



Empowering Turf to
FIGHT BACK
Against Drought.



Reduced Irrigation

This is a fight you can win.

CIVITAS Turf Defense is a fungicide, insecticide, and plant protection product with an innovative ability to increase turf's tolerance to both biotic and abiotic stresses.

CIVITAS Turf Defense works both with and through the plant to stop threats from taking hold in the first place, **reducing the effect stress has on your turf**. In addition, the active ingredient in CIVITAS Turf Defense is a pharmaceutical-grade white mineral oil which has a chemical structure that resembles the natural paraffins found on the surface of leaves to provide maximum turf benefits.

Here's how it works.

The mode of action, **Induced Systemic Resistance (ISR)**, is a process in which the naturally occurring stress fighting genes in a plant are primed to defend itself and then activate once those environmental conditions or pathogens become present. Through this process of activation, the plant's ability to tolerate both abiotic and biotic stresses can be increased through the same application. CIVITAS Turf Defense provides turf managers a tool to enhance IPM efficiencies, increasing turf quality and disease control during the most stressful periods of the year.

Reduces water usage by up to 25%

The process of activation enhances the plant's ability to defend itself during periods of reduced water availability by priming the estimated 62 genes connected to drought tolerance. Since 2012, multiple University and Independent research trials have proven turf managers can reduce overhead irrigation by at least 25% while maintaining acceptable turf quality.



Seeing is believing: The response of a healthier plant

Try CIVITAS Turf Defense. Compare your treated vs. untreated turf. Look for unique plant responses like delayed leaf senescence and percentage of live green leaf tissue, indicative of a healthier plant, a stronger plant better able to withstand the effects of stresses.



Proven to perform:

Independent studies demonstrate CIVITAS effects

1. Reduced Irrigation Program for Warm Season Turfgrass

Benjamin Wherley, Ph.D., Texas A&M University

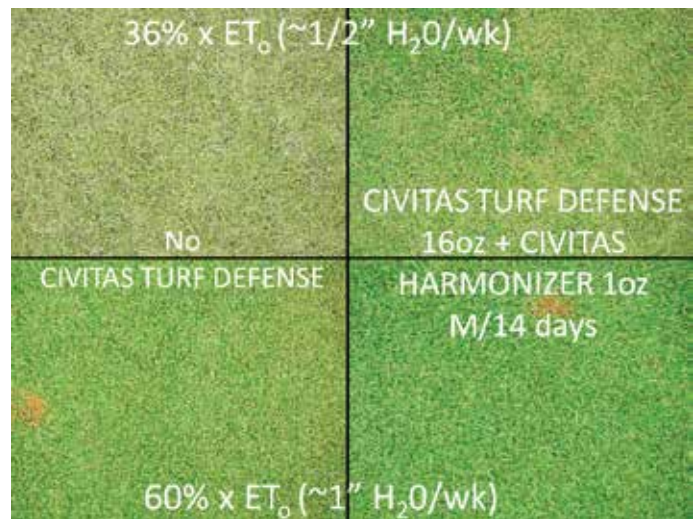
TARGET: Non-uniform, high value, water stressed areas on your valuable golf course turf.

SOLUTION: Increase turf quality through applications of CIVITAS Turf Defense

FAIRWAYS: Moderate Stress: Pre-stress applications of 17 oz. CIVITAS TURF DEFENSE Pre-M1xed/28d Heavy Stress: Pre-stress applications of 17 oz. CIVITAS Turf Defense Pre-M1xed/21d

GREENS: Pre-stress applications of 8.5 oz. CIVITAS TURF DEFENSE Pre-M1xed/14d

Back to back drought studies conducted through Texas A&M University showed improved turf performance with CIVITAS Turf Defense under deficit irrigation programs. Deficit irrigation was applied to replace either 60% of evapotranspiration (60% x ETo, mild water stress) or 36% of evapotranspiration (36% x ETo, moderate water stress). Where CIVITAS TURF DEFENSE was applied, zoysiagrass performance improved. CIVITAS TURF DEFENSE treated plots receiving only 36% x ETo (40% reduction) were comparable to non-treated plots receiving 60% x ETo.



2. Drought Response Trial Cool Season Turfgrass

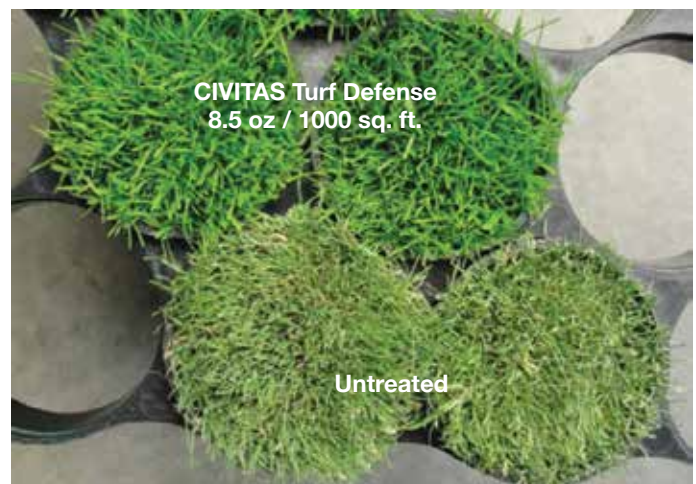
Michelle DaCosta Ph.D., University of Massachusetts

TARGET: Non-uniform, high value, water stressed areas on your valuable golf course turf

SOLUTION: Use CIVITAS Turf Defense so your turfgrass can better tolerate drought stress conditions.

