

Managing Leaf and Head Diseases in Wheat

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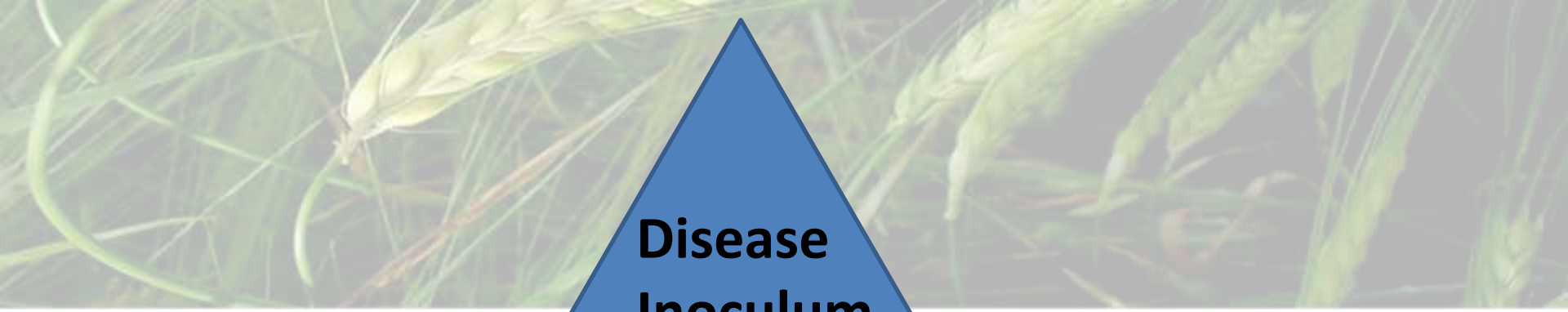
Northeast Agriculture Research Foundation



Wheat Lead and Head Diseases

- Tan spot and Septoria
- Fusarium Head Blight
- Others: Leaf and Stem Rust, Ergot, Smuts etc



