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复水对海水浇灌的玉米幼苗根系补偿效应的影响

Influence of rewatering on compensatory effect of maize seedling roots with diluted seawater irrigation

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中文摘要:

为了在沿海地区利用海水补充浇灌技术实现作物的安全节水灌溉，从而节约农业用水，以抗性玉米品种“农大108”为材料，研究了先用不同浓度海水处理组分别浇灌玉米幼苗，再用清水浇灌，然后用聚乙二醇（PEG-6000）模拟干旱胁迫的过程中根系补偿特性的变化。结果表明，复水前25%海水持续浇灌组和25%海水和50%海水交替浇灌组处理中，根系脯氨酸含量及超氧物歧化酶活性明显增加，可溶性糖及K+含量、根系活性及相对含水率、根冠比缓慢上升，丙二醛含量减少；复水后，根系K+含量、根系活性及相对含水率明显上升，而其他指标呈现下降的趋势；干旱模拟期间，根系活性及丙二醛含量略微下降，其他指标急剧升高。与清水灌溉组相比，50%海水持续胁迫对根系造成损伤使得复水补偿代谢显著降低，25%海水持续浇灌组的补偿能力略微下降，25%海水和50%海水交替浇灌组复水补偿效应略微或明显增强。因此，经过适宜浓度的海水胁迫诱导后，根系发生适应性代谢，然后复水，根系的物质代谢及抗旱性可以产生补偿甚至超补偿效应，同时也缓解了盐渍对植物的次生胁迫效应。

英文摘要:

In order to use seawater as supplement water to realize water-saving irrigation in coastal areas, taking the resistant maize “Nongda 108” as study object, some compensatory characteristics related to the roots of seedlings were studied under different treatments. Firstly the seedlings were irrigated with different salinity seawater, then irrigated with freshwater and lastly treated with polyethylene glycol (PEG) solution to simulate the drought stress. The results indicated that, under the irrigation of sustained 25% seawater and alternate 25% seawater-50% seawater respectively, the proline content and superoxide dismutase activity were obviously increased, the contents of soluble sugar and potassium ion (K+), root activity and relative water content (RWC) and ratio of root/top slowly increased, but malondialdehyde (MDA) contents quickly decreased. After rewatering, K+ content, root activity and RWC raised apparently, and other determinants declined. During the PEG stress, MDA content and root activity showed a little decrease, and else indexes dramatically increased. Compared with freshwater treatment, the compensatory effect of rewatering after sustained 50% seawater stress was evidently debased due to severe root damage, and that of sustained 25% seawater treatment was lessened inapparently, but that of alternate 25% seawater-50% seawater irrigation was enhanced a little or markedly. This implied that seedlings were induced by the optimized seawater stress, which led to corresponsive metabolism, and the rewatering caused compensatory even “over-compensatory” metabolism and drought-resistance in the root, which also alleviated sub-stress effects on seedlings to the salinity.

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