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Preventing herbicide mix-ups

Put a system in place to ensure misapplication doesn't happen

Every year, we hear of at least one serious incident of herbicide misapplication on turf. Glyphosate accidentally applied to greens is one example, as are preemergent herbicides that are unknowingly applied (usually via herbicide-impregnated fertilizer granules) on fairways that are about to be overseeded. These accidents usually happen when people don't realize they're applying an herbicide because:

- The commercial name resembles a nonherbicide product. For example, there are many pesticides, surfactants and water-treatment products that begin with the word aqua. Unfortunately, there are several glyphosate-based products that also have the word aqua in their names, making it easy to mix up products.

Accidental applications of glyphosate is an all-too-common occurrence that can be avoided.

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Table 1. Commercial names of commonly encountered glyphosate-based (pure glyphosate, as well as mixtures and salts) herbicides. Because glyphosate will kill almost any plant it comes in contact with, and it's ubiquitous and sold under a large variety of commercial names, take special care with proper identification, storage and use. This list is not all-inclusive, and there might be glyphosate-based products available for use in turf that don't appear at the right.

Accord	Eagre	Ranger	Shootout
Aqua Neat	Gly-4	Rattler	Showdown
Aquamaster	Gly Star	Razor	Silhouette
Aquapro	Glyfos	Rodeo	Strikeout
Aquastar	Glyphosate	Roughneck	Touchdown
Avocet	Honcho	Roundup	Trailblazer
Buccaneer	Kleen Up	Sequence	Traxion
Campaign	Mirage	Shoreklear	
Credit Duo	Prosecutor		

- The commercial name isn't recognized. While most people recognize RoundUp is a broad-spectrum herbicide, many other products based on glyphosate aren't so easily recognized. (See Table 1 above.)

- Label art is similar. Many herbicide product labels have similar colors and designs compared to other turf management products.

- Fertilizers that are impregnated with herbicides are applied as if they were just fertilizers. If labels aren't carefully reviewed at the time of each application, workers might mistake herbicide products for plain fertilizer products.

- Herbicide products are stored next to other turf management products. Workers might mean to pick up one product but take the one next to it instead.

- Dealers or distributors mistakenly deliver the wrong product.

PATENTS AND THEIR ROLE IN THE PROBLEM

Recently, there were only a few glyphosate-based products on the market, and it was easy to train

crew members about the proper and improper uses of RoundUp. But since Monsanto's patent for glyphosate expired, workers must now deal with close to 100 different glyphosate-based products with names ranging from Accord all the way through the alphabet to Traxion.

AVOIDING THE NIGHTMARE: THE LABEL

The brand name of the product alone is a poor indicator of the nature of the material that workers are about to spray. The product label contains all the information one needs to know to avoid the heartache of herbicide errors. The following elements of the front panel of the label are your guides to what is contained within (See Figure 1 below.):

1. Commercial name. This is the name the manufacturer selected for marketing the product. As Table 1 indicates, there can be several commercial names for each active ingredient.

2. Product type. Most labels indicate whether the product is an herbicide, insecticide, fungicide or other pest control product.

3. Active ingredient common and chemical names. This section of the label identifies each pesticide chemical and its percentage by weight in the product. The active ingredient can be listed in two different ways. The common name is the shorthand term chemists use to refer to this molecule. The chemical name is usually much longer and more descriptive. The federal EPA requires, at a minimum, the common name be used. For example, glyphosate is the common name for the active ingredient in RoundUp and other related products, while N (phosphonomethyl) glycine, in the form of its isopropylamine salt, is the chemical name. Note: The words other ingredients or inert ingredients refer to nonpesticide formulation components, such as water, spreaders, stabilizers, etc.

EDUCATING THE STAFF

Key staff members should understand these label components. The product type always should be double-checked before application, and if the word herbicide appears on the label, staff should be encouraged to ask questions if they have any doubts about the suitability of applying a product. If possible, they should be familiar with the commercial and common names, as well as use patterns of all pesticide products that are used on the golf course.

Workers need to be familiar with the herbicide-impregnated fertilizer products used on the golf course and understand these products have plant-killing capabilities.

