

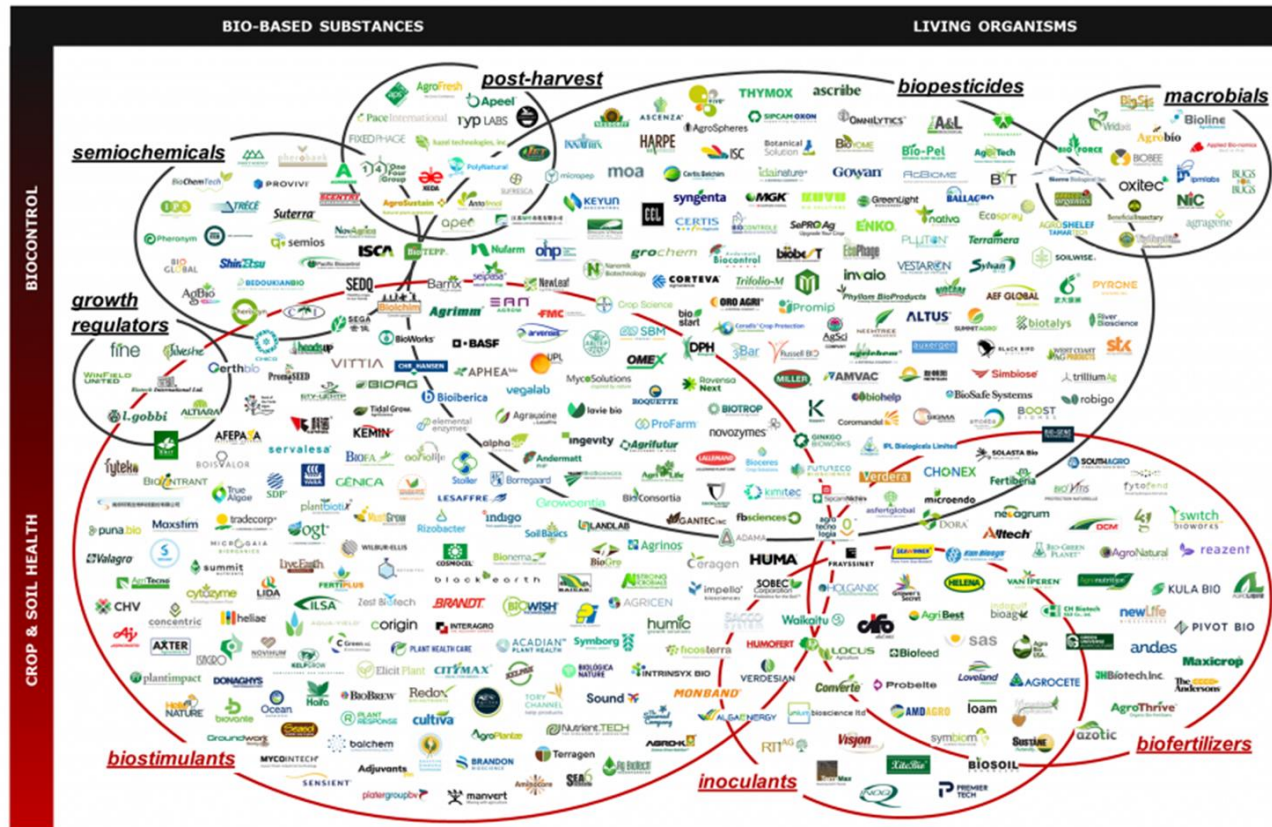


**Biostimulants and biologicals: Identifying the disparities among academia, industry, and regulatory perspectives**

**Connor Sible and Fred Below**

Crop Physiology Laboratory  
Department of Crop Sciences  
University of Illinois Urbana-Champaign

