

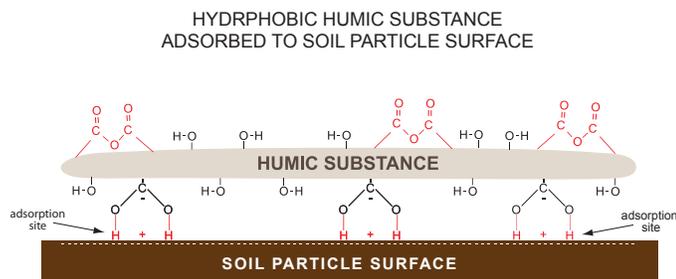
MANAGING SUMMER STRESS

Neptune is a highly innovative, advanced non-ionic rootzone surfactant complex designed to amend soil profiles and significantly enhance water movement, water distribution, hydration and drainage in root zones influenced by water repellent soil particles. This ground breaking combination of leading edge surfactants also provides the professional turfgrass manager with an effective tool to refresh, restore and manage rootzone quality and productivity – through the uniform and stable movement, retention and distribution of water and dissolved nutrients to plant roots and to life-sustaining ecological communities that reside in this critical portion of the soil profile.

MANAGING WATER REPELLENT SOILS

Problems with localized dry spots and turfgrass suffering under non-uniform growing conditions are more prevalent today than when USGA green method construction emerged in the early 1960's. Many superintendents are finding that rootzone growing conditions that would support quality turfgrass under USGA specifications in the past will not sustain similar quality ratings on today's turfgrass.

Many scientists, agronomists and professional turfgrass managers believe that increases in LDS and unhealthy turfgrass growth on USGA greens may be the result of increased hydrophobicity (water repellency) in the rootzone caused in part, by the use of new turf varieties that are prolific producers of organic matter. Decomposition of organic matter that occur during natural microbial saprophytic processes, produce non-polar organic compounds that coat soil particles and render them water repellent.



Consequently, professional turfgrass managers have found it imperative to assist the plant with increased rootzone maintenance to:

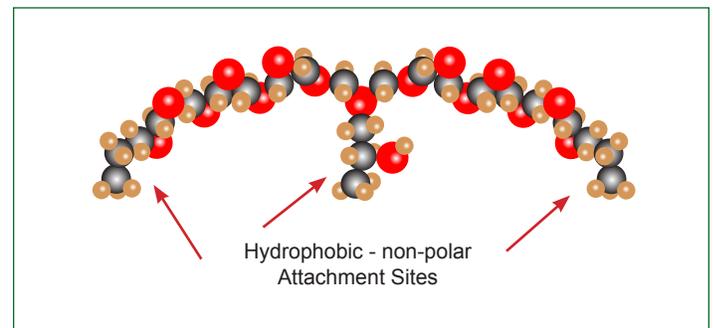
- Improve water and nutrient availability
- Enhance the plant's ability to uptake applied water and nutrients (root development)
- Balance air-to-water ratios
- Reduce below-ground stress conditions

NEPTUNE TECHNOLOGY

The Neptune surfactant complex contains unique surfactants that are designed to work in sand-based profiles, in root zones containing highly variable (heterogeneous) soil types and organic matter (such as native soils / push-up greens) and in highly amended soils.

What sets Neptune apart from its competitors is that while both of its surfactant constituents, possess different performance characteristics, they have been constructed to work in harmony together to form a very uniform and consistent pattern of hydration and re-hydration – even with highly water repellent rootzone profiles.

One of the surfactant blend components is a complex tri-block copolymer containing non-polar terminating groups. These unique terminating groups provide additional non-polar "anchors" that the surfactant uses to adhere to the water repellent surface of the soil particle.



Graphic representation of Neptune tri-block co-polymer. Additional non-polar terminal groups provide additional sites for attachment and change the surfactant's "shape" as it sits on the particle surface.

In addition to its innovative tri-block copolymer, Neptune is formulated in combination with a high molecular weight, complex surfactant proven to promote uniform vertical and lateral movement of water and solutes into and through the soil profile.

30-Day Strategy For Relief of Heat and Drought Stress

PERFORMANCE VERIFIED

Neptune was tested on a 8-year-old 'L-93' at the University of Arkansas on sand based putting green that was constructed according to USGA recommendations. The study was conducted from May through September in 2011.

