

A close-up photograph of a tomato plant. The leaves are green but show significant damage, including yellowing, necrotic spots, and some leaf curling. The background is a dense thicket of similar foliage.

# Tomato Spray Program: The Need to Change

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Early blight is a destructive fungal disease of tomato. It has increased in severity in Tennessee tomato fields in recent years. Spray programs have generally been inadequate to maintain early blight at desired levels, especially programs that rely heavily on Quadris, Cabrio, or Tanos. These products belong to the strobilurin (also called Group 11 or QoI) group of fungicides. Resistance to this group has become widespread in populations of the early blight fungus.



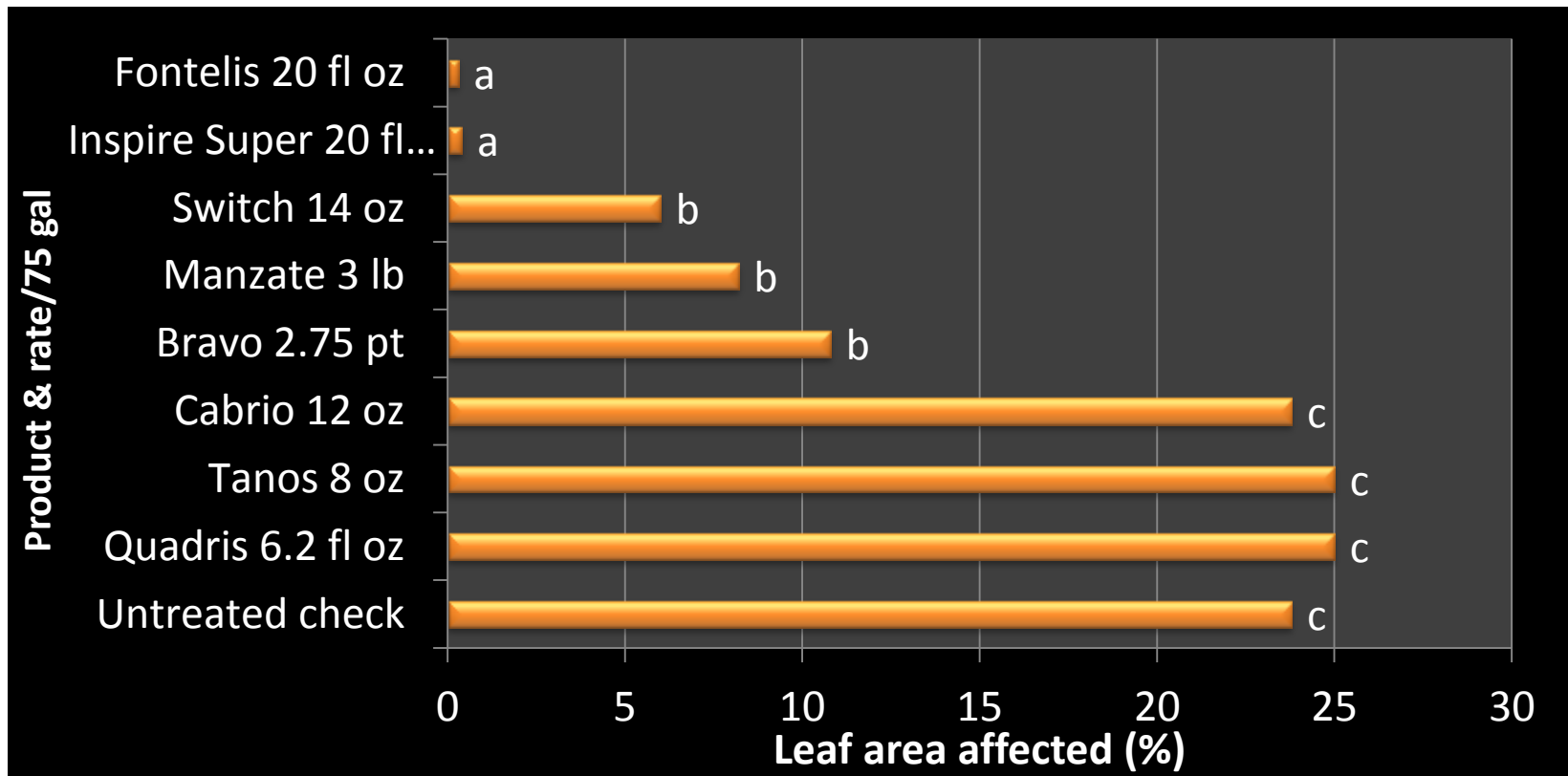
Cultural methods of control are inadequate. Since early blight is such a common problem, a new spray program involving an effective early blight fungicide in every application was needed. In a trial conducted at Nashville, TN, all labeled fungicides considered candidates for a tomato spray program were compared.



