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Physical Water Conditioner Effects on Turfgrass


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Physical Water Conditioner Effects on Turfgrass

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Physical Water Conditioners


- Devices that generate a magnetic or electrical field for the water to pass through
- Either plumbed into the pipe system or clamped on/wrapped around (non-intrusive)
- Exert a physical effect
- No distinct change to chemical composition
- Physical conditioning might affect other water quality factors: Which and to what extent are unknown

Physical Water Conditioners - Types

- 1) Magnetic or electro-magnetic
magnetic field around water lines causes polar molecules to align (reduced surface tension, reduced scaling)
- 2) Catalytic
catalysts (alloy cores) inject electrons into the water
- 3) Electrical, hydro-electrical
unit induces a significant and measurable electrical charge into the water

1) Magnetic Conditioners - Claims

- Magnetic fields cause polar molecules to align
 - Reduce surface tension
 - Reduce irrigation water use
 - Eliminate need for wetting agents
 - Deeper thicker root system
 - Improve germination
 - Enhance activity of pesticides
 - Even distribution of spray solution
 - More thorough weed control



www.magnawet.com

2) Catalytic Conditioners - Claims

- Turbulent flow situation allows Ca to get in contact with core
- Fluid mechanics change physical properties in water
 - Reduced scaling and corrosion
 - Breakdown of Mg and Ca salts
 - Increased leaching of salts
 - Reduced irrigation requirements
 - Enhance plant health and improve soil structure
 - No clogging of sprinklers and drip emitters
 - Deflocculate soil and solubilize minerals



www.freflowater.com; www.zetacoreusa.com

3) (Hydro-) Electrical Conditioners - Claims

- Apply hydro-electric dynamic charge
- Field tests monitored by superintendents:
 - Healthier, greener grass
 - Increased moisture retention
 - Reduced soil compaction
 - Reduced irrigation requirements
 - Release binding salts in the soil through ion exchange (reduce salts)
 - Clean irrigation systems



www.aqua-phyd.com

Literature

- increased delivery of Fre-Flo treated water through drip system compared to untreated control (Rible, J., 1982)
- Study conducted on 5 golf courses (CA) shows increased turf and soil quality when container received Aqua-PhyD treated water
- Martin and Gazaway (2003) concluded that the devices were not effective in increasing bermudagrass quality



Study: Do physical water conditioners

- influence establishment
- improve turf quality?
- improve soil quality?
- affect irrigation requirements?

Study

- 2 Water Qualities
 - potable
 - saline groundwater
- 4 (5) Conditioning Devices
- CRBD (3 replications)
- Plot size 20' by 20' (6.5 m x 6.5 m)
- 4 MP Rotators (streaming sprinkler heads): plots individually controlled
- Soil type: Torripsamment (sandy entisol)
- Perennial ryegrass cv. 1G2

Materials and Methods

Treatment processes:

- 1 Magnetic device
 - Magnawet
- 2 Catalytic devices
 - ZetaCore (grounded)
 - Fre-Flo (Non-grounded)
- Hydro-electrical (2007)
 - AquaPhyD
- Control



Study

	2005	Soil		Water	
		potable	saline	potable	saline
pH	8.4	7.7	7.6	8.0	7.5
EC (dS/m)	0.45	0.8	0.9	0.6	3.1
SAR	0.1	1.3	2.5	1.6	8.9
RSC				n.a.	2.4
Ca (ppm)	2620	110	76	48	100
Na (ppm)	20	56	95	56	400

Parameters measured:

- Establishment 2005; 2007
 - Digital Image Analysis (DIA)
- Turf Quality (visual)
- NDVI (Greenseeker) 2006; 2008
- Soil salinity (2 depths)
 - pH
 - EC
 - SAR



Irrigation

- ET based (FAO 26)
- Recorded run times
- Water meters
- Irrigation audit



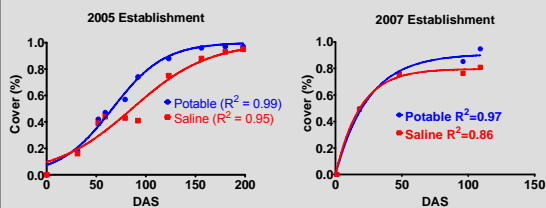
Irrigation

	2005		2006		2007		2008
	March June	July Sep	Apr June	July Sep	March May	June July	May Sep
ETp	44"	31"	37"	25"	29"	23"	44"
Potable	90%	70%	80%	60%	100%	80%	80%
Saline	121%	82%	105%	115%	115%	90%	110%
Rain	0.9"	5.9"	0.6"	10.3"	0.0"	5.1"	8.2"

