

Biology is Fertility

Beneficial Microbes, Plant Extracts, and Enzymes Can Mean More Nutrients, Higher Yields and Better Soil Health.

A position paper from Meristem Crop Performance®

Significant innovation in crop inputs has been sparse for decades. Few new active ingredients for crop protection have cleared the burdensome regulatory process. About 90 percent of what's commonly used is off-patent. On the fertilizer side, claiming a "new slow-release polymer coating" is feeling a little stale.

But that's now changing. Smart people the world over – aided by DNA soil tests, genome mapping, and CRISPR technology – are learning how to power up soil biology to provide more nutrients, healthier plants, higher yields, and improved soil health for the long haul.

Crop Nutrition: Not Either/Or, But Both

"Fertilizer Feeds the World," goes the old industry slogan. And it's largely true. About 60 percent of the world's food production can be credited to the use of fertilizer, according to industry estimates. But fertilizer does bring problems along with its blessings, both for farmers and the environment. A few big multinationals own the fertilizer trade, and farmers often feel caged in as price-takers. With some 90 percent of fertilizer imported, depending on the nutrient, prices soar when global catastrophes hit (think Russia invading Ukraine) or trade issues arise (think fertilizer manufacturers lobbying to limit imports)¹. Meanwhile, conflict around "nutrient stewardship" heats up with issues of runoff in Iowa, algae bloom in Lake Erie and hypoxia in the Gulf of Mexico. All of this motivates the search for alternatives.

As much as 60 to 70 percent of applied "synthetic fertilizers" go unabsorbed by the plants in the first year of application due to "low use efficiency, which can cause environmental pollution," according to researchers studying fertilizer's problems. They say healthy microbiomes can act as biofertilizers in sustainable agriculture practices, offering innovative and environment-friendly answers for improving soil fertility and plant growth.² All of these issues have prompted more research on exactly what's happening with life below the surface of the soil.

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"People have speculated that plants can get nutrients from microbes, but understanding the mechanism for transfer of nutrients from microbes to plants has been elusive, until now," wrote James F. White, Ph.D. professor of Plant Biology at Rutgers University, in 2018. "Understanding how this process works may allow us to grow plants with less fertilizers."³

"Plants are cultivating, or farming, these microbes in their roots," explains White, who has been studying this "rhizophagy cycle" for more than 10 years. "They are essentially attracting these microbes to their roots, internalizing them, extracting nutrients, and then ejecting those microbes back out into the soil to acquire more nutrients."

"This has all been around and working since God created the earth," says Mitch Eviston, Founder and CEO of Meristem Crop Performance. "It's only now that we have the technology and tools

needed to really isolate them and apply them effectively to broad acre crop production.” Eviston lists several ways farmers can win with biologicals right away:

Enhance Nutrient Use Efficiency

The right biologicals can unlock nutrients tied up in crop residue and build healthier soils through increased biological activity. In essence, they can help you access more of the NPK you already own.

Build Strong, Healthy Plants Faster

Biofertilizers and biostimulants are redefining the term “starter.” When added to the furrow, they boost plant nutrition by fixing nitrogen, solubilizing nutrients, and building robust root systems.

Optimize Genetic Potential All Season Long

In-season use of biologicals – enzymes, amino acids, and other plant extracts – along with fungicides and micronutrients, will minimize stress in the crop and maximize yield with more pods in soybeans and better ear-fill in corn.

“Biology is fertility,” agrees Brewer Blessitt, Ph.D., a crop consultant and founder of Blythe Bayou Research and Consulting, who helps manage 40,000 acres of crops in the mid-south. “We can put the microbes out there, and they help provide nutrients to the plant, and the plant, in return, provides those bugs with carbon, the soil currency, in the form of root exudates. Another thing I see is the biofertilizer portion of the soil tends to do a better job acting as a season-long supply versus commercial fertilizer, which works well close to the time of application but poorer as time progresses.”

Blessitt says applying too much synthetic fertilizer can make the plants lazy. “They will choose the NPK you put down rather than build their microbial supply. If you want to build a less expensive nutrient system, you’ve got to reduce the amount of synthetic fertilizer you’re applying.” Blessitt says you don’t need to go ‘whole hog’ in this kind of reduction, but “you simply need to be open to dialing back a little, especially with N, P, and K.” He suggests backing off 30 or 40 pounds, yet he knows cutting back on fertilizer is a challenge for growers, “because they are scared there will be a yield penalty. But once they do it, they find it’s no big deal. In fact, it’s most often a better economic outcome.”

It’s Time to Break Out

“We all certainly understand how important it is for families to work together on the farm. I can remember my dad saying we’ve always done it this way, and it has worked well so far. We want farmers and their agronomists to consider taking around \$30 out of their traditional fertilizer budget in the fall and at the planter,” says Peter Rousonelos, Senior VP of Business Development for Meristem. “Put those dollars toward igniting this ‘biology-is-fertility’ system. We’re confident it will pay dividends.” Rousonelos speaks of his own proven step-by-step:

Make The Most of Nutrients You Already Own.

“Unlock hundreds of pounds of NPK trapped in crop residue with EXCAVATOR®, powered by MICROBILIZE™; you may save even more fuel and labor with one less tillage pass. This stuff works.”

Manage Nitrogen for Just-in-time Delivery.

“Meristem’s MAINTAIN™ ELITE with Micro-Chain Technology captures and maintains more nitrogen in the upper root zone, increasing nitrogen uptake and utilization at planting time.”

Boost the Plant’s Focus on Building Massive Root Systems and Enhance Nutrient Availability.

“At planting, use REVLIN® HOPPER THROTTLE™, powered by ETHER™ Enzyme Technology, to deliver active, lively microbes to build massive root structures and boost nutrient availability. Growers that have liquid systems on the planter should use UPSHIFT® C liquid fertilizer concentrate to dramatically reduce the cost compared to traditional starters and jumpstart biologicals that make nutrients available.”

No-till farmer Lee Anderson, of Burnettsville, Indiana, was skeptical of the claims made for a biological “residue reducer” called EXCAVATOR but tried it on a small plot to evaluate. After applying the product in the spring to the prior year’s corn residue, Anderson pulled soil samples from EXCAVATOR treated ground and untreated ground at 40 days and again at 80 days. “I pulled the samples myself to be sure they were good ones,” he says. “I saw about a 48% increase in P and K with increases in Zinc, Magnesium, Calcium, and organic matter in the plots treated with EXCAVATOR,” Anderson says more good news came at harvest. His yield showed a +5.2 bu./A. advantage on the treated ground compared with the untreated. “Even if I didn’t get the yield bump, I really liked what I was seeing with the increased fertility,” he says.⁴

“We see in our research that these biologicals can help you be more efficient with your fertilizer,” says Connor Sible, Ph.D., crop physiologist at the University of Illinois. “It’s all about better management and stewardship of nutrients. If we can add something to our fertilizer plan to make that happen, it’s a win-win.”

Meristem Crop Performance is a specialty crop input manufacturer focused on helping U.S. farmers produce more bushels for less labor, time, and expense. Meristem has developed two patent-pending technologies – BIO-CAPSULE™ and MICROBILIZE™ that have been designed specifically to keep biologicals alive and make them easier to use as part of a total cropping system.