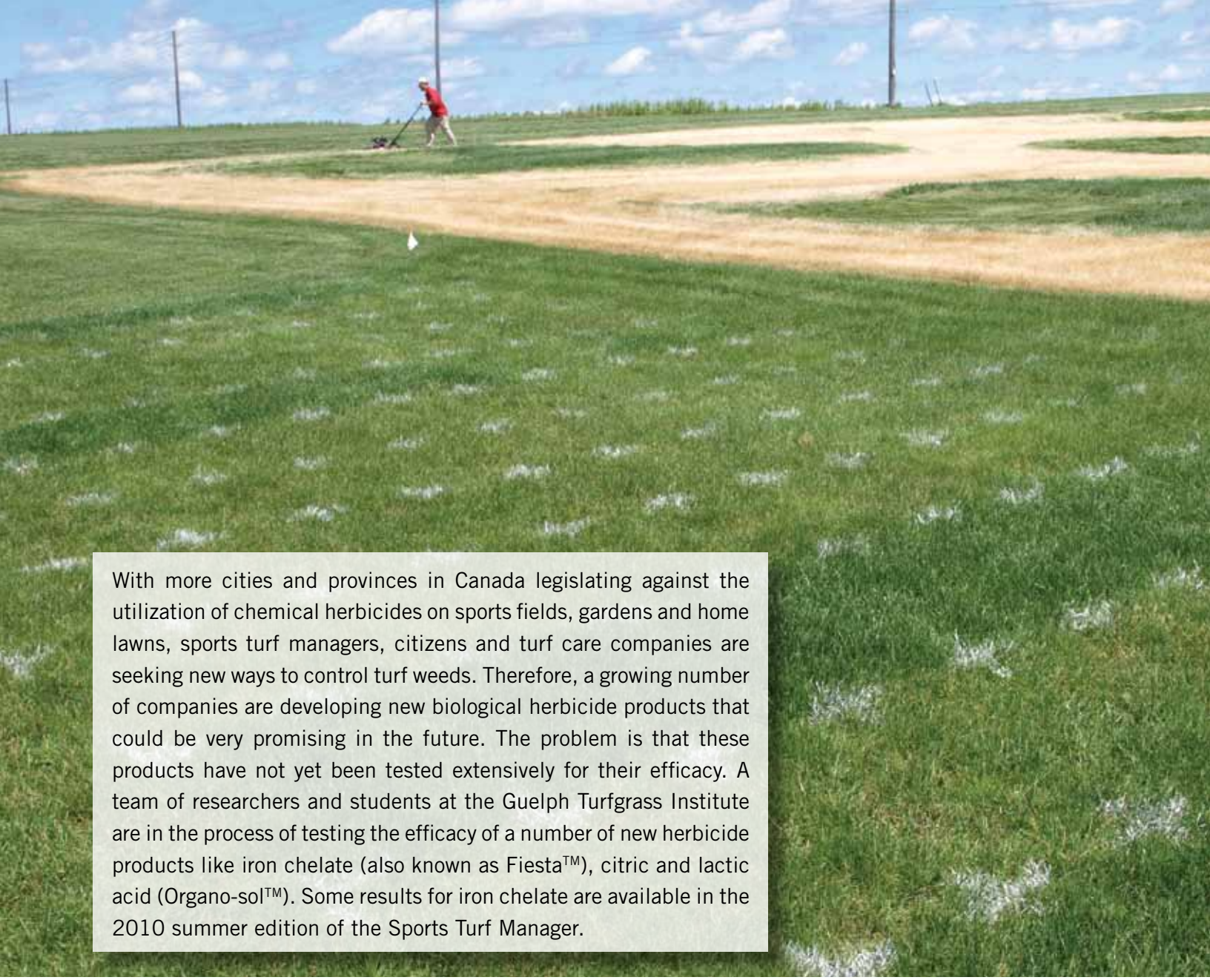

With more cities and provinces in Canada legislating against the utilization of chemical herbicides on sports fields, gardens and home lawns, sports turf managers, citizens and turf care companies are seeking new ways to control turf weeds. Therefore, a growing number of companies are developing new biological herbicide products that could be very promising in the future. The problem is that these products have not yet been tested extensively for their efficacy. A team of researchers and students at the Guelph Turfgrass Institute are in the process of testing the efficacy of a number of new herbicide products like iron chelate (also known as Fiesta™), citric and lactic acid (Organo-sol™). Some results for iron chelate are available in the 2010 summer edition of the Sports Turf Manager.

What is the Future for Corn Gluten Meal Based Products for Controlling Weeds?

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In 2010, we began a number of trials with the objective of evaluating the efficacy of corn gluten meal (CGM) and its liquid derivate (hydrolyzed corn gluten meal) as a pre-emergent herbicide. Corn gluten meal is the protein fraction of corn extracted from the wet-milling process and is used mainly for animal feed. Unlike Fiesta™ and Organo-sol™, CGM is not a new product on the market. In the early 1990s, scientific research found that CGM inhibited root elongation of many broadleaf weeds like dandelion (*Taraxacum officinale*), white clover (*Trifolium repens*), Canada thistle (*Cirsium arvense*), smooth crabgrass (*Digitaria ischaemum*), catchweed bedstraw (*Galium aparine),* curly dock (*Rumex crispus*), purslane (*Portulaca oleracea*), redroot pigweed (*Amaranthus retroflexus*) and giant foxtail (*Setaria faberi*). The solubility of this product was poor, which limited broad scale application due to the large amount of this product required to ensure efficacy[1].

