calls for early application of Ridomil before visual black shank symptoms appear in the field.

				Percent Disease				Percent
Material, rate, timing				7/28/2008	8/12/2008	8/26/2008	10/3/2008	Control
SP 227								
Untreated Check				1.1 bc*	1.1 e	1.1 e	1.1 e	100 a
Ridomil Gold	0.25	pt/a	Attran	0 c	0 e	0 e	0 e	100 a
Ridomil Gold	0.25	pt/a	Attran	0 c	0 e	0 e	0 e	100 a
	1	pt/a	1stcult					
Ridomil Gold	0.25	pt/a	Attran	0 c	0 e	0 e	0 e	100 a
	1	pt/a	Layby					
Ridomil Gold	0.25	pt/a	attran	0 c	0 e	0 e	0 e	100 a
	1	pt/a	1stcult					
	1	pt/a	Layby					
NC 196								
Untreated Check				0 c	0 e	0 e	0 e	100 a
Ridomil Gold	0.25	pt/a	Attran	0 c	0 e	0 e	0 e	100 a
Ridomil Gold	0.25	pt/a	Attran	0 c	0 e	0 e	0 e	100 a
	1	pt/a	1stcult					
Ridomil Gold	0.25	pt/a	Attran	0 c	0 e	0 e	0 e	100 a
	1	pt/a	Layby					
Ridomil Gold	0.25	pt/a	attran	0 c	0 e	0 e	0 e	100 a
	1	pt/a	1stcult					
	1	pt/a	Layby					

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

Material, rate, timing				Percent Disease 7/28/2008		8/12/2008		8/26/2008		10/3/2008		Percent Control	
K 326													
Untreated Check				32.6	a*	63.1	a	78.9	a	82.1	a	0.0	e
Ridomil Gold	0.25	pt/a	Attran	9.1	b	31.5	c	42.8	c	56.1	b	28.6	d
Ridomil Gold	0.25	pt/a	Attran	1	bc	6.3	e	13.8	d	17	cd	77.9	b
	1	pt/a	1stcult										
Ridomil Gold	0.25	pt/a	Attran	2.1	bc	3.2	e	4.2	e	7.3	de	91.0	a
	1	pt/a	Layby										
Ridomil Gold	0.25	pt/a	attran	2.1	bc	3.1	e	4.2	e	4.2	e	95.6	a
	1	pt/a	1stcult										
	1	pt/a	Layby										
TN 90													
Untreated Check				27.2	a	50.5	b	61	b	61	b	0.0	e
Ridomil Gold	0.25	pt/a	Attran	6.3	bc	16.1	d	21.4	d	21.4	c	64.1	c
Ridomil Gold	0.25	pt/a	Attran	0	c	2	e	3	e	3	e	95.0	a
	1	pt/a	1stcult										
Ridomil Gold	0.25	pt/a	Attran	0	c	0	e	0	e	0	e	100.0	a
	1	pt/a	Layby										
Ridomil Gold	0.25	pt/a	attran	0	c	0	e	0	e	0	e	100.0	a
	1	pt/a	1stcult										
	1	pt/a	Layby										

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Chemical and variety controls for Black Shank in flue cured tobacco, 2008.

This trial was established in a naturally infested field in Rockingham County, NC in a Cecil fine sandy loam soil series with a pH of 5.7. The trial design was a split-plot arranged in a randomized complete block consisting of one 46 in. wide row 50 ft in length with alternating skip-rows and four replications. Factors were assigned as follows: factor A = variety, factor B = chemical treatment. Three flue-cured cultivars (SP 227, NC 196 and K 326) were transplanted 27 May. At transplant materials (attran) were applied at 0.25 pt/a in the row using transplant water on the transplant date. Soil directed 1st cultivation materials (1stcult) were applied at 1 pt/a on 10 June in a 24 in. band on one side of the row then cultivated to incorporate. Soil directed layby materials (layby) were applied at 1pt/a on 8 July in a 24 in. band on both sides of the row then cultivated to incorporate. All normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 8, 28 Jul and 12 Aug. The percent of control was calculated from the percent disease. No yield data was collected at this site.

