



Field Evaluation of Fungicides for Management of Black shank of tobacco caused by *Phytophthora nicotianae* on Burley

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Black shank of tobacco

- Soil-borne disease
- Caused by the fungus *Phytophthora nicotianae*
- Pathogen races 0 and 1 in Kentucky
- Fungal chlamydospores and oospores overwinter in the soil and on infected tobacco debris
- Infections start when rain triggers zoospores release
- Favored by warm damp weather



Current management practices

- Rotations with grass sods, corn, and soybeans
- Use of resistant cultivars on the 4-10 rating scale
- Good sanitary practices to prevent pathogen introduction and spread
- Select field locations away from down-slopes and standing water
- There is a need to still use fungicides since there is no 100% genetic resistance (especially to race 1):
 - Mefenoxam (Ridomil Gold 480 SL)
 - Preplant or at transplant treatments if history of BS in the field
 - On infested fields, two additional applications at first cultivation and layby

Methods

- **Planting date:** June 6, 2023
- **Application of fungicides:**
 - a. Transplant water (June 6)
 - b. First cultivation (July 6)
 - c. Layby (July 21)
- **Disease evaluations** (6 ratings from late June-early September):

Percent of plants with Black Shank wilting, yellowing, death



Plant Setter – RJ Equipment

Uses continuous flow of transplant water

Water is pumped from main tank with a PTO driven pump

Delivering solution at 230 gallons/Acre

Treatment solutions are injected into the transplant water line with a venturi-style injector

Objective – Test 1

Evaluate different formulations of active ingredients, and compare their control of Black shank in tobacco with currently labeled fungicide Ridomil Gold 480 SL (mefenoxam)

Test 1

TRANSPLANT WATER (TPW) TREATMENTS TESTED

- **Ridomil Gold 480 SL: mefenoxam** - Group 4
- **Revus: mandipropamid** – Group 40
(labeled for Blue mold in tobacco)
- **Orondis Gold: oxathiapiprolin + mefenoxam F1** - Group 49 + Group 4
(currently labeled for Black shank in tobacco)
- **Orondis Gold DC: oxathiapiprolin + mefenoxam F2** - Group 49 + Group 4
Tested both as TPW and pre-plant broadcast/incorporated

Experimental Design – Test 1

- **Tobacco Variety:** Burley tobacco TN 90LC (moderately resistant (4/4) to Black shank)
- **Transplant water treatments:**
 - Disease Check (UTC)
 - Ridomil Gold 480 SL
 - Revus
 - Orondis Gold
 - Orondis Gold DC
- **First cultivation/layby sprays:** Ridomil and Presidio 4 SC (fluopicolide – Group 43)
Backpack CO₂ sprayer with two 8004 flat fan nozzles/row, at plant base (30 gal/A rate)
- **Experimental Unit:** 2 row plots, flanked with rows of susceptible Hybrid 404LC
- **Replications:** 4
- **Arrangement:** Randomized Complete Block (RCB)
- **Location:** Winchester, Kentucky (17+ years history of continuous Black shank)

