Innovation in Product Formulation

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“Most of what exists in the Realm of knowledge remains still to be discovered”

Albert the Great — 13th Century
Formulation Complexity
Two lenses to look at Innovation

- Product types
- Kinds of Novelty
• ADJUVANTS

• Fierce competition drives innovation
• Misunderstood by outside community, including basic manufacturers, nozzles makers and academics
  • More to life than COC, MSO, NIS and DRA
• Of vital importance to Distributors
• In certain sense, adjuvant innovation occurs in a “bubble” by the adjuvant community - developers and distributors
• Need for better education and communication among all stakeholders
• OFF PATENT PESTICIDES

• Similar, *but different*, skill set from adjuvants
• Product development is driven by key drivers
  • Market needs
  • Supply chain for pesticide ai
  • Not everyone wants to or can make the same formulations
• Neither CLA nor CPDA are monolithic groups
• OTHERS
  • Combination products – in can adjuvancy, combination adjuvant/nutrients etc
  • Biologicals
    • Biostimulants – are these treated like pesticide ai?
    • Microbials
  • Enhanced fertilizers
  • Era of soil manipulation
Definition: Innovation

- Gross oversimplification
- Novel applications
- Novel ingredients
Novel Applications

- Multicomponent pesticides – example Halex GT®
  - Everything + mesotrione for maize
  - Everything + sulfentrazone for soybeans
  - Everything + glyphosate

- Low drift formulations – eg Enlist Duo ®

- Fertilizer compatible soil insecticides – eg Capture LFR®

- AMS free water conditioning + DRA
• Suspoemulsions were once exotic, now are common
• Concentrated emulsions
• Nanoemulsions

• Development of novel polymeric dispersing agents has helped drive suspoemulsion development
• Formulation patents are a key part of post patent strategies
• Relative economic advantage drives different combination products
Novel Ingredients

- Inerts finder list approximately 2200 ingredients, with 600+ polymers
- Is ingredient availability the problem, or lack of knowledge about allowed ingredients the obstacle to innovation?
Novel Ingredients

• Relative ease of approval for polymers has led to increase in number of polymer exemptions from tolerance
• New surfactants and solvents are more difficult due to cost of data package generation. As a result new technology in these areas are limited
  • Green solvents such as the dimethylamides & NMP replacements have been introduced, but usually more expensive than standards like A150.
Novel Ingredients

• Novel surfactants are rare due to cost of approval and market forces
  • No guarantee of ROI or commercial success
  • “What’s the cost compared to NP-9”
• Examples
  • Agnique ME 818-5 exemption from tolerance June 2018
Barriers to Innovation? Or Opportunities?

- Patent environment can be confusing
- Understanding Inerts list – what are the functions? Where can I get a sample?
  - Knowledge “opacity”
- State interpretations – eg WSDA and CDPR often have different opinions
  - New players – CDFA, various states concerns about aquatic tox
  - How will next generation products (eg biostimulants) be regulated?
- Increased complexity of multicomponent systems
- Knowledge Opacity II - what is the biology we are focusing on? Carpet bombing weeds begets resistance. Are finer levels of control possible using inerts/adjuvant chemistry?
Some examples of what can be done

Antibounce
Improved uptake
Drift reduction
Example of Deposition on a vertically oriented leaf

111 g/kg metsulfuron-methyl and 22 g/kg tribenuron-methyl

TRATON SX ALONE

TRATON SX WITH Additive

UNIVERSITY OF AMSTERDAM
van der Waals Zeeman Institute

HSC: Vision Research; Phantom series V7.1
Camera: max. 10,000 fps (frames/second)
Example of uptake enhancer on herbicide uptake and movement

Bromoxynil K-salt  Bromoxynil K-salt + Uptake enhancer

0  20 min.  1 hour

6 hours  12 hours  30 hours
Air Blast Sprayer without Drift Control Adjuvant
With new Drift Control Adjuvant Technology developed specifically for Air Blast Sprayers.
Conclusions:

- Innovation is alive and well
- Constraints exist on how innovation happens
- Regulatory barriers are relatively minor today
- Knowledge barriers are relatively major
  - Chemistry
  - Biology
- Biological products present new opportunities
Thank You