

# HIGH BLACK SHANK LOSSES

*in*

**2013 .....**







..... **RECORD LOSSES**  
*in*  
**2014**

# **WORKING TO IMPROVE BLACK SHANK CONTROL IN FLUE-CURED TOBACCO**

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# BLACK SHANK CONTROL

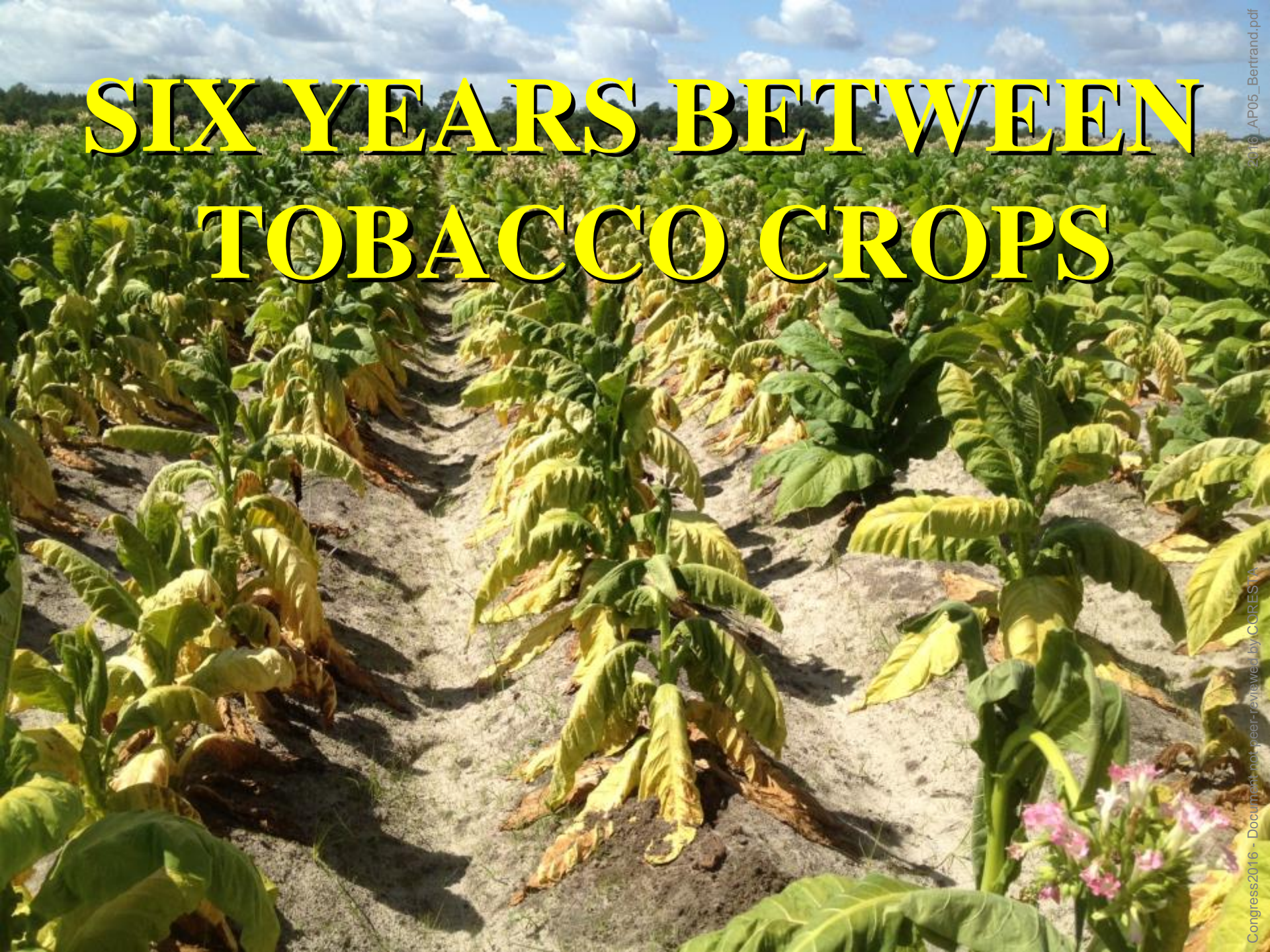
- RESISTANCE
- CHEMICALS
- ROTATION
- NEMATODES
- IRRIGATION



# **CROP ROTATION**

**AS LONG AS POSSIBLE  
BETWEEN TOBACCO CROPS**

# SIX YEARS BETWEEN TOBACCO CROPS







**ROOT-KNOT NEMATODE  
CONTROL REDUCES  
BLACK SHANK**

# EFFECT OF NEMATODE CONTROL ON FINAL % BLACK SHANK

	TREATMENT	% ROOT GALL	% BLACK SHANK
<b>A</b>	<b>TELONE II</b>	<b>3.6</b>	<b>11.3</b>
	<b>CONTROL</b>	<b>49.0</b>	<b>36.2</b>
<b>B</b>	<b>TELONE II</b>	<b>7.0</b>	<b>6.3</b>
	<b>CONTROL</b>	<b>44.8</b>	<b>14.2</b>
<b>C</b>	<b>TELONE II</b>	<b>1.4</b>	<b>0.8</b>
	<b>CONTROL</b>	<b>63.8</b>	<b>12.8</b>





# IRRIGATION

# IRRIGATION

- **LESS WATER - MORE OFTEN**
- **AVOID STANDING WATER**
- **DRAIN TILE ?**
- **POND WATER ?**



# BLACK SHANK CONTROL

- RESISTANCE
- CHEMICALS
- ROTATION
- NEMATODES
- IRRIGATION

# BLACK SHANK RESISTANCE

HORIZONTAL (PARTIAL)

*vs*

VERTICAL (COMPLETE)



# HORIZONTAL RESISTANCE

- **BASED ON MULTIPLE GENES**
- **VARIABLE AMONG VAR.**
- **FARM *to* FARM VARIATION**
- **USUALLY LONG LIVED**
- **FL-301 RESISTANCE**