Irrigation was applied judiciously in May, moderately in June and July, and only to avoid drought and heat stress symptoms in August and September, so that the Neptune wetting agent effects may be evaluated across a range of irrigation regimes. NOTE: In July, there were 11 days of temperatures over 100° F.

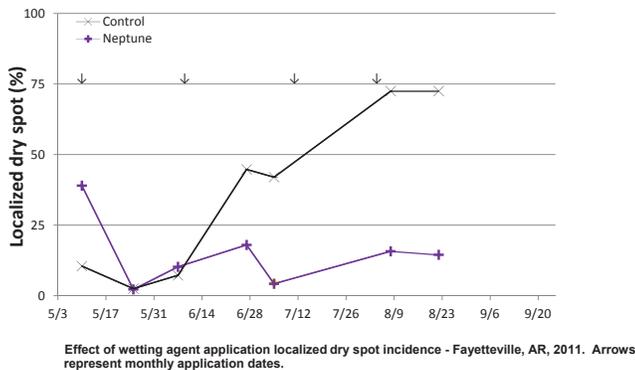
Phytotoxicity: Plots were evaluated for phytotoxicity 24 hours following wetting agent application using digital image analysis.

LDS formation: Plots were evaluated biweekly for the formation of localized dry spot. Data were recorded as a percentage of the plot affected by LDS.

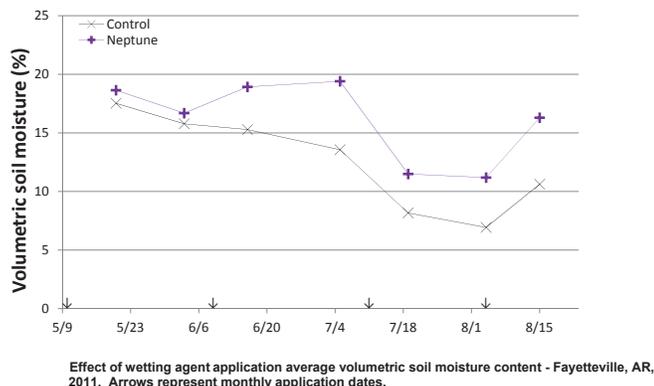
Volumetric soil moisture was evaluated twice monthly. Twenty five measurements were taken on each plot using a 5 x 5 ft. grid (1 ft. centers) at three depths (1.5, 3, and 5 inches).

Results are illustrated below:

1. Phytotoxicity: There was no phytotoxicity observed throughout the trial; so no data are presented.
2. Localized Dry Spot (LDS): On the final five evaluation dates, the untreated control consistently had the most localized dry spot, which was significantly greater than Neptune.



3. Neptune significantly affected average volumetric soil moisture retention three of the final four evaluation dates of the trial (5 July, 4 and 18 August). The untreated control consistently had the driest average soil moisture content.



SAFE AND EASY TO USE

The use of Neptune poses no additional management resources than those associated with surfactant applications used to treat symptoms of water repellency in soils. Neptune is safe to apply to turf under the most severe summer stress conditions.

When used on a monthly basis, its best-in-class non-ionic surfactants will overcome hydrophobic conditions and promote a consistent and effective pattern of hydration and re-hydration of the soil profile.

Following its use in a well-designed rootzone management program, turfgrass managers should expect:

- Uniform distribution of soil moisture throughout the soil rootzone
- Reductions in localized dry spot (LDS)
- Exceptional hydration and rehydration of existing areas showing symptoms of hydrophobicity
- Improved stress tolerance, color and overall turf quality
- Significant improvement in soil air:water ratios
- Safe to use in high heat and drought conditions
- Reduced surfactant and labor costs associated with application
- Enhanced water use efficiency
- Healthier roots

APPLICATION RATES:

Greens & Tees, Fairways, Bunker Faces, Collars, Sports Turf and Parks/ Recreations Areas

Sand-Based Soil Profiles

Apply Neptune at 6 oz. per 1000 ft² in 2 gallons of water (180 ml. per 100 sq. meters in 8 liters of water). For best results, apply monthly throughout the growing season. No watering-in is required when used at recommended rates.

neptune[®]
superior
turf wetting
agent

Surfactant performance that can stand up to summer stress!