Finally, workers need to avoid using design and/or colors on the label as a means of identifying products.

STORAGE

If possible, herbicides should be stored in a separate cabinet or room from all other products. At a minimum, specific shelves should be set aside and labeled for herbicides only.

CHECK AND DOUBLE-CHECK

Many superintendents have systems that require the approval of a second person – usually the superintendent or a designated manager – before daily product selections are applied. This type of arrangement is a good safety net for catching product mix-ups and probably is most successful when the manager assumes final responsibility for the product selections. **GC1**

Wendy Gelernter and Larry Stowell are the owners of PACE Turf. For more information about avoiding mishaps and other production practices, visit www.PaceTurf.org.

Figure 1. A glyphosate product label, highlighting the information that's most useful when determining the nature and damage potential for pesticide products.



ACTIVE INGREDIENT:
 *Glyphosate, N-(phosphonomethyl)glycine,
 in the form of its isopropylamine salt53.8%
 OTHER INGREDIENTS:46.2%
 100.0%
 *Contains 648 grams per liter or 5.4 pounds per U.S. gallon of the active
 ingredient glyphosate, in the form of its isopropylamine salt. Equivalent
 to 480 grams per liter or 4 pounds per U.S. gallon of the acid,
 glyphosate.

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BY CATHIE CUSH

A new approach

Fertilizer meta-catalysts can maximize nutrient management

Rising natural gas prices, an increased focus on biofuel crops and growing offshore demand have driven fertilizer costs to record highs. In many markets, fertilizer costs have almost doubled since 2007. Additionally, the growing environmental movement is raising concerns about nitrate and phosphate leaching and runoff.

The industry has tried many approaches to address these concerns, with only partial satisfaction. Some organic products may be costly or offer lackluster performance. However, some research indicates a new category of fertilizer catalysts offers relief for turf managers.

THE NEED FOR NUTRIENTS

Like all living things, plants require various types of nutrients. Nonmineral nutrients – carbon, oxygen and hydrogen – are readily available from water, sunlight, soil and the atmosphere. Plants also require more than a dozen primary mineral nutrients – macronutrients and micronutrients, most of which are obtained from the soil and decaying plant matter.

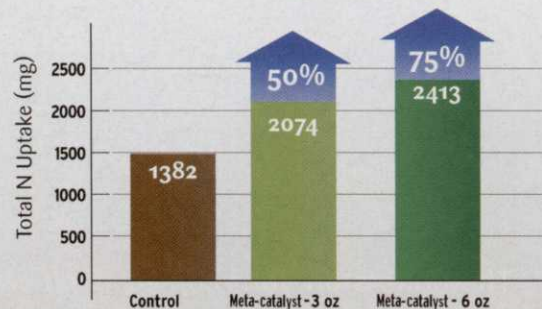
The three most important macronutrients are nitrogen, phosphorus and potassium, which provide raw materials that the plant needs at a molecular level to grow and thrive. Plants use these nutrients in large amounts to grow and resist disease. Nitrogen is necessary for all metabolic processes, including protein and energy synthesis. It's a component of chlorophyll and associated with rapid plant growth and vigor. Phosphorus plays a key role in photosynthesis and is necessary to support plant maturation, rapid growth and stress resistance. Potassium is necessary for protein synthesis, photosynthesis and disease resistance.

Soil analysis results on extremely salt-contaminated soil by Texas A&M University:

	Calcium	Magnesium	Potassium	Sodium	Total Salinity	Soluble Salts
Meta-catalyst	154 ppm	83 ppm	44 ppm	178 ppm	815 ppm	2.06 mmhos/cm
Alternate Treatment	493 ppm	284 ppm	94 ppm	494 ppm	2138 ppm	5.37 mmhos/cm

Figure 1: The technology in the meta-catalyst has been shown to reduce total salinity and soluble salts, freeing up nutrients for plant use.