# FL-301 RESISTANCE

- ONLY PARTIAL



# **FL-301 RESISTANCE PARTIAL RESISTANCE**

**THIS DOES NOT MEAN NO  
DISEASE**

# **FL-301 RESISTANCE PARTIAL RESISTANCE**

**THIS DOES NOT MEAN NO  
DISEASE**

**IT MEANS LESS DISEASE  
THAN SOME STANDARD;  
SUCH AS K-326**

# FL-301 RESISTANCE

- ONLY PARTIAL
- VARIABLE BY FARM



# RESISTANCE VARIATION

FARM	% BLACK SHANK		%
	K-326	K-394	CONTROL
A	10.1	0.4	96.2
B	39.5	9.9	72.9
C	46.4	24.5	47.2
D	15.1	11.0	27.2

# VERTICAL RESISTANCE

- **BASED ON A SINGLE GENE**
- **NOT VARIABLE AMONG VAR.**
- **USUALLY SHORT LIVED**
- ***Php* GENE RESISTANCE**



**THE FIRST GOOD  
*Php* GENE VARIETY  
NC-71  
WAS RELEASED IN 1995**



# 2001 BROOKS CO., GA

VARIETY	RES. RATING	% BLACK SHANK
K-326	LOW	51.1a
NC-297*	HIGH	26.8 b
NC-71*	HIGH	17.2 b

\* VARIETIES WITH A *Php* GENE

# 2014 NC-196 (*Php* GENE)



**CURRENT  
BLACK SHANK  
RESISTANCE**

**PARTIAL RESISTANCE  
BASED ON FL-301**



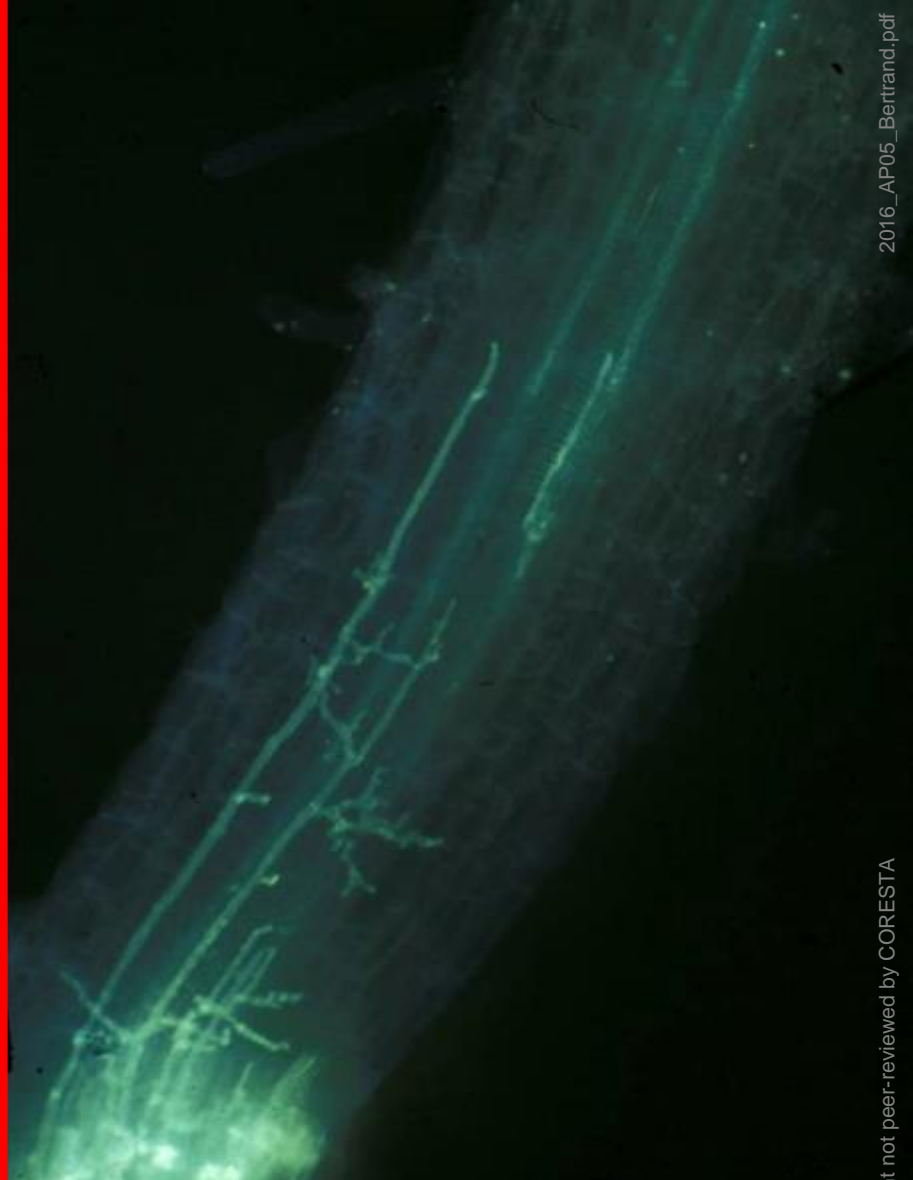
**FL-301 RESISTANCE  
OPERATES**

*by*

**SLOWING DISEASE  
DEVELOPMENT**



**LOW FL-301 RESISTANCE**  
*(ie. K- 326)*



**HIGH FL-301 RESISTANCE**  
*(ie. K- 346)*





**DISEASE PRESSURE**  
**EARLY ENOUGH**  
*and*  
**HIGH ENOUGH**



# **CAN DESTROY ANY FL-301 VARIETY**







# **DISEASE PRESSURE IS CONTROLLED BY:**

- **HOW MANY INFECTION PERIODS**
- **HOW LONG EACH ONE LASTS**
