Cotton phenology and production response to sowing time, row orientation and plant spacing using CROPGRO-cotton model

ABHISHEK DHIR, R. K. PAL*, P. K. KINGRA, S. K. MISHRA** and S. S. SANDHU
Department of Climate Change and Agricultural Meteorology, Ludhiana – 141 004, Punjab, India
*Punjab Agricultural University, Regional Research Station, Bathinda – 151 001, Punjab, India
**Punjab Agricultural University, Regional Research Station, Faridkot – 151 203, Punjab, India
(Received 2 November 2020, Accepted 5 March 2021)
e mail : gauravdhir45@gmail.com

ABSTRACT. The DSSAT module for cotton crop has been evaluated as a tool to predict the crop growth and yield response to microclimatic modifications. In this context, multi-location field experiments were laid out at Bathinda and Faridkot, districts of Punjab during Kharif 2018 with Bt-cotton hybrid RCH 773 BGII and sown at three times, i.e., April 30, May 15 and May 30 with two row orientations (North-South : N-S and East-West : E-W) and three plant spacing’s (67.5 cm × 45.0 cm, 67.5 cm × 60.0 cm and 67.5 cm × 75.0 cm) in factorial split plot design and replicated by three times. The model output in terms of simulated phenology showed close proximity over observed value having R² of 0.51 and 0.61 at Bathinda and 0.43 and 0.87 at Faridkot anthesis and maturity, respectively. Among study locations, observed and simulated LAI ranged from 2.7 to 3.7 and 1.8 to 3.0. Simulated seed cotton yield was found significantly higher with the crop sown on 30th April (3053 and 3274 kg ha⁻¹) than 30th May sowing (2392 and 2511 kg ha⁻¹) at Bathinda and Faridkot, respectively, which was in good agreement with observed yield having higher value of d-stat (0.84 for Bathinda and 0.89 for Faridkot) and R² (0.75 for Bathinda and 0.83 for Faridkot). Moreover, higher seed cotton yield was simulated under East-West row direction along with wider plant spacing (67.5 × 75 cm) at both locations. Overall, CROPGRO-cotton model can be used as research tool for the prediction of cotton phenology and yield and to explore site-specific adoption strategies such as appropriate sowing time, row orientation and plant spacing to sustain cotton productivity under changing climatic conditions.

Key words – CROPGRO-cotton model, Bt cotton hybrid, Sowing dates, Row orientation, Plant spacing, Phenology and seed cotton yield.