

Salinity Tolerance of Super-Nodulating Soybean Genotype En-b0-1

Responses to Salt Stress in Soybean: Comparison between Normal-Nodulating and Super-Nodulating Genotypes

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【Aim】

Super-nodulating soybean is known by its greater biomass production under elevated CO₂ concentrations, N₂ fixation capacity, and flooding tolerance. However, the salt tolerance of super-nodulating soybean genotype had not been researched. Soil salinity is a major constraint for crop production; about 10% of the world's cropland is detrimentally affected by salinity. In this study, we tested the hypothesis that the super-nodulating genotype En-b0-1 is more tolerant to salinity than the normal-nodulating genotype.

【Materials and Methods】

Plant materials:

Enrei (normal-nodulating cultivar)

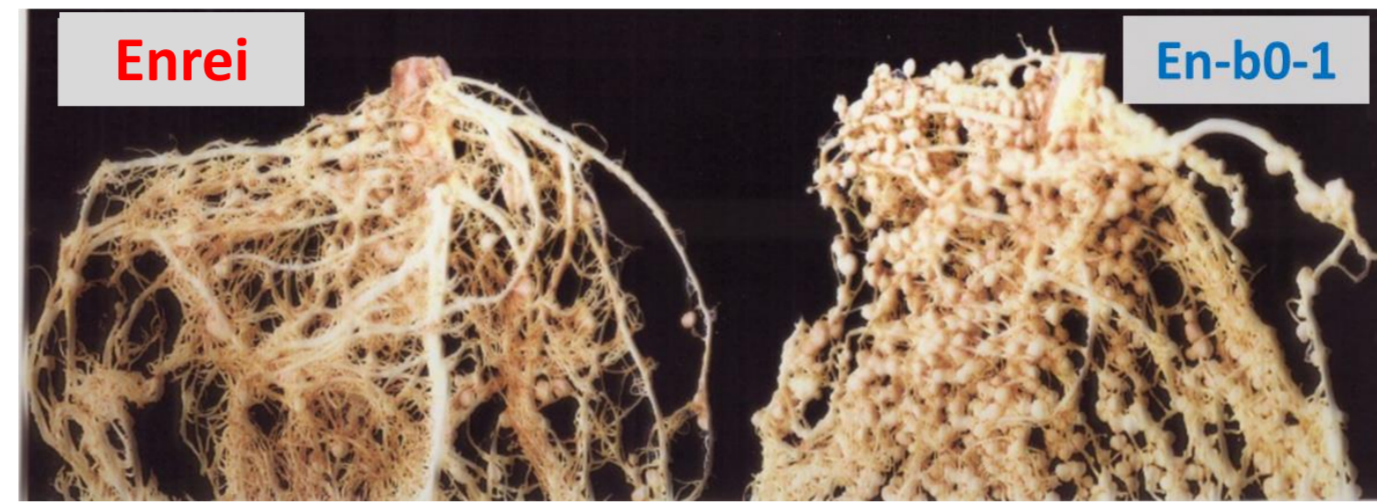
En-b0-1 (super-nodulating genotype derived from Enrei)

Fertilization: Chemical fertilizer (0.5g of N, 1.5g of P₂O₅, 2.0g of K₂O), 10g of fused phosphate, 10g of slaked lime per pot (1/5000 Wagner pots)

Saline treatment: 100mM NaCl solution

Control: tap water

Saline treatment was imposed at the pre-flowering stage (from 23 DAS (days after sowing) to 51DAS), and the reproductive growth stage (from 52 DAS to 101 DAS).



