PlatinumTE
PASPALUM

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THE PLATINUM TE™ ROOT SYSTEM

Seashore paspalum has the typical fibrous root system that is found in monocotyledonous grass plants. The uniqueness of the root system in seashore paspalum in comparison with bermudagrass or zoysiagrass involves the genetically programmed priority development and regeneration of the root system during cyclic environmental conditions or when exposed to both abiotic and biotic stresses, plus the actual root volume (generally 2x+ the total root volume compared with bermudagrass).

ROOT GROWTH PRIORITIES

Seashore paspalum is primarily rhizomatous and secondarily stoloniferous. Since paspalum evolved on sand dunes exposed to ocean water, the grass developed a genetically controlled mechanism to prioritize development of its root system, i.e., to 'build and maintain a foundation under that grass plant.' That priority plant rhizosphere system is focused totally on initial development of adventitious roots from nodes on stem segments emanating from sprigs or stolons or rhizomes for at least 2-3 weeks after planting. The nodal segment initiates roots and forms the crown region about 2 inches deep (at about the three-leaf stage) in the soil profile, where it allocates carbohydrates and hormones (especially cytokinins) for primary and secondary branching of lateral roots and root hairs. The primary branches often expand in size, depending on salinity accumulation in the soil, and develop the rhizomes or underground roots that become the most

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critical and essential component of the Platinum TE paspalum root system. Recovery from injury (or disease attack or any problems) that damage surface canopy shoot density is predominately via the rhizomes for root regeneration initially before any other shoot canopy density recovery will initiate.

POST PLANTING PERIOD

After planting sprigs, Platinum TE paspalum will build this root system foundation for about 3 weeks and most of the nutrients that are absorbed and stored or any generated carbohydrates are devoted to root development exclusive of shoot formation. Once the 'root foundation' is in place, the plant shifts the grass root development process to shoot formation from surface stolons and plantlets emerging from underground rhizome nodes.

The surface stolons will also initiate adventitious roots, lateral branch roots, and root hairs at nodal segments as canopy density gradually increases. Final fill-in and achievement of 100% canopy density is via stolon growth, and rhizome extension underground with subsequent surface emergence of new plantlets and shoots.

Because of this priority on rhizome development, underground extension, and total root volume maintenance, Platinum TE is constantly in a root regeneration mode. Understanding this root system prioritization is critical for sustaining surface canopy density and in developing management programs to escalate recovery from damage to shoots or loss of density at the soil surface.

RHIZOSPHERE PLASTICITY

Root plasticity, or the ability of Platinum TE to alter root distribution as the plant adapts to soil profile heterogeneity and site-specific environmental conditions is essential to achieving an extensive root volume for water and nutrient absorption. Root and subsequent shoot canopy density developmental stages are quite rapid in Platinum TE when properly managed, with 100% grow-in often being completed in 6-7 weeks from sprig planting.

Mismanagement, especially with frequent, short duration irrigation scheduling (which causes shallow root volume positioning) and application of highly saline water, can prolong the grow-in period since excess salts act as a growth regulator to shut down gibberellin production and subsequent stolon growth. Young juvenile roots, especially root hairs, are quite vulnerable to salt accumulation in the upper soil profile.

RHIZOME POSITIONING IN THE SOIL PROFILE

Irrigation scheduling (frequency of application, duration of each cycle, water volume applied, and depth of wetting front) is the key determinant on how fast and how deep the rhizomes are placed in the soil. Platinum TE is highly responsive to the total moisture regimen and spacial distribution of water in the soil profile, regardless of soil texture.

As long as short duration, frequent irrigation cycles are implemented during initial grow-in, Platinum TE will maintain a very shallow positioning of the rhizomes. The irrigation scheduling should be gradually extended from the frequent cycles to less frequent and longer duration cycles to move the wetting front deeper into the soil.

When the Platinum TE senses the soil profile zone above the rhizomes undergoing a dry-down phase, the grass will automatically position the rhizomes deeper into the soil, below 1 inch and preferably 2-3 inches deep in that upper soil profile.

This rhizome positioning is critical during the late grow-in stage when verticutting is needed to cut stolons and increase canopy density. It is recommended to minimize cutting a rhizome when cultivating Platinum TE, since the plant will revert back to root regeneration and this recovery period can often extend to 6-8 weeks before surface stolon growth is reactivated to tighten up surface canopy density.