K 326 had the highest incidence in mid Aug followed by NC 196 and SP 227. This field has a history of black shank and the *ph* gene has been planted before several times. Thus the population of *P. nicotianea* is predominately race 1. All treatments provided very high disease control. The best numerical control was provided with a total of 2.25 pt/A applied at attran, 1st cultivation and layby. 0.25 pt/a at transplant provided control significantly different than doing nothing; however it was numerically lower than the total of 2.25 pt/A applied at 3 different times. Good control was also provided by 0.25 pt/a at transplant and 1 pt/a at 1st cultivation, not statistically different than the total of 2.25 pt/A applied at attran, 1st cultivation and layby. This study re-enforces our previous recommendation that calls for early application of Ridomil before visual black shank symptoms appear in the field and use of resistant variety such as SP 227 in fields with severe black shank history.

				Percent Disease						Percent	
Material, rate, timing				7/8/2008		7/28/2008		8/12/2008		Control	
SP 227											
Untreated Check				1	c*	7.2	cd	23.5	cde	0	e
Ridomil Gold	0.25	pt/a	Attran	1	c	2.2	cd	14.9	cde	50	bcd
Ridomil Gold	0.25	pt/a	Attran	0	c	1	d	12.6	cde	44.4	bcd
	1	pt/a	1stcult								
Ridomil Gold	0.25	pt/a	Attran	1.9	bc	5.7	cd	12.5	cde	37.5	cde
	1	pt/a	Layby								
Ridomil Gold	0.25	pt/a	attran	0	c	4.3	cd	10.3	de	46	bcd
	1	pt/a	1stcult								
	1	pt/a	Layby								
NC 196											
Untreated Check				4.1	bc	35.6	ab	53.4	ab	0	e
Ridomil Gold	0.25	pt/a	Attran	1	c	20.3	bcd	30	b-e	57.7	a-d
Ridomil Gold	0.25	pt/a	Attran	0	c	3.9	cd	13.9	cde	70.5	abc
	1	pt/a	1stcult								
Ridomil Gold	0.25	pt/a	Attran	1.9	bc	23	bc	33.3	bcd	38.1	cde
	1	pt/a	Layby								
Ridomil Gold	0.25	pt/a	attran	0	c	4.7	cd	10.4	de	83.9	ab
	1	pt/a	1stcult								
	1	pt/a	Layby								

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

Material, rate, timing				Percent Disease 7/8/2008		7/28/2008		8/12/2008		Percent Control	
K 326											
Untreated Check				11.8	a*	44.3	a	75	a	0	e
Ridomil Gold	0.25	pt/a	Attran	0.9	c	11	cd	25.6	b-e	67.4	abc
Ridomil Gold	0.25	pt/a	Attran	1	c	2.7	cd	11.2	cde	84	ab
	1	pt/a	1stcult								
Ridomil Gold	0.25	pt/a	Attran	3.8	bc	13.2	cd	39.2	bc	44.7	bcd
	1	pt/a	Layby								
Ridomil Gold	0.25	pt/a	attran	1.9	bc	2.9	cd	8.7	de	86.8	ab
	1	pt/a	1stcult								
	1	pt/a	Layby								
TN 90											
Untreated Check				5.9	b	19.5	bcd	32.8	bcd	0	e
Ridomil Gold	0.25	pt/a	Attran	0.9	c	9.2	cd	23	cde	30.1	cde
Ridomil Gold	0.25	pt/a	Attran	0	c	2.8	cd	9.1	de	62.6	a-d
	1	pt/a	1stcult								
Ridomil Gold	0.25	pt/a	Attran	1	c	10.9	cd	25.5	b-e	20.44	de
Ridomil Gold	1	pt/a	Layby								
Ridomil Gold	0.25	pt/a	attran	1.2	c	1.2	d	3.1	e	93.9	a
	1	pt/a	1stcult								
	1	pt/a	Layby								

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Chemical and variety controls for Black Shank in flue cured tobacco, 2008.

This trial was established in a naturally infested field in Surry County, NC in a Farview sandy clay loam soil series with a pH of 6.9. The trial design was a split-plot arranged in a randomized complete block consisting of one 46 in. wide row 50 ft in length with alternating skip-rows and four replications. Factors were assigned as follows: factor A = variety, factor B = chemical treatment. Three flue-cured cultivars (K 326, NC 71 and NC 196) were transplanted 23 May. At transplant materials (attran) were applied at 0.25 pt/a using a cup-on method on the transplant date. Soil directed 1st cultivation materials (1stcult) were applied at 0.67 pt/a, 1 pt/a and 1.5 pt/a on 16 June in a 24 in. band on one side of the row then cultivated to incorporate. Soil directed layby materials (layby) were applied at 0.67 pt/a and 1pt/a on 15 July in a 24 in. band on both sides of the row then cultivated to incorporate. All normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 15, 29 Jul, 14 Aug and 3 Sep. The percent of control was calculated from the percent disease. No yield data was collected at this site.

