QUADRIS + WARRIOR USE ON SOYBEAN

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Historical Use of Foliar Fungicides On Soybean in KY

- **Was extensively studied in 70's and early 1980's.**
- **Inconsistent yield results due to inconsistent disease pressure and product limitations.**
- **Conclusion: best suited for use by seed producers in very specific situations.**
- **Rarely used in grain operations.**

FAST FORWARD TO 2002

- **In 2002, Syngenta tested Quadris + Warrior tank mix in non-replicated strip plots in 13 grower fields in S. Indiana and Kentucky.**
- **6.2 fl oz/A Quadris + 2.56 fl oz Warrior applied between R3 to R5 stages (COST ca. $23/ac).**
- **Excellent yield results from "strip trials" and encouraging grower testimonials.**

Quadris + Warrior 2002

Syngenta data

Cooperator	Address	Treated	Untreated	Difference
Tom Benton	Mt. Vernon, IN	53 bu.	44 bu.	9 bu.
Tom Benton	Mt. Vernon, IN	62 bu.	48 bu.	14 bu.
Jeff Smith	Patoka, IN	58 bu.	52 bu.	6 bu.
Bob Grogan	Arlington, KY	68 bu.	62 bu.	6 bu.
Bob McIndoo	Henderson, KY	54 bu.	50 bu.	4 bu.
Wischmeier Farms	Brownstown, IN	72 bu.	58 bu.	14 bu.
Robt. Schwenke	Union, KY	74 bu.	69 bu.	5 bu.
Billy Lear	Elkton, KY	52 bu.	41 bu.	11 bu.
Porter/Brown	Beaver Dam, KY	64 bu.	63 bu.	1 bu.
Cecilia KY location		41 bu.	38 bu.	3 bu.
Rick Murdock	Murry, KY	49 bu.	41 bu.	8 bu.
Curtis Hancock	Fulton, KY	50 bu.	43 bu.	7 bu.
Kenny Davis	Clinton, KY	59 bu.	52 bu.	7 bu.
	Average			**6.8 bu.**

Pest Data Collected From 2002 Syngenta Strip Plots

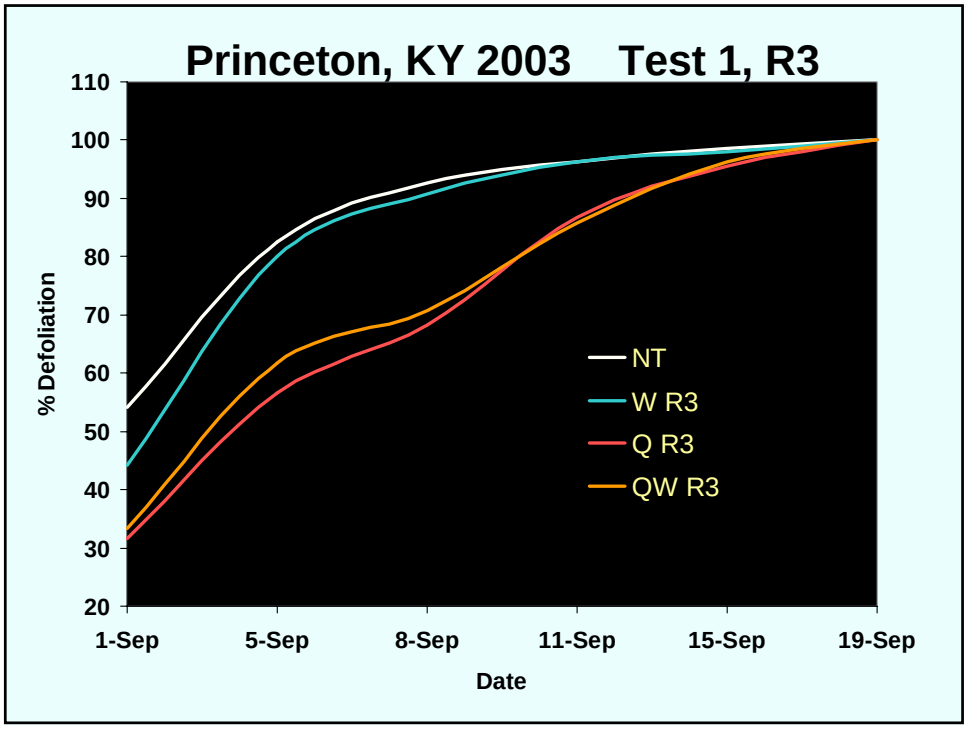
- **Disease and insect pests: NONE**
- **Reason for yield increases: unknown.**
- **2003: Syngenta initiated "Guarantee program" based on 2002 results.**
- **Target pest(s)?: None specific, many possible (prophylactic spray).**
- **Suppliers estimated that 30,000 acres would be treated in KY in 2003.**

