

Boron alleviates the aluminum toxicity in buckwheat by regulating antioxidant defense system and maintaining osmotic balance

Jiahao Ge¹, Jinfeng Gao¹

(²⁸Northwest A & F University, Yangling 712000, China)

Abstract: **【 Objective 】** Aluminum (Al) toxicity in acidic soils has become a serious environmental problem worldwide. Boron can help plants mitigate aluminum phytotoxicity in acidic soils, but its underlying mechanism in buckwheat remains completely unknown. **【 Method 】** the buckwheat germination and greenhouse pot experiments were carried out under the conditions of four Al concentrations (0, 5, 10, and 15 mM) and four boron concentrations (0, 10, 30, and 50 μ M). The root length, plant height, root weight, shoot weight, antioxidant enzyme activity, MDA, osmotic adjustment substance content, photosynthetic pigment content, root activity were determined during two growth stages. This research aimed to investigate the mitigation effect of exogenous boron on the Al toxicity of buckwheat and reveal the mechanism from the aspects of growth characteristics, antioxidant enzyme system, and osmotic regulation. **【 Result 】** Al toxicity in acidic soils could cause damage to the buckwheat root system, inhibit root elongation, reduce root activity, reduce the leaf photosynthetic pigment content, and eventually lead to a reduction in buckwheat biomass. Boron treatment with different concentrations could reduce the Al^{3+} concentration in the root, regulate the antioxidant enzyme activity and the osmotic adjustment substance content, reduce the membrane lipid peroxidation and MDA content, reduce the damage to the root system, improve the root activity, and promote the growth and development of the root system and the synthesis of photosynthetic pigments in the leaves, thereby enhance the tolerance of buckwheat to Al toxicity, and the biomass of the plant can be significantly increased. **【 Conclusion 】** Different levels of boron treatment increased the tolerance of buckwheat root and leave to Al toxicity, and had a promoting effect on the growth of buckwheat. Therefore, applying boron is a promising green remediation technique to improve crop tolerance in Al-contaminated acidic soil.

Acknowledgements: National Natural Science Foundation of China (31671631)
Jiahao Ge, E-mail: a986124721@163.com