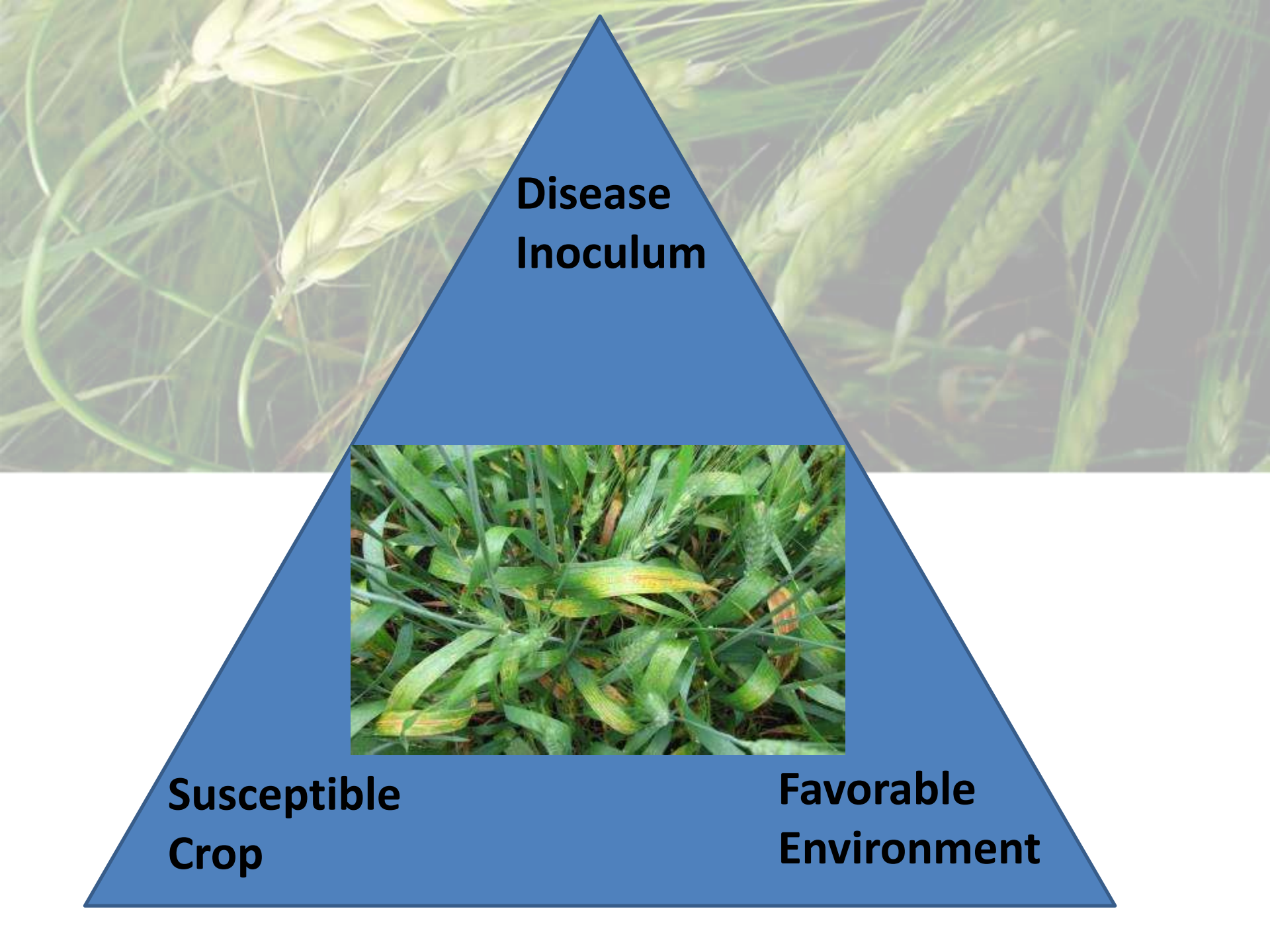


**Disease
Inoculum**

**THE
DISEASE
TRIANGLE**

**Susceptible
Crop**

**Favorable
Environment**



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Managing Wheat Diseases Means Managing The Disease Triangle!

We can:


- ❑ Reduce Inoculum
 - ❑ Rotation
 - ❑ Disease Free Seed
 - ❑ Tillage practices??
- ❑ Reduce Crop Susceptibility
 - ❑ Genetic resistance
 - ❑ Fungicides
- ❑ Monitor climate
 - ❑ Predict disease risk



Rotation

- Growing a non-susceptible crop allows infected residues to decompose.
- No new infected residues added so inoculum declines
- Other cereals may not be completely non-susceptible, but pulses and oilseeds are.
- Rotation alone has practical limitations since a 1 year break may not be sufficient

Disease Free Seed

- 
- **Some diseases like Fusarium are seed borne.**
 - **Using disease free seed reduces inoculum and can slow spread of disease.**
 - **Seed treatments can be effective on infected seed.**

Tillage

- Buries some residues
 - Spores are released on the soil surface
- May hasten decomposition of infected residues
- Effectiveness varies with climate, disease species and tillage practices





Genetic Resistance

- Makes the crop less susceptible to disease infection or development
- Over time, new disease strains overcome new resistance genes
- Challenge is to introduce new resistance genes before resistance is overcome AND have resistance to multiple diseases in one cultivar

