

# Factors Impacting Maleic Hydrazide Residues on Flue-Cured Tobacco

T. David Reed

Virginia Tech  
Southern Piedmont Center  
Blackstone, Virginia

# Maleic Hydrazide (MH)

MH remains an important compound for effective sucker control for U.S. tobacco growers

- Cured leaf residues of MH remain a critical issue for the U.S. industry
- Extension recommendations have addressed lowering residues
- U.S. growers can produce tobacco without MH

Systemic sucker control of MH is important in some circumstances



Pesticide exposure to workers must be minimized and the use of hand labor reduced as much as possible.



# Fate of MH applied to tobacco

## Uptake into the leaf

- Systemically act within plants to prevent sucker growth
- Rate of uptake is affected by weather and plant factors

## Bound onto leaf surface

- Does not impact sucker control but contributes to residue levels
- Residues can be weathered by leaf surface moisture (rainfall, dews, and irrigation)
- Application technique may impact weathering of residues (for example: low pressure, coarse spray droplets)



# **The Effects of Simulated Rainfall Wash-off Treatments on Maleic Hydrazide (MH) Residues in Flue-Cured Tobacco**

**T. D. Reed, L. Fisher, D. Gooden,  
and J.M. Moore**

**Virginia Tech, North Carolina State Univ.,  
Clemson Univ., and Univ. of Georgia**

- Wash-off to simulate 0.25 cm of rainfall (25,250 l per ha)
- Wash-off applications at 3, 8, 24, and 96 hours after MH





# Summary of Results

- ✓ Simulated 0.25 cm rainfall later than 8 hrs after MH application did not impact green or cured leaf MH residues nor sucker control
- ✓ The addition of a spray adjuvant to the MH did not affect rainfastness
- ✓ Differences in cured leaf residues between the test locations were due to rainfall after MH was applied

# Low Volume MH Wash-off Study, 2012

---

## Objective

Evaluate the use of a low volume wash-off spray application to reduce MH residues

# Low Volume MH Wash-off Study, 2012

## Treatment variables

### Spray volume

560 and 1680 liters per ha

### Wash-off timing

2 and 6 hours after MH application

### Spray adjuvant

with and without fatty alcohol (2%)

# Low Volume MH Wash-off Study, 2012

## Treatment Protocol

1. Two (2) contact fatty alcohol applications (4 and 5%)
2. Flumetralin (0.67 kg/ha a.i.)
3. First harvest
4. MH application (2.5 kg per ha a.i.)
5. Wash-off treatments

