

Effects of Biodynamic Preparation 500 (P500) Cow Horn Manure on Early Growth of Barley, Pea, Quinoa, and Tomato under Saline Stress Conditions

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Introduction

- A large proportion of salt-affected soils are found in arid and semi-arid areas of developing countries (Fig. 1).
- On-farm salinity management should involve locally-available resources at a low-cost.
- Biodynamic preparation 500 (P500) was rarely tested on stressed soils.
- This study was conducted to quantitatively determine the effects of P500 on the early growth of different crops under saline conditions.



Fig. 1. Soil affected by salt stress in the tropics
Source: <http://irri.org> (accessed on 19 Aug 2015)

Materials and Methods

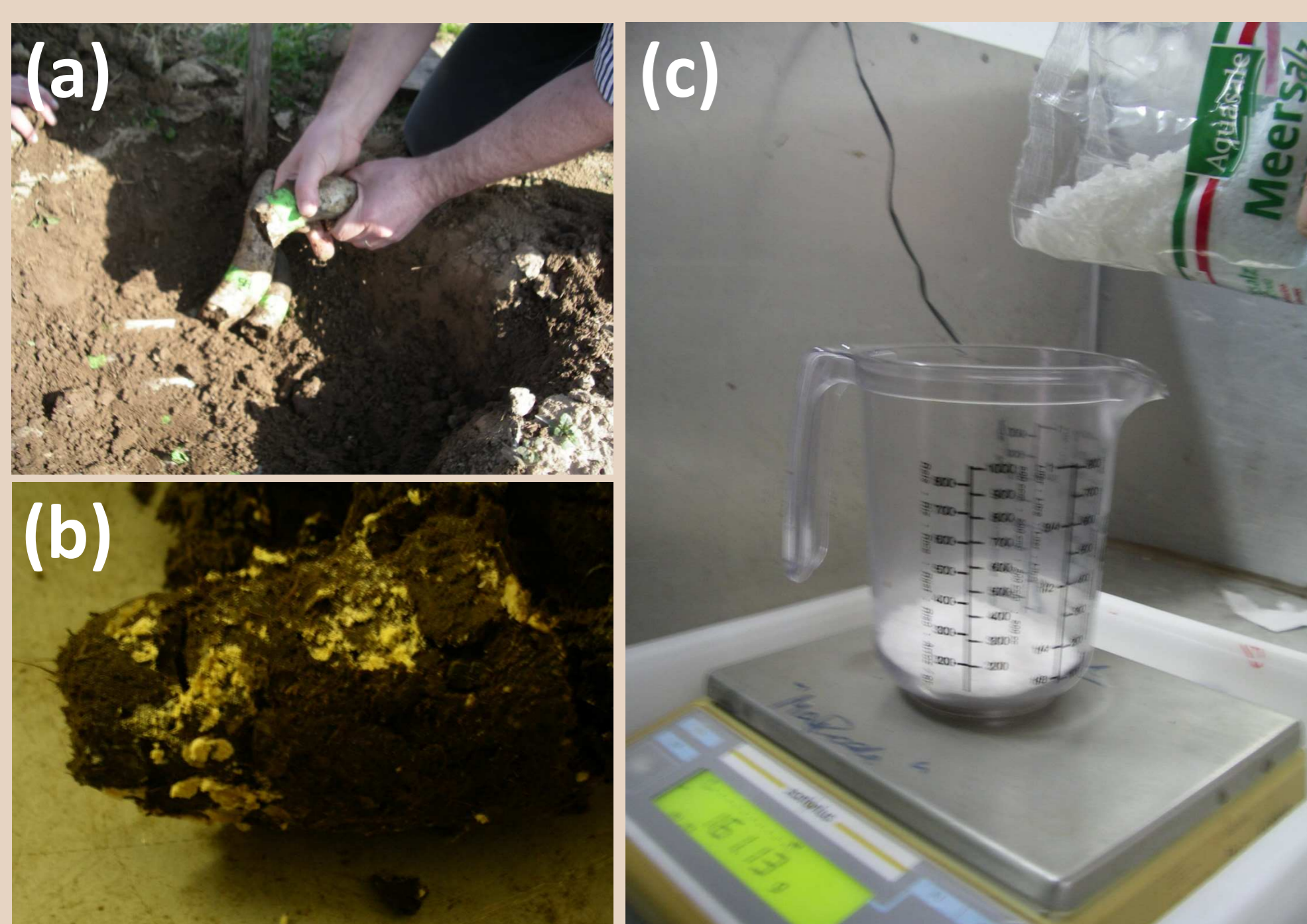


Fig. 2. Cow horns filled with manure collected from Neu-Eichenberg (a); manure out of horn (b); preparation of salinity treatments (c)

