

NATURE'S WONDER ON PERFORMANCE UNDER REDUCED FERTILITY & IRRIGATION REGIMES

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MATERIALS AND METHODS

Penncross creeping bentgrass were collected from 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 70F day & 63F night temperature's with biweekly foliar applications of 0.07 lb N/1000 ft² with half the plants receiving biweekly foliar applications of Nature's Wonder 3 oz/1000 ft² and the other half with water.

Following pre-stress, plants were moved back to the greenhouse at 100F day and 86F night temperatures at 60% RH for a six weeks. Nature's Wonder 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)

- Nature's Wonder showed no significant difference in TQ with plants irrigated 3x/wk.
- Nature's Wonder improved TQ for plants irrigated at 2x/wk or 1x/wk compared to untreated plants.
- Nature's Wonder treated turf irrigated 2x/wk had similar TQ as plants irrigated 3x/wk.
- Nature's Wonder treated turf irrigated 1x/wk had significantly higher TQ than untreated, irrigated 1x/wk.
- Untreated turf irrigated 2x/wk had significantly lower TQ.
- Untreated turf irrigated 1x/wk consistently showed lowest TQ of all treatments and fell below the acceptable level.
- At no point during stress did plants receiving Nature's Wonder 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/wk displayed a drop in NDVI starting at day 21.
- Nature's Wonder treated turf with the same irrigation regimen delayed this decline until day 35.
- Untreated turf irrigated 2x/wk began to decline at day 28.
- Nature's Wonder treated turf irrigated 2x/wk began to decline at day 35.
- As with the TQ results, there was no significant difference between Nature's Wonder treated and non-Nature's Wonder treated turf irrigated 3x/wk.

CHLOROPHYLL

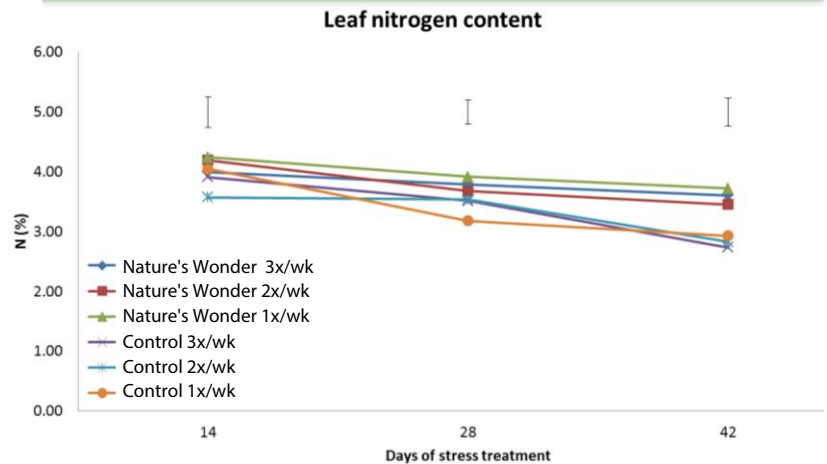
- Leaf chlorophyll content declined for all treatments during the stress period, most likely due to intense heat stress in the greenhouse. This was most evident during the 28-42 day time period.
- Nature's Wonder treated turf irrigated 2x or 1x/wk had significantly higher chlorophyll content than respective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

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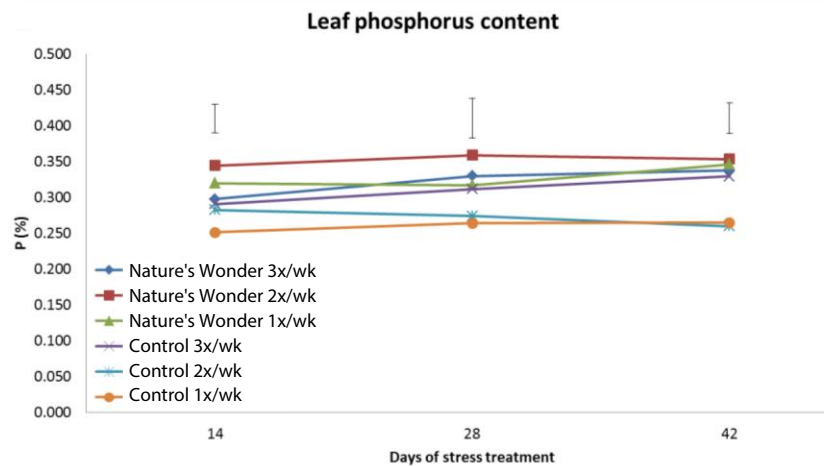
N, P, & K LEAF TISSUE ANALYSIS

- 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/wk having significantly lower N content than all turf receiving foliar Nature's Wonder.
- Separation between treatments was most evident at day 42 regardless of irrigation regimen, Nature's Wonder turf had significantly higher leaf N content than untreated plants.
- Leaf phosphorus content (Graph 2) showed differences at day 28, as plants treated with Nature's Wonder irrigated 2x/wk had significantly higher leaf P content than untreated controls.
- At day 42 turf treated with Nature's Wonder promoted significantly higher leaf P content in both 2x and 3x/wk irrigation regimens.

Graph 1



Graph 2



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 Nature's Wonder maintained higher content of nitrogen and phosphorus in leaves when turf plants were under limited irrigation (2x or 1x/week) suggesting that its best to use Nature's Wonder prior to and during periods of stress.

Nature's Wonder 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 Nature's Wonder 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.