Control Summer Stress Complex*

*Occurs when stresses such as Rhizoctonia and Pythium species combine with heat, traffic and other factors. This results in reduced turfgrass vigor.

RHONE-POULENC AG COMPANY
P.O. Box 12014, 2 T.W. Alexander Drive
Research Triangle Park, NC 27709
1-800-334-9745

Contaminated soil must be stored on site until lab results determine the best disposal method. Extremely contaminated soil must be hauled to an approved burn center — a very expensive proposition.

ing underground so that you can establish a perimeter for the plume of contaminated water.

At this point American Environmental Group entered and began doing the work. The groundwater flow direction was established and test wells were installed to test the water on the perimeter of the plume.

Test wells were installed in the area where the tanks had been, and a deep well was also installed to see if the contamination had moved down through the water. The other wells were drilled mainly downstream to see how far the plume had moved.

The test wells were well placed because once the perimeter was established, only one additional well was needed to prove its boundary. With the tests all complete and the plume defined, the CAR can be submitted.

Our water tests came back with an 81 percent reduction in contamination since the first test. If the contamination continues to decline at that rate, we may be able to avoid remediation entirely.

This has been an experience that I will not forget and it is one that I hope that I will not have to repeat.

The tremendous size of the spill and the excessive costs for the cleanup, report filing and testing can ruin a budget and, if large enough, a business.

What have I learned from all of this?

•First, if you have underground tanks, get insurance.

•My experience has been that the DER is not out to make your life miserable as long as you comply with the rules and meet the deadlines. Good communication is the key.

•Get a good, reputable, tank-removal company… one that does this type of work every day. Drew Bentley had the experience to guide me through soil remediation, thus saving us money.

• Finally, take it one day at a time. I wanted the whole thing cleaned up and out of sight overnight. Things like this take time: Tests take time, DER approvals and/or decisions take time. Remediation takes a long time.

Once the contaminated soil is removed, then time is your friend.

I hope that no one else has to go through this, but I'm sure that others will. I wish you lots of luck and patience.

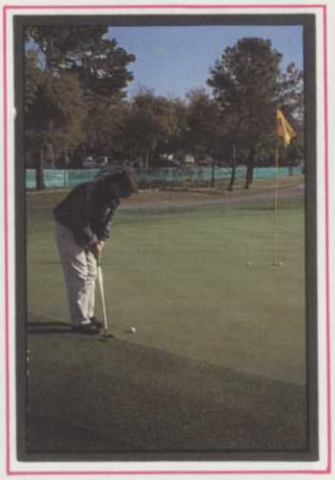
Poa trivialis

Advantages of Winter Overseeding with LASER *Poa trivialis*

- Can be cut close immediately after overseeding
- Germinates quickly
- Improves putting surfaces compared to greens overseeded with 100% perennial ryegrass
- Darker color
- Retains dark color in winter
- Tolerates cold weather
- Provides a smooth spring transition
- Performs well in damp soil
- Tolerates shade

LASER Keeps Greens in Play

Overseeding with Laser *Poa trivialis* has a big advantage over ryegrass. You won't hear golfers complain about poor putting greens during the fall grow-in period like you do with ryegrass. Laser can be cut close immediately after germination, unlike perennial ryes that need to become established first. With Laser there's no waiting. That means uninterrupted play on your greens after fall overseeding.



Use LASER

More and more professionals are using a *Poa trivialis* for their overseeding programs. Make sure you get all the benefits. Use Laser — alone or blended with perennial ryegrass and chewing fescue — for a smooth putting surface and a much darker color.

NOTE: Laser *Poa trivialis* is included as a component of Marvelgreen + Laser and Marvelgreen Classic winter overseeding mixtures.

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(503) 928-3100
(800) 547-4063

Enhancement products tested on experimental putting green

MONICA L. ELLIOTT
and MARCUS PREVATTE
University of Florida - IFAS
Fort Lauderdale Research
and Education Center

During the summer of 1990, the Florida Golf Course Superintendents Association (in cooperation with the University of Florida built a golf course putting green (20,000 sq. ft.) at the Fort Lauderdale Research and Education Center.

The purpose was to develop a field laboratory to be used by turf researchers for their research projects and to conduct independent field testing of products that the superintendents wished to evaluate on bermudagrass maintained as a putting green. The first project initiated in May 1991 for the FGCSA was an evaluation of nitrogen sources, primarily slow-release nitrogen sources.

