



An Update from the Pesticide Residue Testing Program at NCSU

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Presentation Overview

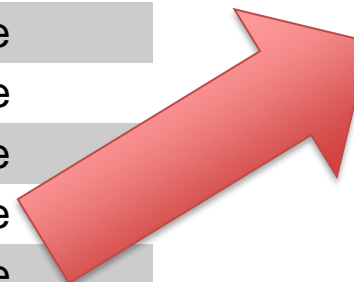


- Program created in 2004:
 - End of the federal tobacco program
 - Market samples were no longer available due to the changing industry
- Program is directed by the Tobacco Pesticide Committee
 - Subgroup of the Tobacco Workers Conference
 - Committee is comprised of University and Industry personnel
- Committee Meetings:
 - Once every other year at the Tobacco Workers Conference
- Research conducted on a three year cycle
- Once complete the Pesticide Residue Committee decides which compounds are entered for the next cycle

- Determine the expected residues from maximum labeled applications
 - Maximum labeled rate and number of applications.
 - Final application at the pre-harvest interval specified on the label.
- Data are reported by individual year, location, compound, and stalk position
 - Maximum, Minimum, Mean, Standard Deviation, and 95% Confidence Interval
- The goal is to determine what maximum residues could be based on maximum application rate
- Results are submitted to the industry for determining specific residue tolerances
 - Data are mostly used internally

Cycle	Compound Name	Classification
2004-2006	Endosulfan	Insecticide
	λ-cyhalothrin	Insecticide
	Acephate	Insecticide
	Dimethomorph+Mancozeb	Fungicide
	Maleic Hydrazide	Suckercide
2007-2009	Imidacloprid (2 apps)	Insecticide
	Imidacloprid (4 apps)	Insecticide
	Butralin (Dropline)	Suckercide
	Butralin (Broadcast)	Suckercide
	Flumetralin (Dropline)	Suckercide
	Flumetralin (Broadcast)	Suckercide
	Azoxystrobin	Fungicide
2010-2012	Cypermethrin	Insecticide
	Bifenthrin	Insecticide
	Chlorantraniliprole	Insecticide
	Clothianidin	Insecticide
	Flubendiamide	Insecticide
2013-2015	Spinosad	Insecticide
	Cyantraniliprole	Insecticide

2012: CORESTA RFT Task Force created



4 peer-reviewed publications
10 research presentations



FLUOPICOLIDE, INDOXACARB, AND OXATHIPIPROLIN RESIDUES AFTER APPLICATION TO FLUE-CURED TOBACCO (*Nicotiana tabacum* L.)

M.D. Inman¹, M.C. Vann^{1*}, and D.S. Whitley¹

Research Note

AZOXYSTROBIN, BUTRALIN, AND FLUMETRALIN RESIDUES IN FLUE-CURED TOBACCO

M.C. Vann^{1*} and L.R. Fisher¹

CYANTRANILIPROLE AND SPINOSAD RESIDUES IN FLUE-CURED TOBACCO

M.C. Vann^{*}, L.R. Fisher, and D.S. Whitley¹

BIFENTHRIN, CLOTHIANIDIN, AND FLUBENDIAMIDE RESIDUES IN FLUE-CURED TOBACCO

M.C. Vann^{1*}, L.R. Fisher¹, and A.M. Stewart²

Recent Changes

- 2016:
 - Agreement to sample lamina
 - 100 g from each stalk position group
- 2018:
 - More powerful data analysis added
- 2021:
 - Air-cured tobacco research discontinued at NCSU
- Approval of new synthetic pesticides for tobacco has declined
 - Cyantraniliprole (2)
 - Indoxacarb
 - Fluopicolide
 - Oxathiapiprolin
- How do we select products moving forward?

