Efficacy and Crop Safety Data Needs to Support Specialty Crops

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John Abbott, NAFTA Regulatory Team Leader, Herbicides
Late Blight (*Phytophthora infestans*) in tomatoes

**Untreated**

**Syngenta New AI**
From a Lead Compound to a Reduced Risk Commercial Product

- Beyond having a novel mode of action and broad spectrum:
  - Delivers high level of potency across required spectrum
  - Fine tune uptake, redistribution, and persistency
  - Establish crop safety
  - Demonstrate favorable environmental and toxicological properties
  - Establish Intellectual Property position
  - Confirm efficacy under various field and environmental conditions
  - Evaluate the influence of formulation and key partners on performance
  - This process takes several years with an overall cost of > $150 million
Major Crops vs. Specialty Crops

● Due to the huge development costs, major crops drive the active ingredient promotion decision as well as development and registration processes
  - The risk : reward is greatly in favor of major crops

● Specialty crops have become increasingly important
  - FQPA established an extension of 1 year of exclusive use protection when 3 minor use crops are registered with the potential for up to 3 years (9 crops) – Has real $ value
  - Some producers of major crops also grow minor crops
  - Some specialty markets can have large sales potential e.g. Residential home lawns
A Few Facts from ARS Regarding Minor Crops

● Defined as crops with <300,000 Acres

● Over 600 crops are considered minor use not including non-food specialty crops

● Combined value represents 40% of all crops

● In 2004, minor crops were valued at over $40 Billion
Specialty Crops are High Value
Fewer Acres = Less Return

- Value of Crops ($)
  - 1 Acre of Strawberries = $25,000 (56,000 Acres)
  - 1 Acre of Carrots = $6,500 (82,000 Acres)
  - 1 Acre of Apples = $5,500 (381,000 Acres)
  - 1 Acre of Corn = $3.80/bu X 150 bu/A = $570 (90MM Acres)
  - 1 Acre of Wheat = $5.90/bu X 45 bu/A = $265 (60MM Acres)
## Development of a Crop Protection Product

<table>
<thead>
<tr>
<th>Year</th>
<th>Costs (mUSD)</th>
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<tbody>
<tr>
<td>0 - 9</td>
<td>~ 70</td>
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### Chemistry
- **Active Ingredient**
  - 0 - 2: Synthesis
  - 3 - 6: Process development
  - 7 - 9: Production

### Formulation
- 0 - 2: Synthesis optimisation
- 3 - 6: Pilot production
- 7 - 9: Production

### Biology
- **Discovery/Profiling**
  - 0 - 2: Lab & Greenhouse
  - 3 - 6: Field Validation
  - 7 - 9: Scientific Support

- **Development & Registration**
  - 0 - 2: Global Field Trials
  - 3 - 6: Optimisation

### Toxicology
- **Mammals**
  - Acute, sub-chronic, chronic, mutagenic, carcinogenic, teratogenic, reproduction

- **Environment**
  - Algae, *Daphnia*, fish, bird, micro-organisms, bees, beneficials, non-target organisms

### Environment
- **Metabolism**
  - Plants, animals, soil, water, air

- **Residues**
  - Plants, animals, soil, water, air

### Substances
- 0: 15'000
- 1-9: 500, 10, 3, 2, 1, 1, 1, 1, 1

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*Synovia*
The Big Unknowns

- Tox Results
- Grower Needs
- Competitors
- EPA Policy
Stageplan Crop Protection and Contribution of Research

- Lead Finding
- Optimization Selection
- Development
- Registration, Launch
- Product Support & Life Cycle Management
New Product Selection and Development

Stage 1 - Synthesis And Screening

- Herbicide Synthesis
- Fungicide Synthesis
- Insecticide Synthesis
- External Sources

100,000 Candidates/Year: High Throughput Screen
15,000 Candidates/Year: Optimization
Greenhouse Screen: 5-6,000 Candidates
Stage 1F Field Screening: 50-100 Candidates/Year
Project Statistics – Syngenta new AI

