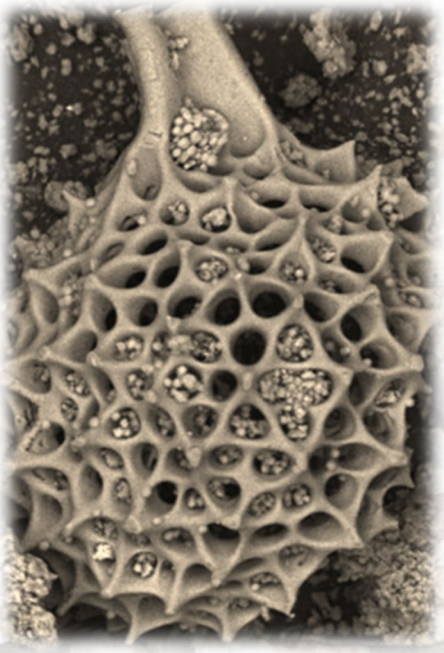
FACT SHEET No. 20 SCIENTIFIC DATA-TURF

mineral magic

Making soils better & wetter - permanently

Scientific Papers Published on Amorphous Silica in Turf



As turf managers face increasing challenges from water scarcity, nutrient leaching, and extreme weather conditions, the demand for sustainable, science-backed soil amendments continues to grow. Amorphous silica (ASi) **Mineral Magic**, has emerged as a powerful solution in turfgrass management, offering measurable improvements in soil structure, water retention, nutrient efficiency, and plant resilience.

The following peer-reviewed studies provide compelling evidence of how ASi enhances turf performance—particularly in sandy or degraded soils—by boosting drought tolerance, promoting root development, and reducing the need for synthetic inputs.

These findings not only support the integration of ASi in high-performance turf systems like golf courses and sports fields but also align with broader goals of sustainability and soil health.

10 Peer Reviewed Studies Include ;

1. Enhancement of Soil Water Retention and Hydraulic Conductivity
Study: Amorphous silica amendment to improve sandy soils' hydraulic properties for sustained plant root access under drying conditions
Authors: Mohsen Zarebanadkouki et al.
Journal: Frontiers in Environmental Science (2022)
Findings: Incorporating 1–5% ASi into sandy soils increased water holding capacity and maintained higher hydraulic conductivity under drying conditions, enhancing plant access to water during drought.
🔗 Read the full paper

2. Improved Water Storage and Phosphorus Availability
Study: Amorphous Silica Controls Water Storage Capacity and Phosphorus Mobility in Sandy Soils
Authors: Jörg Schaller et al.
Journal: Frontiers in Environmental Science (2020)
Findings: A 3% ASi application improved soil water storage by up to 180% and increased phosphorus mobility, enhancing nutrient access.
🔗 Read the full paper

3. Influence on Soil–Plant–Water Relations
Study: The effect of amorphous silica on soil–plant–water relations in soils with contrasting textures
Authors: Mohsen Zarebanadkouki et al.
Journal: Scientific Reports (2024)
Findings: In sandy loam soils, 2% ASi improved water retention and hydraulic conductivity, sustaining plant transpiration even under dry conditions.
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4. Growth and Silicic Acid Accumulation in Turfgrass
Study: Effects of Silicate Fertilizer on Growth and Silicic Acid Accumulation in Turfgrass
Authors: Takayasu Inoue et al.
Journal: Asian Journal of Plant Sciences (2021)
Findings: Silicate fertilizer boosted growth and silicic acid levels in Zoysia matrella and creeping bentgrass, supporting turf vigor and stress resilience.
Read the full paper

5. Biogenic Amorphous Silica and Plant-Available Water
Study: Biogenic amorphous silica as main driver for plant available water in soils
Authors: Jörg Schaller et al.
Journal: Scientific Reports (2020)
Findings: Biogenic ASi increased plant-available water across soil types, demonstrating a key role in improving drought resilience.
Read the full paper

6. Silicon in the Life and Performance of Turfgrass
Study: Silicon in the Life and Performance of Turfgrass
Author: Lawrence Datnoff
Journal: Applied Turfgrass Science (2005)
Findings: Silicon fertilization has been shown to alleviate abiotic stress and improve plant growth and development in several turfgrass species. Silicon improves leaf and stem strength through deposition in the cuticle and by maintaining cell wall polysaccharide and lignin polymers, potentially enhancing wear tolerance.
Read the full paper

7. Amorphous Silica Fertilization Ameliorated Soil Properties and Promoted Plant Productivity
Study: Amorphous silica fertilization ameliorated soil properties and promoted plant productivity
Journal: ScienceDirect (2024)
Findings: Application of ASi improved soil water retention and nutrient availability, leading to enhanced plant productivity. The study suggests that ASi can be a sustainable soil amendment to cope with drought stress and reduce the need for phosphorus fertilizers.
Read the full paper

8. Effect of Amorphous Silica on Soil–Plant–Water Relations in Soils with Contrasting Textures
Study: Effect of Amorphous Silica on Soil–Plant–Water Relations in Soils Contrasting Textures
Authors: Mohsen Zarebanadkouki et al.
Journal: SSRN (2023)
Findings: ASi application improved water retention and hydraulic conductivity in sandy loam soils, enhancing plant transpiration under drought conditions. The study indicates that ASi is particularly beneficial in coarse-textured soils.
Read the full paper

9. Silicon in the Life and Performance of Turfgrass
Study: Silicon in the Life and Performance of Turfgrass
Author: Lawrence Datnoff
Journal: Academia.edu
Findings: Silicon accumulation in turfgrass species like creeping bentgrass and Zoysiagrass improved turf quality, growth, and resistance to traffic and heat stress. Si-fertilized St. Augustinegrass showed better responses under severe drought stress compared to non-fertilized plants.
Read the full paper

FACT SHEET No. 20 SCIENTIFIC DATA-TURF

10. Amorphous Silica Amendment to Improve Sandy Soils' Hydraulic Properties
Study: Amorphous silica amendment to improve sandy soils' hydraulic properties for sustained plant root access under drying conditions
Authors: Mohsen Zarebanadkouki et al.
Journal: Frontiers in Environmental Science (2022)
Findings: Incorporating ASi into sandy soils increased water holding capacity and maintained higher hydraulic conductivity under drying conditions, enhancing plant access to water during drought stress.
Read the full paper

These studies collectively demonstrate that amorphous silica (Mineral Magic) amendments can:

- Enhance soil water retention and availability
- Improve nutrient mobility
- Maintain higher soil hydraulic conductivity during dry periods
- Promote turfgrass growth and stress tolerance

It should be noted that the key factor behind the efficacy of amorphous silica is the content percentage of SiO_2 (Silicon Dioxide) .

Mineral Magic is one of the purest forms from its Radiolarite deposit in the Northwest of Western Australia with a breakdown of 86% SiO_2.