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Grain Filling Mechanisms in Spring Wheat : VI. Cultivar variation in nitrogen metabolism and changes in assimilate shortages

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Abstract:

Improvement of wheat flour quality, an increase in grain nitrogen content accompanied by an increase in grain yield, is required through cultivation techniques and breeding program. Changes in nitrogen content in grains and vegetative organs were investigated to clarify nitrogen metabolism in four grain filling phases in spring wheat. Three cultivars including semi-dwarf Haruyutaka with early maturity bred in Hokkaido in Japan, semi-dwarf Norin 61 with early maturity bred in Kyushu in Japan, and tall Selpek with late maturity bred in Germany were selected for the present experiments. Plants from each cultivar were sampled at intervals of a few days throughout the grain filling period in 1993. In 1992, Haruyutaka canopy was covered with 95% shading cloths for three grain filling phases; the initial phase from two days before anthesis to seven days after anthesis, the early phase from seven to 14 days after anthesis, and the late phase from 14 to 21 days after anthesis. Haruyutaka required more nitrogen for grain filling during its earlier phases than Norin 61 and Selpek. This fact resulted in a higher remobilization of nitrogen from vegetative organs into grains in Haruyutaka (73%) than in Norin 61 (49%) and Selpek (47%). Shading treatments did not affect the nitrogen content in grains until a week before maturity. However, the nitrogen in vegetative organs for each shading was translocated into grains rapidly during the last week of the final phase, with the result that the nitrogen content in each shading grain was higher than no shading. As strategies to achieve both high yield and high nitrogen percentage in grain, it appeared that much nitrogen must be accumulated in vegetative organs and allocated to more active photosynthetic organs until anthesis, and that more nitrogen must be absorbed from soil during earlier grain filling phases, then completely

translocated into grains during the final grain filling phase.

Keywords:

Grain filling phases, Nitrogen metabolism, Nitrogen percentage in grain,
Shading treatment, Spring wheat varieties

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