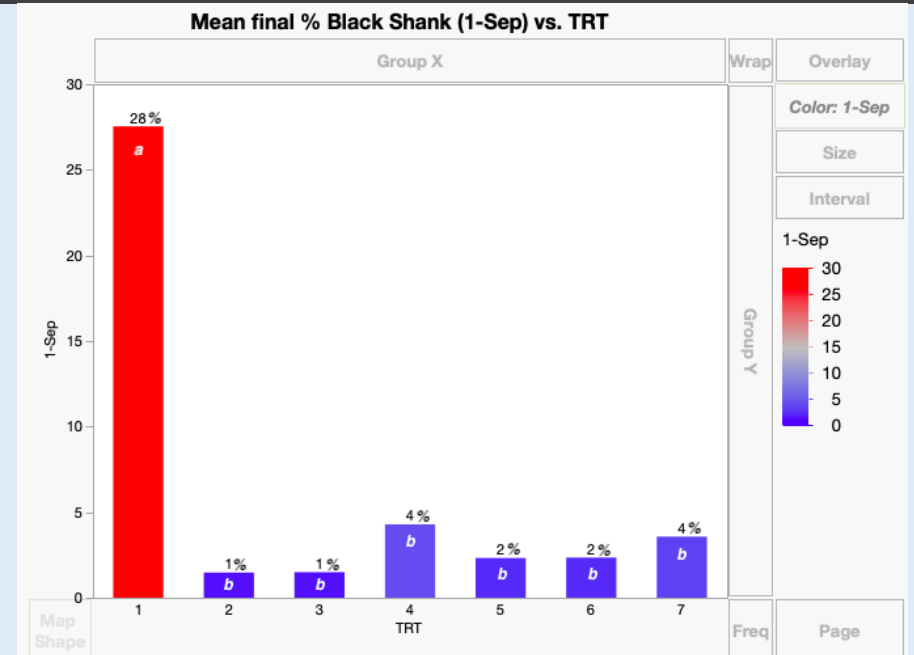
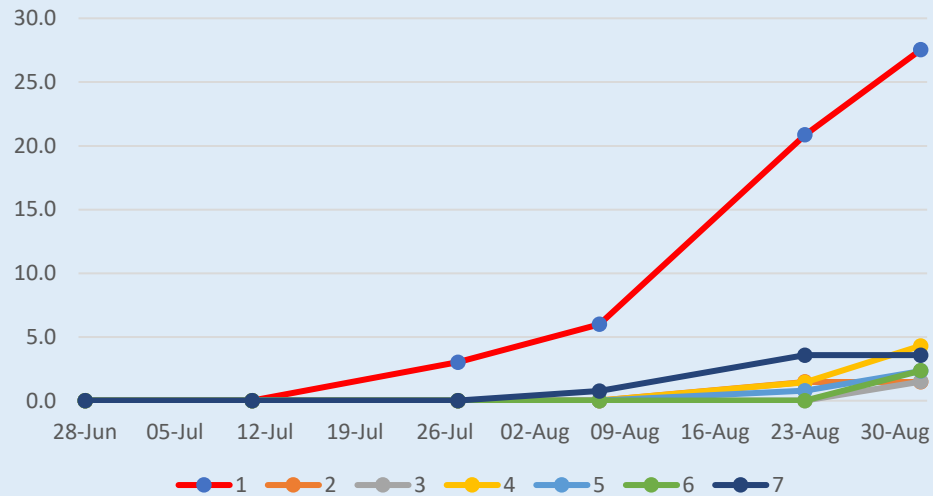
Statistical Analysis

- ANOVA
- Student's t-test



Percent Black shank incidence - Test 1

Average Percent Black Shank during 2023 - By treatment



	Treatments (Transplant water + spray 1 st cult + spray layby)
1	Untreated – Disease check
2	Orondis Gold + Ridomil + Presidio
3	Orondis Gold DC + Ridomil + Presidio
4	Orondis Gold DC + Revus + Presidio
5	Revus + Ridomil + Presidio
6	Orondis Gold DC (<i>pre-plant broadcast</i>) + Ridomil + Presidio
7	Ridomil + Ridomil + Presidio

Total yield/cured leaves - Test 1

	TREATMENTS (Transplant water + spray 1 st cult + spray layby)	AVERAGE YIELD (lbs/Acre)	
1	Untreated – Disease check	1967.93	b **
2	Orondis Gold + Ridomil + Presidio	3074.21	<i>a</i>
3	Orondis Gold DC + Ridomil + Presidio	3160.57	<i>a</i>
4	Orondis Gold DC + Revus + Presidio	2899.62	<i>a</i>
5	Revus + Ridomil + Presidio	2967.91	<i>a</i>
6	Orondis Gold DC (<i>pre-plant incorporated</i>) + Ridomil + Presidio	2912.00	<i>a</i>
7	Ridomil + Ridomil + Presidio	3550.59	<i>a</i>

**Means with different letters are significantly different $P=0.05$
Comparisons for all pairs using Student t-test

Conclusions I

TEST 1:

- a. All fungicidal applications significantly reduced by 90% the average incidence of Black shank in TN 90 compared to the non-treated check, and at comparable levels to the current recommendation (Ridomil).
- b. There were no significant differences in Black Shank reduction amongst all the fungicidal treatments, and no phytotoxicity effects were observed.
- c. The average yield was significantly higher in all treated plots compared to the non-treated check
- d. For resistance management, it will be very desirable to have all of these fungicides available to the tobacco growers for rotation programs to control Black shank (FRAC Groups 4, 40, 43 and 49)

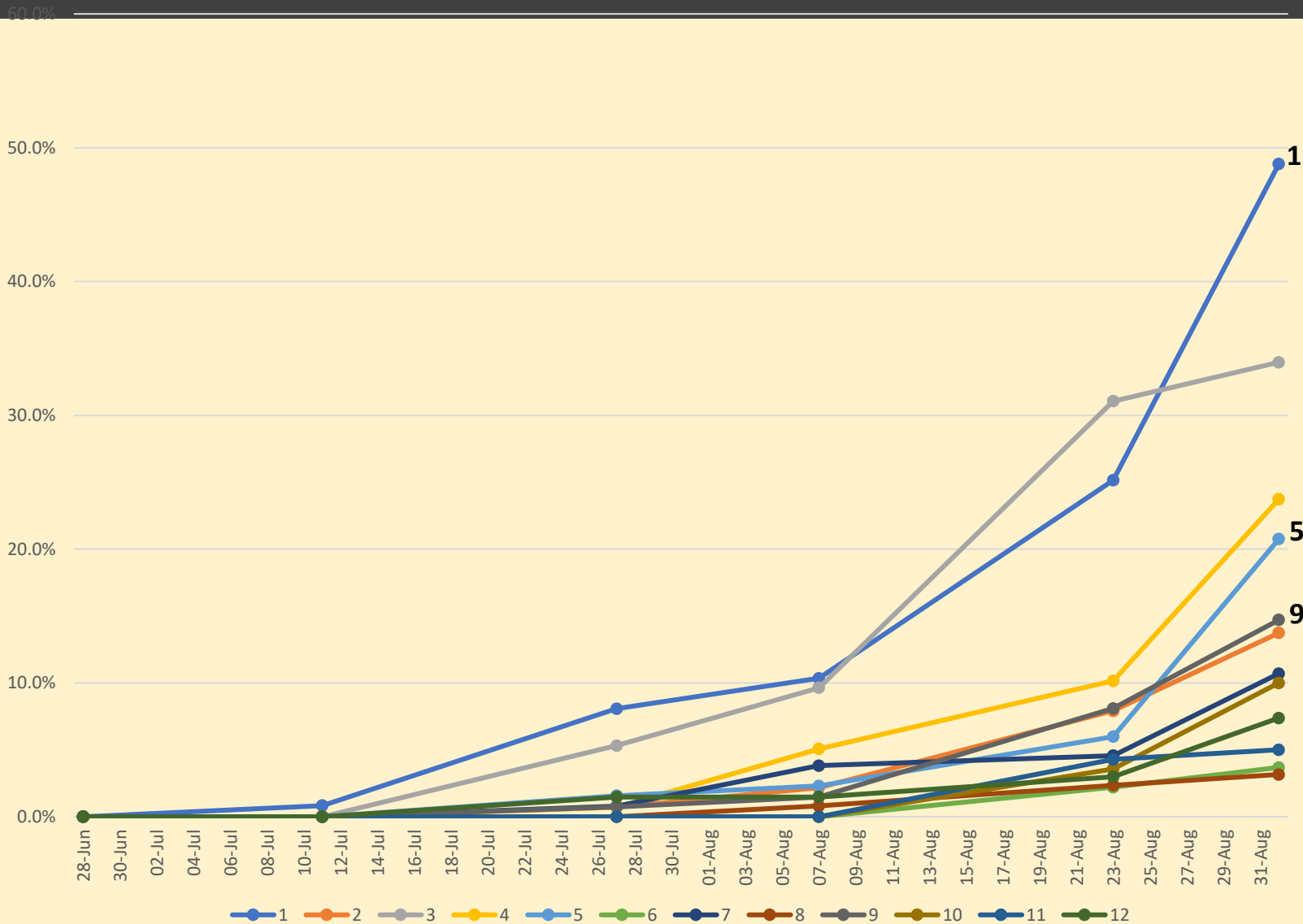
Objective – Test 2

Evaluate two doses of cyazofamid (Fungicide Group 21) and compare its control of Black shank with currently labeled mefenoxam, within three Burley tobacco varieties with differential resistance