K 326 had the highest incidence in early September followed by NC 196 and NC 71. This field has a history of black shank and the *ph* gene has been planted before. Thus the population of *P. nicotianea* is a mixture of race 0 and 1. Half of the field had been rotated for one year with corn and thus disease pressure was very uneven among treatments and replicates. All treatments provided some disease control. Control was better on the side of the field that was previously rotated with corn. This test re-enforces our recommendation that calls for rotation with other crops and application of Ridomil early in the season before black shank symptoms are visually present in the field.

				Percent Disease								Percent	
Material, rate, timing				7/15/2008		7/29/2008		8/14/2008		9/3/2008		Control	
K326													
Untreated Control				2	a*	33.2	a	57.7	a	70.9	a	0	c
Ridomil Gold	0.25	pt/a	attran	0	b	18.2	a-e	32.3	a-d	50.4	abc	29.9	abc
	1	pt/a	1stcult										
	1	pt/a	Layby										
Ridomil Gold	0.25	pt/a	attran	0	b	5.1	cde	12.4	cde	20.4	c-f	57.7	ab
	0.67	pt/a	1stcult										
	0.67	pt/a	Layby										
Ridomil Gold	1	pt/a	1stcult	0	b	21.7	abc	30	a-d	38.4	b-f	41.7	abc
	1	pt/a	Layby										
Ridomil Gold	0.67	pt/a	1stcult	0	b	30.8	ab	42.1	ab	52.7	ab	27.3	abc
	0.67	pt/a	Layby										
Ridomil Gold	1.5	pt/a	1stcult	0	b	7.9	cde	25.7	b-e	43.7	a-e	38	abc
NC 71													
Untreated Control				2.3	a	12	b-e	19.5	b-e	36.6	b-f	0	c
Ridomil Gold	0.25	pt/a	attran	0	b	21.2	a-d	42.4	ab	55.8	ab	9.5	bc
	1	pt/a	1stcult										
	1	pt/a	Layby										
Ridomil Gold	0.25	pt/a	attran	0	b	21.4	a-d	36.6	abc	47.5	a-d	6.6	c
	0.67	pt/a	1stcult										
	0.67	pt/a	Layby										
Ridomil Gold	1	pt/a	1stcult	0	b	13	b-e	23.4	b-e	30.8	b-f	33.4	abc
	1	pt/a	Layby										
Ridomil Gold	0.67	pt/a	1stcult	0	b	7	cde	10	cde	17.4	def	48.4	abc
	0.67	pt/a	Layby										
Ridomil Gold	1.5	pt/a	1stcult	0	b	4.1	cde	16.6	b-e	27.7	b-f	24.3	abc

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

Material, rate, timing				Percent Disease 7/15/2008		7/29/2008		8/14/2008		9/3/2008		Percent Control	
NC 196													
Untreated Control				1.3	ab	6.5	cde	13.1	cde	19.7	c-f	0	c
Ridomil Gold	0.25	pt/a	attran	0	b	2.3	de	6.7	de	16.6	def	39.3	abc
	1	pt/a	1stcult										
	1	pt/a	Layby										
Ridomil Gold	0.25	pt/a	attran	0	b	4.5	cde	17	b-e	26	b-f	46.5	abc
	0.67	pt/a	1stcult										
	0.67	pt/a	Layby										
Ridomil Gold	1	pt/a	1stcult	0	b	1	e	1	e	15	ef	41.7	abc
	1	pt/a	Layby										
Ridomil Gold	0.67	pt/a	1stcult	0	b	5	cde	8	de	11	f	71.5	a
	0.67	pt/a	Layby										
Ridomil Gold	1.5	pt/a	1stcult	0	b	4.3	cde	19.4	b-e	27.6	b-f	9.1	bc

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Black Shank; *Phytophthora parasitica* var *nicotianae*

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Evaluation of alternative chemicals for control of Black Shank in tobacco, 2008.