OTS HIGHLIGHT
Presented February in Guelph, Ontario.

Researchers discovered that the protein fraction of gluten meal was responsible for the inhibition of root elongation of plants


Photo 4

Photo 1


Photo 2

Photo 1. Corn gluten meal, greenhouse experiment. **Photo 2.** Air sprayer, field experiments. **Photo 4.** Clover cover in the overseeding experiment. Notice the darker green colour in the gluten meal (2x) plots.

and decided to further develop the technology to increase its efficiency. They found that hydrolyzed corn gluten meal (HCGM), which is prepared with a proteinase from a bacterial source, had a higher inhibitory activity to the root growth of germinating seeds than CGM and is highly water soluble making it more adequate for a broad scale use. With new regulations, it is imperative to develop weed management alternatives for turfgrass managers in Ontario and this has renewed the focus on biological herbicides like CGM and HCGM.

A number of trials were implemented in 2010 to test the efficacy of both CGM and HCGM as a pre-emergent herbicide. We began with a simple greenhouse experiment to test the effect of those products on germination and survival of both weed and grass species. On the field, we wanted to test the efficacy of corn gluten meal and hydrolyzed corn gluten meal in a turf establishment and on an existing turf stand. For all the experiments we have tested two rates of both CGM and HCGM (label and 2x rate) and compared these products with a positive control (Bensulide) and a negative control where only water was applied.

Greenhouse Experiment

We found a significant decrease of survival rate after germination for all weed species for the CGM treatments, but there was no difference between application rates. Six weeks after seeding, survival rate and germination in the corn gluten meal treatment, compared to the control, was 58% lower for prostrate knotweed, 92% lower for dandelion, 74% lower for white clover and 85% lower for black medic. However, the low dissolution rate of corn gluten meal could have limited the physical space available for seed germination (Photo 1). For the hydrolyzed corn gluten meal, we did not find any suppressing effect. For grasses, neither product reduced survival rate after germination of grass except for Kentucky bluegrass (*Poa pratensis*) seeded one week after treatment application.

Grass Establishment

In the field, three grass species were seeded: Kentucky bluegrass, perennial ryegrass and a fine fescue mix (*Festuca spp.*) on a bare tilled and leveled area. Corn gluten meal was applied by hand and hydrolyzed corn gluten meal was applied with an air sprayer at a rate of 20 ml per second (Photo 2). We did two experiments, one in the spring and one in the summer of 2010. For the spring trial, we found a reduction of weed cover for the CGM treatment regardless of the amount applied for fine fescue. But even if the reduction was statistically significant, there was a

Researchers discovered that hydrolyzed corn gluten meal, prepared with a proteinase from a bacterial source, has a higher inhibitory activity to the root growth of germinating seeds than corn gluten meal and is highly water soluble.

substantial amount of weed cover even if the grass cover was also higher (Photo 3). The weed suppressing effect of CGM and HCGM treatment was not noticed either on Kentucky bluegrass or perennial ryegrass seeded plots. Both gluten meal types did not reduce turfgrass germination for the species studied. The same results were found in the summer trial; both gluten meal types did not reduce turfgrass establishment and were not efficient as a weed suppressor (Photo 3).

Existing Turf & Overseeding

In this study, we applied CGM and HCGM, as well as Bensulide, on an existing turf and we seeded one weed (white clover) and one grass (perennial ryegrass) 0, 2, 4, and 6 weeks after treatment application. The weed cover measurements revealed a significant effect of CGM at 2x label rate on white clover cover, especially two to six weeks after treatment application with more than 60% reduction compared to the control plots (Photo 4). A similar trend was found for CGM applied at label rate but the difference was not statistically significant. Surprisingly, Bensulide did not reduce white clover cover. All herbicide treatments did not reduce (or increase) perennial ryegrass cover. In fact, we measured a very low amount of this species (below 5%). The efficacy of CGM and the low germination of perennial ryegrass could be due to a reduction of water application on the field during the trial to prevent leaching of the hydrolyzed corn gluten meal.

Conclusion

Our different trials indicated that CGM could be an efficient product to control white clover germination on existing lawns. We also discovered that hydrolyzed corn gluten meal did not affect turfgrass establishment but had no suppressing effect on broadleaf weeds in an establishment scenario. Further research is needed for this product, especially the timing of application and issues with solubility need to be addressed. As mentioned earlier in this article, CGM can be an interesting alternative to control weeds, but its use should be preferred for home lawns due to the high amount of product needed and its method of application. Finally, the lack of weed control by CGM when establishing turfgrasses requires further research and development to find other alternatives for establishing turf.

Photo 3. Weed cover 6 weeks after treatment application.

[1]Bingaman and Christian 1995, Christian 2001, Daily et al. 2002. Funding provided by Environmental Factor, Agricultural Adaptation Council, and the Ontario Ministry of Agriculture Food & Rural Affairs.