- **HOW EARLY THEY BEGIN**

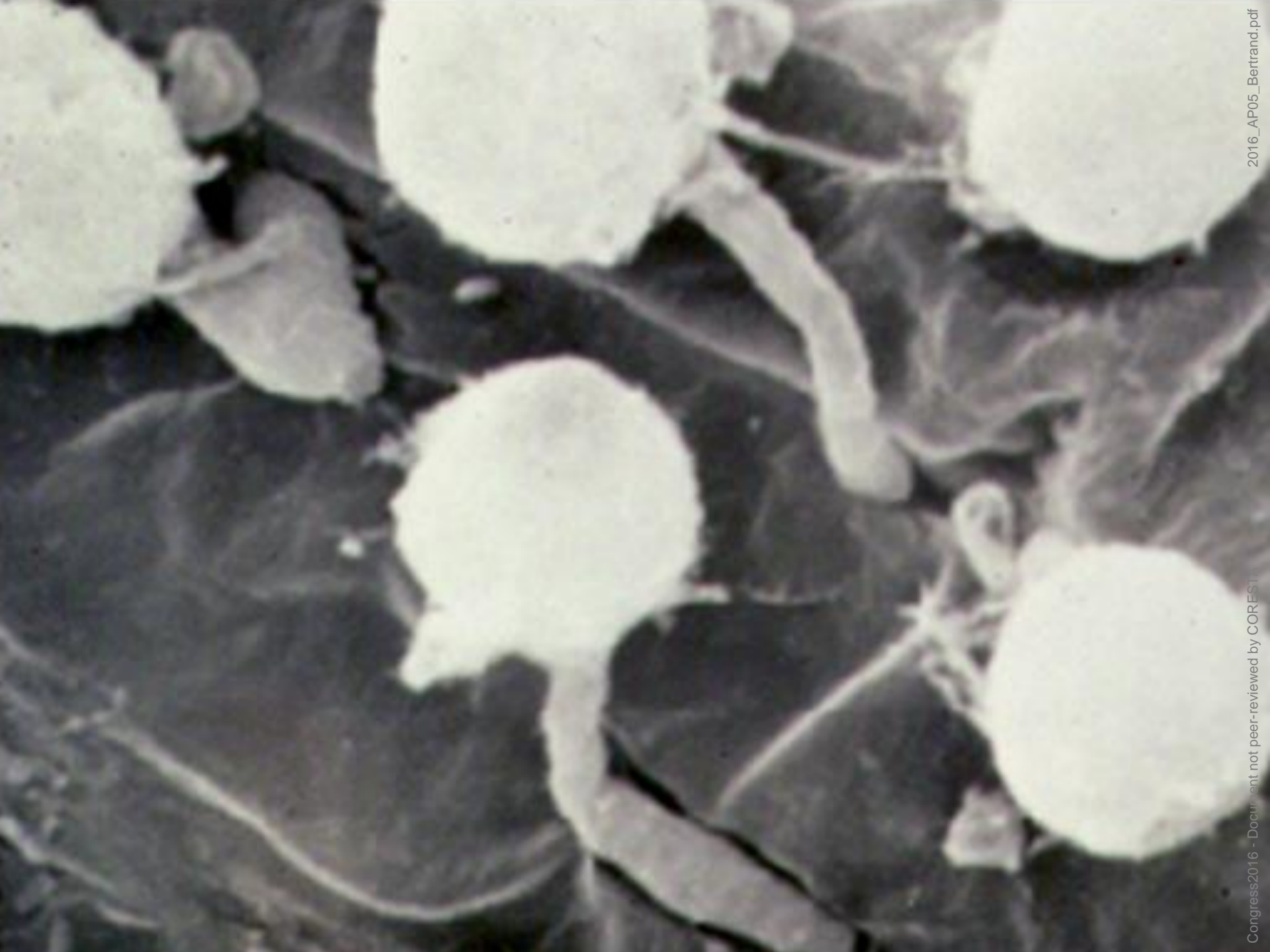
# BLACK SHANK INFECTION

- SOIL TEMP. 16-30 °C
- SATURATED SOIL (*72 hrs.*)



**FINAL 15-30 *min.***







# PROJECT GOALS

## EVALUATE THE FOLLOWING:

- FL-301 RESISTANCE *in*  
RELEASED VARIETIES
- NEW SOURCES *of*  
RESISTANCE
- NEW OPTIONS *for*  
CHEMICAL CONTROL



# PLOT EVALUATION



A photograph of a tobacco field. The plants are arranged in rows, and the soil is visible between them. Some plants appear healthy and green, while others show signs of wilting, with drooping leaves and some yellowing. The text "WILTED PLANTS" is overlaid in the center in a large, bold, yellow font with a black outline.