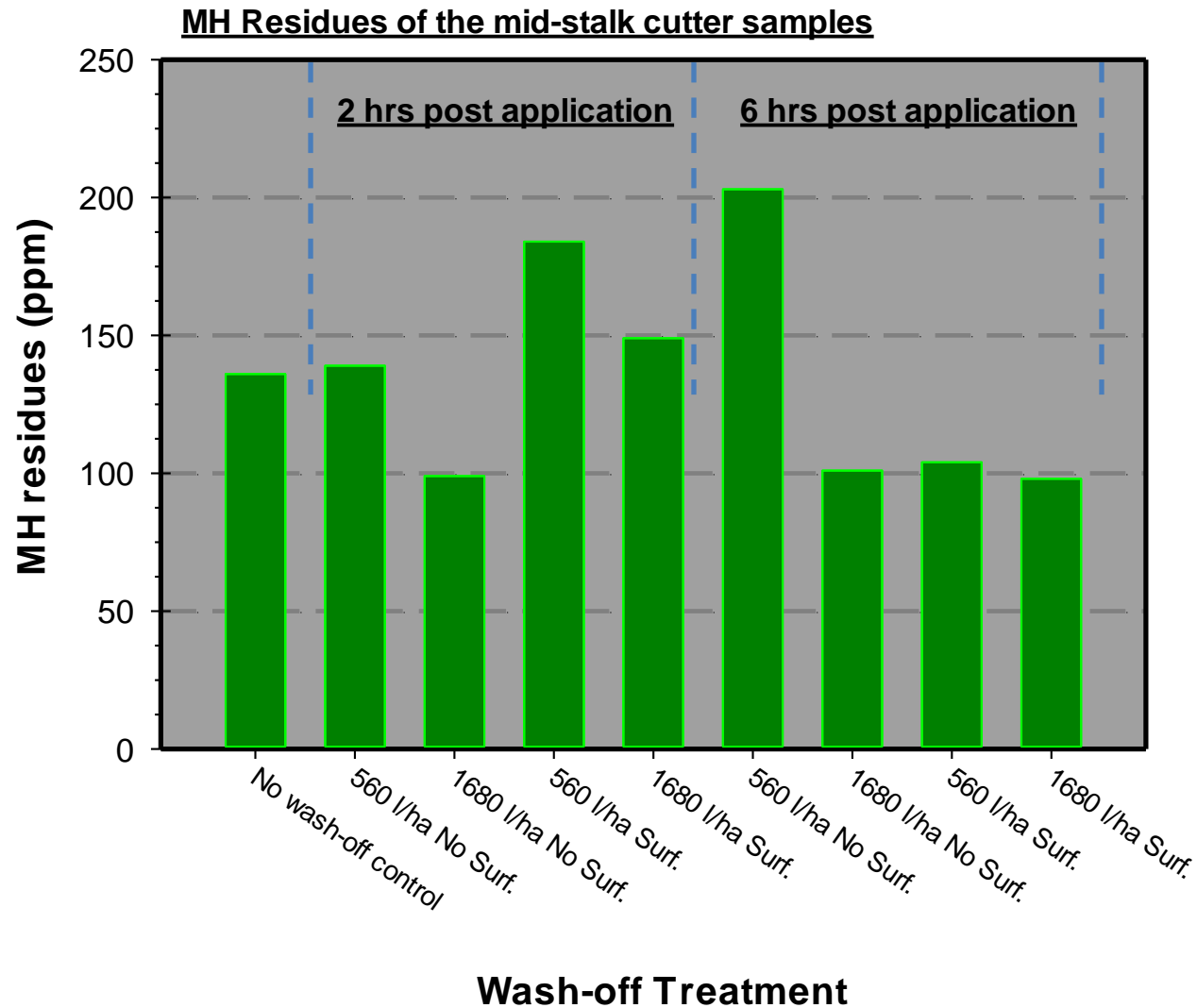
# Low Volume MH Wash-off Study, 2012

## Data Collected

1. Green leaf samples for MH 1 day after MH application (mid-stalk (C) and 4<sup>th</sup>-leaf)
2. Cured leaf MH residues
3. Sucker control  
(no. and wt. of suckers)
4. Daily rainfall at test site

