Development of two-leaf photosynthetic model sensitive to chlorophyll content and its couple with wheat growth model

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Abstract

Crop growth model simulates the response of photosynthetic rate to nitrogen (N) dynamic by calculating critical N concentration. However, critical N concentration cannot describe the physiological effect of N dynamic to photosynthesis. In this paper, a Two-leaf Photosynthetic Model Sensitive to Chlorophyll Content (TPMSCC) was developed and coupled with the crop growth model (WheatGrow) to improve the mechanism of N dynamics on photosynthesis. The simulating results of TPMSCC revealed the high sensitivity of LCC on photosynthesis. The relationships of LCC to the maximum photosynthetic rate (A_{max}) and the initial light use efficiency (a) simulated by TPMSCC were linear and logarithmic. In addition, canopy photosynthetic rate benefited from the increase of diffuse radiation fraction (DRF) except for the condition of dense canopy at high solar zenith angle. The optimized WheatGrow performed better than WheatGrow on describing the response of N level on biomass accumulation and distribution in different organs.

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