

Applications of Plant Growth Regulators on Growth and Physiological Responses of Perennial Ryegrass under Salinity Stress

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Introduction:

Perennial Ryegrass (*Lolium perenne* L.) used as turf and forage is increasingly subject to salinity stress in many areas due to the acceleration of salinization. Plant growth regulators (PGRs) play essential roles in regulation of plant growth and developmental processes and abiotic stress responses and tolerance. However, salinity tolerance mechanisms as affected by PGR applications are not well understood in turfgrass species.

Objective:

To investigate effects of exogenous application of plant growth regulators on growth and physiological responses of perennial ryegrass exposed to salinity stress.

Materials & Methods:

- ◆ **Four cultivars:** BrightStar SLT, Catalina, Inspire, and SR4660ST varying in salinity tolerance.
- ◆ Seeded and grown in pots containing sand and watered with half-strength Hoagland solution in a greenhouse.
- ◆ **Salinity:** 100- and 200- mM NaCl with half-strength Hoagland solution.
- ◆ **PGRs:** foliar sprayed 10 mL of each PGR three times prior to salinity stress, and subsequently sprayed every two days after stress initiation:
 - ◆ 10 μ m 6-benzylaminopunine (6-BA), 50 μ m jasmonic acid (JA), 50 μ m salicylic acid (SA), 500 μ m γ -Aminobutyric (GABA), 200 μ m sodium nitroprusside (SNP), 100 μ m abscisic acid (ABA), and 10 mM calcium chloride (CaCl_2).
- ◆ **Treatments:**
 - ◆ Control, spray with water
 - ◆ Control + PGRs, spray with PGRs
 - ◆ Salinity, spray with water
 - ◆ Salinity + PGRs, spray with PGRs
- ◆ **Replication:** four (4 pots)
- ◆ **Stress duration:** 14 days

Results:

Across four cultivars, PGR sprays did not improve salinity tolerance under 100 mM NaCl, but increased leaf fresh and dry weight under 200 mM NaCl, compared to the non-sprayed plants, especially for 6-BA (Fig. 1). PGR-treated plants also had lower Na^+ concentration in the leaves than the untreated plants except for ABA (Fig. 1).

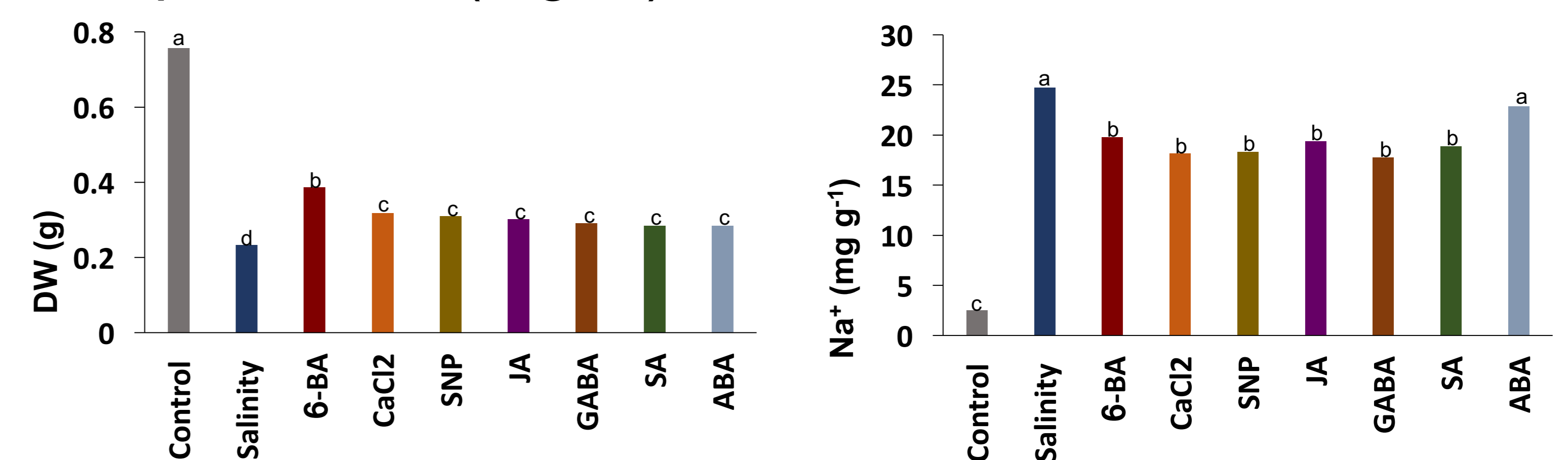


Fig 1. Effects of PGRs on leaf dry weight (DW) and leaf Na^+ concentration under 200 mM NaCl.