# WILTED PLANTS





**EVALUATION**  
*of*  
**FL-301 RESISTANCE**  
*in*  
**RELEASED VARIETIES**



**DATA WILL BE SHOWN**

*as*

**% CONTROL RELATIVE**

*to*

**K-326 (STANDARD OF LOW  
FL-301 RESISTANCE)**





# 2014 VARIETY TRIALS

# 2014 RESULTS

VARIETY	% BLACK SHANK CONTROL		
	ATKINSON	BERRIEN	IRWIN
K-326	00.0 a	00.0 a	00.0 a
GF-318*	17.7 a	09.2 a	37.9 a
NC-196*	21.9 a	44.0 b	46.6 a

\* VARIETIES GROWERS WERE  
COUNTING ON  
FOR BLACK SHANK RESISTANCE

# 2014 RESULTS

VARIETY	% BLACK SHANK CONTROL		
	ATKINSON	BERRIEN	IRWIN
K-326	00.0 a	00.0 a	00.0 a
GF-318	17.7 a	09.2 a	37.9 a
NC-196	21.9 a	44.0 b	46.6 a
CC-143	62.2 b	81.4 c	73.5 b
GL-395	67.2 b	64.4 c	72.6 b
NC-925	74.7 b	85.2 c	99.0 b





# 2015 VARIETY TRIALS

# 2015 VARIETY TRIALS

- DATA FROM 7 TRIALS
- 16 TEST VARIETIES
- 8 VARIETIES PER TRIAL
  - K-326, NC-196, + 6 UNKNOWNNS



# 2015 VARIETY TRIALS

- DATA FROM 7 LOCATIONS
- 16 TEST VARIETIES
- 8 VARIETIES PER
  - K-326, NC-196, + 6 UNKNOWNNS
- **DISEASE PRESSURE VARIED**
  - **K-326: 7.6% - 84.4% ( $\bar{X}$  = 34.2%)**

# 2015 RESULTS

<b>VARIETY</b>	<b>% CONTROL</b>
<b>K-326</b>	<b>00.0</b>
<b>NC-196</b>	<b>11.7</b>
<b>NC-606</b>	<b>76.8</b>
<b>PVH-1600</b>	<b>23.8</b>
<b>NC-938</b>	<b>44.9</b>
<b>CC-1063</b>	<b>32.2</b>
<b>K-346</b>	<b>47.6</b>



# 2015 RESULTS

VARIETY	% CONTROL	$\bar{X}$ % K-326
K-326	00.0	34.2
NC-196	11.7	34.2
NC-606	76.8	13.8
PVH-1600	23.8	37.8
NC-938	44.9	40.1
CC-1063	32.2	59.3
K-346	47.6	46.8



**2016**  
**VARIETY TRIALS**  
**THREE LOCATIONS**



# 2016 VARIETY TRIALS

- 4 VARIETIES SELECTED FROM 2015
- K-326 LOW FL-301 RESISTANCE
- K-346 HIGH FL-301 RESISTANCE
- 2 UNKNOWNNS (PVH-1118 & PVH-2254)

# 2016 RESULTS

<b>VARIETY</b>	<b>% CONTROL</b>
<b>PVH-2254</b>	<b>-04.4</b>
<b>K-326</b>	<b>00.0</b>
<b>PVH-1118</b>	<b>19.2</b>
<b>NC-606</b>	<b>23.6</b>
<b>PVH-1600</b>	<b>45.5</b>
<b>NC-938</b>	<b>55.2</b>
<b>K-346</b>	<b>62.3</b>
<b>CC-1063</b>	<b>63.3</b>