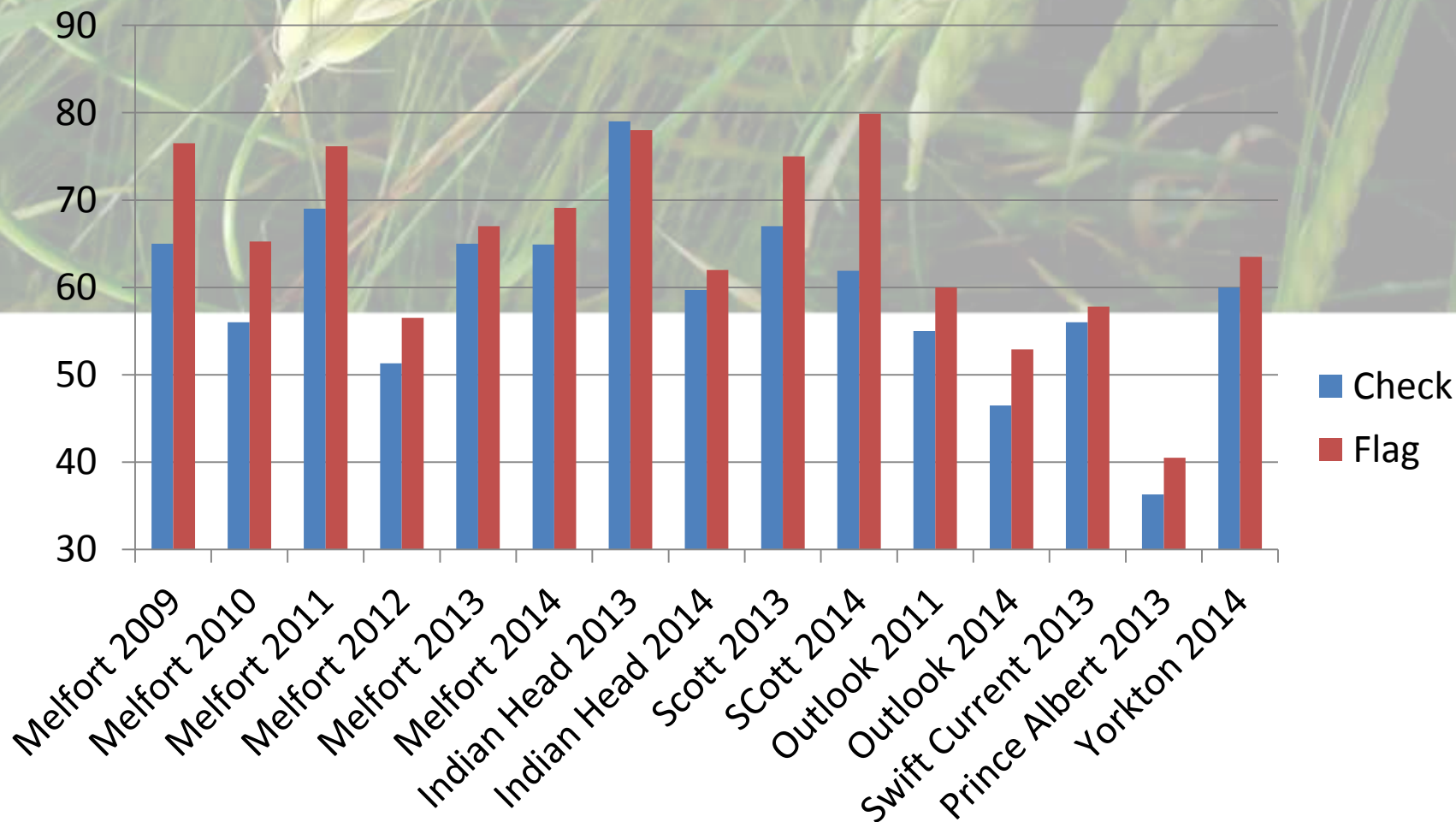
Foliar Fungicides

- Can inhibit spore development, prevent entry of disease into the plant, or inhibit disease development in the plant
- Most need to be timed shortly before or after time of infection
- Need to know which disease to target as times of infection can vary
- Agri-ARM sites have recently completed numerous fungicide timing studies

