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# LOSSES OF WATER FROM RICE FIELD THROUGH EVAPOTRANSPIRATION AND PERCOLATION DURING DIFFERENT SEASONS UNDER SHALLOW WATER TABLE CONDITIONS

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Attempts had been made in many countries for correlating the pan evaporation with potential evapotranspiration data for wet land rice but the small sized unrealistic boundary conditions made many studies unreliable (Chang, 1968). Thongtawse (1965) indicated that the evapotranspiration (ET) for flooded rice responds to the evaporative demand of the atmosphere and is independent of the stage of crop growth. Morachan (1978) opined that appreciable quantity of water can move upwards sufficiently to be used by the plants from depths of as much as 180 cm below the root zone.

## Materials and Methods

Field experiments were conducted with rice varieties Jaya and Prakash (120-130 days) during early and late kharif seasons (1982 and 1983) and Puspha and Pragathi (100-120 days) during the summer season (1983 and 1984) in the tank irrigated wet lands of the University of Agricultural Sciences, Bangalore. Standing water was maintained in the field at a depth of 5 to 1 cm throughout the crop growth period. The quantity of water diverted to each plot was measured by moans of a Parshal Flume installed at the diversion point. The growth period of the crop was divided into four quarters of equal duration and expressed as stages I, II, III and IV. Percolation losses in the rice field were measured by using tho drum culture technique (Dastane, 1970). Based on the per cent percolation from these estimations during different growth stages of rice in the kharif and summer seasons, the percolation losses in the main-field during the respective stages and seasons were computed. The percolation losses were subtracted from the values of total water use to estimate the total evapotranspiration of rice under fieid conditions stagewise and season-wise.

Depth to the water table was measured at weekly intervals. Pan evaporation readings (E) were recorded from the sunken screen pan evaporimeter of Colorado type installed in the field. The ratios ET/E were computed for each of the stages of rice crop growth during early kharif (July transplanting), late kharif (August transplanting) and summer (January transplanting) seasons.

## Results and Discussion

The Mean water table depths varied from 30.90 to 34.94 cm during early kharif 1982 and 16.34 to 24.45 cm during early kharif 1983. During the late kharif seasons the depths to the water table were in the range of 22.94 to 28.45 cm in 1982 and 19.62 to 29.04 cm in 1983. The corresponding depths to the water table were 20.60 to 63.30 cm during summer 1983 and 23.27 to 46.13 cm during summer 1984. The results thus indicated that while high water table was maintained in the kharif seasons, there was receding water table during the summer season.

The data on the water use, percolation losses, ET and ET/E are presented in Table 1. It is observed that the percolation losses varied from 52.27 to 72.54 cm in the different seasons. On an average over the seasons, the percolation loss works out to 56.53 per cent of the total water requirement. In the experimental site of the present studies, the depth to the water table was receding, from planting to harvest in summer 1983. This might have resulted in slightly higher percolation losses of 72.54 cm in summer 1983 compared to 60.93 cm in summer 1984. It can further be mentioned that drying of the tank and lack of rainfall resulted in lowering of water table in 1983. Evapotranspiration loss was 46.02 cm on an average in summer as compared to 52.39 cm on an average in kharif seasons.

The seasonal ET of the rice crop over all the seasons was found to be 50.27 cm for an average crop period of 120 days and it works out to 4.19 mm/day. The calculated ET/day was thus much lower than the mean consumptive use of water of 7.8 and 16.8 mm/day in the kharif and summer seasons respectively as reported by Achar and Dastane (1971). This might be due to the low mean temperature normally prevailing in Bangalore.

The ET/E values for the crop seasons were of the order of 0.89 to 1.02 for early kharif and late kharif seasons and 0.76 to 0.82 for summer seasons. The seasonal ET/E values estimated in the present studies were slightly lower than those observed elsewhere due to the lower water use of rice in general. The lower ET/E values observed at the stage IV may be attributed to the cut off of irrigation water prior to harvest. However, the trend in the variations of ET/E values from planting to harvest are in general agreement with the findings of Caozii (1963).

## Summary

Experiments were conducted in the tank irrigated wet lands of the University of Agricultural sciences, Bangalore to study the evapotranspiration (ET) and ET/E at different stages of crop growth in rice during different seasons under shallow water table conditions. In the light of the results obtained, it may be concluded that the seasonal ET in rice ranged from 45.23 to 57.12 crn under tank irrigation with shallow submergence of 5 to 1 cm standing water in the field. Water use and ET were comparatively more in the first half of crop growth. The ET/E ratio for ths crop season ranged from 0.76 to 1.06.

Table 1

Water use, percolation, ET and ET/E in the different stages of crop growth in rice during different seasons

| | Stages of crop growth | | | | Seasonal |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| | Early kharif 1982 | | | | |
| Water use (cm) | 23.53 | 37.59 | 46.81 | 18.26 | 126.19 |
| Percolation (cm) | 12.12 | 19.66 | 28.04 | 9.25 | 69.07 |
| ET (cm) | 11.41 | 17.93 | 18.77 | 9.01 | 57.12 |
| ET/E | 0.90 | 0.99 | 1.44 | 0.75 | 1.02 |
| | Late kharif 1 982 | | | | |
| Water use (cm) | 36.75 | 46.63 | 20,98 | 11.80 | 116.16 |
| Percolation (cm) | 22.13 | 24.79 | 9.89 | 7.01 | 63.80 |
| ET (cm) | 14.62 | 21.84 | 11 09 | 4.79 | 52.34 |
| ET/E | 0.87 | 1.92 | 1.00 | 0.45 | 1.06 |
| | Summer 1983 | | | | |
| Water use (cm) | 36.28 | 44.36 | 26.00 | 11.13 | 117.77 |
| Percolation (cm) | 22.80 | 26.87 | 15.54 | 7.33 | 72.54 |
| ET (cm) | 13.48 | 17.49 | 10.46 | 3.80 | 45,23 |
| ET/E | 0.93 | 0.34 | 0.62 | 0.65 | 0.76 |
| | Early kharif 1983 | | | | |
| Water use (cm) | 25.73 | 38.00 | 22.83 | 20.44 | 107.05 |
| Percolation (cm) | 16.07 | 16.14 | 8.90 | 11.19 | 52.27 |
| ET (cm) | 9.71 | 21.86 | 13.85 | 9.25 | 54.67 |
| ET/E | 0.89 | 1.28 | 1.06 | 0.61 | 0.96 |
| | Late kharif 1983 | | | | |
| Water use (cm) | 41.25 | 25.58 | 24.64 | 9.87 | 101.34 |
| Percolation (cm) | 25.24 | 13.86 | 11.31 | 5.51 | 55.92 |
| ET (cm) | 16.01 | 11.72 | 13.33 | 4.36 | 45.43 |
| ET/E | 1.10 | 1.05 | 0.93 | 0.48 | 0.89 |
| | Summer 1984 | | | | |
| Water use (cm) | 30.05 | 28.22 | 29.83 | 19.64 | 107.74 |
| Percolation (cm) | 18.23 | 16.17 | 15.03 | 11.50 | 60.93 |
| ET (cm) | 11.82 | 12.05 | 14.80 | 8.14 | 46.81 |
| ET/E | 086 | 0.64 | 0.85 | 0.92 | 0.82 |

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