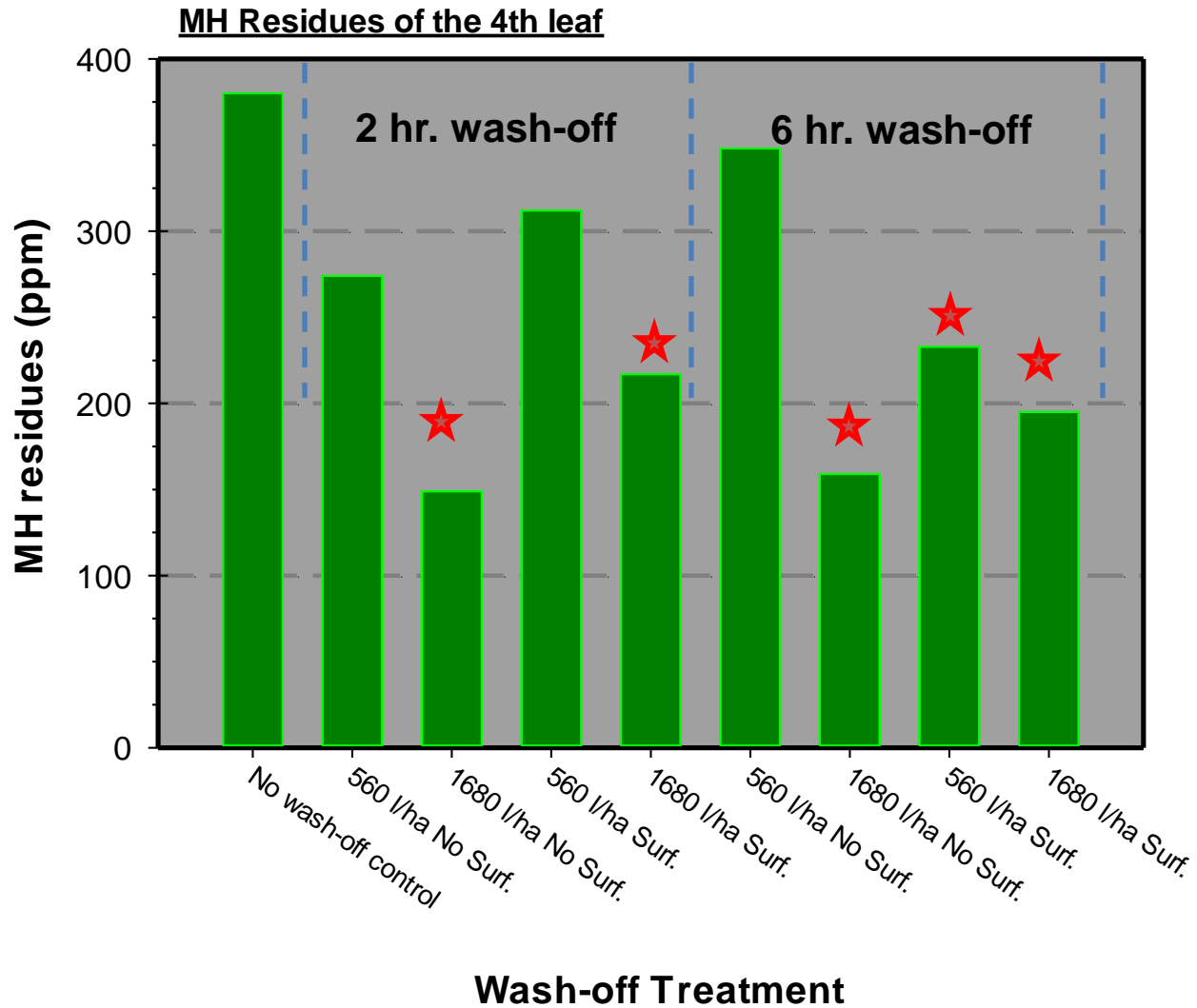
# Low Volume MH Wash-off Study, 2012

## Southern Piedmont Center



# Low Volume MH Wash-off Study, 2012

## Southern Piedmont Center



★ Dunnett's test vs. a control treatment

# Three-factor ANOVA

## Green leaf MH residues on the 4<sup>th</sup>-leaf

Source	F-value	P > F
Rep	2.61	0.0786
Wash-off timing	0.04	0.8381
<b>Wash-off rate</b>	<b>24.35</b>	<b>0.0001</b>
Surfactant	0.09	0.7666
Timing X Rate	0.01	0.9370
<i>Timing X Surfactant</i>	<i>4.20</i>	<i>0.0531</i>
<i>Rate X Surfactant</i>	<i>3.98</i>	<i>0.0593</i>
Timing X Rate X Surfactant	1.80	0.1935

