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研究论文

不同基因型小麦对低氮胁迫的生物学响应

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摘要 采用溶液培养法，研究了不同基因型春小麦（加春1、2、4号）根系对低氮胁迫的生物学响应、苗期氮素吸收、分配的基因型差异以及与根系形态之间的相关关系。结果表明，在低氮胁迫下，小麦的根重、根长、根条数、根系总吸收面积与活性吸收面积、根系活力均明显降低，但不同基因型间差异明显，加春2号根系具有较好的形态学与生理学性状，根重、根长、根总吸收面积与活性吸收面积、根系活力的下降幅度明显低于其他2个基因型，地上部氮累积量占总氮量的百分率比其他2个基因型分别高7.6%和8.2%，氮的利用率也分别高8.0%和9.9%，差异达显著水平。加春2号比其他2个基因型更能适应低氮环境胁迫。在低氮胁迫下，春小麦根重、根总长度、根系活力、根系总吸收面积及活性吸收面积与总吸氮量呈显著线性相关，而在高氮水平下无相关关系，表明在氮素胁迫条件下，根系形态对氮吸收率起重要作用。

关键词 春小麦 低氮胁迫 根系 生物学响应

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Biological Response of Roots in Different Spring Wheat Genotypes to Low Nitrogen Stress

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Abstract Three spring wheat cultivars, Robin, Gzandin and Quantum, were used to compare the different responses of root systems in total N uptake, N partition between shoot and root, and its relationship with morphological and physiological characters of root system to low nitrogen stress with solution culture. The results showed that compared with the control group, the spring wheat seedlings under low nitrogen stress were lower in root dry weight and shorter in root length. And the root number, total absorbing area and efficient absorbing area, and root activity were decreased drastically. But the responses of different genotypes varied greatly (Table 1 – 3). Under low nitrogen stress, Gzandin’ s root system had better morphological and physiological characters, its root weight, root length, root activity, root total absorbing area and efficient absorbing area were lower than those of other 2 cultivars, meanwhile, its nitrogen percentage of shoots to whole plant was increased by 7.6% and 8.2%, and its utilization ratio of nitrogen was also increased by 8.0% and 9.9% compared with the other two genotypes (Table 4 – 5). Therefore, Gzandin was more suitable to growing under low nitrogen stress. The total nitrogen uptake was correlated linearly with dry weight, length, activity, total absorbing area and efficient absorbing area in roots under low nitrogen. On the contrary, the correlation between them was not so obvious under high nitrogen (Fig.2 – 6). It shows that the morphological form of roots plays a very important role in nitrogen uptake under nitrogen stress.

Key words Spring wheat (Triticum aestivum L.) Low nitrogen stress Root system Biological response

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