This study was established in a black shank nursery field located at the Upper Coastal Plains Research Station near Rocky Mount, NC in a Norfolk loamy sand soil series with a ph of 5.9. The plots were 22 plants long with alternating skip rows arranged in a randomized complete block design with four replications. Telone C-17 at 13 gal/a broadcast was applied early pretransplant for nematode control. One flue-cured cultivar (NC 71) was transplanted 6 May. At transplant materials (attran) were applied at 11 oz/a (Revus), 44 oz/a (Revus) and 1 pt/a (Ridomil) using a cup-on method on the transplant date. Soil directed 1st cultivation materials (1stcult) were applied at 11 oz/a (Revus), 44 oz/a (Revus), 1 pt/a (Ridomil) and 4 lbs/a (Alliette) on 13 May in a 24 in. band on one side of the row then cultivated to incorporate. Soil directed layby materials (layby) were applied at 11 oz/a (Revus), 44 oz/a (Revus), 1 pt/a (Ridomil) and 4 lbs/a (Alliette) on 24 June in a 24 in. band on both sides of the row then cultivated to incorporate. All normal cultural practices for the area were observed throughout the season. Disease incidence was evaluated on 3, 17, 30 Jul, 19 Aug and 4 Sep. The percent of control was calculated from the percent disease. No yield data was collected at this site.

The disease pressure in this field was moderate. The best control was with Ridomil Gold with or without Aliette® applied at layby. There were not significant statistical differences among most treatments; the worst percent control was obtained with Revus (11 oz/a) at layby. There was a numerical difference in the control obtained with 11 or 44 oz/a of Revus at transplant vs 1 pt/a of Ridomil. However at layby Ridomil provided the best control, especially when it was coupled with Aliette. This study suggests that Revus may provide equally good control with Ridomil against black shank. Also as we have observed in previous studies Ridomil Gold in combination with a source of potassium phosphite, such as Aliette, may enhance black shank control.

				Percent Disease										**Percent Control**	
Material, rate, timing				7/3/2008		7/17/2008		7/30/2008		8/19/2008		9/4/2008			
Untreated				4.5	a*	14.8	a	36.4	ab	36.4	ab	36.4	ab	0.0	d
Revus	11	oz/a	Attran	0	a	2.3	a	17	cd	17	cd	17	cd	53.4	ab
Revus	11	oz/a	1st cult	8	a	22.7	a	35.2	ab	35.2	ab	35.2	ab	27.6	bcd
Revus	11	oz/a	Layby	9.1	a	14.8	a	37.5	a	37.5	a	37.5	a	7.7	cd
Revus	44	oz/a	Attran	0	a	5.7	a	13.6	cd	13.6	cd	13.6	cd	47.3	abc
Revus	44	oz/a	1st Cult	3.4	a	11.4	a	26.1	abc	26.1	abc	26.1	abc	32.9	a-d
Revus	44	oz/a	Layby	8	a	18.2	a	37.5	a	37.5	a	37.5	a	17.3	bcd
Ridomil Gold	1	pt/a	Attran	0	a	9.1	a	25	abc	25	abc	25	abc	31.0	a-d
Ridomil Gold	1	pt/a	1st Cult	3.4	a	6.8	a	19.3	bcd	19.3	bcd	19.3	bcd	39.0	a-d
Ridomil Gold	1	pt/a	Layby	4.5	a	8	a	11.4	cd	11.4	cd	11.4	cd	56.0	ab
Ridomil Gold+	1	pt/a	1st Cult	3.4	a	9.1	a	23.9	abc	23.9	abc	23.9	abc	30.6	a-d
Aliette	4	lb/a	1st Cult												
Ridomil Gold+	1	pt/a	layby	1.1	a	4.5	a	5.7	d	5.7	d	5.7	d	73.3	a
Aliette	4	lb/a	layby												

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Tomato Spotted Wilt Virus

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Control of tomato spotted wilt in flue-cured tobacco, 2008.

This trial was established in Duplin, NC in a Noboco soil series with a pH of 5.7. This area has a history of significant losses to tomato spotted wilt virus (TSWV). The trial was arranged as a randomized complete block; plots consisted of four 48 in. wide rows, 50 ft in length with four replications. Cultivar K 326 was transplanted on 30 Apr. The greenhouse treatments (pretra, drench and pretra, float water) were applied on 22 Apr to seedlings. The drench was applied as a foliar spray and then drenched with a sufficient amount of water to move the material to the root zone, and the float water was applied to the greenhouse float water. The field treatments were applied on 2 May. The foliar treatments were sprayed onto the transplanted seedlings. Leaf width measurements were taken 26 May by measuring the widest leaf on individual plants. Ten plants were measured in each plot and then averaged. Disease incidence was evaluated on 19, 26 May and 2, 9, 16, 23, 30 June.

