

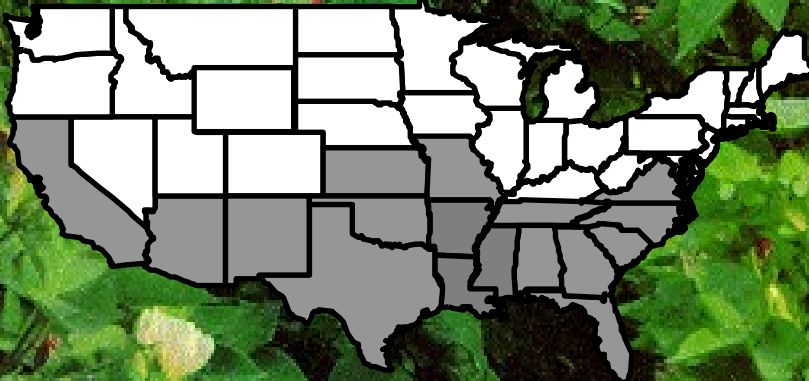
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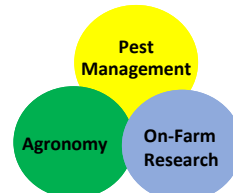
A Discussion of Biostimulants in MidSouth Field Crops

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Direction of Comments

- **BRL - Brief Introduction**
- **Corey Bryant - MSU Field Research**

What are BioStimulants?

What are BioStimulants?

Lets Take a Step Back and Define Biologicals:

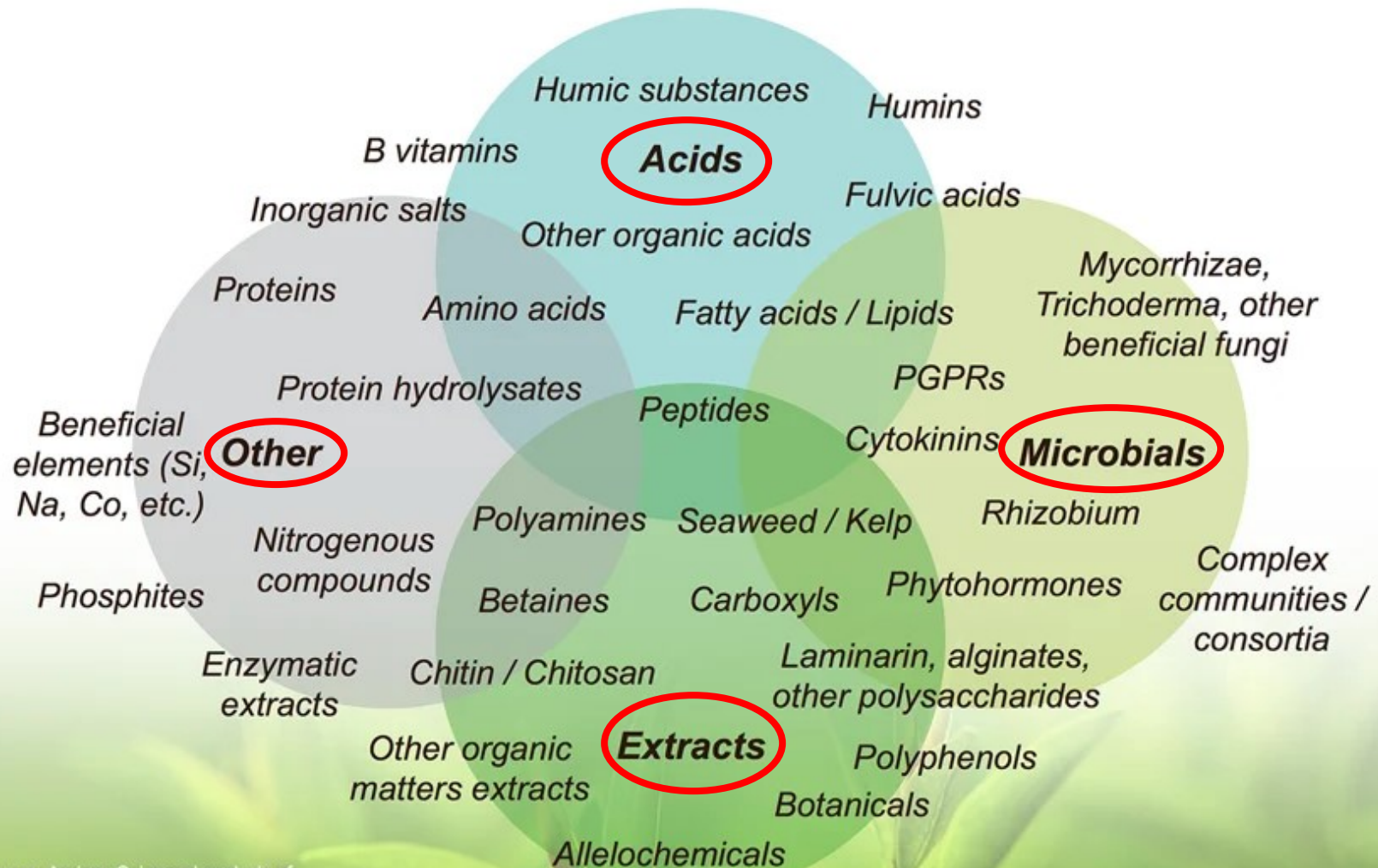
- BPIA defines biologicals as “naturally occurring compounds or synthetically derived compounds that are structurally and functionally similar to natural counterparts.”
- Three broad categories: biopesticides, beneficial microbes (biofertilizers), and biostimulants.
- Biopesticides help control pests and are regulated by the EPA.
- N-fixing bacteria, P-solubilizing bacteria, and mycorrhizal fungi are all beneficial microbes.
- **Biostimulants** include humic substances, amino acids & other N compounds, chitosans, seaweed extracts, and microbes; such as bacteria or fungi.

