



Improves Posture of Turf & Ornamentals

Plants stand up straight with Pennamin® Si. An application of Pennamin Si increases plant turgidity and results in turf and ornamentals with more upright growth. It also improves turf appearance, density, wear and stress tolerance, and can even increase green speeds in golf turf. Pennamin Si (10-0-0 with 4% Si) is a blend of Pennamin amino acids and micro-fine water-dispersible silica. Together, they effectively deliver organic nitrogen and available Si.

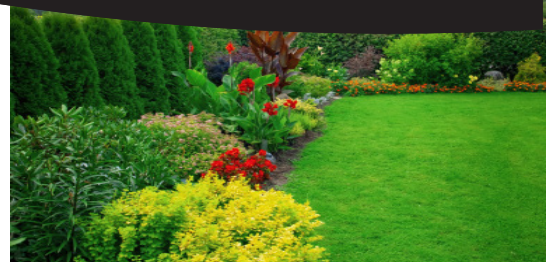
Silicon Effects on Abiotic and Biotic Stress

The beneficial effects of Si, direct or indirect, to plants under abiotic and/or biotic stress have been reported to occur in ornamentals and turfgrass. Leaves and stems of plants grown in the presence of Si show upright growth. This suggests that the distribution of light within the canopy is greatly improved. Silicon can positively affect the activity of some enzymes involved in the photosynthesis in turfgrass.

Role of Silicon in Turfgrass¹

Fertilization with Si has shown positive effects in alleviating abiotic stress as well as improving plant growth and development in several turfgrass species. Silicon has been shown to improve tolerance to turfgrass wear. When Silicon is deposited in the plant cuticle it improves leaf and stem strength, as well as maintaining cell wall polysaccharide and lignin polymers. Research demonstrates that Si may improve these turfgrass qualitative factors under extreme drought stress. Research has also showed that foliar applications of Si significantly enhanced photosynthetic capacity increasing chlorophyll content especially during the summer when plants were influenced by environmental stress.

¹ Silicon in the Life and Performance of Turfgrass, Lawrence E. Datnoff, Professor of Plant Pathology, University of Florida-IFAS, Department of Plant Pathology, 1453 Fifield Hall, Gainesville 32611



Benefits of Silicon in Plants

- More Upright Growth
- Increases Turgidity
- Improves Photosynthesis
- Increases Wear Tolerance
- Improves Winter Hardiness
- Improves Leaf Strength
- Improves Turf Color, Quality & Density
- Improves Drought Tolerance
- Increases Turf Coverage





Pennamin Si

- Will not leach from soil
- Compatible with all conventional nitrogen sources and most fertilizers
- Small particle size, water soluble nitrogen
- Contains 17 L-amino acids
- Contains essential amino acids
- Reliable release curve in all environmental conditions
- Friendly and safe for employees to handle
- No risk of tip burn normally associated with nitrates or volatilization of ammonia
- No risk of groundwater contamination
- Application safe during high stress periods



Pennamin Advantages



-  **Pennamin products** are readily absorbed by turf and ornamental foliage
-  **Pennamin Products** have a low C:N ratio (6:1), which assures that the organic nitrogen is utilized by turf and ornamentals.
-  **Pennamin products** help chelate soil micronutrients, making them more plant available.
-  **Pennamin products** contain a blend of 17 free L-amino acids and biodegradable Baypure®.

Pennamin Si for Golf Turf

Most USGA greens, because of their high quartz sand content, are low in plant-available Si. Pennamin Si can help to correct that deficiency, making Si more readily available to greens turf. Silicon is also known to help with plant turgidity and gives turf blades an upright growth pattern—this leads to a cleaner cut on turf and may increase green speeds. Pennamin Si may be used to harden off turf in preparation for cooler temperatures and to increase winter hardiness.

Application Rates:

Cool Season Grasses: Greens and Tees: Apply 0.5 to 1.5 pounds of Pennamin Si per acre (0.2 to 0.5 ounces per 1,000 ft²).

Fairways: Apply 0.5 to 1.5 pounds of Pennamin Si per acre (0.2 to 0.5 ounces per 1,000 ft²).

Warm Season Grasses: Greens and Tees: Apply 1.0 to 2.5 pounds of Pennamin Si per acre (0.4 to 0.9 ounces per 1,000 ft²).

Fairways: Apply 0.5 to 1.5 pounds of Pennamin Si per acre (0.2 to 0.5 ounces per 1,000 ft²).

Note: Low rates are intended for weekly maintenance. High rates are to be used for corrective applications. Adjust rates for bi-weekly applications.

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