

APEX-10 ON PERFORMANCE UNDER REDUCED FERTILITY & IRRIGATION REGIMES

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MATERIALS AND METHODS

Penncross creeping bentgrass were collected from at the Rutgers turf farm and planted in a mixture of sand (85%) and peat (15%) with an 18-24-6 granular at 1.0 lb/1000 ft² for five weeks in a greenhouse with daily irrigation and trimmed regularly to 2.0 cm height. Plants were then moved to a growth chamber for a two-week pre-stress treatment at 70 F day & 63 F day night temperature's with biweekly foliar applications of 0.07 lb N/1000 ft² with half the plants receiving biweekly foliar applications of APEX-10 1.5 oz/1000 ft² and the other half with water.

Following pre-stress, plants were moved back to the greenhouse at 100 F day and 86 F night temperatures at 60% RH for a six weeks. APEX-10 treated plants were separated into three groups and irrigated at 3x/week, 2x/week, and 1x/week. Weekly measurements included visual turf quality, and normalized difference vegetation index (NDVI), and leaf chlorophyll. Leaf tissue samples were collected bi-weekly, and tested for nitrogen, phosphorus, and potassium content.

TURF QUALITY (TQ)

- APEX-10 showed no significant difference in TQ with plants irrigated 3x/week.
- APEX-10 improved TQ for plants irrigated at 2x/week or 1x/week compared to untreated plants.
- APEX-10 treated turf irrigated 2x/week had similar TQ as plants irrigated 3x/week.
- APEX-10 treated turf irrigated 1x/week had significantly higher TQ than untreated, irrigated 1x/week.
- Untreated turf irrigated 2x/week had significantly lower TQ.
- Untreated turf irrigated 1x/week consistently showed lowest TQ of all treatments and fell below the acceptable level.
- At no point during stress did plants receiving APEX-10 fall below the acceptable level of TQ.

NORMALIZED DIFFERENCE VEGETATION INDEX (NDVI)

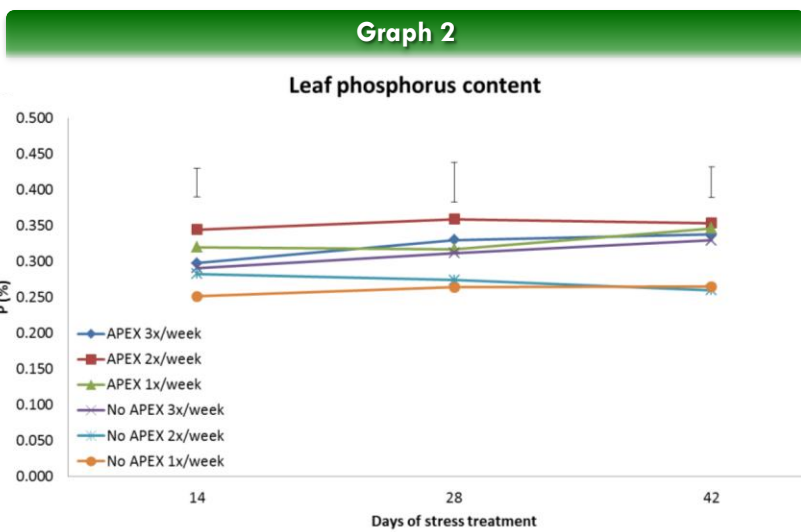
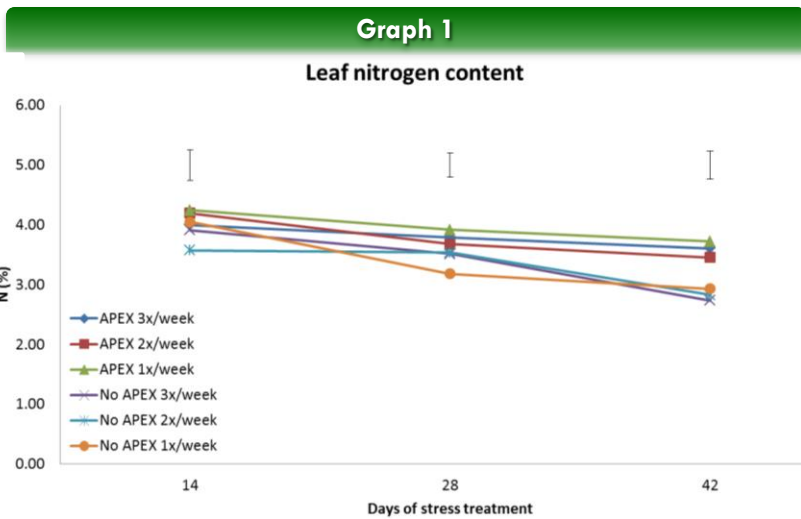
- Objective canopy measurements of NDVI showed similar patterns to TQ measurements.
- Untreated turf irrigated 1x/week displayed a drop in NDVI starting at day 21.
- APEX-10 treated turf with the same irrigation regimen delayed this decline until day 35.
- Untreated turf irrigated 2x/week began to decline at day 28.
- APEX-10 treated turf irrigated 2x/week began to decline at day 35.
- As with the TQ results, there was no significant difference between APEX-10 treated and non-APEX-10 treated turf irrigated 3x/week.

CHLOROPHYLL

- Leaf chlorophyll content declined for all treatments during the stress period, most likely due to intense heat stress in the greenhouse. This was most evident during the 28-42 day time period.
- APEX-10 treated turf irrigated 2x or 1x/week had significantly higher chlorophyll content than respective untreated controls at day 28 and was similar to plants irrigated 3x/week.
- APEX-10 treated turf irrigated 2x/week still showed a significant difference compared to untreated turf.
- APEX-10 treated turf irrigated 2x/week at day 42 had similar results as plants irrigated 3x/week.
- APEX-10 treated turf irrigated 1x/week at day 35 showed no significant difference in chlorophyll levels.

N, P, & K LEAF TISSUE ANALYSIS

- Leaf samples for N-P-K quantification were collected during stress at days 14, 28, and 42, with significant differences noted for nitrogen and phosphorus only.
- Differences in leaf nitrogen content (Graph 1) first occurred at day 28 with untreated turf irrigated 1x/week having significantly lower N content than all turf receiving foliar APEX-10.
- Separation between treatments was most evident at day 42 regardless of irrigation regimen, APEX-10 turf had significantly higher leaf N content than untreated plants.
- Leaf phosphorus content (Graph 2) showed differences at day 28, as plants treated with APEX-10 irrigated 2x/week had significantly higher leaf P content than untreated controls.
- At day 42 turf treated with APEX-10 promoted significantly higher leaf P content in both 2x and 3x/week irrigation regimens.



DISCUSSION AND CONCLUSION

Symptoms of summer stress typically manifests leaf yellowing, canopy wilting, and thinning. When the stress is prolonged or compounded by a reduced fertility regimen, turf stands will quickly lose attractiveness and functionality.

Foliar applications of APEX-10 maintained higher content of nitrogen and phosphorus in leaves when turf plants were under limited irrigation (2x or 1x/week) suggesting that turf managers would benefit most to use APEX-10 prior to and during periods of stress.

APEX-10 treated turf maintained higher nitrogen and phosphorus in the plant system which translated into higher chlorophyll content and a more-desirable turf color. This occurred because nitrogen is a key component of the chlorophyll molecule while phosphorus serves important roles in phospholipids structure.

Overall, this study provides promising results that APEX-10 can produce healthier turfgrass when plants are managed under a 30% reduction in fertility and limited irrigation. Healthier plants are then better able to withstand commonly occurring abiotic stresses such as heat and drought.