What are Biostimulants?

- No regulatory framework / legal definition for Biostimulants in US.
- Used to stimulate or improve natural processes in plants / soils.
 - Nutrient availability; Water use efficiency; Abiotic / (Biotic) stress tolerance, Plant quality; Soil characteristics (plants / rhizosphere).
- Biostimulants Council (US) - Regulatory and legislative issues involving biological / naturally derived additives used in crops.
- EU Fertilizing Products Regulation (FPR) – July 2019
- **Farm Bill 2018; USDA Report to Congress 2019**

What are Biostimulants?

A Very Broad Landscape of Emerging Products



These are Biostimulants / Microbes



These are not Biostimulants?



Specimen Label

 Dow AgroSciences

Entrust[®]
SC

Naturalyte[®] Insect Control

®Trademark of Dow AgroSciences LLC

A Naturalyte[®] insect control product formulated for control of lepidopterous larvae (worms or caterpillars), leafminers, thrips, and red imported fire ants.

Group	5	INSECTICIDE
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Active Ingredient: spinosad (a mixture of spinosyn A and spinosyn D).....22.5%
Other Ingredients.....77.5%
Total.....100.0%

Contains 2 lb of active ingredient per gallon.

OMRI
Listed

Listed by the Organic Materials Review Institute (OMRI) for use in organic production.

For Organic Production

Precautionary Statements

EPA Reg. No. 62719-621

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

Environmental Hazards

This product is toxic to bees exposed to treatment for 3 hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. This product is toxic to aquatic invertebrates. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters. Do not apply where runoff is likely to occur. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Apply this product only as specified on the label.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves made of any waterproof material
- Shoes plus socks

Non-Agricultural Use Requirements

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Do not enter or allow others to enter the treated area until sprays have dried.

Storage and Disposal

Do not contaminate water, food or feed by storage or disposal.

Pesticide Storage: Store in original container only. In case of leak or spill, contain material with absorbent materials and dispose as waste.

Pesticide Disposal: Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

Nonrefillable containers 5 gallons or less:

Container Handling: Nonrefillable container. Do not reuse or refill this container.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Refillable containers 5 gallons or larger:

Container Handling: Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose.

Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10% full with water and, if possible, spray all sides while adding water. If practical, agitate vigorously or recirculate water with the pump for two minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures allowed by state and local authorities.

Nonrefillable containers 5 gallons or larger:

Container Handling: Nonrefillable container. Do not reuse or refill this container.

What is the Value of Biostimulants?

- The biostimulant market is currently valued at \$2.5 Bill.
 - Expected to grow to over \$4 Bill. globally by 2025.
- Biologicals are the fastest-growing segment in agriculture.
- Growth in crop biologicals is now forecast to outpace that of conventional agric. chemicals, with annual growth of 14% through 2029.

