

Research Paper :

Determination of pan coefficients for Jalgaon district in Maharashtra

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ABSTRACT

This study was undertaken to determine monthly, seasonal and annual pan coefficients of Jalgaon district. Climatic parameters (maximum and minimum temperature, maximum and minimum relative humidity, bright sunshine hours, wind speed and open pan evaporation) for 11 years *i.e.* 1998-2008 were collected from agriculture meteorological observatory, Jalgaon. Reference evapotranspiration (ET_o) was determined by FAO-56 PM method (ET_{opm}). Pan coefficients were estimated by using Doorenbos and Pruitt equation. Estimated pan coefficients were evaluated and compared with FAO-56 PM method for the year 2007 and 2008. It was found that ET_{opc} and ET_{opm} had a very good correlation between them. Mean absolute error (MAE), mean absolute relative error (MARE) and root mean square error (RMSE) were also found to be minimum for all the analysis.

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Key words : Pan evaporation, Pan coefficient, Reference evapotranspiration

Evapotranspiration (ET) refers to the total atmospheric loss of water from plant and soil surface. The evapotranspiration rate from a reference surface, not short of water is called the reference crop evapotranspiration or reference evapotranspiration (ET_o). The concept of reference evapotranspiration was introduced to study evaporative demand of the atmosphere independently of crop type, crop development and management practices. It is useful in determining seasonal water requirement to plan crop irrigation. It is an immediate tool for irrigation planners, researchers to design water storage reservoirs and select crop or cropping pattern, which can give maximum benefit. ET data are frequently needed at short notice for projects planning or irrigation scheduling design, however, it is not easy to measure. Specific devices and accurate measurement of various physical parameters are required. Numerous scientist and specialists worldwide have developed large number of empirical methods to estimate ET from different climatic variables.

ET_o can be computed from meteorological data by large number of empirical or semi empirical equations. Some of the methods are valid only under specific climatic and agronomic conditions and cannot be applied under conditions different from those under which they were originally developed. Large number of data requirement also limits the application of many of these methods.

Keeping in view the complexity, accuracy and data requirements of prediction methods, pan evaporation method is comparatively less expensive and easy. A pan coefficient has been used successfully to estimate ET_o . Appropriate pan coefficient selection depends upon, pan type, environment, ground cover in its surrounding, wind and humidity conditions. Therefore it was decided to determine monthly, seasonal and annual reference evapotranspiration, class 'A' pan coefficients and evaluate their suitability to compute reference evapotranspiration for Jalgaon district's climatic condition.

Michael (1978) stated that the pan have higher rates of evaporation than a large free water surface and a factor of about 0.7 was recommended for converting the observed evaporation rate to those of large water surface area. Several researcher studied factors affecting evapotranspiration and reference evapotranspiration, Singh and Kumar (1993) reported the ratio of actual ET_o to class A pan evaporation and actual ET for different wheat cultivators were influenced by rainfall pattern, irrigation, ground water table depth and soil and plant factors addition to class A pan evaporation. Some studies also reported the effect of degree of soil cover with vegetation (Redersma and Ridder, 1996), radiation, air temperature, relative humidity, wind speed, sunshine hours (Allen *et al.*, 1998; Bhakar, 2000; Goyal, 2004).