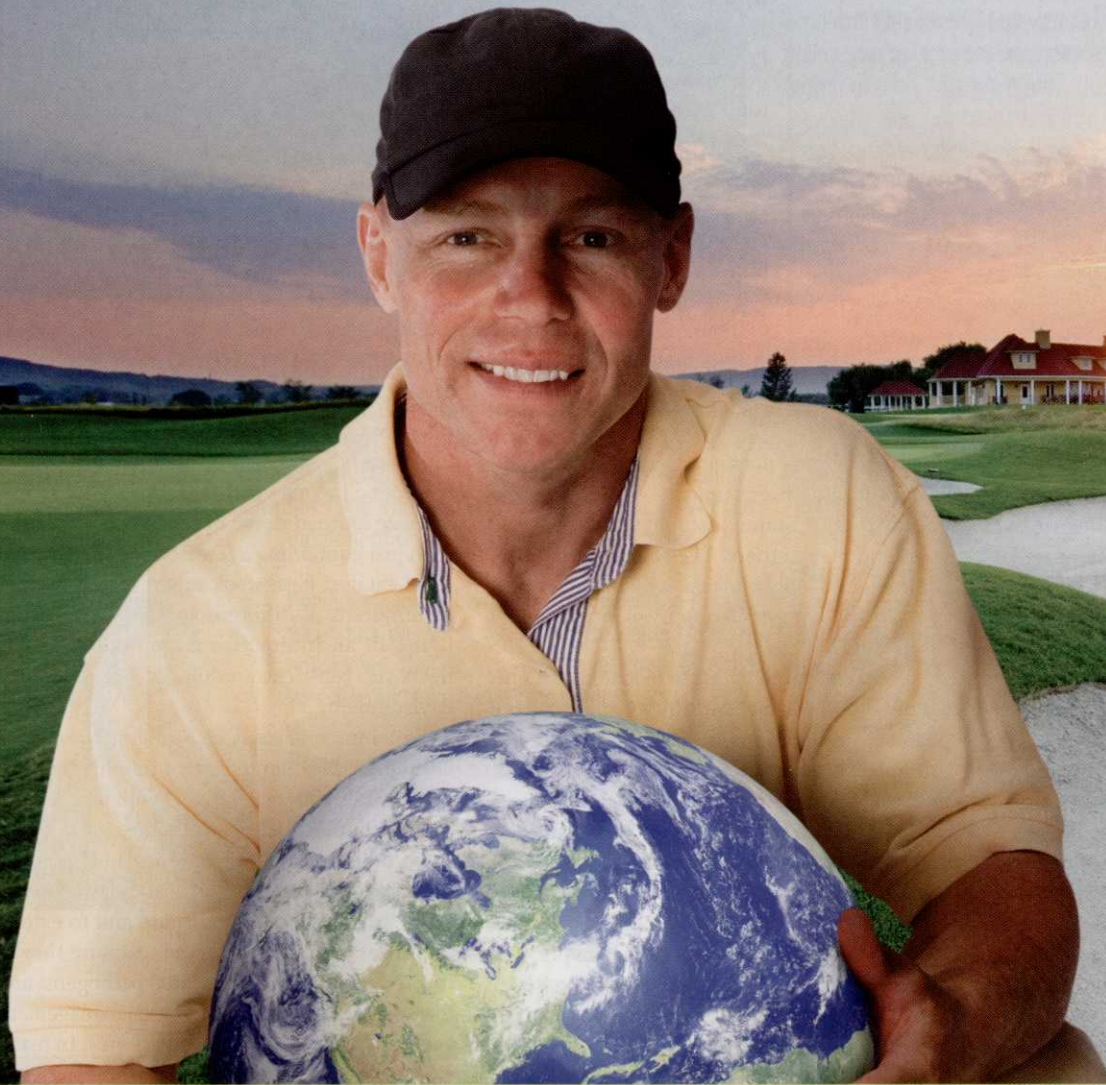
Meta-catalyst increases nitrogen uptake in turfgrass



University of Florida perennial ryegrass in hybrid bermuda grass green

Figure 2: The technology in the meta-catalyst increases nutrient uptake.

WE'RE CHANGING THE GAME. FOR THE BETTER.