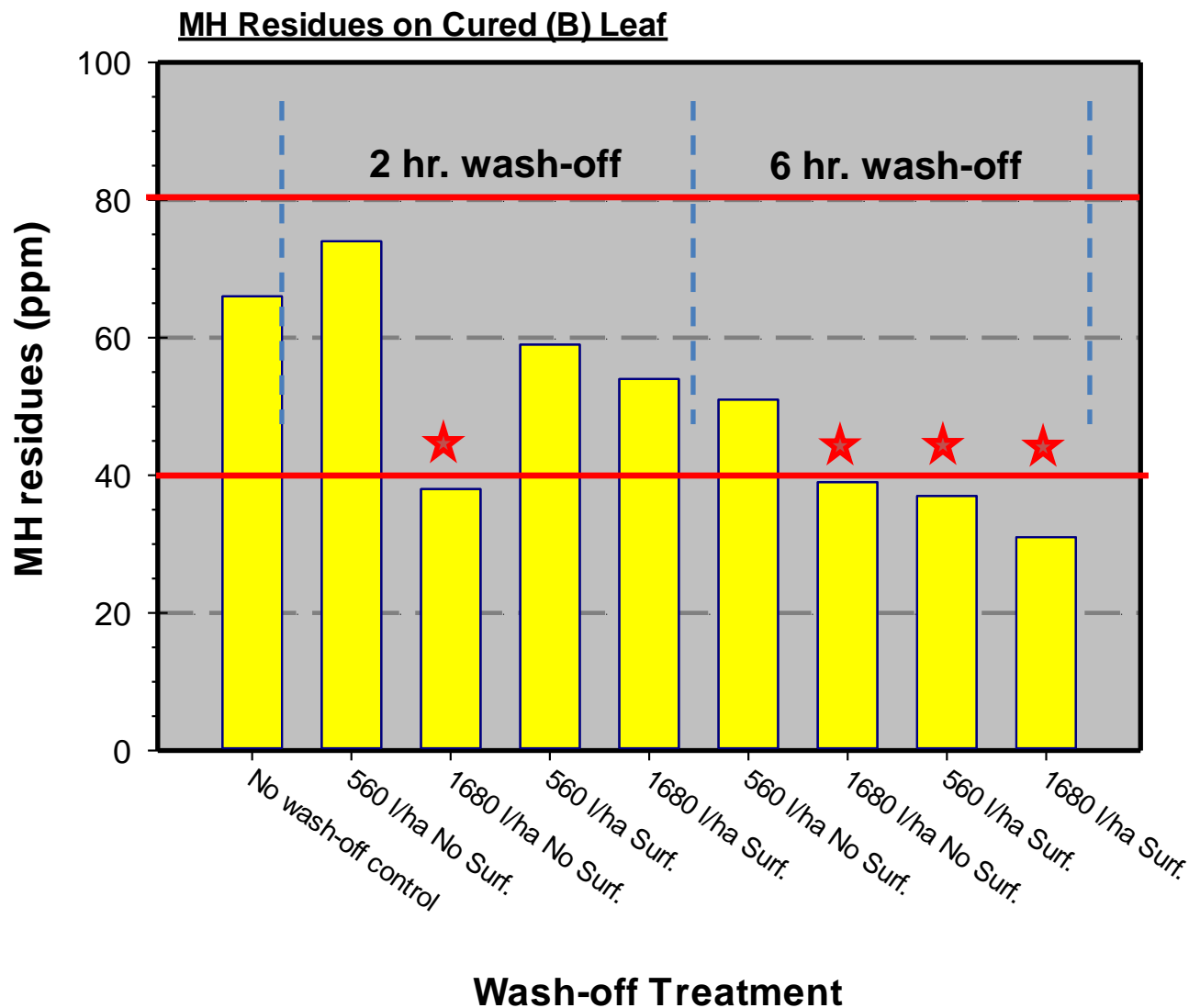


# Main Factor Treatment Effects

## Green leaf MH residues (4<sup>th</sup> leaf)

Variable	Mean MH residues (ppm) (averaged across other variables)
Non-wash off control	380
<u>Wash-off timing after MH application</u>	
2 hours	238
6 hours	233
<u>Wash-off spray volume</u> ★	
560 l/ha	292
1680 l/ha	180
<u>Spray additive</u>	
No surfactant	232
Surfactant	239