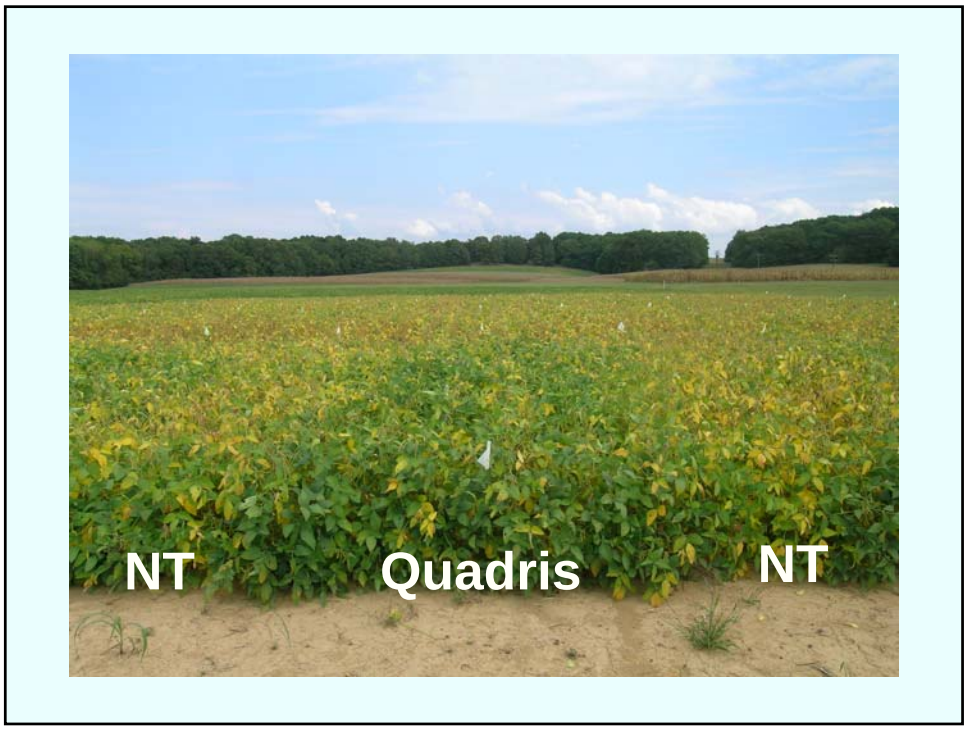
2003 Studies Initiated by University of Kentucky

- **Two replicated small plot studies at Princeton.**
- **Three replicated strip plots in grower's fields.**
- **Observed 6 non-replicated strip tests in grower's fields.**
- **Summarized yield data from 51 paired strip plots in grower's fields.**