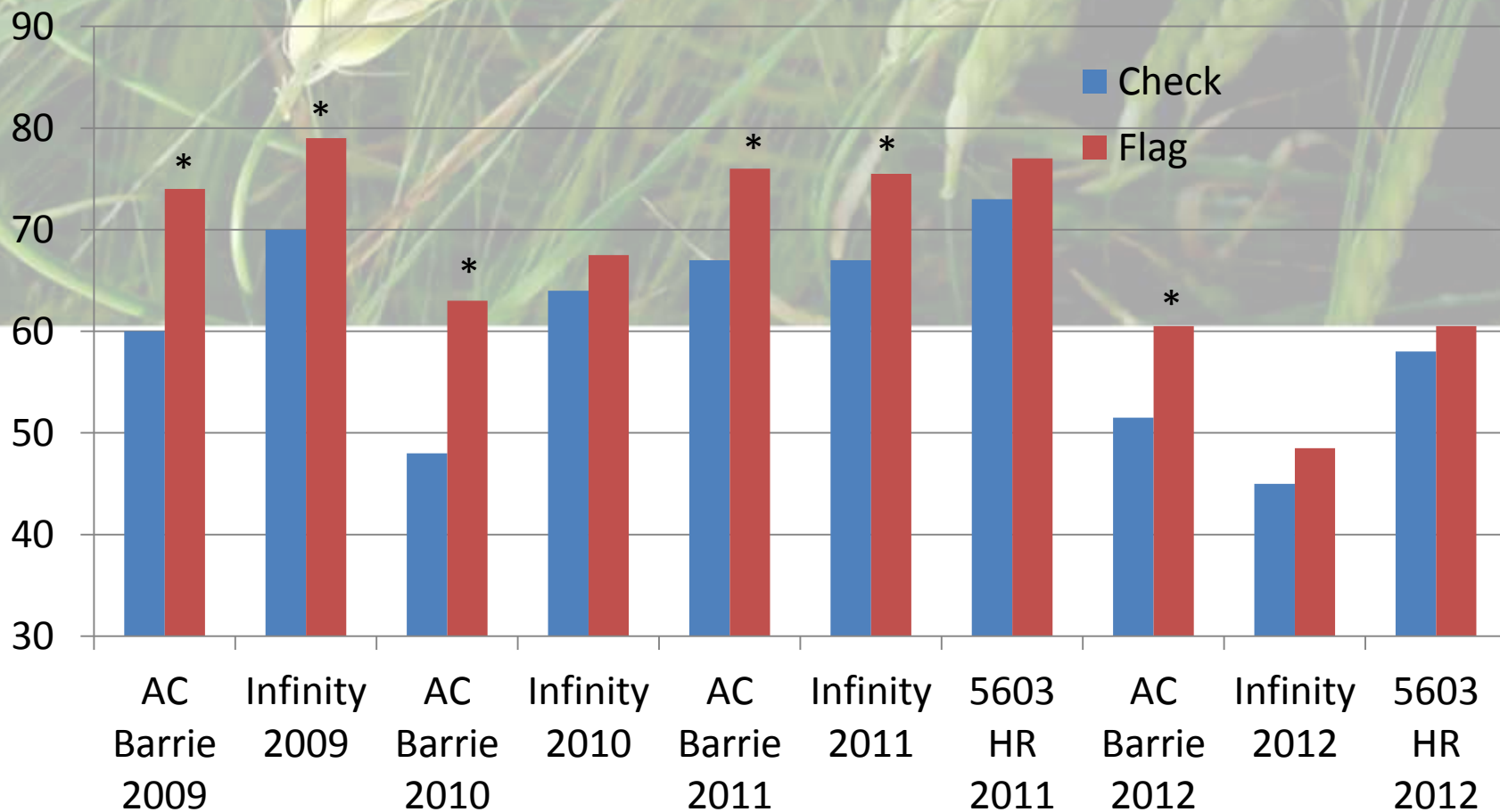
Fungicide Summary Across Location Years

- 38 comparisons untreated vs fungicide @ flag leaf emerged stage over 16 location years.
 - 1 Kane, 1 Brigade Durum, 2 Goodeve, 4 5603HR, 7Barrie, 7 Infinity, 7 ShawVB, 9 UnityVB
 - 1 Quilt, 4 Acapella, 7 Tilt, 10 Headline,15 Twinline
 - 14 location years were replicated small plot trials
 - 2 location years were non-replicated large plots (10 ac+)

Yield (bu/ac) Effect of Fungicide at Flag (Summary Across Location Years)