• **4468** compounds made and tested

• **4468** on Leafdisks and on agar

• **4009** on first level whole plant tests in the greenhouse

• **955** on second level whole plant tests in the greenhouse

• **72** in Field trials

• **3** on Stage 2

• **1** on Stage 3 → **Registered Active Ingredient**
Crop screening tools

- Early ai crop screens – Major crops
- Minor crop screens – Greenhouse then Field
- Efficacy Trials – Greenhouse then Field
- Rotational Crop Studies – residue and safety (carryover risk)
- Ecotoxicology Studies – seedling vigor and emergence
- Magnitude of Residue Trials
- Large scale field testing
- Sales
Biological Testing - Significant amount of data generation
Takes several years with a significant $ investment

- These factors (and more) can impact biological results and product use –
  requires thorough testing on each crop/crop group(?)
  - Use rate
  - Growth stage of the pest and crop
  - Climate, Soils, Varieties
  - Formulation
  - Tank-mixing – compatible, synergy
  - Adjuvants, fertilizers, and carriers
  - Product delivery
Who develops biological data (up to approx. 2005)? Registrant Focused until Last Stage

- Early Stages (Stage 1-3)
  - Registrant
  - Possibly others under secrecy agreement but quite limited

- Late Stage (Stage 4)
  - University Researchers
  - Government – USDA, ARS, IR-4
  - Contract Researchers
  - Growers
Who develops biological data (2005 to present/future)?
Change in development model = Earlier Collaboration

- Early Stages (Stage 1-3) – Need to protect IP and insure confidentiality
  - Registrants – Fewer Research Stations and/or Field Reps
  - Expanded Testing Under secrecy agreements
  - IR-4 (shift to participation earlier in the process)
  - Contract Researchers

- Late Stage (Stage 4)
  - University Researchers and Consultants
  - Government – USDA, ARS
  - Growers
Roles for IR-4

● Continue full support of successful magnitude of residue program

● Increased focus on basic research, funding challenges at Universities and shift in resources by registrants enhances the need for expanded crop tolerance and biology data generation by IR-4

● Need good coordination between IR-4 and registrants on timing, rates, methods of application, target pests, etc. and timely receipt of results

● Ornamentals – need efficacy/tolerance testing on a representative range of ornamental crops and cultivars be conducted by 3rd parties funded by IR-4 and supplemented by industry. Current levels of funding and work are insufficient to support a multi-billion $ consumer based industry.

● IR-4 participation in GMO submissions for specialty crops – capacity building at IR-4
Roles for IR-4 (continued)

- Crop groups and need for expanded testing. e.g. A tolerance can be established for a crop group on multiple crops via rep crops. Registrants are generally reluctant to add all the crops within the crop group without crop safety data on the specific crop. Also, need to gather data across varying conditions e.g. climate, soils, cultural practices, etc.

- Coordinate closely with PMRA to cover NAFTA EcoZones in efficacy testing and allow for NAFTA DFUs where appropriate.

- Always consider multi-country / multi-region nature of commodity movement to ensure that trade barriers are not inadvertently set by work done in IR-4 program

- Continued IR-4 leadership for proposed indemnified Section 3 label is needed while continuing to support current indemnified Section 24c process
Indemnified Labels-Why?

● Indemnified labels have been used by registrants on minor crops when the risk of crop injury is unacceptable but the growers have a critical need for access as a pest control tool. In this case, the grower accepts the liability for potential crop injury otherwise tool would not be available.

● As stated earlier, the high value of minor crops equals high risk in a situation where the sales potential is generally low.

● In the past, Section 24c’s have been the mechanism to support the indemnified uses with approved special label language and disclaimers.

● A proposal was put forward to allow for a Supplemental Section 3 label with approved special label language and disclaimers.
  
  - No limitation to certain states, access to any grower
  
  - Minimize EPA, State Lead Agency, and registrant workload
Thank you for your attention.
Any Questions?
Important: Always read and follow label directions before buying and using these products.

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