

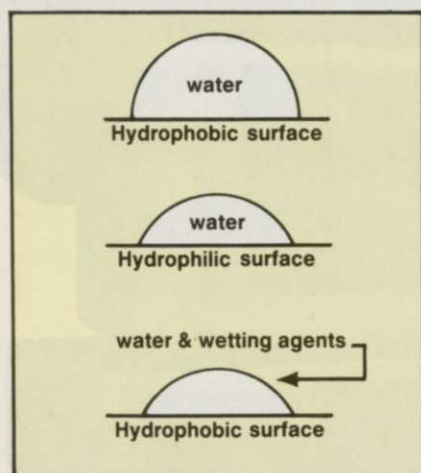
Wetting Agents

by Dr. A. Martin Petrovic, Cornell University

The field of turfgrass management has seen a myriad of products come and go. One class of products called wetting agents has received a lot of attention and caused some controversy from time to time.

Wetting agents, sometimes called surfactants or surface active agents, have been developed mainly to change the physical properties of water.

They act by reducing the surface tension of water, which makes it possible to wet the surface of solid objects such as soil particles or thatch. Surface tension is the tendency of water to form a droplet, as shown below, when placed on a surface.



If the surface is hydrophobic (water repellent), there is a large contact angle formed between the water and the surface; a drop forms. If a drop of water is placed on a hydrophilic (water loving) surface, such as a sponge, a small contact angle develops; wetting occurs.

If a wetting agent is added to the water on the hydrophobic surface, there is a small contact angle formed, due to a lower surface tension, and wetting occurs. Wetting agents are generally classified based on their chemistry: anionic, cationic and nonionic.

Anionic surfactants (negatively charged) are seldom used on turfgrass because they are somewhat more phytotoxic than the other forms and are suspect to leaching as are any



The effects of wetting agents on improving the quality of an area with localized dry spots is dramatic. Note the darker, healthier areas treated with wetting agents.

anions like nitrates.

On the other hand, cationic wetting agents (positively charged) act much like cations in the soil and are tightly held to the soil which makes them less effective.

Nonionic wetting agents have no charge and appear to be less phytotoxic than the other classes. Nonionic wetting agents come in the form of esters, ethers and alcohols.

Combinations of one or more of these forms provides for more effective wetting over a wide range of soil types. Table 1 contains a list of some of the wetting agents used in turf.

Current uses for wetting agents

Wetting agents have been reported to or claimed to be useful in the following ways:

- 1 Improving the wetting of localized dry spots, such as hydrophobic soils and/or thatch
- 2 Affecting plant growth
- 3 Improving water movement into soil
- 4 Improving drainage
- 5 Reducing compaction
- 6 Helping to reduce the development of thatch
- 7 Removing frost and dew
- 8 Increasing fertilizer and pesticide effectiveness
- 9 Aiding water efficiency, thus reducing irrigation costs

What is known that can support some of these concepts?

Improving localized dryness

The name wetting agent implies that their major purpose is to aid in the wetting of substances.

There has been considerable research done at both Michigan State University and Ohio State University on the causes and cures of localized dry spots, LDS.

Table 1.
A list of common wetting agents used in turfgrass management

Trade Name	Manufacturer	Rate of Application (oz/1000 ft ²)
Aqua Gro	Aquatrols Corp. of America	4 to 16
Hydro Wet	Kalo Laboratories	8 to 16
Lesco Wet	Lesco Corp.	8 to 16
Peneturf*	Four Star Agr. Serv.	0.2
Surf Side	Montco Prod. Corp.	16 to 32

* Marketed as a soil conditioner.

The problem of LDS has been primarily on golf courses but it is becoming more clear that they are a problem on most turfgrass sites.

The problem of LDS is caused by a fungal growth that produces a wax-like material that coats the particles of soil or thatch. When wetting agents are applied to LDS, the soil moisture conditions are improved, resulting in better quality turf (see Table 2).

The depth of soil affected by the fungi can be considerable so that some form of cultivation may be ineffective in alleviating the dry spot, as seen in Table 3.

A soil probe is a useful tool in determining whether you have LDS. Probe both the healthy and affected areas and compare moisture levels. LDS soil will appear bone dry compared to the moisture-healthy area. Another method used in diagnosing LDS is to place several drops of water on the dry soil or thatch that you suspect has LDS.

If the droplets do not disappear in

10 minutes there is a good chance that the area has LDS. Remember that uneven irrigation delivery, heavily sloped sites and shallow soil underlined by debris or rocks can appear to have LDS.

Growth, quality

On areas that contain LDS, treatments with wetting agents can result in a dramatic improvement in plant growth and visual quality, as seen in Figure 1.

However, on easy to wet soils, wetting agent effects on plant growth have been inconsistent.

Early reports (Whitcomb and Roberts) suggested that wetting agents had no effects on turfgrass when applied to easy-to-wet soils.

Since that time several others have shown different effects.

Dr. Richard E. Schmidt at the Virginia Polytechnic Institute, found that sod treated with the wetting agent Aqua Gro prior to installation rooted much faster under dry soil conditions.

On areas that have localized dry spots, wetting agents can result in a dramatic improvement."

This author's work at Cornell University showed that Aqua Gro substantially reduced the seedhead production of annual bluegrass fairways without reducing clipping yields. These effects could be explained in several ways.