Influence of Variety on Fungicide Yield (bu/ac) Response at Melfort 2009-12



* Denotes instances where fungicide at flag was significantly greater than check

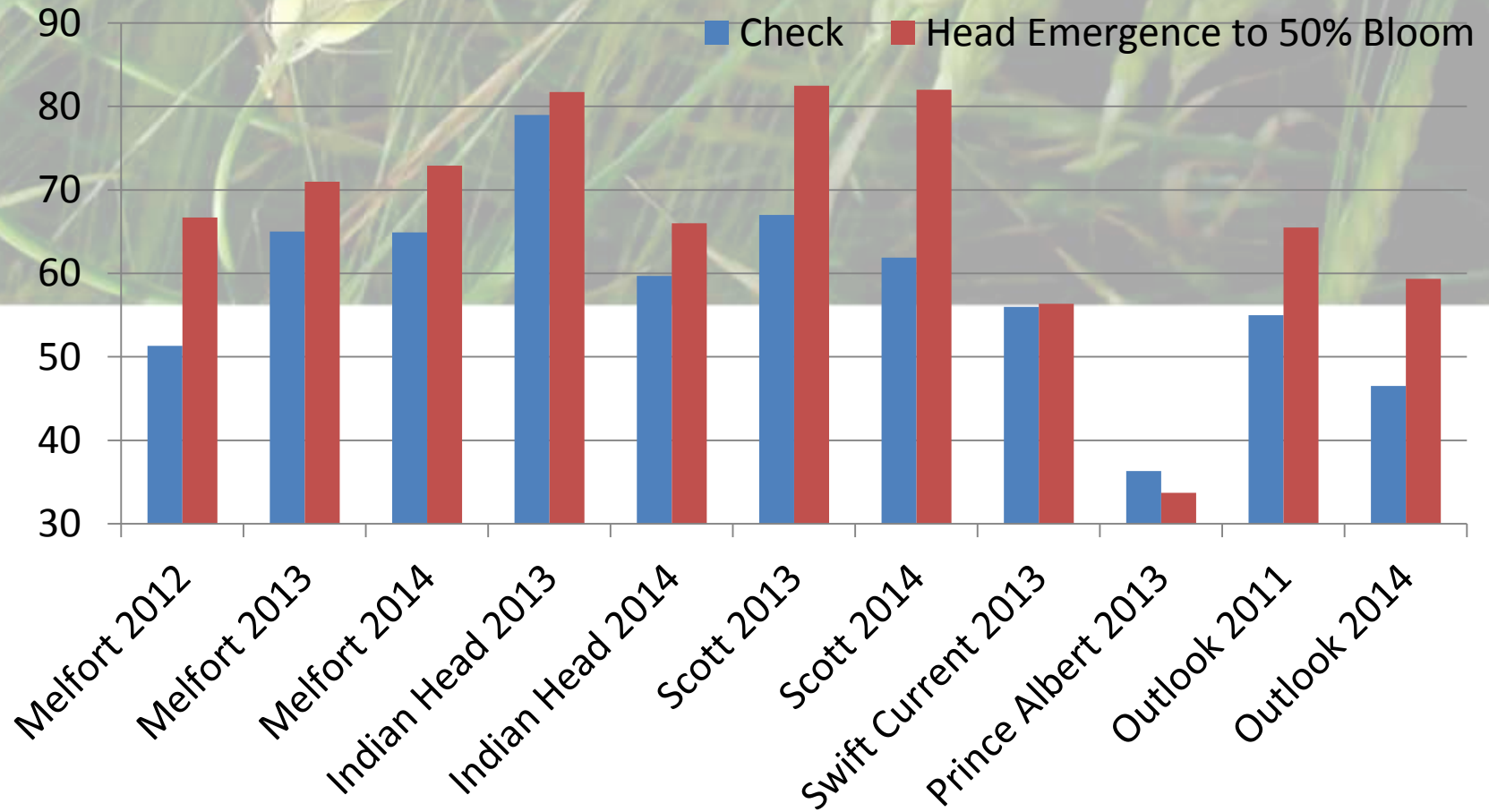
Comparing Untreated to Fungicide @ Flag (37 comparisons)

- Average Yield Untreated = 59.0 bu/ac
- Average Yield Fungicide @ Flag = 64.6 bu/ac
- Average Response = 5.6 bu/ac
- Range -1.0 (Shaw VB) to + 13 bu/ac (AC Barrie)
 - Most responses that exceeded 10 bu/ac were with AC Barrie, but also included Infinity, Unity VB and Shaw VB