A major concern of the golf course superintendents, however, is the root loss that seems to occur during the long summer season in southern Florida. Part of this root loss may be due to soilborne pathogens. However, most bermudagrass putting greens are maintained at a cutting height of $^{3}/_{16}$ inch or less. This places a natural stress on the root system by virtue of the fact that there is very little leaf tissue to support photosynthesis. Thus, a second project was initiated in May 1992 to evaluate natural organic fertilizers and cytokinin-like hormonal products derived from sea plants (kelp) as potential products to help minimize

Table 1

Natural organic fertilizers and cytokinin-like products evaluated on the FGCSA Research Green from May 1992 through April 1993.

Treatment Number	Treatment	Rate per 1000 sq. ft.*	Application Application Interval
1	Enersol**	16 fl oz	Once per week for 3 weeks with 8 weeks between the multiple applications
	IBDU mix***	0.5 lb N	2 weeks
2	PanaSea Plus	4 fl oz	2 weeks
	IBDU mix	0.5 lb N	2 weeks
3	PanaSea Plus	4 fl oz	4 weeks
	IBDU mix	0.5 lb N	2 weeks
4	Kelpak	4.5 fl oz	First application only
		1 fl oz	6 weeks
	IBDU mix	0.5 lb N	2 weeks
5	Eco 7-1-5	0.5 lb N	2 weeks
6	Sustane 5-2-4	0.5 lb N	2 weeks
7	Ringer 8-2-8	0.5 lb N	2 weeks
8	Milorganite 6-2-0	0.5 lb N	2 weeks
	sulpomag (0-0-22)	0.5 lb K	2 weeks
9	Eco 7-1-5	0.25 lb N	2 weeks
	IBDU mix	0.25 lb N	2 weeks
10	Sustane 5-2-4	0.25 lb N	2 weeks
	IBDU mix	0.25 lb N	2 weeks
11	Ringer 8-2-8	0.25 lb N	2 weeks
	IBDU mix	0.25 lb N	2 weeks
12	Milorganite 6-2-0	0.25 lb N	2 weeks
	IBDU mix	0.25 lb N	2 weeks
13	IBDU ™ mix only	0.5 lb N	2 weeks

***Fertilizer rate was increased 2X from November 1992 through April 1993 to a total of 1.0 pounds N per 1000 sq. ft. every 2 weeks.**
****Treatment was terminated November 1992, but area continued to be fertilized.**
*****The IBDU mix is a blend of 8% N (as IBDU™), 8% K (potassium magnesium sulfate=sulpomag), 4% Mg, 0.5% Fe (iron oxide and iron sulfate), and 0.4% manganese sulfate.**

A major concern of the golf course superintendents, however, is the root loss that seems to occur during the long summer season in southern Florida.

Acknowledgments

This project was supported by the following companies: Sinnamon Brothers/Eco, Inc.; Ringer Corporation; Milorganite Division - MMSD; Sustane Corporation; Emerald Isle, Ltd. (PanaSea Plus); Environmental Supplies, Ltd./Arbor Groves, Inc. (Kelpak); and American Colloid (Enersol).

We would also like to take this opportunity to thank the following suppliers for their donations of equipment and materials for the basic maintenance of the FGCSA Research Green in 1993. Without their generosity, we would be unable to conduct research!

- **Golf Agronomics** (topdressing material)
- **Googe Trucking** (trucking services)
- **Harrell's Inc.** (fertilizer)
- **La Gorce Country Club** (used triplex mower)
- **NuCrane Machinery** (equipment)
- **Regal Chemical Company** (weather station)
- **RSI Holdings of Florida, Inc.** (equipment)
- **Vigoro Industries** (fertilizer)

Turf Formula®

AGRI GRO

The Natural Solution

Agri-Gro of Florida, Inc. introduces **Turf Formula**, "The Natural Solution" for quality Turfgrass maintenance. Florida golf course superintendents are experiencing the following benefits of **Turf Formula**:

1. **Increased Soil Microbial Activity**
2. **Increased Root Mass and Root Penetration**
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4. **Increased Aerobic Bacteria, a Natural Predator to Nematode Eggs**
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Turf Formula is a non-toxic and environmentally safe product which contains stabilized micro-organisms from the following genera: *Azotobacter, Bacillus* and *Clostridium.*

Turf Formula is a premium soil amendment and bio-catalyst with a four year shelf life.

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Fax (305) 776-6942

Table 2

Pesticides applied to research study area on the FGCSA Research Green from May 1992 through April 1993.