Experimental Design – Test 2

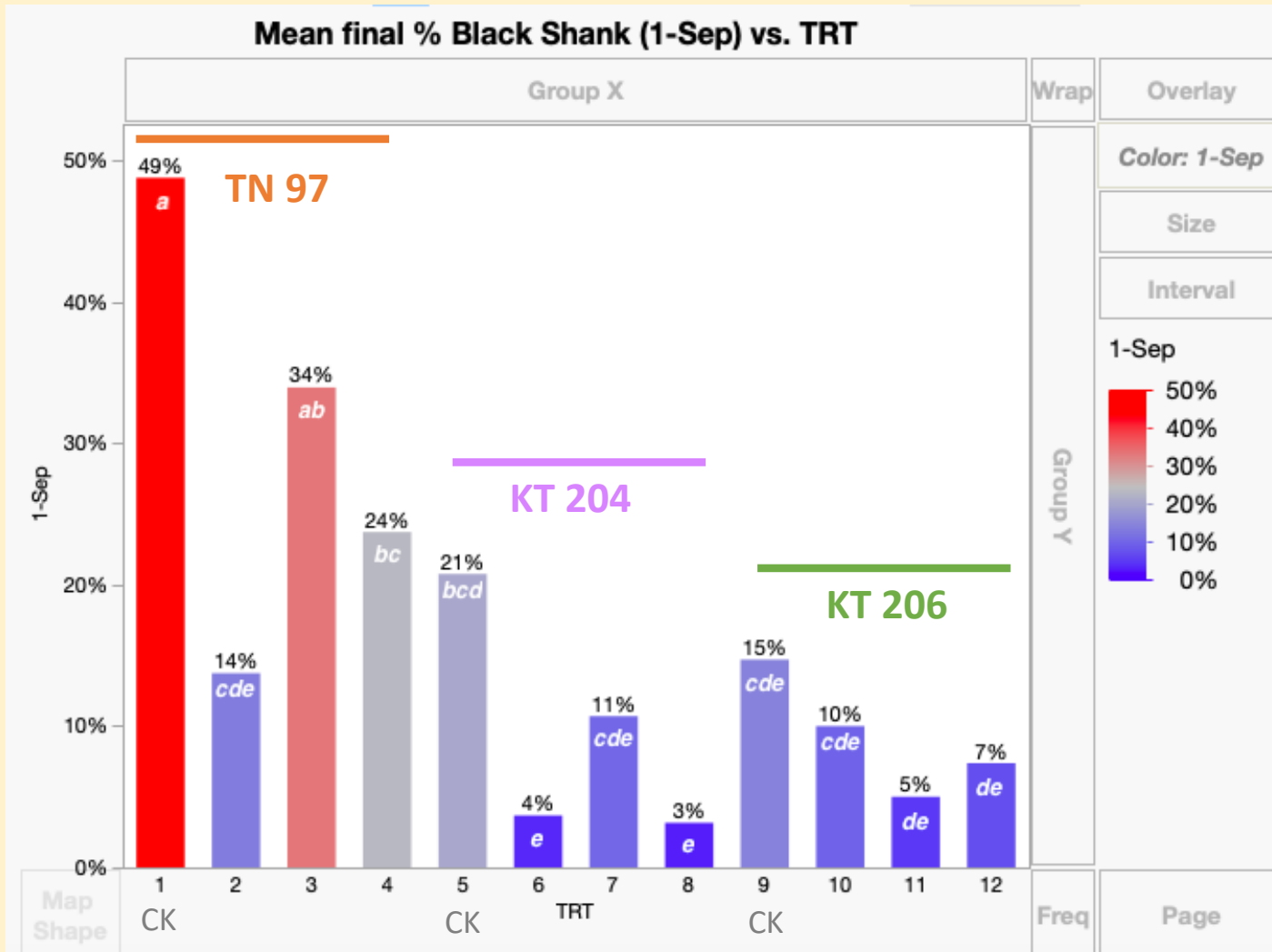
- **Burley Tobacco Varieties:**
 - TN 97LC: moderately resistance (4/4) to BS
 - KT 204LC: mod-high resistance (7/7) to BS
 - KT 206LC: highly resistant (10/6) to BS
- **Fungicide treatments:**
 - Disease Check (Untreated check)
 - Mefenoxam (Ridomil Gold 480 SL)
 - Cyazofamid – Low dose
 - Cyazofamid – High dose
- **Experimental Unit:** 2 row plots, flanked with rows of Hybrid 404LC
- **Replications:** 4
- **Arrangement:** Randomized Complete Block (RCB)
- **Location:** Winchester, Kentucky – 17+ years history of continuous Black shank