# 2023 AG BIOLOGICALS LANDSCAPE



Chris Taylor  
chris@mixingbowlhub.com

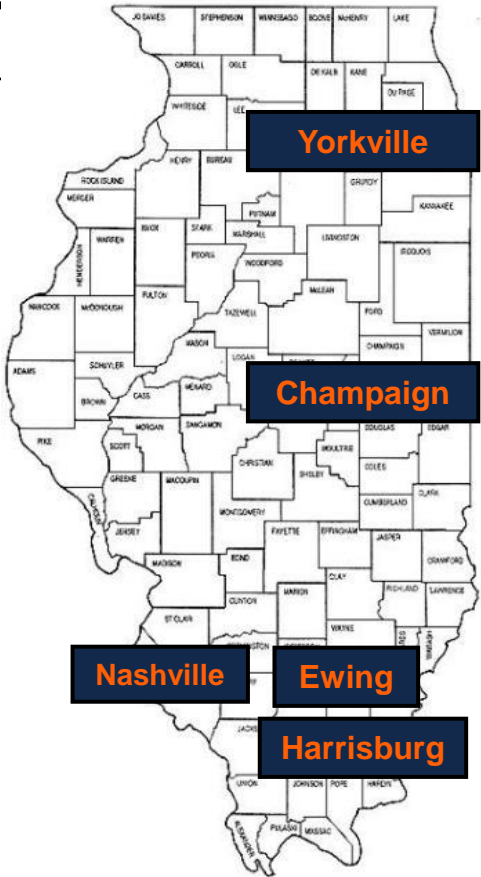
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Companies appear on the landscape only once, although some may offer products in multiple segments. Overlapping areas are meant to imply this, however, logo positions are not necessarily indicative of any specific or limited product offerings.

# Last 11 Years of Biostimulant/Biological Trials

Year	Corn	Soybean
Number of Trials		
2014	6	6
2015	10	6
2016	9	5
2017	10	7
2018	11	11
2019	13	7
<b>2020</b>	<b>28</b>	<b>11</b>
<b>2021</b>	<b>23</b>	<b>7</b>
<b>2022</b>	<b>26</b>	<b>5</b>
<b>2023</b>	<b>26</b>	<b>9</b>
<b>2024</b>	<b>28</b>	<b>12</b>