Roots of Enrei and En-b0-1



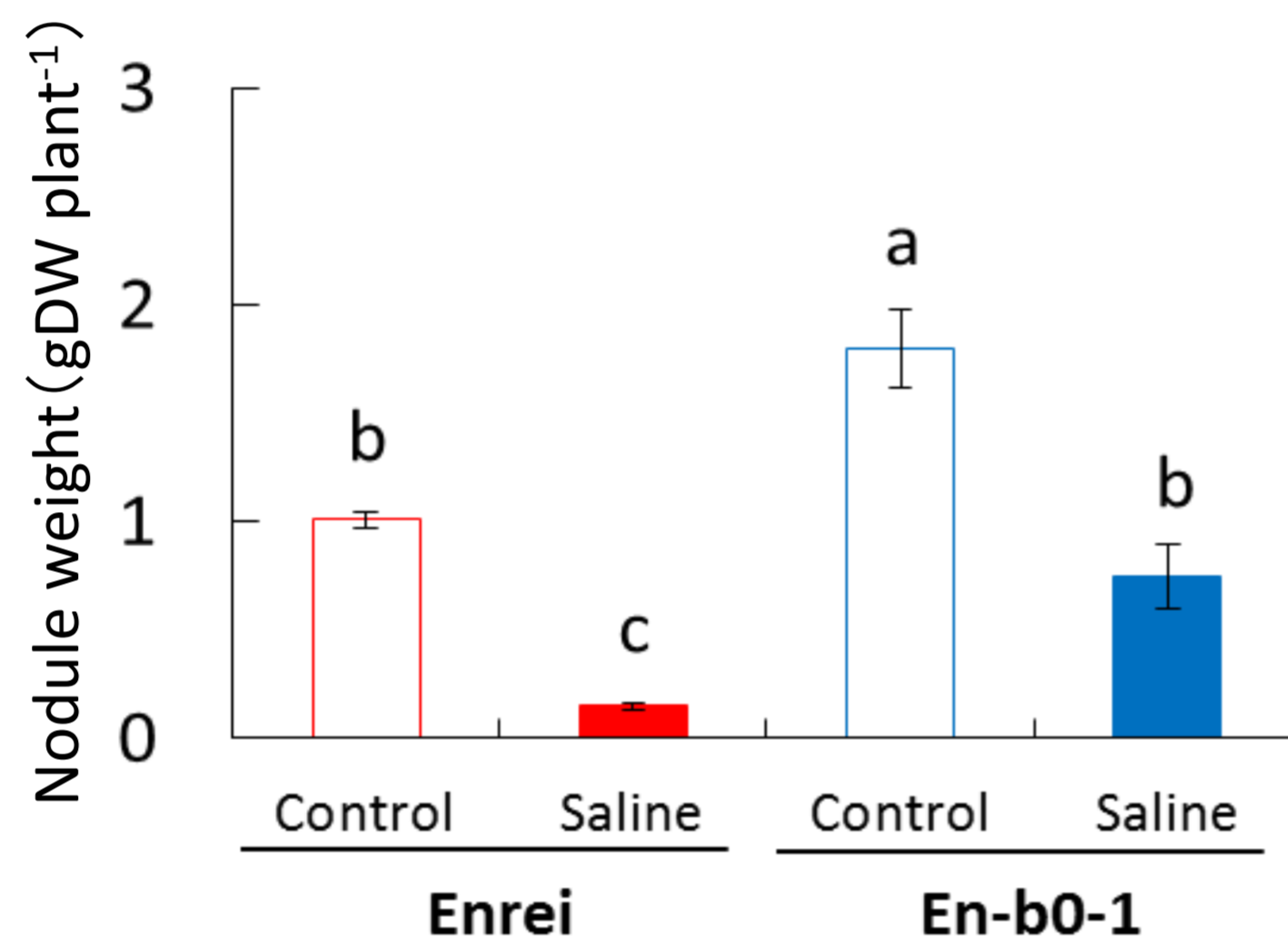
NaCl solution or tap water

Solution was supplied from the hole of pots

【Results and Discussion】

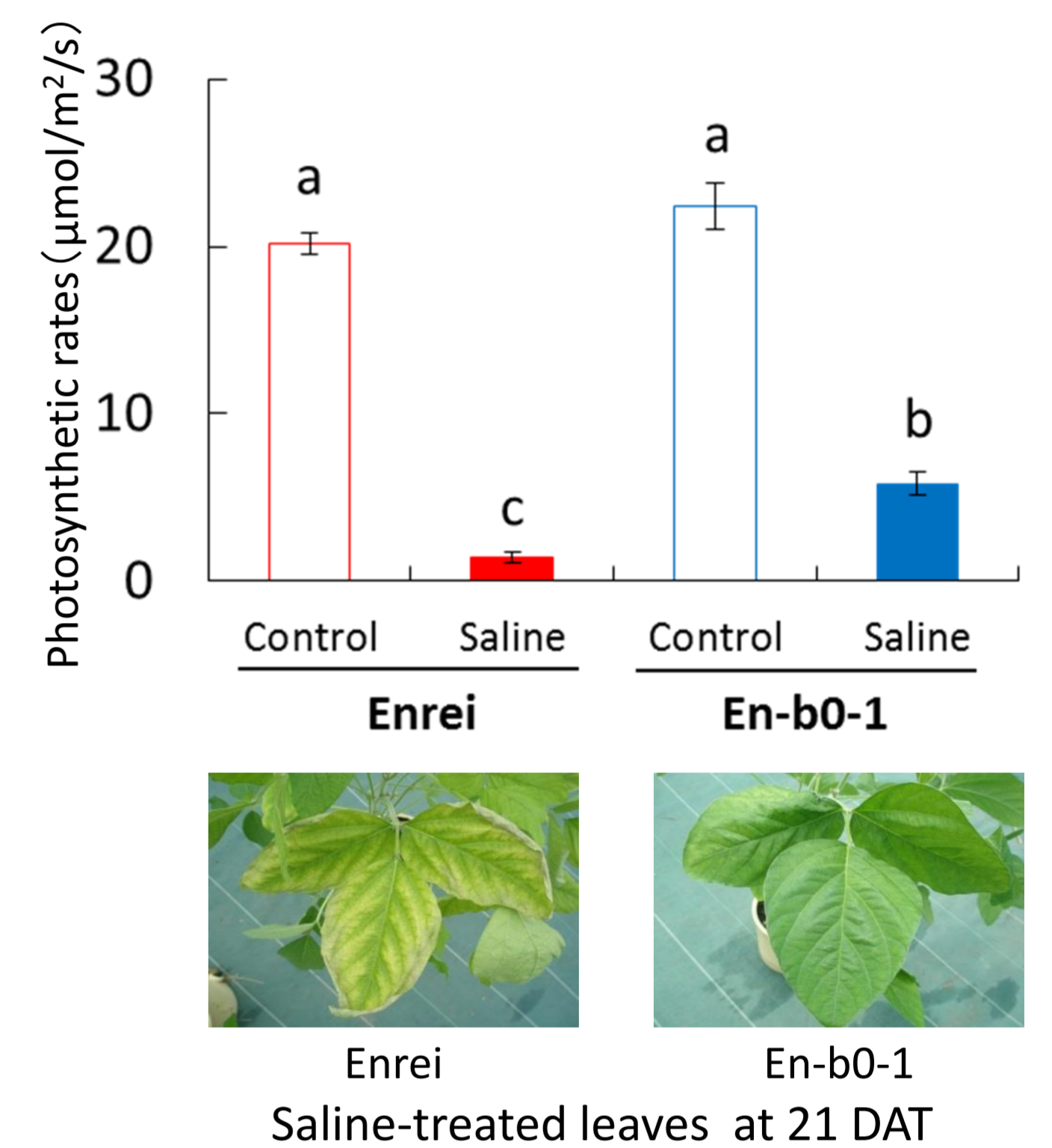
1. Nodulation at 51 DAS

In salt-treated plants, nodule number was substantially reduced regardless of genotype, while weight per nodule was markedly heavier in En-b0-1, resulting in heavier nodule weight per plant in En-b0-1.



