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VARIATION IN EVAPOTRANSPIRATION AND CROP COEFFICIENTS OF RICE AT THE REGIONAL AGRICULTURAL RESEARCH STATION, PATTAMBI

The estimation of evapotranspiration (ET) *and* crop coefficient (kc) has gained importance because of their utility in designing irrigation projects, fixing cropping patterns and working out irrigation requirements of crops. ET is the largest output of the hydrological cycle; kc is a function of growth and can be represented by the relationship kc = ETa/ETp where ETa is the actual evapotranspiration and ETp is the potential evapotranspiration (Doorenbos and Pruit, 1977). ETp can be easily computed by any of the standard methods from weather data. Several investigators have studied the seasonal variability of ET and kc values under different soil and climatic conditions. Varying results have been obtained due to completely different sets of climatic conditions, soil factors and agronomic practices prevailing over different places (Tomar and O'Toole, 1979). Comparatively little work has been done on these lines and hence an attempt has been made to study the evapotranspiration rates of rice.

The study was conducted during both kharif (June to September) and rabi (October-January) seasons (1978-1985) in a well drained sandy loam soil of lateritic origin with a pH of 5.5 at the Regional Agricultural Research Station, Pattambi (10° 48′ N and 76° 12′ E), Kerala. The region is influenced by both south-west and north-east monsoons which bring about an average of 2750 mm of rainfall annually. The average maximum air temperature was 29.8°C during kharif season and 32.7°C during rabi season. The average minimum air temperature was 23.1°C during kharif season and 22.1°C during rabi season.

Daily measurement of evapotranspiration (ETa) was made at 0730 1ST with the help of two sets of volumetric lysimeters installed in the field. Triveni (105 days duration) and Jaya (120 days duration) varieties of rice were used for the study. Submergence level of 5 cm depth was allowed throughout the growing period. Monthly crop coefficient (kc) and seasonal consumptive use coefficient (K) were worked out by using the modified Blaney-Criddle formula suggested by Doorenbos and Pruit (1977).

Large fluctuations were observed in ETa, ETp, kc and K values over the seasons from 1978 to 1985 (Table 1). ET values were higher in the rabi season (ETa = 5.01 to 6.88 mm per day, ETp = 3.65 to 4.07 mm per day) than kharif season (ETa 3.98 to 6.36 mm per day, ETp = 3.45 to 3.58 mm per day). The values of kc ranged from 1.15 to 1.84 during kliarif season and 1.37 to 1.71 during rabi season. The respective values for K were 1.22 to 1.82 and 1.42 to 1.75. ET values become high when the evaporative demand of the atmosphere is high (Tomar and O'Toole, 1979). The rainfall pattern indicated that about 78 per cent of the total rainfall was received during kharif seasons as against 14 per cent in rabi season. Thus, it is evident mat high rainfall and consequent low solar radiation and low temperature are the reasons for the low evaporative demand and low ET rates during kharif season. In general, the crop coefficient values were also higher during rabi than kharif crop period. On an average, the daily ETa is about 25 per cent more in the rabi season as compared to that in kharif season.

Though the ETp values are almost identical during kharif 1978 and 1980, the higher ETa and kc values for August and September 1978 may be because of the better growth of Jaya during 1978. The higher ETa and kc of Triveni during rabi may be because it had higher leaf area index and leaf angle and smaller leaf width than Jaya (Hassan *et al.*, 1987). The higher kc values for Triveni consistently over major growth periods during rabi season may be due to higher solar radiation and lower humidity during these periods coupled with lower senescence pattern of leaves of Triveni than that of Jaya. In an intensive study by the authors during kliarif 1986, it was found that in the variety Triveni

leaf area index and number of leaves were reduced to the tune of 29.41% and 15.05% ten days after flowering whereas in the case of Jaya the reductions of the above parameters were 40.85% and 31.35% respectively.

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Table 1. ET and crop coefficients of rice during kharif and rabi seasons (1978-85) at Pattambi

Year	Season	Eta mm day^{-1}	ETp mm day^{1}	kc	K	Variety
1978	Kharif (June - Sept)	5.21	3.51	1.48	1.57	Jaya
1979	Kharif (July - Oct)	5.13	3.58	1.43	1.42	Jaya
1980	Kharif (June - Sept)	4.30	3.58	1.20	1.22	Jaya
1981	Kharif (June - Sept)	4.92	3.45	1.43	1.35	Triveni
1982	Kharif (July - Sept)	4.48	3.57	1.25	1.26	Triveni
1983	Kharif (July - Sept)	3.98	3.45	1.15	1.27	Triveni
1984	Kharif (July - Sept)	6.36	3.46	1.84	1.82	Triveni
1985	Kharif (July - Sept)	4.84	3.52	1.38	1.38	Triveni
1978	Rabi (Oct - Dec)	5.01	3.65	1.37	1.43	Triveni
1979	Rabi (Oct - Jan)	6.28	4.07	1.54	1.42	Jaya
1981	Rabi (Oct - Dec)	5.56	3.94	1.41	1.44	Triveni
1983	Rahi (Nov - Jan)	6.88	4.03	1.71	1.75	Triveni
1984	Rabi (Oct - Dec)	6.70	4.03	1.66	1.75	Triveni
1985	Rabi (Oct - Dec)	5.65	3.98	1.42	1.50	Triveni

kc - Average crop coefficients K = Seasonal consumptive use coefficients

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