

Simulation Model for Cotton Development Stages Based on Physiological Development Time

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Abstract: The simulation of cotton development stages is necessary for studying of cotton growth in relation to environment. This paper analyzed the dynamic relationships between cotton development and environmental factors with 3 different genotypes involving 16 cultivars (lines). Three genotypes are: 1) spring sowing middle season varieties; 2) spring sowing middle season Bt transgenic cotton varieties; 3) summer so-

wing early season varieties. A simulation model on cotton development stages was developed on the basis of the physiological development time (PDT). The model quantified thermal effectiveness (RTE), photoperiod effectiveness (RPE), variety earliness (VE) and compensation efficiency (CE) for active accumulative air temperature from increasing soil temperature under plastic film coverage. Validation of the model with data sets from different years, ecological zones, genotypes and cultural practices indicates a high goodness of fit between the simulated results and observed values, with RMSE of 1.4 to 4.9 d for different development stages. Therefore, this model is relatively strong on mechanistic explanation as well as wide suitability.

Key words: cotton (*Gossypium hirsutum* L.); physiological development time; genotype; development stage; simulation model