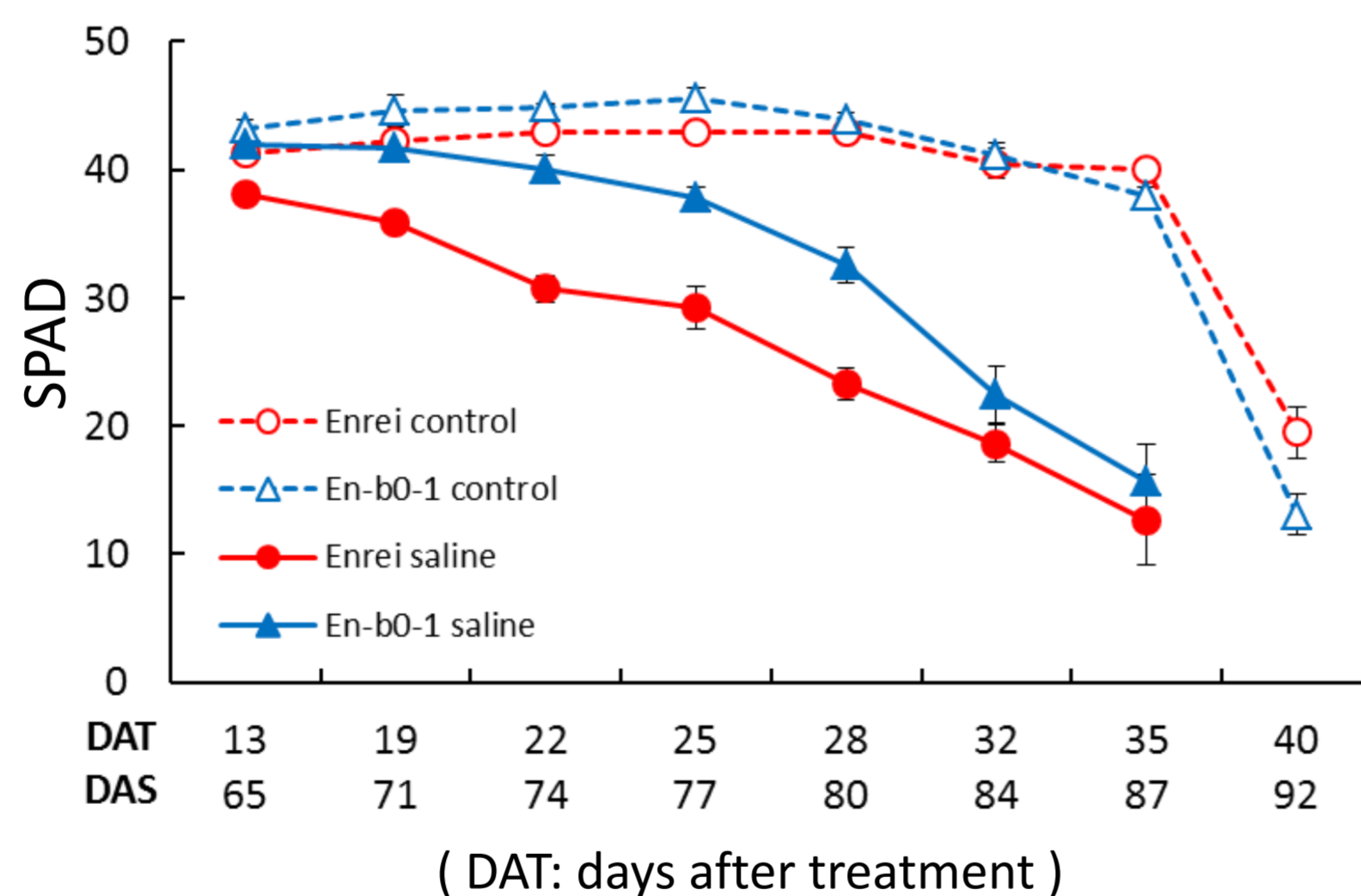
4. Photosynthetic rate at 51 DAS

Photosynthetic rates were markedly reduced by the saline treatment regardless of genotype. The reduction in photosynthetic rate was more substantial in Enrei than in En-b0-1.