Harvest Maturity Delayed

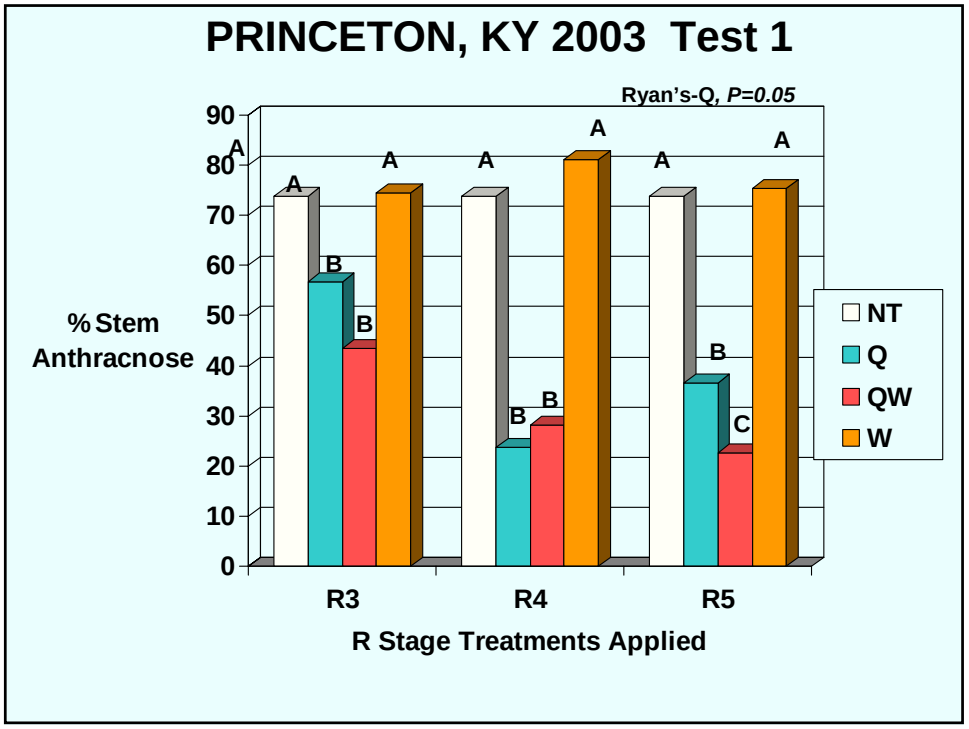
- **In all studies, harvest maturity was delayed by 4 to 5 days in Quadris and Quadris + Warrior plots compared to Warrior and non-treated plots.**





2003 PEST EFFECTS

- **Insects populations were low in all tests.**
- **No significant foliar diseases developed in any observed test.**
- **Stem anthracnose (*Colletotrichum truncatum*) was reduced by Quadris and Quadris + Warrior by 50-70% in 9 of 11 tests.**



Stem Disease (%) Results of Six, Paired County Strip Trials, 2003.

Treatment	% Stem disease*
Non-treated	41.1
Q+W	20.6
Q+Q Difference	-20.5%**

*Primarily anthracnose

**ANOVA $P \leq 0.002$

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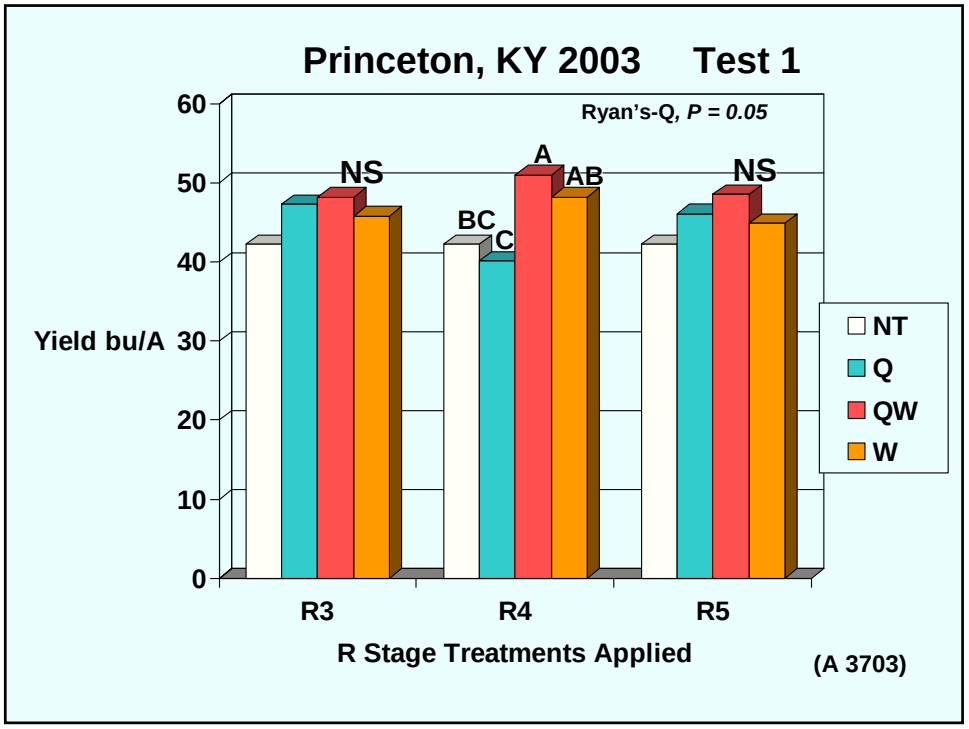
- **Phomopsis seed infection was not impacted by any treatment.**