In the first example, the wetting agent could have improved the soil moisture condition at the sod/soil interface. Wetting agents have been shown (Law, 1964) to reduce the evaporation of water from a bare soil surface, which could support the claim of improved moisture conditions.

However, the reduction in evaporation could also be explained by having less water to evaporate since the wetting agent could reduce the amount of water reaching the soil surface by capillary action.

Another explanation of these results might be that wetting agents could be acting as plant growth regulators.

Seedhead suppression and increased rooting are two effects of plant growth regulators.

Classes of regulators

Two classes of plant growth regulators are phenolics, like 2,4-D, and ethylene compounds.

Aqua Gro contains both phenolic and ethylene compounds and it is very likely it is acting like a plant growth regulator.

Improvement of water movement into soil by wetting agents has been shown primarily on LDS areas; however, on easy to wet soils there is little evidence to suggest any improvement.

Drainage can be improved by wetting agents, especially in layer soil profiles. Wetting agent manufacturers claim that compaction is reduced by wetting agents.

Research has not been done to substantiate this claim. However, if water is drained more rapidly following rainfall or irrigation, the soil will be less likely to be compacted, which can be important on sites that receive heavy, uncontrolled traffic.

Adding a wetting agent to an exist-
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TABLE 2.
Effects of wetting agents on the visual quality and soil moisture content, Boyne Highland, MI.

Wetting Agent	Rate† Oz/1000 sq. ft.	Quality rating (1=ideal) % Moisture content	
		August 4, 1977	
Check	-	6.1	12
Aqua Gro	8 + 8	3.8	16
	16	2.2	20
	16 + 16	3.8	16
	32	2.4	19
	8 monthly	2.5	18
Hydro Wet	16	2.5	17
	16 + 16	2.3	17
	8 monthly	1.6	23

* Data courtesy of Dr. Paul E. Rieke and Mr. R. Bay, Michigan State University.

† Treatments started June 9, 1977.

TABLE 3.
The effects of wetting agents and cultivation on the visual quality, 18th Fairway, Boyne Highland, MI*

Cultivation	Visual Quality Rating (1 = ideal), Oct. 26, 1973	
	Check	Aqua Gro (16 oz/1000 ft ²)
None	6.7	4.0
Spiker	5.3	3.2
Core cultivator, 1/2" tine	4.0	2.2
Core cultivator, 5/8" tine	5.0	2.3

* Data courtesy of Drs. Paul Rieke and James Beard, Michigan State University

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Brouwer introduces large capacity vac

With a 350 cubic foot load box capacity, the new Brouwer Vac is designed for big jobs. It features a hydraulically operated suction head, floating head to follow contours, rear unloading gate, and is self unloading.

The unit can be towed by most 35 hp tractors equipped with 540 rpm PTO and travels on dual flotation tires for reduced compaction. The Brouwer Vac also offers an optional extension suction hose which allows for pick-up of litter and debris in hard to get spots.



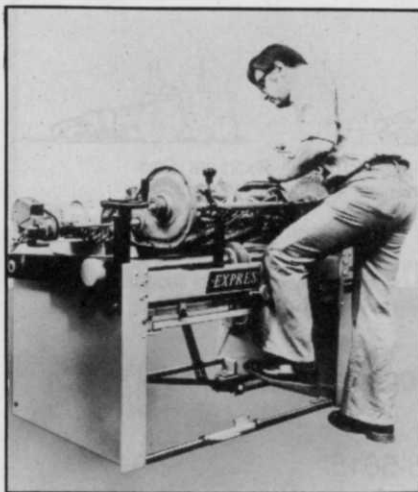
Circle No. 193 on Reader Inquiry Card

Reel mower sharpening machine made in England

A network of 45 distributors carry a British-made reel mower sharpener. The Express Dual automatic spin

sharpening machine sharpens all types of reel mowers in under 20 minutes (domestic walk behind and greens trimming types in four minutes), according to Bernhard & Company LTD.

Wearing parts of the Express Dual carry a three year warranty, while the UL/CSA motors and electronic controls carry a 10 year unconditional warranty. The sharpening machine is backed up with six service centers in the U.S.



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pacted will not alleviate compaction.

Thatch development

There is little or no evidence to suggest that wetting agents reduce thatch accumulation.

In two long term studies of eight and 10 years (Murray and Juska, 1977; Engle and Alderfer, 1967), it was found that wetting agents had either no effect on or a slight increase in thatch accumulation.

Adding a wetting agent to an existing site which is already heavily compacted will not alleviate compaction.

More recent work at Cornell University by Dr. Richard Smiley has also shown no effect of wetting agents on thatch development.

Enhancing efficiency

Wetting agents obviously can have a major impact on water efficiency where LDS occurs. On wettable soils, it has been shown recently by Dr. Robert Shearman of the University of Nebraska that the evapotranspiration rates (ET) of turfgrass were reduced by as much as 25 percent by wetting agents, when water was not limiting.

Work done by Mark J. Carroll and this author at Cornell University suggests that the reduction in water loss (ET) or a saving on water was a result of having less water available for transpiration because of the greater loss of free water to drainage.

This would indicate that wetting agents would probably not improve the water use efficiency (the amount of water needed to produce a given amount of dry clippings) of turfgrass if they just reduced the amount of water available for transpiration.

Wetting agents have a useful place as one of the tools available to turfgrass managers. As more and more is learned about the benefits and shortcomings of wetting agents for turfgrass, refinement in application strategies can be made for the benefit of those who may decide to incorporate them into their turfgrass management regime.

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