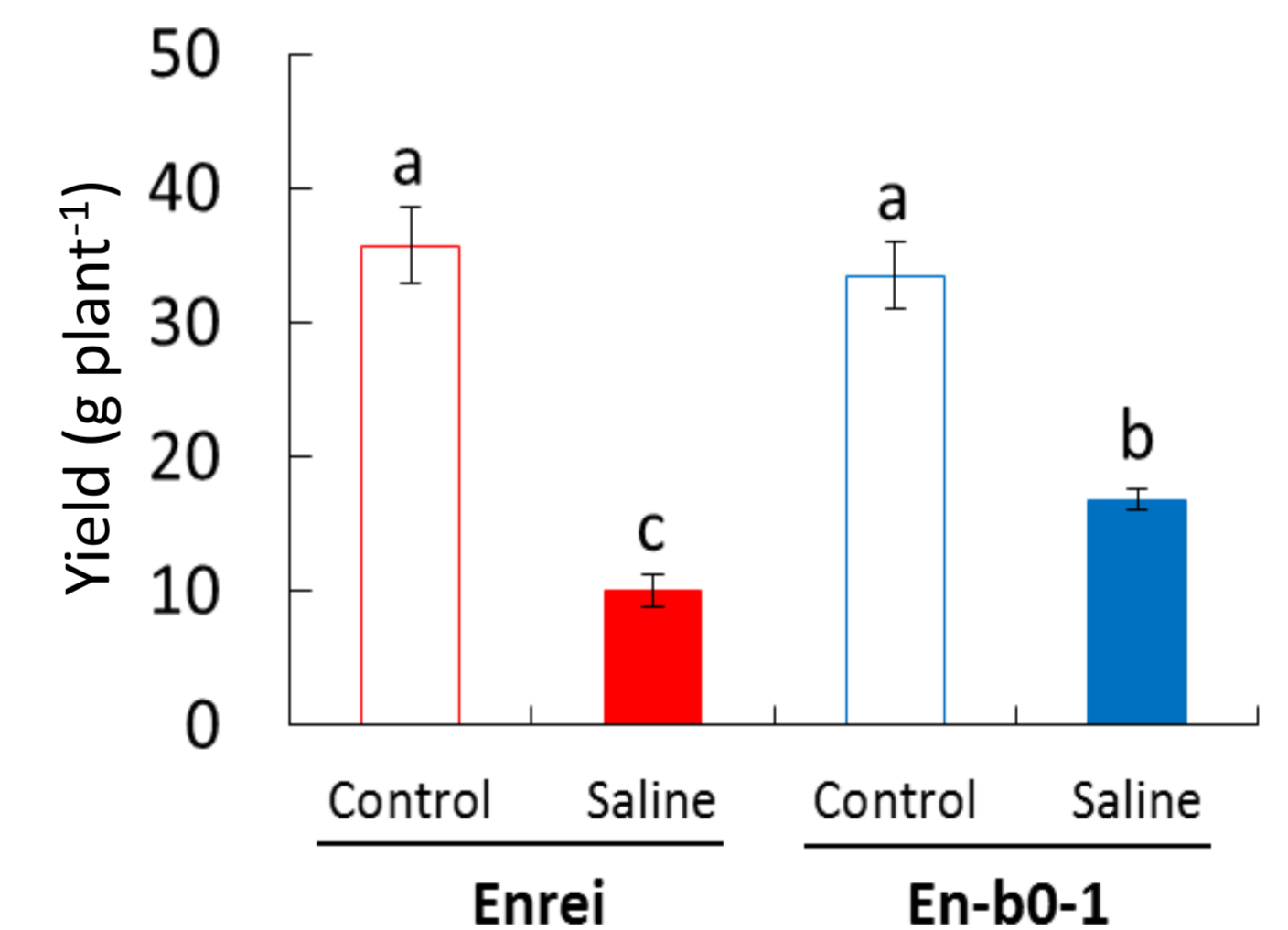
2. Changes in chlorophyll content

In the salt-treated plot, the leaf chlorophyll content declined sharply after ca. 18 DAT, and this decline was steeper in Enrei than in En-b0-1.



