RESEARCH PAPER:

Utility of empirical models and pan evaporation method to estimate chickpea evapotranspiration in mollisol of *Tarai* region of Uttrakhand

NEERAJ KUMAR, SUMAN KUMAR AND N.K. RATHOD

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See end of the article for authors' affiliations

Correspondence to :

NEERAJ KUMAR
Agricultural Research Station, Anand Agricultural University, Derol, PANCHMAHAL (GUJARAT) INDIA
neeraj34012 @gmail.com

SUMMARY

The experiments were conducted at the Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar, Uttrakhand with the objectives for quantifying evapotranspiration (ET) losses of chickpea under *Tarai* conditions, and to select some suitable empirical methods based on meteorological parameters for estimating ET from chickpea. Evapotranspiration of chickpea was measured with weighing type lysimeter. Data on pan evaporation measured with USWB class A pan evaporimeter and chickpea parameters for the corresponding period were collected from Meteorological observatory of G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand. Evapotranspiration from chickpea was also estimated by using empirical methods of Thornthwaite, Turc, Stephens-Stewar, Jensen-Haise, Blaney-Criddle and modified Penman. Evapotranspiration of chickpea during 2005-06 and 2006-07 were about 416.5 and 475.6 mm, respectively. The average total rainfall during 2005-06 and 2006-07 were 18.2 and 275 mm, respectively. Thus, supplementary irrigation was required during crop season due to low rainfall. The pan evaporation did not give accurate estimate of ET, both on seasonal and as well as weekly basis. Thus, the pan evaporation does not seem to be good criterion for the estimation of ET. Modified Penman method was found to be most very suitable for estimation of ET in *Tarai* region of Uttarakhand

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Key words : Chickpea, Lysimeters, USWB class, Pan evaporimeter, Empirical methods.

Pulses have been the mainstay of Indian agriculture, enabling the land to restore fertility so as to produce reasonable yields of succeeding crops and providing proteineous grain and nutritive fodder. Chickpea (*Cicer arietinum* L.) is one of the important pulse crops of *Tarai* and other regions of Uttarakhand. It is an essentially a winter season crop grown from November to April of this region. In this season supplementary irrigation is essential for successful completion of the life cycle of crop and higher yields. For economizing the water, irrigation should be given as per needs of the crop. Evapotranspiration (ET) is a complex phenomenon which depends on the extremely complicated interactions of soil, plant and meteorological factors. The best estimation of evapotranspiration was achieved through measurement of water used by well watered crops which exert minimal canopy resistance. Lysimeter offers not only the advantage of sensitivity and precision but also an accuracy. However, the technique is expensive and involves various complexities. Pan evaporation measured with standard pan (*viz.* USWB class A) can be related to ET or consumptive use but the technique has to be standardized for different crops under different soils and agroclimatic conditions. A large number of empirical and semi-empirical methods have been proposed and used by various workers for estimating evapotranspiration from various meteorological parameters. However, these methods are not equally applicable and suitable for all the locations and situations. Water is one of most important factors required by a crop or diversified pattern of crops for their normal growth under field conditions. Water is needed mainly to meet the demands of evaporanspiration and the metabolic activities of plants, both together known as consumptive use. Evapotranspiration is an important feature in microclimatic studies related to crop production, due to its largely successful application in the economic utilization and application of irrigation water as per actual

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