# Early Blight of Tomato

## 2013 Field Trial, Nashville

This trial was a search for replacements for the strobilurin (QoI) fungicides – Quadris, Cabrio, and Tanos. Plants were sprayed 3 times at weekly intervals and evaluated 1 week after the 3<sup>rd</sup> spray.



The results were used to guide the development of non-strobilurin-based spray programs.

# Early Blight of Tomato

## 2013 Trial, Highland Rim REC

Four spray programs were evaluated on trellised, 'Mountain Glory' tomatoes sprayed every 7-10 days, beginning 3 wks after planting.

Pro-gram	Product and rate per acre at application number										Early blight % leaf area affected (final)	
	1	2	3	4	5	6	7	8	9	10		
Check	none	none	none	none	none	none	none	none	none	none	none	88.0 a*
1	Quadris 6 fl oz	Manzate	Quadris 6 fl oz	Manzate	Quadris 6 fl oz	Manzate	Quadris 6 fl oz	Manzate	Quadris 6 fl oz	Manzate	Manzate	57.5 b
2	Manzate	Manzate	Manzate	Manzate	Manzate	Manzate	Manzate	Manzate	Manzate	Manzate	Manzate	23.3 c
3	Fontelis 10 fl oz** + Manzate + Kocide	Manzate	Fontelis 10 fl oz + Manzate + Kocide	Manzate	Fontelis 10 fl oz + Manzate + Kocide	Manzate	Fontelis 10 fl oz + Manzate + Kocide	Manzate	Fontelis 10 fl oz + Manzate + Kocide	Manzate	Manzate	0.3 d
4	Inspire Super 1 pt	Manzate	Fontelis 1 pt	Manzate	Inspire Super 1 pt	Manzate	Fontelis 1 pt	Manzate	Inspire Super 1 pt	Manzate	Manzate	0.1 d

\* Column means followed by the same letter are not significantly different (LSD,  $P=0.05$ ).

\*\* The minimum labeled rate of Fontelis is 1 pt/acre.

# Results

Quadris alternated with mancozeb (Program 1) provided poor control of early blight. A comparison with the continuous mancozeb treatment (Program 2) indicates the failure of the Quadris component of Program 1. Lack of control of early blight by the strobilurins has been observed throughout the state. Since a tomato program must control early blight, it is recommended that the strobilurins no longer be used, unless they are added for control of another disease. A program similar to Number 4 appears to be appropriate for a basic schedule.



Excellent control of early blight was provided by spray programs containing Inspire Super or Fontelis.



Unsprayed check

Program 4

Program 3 was designed to evaluate a lower-than-labeled rate of Fontelis, mixed with mancozeb and copper, commonly used for bacterial disease control. This regimen was as good as Program 4, but Fontelis is not approved at this rate.





# Design

- Design your spray program with early blight in mind.
- Add other products as needed for control of other diseases. On many farms, bacterial spot control is also considered a necessity.
- Prevent resistance development. Rotate fungicides with non-related fungicides and do not over-use them. The “always rotate” rule does not apply to the multi-site fungicides mancozeb and chlorothalonil. The risk of resistance developing to them is extremely low.
- Spray to protect, not to rescue.
  - Disease control is better.
  - Fungal resistance is much less likely to occur if the product is applied to a small population of the fungus than to a large one. **DO NOT APPLY FONTELIS OR INSPIRE SUPER TO SEVERELY DISEASED CROPS.** It is important that we retain their effectiveness.