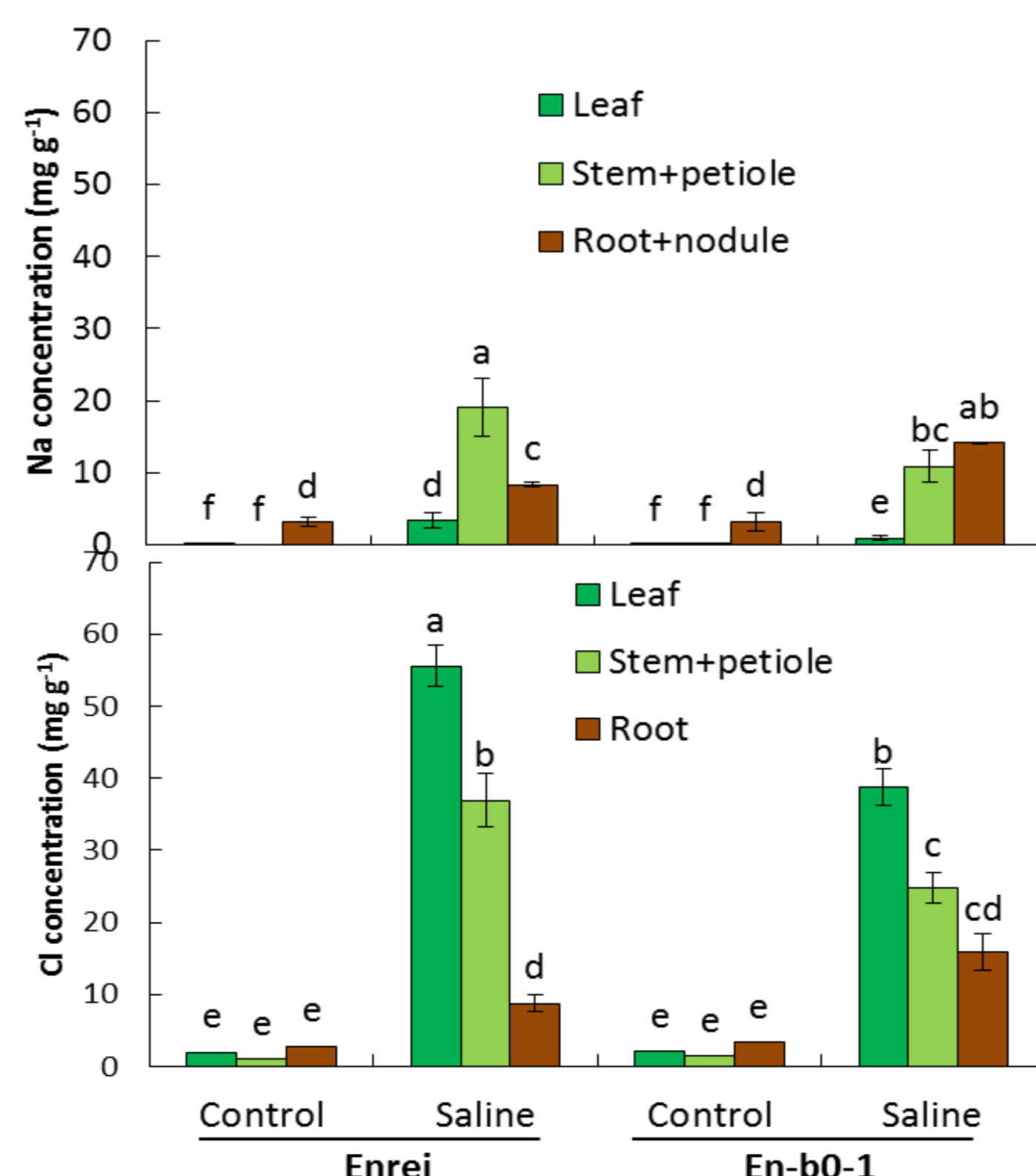
5. Yield and biomass production at 101 DAS

The saline-induced yield reduction was markedly smaller in En-b0-1 than in Enrei, due to the larger number of pods, and weight per 100 grains in En-b0-1.



3. Na and Cl accumulation at 51 DAS

Under saline conditions, in En-b0-1, the concentrations of Na and Cl in shoots were significantly lower, while those in roots and nodules were higher than in Enrei.



【Conclusion】

Under saline conditions, the super-nodulating genotype En-b0-1 had heavier nodule weight, resulting in superior N uptake, higher photosynthetic activity, and greater biomass production compared to its normal-nodulating parental cultivar Enrei.

En-b0-1 was more tolerant to salinity than its parental normal-nodulating cultivar, due to its higher capacity for nodulation and superior ability to prevent excessive accumulation of Na and Cl in shoots, while withholding those toxic elements in roots and nodules.