| What is the right terminology? **I**

**Biostimulants**

**or...**

**Biologicals?**

# Groups Working Towards Defining the Market



BIOSTIMULANTS COUNCIL

**Association of American Plant Food Control Officials (AAPFCO)**

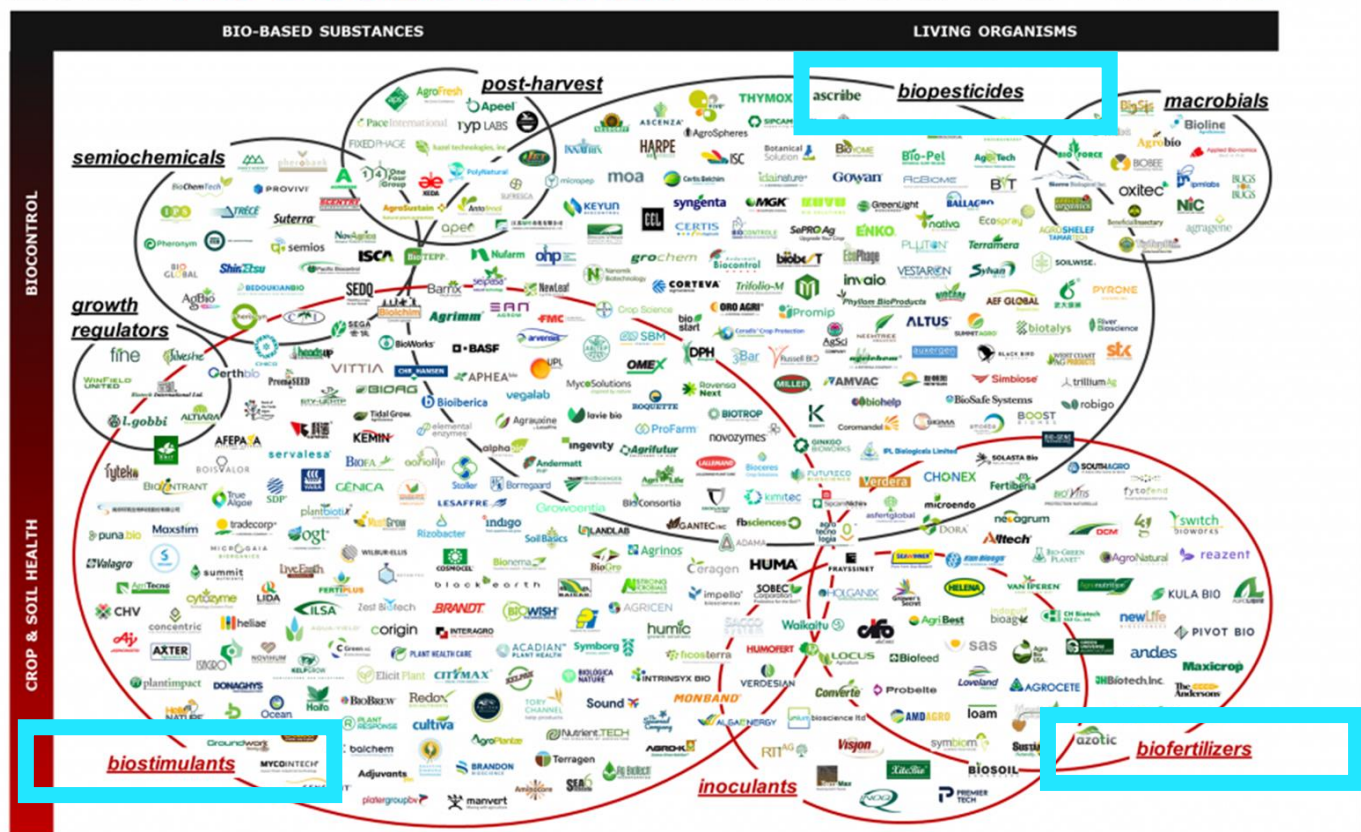
University of Illinois – Dept. of Crop Sciences

# | Biologicals:



The term “biologicals” is not currently defined, but generally has been used by AAPFCO, BPIA, and others to collectively refer to biostimulants, biopesticides, and biofertilizers

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chris@mixingbowlhub.com

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# How do we define biostimulants?



- **2018 Farm Bill: First Mention of “Plant Biostimulant”**

# How do we define biostimulants?



“...a substance or microorganism that, when applied to seeds, plants, or the rhizosphere, stimulates natural processes to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress, or crop quality and yield” – 2018 Farm Bill

# Biostimulant Sub-Categories

- Nitrogen-Fixing Bacteria
- P-Solubilizing Microbes
- Mycorrhizal Fungi
- Residue Degradation
- Enzymes (Phosphatases)
- Humic/Fulvic Acids
- Marine Extracts
- Sugars

**Microbes**

**Substances**

# How do we define biostimulants?



- **2018 Farm Bill: First Mention of “Plant Biostimulant”**
- **Plant Biostimulant Act of 2023: Tried to amend FIFRA, never enacted**
- **Plant Biostimulant Act of 2025: Latest attempt to update regulation (May 22<sup>nd</sup>)**