Cycle	Compound Name	Classification	Cycle	Compound Name	Classification
2004-2006	Endosulfan	Insecticide	2013-2015	Spinosad	Insecticide
	λ-cyhalothrin	Insecticide		Cyantraniliprole	Insecticide
	Acephate	Insecticide	2016-2018	Fluopicolide	Fungicide
Dimethomorph+Mancozeb	Fungicide	Oxathiapiprolin		Fungicide	
Maleic Hydrazide	Suckercide	Indoxacarb		Insecticide	
2007-2009	Imidacloprid (2 apps)	Insecticide	2019-2021	Cyantraniliprole	Insecticide
	Imidacloprid (4 apps)	Insecticide		Flutriafol	Fungicide
	Butralin (Dropline)	Suckercide	Azoxystrobin + Flutriafol	Fungicide	
Butralin (Broadcast)	Suckercide	S-metolachlor	Herbicide		
Flumetralin (Dropline)	Suckercide	2022-2024	Inpyrfluxam	Fungicide	
Flumetralin (Broadcast)	Suckercide		Napropamide	Herbicide	
Azoxystrobin	Fungicide		Mancozeb	Fungicide	
Cypermethrin	Insecticide		Oxathiapiprolin + Mefenoxam	Fungicide	
2010-2012	Bifenthrin	Insecticide	Pydiflumetofen + Difenoconazole	Fungicide	
	Chlorantraniliprole	Insecticide			
	Clothianidin	Insecticide	Total of 31 treatments		
Flubendiamide	Insecticide				

	Cycle	Compound Name	Classification
Tray Drench – Verimark®	2013-2015	Spinosad	Insecticide
		Cyantraniliprole	Insecticide
	2016-2018	Fluopicolide	Fungicide
		Oxathiapiprolin	Fungicide
		Indoxacarb	Insecticide
Foliar - Exirel®	2019-2021	Cyantraniliprole	Insecticide
		Flutriafol	Fungicide
		Azoxystrobin + Flutriafol	Fungicide
		S-metolachlor	Herbicide
	2022-2024	Inpyrfluxam	Fungicide
	Napropamide	Herbicide	
	Mancozeb	Fungicide	
	Oxathiapiprolin + Mefenoxam	Fungicide	
	Pydiflumetofen + Difenoconazole	Fungicide	

Cycle	Compound Name	Classification
2013-2015	Spinosad	Insecticide
	Cyantraniliprole	Insecticide
2016-2018	Fluopicolide	Fungicide
	Oxathiapiprolin	Fungicide
	Indoxacarb	Insecticide
2019-2021	Cyantraniliprole	Insecticide
	Flutriafol	Fungicide
	Azoxystrobin + Flutriafol	Fungicide
	S-metolachlor	Herbicide
2022-2024	Inpyrfluxam	Fungicide
	Napropamide	Herbicide
	Mancozeb	Fungicide
	Oxathiapiprolin + Mefenoxam	Fungicide
	Pydiflumetofen + Difenoconazole	Fungicide

Topguard®



Topguard® EQ



	Cycle	Compound Name	Classification
Soil banded application ←	2013-2015	Spinosad	Insecticide
		Cyantraniliprole	Insecticide
	2016-2018	Fluopicolide	Fungicide
		Oxathiapiprolin	Fungicide
	2019-2021	Indoxacarb	Insecticide
		Cyantraniliprole	Insecticide
		Flutriafol	Fungicide
		Azoxystrobin + Flutriafol	Fungicide
		S-metolachlor	Herbicide
		2022-2024	Inpyrfluxam
Napropamide	Herbicide		
Mancozeb	Fungicide		
Oxathiapiprolin + Mefenoxam	Fungicide		
Transplant water application ←		Pydiflumetofen + Difenoconazole	Fungicide

Cycle	Compound Name	Classification
2013-2015	Spinosad	Insecticide
	Cyantraniliprole	Insecticide
2016-2018	Fluopicolide	Fungicide
	Oxathiapiprolin	Fungicide
	Indoxacarb	Insecticide
2019-2021	Cyantraniliprole	Insecticide
	Flutriafol	Fungicide
	Azoxystrobin + Flutriafol	Fungicide
2022-2024	S-metolachlor	Herbicide
	Inpyrfluxam	Fungicide
	Napropamide	Herbicide
	Mancozeb	Fungicide
	Oxathiapiprolin + Mefenoxam	Fungicide
	Pydiflumetofen + Difenoconazole	Fungicide