Introducing CIVITAS™—a breakthrough in fungus control technology.

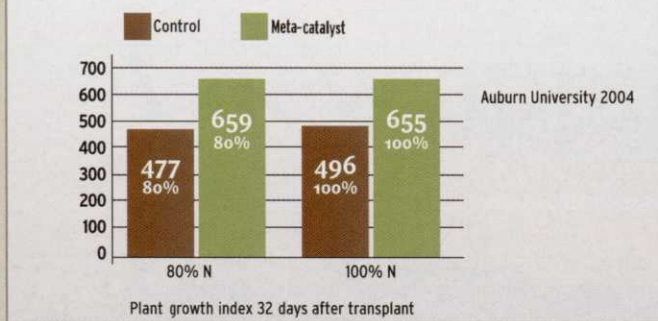
Turn on the natural defenses of your turf and drive away fungus.

CIVITAS is unlike any other fungicide you've ever used. That's because – unlike conventional chemistry – CIVITAS does not kill anything. Its unique mode of action activates the natural defenses of your turf enabling it to effectively defend itself against dollar spot, brown patch, anthracnose, snow mold and other fungi. Without the resistance headaches. Embrace CIVITAS and change your game for the better.



changing the game

80% catalyzed fertilizer outperforms 100% fertilizer alone



THE ROLE OF MICROBES

The oldest form of life on earth, microorganisms (or microbes), are tiny single-cell organisms such as micro arthropods, nematodes, protozoa, fungi, algae and bacteria. All plants and animals depend on microbes to digest food.

Microbes are everywhere, with especially high concentrations in the soil. A single teaspoon of healthy soil may contain 25,000 algae, more than 120,000 fungi and more than 1 billion bacteria. Using genetic analysis, researchers estimate a biologically rich soil sample may contain as many as 10,000 distinct species of bacteria. Of these many species, only about 1 percent or fewer can be cultured (isolated and grown synthetically). Even less are known to have specific soil functions.

Microorganisms play active roles in many aspects of the soil environment in which they live. Their activity has measurable impact on organic matter and nutrient availability, nutrient cycling and uptake (by the plants), and soil structure and function. Living in the soil, this community of microbes will metabolize various organic and inorganic materials. All microbes don't process the same nutrients. Different species metabolize different food sources. Some species may do a less effective job in the absence of a microbial community structure that aids efficient metabolic functioning. The

microbes absorb nutrients, process them and release unique biochemicals – a rich variety of enzymes, proteins, carbohydrates, organic acids and many others. The soil solution holds these exuded biochemicals, which play critical roles in the complex array of plant/microbial interactions.

Current research points to biochemical communication as a mechanism for many of the observed interactions in growing plants. For example, bacteria will multiply in the presence of nutrients, but they also seem to be receptive to biochemical signals indicating the food reserves are limited or that conditions are not otherwise optimal, which may slow down or stabilize population growth.

Other signaling agents – for example, the release of root exudates that nourish the indigenous microbial community – may be required to elicit certain functions from a plant. Adding microbes to fertilizer blends (along with concentrated solutions of their biochemical byproducts), appears to help increase the plant's efficient use of essential nutrients.

However, recent research points to the likelihood that the product's metabolic capacity, rather than organism counts, may be the critical variable in enhancing fertilizer efficiency. In other words, products with a broad metabolic profile may metabolize a wider range of food

Figure 3:

Transplanted nonturf plants that were treated with 80-percent fertilizer containing the meta-catalyst fertilizer showed significantly better growth than nonturf plants treated with 100-percent fertilizer alone.

sources, making them more available to the plant. Improved nutrient uptake by the plant will, in turn, build greater biomass (roots and shoots) and allow the plant to reach its full genetic potential better.

A NEW CATEGORY: META-CATALYSTS

The concept of adding microbes or other enhancements to fertilizer is not new. However, much of the focus has been placed on growing and harvesting individual strains that have been cultured in high concentrations in the laboratory.