TEST 2 PRINCETON, KY, 2003

Treatment*	Yield (bu/ac)
Non-treated	66.0b**
Quadris	68.5ab
Warrior	68.3ab
Quadris + Warrior	70.8a

**Applied at R4 stage*
***Ryan's Q test, P=0.05*

Yield Results of Replicated Farm Tests, 2003.

	Farm no and yield (bu/ac)		
Treatment	1	2*	3*
Q+W	54.7	44.0	45.9
Non-treated	48.0	44.0	48.3
Diff.Q+W	6.7 ns	0 ns	-2.4 ns

*Fields 2 and 3 were double-crop fields; MG5's.

ns = ANOVA $P > 0.05$

Yield Results of Six, Paired County Strip Trials, 2003.

Treatment	Yield (bu/ac)
Quadris + Warrior	57.34
Non-treated	53.92
Q+W Difference	3.42*

*ANOVA $P \leq 0.02$

Yield Data From 51 Grower Fields, 2003.

Trt.	Yield (bu/A)
Quadris + Warrior	53.84
Non-treated	49.21
Q+W Difference	+4.63*

*ANOVA *P* = 0.03

Distribution of 2003 County Yield Data

Yld. Range	No.
0 bu or <	2
+ 0.1 – 2	9
+ 2.1 – 4	12
+ 4.1 – 6	12
+ 6.1 – 8	11
+ 8.1 – 10	3
+ 10.1 - 12.1	2

Yield Summary

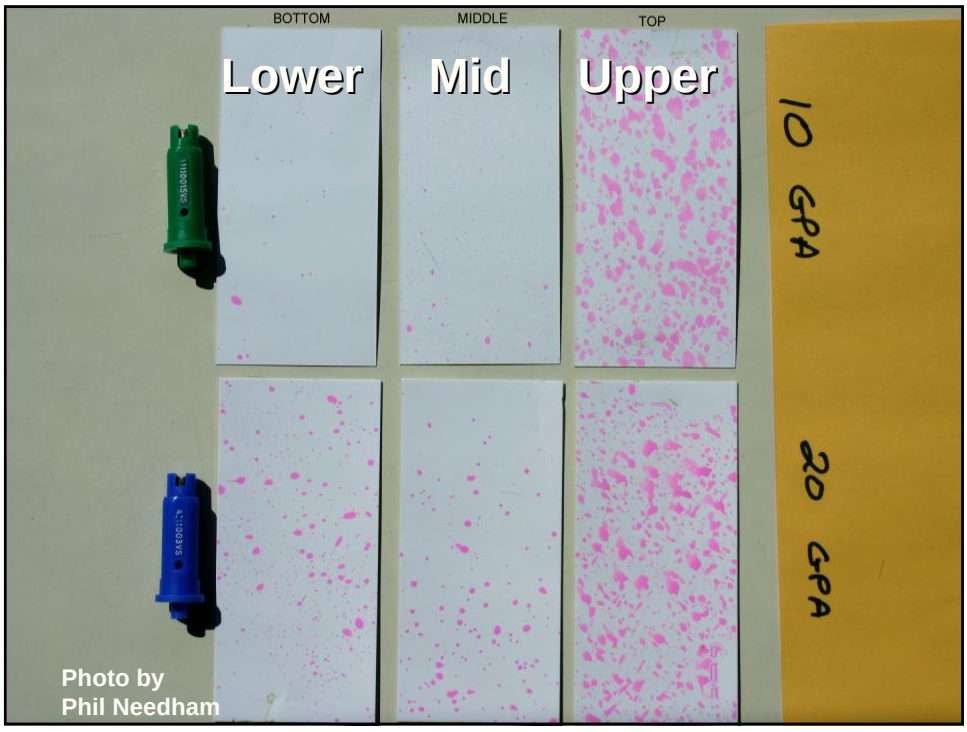
- Across all studies and grower fields where yield increases were detected, the ave. yield increase was 4.7 bu/ac.
- Data indicate that yield increases due to Quadris + Warrior are real, but results are highly variable (0 -14 bu/ac!).
- In replicated tests, Quadris + Warrior, but not Quadris or Warrior alone, significantly increased yields.
- Different timing of application to the same cultivar produced different results.

