Simulation of Leaf Area Index for Corn, cv. Single Cross 704, in Drought Stress Conditions

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Abstract

Crop growth models facilitate management of irrigation water and fertilizer because less on-site (filed) visits and direct measurements are required. On the other hand, these models are complex and difficult to be understood and require input data that is not available, thus, using them in management decisions, which should be done before cultivating season, will be difficult. The objective of this study was to develop a model for grain yield prediction of Corn (*Zea maize*) based on simulated leaf area index (LAI) under water stress conditions. In this study, corn LAI was simulated based on cumulative degree-days and water stress index. The model used crop and soil as well as meteorological data including daily maximum and minimum air temperature (^{o}C), precipitation (mm), and solar radiation (MJ.m^{-2}d^{-1}). The model was developed based on the 2013 growing season data for single cross 704 cultivar under full irrigation and water stress conditions, and was validated with 2014 growing season data. The highest values of simulated LAI in the 100% water requirement (WR) treatment were between 6.14 and 5.78, in the 80% WR between 5.63 and 5.4, and in the 60% WR was between 4.11 and 3.47, which varied by 0.13 (2%), 0.14 (2.5%) and 0.29 (6.6%), respectively. In the mid- stage of growth, the estimated LAI was more consistent with measured values (2%). In treatments under stress (except for the fourth stage of sampling), the LAI estimated by the model was 6.6% higher than the values observed. In all treatments, the high correlations (R2) between the values of the simulated LAI and observed LAI in both years of the experiment were between 0.9 and 0.99.

Keywords: Water stress, Crop growth models, Kerman.

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