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Can growth-days predict the crop coefficient of cotton under mulched drip irrigation?

Pengju Yang (1), Fuqiang Tian (2), Hongchang Hu (3), Zhi Zhang (4), and Chao Dai (5)

(1) Department of Hydraulic Engineering, State Key Laboratory of Hydro science and Engineering,China,Tsinghua University, Beijing (ypj13@mails.tsinghua.edu.cn), (2) Department of Hydraulic Engineering, State Key Laboratory of Hydro science and Engineering,China,Tsinghua University, Beijing (ypj13@mails.tsinghua.edu.cn), (3) Department of Hydraulic Engineering, State Key Laboratory of Hydro science and Engineering,China,Tsinghua University, Beijing (ypj13@mails.tsinghua.edu.cn), (4) Department of Hydraulic Engineering, State Key Laboratory of Hydro science and Engineering,China,Tsinghua University, Beijing (ypj13@mails.tsinghua.edu.cn), (5) Department of Hydraulic Engineering, State Key Laboratory of Hydro science and Engineering,China,Tsinghua University, Beijing (ypj13@mails.tsinghua.edu.cn)

Mulched drip irrigation (MDI) has now become popular in arid and semi-arid areas like Tarim River basin located in northwest of China. It has the advantages of saving water as well as increasing crop yield. As an important cash crop, cotton is widely planted in Tarim basin that usually adopts MDI. Irrigation management requires prediction of evapotranspiration (ET). It is usually calculated by FAO-56 method, in which the crop coefficient (Kc) is a necessary parameter needed to determined a prior. Theoretically the crop characteristics like LAI can serve as a direct indicator to determine Kc. Practically two other indicators of growing-degree-day (GDD) and growth-day (GD) are also used to determine Kc. In this study a 3-year experiment was conducted to quantify the weekly ETc and develop a crop coefficient (Kc) model for mulched drip-irrigated cotton based on eddy covariance observation. Two polynomial models were developed to predict the Kc as a function of growth days (r2=0.95) and growing degree-day (GDD) (r2=0.96) in the growth stage after seeding. A logarithmic function (r2=0.87) was used to describe the Kc variability with LAI increase. The results showed that both the three models fitted well with the Kc and the LAI values could fit the Kc well before the end growth stage. The LAI can better simulate Kc with daily step, but with weekly step the accuracy of LAI is lower than the other two variables. Our results showed that the growth-day is a reliable indicator to predict the cotton Kc under MDI, which provide a basis for transpiration modeling in cotton fields.