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Effects of the inoculations using bacteria producing ACC deaminase on ethylene metabolism and growth of wheat grown under different soil water contents

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1 Effects of the inoculations using bacteria producing ACC deaminase on ethylene
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12 **Abstract**

13 Crop growth and productivity are often impacted by the increased ethylene content
14 induced by adverse environmental conditions such drought. Inoculations with bacteria
15 producing ACC deaminase is considered as a potential biological approach to improve the
16 growth and tolerance of stressed plants by lowering endogenous ethylene level. In this study,
17 germinated wheat seeds were inoculated using three species of the rhizobacteria, which were
18 isolated from the rhizosphere of wheat growing in dryland, and sown in pots. After three weeks,
19 wheat seedlings were exposed to non-limiting water condition, medium drought and severe
20 drought, respectively, for six weeks. The results showed that, irrespectively of rhizobacterial
21 inoculations, decreased soil water contents stimulated wheat ethylene metabolism, which was
22 reflected by the significantly increased activity of ACC synthetase and ACC oxidase, besides an
23 increased content of ACC both in the roots and leaves, and an enhanced capacity of leaves to
24 release ethylene, concomitant with a significant decline in shoot and roots biomass. The
25 inoculations of all three rhizobacterial species under each water condition reduced ACC content
26 in wheat leaves, but effects of the inoculations on ACC synthase and ACC oxidase activity in
27 the leaves and roots, ACC content in the roots, the capacity of leaves to release ethylene, and
28 wheat growth varied with water conditions and bacterial species. Hence, both soil water
29 conditions and rhizobacterial inoculations acted on all the processes of ethylene metabolism,
30 with the former being dominant. The inoculations under non-limiting water condition and
31 medium drought promoted shoot and root growth of wheat plants.

32 **Keywords:** rhizobacteria, drought, ethylene metabolism, plant growth, inoculation, wheat
33 (*Triticum aestivum* L.)

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