- A two-factorial pot trial of a randomized block design with Barley, Pea, Quinoa and Tomato was conducted in a greenhouse chamber.
- P500 solution (100 g of cow horn manure + 40 l of rainwater) was applied to the pots before and after sowing (Fig. 2a and b).
- NaCl was used to adjust the critical electric conductivity (EC) for each crop (Fig. 2c); Tomato: 5.0 dS m⁻¹, Pea: 4.0 dS m⁻¹, Barley: 12.0 dS m⁻¹, Quinoa: 20.0 dS m⁻¹.
- Shoot biomass was measured as dry matter (DM g) 38 days after sowing.

Results and Discussion

- Results suggest that the application of P500 enhanced the initial plant growth of all tested crops (Fig. 3a and b): on average 18.5 % and 16.7 % for non-saline and saline treatments, respectively.
- For Barley and Pea the effects were consistently shown with the salt stress, whereas, biomass yield of P500 treatments reduced for Quinoa and did not reveal for Tomato under stress condition (Fig. 4).

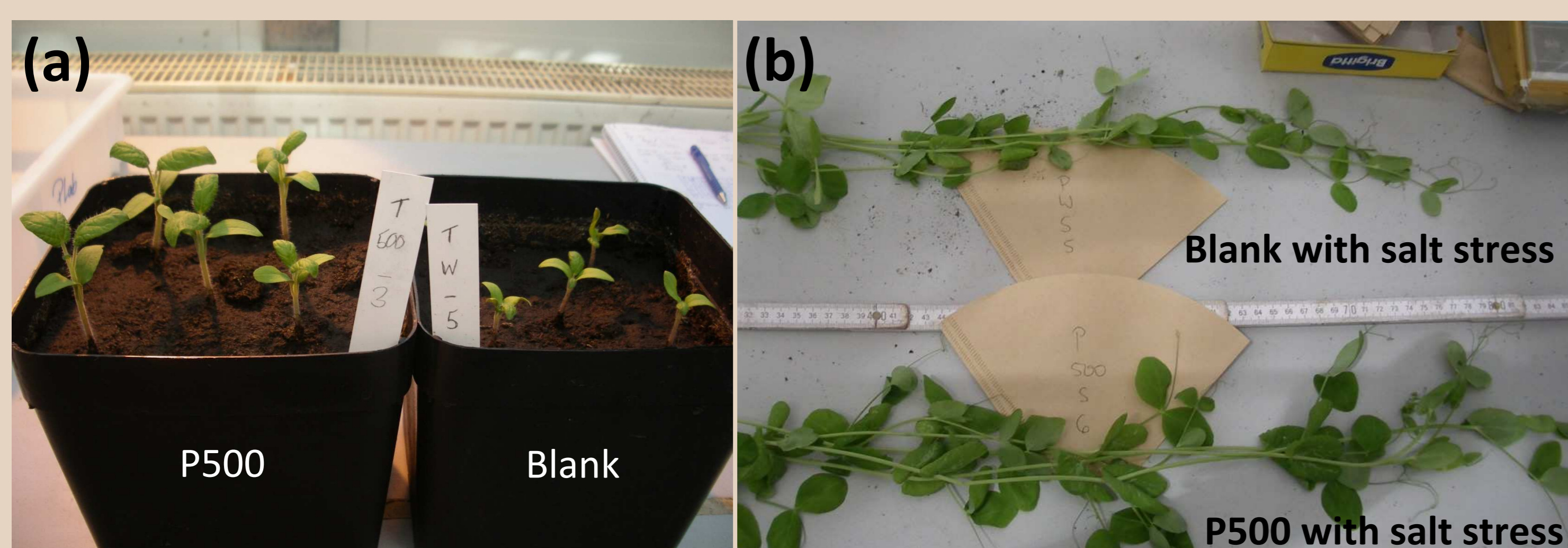


Fig. 3. Early plant growth of tomato (a) as affected by application of biodynamic preparation 500 (P500) without salt stress; and pea (b) with salt stress