Comparing Untreated with Fungicide @ 75% Head Emergence to 50% Bloom

- 24 comparisons over 12 location years
- 1 Kane, 1 Brigade Durum, 1 AC Barrie, 1 Infinity, 1 5603HR, 4 Goodeve, 7 Shaw VB, 9 Unity VB
- 1 Tilt, 1 Quilt, 4 Headline, 4 Acapella, 14 Twinline
- All but 2 were small plot replicated trials.

Summary Across Location Years (bu/ac)



Fungicide Timing and % of Heads Infected by Fusarium Head Blight

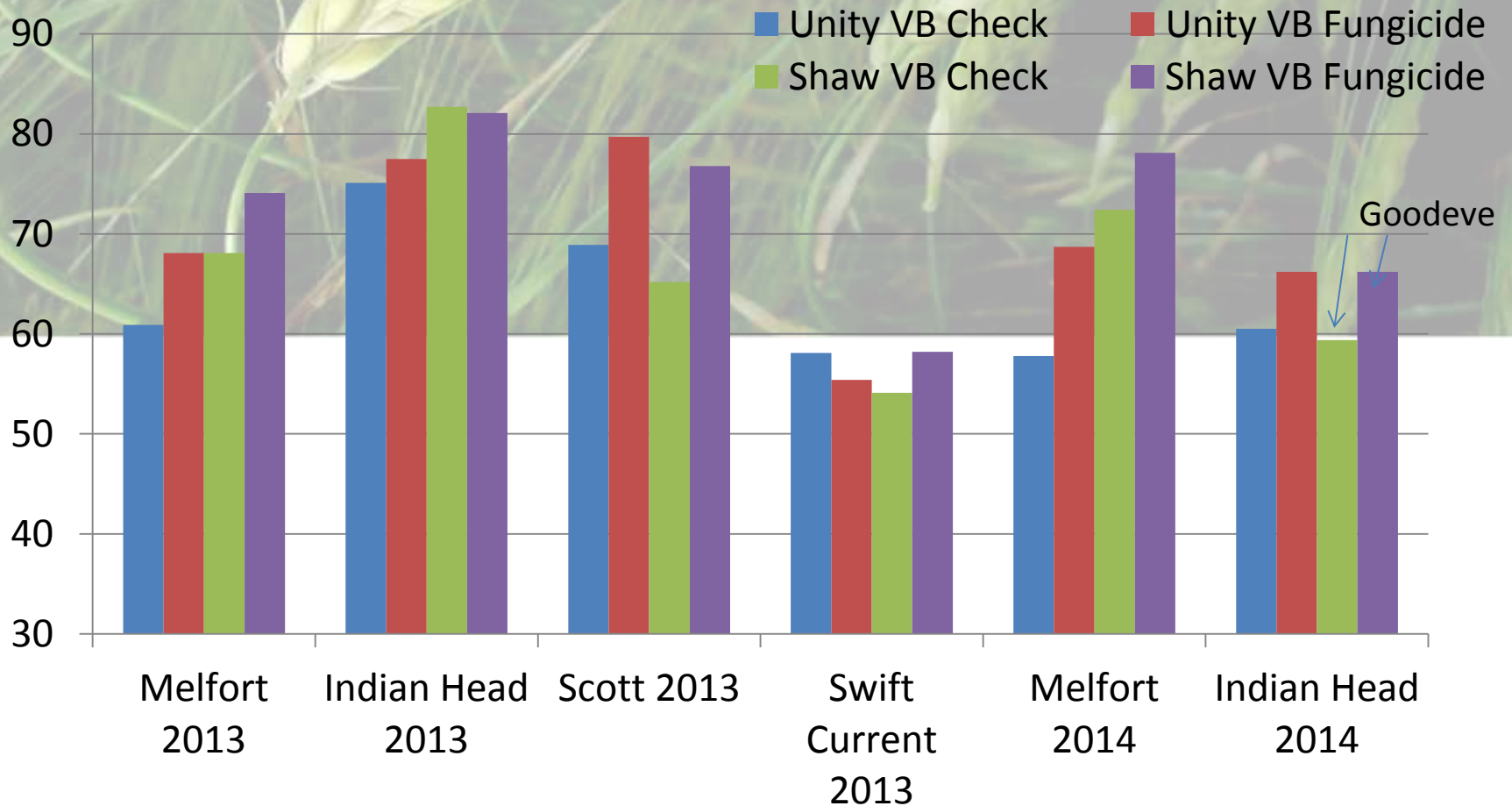
| Treatment | Indian Head | Melfort | Scott |
|--------------|-------------|---------|-------|
| Check | 51 | 83 | 6 |
| T1 | 41 | 86 | 2 |
| T2 | 33 | 73 | 2 |
| T3 | 17 | 77 | 1 |
| T1 + T2 | 32 | 76 | 1 |
| T1 + T3 | 16 | 82 | 3 |
| T1 + T2 + T3 | 11 | 79 | 1 |