A fertilizer meta-catalyst, on the other hand, starts with a base stock of naturally occurring microbes that's highly diverse – both micro-biologically, as shown in plate counts, and in metabolic capacity – that is, the ability to metabolize a broad range of food sources. Rather than just containing a few isolated species, this meta-catalyst base stock might include scores or hundreds of different strains of organisms living in an interactive community that reflects the soil's extraordinarily rich microbial environment.

To commercialize a meta-catalyst, the diverse base stock is fermented in community, and the microbes are harvested along with a fermentation medium, which contains the rich deposits of naturally exuded biochemicals. The better products are taken through a stabilization process to make them easier to use and to extend their shelf life. They're tested to assure they're free of known plant and animal pathogens, and then profiled for production batch management and traceability to ensure consistency. In many cases, the base solution may be blended with other beneficial materials such as humic acid, nutrients or other biostimulants to bundle together benefits for the plant and soil.

The end result is a fertilizer meta-catalyst that contains viable, beneficial bacteria, a complex of fermentation byproducts (biochemicals) and other materials that increase the efficient processing, conversion and uptake of soil-applied nutrients. The meta-catalyst may be added to

Superintendent at Leading Saucon Valley Country Club Course Reports Exceptional Control of Annual Bluegrass Weevil and White Grubs with ALOFT® Insecticide



Saucon Valley Country Club, host of the 1992 and 2000 Senior Opens and 2009 U.S. Women's Open

In an attempt to control the Annual Bluegrass Weevil, Jim Roney, course superintendent at the 850 acre, 60-hole Saucon Valley Country Club in Bethlehem, Penn. has tried multiple products and received lackluster results. Saucon Valley was the site for the 1992 and 2000 U.S. Senior Opens, as well as the host of the 2009 U.S. Women's Open.



Jim Roney

Roney's main concern lately has been the Annual Bluegrass Weevil. A tough bug to control, Roney anticipated that a treatment that controlled the weevil would take care of the other insects as well.

Previous Annual Bluegrass Weevil products results mediocre

Roney reports that he had tried everything on the market in the past to control the weevils with other products, but determined that the results were mediocre at best. **"My goal has been to take advantage of the early application, to prevent the adults from laying eggs,** since the larvae are what cause the most damage," says Roney. "But when I used those products that claimed adult control, I just wasn't seeing that happen."

With the 2009 U.S. Women's Open looming, Roney contacted Dr. Harry Niemczyk, turfgrass entomologist, to determine his options. Dr. Niemczyk engaged Roney in a comprehensive field trial of seven different products at varied rates.



Annual Bluegrass Weevil

Outstanding performance on Annual Bluegrass Weevils achieved with ALOFT

"In my experience, courses either have a really bad problem or a minor weevil problem. But on courses where you have a really bad problem, like at Saucon Valley, you need to find something that provides the best control for the greatest length of time," states Roney. "Keeping this in mind, **I was completely blown away by the control I saw on the ALOFT holes. I'd say we experienced close to 95% control.**"

Season-long white grub control reported

Roney experienced season-long control of white grubs in addition to the Bluegrass Weevil with the full application of ALOFT. "The full application of ALOFT provided season-long control of all white grubs. We actually experienced some white grub damage in areas where we used other products, but **zero damage in the ALOFT plots,**" according to Roney. "I was so impressed with the results that **I've decided to put all my eggs in one basket, and will be using ALOFT on the entire 60 holes.**"



White Grub

Extensive university field trials verify similar results

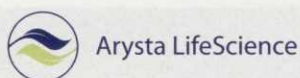
Dr. Doug Houseworth, technical service manager at Arysta LifeScience, has worked with university researchers in extensive field trials over the last two years, confirming the results Jim Roney found – that ALOFT, applied preventively, offers season-long systemic and contact control of multiple insect pests. Houseworth reported, "The more experience we have with ALOFT on early season insects, surface-feeding insect pests, and all white grubs, the more evidence we see that the unique activity of ALOFT increasingly delivers exceptional insect control throughout the season."

More information

To watch a video interview with Jim Roney about his successful experience with ALOFT at Saucon Valley Country Club, view the latest ALOFT field trial data, and learn where to buy ALOFT, please go to www.arystalifescience.us/alofttestimony.