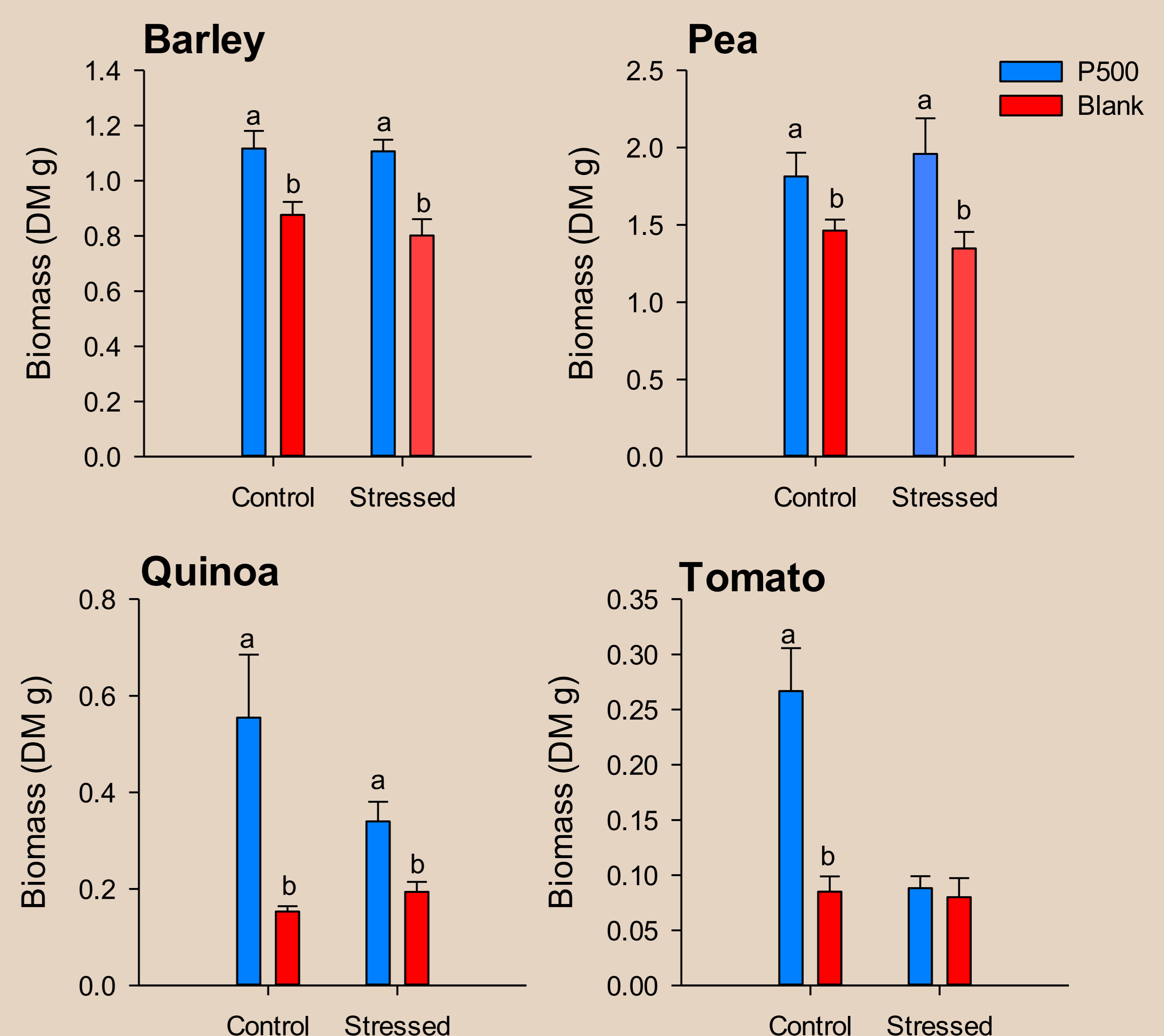


Fig. 4. Shoot dry matter of Barley, Pea, Quinoa and Tomato as affected by biodynamic preparation 500 (P500) under control and salt-stressed condition. Small letters indicate significant differences (*Mixed-effects model*, $P \leq 0.05$).

Conclusions

- Findings suggest that P500 may be a measure to mitigate the stress from adverse environmental conditions.
- Crop species and genotypes in different climatic zones might react in different ways to P500.
- Long-term investigation in combination with various stress conditions and levels is necessary.