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Adaptation of the CROPGRO Growth Model to Chinese Cabbage (*Brassica campestris* spp. *pekinensis* (Louv.) Rupr.)

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Abstract

Chinese cabbage (*Brassica campestris* spp. *pekinensis* (Louv.) Rupr.) is a major vegetable crop of East Asia, which has special nutritional value as source of vitamin C in many rural regions during winter months. However, its production is often characterised by unbalanced use of fertiliser and irrigation, which negatively contributes to ongoing resource degradation. Process based simulation models can help to enhance agricultural production by facilitating the assessment of management strategies for different environments, soils and production systems. The CROPGRO model, which was initially developed for soybean (*Glycine max* (L.) Merr.) is a generic model that is also employed to simulate growth and development of various vegetable crops like tomato, bell pepper and cabbage. For the adaptation of CROPGRO to Chinese cabbage basic growth parameters and temperature response data were obtained in a series of greenhouse and climate chamber experiments. Based on the results the phenological parameters in the species file were adjusted, as well as the parameters determining vegetative partitioning in leaf, stem and root compartments. Additionally, canopy development and leaf growth parameters were modified. Identified as the key trigger to determine final yield was the timing of the onset of head formation, which is the economic tissue in Chinese cabbage. As the phenological development differs between cultivars the demand of thermal and photothermal days to reach a certain phenological stage had to be calibrated for each cultivar in the .CUL file. The model was calibrated and later validated for three cultivars, using two years experimental data from two sites, one in Germany and one in China. The new model, that is going to be incorporated as part of the DSSAT, version 4.5 suite of crop simulation models, has potential to test and evaluate production of Chinese cabbage under various management strategies in different environments.

Keywords: Chinese cabbage, CROPGRO, model