BioStimulant / Microbe Testing

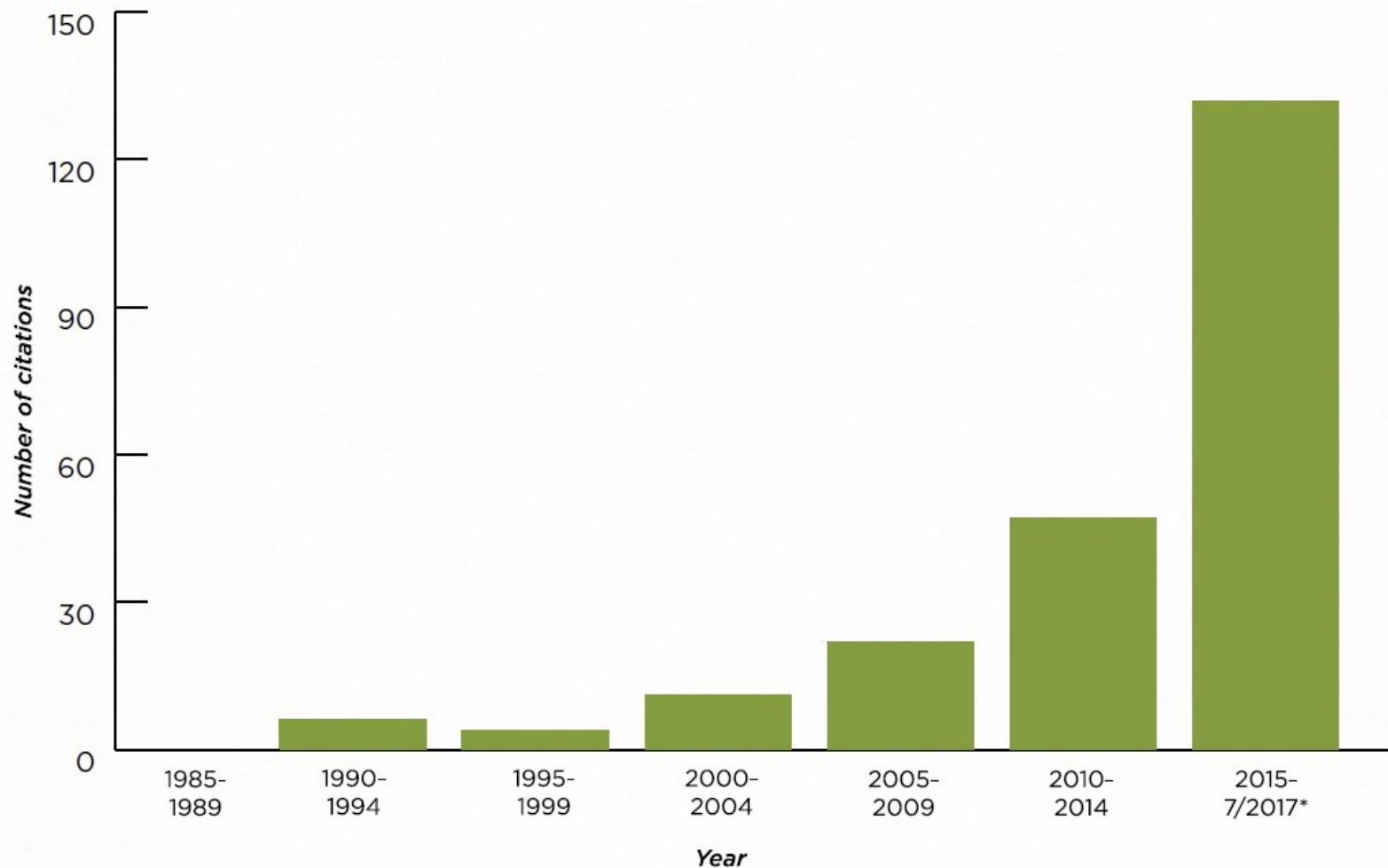
- Research from ND, MN, IL, IA, KY, MO, OH, NE, MI, IN, & KS.
- From 2019 to 2022, NDSU compiled results from 12 trials in 10 states across the NC region (looking at the asymbiotic N-fixing products in corn, spring wheat, sugar beet, and canola). Dave Franzen, Extension soil specialist at NDSU, says, “Of the 51 sites, 49 did not show a statistical yield benefit to using a biological product.”



BioStimulant / Microbe Testing

- Science for Success, a collaborative effort of soybean specialists across Extension in several states, conducted a study evaluating biological seed treatments in soybeans during 2022. (9 Trts with multiple species) spanned 17 states and 49 locations.
- OSU scientists directed the project and found: “yield differences from biological seed treatments in soybeans ranged from **-6.5 bu/acre to 4.5 bu/acre**. The summary of combined results suggested no significant differences in yield by treatment.”

A Growing Body of Scientific Literature on Microorganisms and Fertilizer Use Efficiency Has Emerged in Recent Years



**Note: This period is ~31 months, while others are periods of 60 months.*

Figure 4. Search performed August 1, 2015 and July 17, 2017 by J. Kloepper and C. Jenda at Auburn University using Web of Science-Thomson Reuters database. Searchers selected “only science citations” and searched for the terms “microorganism” and “fertilizer use efficiency” [personal correspondence].

What are Biostimulants?

- The plant biostimulants market is currently valued at \$2.5 Bn. and is expected to grow to over \$4 Bn globally by 2025.

Versus

- The synthetic seed treatment market in 2022 was approx. \$12.4 Bn. and is expected to reach \$40 Bn. by 2032. Biological ST in 2022 was > \$10. Bn.