Greenhouse study evaluating the performance of creeping bentgrass pre-treated with CIVITAS Turf Defense Pre-M1xed and subjected to dry down conditions (no water).

Two applications of CIVITAS Turf Defense Pre-M1xed were made at 14 day intervals prior to initiation of dry down, followed by a 3rd application 3 days after initiation of dry down.



Treatment	Rate	TURF QUALITY (1-9)				
		DAYS POST DRY DOWN				
		0 d	6 d	7 d	8 d	10 d
Untreated Control	N/A	8.0 a	6.7 c	6.2 b	5.3 c	1.3 b
CIVITAS Turf Defense	8.5 fl. oz/ 1000 sq. ft.	8.0 a	7.3 b	8.0 a	7.1 ab	6.7 a

effectiveness in protecting Warm and Cool season turf in drought or reduced irrigation conditions.

3. Reduced Irrigation Program for **Cool Season Turfgrass** *Adam Van Dyke, Professional Turfgrass Solutions, LLC, Salt Lake City, Utah*

TARGET: Non-uniform, high value, water stressed areas on your valuable golf course turf.

SOLUTION: Use CIVITAS Turf Defense so your turfgrass can better tolerate drought stress conditions.

Lawn-height Kentucky Bluegrass and Perennial Ryegrass. Maintained at Low level of water regime at (60% ETo) CIVITAS Turf Defense treatments every 2 weeks June through October.

	% TURF GREEN COVER			
	Aug. 9	Aug. 23	Sept. 6	Sept. 16
CIVITAS 8.5 fl.oz.	91.6 a	91.1 a	92.3 a	93.9 ab
Untreated Control	69.1 b	44.1 b	51.0 b	55.3 c



4. Long Term Deficit Response **Warm Season Turfgrass** *Jim Baird, Ph.D. & Mingying Xiang, Ph.D., University of California Riverside*

TARGET: Tifway II Bermudagrass Fairway Height of Cut.

SOLUTION: CIVITAS Turf Defense applications at 8.5 fl.oz. every 14 days.

At 55% ETo replacement, CIVITAS showed better turf quality on most rating dates compared to the untreated control. All CIVITAS ratings were greater than the acceptable turf quality level of 6.0. Plots treated with CIVITAS also improved the percentage of turf canopy coverage compared to the untreated control during the study.

TURF QUALITY @ 55 ET							
Treatment	Rate	8/11/20	8/25/20	9/9/20	9/25/20	10/6/20	10/20/20
Untreated Control	N/A	6.5	5.5	5.5	5.4	4.3	5.3
CIVITAS Turf Defense	8.5 fl. oz/ 1000 sq. ft.	6.5	6.3	6.0	6.1	6.9	6.1
% (0-100%) CANOPY COVERAGE @ 55 ET							
Untreated Control	N/A	87.8	81.3	70.0	67.5	73.8	75.0
CIVITAS Turf Defense	8.5 fl. oz/ 1000 sq. ft.	94.8	89.0	90.5	87.0	95.0	84.0





Drought Tolerant.

CIVITAS Turf Defense delivers maximum turf quality by enhancing stress tolerance.

Here are CIVITAS Turf Defense benefits you can appreciate:

- ✓ Allows turf managers to use less water and lower costs.
- ✓ Shortens the time to complete an irrigation cycle, as less water volume is required.
- ✓ Helps control the amount of moisture applied and conditions that favor disease development.
- ✓ Provides a tool to maintain firmer, faster and more consistent playing conditions throughout the day.
- ✓ Expands watering window between periods of rainfall.
- ✓ Decreases labor associated with supplemental irrigation and spot watering.
- ✓ Reduces the amount of poor quality water applied.

CIVITAS Turf Defense applied as part of an IPM Program



Treated with CIVITAS
Turf Defense

Untreated



CIVITAS Turf Defense Application Recommendations

The Reduced Irrigation Program

CIVITAS TURF DEFENSE Pre-M1xed at 8.5 fl.oz. every 14 days. On higher cut turf - fairways and roughs - apply every 14-28 days.

Best Management Practices

- Start program 3-4 weeks before expected drought conditions.
- Continue applications through periods of drought. Time applications after an irrigation cycle or rain - i.e. do not make applications to actively wilting turfgrass.
- Favor shorter application interval during periods of increased plant growth and/or lower heights of cut. Extend application interval during periods of decreased plant growth and/or higher heights of cut.

CIVITAS Turf Defense: Results you can appreciate

Warm Season



UNTREATED



TREATED with CIVITAS Turf Defense
twice a month with 20% water reduction

Bermuda Grass Warm Season



UNTREATED



TREATED with CIVITAS Turf Defense
after only two applications

Rye Grass Cool Season



UNTREATED



TREATED with CIVITAS Turf Defense
at 80% water



Visit civitasturf.com for additional
research and other information.



™Trademark of Suncor Energy Inc. Used under license.

™ Owned or used under license

© 2021 Hollymarks, LLC used with permission by HollyFrontier Refining & Marketing, LLC.