Resistance Action Committees: Successfully Implementing Product Stewardship

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Resistance Action Committees

- Clearinghouse for information on resistance management (RM),
- Encourage best management practices,
- Coordinate of basic research into resistance development
- Design and implement management strategies.
- Educate stakeholders
Science is Crucial

- We cannot manage the development of resistance without sound knowledge of the pathogen, the chemistry, and the process of resistance.
- Current recommendations manage SELECTION PRESSURE
  - Cultural control
  - Application rates
  - Limiting exposure - fewer sprays
  - Alternation of mode of action
Nearly all recommendations limit the amount of fungicide that may be applied to a grower's field.

Resistance management reduces the potential sales of a pesticide.

Why then, are the RAC’s strongly supported by Industry?
4 Phases of the Product Life Cycle

PRELAUNCH
5-8 years

LAUNCH
at Registration

EXPANSION

MAINTENANCE
New ideas, innovation, creativity

The first product into a market should hit peak sales in 3-5 years.

New uses, crops, pests, etc.

Downturn may coincide with expiration of patent and entry of generics into market.

Sales

2-3 Years 3 Years 5 Years

Time

$25 M
Costs and Return at 100% Share
Sales peak at $22 million/year

1. EBITDA = Earnings Before Interest, Taxes, Depreciation, Amortization
2. Typical partial costs of new pesticide development, USA only. (000’s)

1.3 Million acres planted
4 spays/year is max allowed
5.1M treated
$20/acre
0.25 lb/ai/A
New Resistance Management Guidelines Projected Grower Sales with 2 or 4 Sprays

Guidelines allow 4 sprays

Guidelines allow 2 sprays

Grower Sales in Millions $
What happens if Resistance hits?
Grower Sales with Resistance

- Resistance after 2 years
- Resistance after 4 years

Grower Sales Millions $

Years

Resistance management reduces the value of a product, but it also reduces the risk of catastrophic loss.

<table>
<thead>
<tr>
<th># Sprays</th>
<th>Peak Sales Millions</th>
<th>Years to Resistance</th>
<th>NPV Millions</th>
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<tbody>
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<td>13</td>
<td>18</td>
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<tr>
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<td>11</td>
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<tr>
<td>Wonder 6</td>
<td>34</td>
<td>4</td>
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Conclusions

- If risk is high, resistance management is always preferred.
- When market size is small, resistance management is essential. (Important for late entries into the market.)
- Reducing market size will drive products from the marketplace.
- Different people see different futures.
- The models work only if the customers adopt the guidelines.
Objectives and activities of RAC’s

- RAC’s Working Groups
- Mode of Action Groupings
- Communication efforts
  - Grower talks and education publications
  - Funding for commodity groups (NPC guidelines)
  - Displays at Conventions and meetings
  - Internal publications and education
- Support research into Resistance Management
- Monitoring efforts and development of baselines (sugarbeet, potato, peanut, turf, wheat)
Some populations are very diverse:

Example - Pyrimethanil Botrytis on Vines
Disruptive selection
Most common with Single gene mode of action

Illustrating disruptive selection. Pre-selection the majority of the fungal population is sensitive with a minority resistant. Post-selection the majority is resistant. There is a clear demarcation between sensitive and resistant.
Shift in sensitivity seen with DMI

France 1991-1997 Response of isolates to 0.5 ppm prochloraz

Growth at 0.5 ppm prochloraz as

Year

Percentage of isolates

1991 (n=61)
1992 (n=265)
1993 (n=797)
1994 (n=126)
1995 (n=156)
1996 (n=34)
1997 (n=103)
1998 (n=162)
Average EC-50 value of *Cercospora beticola* isolates collected from 1997-2005 to tetraconazole

Sugarbeets - Data from Gary Secor, NDSU
What does a Salesman do when called out on a complaint? or Why didn’t it work as expected?

POSSIBLE CAUSAL FACTORS

- Fungi susceptibility (resistance?)
- Rainfall or irrigation timing
- Early vs. late leaf spot (shifts in pathogen population or error in identification of primary disease)
- Weather conditions extremely favorable for disease development
Resistance Management is about sustainable agriculture and reducing business risk.