# 2025 Plant Biostimulant Act

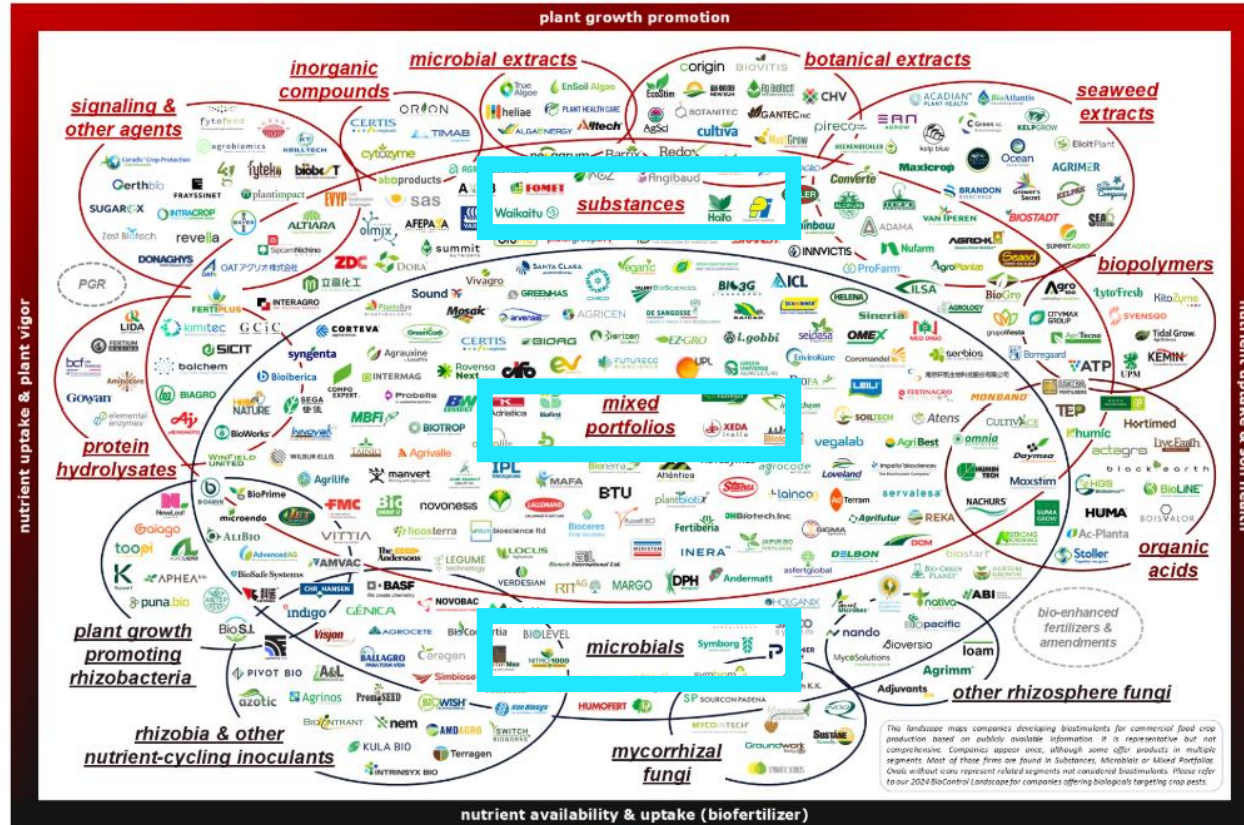
(proposed May 22<sup>nd</sup>, not yet enacted)



“...a **substance, microorganism, or mixture thereof**, that, when applied to seeds, plants, the rhizosphere, soil, or other growth media, acts to support a plant’s natural processes independently of the nutrient content of that substance, microorganism, or mixture thereof, and that thereby improves-

- (1) Nutrient availability, uptake, or use efficiency;
- (2) Tolerance to abiotic stress; and
- (3) Consequent growth, development, quality, or yield.

# 2025 CROP BIOSTIMULANT LANDSCAPE



This landscape maps companies developing biostimulants for commercial food crop production based on publicly available information. It is representative but not comprehensive. Companies appear since, although some offer products in multiple segments. Most of those from one cluster in substances, microbials or listed bioactive. Ovals without stars represent related segments not considered biostimulants. Please refer to our 2024 BioControl Landscape for companies offering biologicals targeting crop pests.