# Example Spray Program I

Where bacterial diseases are not expected

Applica- tion no.	Product
1	mancozeb
2	Fontelis
3	mancozeb
4	Inspire Super
5	mancozeb
6	Fontelis
7	mancozeb
8	Inspire Super

Notable restrictions:

Fontelis: 72 fl oz/A/season

Inspire Super: 47 fl oz/A/season

See labels for other restrictions.

Applica- tion no.	Product
9	mancozeb/chlorothalonil*
10	Fontelis
11	chlorothalonil
12	Inspire Super
13	chlorothalonil
14	Fontelis
15	chlorothalonil

\*The 5-day PHI for mancozeb interferes with harvest. Switch to chlorothalonil when harvest begins.

NOTE: If late blight occurs, appropriate fungicides must be added. Fontelis and Inspire Super do not have any late blight activity.

# Example Spray Program II

Where bacterial diseases are expected

Applica- tion no.	Product
1	mancozeb + Actigard
2	mancozeb + copper
3	Fontelis + Actigard
4	mancozeb + copper
5	Inspire Super + Actigard
6	mancozeb + copper
7	Fontelis + Actigard
8	mancozeb + copper

Notable restrictions:

Actigard: 14-day PHI

Fontelis: 72 fl oz/A/season

Inspire Super: 47 fl oz/A/season

See labels for other restrictions.

Applica- tion no.	Product
9	Inspire Super + Actigard
10	mancozeb/chlorothalonil* + copper
11	Fontelis + copper
12	chlorothalonil + copper
13	Inspire Super + copper
14	chlorothalonil + copper
15	Fontelis + copper

\*The 5-day PHI for mancozeb interferes with harvest. Switch to chlorothalonil when harvest begins. When not using mancozeb, discontinue use of copper if possible.

NOTE: If late blight occurs, appropriate fungicides must be added. Fontelis and Inspire Super do not have any late blight activity.

# Relative Effectiveness of Fungicides against Early Blight

Product	MOA <sup>a</sup> group	PHI <sup>b</sup> (days)	Max. use/acre/season <sup>c</sup>	Max. no. consecutive apps.	Early blight control rating <sup>d</sup>
chlorothalonil	M	0	15 lb a.i. (7-14 apps.)	no limit	3
mancozeb	M	5	22.4 lb (7-30 apps.)	no limit	3
Cabrio	11	0	96 oz (8 apps.)	1	0 <sup>e</sup>
Quadris	11	0	37 fl oz (6 apps.)	1	0 <sup>e</sup>
Tanos	11,27	3	72 oz (9 apps.)	1	0 <sup>e</sup>
Priaxor	7,11	0	24 fl oz (3 apps.)	2	5
Endura	7	0	21 fl oz (6 apps.)	2	4
Fontelis	7	0	72 fl oz (3-4 apps.)	2	5
Inspire Super	3,9	0	47 fl oz (2-3 apps.)	2	5
Revus Top	3,40	1	28 fl oz (4-5 apps.)	2	3
Scala	9	1	35 fl oz (5 apps.)	2	2
Switch	9,12	0	56 fl oz (4-5 apps.)	2	3

<sup>a</sup> MOA=mode of action. Do not rotate products containing ingredients belonging to the same MOA group, with the exception of Group M. Rotation is not required of members of this group.

<sup>b</sup> PHI=pre-harvest interval.

<sup>c</sup> Where presented as a range of applications, the appropriate number depends on the rate(s) used.

<sup>d</sup> Scale of 0-5, 0=no control and 5=excellent control.

<sup>e</sup> Not recommended due to the widespread occurrence of resistant strains.