**CHEMICAL CONTROL**  
*of*  
**BLACK SHANK**





**1980-1995**  
**METALAXYL:**  
**A DUAL ISOMER PRODUCT**  
**(RIDOMIL 2E)**





**1996 -  
MEFENOXAM:  
MORE ACTIVE ISOMER  
(RIDOMIL GOLD)**

# CHEMICAL CONTROL

## 1996 - 2015

### MEFENOXAM:

**280** *grams/hectare* **TPW**

**280** *grams/hectare* **PLOWING**

**560** *grams/hectare* **LAYBY**









**2015**  
**TRANSPLANT WATER**

**MEFENOXAM @ 280 g/ha**

**vs**

**UNTREATED**



# RESULTS:

## % BLACK SHANK AT 35 DAYS

<u>TREATMENT</u>	<u>COFFEE</u>	<u>BERRIEN</u>
UNTREATED	5.3	7.3
MEFENOXAM (280 g/ha)	2.5	1.3
LSD ( $p=0.05$ )	2.3	2.1

# **MEFENOXAM AT PLOWING (13-18 DAYS POST PLANT)**

- **RAINFALL SINCE PLANTING**
- **BLACK SHANK HISTORY**
- **ROTATION HISTORY**





**MEFENOXAM AT LAYBY  
(35-42 DAYS POST PLANT)**

**MUST HOLD  
*to*  
SEASON END**





2014





**2014**  
**TWO APPLICATIONS**  
*of*  
**MEFENOXAM**



# **MEFENOXAM SENSITIVITY**

- **LANIER CO. (GF-318)**
- **ATKINSON CO. (K-346)**
- **COFFEE CO. (NC-196)**

**30 FARM ISOLATES**



# **MEFENOXAM SENSITIVITY**

- **LANIER CO. (GF-318)**
- **ATKINSON CO. (K-346)**
- **COFFEE CO. (NC-196)**

**ALL 30 ISOLATES WERE FOUND  
SENSITIVE TO MEFENOXAM**

**EVALUATION**  
*of*  
**NEW OPTIONS**  
*for*  
**CHEMICAL CONTROL**





# 2015 DATA





# FINAL PLOWING (35 DAYS POST PLANT)

**MEFENOXAM @ 560 g/ha**

**vs**

**FLUPICOLIDE @ 140 g/ha**



# RESULTS:

TREATMENT	FINAL % BLACK SHANK
UNTREATED	74.5
MEFENOXAM (560 g/ha)	31.3
FLUPICOLIDE (140 g/ha)	26.5
LSD ( $p=0.05$ )	28.8



# 2016 DATA





**MEFENOXAM (280 g/ha) = Mf**

**vs**

**UNTREATED = CK**



# THEN EITHER:

MEFENOXAM (560 g/ha) = Mf

*or*

FLUPICOLIDE (140 g/ha) = FI

*or*

OXATHIPIPROLIN (70.2 g/ha)

+

= Mf+Ox

MEFENOXAM (280 g/ha)

*or*

UNTREATED = CK

## AT FINAL PLOWING



# BLACK SHANK CONTROL (ECHOLS CO.)

TREATMENT TPW X LAYBY	% BLACK SHANK
CK X CK	66.0a
CK X FI	51.0ab
CK X Mf	45.9 bc
CK X Mf+Ox	37.8 c

# BLACK SHANK CONTROL (ECHOLS CO.)

TREATMENT TPW X LAYBY	% BLACK SHANK	TREATMENT TPW X LAYBY	% BLACK SHANK
CK X CK	66.0a	Mf X CK	51.8a
CK X FI	51.0ab	Mf X FI	37.7 b
CK X Mf	45.9 bc	Mf X Mf	32.6 b
CK X Mf+Ox	37.8 c	Mf X Mf+Ox	29.8 b



# BLACK SHANK CONTROL (BROOKS CO.)

TREATMENT		%	TREATMENT		%
TPW	X LAYBY	BLACK SHANK	TPW	X LAYBY	BLACK SHANK
CK	X CK	28.5a	Mf	X CK	24.9a
CK	X Mf	21.5a	Mf	X Mf	27.7a
CK	X Mf+Ox	18.3ab	Mf	X Mf+Ox	24.1a
CK	X FI	7.4 b	Mf	X FI	5.7 b





**BLACK SHANK**  
*is*  
**USUALLY UNEVEN**



**EVALUATION**  
*of*  
**NEW SOURCES**  
*of*  
**RESISTANCE**

# 2013 VARIETY TRIAL

7 ENTRIES  $\geq$  80%  
BLACK SHANK  
(K-326, NC-71, NC-196)

*but .....*



# 2013 VARIETY TRIAL

12 ENTRIES

*with*

Wz GENES < 10%

BLACK SHANK

# CONCLUSIONS

- FOUND BETTER FL-301 RESISTANCE
- THERE ARE NEW SOURCES *of* RESISTANCE
- NEW OPTIONS *for* CHEMICAL CONTROL