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Prediction of water requirement for pea (*Pisum sativum*. L.) in mid-hill zone of Himachal Pradesh

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ABSTRACT

The water requirement of pea as predicted by Hargreaves equation is in close agreement (3.6 % deviation) with the actual water requirement, hence, the equation is the most suitable for predicting the water requirement of pea in mid hill zone of Himachal Pradesh.

Key words : Water Requirement and Pea.

INTRODUCTION

Knowledge of the water requirement of different crops is needed for scheduling of irrigations, in planning the farm irrigation systems, the design of irrigation projects and in resource development. The water requirement of a crop is the sum of crop evapotranspiration and percolation. Reference evapotranspiration approximates the evapotranspiration from tall cool season grass with adequate water supply to avoid moderately severe water stress and adequate fetch to minimize localized advection effects on evaporation. Actual evapotranspiration may be less than the potential evapotranspiration much of the time during the production of an agricultural crop. There are numerous approaches used to estimate evapotranspiration and potential evapotranspiration. Frequently used methods are mass transfer, energy budget, watershed water budget, soil water budget, ground water fluctuations and empirical formulae.

Various empirical methods have been developed by research workers considering various combinations of climatological parameters by correlating the data collected with actual evapotranspiration measured by lysimeters.

As the determination of water requirement of crops using lysimeter is laborious and quite expensive, efforts have been made to correlate the actual water requirements in the field with the agro meteorological data using different equations/methods for prediction of water requirement of crops (Doorenbos and Pruitt, 1997; Doss et al., 1962; Sharda and Bhushan, 1984; Chakraborty, 1985; Rao, 1985; Abdulmumin, 1988; Allen, 1993).

The present study had been undertaken to compute the evapotranspiration of commercially grown pea in the humid zone of the Himalayas for predicting the water requirement. The water requirement for pea was determined by multiplying the evapotranspiration calculated by each of the above methods by crop coefficients given by Doorenbos and Pruitt (1997). The potential evapotranspiration were computed using a computer programme written by Snyder and Pruitt (1992).

MATERIALS AND METHODS

The present study was conducted at the University of Horticulture and Forestry, Solan, Himachal Pradesh, receiving an annual average rainfall of 1100 mm with 70 per cent during Monsoon period. The maximum temperature does not exceed 35°C in summer and the minimum recorded is as low as –2°C in the month of January. The evapotranspiration (ET) requirements of pea for the region have been calculated using ten different empirical equations (Snyder and Pruitt, 1992) based on the meteorological data of the two crop growing seasons (Table 1). The computed potential evapotranspiration (PET) are presented in Table 3 and the equations used are:

1. FAO Penman Method

$$ET_{FAO} = R_{df} + A_{df}$$

ET_{FAO} = Potential Evapotranspiration, mmd^{-1}

R_{df} = Net Radiation term, mmd^{-1}

$$R_{df} = \frac{\Delta}{\Delta + ¥} R_{nf}$$

Δ = Slope of saturation vapour pressure

¥ = Psychrometric constant

$$R_{nf} = R_{ns} + R_L$$

R_{nf} = Net Solar Radiation, mmd^{-1}

R_L = Net terrestrial radiation, mmd^{-1}

$$A_{df} = \frac{\frac{¥}{\Delta + ¥}(e_{am} - e_d)(6.61)(1 + 0.864«)}{¥}$$

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