Pesticide	Application Date	Application Area
Herbicides		
MSMA	12 January 1993	Spot Treatment
Basagran	28 January 1993	Entire Green
MSMA	9 February 1993	Spot Treatment
Basagran	9 February 1993	Spot Treatment
Insecticides		
Amdro Bait	8 May 1992	Spot Treatment
Dursban Bait	10 July 1992	Spot Treatment
Dursban Bait	25 July 1992	Spot Treatment
Dursban Bait	12 August 1992	Spot Treatment
Amdro Bait	12 August 1992	Spot Treatment
Di-Pel	22 September 1992	Entire Green
Oftanol	15 January 1993	Spot Treatment
Dursban Bait	22 February 1993	Spot Treatment
Dursban Bait	10 March 1993	Spot Treatment
Oftanol	29 March 1993	Spot Treatment
Oftanol	14 April 1993	Spot Treatment
Fungicides		
Daconil 2787	22 January 1993	Entire Green
Daconil 2787	13 February 1993	Entire Green

this root loss. The following is a summary report of the first year of the study. The products evaluated are listed in Table 1.

The Eco, Sustane, Ringer and Milorganite products are described as natural organic fertilizers because they conform to the Association of American Plant Fertilizer Control Officials definition of "materials derived from either plant or animal products containing one or more elements (other than carbon, hydrogen and oxygen) that are essential for plant growth." In other words, they are derived from natural organic materials such as turkey litter, sewage sludge, alfalfa, bloodmeal, wheat germ, etc. This is in contrast to the synthetic organic fertilizers which are composed of urea. Urea is also an organic material but the slow-release urea fertilizers commonly used in the golf industry are derived via a chemical process. For more information, please refer to an article on "Natural Organic Nitrogen Sources" in the March 1992 issue of *Golf Course Management.*

The natural organic fertilizers were evaluated two ways. First, they were used as the only source of fertilizer. For Eco, Sustane and Ringer, these fertilizers were the only products applied to those particular treatment plots. All plots would receive the same amount of nitrogen, but

IBDU™ was used as the standard for synthetic organic nitrogen sources. Therefore, this treatment is considered the "check" treatment in this study. We formulated a fertilizer using IBDU, sulpomag, iron sulfate and manganese sulfate to obtain a blend containing 8% nitrogen and 8% potassium. We did not use Vigoro Industries standard 8-0-8 blend because part of the nitrogen in that blend is derived from sewage sludge.

Table 3

Quality scores resulting from evaluation of natural organic fertilizers on the FGCSA Research Green from May through October 1992 at the summerfertility rate. *

Treatment	June 2	July 17	July 30	Aug. 13	Aug. 28	Sept. 11	Oct. 12	Oct. 22
Eco	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	5.7 a	5.6 a
Sustane	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	6.1 a	6.1 a
Ringer	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	6.1 a	6.0 a
Milorganite	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	5.8 a	5.5 a
Eco + IBDU	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	5.9 a	5.9 a
Sustane + IBDU	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	5.9 a	5.9 a
Ringer + IBDU	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	6.0 a	5.9 a
Milorganite + IBDU	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	5.9 a	5.9 a
IBDU™ only	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	6.0 a	6.1 a
F Value	0	0	0	0	0	0	1.03	1.19
MSD	----**	----	----	----	----	----	----	0.8

* Quality scores (color and density) are based on a scale of 1 to 10 with 10 equal to a perfect score. Values are means of four replicate plots. Means within a column followed by the same letter are not significantly different (P=0.05), according to Waller-Duncan k-ratio t test.
** F value too small to determine mean significant difference (MSD).

With REWARD® herbicide, there's no waiting for it to go to work.

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Table 4

Quality scores resulting from evaluation of natural organic fertilers on the FGCSA Research Green from November 1992 through April 1993 at the winter fertility rate.*

Treatment	Nov. 3	Dec.18	Dec. 30	Jan. 12	Jan. 27	Feb. 10	Feb. 24	Mar. 20	Mar. 24	Apr. 7	Apr. 21
Eco	5.3 b	5.0 a	5.6 b	4.0 a	5.5 a	4.9 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
Sustane	6.1 a	5.0 a	5.6 b	4.0 a	5.5 a	5.0 a	6.0 a	6.5 a	7.5 a	7.5 a	7.4 b
Ringer	5.8 ab	5.0 a	5.6 b	4.0 a	5.5 a	5.0 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
Milorganite	5.0 ab	5.0 a	5.8 ab	4.0 a	5.5 a	5.4 a	6.0 a	6.5 a	7.5 a	7.0 b	6.5 c
Eco + IBDU	5.5 ab	5.0 a	5.8 ab	4.0 a	5.5 a	5.2 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
Sustane + IBDU	6.1 a	5.0 a	6.0 a	4.0 a	5.5 a	5.4 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
Ringer + IBDU	5.4 ab	5.0 a	6.0 a	4.0 a	5.5 a	5.6 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
Milorganite + IBDU	5.8 ab	5.0 a	6.0 a	4.0 a	5.5 a	5.6 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
IBDU_TMî only	6.1 a	5.0 a	6.0 a	4.0 a	5.5 a	5.2 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
F Value	2.46	0	3.22	0	0	0.74	0	0	0	999.99	253.0
MSD	0.9	----**	0.3	----	----	----	----	----	----	0	0.05

