

干旱胁迫下尖果沙枣幼苗的根系活力和光合特性

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摘要 以尖果沙枣1年生实生苗为材料,研究了自然干旱时不同土壤相对含水量对幼苗叶片细胞质膜相对透性、叶片相对含水量、根系活力、光合色素含量和光合参数等指标的影响.结果表明:土壤相对含水量从70%(CK)降到40%时,幼苗根系活力和净光合速率均逐渐上升并达到最大值,分别为 $1178 \mu\text{g} \cdot \text{g}^{-1} \cdot \text{h}^{-1}$ 和 $21.9 \mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$;光合色素含量稳步上升;蒸腾速率和水分利用效率均保持稳定;叶片细胞质膜相对透性保持较低水平.土壤相对含水量从40%降到20%时,幼苗叶片相对含水量仍在50%以上,叶片细胞质膜相对透性仍保持较低水平;根系活力和光合色素含量仍较高;但其他光合参数开始缓慢下降.土壤相对含水量从10%降到5%时,幼苗叶片细胞质膜相对透性急剧上升;叶片相对含水量、根系活力、总叶绿素含量、光合参数均极显著下降;而土壤相对含水量为10%时幼苗表现出最高的水分利用效率.尖果沙枣土壤相对含水量最好控制在40%~50%,其1年生实生苗的永久萎蔫系数为4.3% (土壤相对含水量).

关键词: 自然干旱 尖果沙枣 根系活力 光合特性

Abstract: Taking one-year old *Elaeagnus oxycarpa* seedlings as test materials, this paper studied their root activity and leaf cell membrane permeability, relative water content, photosynthetic pigment contents, and photosynthetic parameters at different soil relative moisture contents under natural drought condition. When the soil relative moisture content decreased from 70% (CK) to 40%, the *E. oxycarpa* seedlings root activity and net photosynthetic rate increased gradually and reached their maximum ($1178 \mu\text{g} \cdot \text{g}^{-1} \cdot \text{h}^{-1}$ and $21.9 \mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$, respectively), photosynthetic pigment contents increased stably, transpiration rate and water use efficiency did not show any significant difference, and cell membrane permeability kept at a low level. When the soil relative moisture content decreased from 40% to 20%, the leaf relative water content was still higher than 50%, cell membrane permeability maintained at a low level, root activity and photosynthetic pigment contents remained high, and other photosynthesis parameters decreased slowly. When the soil relative moisture content decreased from 10% to 5%, the cell membrane permeability increased acutely, but the leaf relative water content, total chlorophyll content, all photosynthesis parameters, and root activity had a significant decrease. The water use efficiency reached the peak when the soil relative moisture content was 10%. To sum up, the optimal soil relative moisture content for *E. oxycarpa* seedlings should be 40%-50%, and the permanent wilting coefficient of the seedlings was 4.3% (soil relative moisture content).

Key words: natural drought *Elaeagnus oxycarpa* root activity photosynthetic characteristics

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