# Low Volume MH Wash-off Study, 2012 Southern Piedmont Center



★ Dunnett's test vs. the control treatment

# Three-factor ANOVA

## Cured leaf MH residues on B tobacco

Source	F-value	P > F
Rep	0.16	0.9215
<b>Wash-off timing</b>	<b>10.74</b>	<b>0.0036</b> ★
<b>Wash-off rate</b>	<b>8.59</b>	<b>0.0080</b> ★
Surfactant	1.10	0.3052
Timing X Rate	1.21	0.2836
Timing X Surfactant	1.27	0.2732
Rate X Surfactant	3.21	0.0874
Timing X Rate X Surfactant	1.82	0.1921

# Main Factor Treatment Effects

## Cured leaf MH residues on B tobacco

Variable	Mean MH residues (ppm) (averaged across other variables)
No wash off control	66.0
<u>Wash-off timing after MH application</u> ★	
2 hours	56.0
6 hours	39.5
<u>Wash-off spray volume</u> ★	
560 l/ha	55.2
1680 l/ha	40.4
<u>Spray additive</u>	
No surfactant	50.4
Surfactant	45.1

# Low Volume MH Wash-off Study, 2012

- No significant effect of wash-off treatments on sucker control
- Future studies to evaluate lower MH rates



# Conclusions

1. Low volume wash-off applications were effective in reducing MH residues
  - Application rate was the most important variable
  - Application timing had minimal impact
  - Addition of a surfactant to the wash-off had no consistent effect

# Conclusions

---

1. Low volume wash-off applications were effective in reducing MH residues
2. Wash-off treatments did not impact sucker control using a rate of 2.5 kg/ha MH

# Conclusions

1. Low volume wash-off applications were effective in reducing MH residues
2. Wash-off treatments did not impact sucker control using a rate of 2.5 kg/ha MH
3. The sampling of green leaves is a useful research tool to evaluate treatment effects on MH residues



A close-up photograph of a tobacco plant stem with a cut section, surrounded by green leaves. The stem is light green and has a distinct cut at the top. The leaves are large and green, with visible veins. The background is blurred, showing more of the plant.

**The financial support of the Virginia Tobacco Board  
and Philip Morris International  
is acknowledged**

# MH Plant Factors Study

Investigate factors impacting MH residues and sucker control resulting from applications of MH.

## Objectives

1. Evaluate time of day for MH application – temperature, humidity, and plant condition change through the day.
2. Evaluate timing of MH application relative to first harvest.
3. Monitor the weathering of green leaf MH residues following application (timing of rainfall).