The nontreated control had the highest disease incidence while the Admire Pro plus Actigard float water treatment had the lowest disease incidence. The Admire Pro plus Actigard (0.02 oz/1000 plants) drench and the Admire Pro plus Actigard (0.005 oz/1000 plants) drench treatments were statistically similar to the Admire Pro plus Actigard drench treatment. Meanwhile, the nontreated control had the least phytotoxicity while the Admire Pro plus Actigard (0.02 oz/1000 plants) drench and the Admire Pro plus Actigard float water treatments had the highest phytotoxicity. Other treatments with high phytotoxicity were the Actigard drench and the Admire Pro plus Actigard (0.005 oz/1000 plants) drench. The Admire Pro plus Actigard (0.02 oz/1000 plants) drench treatment was lower in disease incidence and higher in phytotoxicity than the Admire Pro drench plus Actigard foliar treatment.

	Percent Disease		Percent	Leaf Width
Material, rate, timing, method	5 weeks after transplant	9 weeks after transplant	Control	(in)
Nontreated Control	20.9 a	37.8 a	0.0 d	5.4 a
Admire Pro 0.8fl oz/1000pl, pretra, drench	4.9 b	9.8 b	73.5 c	5.1 a
Actigard 0.02 oz/1000pl, pretra, drench	3.3 bc	8.9 b	75.4 bc	4.4 c
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 0.02 oz/1000pl, pretra, drench	0.0 d	4.1 c	88.2 ab	4.3 c
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 0.5 oz/A, attran, foliar	4.1 b	9.5 b	74.0 c	5.1 ab
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 10 PPM, pretra, float water	0.9 cd	3.9 c	88.8 a	4.3 c
Admire Pro 1.0 fl oz/A, attran, water +Actigard 0.005 oz/1000pl, pretra, drench	1.1 cd	5.0 bc	86.1 abc	4.4 bc

*Means within columns followed by same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Tomato Spotted Wilt Virus

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Control of tomato spotted wilt in flue-cured tobacco, 2008.

This trial was established in Craven, NC in a Lenoir soil series with a pH of 6.0. This area has a history of significant losses to tomato spotted wilt virus (TSWV). The trial was arranged as a randomized complete block; plots consisted of four 48 in. wide rows, 50 ft in length with four replications. Cultivar K 326 was transplanted on 2 May. The greenhouse treatments (pretra, drench and pretra, float water) were applied on 25 Apr to seedlings. The drench was applied as a foliar spray and then drenched with a sufficient amount of water to move the material to the root zone, and the float water was applied to the greenhouse float water. The field treatments were applied on 2 May right after transplanting. The foliar treatments were sprayed onto the transplanted seedlings. Leaf width measurements were taken 28 May, by measuring the widest leaf on individual plants. Ten plants were measured in each plot and then averaged. Disease incidence was evaluated on 28 May and 4, 11, 18, 25 June and 2, 9 July.

The nontreated control had the highest disease incidence while the Admire Pro plus Actigard (0.02 oz/1000 plants) drench application had the lowest incidence. The Actigard drench, Admire Pro plus Actigard float water, and Admire Pro plus Actigard (0.005 oz/1000 plants) drench treatments were statistically not different than the Admire Pro plus Actigard (0.02 oz/1000 plants) drench treatment. Meanwhile, the nontreated control had the least phytotoxicity while the Admire Pro plus Actigard (0.02 oz/1000 plants) drench treatment had the highest phytotoxicity. Other treatments with high phytotoxicity were the Actigard drench, Admire Pro plus Actigard float water, and Admire Pro plus Actigard (0.005 oz/1000 plants) drench treatments. The Admire Pro plus Actigard (0.02 oz/1000 plants) drench treatment was lower in disease incidence and higher in phytotoxicity than the Admire Pro drench plus Actigard foliar treatment.

	Percent Disease		Percent	Leaf Width
Material, rate, timing, method	5 weeks after transplant	9 weeks after transplant	Control	(in)
Nontreated Control	12.7 a	20.1 a	0 d	6.8 a
Admire Pro 0.8fl oz/1000pl, pretra, drench	8.3 ab	11.3 b	43.1 c	6.5 a
Actigard 0.02 oz/1000pl, pretra, drench	2.4 cd	5.6 cd	73.2 ab	4.9 bc
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 0.02 oz/1000pl, pretra, drench	1.0 d	2.9 d	85.4 a	4.3 c
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 0.5 oz/A, attran, foliar	5.1 bc	8.4 bc	55.3 bc	5.6 ab
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 10 PPM, pretra, float water	1.6 d	4.6 d	80.3 a	4.9 bc
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 0.005 oz/1000pl, pretra, drench	1.7 d	3.7 cd	77.1 ab	4.6 bc

*Means within columns followed by same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Tomato Spotted Wilt Virus

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Control of tomato spotted wilt in flue-cured tobacco, 2008.