Chris Taylor  
chris@mixingbowlhub.com

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Prior to Understanding  
BioProducts



After Understanding  
BioProducts

# Following regulatory approach, academics utilize similar terminology **I**

**du Jardin, 2012**

**Calvo et al., 2014**

**Sharma et al., 2014**

**Bulgari et al., 2015**

**du Jardin, 2015**

**Halpern et al., 2015**

**Yakhin et al., 2017**

**Barros-Rodríguez et al., 2020**

**Wozniak et al., 2020**

**Sible et al., 2021**

**Hendriksen, 2022**

**Kumari et al., 2022**

**Bhattacharya et al., 2024**

**Khalid et al., 2024**

Following regulatory approach,  
academics utilize similar terminology **I**

**So, where is the  
“biological” terminology?**

Tarkenton et al., 2017

Tarkenton et al., 2017

# Enter Biologicals...



IND  
Pra

Fc

gr

“A

Vc

**Study Results**



**Biologicals**

tinues to

ELTA  
armPress.

Why do biological products not work consistently?

What Are Agricultural  
And Why Use Them?

**Corteva Biologicals**

| What is the right terminology? **I**

**Biostimulants**

**or...**

**Biologicals?**

| What is the right terminology? **I**

**Biostimulants** – Term used in regulatory and by academics in peer-review literature

**Biologicals** – Term adopted by industry and farmers

# | #1 Disparity



The terminology used, and what product types belong to which label, is inconsistent between regulatory/academic and industry/farmer groups

# Within Regulatory, This is the Common Theme

- Nitrogen-Fixing Bacteria
- P-Solubilizing Microbes
- Mycorrhizal Fungi
- Residue Degradation
- Enzymes (Phosphatases)
- Humic/Fulvic Acids
- Marine Extracts
- Sugars

**Biostimulants**

# We propose this distinction moving forward

- Nitrogen-Fixing Bacteria
- P-Solubilizing Microbes
- Mycorrhizal Fungi
- Residue Degradation
- Enzymes (Phosphatases)
- Humic/Fulvic Acids
- Marine Extracts
- Sugars

**Biologicals**

**Biostimulants**

# | #2 Disparity



**Current regulatory status and industry member organizations (e.g. BPIA, TFI) define all products together...**

**Should the “living” products be regulated the same as the “dead” ones?**

# Some key distinctions among living vs. non-living products



**1)** A living product is just that, **living**...therefore, manufacturing through application to field necessitates **active ingredients are alive and at specified cfu counts**

# Some key distinctions among living vs. non-living products



2) Our understanding of living microorganisms, and our classification and nomenclature systems, continues to evolve. **As we change how we name microbial species, how do we handle labeling processes of old vs. new products of same active ingredient**

# Separating the Living from the Dead



**It is our recommendation that the biostimulant market, and its regulatory policies, separate the living microbial inoculants as “biologicals” and retain the non-living products as currently defined as “biostimulants”**

# Separating the Living from the Dead



**It is our recommendation that the**

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COMMENTARY

**Biostimulant or biological? The complexity of defining, categorizing, and regulating microbial inoculants**

Assigned to Associate Editor R. Lehman.

Connor N. Sible<sup>1</sup>,   | Juliann R. Seebauer<sup>1</sup>,  | Frederick E. Below<sup>1</sup>, 

<sup>1</sup>Department of Crop Sciences, University of Illinois Urbana-Champaign, Urbana, Illinois, USA

**currently defined as “biostimulants”**

# In Summary



- **Biostimulants are Expanding Rapidly**
  - **Farmer Adoption and Product Options**
- **There is a need for universal description/education**
  - **At all levels – Government, Industry/Retail, Academia/Extension, Farmers, General Public**
- **BioProducts can be effective tools for farmers**
  - **Alignment of Marketing and Research**

# Special Thanks to Today's Attendees and CANVAS

For More Information:

**Crop Physiology Laboratory**

**University of Illinois**

<http://cropphysiology.cropsci.illinois.edu>