Maturity Group X Treatment Interaction Detected for Yield

	Yield (bu/ac)		
Trt	MG3	MG4	MG5
Quadris + Warrior	50.6	57.9	51.3
Non-treated	45.1	53.4	47.5
Q+W Diff.	5.5	4.5	3.8

Possible Reason for Maturity Group Effect.

- **Fungal diseases tend to have most yield impact on early-maturing cultivars.**
- **Differential fungicide coverage due to canopy size differences.**
- **Current application technology is suspect for getting fungicides *INTO* the canopy.**



Planting Date X Treatment Interaction Detected for Yield

	Yield (bu/ac)	
Trt	May	Late-June
Quadris + Warrior	53.3	49.4
Non-treated	48.7	45.9
Q+W Diff.	4.6	3.5

Possible Reason for Planting Date Effect?

- Fungal disease impact on yield is greatest when crops mature in late-August to mid-September.
- Artifact of lower yield potential in late-planted crops.
- Less dense canopy in very late-planted crops

Yield Components Affected by Q+W?

- **500-seed weight and test weight significantly increased.**
- **Pods per plant not affected by treatment.**
- **Seeds per pod not affected.**
- ***Phomopsis* infection (quality) of seed unaffected by Quadris.**

Reason for Yield Increases?

- **Does not appear to be related to insect pressure; few insects were found.**
- **Not related to serious foliar diseases, since none were seen.**
- **May be related to delayed defoliation, and control of stem anthracnose.**
- **Quadris alone did not produce a significant yield increase in 3 tests, but defoliation and anthracnose were impacted by Quadris in each test.**

2004 Research

- **Repeat of timing of application and fungicide efficacy trials from 2003.**
- **Initiated studies looking at various fungicide active ingredients, with and without insecticides**
- **Initiated a planting date X maturity group study.**

Preliminary Observations from 2004

- **Differences in defoliation curve related to treatment with Quadris or Quadris + Warrior not nearly as pronounced as in 2003.**

Preliminary Pest Results from 2004

- **Low levels of mid- and upper canopy diseases (*brown spot, frogeye leaf spot, Cercospora leaf blight*) slightly, but consistently, reduced where Quadris, and other modern fungicides are applied.**
- **Stem anthracnose markedly reduced by Quadris or Headline, with or without Warrior**
- **Insect pests at very low levels.**

Partial, Preliminary Yield Results from 2004

- **Timing Study: Appears that the R5 timing of the Quadris + Warrior application may be the only treatment to have produced a significant yield increase (8.5 bu/A).**
- **Quadris, Warrior at R5 and all treatments applied at R3-R5 had yield similar to the check.**
- **All treatments involving Quadris, at all application dates, reduced low level disease complex in lower to mid canopy.**

2004 Timing Study, Princeton, KY

	Disease*			
Treatment	Mid	Upper	%Stem	Yield
Q + W R3	2.3	2.8	29.2	59.9a**
Q + W R4	2.2	2.5	16.4	60.0a
Q + W R5	2.5	2.3	8.8	67.2b
Q R5	2.8	2.3	9.8	59.1a
W R5	3.2	3.5	53.3	60.0a
Check	3.7	3.2	59.2	58.7

***Mid and upper canopy fungal foliar complex (1-10); % stem anthracnose.

****LSD (*P*=0.05)

In the timing study, yield results continue to be a mystery:

Results cannot be explained by pest control data.

Link to Soybean Rust

- **Current interest in spraying soybean is getting farmers used to nuances of spraying soybean late in the season.**
- **Farmers are becoming more familiar with other foliar diseases of soybean.**
- **Ag. Engineers and Plant Pathologists are evaluating and improving existing spray technology.**
- **Farmer familiarity with fungicide chemistry has been improved.**
- **Fungicides have made the “radar screen” of pesticide manufacturers.**