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发光学应用及交叉前沿

基于生物延迟发光评价玉米萌发期抗旱性的方法

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摘要： 玉米种子萌发期抗旱性评价是节水农业研究中的难点和热点问题之一，生物延迟发光分析技术的应用有可能解决这一问题。采用生物延迟发光评价方法研究了玉米种子萌发期的抗旱性能力，探讨了在渗透势-0.1 MPa和-0.3 MPa的PEG-6000溶液中萌发的玉米品种万瑞168号和堰单8号延迟发光的变化规律。结果表明，万瑞168号和堰单8号玉米品种的延迟发光积分强度都随着萌发进程逐渐升高，-0.1 MPa和-0.3 MPa的PEG-6000溶液形成的干旱胁迫对两个玉米品种延迟发光积分强度的升高有不同的抑制作用，胁迫强度越大，两个品种延迟发光积分强度的差异就越大。研究还发现，在干旱胁迫下萌发的万瑞168号和堰单8号玉米延迟发光相对变化率R_{DL}与种子萌发抗旱指数和储藏物质转运率的变化是一致的，依据干旱胁迫下种子萌发过程中延迟发光积分强度相对变化率R_{DL}的大小可以评价玉米种子萌发期抗旱性的强弱。

关键词： 生物延迟发光 抗旱性评价 玉米萌发 无损检测

Evaluation Method of Maize Drought Resistance During Germination Based on Delayed Luminescence

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Abstract: Evaluation of drought resistance during germination of maize is one of the basic problems that have not been solved in modern water-saving agriculture, while biological delayed luminescence technology may solve this problem. In order to explore the method of using delayed luminescence to evaluate drought resistance in maize germinating stage, the delayed luminescence of two maize varieties Wanrui No.168 and Yandan No.8 germinated in PEG-6000 solution with osmotic potential of-0.1 MPa and-0.3 MPa was measured. The results show that the integrated intensity of delayed luminescence of Wanrui No. 168 and Yandan No. 8 increase gradually with the germination process. Drought stress with osmotic potential of-0.1 MPa and-0.3 MPa inhibits the increase in integrated intensity of delayed luminescence of Wanrui No.168 and Yandan No.8, and the stronger the stress, the greater the difference of integrated intensity of delayed luminescence between two maize varieties. The relative change rate of delayed luminescence is defined as R_{DL}. The study found that the change of R_{DL} of Wanrui No. 168 and Yandan No. 8 was the same as the change of seed germination drought index and storage material transport rate under drought stress. It indicated that the size of R_{DL} during germination under drought stress could be used to evaluate drought resistance of maize during seed germination.

Keywords: biological delayed luminescence evaluation of drought resistance maize germination nondestructive testing
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