This trial was established in Beaufort, NC in a Seabrook soil series with a pH of 5.3. This area has a history of losses to tomato spotted wilt virus (TSWV). The trial was arranged as a randomized complete block; plots consisted of four 48 in. wide rows, 50 ft in length with four replications. Cultivar K 326 was transplanted on 5 May. The greenhouse treatments (pretra, drench) were applied on 25 Apr to seedlings. The drench was applied as a foliar spray and then drenched with a sufficient amount of water to move the material to the root zone. The field treatments were applied on 5 May right after transplanting. The foliar treatments were sprayed onto the transplanted seedlings. Leaf width measurements were taken 28 May, by measuring the widest leaf on individual plants. Ten plants were measured in each plot and then averaged. Disease incidence was evaluated on 28 May and 4, 11, 18, 25 June and 2, 9 July.

The nontreated control had the highest disease incidence while the Admire Pro plus Actigard (0.02 oz/1000 plants) drench treatment had the lowest incidence. The Admire Pro plus Actigard (0.005 oz/1000 plants), Platinum plus Actigard, and Actigard drench treatments had statistically not significant different disease incidence to the Admire Pro plus Actigard (0.02 oz/1000 plants) drench treatment. Meanwhile, the untreated control had the least phytotoxicity while the Admire Pro plus Actigard (0.02 oz/1000 plants) drench treatment had the highest one. Other treatments with high phytotoxicity were the Actigard drench and the Platinum drench plus Actigard drench treatments. The Admire Pro plus Actigard (0.02 oz/1000 plants) drench treatment was lower in disease incidence and higher in phytotoxicity than the Admire Pro drench plus Actigard foliar treatment, while the Admire Pro plus Actigard (0.005 oz/1000 plants) drench treatment fell between them in both disease incidence and phytotoxicity.

	Percent Disease		Percent	Leaf Width
Material, rate, timing, method	5 weeks after transplant	9 weeks after transplant	Control	(in)
Untreated Control	6.8 a	14.4 a	0.0 b	3.2 a
Admire Pro 0.8fl oz/1000pl, pretra, drench	5.8 b	9.5 b	33.7 a	2.9 b
Actigard 0.02 oz/1000pl, pretra, drench	5.3 c	9.3 bc	35.0 a	2.3 cd
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 0.02 oz/1000pl, pretra, drench	5.0 c	7.6 c	47.2 a	2.0 d
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 0.5 oz/A, attran, foliar	6.0 b	9.2 b	35.1 a	2.8 b
Admire Pro 0.8fl oz/1000pl, pretra, drench +Actigard 0.005 oz/1000pl, pretra, drench	5.2 bc	8.2 bc	41.9 a	2.4 c
Platinum 1.3fl oz/1000pl, pretra, drench +Actigard 0.02 oz/1000pl, pretra, drench	5.0 c	9.1 bc	36.6 a	2.1 cd

*Means within columns followed by same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Tomato Spotted Wilt Virus

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Variety evaluation for resistance to tomato spotted wilt in flue-cured tobacco, 2008.

This study was established in a field located in Duplin County, N.C. The soil type was a Noboco soil series with a pH of 5.7. This area has a history of significant losses to tomato spotted wilt virus (TSWV). There were 4 varieties arranged as a randomized complete block; plots consisted of four 48 in. wide rows, 50 ft in length with four replications. Tobacco was transplanted on 30 Apr and normal practices for the area were observed throughout the season. Disease incidence was evaluated on 19, 26 May and 2, 9, 16, 23, 30 June. No yield data was obtained from this location.

The highest TSWV incidence was observed on K 326 and it was 50 to 75% higher than the one recorded on the 3 experimental lines. It appears that the incidence was lower on the experimental lines early in the season (i.e. late May to early June) than on the commercial variety K 326 that had already over 13% incidence by late May. On every date of observation TSW incidence on K 326 was 3 times higher than the experimental lines and this trend hold true until the last date of observation on June 30.

