

Use corn gluten meal as a natural pre-emergent weed control

By Nick Christians

There was a time when pesticides were widely used on turf with little concern about their effects on the environment and human health. This has changed dramatically, and there is now a growing interest in reducing the use of synthetic pesticides and in finding natural products to replace them.

Considerable progress has been made in the development of alternative insect controls. These include things like insecticidal soaps, bacteria that kill insects selectively, pheromone traps and predatory insects. Weed control has been more difficult, however, and standard herbicides have generally been the only solution for weedy turf.

A material that has received a lot of attention in recent years is a byproduct from corn milling called "corn gluten meal." This material is being widely marketed in the United States and Canada as a naturally occurring pre-emergent herbicide and nitrogen source.

Where did the idea originate?

The concept of using corn gluten meal as a natural herbicide originated at Iowa State University in the 1980s. The idea began as a secondary observation from a totally unrelated research project. The original study involved the use of corn meal as a growing medium for pythium, a fungal organism that causes a serious turf disease. The pythium was cultured on corn meal for several weeks and then incorporated into a seed bed before grass was seeded. In adjacent plots, raw corn meal directly from the bag was also incorporated into the soil before seeding. The objective of the study was to observe the effects of the fungal organism on the grass.

The secondary observation came when the germination of the grass was inhibited by the raw corn meal, whereas the grass seed in the plots that received the same amount of corn meal with pythium germinated normally. This indicated there was some type of organic substance in the corn meal that was destroyed when it was cultured with fungal organism.

It was suspected that this substance had some type of inhibitory effect on the germination of grasses. The next step involved the screening of several components of corn meal. These included things like corn starch, corn germ and corn protein (corn gluten meal). This study demonstrated that there was something in the corn gluten meal that had an inhibitory effect on the root formation of germinating seeds.

This led to other studies that demonstrated that corn gluten meal was an effective nitrogen fertilizer on mature grasses and that it could also inhibit the establishment of annual weeds like crabgrass. Eventually, this led to the idea that corn gluten meal could be used as a natural pre-emergent herbicide for turf, as well as gardens and crop production areas.

What is corn gluten meal?

Corn gluten meal is a byproduct of the wet-milling process of corn grain. This process separates the components of the grain to obtain starch and other valuable materials. The corn gluten meal is the protein fraction of the corn.

Corn gluten meal contains 60 percent protein and 10 percent nitrogen (N) by weight and makes an excellent fertilizer for plants that have well-established root systems. The inhibitory substance it contains prevents the formation of roots on germinating seedlings of a variety of grass and broadleaf plants. This includes germinating lawn grasses. Therefore, the product should not be used within six weeks before desirable grasses are seeded.

It is used as a pre-emergent material by applying it to mature stands of grass with well-developed root systems before weeds germinate. Weed establishment is prevented by inhibiting root growth at germination. It is a pre-emergent material only.

How is it used?

Timing is everything with corn gluten meal. It must be applied before weed germination.

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TABLE 1**Companies that market corn gluten meal under license with Iowa State University****Alternative Earth Products Corp.**

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Fax: 641-472-6189
Web site: www.soiltechcorp.com

Walt's Organic Fertilizer Co.

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Wilbur-Ellis Co.

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Portland, Ore. 97209
Ph: 503-227-2661
Fax: 503-274-2518

The standard recommendation for its use includes the application of 20 pounds of product (2 pounds N) per 1,000 square feet in the spring in a two-to-four week period before the germination of summer annuals like crabgrass. This time will vary by location.

Crabgrass will germinate when soil temperatures reach 55 degrees F. The two pounds of nitrogen releases slowly and provides uniform greening and growth through the summer. The second application of 20 pounds nitrogen per 1,000 square feet on cool-season turf is made around August 15. This helps control some of the perennial broadleaves that germinate in late summer and provides another 2 pounds of nitrogen through the fall. These two applications provide 4 pounds nitrogen per 1000 square feet per year, which is sufficient for most cool-season lawns.

Tests performed on areas with high populations of crabgrass indicate that the crabgrass will be reduced by about 60 percent in the first

year of application, in the 80 percent or better range in year two and over 90 percent reduction by year three. This cumulative effect is likely due to an ecological effect of a thickening of the turf due to the nitrogen and to a reduction of weed seed from year to year. There is no carryover of the inhibitory material. Its effect generally dissipates in five to six weeks after application.

There are many other rates and methods of applications being recommended for corn gluten meal. Some individuals are claiming good results with applications of 10 pounds product per 1,000 square feet. Others are combining corn gluten meal with turkey manure and other natural organic products in effective, all-organic programs that appear to be working well.

On warm-season turf like bermudagrass, it can be repeat applied through the weed germination period and through the summer in at amounts equivalent to approximately one pound N per 1,000 square feet per growing month.

What makes it work?

Once it was determined that corn gluten meal contained a natural compound or compounds that could inhibit weed establishment, the next logical step was to determine the nature of that compound. Graduate student Dianna Liu began this work in 1989.

Liu eventually determined that five individual dipeptides (combinations of two amino acids) had the ability to inhibit

root formation of germinating seedlings. These dipeptides were glutamyl-glutamine, glycyl-alanine, alaninyl-glutamine, alaninyl-asparagine and alaninyl-alanine.

Nick Christians is a professor of horticulture at Iowa State University. He teaches undergraduate and graduate turfgrass science courses and is involved in research projects on turfgrass weed control, nutrition and management.

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SECTION STAFF

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Curt Harler
440-238-4556; 440-238-4116 (fax)
curt@curtharler.com

Goldfom Staff Contact

Frank H. Andorka Jr.
440-891-2708; 440-891-2675 (fax)
fandorka@advanstar.com

Online Editor

Lynne Brakeman
440-826-2869; 440-891-2675 (fax)
lbrakeman@advanstar.com

Senior Science Editor

Dr. Karl Danneberger
614-292-8491; 614-292-3505 (fax)
danneberger.1@osu.edu

Production Manager

Jill Hood
218-723-9129; 218/723-9223 (fax)
jhood@advanstar.com

Art Director

Lisa Lehman
440-891-2785; 440-891-2675 (fax)
llehman@advanstar.com

Publisher

Patrick Jones
440-891-3126; 440-891-2675 (fax)
pjones@advanstar.com

Corporate & Editorial Office

7500 Old Oak Blvd.
Cleveland, OH 44130-3369

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