GENERAL GUIDELINES FOR IRRIGATION SCHEDULING

<u>From planting to first 3 weeks of growth</u>: multiple short duration cycles (heavy sand topdressing on greens and tees plus hydro-sprigging or hydro-mulching on fairways, roughs, and slopes will help conserve water and reduce the number of daily cycles, therefore conserving water).

From 3 weeks to full canopy density (should be 6-7 weeks total grow-in duration from planting when implementing the correct site-specific management program):

When stolons emerge from sprigs (about 2.5-3 weeks after planting), scale back gradually on frequency of irrigation cycles. By week 4 after planting, once daily irrigation cycles encompassing a longer duration cycle should be implemented. By week 6-7 and near full canopy density, irrigation cycles should be every 2-4 days depending on evapotranspiration, soil profile, and irrigation water quality (for adequate salt management) conditions.

This strategy will position the rhizomes deeper, total root volume will increase in the soil profile, and the drought tolerance capability of the grass will improve.

Note: short duration, frequent irrigation cycles that do not include aeration events and subsequent downward leaching of salts can result in 2-16 times higher salt concentrations in the upper soil profile compared to the incoming saline irrigation water and these salts will normally accumulate in the soil profile to slow down or deter adequate root system development. Salt is a desiccant and will dehydrate young juvenile roots, especially root hairs. Proper salt management is critical to rapid establishment of the Platinum TE root system and achievement of a reasonable time frame for grow-in to full surface canopy density when irrigating with saline irrigation water.

If water infiltration and subsequent percolation rates through the upper soil profile zones are reduced due to layering/sealing or lack of regularly scheduled aeration events, root borne pathogens that cause paspalum take-all or decline or *Curvularia* fading out can rapidly kill root hairs and eventually rhizomes. The grass automatically shifts into the root regeneration mode when this disease attack occurs.

ACTIVATION OF SALT TOLERANCE MECHANISMS IN PLATINUM TE

Multiple salt tolerance mechanisms are genetically activated involving both up-regulation and down-regulation of genes as salinity in irrigation water increases. These salt tolerance mechanisms are generally not fully functional until the root system is at least 3-4 inches long.

Since the juvenile roots are highly sensitive to high saline water, irrigation water <2000-2500 ppm total dissolved salts should be initially applied at planting, during establishment and continuing through the grow-in period. Once full canopy density has been achieved and the Platinum TE has been nutritionally stabilized, higher salinity water can be applied to the grass on a regular basis with proper site-specific salinity management.

However, salt accumulation in the soil profile must be constantly minimized through aeration and leaching of those excess salts down below the root system and hopefully into the drainage lines. If the salt accumulation in the soil exceeds the developing tolerance capability of Platinum TE during establishment and grow-in, growth reductions of 50-75% can be expected, and the total grow-in period can be extended to 6-12 months after planting. Proper management is the key to successful grow-in programs exposed to high salinity irrigation water.

GUIDELINES TO RAPID PLATINUM TE ROOT ESTABLISHMENT

****weekly to twice weekly applications of a seaweed or kelp extract product containing at least 35+% cytokinins, the hormone that activates root development and regeneration.**

****granular application of lime, gypsum, or dolomite pre-plant (depending on site-specific soil and irrigation water quality test data) to stabilize soil structure and provide <u>available calcium</u> for initial root uptake by juvenile roots. Monthly applications thereafter during grow-in may be needed. Calcium is the primary counter ion to excess sodium either in the soil or the incoming irrigation water and is the nutritional stabilizer internally in the paspalum turfgrass plant.**

****pre-plant granular application of phosphorus and potassium to provide essential nutrients for root development should be a priority strategy. Weekly prescription applications of potassium during grow-in are normally warranted since this nutrient is highly mobile in the soil and frequent irrigation cycles will leach the nutrient beyond the developing root system. Potassium is the primary nutrient for water turgor pressure adjustments internally in the turf plant cells when irrigating with saline water and about 3% K should be maintained in the Platinum TE plant on a regular basis. Potassium activates over 80 enzymes for growth and development.**

****application of granular manganese and zinc fertilizers prior to planting or immediately after planting to activate salt tolerance mechanisms in Platinum TE root system is critical. Once stolons and plantlet shoots emerge from nodes, regular applications of liquid manganese and zinc are needed to fully activate all salt tolerance mechanisms.**

****Manganese is the critical nutrient for activating over 35 enzymes for growth and development in the Platinum TE root system and will suppress root borne pathogens with proper management.**