

不同土壤水分与温度条件下土根系统中水分传导的变化及其相对重要性

Hydraulic Conductivities in Soil Root System and Relative Importance at Different Soil Water Potential and Temperature

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英文关键词: Soil water potential Temperature Hydraulic conductivity Soil root interface gap

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中文摘要:

依据试验资料, 分析了土壤水势和温度对根系收缩程度、土根间隙水分传导和土根系统中各部分水分传导相对重要性的影响。结果表明: 植物根系收缩程度银合欢<台湾相思<向日葵<玉米, 植物在水分胁迫下的根系收缩能反映植物的抗旱性; 在相同土水势条件下, 土根间隙水分传导表现出银合欢>台湾相思>向日葵>玉米; 在土根间隙传导 (L_g)、根系传导 (L_r) 与土壤有效传导 (L_s) 三者之间, L_s 的变幅最大, L_r 的变幅最小, 对于不同植物种类 L_r 、 L_g 与 L_s 成为系统中的水分传输限制因子所对应的土水势范围不同; 当土水势 (ψ) 高于 -1.0 MPa 时, 温度升降对玉米与向日葵的根系收缩无显著影响, 当 $\psi < -1.0$ MPa 时, 高温环境中的根系收缩加剧, 当 $\psi > -1.0$ MPa 时, 玉米、向日葵的 L_g 随温度增加而略有增加, 而当 $\psi < -1.0$ MPa 时, 其 L_g 则随温度增高而下降。

英文摘要:

In this paper, based on the experimental data of maize, sunflower, acacia confusa and leucaena glauca under various treatments of temperature and soil water potential, the effects of temperature and soil water potential on root shrinkage and the hydraulic conductivity in the gap of soil root interface as well as the relative importance of hydraulic conductivities in soil root system were analysed. The results indicated that root shrinkage has apparent difference for different four kind plants in experiment, i. e., maize > sunflower > acacia confusa > leucaena glauca, the root shrinkage state under water stress reflect the drought resistance of plant. At same soil water potential, the conductivity in the gap of soil root interface is that leucaena glauca > acacia confusa > sunflower > maize. Among the gap conductivity (L_g), root system conductivity (L_r) and soil effective conductivity (L_s), the change range of L_s is largest, and that of L_r is smallest. Whether one of L_r , L_g and L_s is the factor limited water transport in soil root system or not, is determined by soil water potential range, when soil water potential (ψ) is larger than -1.0 MPa, temperature increase or decrease has not apparent effect on root shrinkage for maize and sunflower, when ψ is lower than -1.0 MPa, the root shrinkage is increased as temperature increases.

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