	TSWV incidence (%)						
Variety	5/19/2008	5/26/2008	6/2/2008	6/9/2008	6/16/2008	6/23/2008	6/30/2008
H-61	0.51 a*	3 a	6.2 b	8.9 b	9.5 b	10 b	10.6 b
H-94	1.33 a	4.6 a	7.2 b	10.8 b	12.4 b	14.5 b	15.9 b
H-106	0.48 a	3.3 a	6.2 b	9.2 b	9.7 b	10.1 b	10.4 b
K 326	2.73 a	13.3 a	20.9 a	31.8 a	34.2 a	36.3 a	37.8 a

* Means within columns followed by the same letter do not significantly differ (P=0.05).

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Blue mold; *Peronospora tabacina*

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Evaluation of fungicides for control of tobacco blue mold, 2008.

This trial was established in a field at the Oxford Tobacco Research Station in Oxford, NC. The soil series type was Chewcala silt loam with a pH of 5.8. The plots were four 46-in. rows, 50-ft in length arranged in a randomized complete block with four replications. Tobacco was transplanted 12 May using NC 297 as the cultivar and normal cultural practices for the area were observed throughout the season. Treatments were applied using a backpack sprayer at high pressure (40 psi) and high volume (11.6 gal mix/A) to achieve maximum coverage. The first applications of treatments were applied soon after layby on 24 June. The second application per the protocol was applied approximately 2 weeks later on 11 July. The site was revisited 1 Aug for observation. No harvest data was obtained from this site.

Blue mold was not developed in this location. During the visit of Aug 1 plants were evaluated for phytotoxicity. There were no visual symptoms of flecking or other kind of phytotoxicity in any treatement.

Treatment No.	Treatment Name	Rate	Rate Unit	Application Date
1	Untreated Check			
2	Revus	6	oz/a	24 June
3	Revus	8	oz/a	24 June
4	Revus	6	oz/a	24 June
	Induce	0.25	% v/v	
5	Revus	8	oz/a	24 June
	Induce	0.25	% v/v	
6	Forum	7	oz/a	24 June
7	Revus	8	oz/a	24 June & 11 July
8	Quadris			24 June

TOBACCO, FLUE-CURED (*Nicotiana tabacum*)
Root Knot; (*Meloidogyne* spp)

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Chemical nematicides and fumigants for control of root-knot nematodes, 2008.

This trial was established in a field naturally infested with *Meloidgyne* spp in Yadkin County, NC. The soil was Chewcala silt loam with a pH of 5.8. Fumigants were applied 17 Apr (earpre, row). The row-applied materials were injected from a single outlet on a single shank 8 in. below the soil surface while a ridge was being formed, resulting in a final depth of 14 in. The greenhouse treatments (pretra) were applied on 8 May to seedlings as a foliar spray and then drenched with a sufficient amount of water to move the material to the root zone. The plots were four 46-in. wide rows by 50-ft in length arranged in a randomized complete block with four replications. Tobacco was transplanted 15 May using K 394 as the cultivar and normal cultural practices for the area were observed throughout the season. Nematode assay samples for root-knot juvenile and eggs were taken on 1 Aug. Roots were dug and gall indices and percent necrosis were assigned every third plant from the center two rows of each plot on 30 Sep. The indices were averaged before analysis.

The distribution of root knot nematodes in this field was very uneven; the highest numbers were present in the south side while the central part of the field was rather free of nematodes. Thus although there were numerical differences of nematode counts among treatments on Aug 1 these counts were not statistically different. Numerically the untreated check had the highest number of nematode counts followed by BioYield and Admire Pro+GB 99 (at 0.001 g/1000 plants). On Sept 30 root gall index was evaluated; the highest one was in the roots of untreated plants followed again by BioYield and Admire Pro+GB 99 (at 0.001 g/1000 plants). Although there were not statistical differences due to the uneven distribution of nematodes in the field there was a clear numerical trend where Telone II+Admire Pro or Admire Pro+GB 99 (0.01 or 0.1 g/1000 plants) had the lowest gall index.