* Quality scores (color and density) are based on scale of 1 to 10 with 10 equal to a perfect score. Values are means of four replicate plots. Means within a column followed by the same letter are not significantly different (P=0.05) according to Waller-Duncan k-ratio t test.
** F value too small to determine mean significant difference (MSD).

The natural organic fertilizers were also evaluated as individual mixtures with the synthetic organic nitrogen source IBDU™. For these treatments, one half of the nitrogen was derived from the natural organic fertilizer and one half from the IBDU blend.

the amount of phosphorus, potassium and other nutrients would vary depending on the fertilizer source. Milorganite contains no potassium. Since potassium is essential for turfgrass growth, plots fertilized with Milorganite as the sole nitrogen source were supplemented with potassium magnesium sulfate (sulpomag) (0-0-22). However, the amount of Milorganite applied provided an equivalent amount of nitrogen as for the other natural organic fertilizers.

IBDU™ was used as the standard for synthetic organic nitrogen sources. Therefore, this treatment is considered the "check" treatment in this study. We formulated a fertilizer using IBDU, sulpomag, iron sulfate and manganese sulfate to obtain a blend containing 8% nitrogen and 8% potassium. We did not use Vigoro Industries standard 8-0-8 blend because part of the nitrogen in that blend is derived from sewage sludge.

The natural organic fertilizers were also evaluated as individual mixtures with the synthetic organic nitrogen source IBDU™. For these treatments, one half

Table 5

Quality scores resulting from evaluation of cytokinin-like products on the FGCSA Research Green from May through October 1992 at the summer fertility rate. *

Treatment	June 2	July 17	July 30	Aug. 13	Aug. 28	Sept. 11	Oct. 12	Oct. 22
Enersol	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	6.1 a	6.1 a
PanaSea Plus @ 2 weeks	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	5.9 a	5.8 a
PanaSea Plus @ 4 weeks	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	6.1 a	6.1 a
Kelpak	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	6.1 a	6.3 a
IBDU ™ only	6.5 a	6.0 a	6.5 a	7.0 a	7.5 a	7.0 a	6.0 a	6.1 a
F Value	0	0	0	0	0	0	0.61	0.77
MSD	----**	----	----	----	----	----	0.3	0.6

* Quality scores (color and density) are based on a scale of 1 to 10 with 10 equal to a perfect score. Values are means of four replicate plots. Means within a column followed by the same letter are not significantly different (P=0.05) according to Waller-Duncan k-ratio t test.
_**_F value too small to determine mean significant difference (MSD).

The cytokinin-like... products are not intended to be used as fertilizers but rather as biostimulants for plant growth.

of the nitrogen was derived from the natural organic fertilizer and one half from the IBDU blend. Phosphorus was applied twice each year at 2.5 pounds P per 1000 sq. ft. to all plots, except those receiving only the Eco, Sustane, Ringer and Milorganite fertilizers.

The cytokinin-like products were evaluated as supplements to the normal

Table 6

Quality scores resulting from evaluation of cytokinin-like products on the FGCSA Research Green from November 1992 through April 1993 at the winter fertility rate. *

Treatment	Nov. 3	Dec. 18	Dec. 30	Jan. 12	Jan. 27	Feb. 10	Feb. 24	Mar. 20	Mar. 24	Apr. 7	Apr. 21
Enersol	6.1 a	5.0 a	6.0 a	4.0 a	5.5 a	5.4 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
Pana Sea Plus @ 2 weeks	5.8 a	5.0 a	6.0 a	4.0 a	5.5 a	5.4 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
Pana Sea Plus @ 4 weeks	6.3 a	5.0 a	5.9 a	4.0 a	5.5 a	5.6 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
Kelpak	6.2 a	5.0 a	6.0 a	4.0 a	5.5 a	5.1 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
IBDU ™ only	6.1 a	5.0 a	6.0 a	4.0 a	5.5 a	5.2 a	6.0 a	6.5 a	7.5 a	7.5 a	7.5 a
F Value	0.55	0	1.00	0	0	0.40	0	0	0	0	0
MSD	----*	----	----	----	----	----	----	----	----	----	----

* Quality scores (color and density) are based on a scale of 1 to 10 with 10 equal to a perfect score. Values are means of four replicate plots. Means within a column followed by the same letter are not significantly different (P=0.05) according to Waller-Duncan k-ratio t test.
** F value too small to determine mean significant difference (MSD).

