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作物学报 2009, 35(7) 1313-1319 DOI: 10.3724/SP.J.1006.2009.01313 ISSN: 0496-3490
CN: 11-1809/S

论文

低温驯化及封冻后不同抗寒性小麦品种的形态建成及生理基础分析

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摘要：

为比较抗寒性不同的冬麦品种对低温胁迫的适应性，在低温驯化及封冻阶段对东农冬麦1号(抗寒)、东农705 (较抗寒)和济麦22 (不抗寒) 3个品种的植株形态和叶、叶鞘、分蘖节的若干生理指标进行了调查。结果表明，东农冬麦1号在封冻前形成的分蘖数、分蘖叶数显著高于其他两个品种；低温胁迫下3个品种各个部位的含水量均降低，东农冬麦1号地上部含水量降低较快，分蘖节含水量降低较慢且保持较高水平，而济麦22地上部含水量降低较慢，分蘖节含水量降低较快。电导率变化表明，东农冬麦1号、东农705品系和济麦22叶片分别在封冻后30、20和0 d死亡。东农冬麦1号叶片、叶鞘的可溶性总糖含量最高，济麦22最低；封冻期东农冬麦1号分蘖节可溶性总糖含量最高，济麦22最低。封冻后20 d东农705品系和济麦22叶片SOD失活，封冻后40 d东农冬麦1号叶片SOD仍有活性，调查期内济麦22各个部位SOD活性显著低于其他两个品种；封冻期东农冬麦1号叶鞘和分蘖节POD活性保持较高水平，东农705品系分蘖节POD活性较高，而叶鞘POD活性迅速降低，济麦22叶鞘和分蘖节POD活性均处于较低水平。

关键词： 寒地 冬小麦 抗寒性

Morphogenesis and Physiological Basis in Wheat Cultivars with Different Levels of Cold-Resistance during Cold Acclimation and Freezing Period

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Abstract:

“Dongnong dongmai 1” is the released cultivar of winter wheat (*Triticum aestivum* L.) in Heilongjiang province in China. However, the physiological metabolism in the over-wintering process of the cultivar is unclear. In this study, the plant morphological characters were investigated and several physiological parameters were measured with comparisons of three winter wheat cultivars, Dongnong Dongmai 1 (cold tolerant), Dongnong 705 (semitolerant to coldness), and Jimai 22 (cold susceptible), the objective was to understand the physiological adaptation to low temperature of Dongnong Dongmai 1. The numbers of leaf, tiller, and tiller leaf as well as water content in plant were investigated from 3 Oct. to 8 Nov. at a 5 d interval. Leaf, sheath, and tiller nod were sampled from 22 Oct. to 22 Dec. at a 10 d interval. The numbers of tiller and tiller leaf were significantly higher in Dongnong Dongmai 1 than in other cultivars before frozen period. Under cold stress, water content decreased in all parts of cultivars. Dongnong Dongmai 1 had the largest reduction of water content in leaf, but the water content in tiller nod declined slower and maintained the highest level among the three cultivars. In contrast, Jimai 22 had relatively higher water content in leaf and sharp reduction in tiller nod. The electric conductivity measurement indicated that leaves died at 30, 20, and 0 d after the frozen day in Dongnong Dongmai 1, Dongnong 705, and Jimai 22, respectively. The total soluble sugar content in leaves and leaf sheathes was the highest in Dongnong Dongmai 1, and the lowest in Jimai 22. Similarly, during frozen period, the content of total soluble sugar in tiller nod was the highest in Dongnong Dongmai 1 and the lowest in Jimai 22. Superoxide dismutase (SOD) in leaf was inactivated at 20 d after the frozen day in Dongnong 705 and Jimai 22, but maintained the certain activity even at 40 d after the frozen day in Dongnong Dongmai 1. Moreover, the activities of SOD in all parts of Jimai 22 were lower than those of other cultivars. During frozen period the activities of peroxidase (POD) were higher in sheath and tiller nod in Dongnong Dongmai 1, it was higher in tiller nod and lower in leaf sheath in Dongnong 705, and cignificantly lower both in sheath and tiller nod in Jimai 22.The results suggest that high resistance to coldness in Dongdong Dongmai 1 is probably related to the translocation of total soluble sugar from leaf to sheath and tiller nod. Low water content in plant and relative high activities of SOD and POD in sheath and tiller nod are also contributed

to the cold-resistance of Dongnong Dongmai 1.

Keywords: Cold region Winter wheat Cold resistance

收稿日期 2008-12-01 修回日期 2009-03-20 网络版发布日期 2009-05-19

DOI: 10.3724/SP.J.1006.2009.01313

基金项目:

本研究由东北农业大学创新团队项目（cxz003）资助。

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