# MH Plant Factors Study

## Treatment Variables

### Application dates:

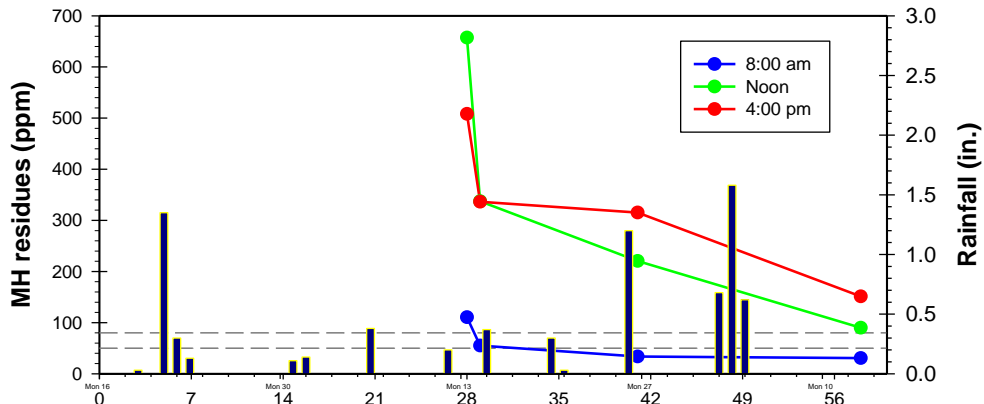
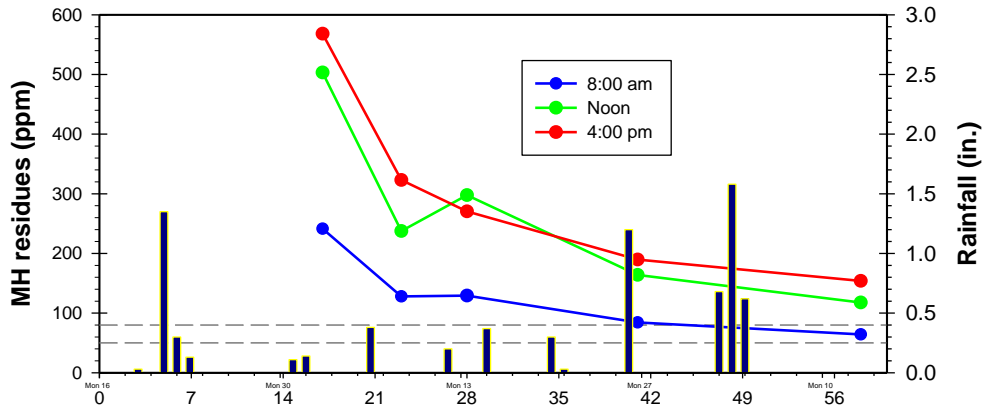
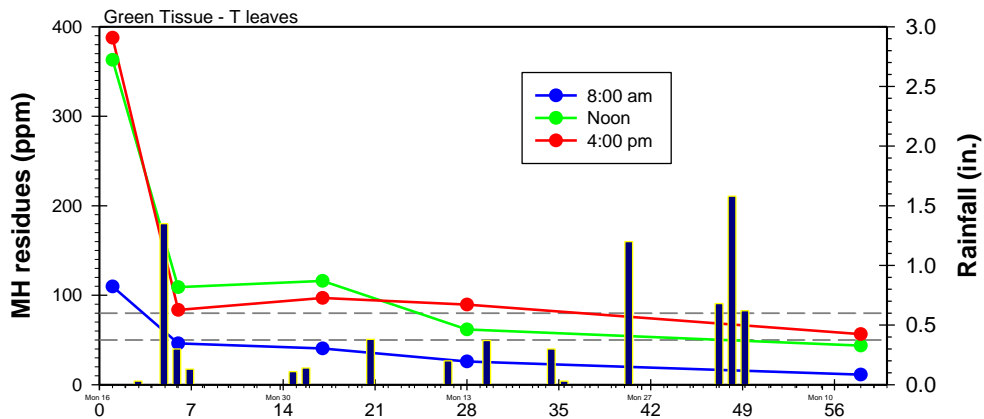
1. Before 1<sup>st</sup> harvest
2. After 1<sup>st</sup> harvest
3. Late after 1<sup>st</sup> harvest

### Time of day:

1. 8 a.m.
2. Noon
3. 4 p.m.

*1½ gal/ac RMH-30 (2.25 lbs a.i. per acre)*

# MH Plant Factors Study, 2012



# MH Residues (ppm) of cured leaf (B)

Date of application	8 a.m.	Noon	4 p.m.
<b>Before first harvest</b>	19	59	22
<b>After 1<sup>st</sup> harvest</b>	33	92	87
<b>Late (14 days later)</b>	40	82	99

Royal MH-30 (2.5 kg per ha)

# Factors Impacting Maleic Hydrazide Residues on Flue-Cured Tobacco

T. David Reed

Virginia Tech  
Southern Piedmont Center  
Blackstone, Virginia