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Water stress induced nitrogen redistribution to root improves nitrogen use efficiency at the vegetative stage of rice (*Oryza sativa L.*)

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N can be easily transported from old organs to developing organs for reutilization. N remobilization between organs is important for high nitrogen use efficiency (NUE) at whole-plant level. Two hybrid rice cultivars japonica 'Yongyou 538' and indica 'Zhongzhou 1' were hydroponically cultivated at low N (LN, 0.71 mM) and sufficient N (SN, 2.86 mM). The imposition of water stress, which was induced by 100 g.L-1 PEG 6000, resulted in an increase of NUE in 'Yongyou 538', but a reduction in 'Zhongzhou 1'. Water stress reduced nitrate and ammonium uptake and accumulation in 'Yongyou 538', whereas nitrate and ammonium uptake in 'Zhongzhou 1' was not significantly affected. Contrary to 'Yongyou 538', 'Zhongzhou 1' accumulated more ammonium in roots under water stress. In addition, water stress caused an increase in catabolism of carbon in roots of 'Zhongzhou 1', as indicated by increased root activity, constant pyruvate kinase activity and sucrose concentration and reduced total carbon. The degradation of protein was also augmented in 'Zhongzhou 1'. In contrast, the consumption of assimilates in 'Yongyou 538' was significantly inhibited, allowing more carbon stored in roots. Furthermore, water stress resulted in a significant increase in N allocation in root at SN. NUE was positive correlated with the percentage of N allocated in roots ($r=0.723$, $n=32$, $p<0.01$), but negatively correlated with the percentage of N allocated in leaves ($r=-0.756$, $n=32$, $p<0.01$). The results indicate that attenuation of root catabolic activity under water stress reduces nitrogen uptake and enhances the accumulation of carbon and nitrogen in roots, subsequently improves NUE at whole-plant level.

Biography

Qianyu Jin has his expertise in rice high yield, mechanized cultivation technology and nitrogen utilization. Recently, he studies the rice productivity and economic benefit of triple cropping systems in paddy field in northern Zhejiang plain and also investigates the mechanisms of drought resistance in different rice varieties and specific expression of QTL for related agronomic characters under water Stress.

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