Re-evaluation due to emerging need



	Cycle	Compound Name	Classification
	2013-2015	Spinosad	Insecticide
		Cyantraniliprole	Insecticide
	2016-2018	Fluopicolide	Fungicide
Not Labeled ←		Oxathiapiprolin	Fungicide
		Indoxacarb	Insecticide
	2019-2021	Cyantraniliprole	Insecticide
Not Labeled ←		Flutriafol	Fungicide
Not Labeled ←		Azoxystrobin + Flutriafol	Fungicide
Not Labeled ←		S-metolachlor	Herbicide
Not Labeled ←	2022-2024	Inpyrfluxam	Fungicide
		Napropamide	Herbicide
		Mancozeb	Fungicide
		Oxathiapiprolin + Mefenoxam	Fungicide
Not Labeled ←		Pydiflumetofen + Difenoconazole	Fungicide

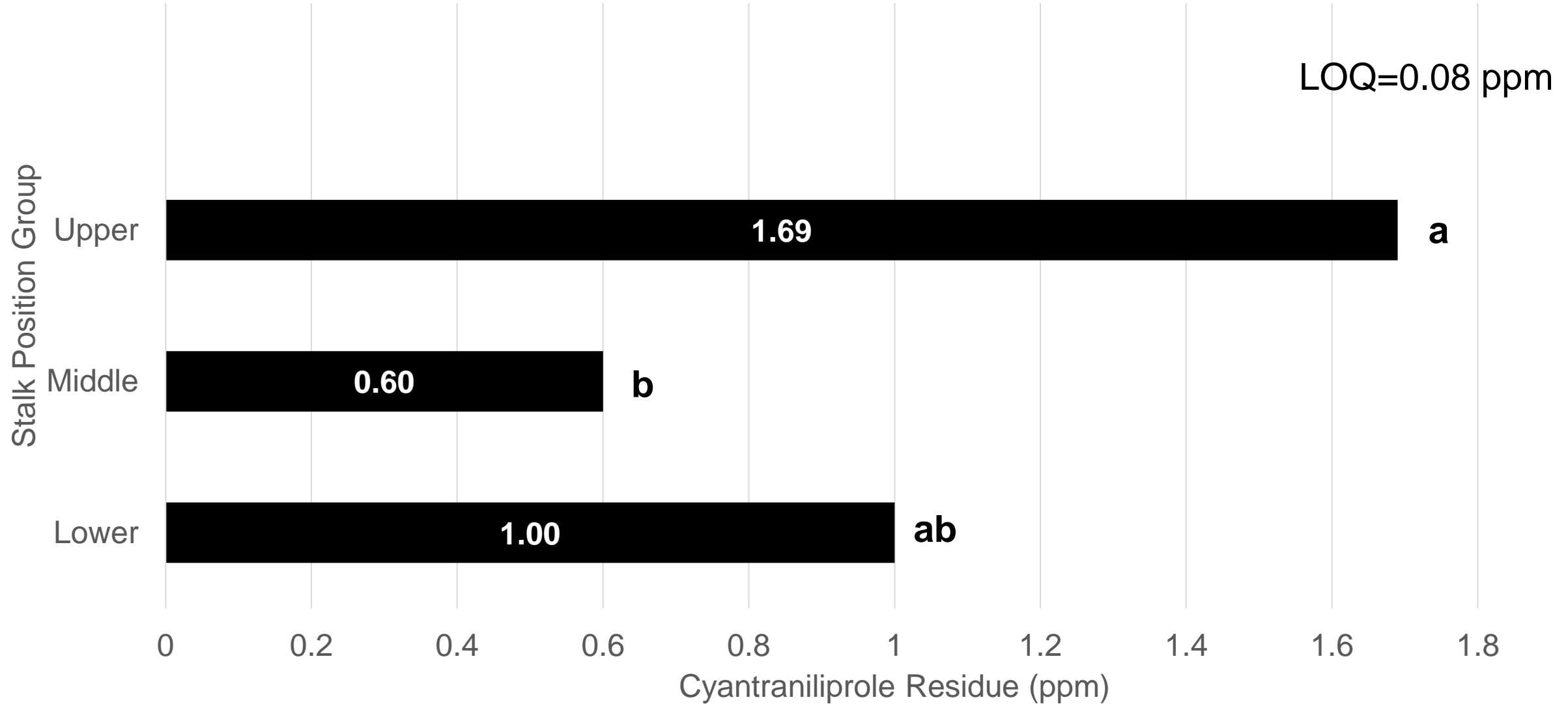


Figure 1. Cured leaf cyantraniliprole residues in lower, middle, and upper stalk positions. Data are pooled across five growing environments. Treatment means with the same letter are not significantly different at the $\alpha = 0.05$ level.