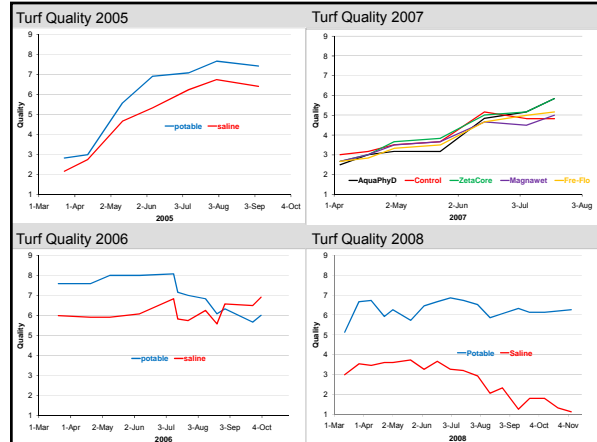
Results

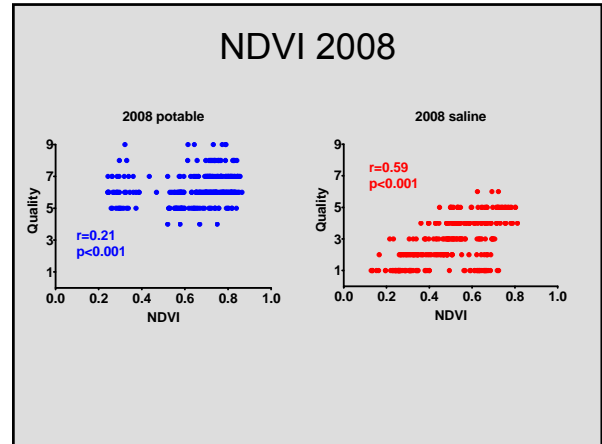
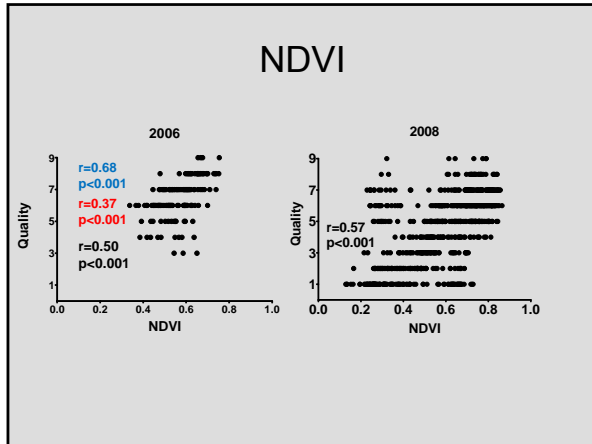


Results



- Days to reach 90% cover:
 - potable 123a
 - saline 170b
 - No difference between conditioning treatments
- Days to reach 90% cover:
 - potable 87
 - saline —
 - No difference between conditioning treatments





Rootzone Salinity 2005

Depth	Treatment	EC (dS/m)		SAR		pH	
		potable	saline	potable	saline	potable	saline
0-4"	Control	0.50b	1.33a		1.1b	8.3ab	9.0ab
	Fre-Flo	0.73a	1.42a	0.18	0.9c	8.3a	8.6c
	Magnawet	0.77a	1.26ab		0.9c	8.3ab	8.9bc
	ZetaCore	0.50b	1.08b		1.1bc	8.1b	9.1a
4-8"	Control	0.45b	1.46a		1.4a		8.8b
	Fre-Flo	0.70a	1.41a	0.18	0.9b	8.4	8.8b
	Magnawet	0.82a	1.14b		1.0b		8.9ab
	ZetaCore	0.51b	1.16b		1.3a		9.0a

Rootzone Salinity 2006

- Potable Irrigation: No treatment effects

Saline Irrigation	EC (dS/m)		SAR		pH	
	0-4"	4-8"	0-4"	4-8"	0-4"	4-8"
May						
Control	1.9d	1.9b			11.5b	
Fre-Flo	2.2c	2.1b			13.9a	
Magnawet	3.7a	3.4a	13.7		8.9	8.5
ZetaCore	3.4b	3.1a			14.2a	
Sep						
Control	2.6a				6.4b	
Fre-Flo	2.5a				6.0b	
Magnawet	1.7b	1.4	9.9		8.4a	8.6
ZetaCore	1.8b				8.4a	

Soil Test Results (2007, 2008)

	pH	EC	Soluble Salts		HCO ₃	Na	Mg	Ca	Cl
			(dS/cm)	SAR					
Block	n.s.	*	n.s.	n.s.	n.s.	*	n.s.	**	*
Conditioning	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Water	***	***	***	***	***	***	***	*	***
Cond. x Water	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Depth	**	***	***	***	n.s.	***	**	n.s.	*
Cond. x Depth	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Water x Depth	*	*	**	***	n.s.	*	*	*	*
Cond. x Water x Depth	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

Rootzone Salinity (1)

- No clear trend among measured salinity parameters for any given conditioner could be established
- In 2005, all salinity parameters measured, even on the plots treated with saline water, were well below threshold levels considered critical for cool season turfgrass growth

Rootzone Salinity (2)

- May 2006
 - Magnawet and ZetaCore treated plots had higher EC levels than control plots at 0 to 4” and 4 to 8” soil depth
 - Fre-Flo and ZetaCore plots had higher SAR values than control plots (4 to 8”)
- September 2005
 - EC and SAR values decreased compared to May
 - EC for Magnawet and ZetaCore was lower compared to control (0 to 4”), but SAR was higher (4-8”)

Summary

- Water conditioning had no effect on perennial ryegrass establishment (2005 & 2007)
- 4 years of turf performance data:
Water conditioning had no effect on quality or stress tolerance of perennial ryegrass
- Physical water conditioning had no consistent effect on the chemical composition of either saline or potable irrigated rootzones

Acknowledgements



Fre-Flo Inc.



Walla-Walla
Bruce Erhard
(CGCS)



ZetaCore



Committed to strengthening the compatibility of the game of golf with our natural environment.