Table 7

Clipping weights (grams) resulting from evaluation of natural organic fertilizers on the FGCSA Research Green from May through October 1992 at the summer fertility rate and November 1992 through April 1993 at the winter fertility rate. *

Treatment	July 29	Aug. 27	Sept. 23	Oct. 28	Nov. 27	Dec. 30	Jan. 27	Feb. 24		Apr. 7
Eco	6.811 a	3.307 b	4.237 a	1.330 a	2.888 ef	2.941 c	2.094 b	2.369 a	5.042 b	3.310 bc
Sustane	6.277 a	4.293 ab	4.846 a	1.505 a	3.285 cde	3.251 c	2.013 b	2.540 a	4.868 b	3.104 bc
Ringer	7.736 a	4.930 ab	5.297 a	1.457 a	3.028 def	2.868 c	2.001 b	2.647 a	4.430 b	2.817 cd
Milorganite	7.740 a	3.724 b	4.185 a	1.404 a	2.535 f	2.954 c	2.855 a	2.895 a	5.120 b	2.081 d
Eco + IBDU	7.337 a	4.703 ab	5.092 a	1.503 a	3.532 bcd	3.488 abc	2.564 ab	3.126 a	5.754 ab	3.459 bc
Sustane + IBDU	7.311 a	4.566 ab	5.621 a	1.729 a	3.988 ab	3.844 ab	2.297 ab	2.678 a	5.752 ab	3.460 bc
Ringer + IBDU	7.641 a	5.463 a	5.315 a	1.565 a	3.659 abc	4.078 a	2.976 a	2.707 a	5.875 ab	3.970 ab
Milorganite + IBDU	6.883 a	4.217 ab	5.495 a	1.661 a	3.766 abc	3.920 ab	2.895 a	2.812 a	6.896 a	3.562 bc
IBDU ™ only	7.276 a	5.466 a	5.228 a	1.591 a	4.192 a	3.960 ab	2.647 ab	3.278 a	6.620 a	4.580 a
F Value	0.61	2.42	1.45	0.45	7.56	4.20	2.94	1.11	3.19	5.30
MSD	----**	1.633	1.735	----	0.557	0.728	0.756	---	1.476	0.893

* Values are means of four replicate plots. Means within a column followed by the same letter are not significantly different (P=0.05) according to Waller-Duncan k-ratio t test.
** F value too small to determine mean significant difference (MSD).

Studies on cool-season turfgrass sod in Virginia have indicated a potential role for these products to enhance root growth and strength and, more importantly, to enhance the plant's ability to survive during stress periods.

Table 8

Clipping weights (grams) resulting from evaluation of cytokinin-like products on the FGCSA Research Green from May through October 1992 at the summer fertility rate and November 1992 through April 1993 at the winter fertility rate. *

Treatment	July 29	Aug. 27	Sept. 23	Oct. 28	Nov. 27	Dec. 30	Jan. 27	Feb. 24	Apr. 7	Apr. 21
Enersol	9.268 a	6.316 a	5.434 a	2.044 a	5.014 a	3.651 a	2.537 a	3.305 a	6.556 a	4.206 a
PanaSea Plus @ 2 weeks	7.471 a	5.201 a	5.070 a	1.837 a	4.095 a	4.249 a	2.707 a	3.179 a	6.419 a	4.650 a
PanaSea Plus @ 4 weeks	8.091 a	5.445 a	4.996 a	1.713 a	4.217 a	3.474 a	2.741 a	3.173 a	6.051 a	4.079 a
Kelpak	7.585 a	6.182 a	5.793 a	1.633 a	4.000 a	3.777 a	2.280 a	2.836 a	6.267 a	4.304 a
IBDU ™ only	7.276 a	5.466 a	5.228 a	1.591 a	4.192 a	3.960 a	2.647 a	3.278 a	6.620 a	4.580 a
F Value	1.19	1.52	0.70	0.86	0.93	1.52	1.52	0.26	0.20	0.27
MSD	----**	----	----	----	----	----	----	----	----	----

* Values are means of four replicate plots. Means within a column followed by the same letter are not significantly different (P=0.05) according to Waller-Duncan k-ratio t test.
** F value too small to calculate mean significant difference (MSD).