Aloft® Insecticide

The One-Two Punch™



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Figure 4: Potential cost savings.

FERTILIZERS	Cost per ton	Application rate-lb/1000 sq ft	Amount Nitrogen	Cost per 1000 sq ft	Savings per sq ft
30-0-10 50% Slow N	\$920	3.5	1.05	\$1.61	
30-0-10 50% Slow N with Meta-catalyst	\$980	2.75	0.825	\$1.35	16.3%
46-0-0	\$1,000	2.5	1.15	\$1.25	
46-0-0 with Meta-catalyst	\$1,060	2	0.92	\$1.06	15.2%
15-25-10 33% SCU	\$1,085	4	0.6	\$2.17	
15-25-10 33% SCU with Meta-catalyst	\$1,150	3	0.45	\$1.73	20.51%

Some studies suggest this microbial technology can increase nutrient uptake in grass and other plants by 25 percent or more.

granular and liquid fertilizer products to enhance performance.

PROVEN RESULTS

Research about fertilizer meta-catalysts shows promising results. More than 400 field, university and third-party studies have been conducted on such blends, and the products have been proven effective in improving nutrient uptake into plants. The potential implications are enormous – opening the door to reduced fertilizer application rates, improved fertilizer performance and the possibility of reduced leaching and runoff of soil nutrients.

Some of the studies suggest this microbial technology can increase nutrient uptake in grass and other plants by 25 percent or more. A University of Florida study about perennial ryegrass and hybrid bermudagrasses showed a soil application of the meta-catalyst increased nitrogen uptake over the control by between 50 percent and 75 percent at application rates of 3 ounces and 6 ounces per thousand square feet, respectively. (See figure 1.)

Meta-catalyzed fertilizer appears to have a significant impact on the plant itself – as measured at roots and shoots. Auburn University conducted a controlled study in bentgrass. Plots were treated with a conventional 19-5-9 fertilizer or a meta-catalyzed 19-5-9 fertilizer, each applied at a rate of four pounds per 1,000 square feet. Bentgrass in the treated plots had 91-percent higher fresh root weight, 105-percent

higher fresh shoot weight and 37-percent higher average diameter.

In a similar Auburn study of root growth in tall fescue, samples treated with the microbial technology showed increased biomass, especially root mass, in less than four weeks. Deeper roots provide more surface area for nutrient uptake and can draw on soil deposits of nutrients that haven't been depleted yet. A healthier root structure also can help plants survive stress better, even in dry soils. Enhanced nutrient uptake is important particularly for new plant establishment.

IMPLICATIONS

When plants use nutrients more efficiently, it's possible to use less fertilizer – or to use fertilizer with a lower ratio – to get the same results. When nutrient uptake is increased by 25 percent or more, one can reduce fertilizer application rates by as much as 25 percent without sacrificing performance. For example, a turfgrass that's normally fertilized at a rate of 4 pounds per 1,000 square feet could be treated at just more than 3 pounds per 1,000 square feet with a meta-catalyzed blend. Similarly, if a ton of fertilizer treats 11.5 acres at the 4-pound rate, a ton of meta-catalyzed fertilizer treats 14.4 acres because it's applied at a lower rate. In either case, the use of the enriched blend could reduce costs by 15 to 20 percent or more.

As an alternative to applying the lower rate, it's possible to use a meta-catalyzed fertilizer with a reduced nutrient content. For example, instead of applying conventional 30-0-10 fertilizer at 4 pounds per 1,000 square feet, an Auburn study says it's possible to apply a meta-catalyzed 22-0-8 fertilizer at the same rate to achieve the same results.

In 2004, an Auburn team fertilized transplanted broccoli plants. Plants were broken into four groups. Two groups were treated with conventional fertilizer with 80 percent and 100 percent nitrogen, respectively. Two other groups were treated with meta-catalyzed 80-percent or 100-percent fertilizer. After 32 days, plants in the meta-catalyzed fertilizer groups were more than 30 percent larger than the other plants, and the 80-percent meta-catalyzed fertil-