Application of 6-BA had higher leaf DW than the untreated plants in all four cultivars under 200 mM NaCl (Fig. 2), while 6-BA treated plants had lower Na^+ accumulation compared to the untreated plants in Brightstar SLT, Inspire and SR4660ST (Fig. 2).

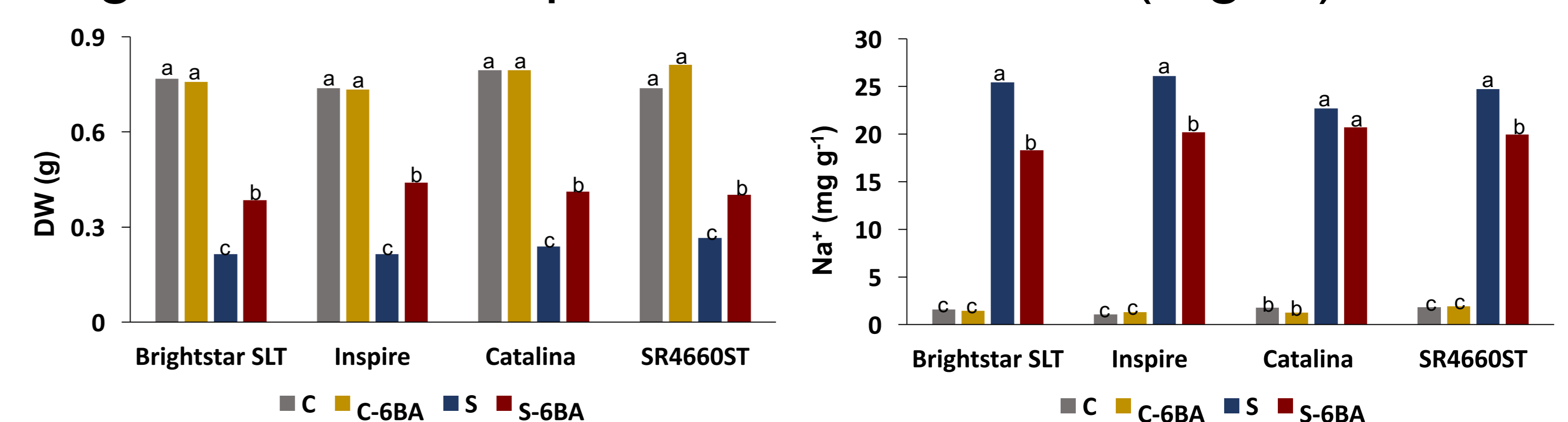


Fig 2. Leaf DW and Na^+ concentration of cultivars as affected by application of water and 6-BA with or without salinity stress. C, no stress; S-200 mM NaCl.

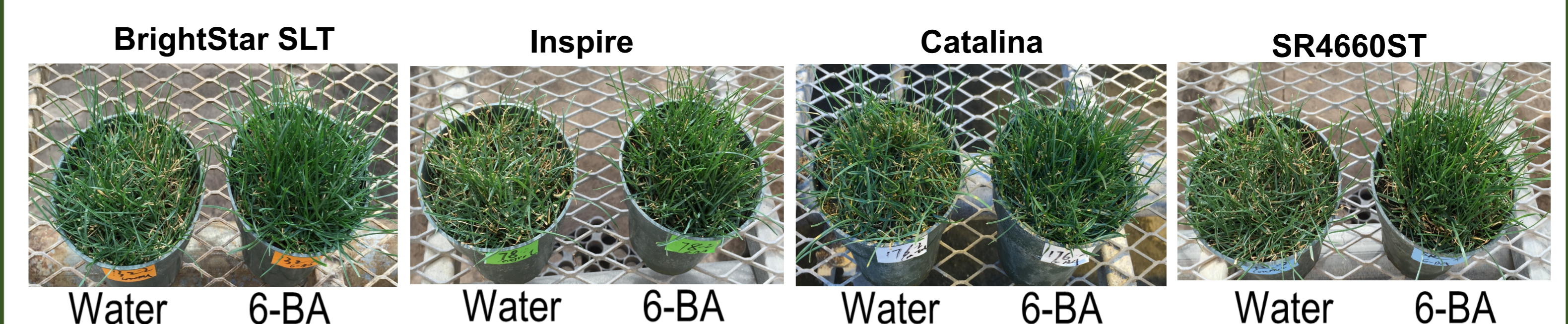


Fig 3. Cultivar response to application of 6-BA under 200 mM NaCl

Ongoing work:

Antioxidants, hormone concentration, and expression of genes controlling hormone biosynthesis are being analyzed.

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