Fungicide Timing and *Stagnospora nodorum* (glume blotch) rating (0-12)

| Treatment | Scott |
|--------------|-------|
| Check | 7.0 |
| T1 | 9.2 |
| T2 | 5.8 |
| T3 | 3.4 |
| T1 + T2 | 4.8 |
| T1 + T3 | 2.8 |
| T1 + T2 + T3 | 2.7 |



Influence of Variety on Yield (bu/ac) +/- Fungicide at Heading to 50% Bloom



Comparing Untreated with Fungicide @ 75% Head Emergence to 50% Bloom

- Average Yield Untreated = 57.5 bu/ac
- Average Yield Fungicide = 67.0 bu/ac
- Average Response = 9.5 bu/ac
- Range -2.7 to + 18.5 bu/ac (both with Shaw VB/Unity VB)
- 17 of 24 comparisons exceeded 5 bu/ac
- **Fungicide @ 75% head emergence to 50% bloom was usually better and never worse than @ flag**



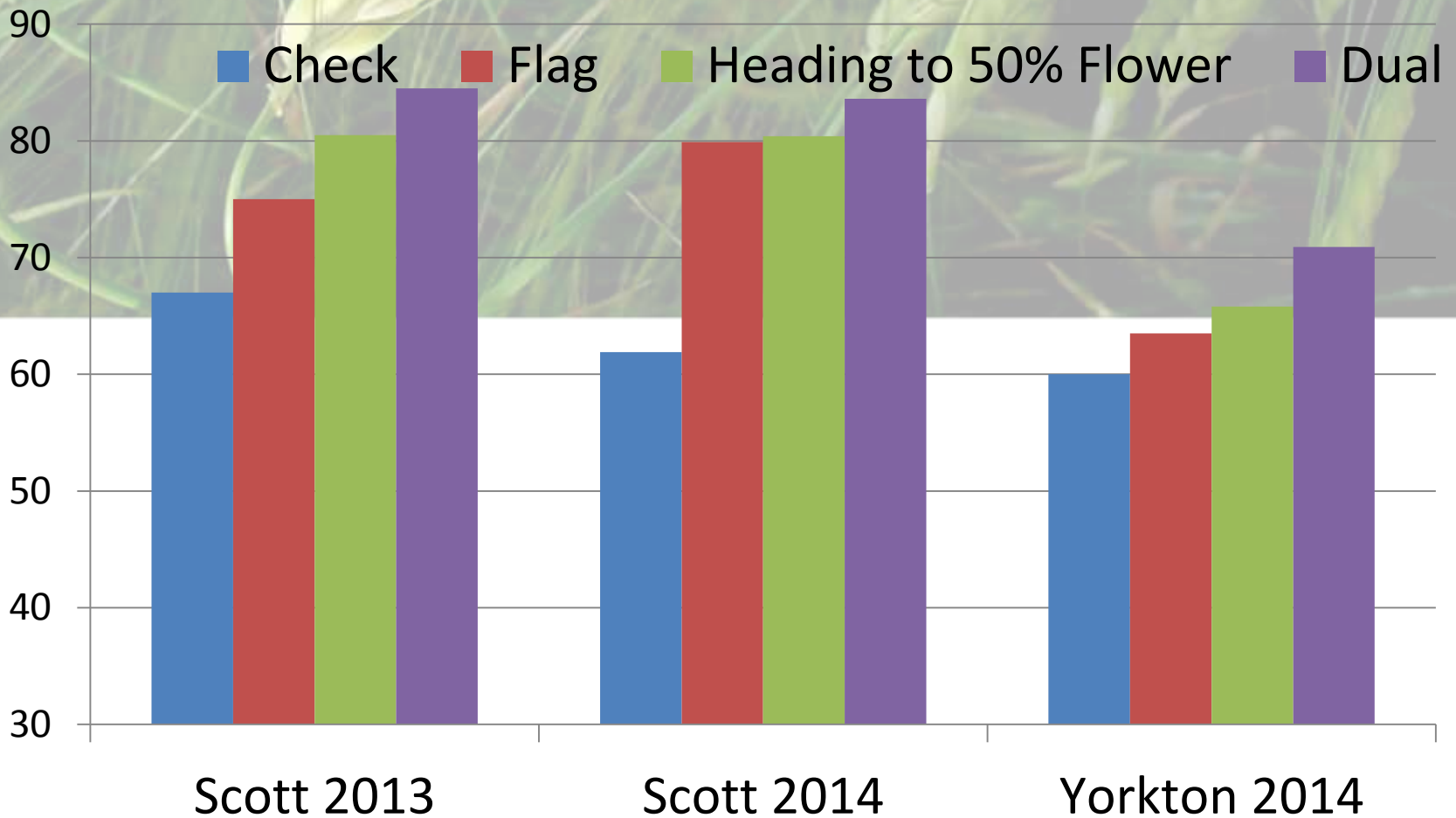
Comparing Untreated with Dual Application (flag and after heading)