Incidence of Black shank during 2023 – Test 2



TRT	Variety	Fungicide
1	TN 97	Untreated – Disease check
2		Mefenoxam
3		Cyazofamid Low
4		Cyazofamid High
5	KT 204	Untreated – Disease check
6		Mefenoxam
7		Cyazofamid Low
8		Cyazofamid High
9	KT 206	Untreated – Disease check
10		Mefenoxam
11		Cyazofamid Low
12		Cyazofamid High

Final percent Black shank – Test 2



TRT	Variety	Fungicide
1	TN 97 (4/4)	Untreated – Disease check
2		Mefenoxam
3		Cyazofamid Low
4		Cyazofamid High
5	KT 204 (7/7)	Untreated – Disease check
6		Mefenoxam
7		Cyazofamid Low
8		Cyazofamid High
9	KT 206 (10/6)	Untreated – Disease check
10		Mefenoxam
11		Cyazofamid Low
12		Cyazofamid High

Means with different letters are significantly different $P=0.05$
 Comparisons for all pairs using Student t-test

Total yield – cured leaves Test 2

TRT	VARIETY	TREATMENTS	AVERAGE YIELD (lbs/Acre)	
1	TN 97 (4/4)	Untreated – Disease check	1205.95	<i>f**</i>
2		Mefenoxam	2316.73	<i>bc</i>
3		Cyazofamid Low	1374.04	<i>ef**</i>
4		Cyazofamid High	1802.77	<i>de**</i>
5	KT 204 (7/7)	Untreated – Disease check	2245.19	<i>cd</i>
6		Mefenoxam	2853.34	<i>a</i>
7		Cyazofamid Low	2569.52	<i>abc</i>
8		Cyazofamid High	2808.69	<i>ab</i>
9	KT 206 (10/6)	Untreated – Disease check	2481.18	<i>abc</i>
10		Mefenoxam	2804.93	<i>ab</i>
11		Cyazofamid Low	2775.81	<i>ab</i>
12		Cyazofamid High	2689.14	<i>abc</i>

Means with different letters are significantly different $P=0.05$
 Comparisons for all pairs using Student t-test

Conclusions II

TEST 2:

- a. As expected, Black shank incidence was significantly higher in TN 97 (49%), when compared to the other two varieties KT 204 (21%) and KT 206 (15%) that have better genetic resistance to both races of the pathogen
- b. Except for the cyazofamid-low dose, all fungicidal treatments significantly reduced the average incidence of Black shank in all three tobacco varieties planted
- c. The three significant lowest yield treatments were in TN 97: UTC and cyazofamid low and high; all other treatment yields were between 2200-2800 lbs/A
- d. Results confirm the Tobacco Extension recommendations to incorporate CPAs in cases of history of Black shank and use of varieties with lower genetic resistance
- e. Cyazofamid it's a promising active ingredient (FRAC Group 21) and it worked better at the higher dose. No phytotoxicity was observed in any of the tobacco varieties

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