				Stand Count		**Nematode Cts/500 cc soil**		**Gall Index**		**Percent Root Necrosis**	
Material, rate, timing				6/9/2008		8/1/2008		9/30/2008		9/30/2008	
Untreated Check				100.5	a*	1780	a	23.8	a	13.7	a
Telone II	6	gal/a	Earlypre	90.3	bc	2.5	a	5.1	a	6.7	a
Admire Pro	0.8	oz/1000 plants	Pretra								
Admire Pro	0.8	oz/1000 plants	Pretra	94.8	ab	0	a	1.6	a	4.7	a
Admire Pro	0.8	oz/1000 plants	Pretra	99.8	a	2.5	a	4.5	a	5.8	a
BioYield	1	oz/1000 plants	Pretra								
BioYield	1	oz/1000 plants	Pretra	99	a	870	a	16	a	8.8	a
Admire Pro	0.8	oz/1000 plants	Pretra	97	ab	400	a	13.6	a	7.8	a
GB99	0.001	g/1000 plants	Pretra								
Admire Pro	0.8	oz/1000 plants	Pretra	86.8	c	47.5	a	3.9	a	6.4	a
GB99	0.01	g/1000 plants	Pretra								
Admire Pro	0.8	oz/1000 plants	Pretra	99	a	67.5	a	10.6	a	6.9	a
GB99	0.1	g/1000 plants	Pretra								

*Means within columns followed by same letter do not significantly differ (*P*=.05, Waller-Duncan *k*=100).

CHEMICALS TESTED

Product	Manufacturer	Composition
Actigard 50WG	Syngenta Crop Protection, Inc. PO Box 18300 Greensboro, NC 27419	1,2,3-Benzothiadiazole-7-carbothioic acid S-methyl ester
Admire Pro	Bayer Crop Science Agriculture Division PO Box 4913 Hawthorn Road Kansas City, MO 64120-0013	1-[(6-chloro-3-pyridinyl)methyl]-N-nitro-2-imidazolidinimine
Aliette	Bayer Environemtal Science 2 T.W. Alexander Dr Research Triangle Pk., NC 27709	Fosetyl Aluminum
BioYield	Helena Chemical Company 5904 US 117 North Fremont, NC 27830	Bacillus amyloliquefaciens Paenobacillus macerans
Chloropicrin 100	Hendrix and Dail, Inc. PO Box 648 Greenville, NC 27835	Chloropicrin
Forum	BASF Corporoation 100 Campus Dr Florham Park, NJ 07932	Dimethomorph
GB 99	Syngenta Crop Protection, Inc PO Box 18300 Greensboro, NC 27419	Bacillus Subtillis (Experimental Nematicide)
Induce	Helena Chemical Company 5904 US 117 North Fremont, NC 27830	90% Blend of alkyl aryl polyoxylkane ether and free fatty acids
Mycostop	Yerdera Oy Riihitontuntie 14 A PO Box 1 Espoo, Finland 02201	Dried spores and mycelium of ray fungus (Steptomyces griseoviridis Strain K61)
Plant Shield HC	BioWorks, Inc. 51 Central Avenue Geneva, New York 14456	Trichoderma harzianum Rifai strain KRL-AG2
Platinum 75SG	Syngenta Crop Protection, Inc. PO Box 18300 Greensboro, NC 27419	4H-1,3,5-Oxadiazin-4-imine,3-[(2-chloro-5-thiazolyl)methyl]tetrahydro-5-methyl-N-nitro-
Quadris F	Syngenta Crop Protection, Inc. PO Box 18300 Greensboro, NC 27419	Methyl (E)-2-{2-[6-(cyanophenoxy)pyrimidin-4-yloxy]phenyl}-3-methoxyacrylate

CHEMICALS TESTED (continued)

Product	Manufacturer	Composition
Revus 250 SC	Syngenta Crop Protection, Inc PO Box 18300 Greensboro, NC 27419	2-(4-chloro-phenyl)-N-[2-(3-methoxy-4-prop-2-ynyloxy-phenyl)-ehtyl]-2-prop-2-ynyloxy-acetamide
Ridomil Gold SL	Syngenta Crop Protection, Inc. PO Box 18300 Greensboro, NC 27419	(R,S)-2-[(2,6-dimethylphenyl)-methoxyacetylamino] -propionic acid methyl ester
Telone II	Dow AgroSciences 9330 Zionsville Road Indianapolis, IN 46268-1189	1, 3-Dichloropropene
Telone C- 17	Dow AgroSciences 9330 Zionsville Road Indianapolis, IN 46268-1189	1,3-Dichloropropene (78.3%) Chloropicrin (16.5%)1,3,3-Trichloropropenes (5.2%)
Terramaster 4EC	Chemtura Corporation 199 Benson Rd. Middlebury, CT 06749	[5-Ethoxy-3-(trichloromethyl)-1,2,4-thiadiazole]