- 21 comparisons over 11 location years
- 1 Kane, 4 Goodeve, 7 Shaw VB, 9 Unity VB
- All but 2 were small plot replicated trials.

Comparing Untreated with Dual Application (flag and after heading)

- Average Yield Untreated = 59.2bu/ac
- Average Yield Fungicide = 67.4 bu/ac
- Average Response = 8.2 bu/ac
- Range -2.5 (Shaw VB) to + 21.7 bu/ac (AC Barrie)
- 7 of 21 comparisons exceeded 10 bu/ac
- 2 comparisons were where glume blotch was severe, other 5 had lots of fusarium

Fungicide Yield (bu/ac) Responses at 3 Locations With Good Responses to 2 Applications



What About Quality??

- TKW and Test Weight often increased.
- Protein sometimes declined where large yield responses were noted
- % FHB damaged kernels was rarely reduced.
- Grade usually not affected

The background of the slide features a close-up, slightly blurred image of wheat stalks. The stalks are green and yellow, with long, thin awns extending from the grain heads. The lighting is soft, highlighting the texture of the wheat.

Summary – Varietal Resistance

- Valuable for leaf diseases
- Less valuable for fusarium
- Challenge is to select a variety with all desirable traits (yield, lodging, protein, disease and insect resistance)
- What are the tradeoffs?

Summary - Fungicides

- Application at head emergence to 50% bloom were usually as effective or more effective than fungicides at flag emergence
- Fungicides alone aren't the full answer for yield and quality
- Dual fungicide applications (@ heading + flowering) usually not better than single (@ heading)
 - ? Glume blotch, severe fusarium pressure or low plant density?

New focus?

- Evaluate broader range of varieties with wider range of resistances?
 - Yield AND quality improvement
- Fungicides applications to provide better coverage
- Products or combinations of products
- Shorten heading to optimize fungicides?
 - Higher seed rates

There are no
easy answers
to Fusarium

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Need to use all tools available to us

- ✓ Fungicides
- ✓ Rotation
- ✓ Disease Free Seed
- ✓ Tillage practices??
- ✓ Genetic resistance
- ✓ Predict disease risk

Acknowledgements

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Questions?