Cyantraniliprole

- PHI ranged from 8 to 28 days
- Residues typically highest in upper-stalk samples
- Much lower than CORESTA GRL (18 ppm)
- Very promising for US market, considering recent late-season flea beetle issues
- Complimentary to current foliar flea beetle insecticides
 - Acephate, indoxacarb and imidacloprid

Table 3. Treatment list and application programs for the 2022 – 2024 pesticide residue testing research cycle in North Carolina.

Active Ingredient(s)	Tradename	Rate/A	Total Rate	Timing^a	Volume^b
		per app	lbs ai/acre		gal/acre
Inpyrfluxam	Excalia	2 fl oz/a	0.13	4, 6, 8 WAT	25, 35, 50
Oxathiapiprolin + Mefenoxam	Orondis Gold 200 + Ridomil Gold SL	4.8 + 8.0 fl oz/a	0.06 + 0.25	At Transplanting	100
Napropamide	Devrinol 2XT	4 qt/a	2.00	1 WAT	20
Mancozeb	Manzate Pro-Stick	2 lbs/a	4.50	4, 6, 8 WAT	25, 35, 50
Difenoconazole + Pydiflumetofen	Miravis Top	13.7 fl oz/a	0.33 + 0.20	28, 21, 14, 7 day PHI	50

^a WAT; weeks after transplanting, PHI; pre-harvest interval.

^b GPA; gallons per acre.

Table 4. Cured leaf pesticide residues from the 2022 Pesticide Residue Testing Program. Data are pooled across two growing environments.^a

Trt. No.	Active Ingredient(s)	LOQ	CORESTA GRL	Stalk Position		
				Lower (ppm)	Middle (ppm)	Upper (ppm)
1	Inpyrfluxam	0.05	n/a	1.37 a	0.20 b	0.08 b *
2	Oxathiapiprolin	0.09	n/a	0.09 *	0.09 *	0.09 *
2	Mefenoxam	0.08	2	0.15 a	0.08 b *	0.08 b *
3	Napropamide	0.08	n/a	0.08 *	0.08 *	0.08 *
4	Mancozeb	1.00	5	1.58 *	1.40 *	1.00 *
5 ^b	Difenoconazole	0.09	12	12.35 a	5.98 b	2.18 c
5 ^b	Pydiflumetofen	0.09	n/a	14.05 a	6.80 b	2.18 c

^a Treatment means followed by the same letter within the same row are not significantly different at the $\alpha=0.05$ level.

^b Miravis Top data collected from one growing environment.

“*” indicates at least one sample had residues below the limit of quantification.

Table 5. Inpyrfluxam residues on individual stalk positions in 2022.

Pesticide Name	Kinston			Rocky Mount		
	Lower	Middle	Upper	Lower	Middle	Upper
<u>Inpyrfluxam (0.05^a)</u>	ppm					
Maximum	2.40	0.34	0.09	0.75	0.26	0.07
Mean	2.10	0.26	0.07	0.64	0.14	0.06
Minimum	1.80	0.19	0.06	0.50	0.08	0.05
Standard Dev.	0.24	0.06	0.01	0.12	0.09	0.01
95% CI	1.86-2.35	0.20-0.32	0.01-0.08	0.52-0.76	0.05-0.23	0.05-0.07

^a Detection limit in ppm.

Mancozeb & Inpyrfluxam Application



**Single TG6 Nozzle
25 GPA Output**



**XR8004 Flat Fan Nozzles (3)
20 in. boom width
35 GPA Output**



**Drop Nozzle Application
XR8003 - XR11003 (7)
flat fan nozzles
50 GPA Output**

Future Efforts

- Testing more experimental compounds
- Refined testing protocol
 - Using practical application techniques and programs
- New laboratory partners
 - Pacific Ag Labs
 - Eurofins
 - Labstat
- Supporting the allied industry with emerging issues
- Support CORESTA RFT
 - Share old and new data
- Creating data repository on the NC State Tobacco Portal

Why is this program important?

- Nobody else is collecting or generating this kind of data...
 - No support from USDA or the IR-4 research program
- Creates transparency and communication needed for production decisions based on residues
 - Researchers and Extension personnel can also identify residue issues
- Tobacco isn't the target crop for most CPA manufacturers
 - This program helps chemical manufacturers collect useful data

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Questions??

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