Evolution of Fungicide Application Technologies for reducing FHB and DON

David C. Hooker,  
Univ. of Guelph Ridgetown Campus  
Email: dhooker@uoguelph.ca  
Twitter: @cropdoc2

Art Schaafsma (Univ. Guelph)  
Helmut Spieser (OMAFRA)  
Albert Tenuta (OMAFRA)  
Peter Johnson (OMAFRA)
DON Toxin

PHOTOSYNTHESIS

Tillage -- Surface residue vs. none

Crop Rotation -- Corn vs. bean

Cultivar -- MR vs. HS

Weather

Application of triazole fungicide <40-60% reduction at best

Unknown Influences

Adapted from Hooker et al., 2002
Best fungicide @ best timing using best application technology

Hooker (Univ Guelph)
First generation testing

- UV dye sprayed
- different nozzles
- image analysis

- uneven head coverage
- good leaf coverage
- good soil coverage
- Head coverage = fungicide efficacy??

Hooker (Univ Guelph)
Second generation testing

Hooker (Univ Guelph)
5 Swath Positions x 9

Hooker (Univ Guelph)
Sprayer Rodeo

Hooker (Univ Guelph)
Back-Fwd Turbo FF TeeJet et

TwinJet et

Conventional Turbo FF TeeJet et

Sprayed 2x – Opposite Directions

Hooker (Univ Guelph)
Spray Coverage vs Application Method

Airplane
Chopper
XR11002 Sprayed 2x
XR11004
TwinJet Nozzles
Backward Forward Nozzles

3 GPA vs. 20 GPA with the ground rigs

n=45

% Droplet Coverage

Hooker (Univ Guelph)
Spray Distribution on Heads vs Applicator

Copper was used as a chemical tracer, applied at the same use rate in all apps.

* * * differences in coverage among sides (P=0.05, 0.01, <0.01 respectively)

3 GPA vs. 20 GPA with the ground rigs

n=45

Spray Nozzle Configuration/Applicator

Hooker (Univ Guelph)
Copper was used as a chemical tracer. Note differences in coverage from side-to-side on boom, and on “head” coverage.
Spray Distribution on Heads Across Swath Width
-- Helicopter --

Coverage (%)

Right Side of Boom

Left Side of Boom

Copper deposition (mg m⁻²)

Swath Position From Left-Right on Boom

n=9

Hooker (Univ Guelph)
Various nozzle configs on ground rigs also compared

Back-Fwd Turbo TeeJet et

Back Only Turbo TeeJet et

TwinJ et

Fwd Only Hooker (Univ Guelph)

Fwd Only Turbo TeeJet et
Alternating Turbo Flood

Alternating front facing and back-facing along boom

Hooker (Univ Guelph)
Fwd-Back @ 6 mph

TwinJet @ 6 mph

XR11002 Sprayed 2x @ 6 mph

Twin Cap @ 6 mph

6 cards shown of 24

6 cards shown of 24

6 cards shown of 24

6 cards shown of 24

Hooker (Univ Guelph)
Spray Distribution on “Heads” vs Nozzle

- Cone: Note poor coverage on the backside of heads
- Forward Only: Note relatively even coverage around wheat heads
- Backward Only: Note relatively even coverage around wheat heads
- Backward-Forward AI: Note relatively even coverage around wheat heads
- TwinJet: Note relatively even coverage around wheat heads
- Backward-Forward FF: Note relatively even coverage around wheat heads
- Alternating Turbo FloodJet: Note relatively even coverage around wheat heads

All tmts applied 12 mph @ 20 GPA
Nozzle Configurations Compared

**FWD-BACK** TT11004
12 mph

**TurboFlood Alternate** on Boom
12 mph

**TwinJet**
12 mph

Hooker (Univ Guelph)
TwinJet et al. @ 6 mph

TwinJet et al. @ 12 mph

Forward-Backward @ 6 mph

Forward-Backward @ 12 mph

6 cards shown of 24

6 cards shown of 24

6 cards shown of 24

6 cards shown of 24

Note coverage vs. similar at 6 or 12 mph; 20 GPA

Hooker (Univ Guelph)
Coverage: Travel Speed vs Nozzle

- TwinJet 12 mph
- TwinJet 6 mph
- Backward-Forward FF 6 mph
- Backward-Forward FF 12 mph
- Alternating Turbo FloodJet 6 mph
- Alternating Turbo FloodJet 12 mph

All tmts applied at 20 GPA

Hooker (Univ Guelph)
Boom Height Affects Coverage!!

- **Back-Fwd Flat Fan**: Ideal vs. High (2x ideal)
  - Ideal: 30
  - High (2x ideal): 20

- **Back-Fwd Al**: Ideal vs. High (2x ideal)
  - Ideal: 30
  - High (2x ideal): 20

- **Alternating TurboFlood**: Ideal vs. High (2x ideal)
  - Ideal: 30
  - High (2x ideal): 20

- **TwinJet**: Ideal vs. High (2x ideal)
  - Ideal: 10
  - High (2x ideal): 10

*Marker: Ideal, **marker: High (2x ideal)
Boom Height and Spray Drift

Source: Tom Robinson, Syngenta. UK

Hooker (Univ Guelph)
Spray Coverage – Wind Effects

- **Leeward**
  - Back
  - Left
  - Front
  - Right

- **Windward**

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- **Forward Only**
  - Leeward:
    - Back: 5%
    - Left: 10%
    - Front: 10%
    - Right: 5%

- **Twin Caps**
  - Leeward:
    - Back: 20%
    - Left: 10%
    - Front: 20%
    - Right: 10%

- **Teejet Duo**
  - Leeward:
    - Back: 15%
    - Left: 15%
    - Front: 15%
    - Right: 15%

- **Back-Forward**
  - Leeward:
    - Back: 25%
    - Left: 10%
    - Front: 20%
    - Right: 10%

- **Alternating Turbo Floods**
  - Leeward:
    - Back: 30%
    - Left: 20%
    - Front: 25%
    - Right: 20%

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*Hooker (Univ Guelph)*
Conclusions

• Coverage with aerial app = TwinJet™ ground app
• Most uniform highest coverage using alternating TurboFlood™ or Back-Fwd nozzles
  • Spray pattern 15 degrees from horizontal
• Poor coverage other nozzles including “Forward Only”
• 12 MPH = 6 MPH forward speed
• Slight wind = low coverage on leeward side of spike
  • Boom height important for reducing wind effects
• 20 GPA >> 10 GPA for coverage and uniformity
Thanks!!

Dave Hooker, PhD
Email: dhooker@uoguelph.ca
Twitter: @cropdoc2