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SOME LYSIMETRIC OBSERVATIONS ON THE WATER REQUIREMENTS AND WATER USE OF PEARL MILLET HYBRIDS AT JODHPUR

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Pearl millet has traditionally been confined to arid and semi-arid regions on account of its plasticity to drought situations. Basic information on water consumption and water needs of hybrid pearl millet help in formulating agronomic practices designed to increase water-use efficiency of rainfed crop. Daily evapotranspiration (ET) data were recorded with gravimetric lysimeters on hybrid varieties of pearl millet at the Central Arid Zone Research Institute, Jodhpur in two kharif cropping seasons were recorded. The mean ratios of ET to pan evaporation (EP) for 3-day periods with marginal adjustments for rain or irrigation were tabulated. The ratios of ET/EP from sowing to harvest are shown in Figs. 1 and 2, respectively, for the years 1976 and 1977. Dates and amount of rain (RR) or irrigation (IR) are shown alongwith the dates of first and 50% flowering.

In 1976, pearl millet cv 'HB 3' was sown on July 17 and the moisture status of the soil was at field capacity by 14 mm of rain (Fig. 1). Rains occurred three weeks after sowing, interspersed with dry spells of about 10 days duration till September when, after good showers, rains stopped on 9 September. The crop required no irrigation due to good seasonal rainfall of 46 cm. Potential ET of established stands could be worked out from the dry spells. The moisture need of the crop was 1/3 of EP in the first 20 days of sowing (Fig. 1). It began to increase sharply thereafter. Ground shading stage, typified by an ET/EP ratio of 0.80, was reached in 40 days after sowing. Maximal ET equaled EP and lasted from 45 to 75 days of sowing or 10 days before harvest. Cumulative ET from 10 September (tank at field capacity due to heavy rains) to 30 September (rain-free period, ET fell sharply from EP) was 131 mm. Thus, limiting quantum of field moisture for potential ET worked out to be 13 cms for 'HB 3' variety of pearl millet.

In 1977, cv 'BJ 104' was sown on July 9. Moisture need in the early phase was obscured due to good rains after sowing (Fig. 2). Ground shading stage was reached in about 30 days after sowing. Rainfall was low in early August and practically ceased thereafter. Resumption of rains in early September brought down the EP values for sometime. ET nearly equaled EP from August 1 to September 11 (4 to 9 weeks after sowing).

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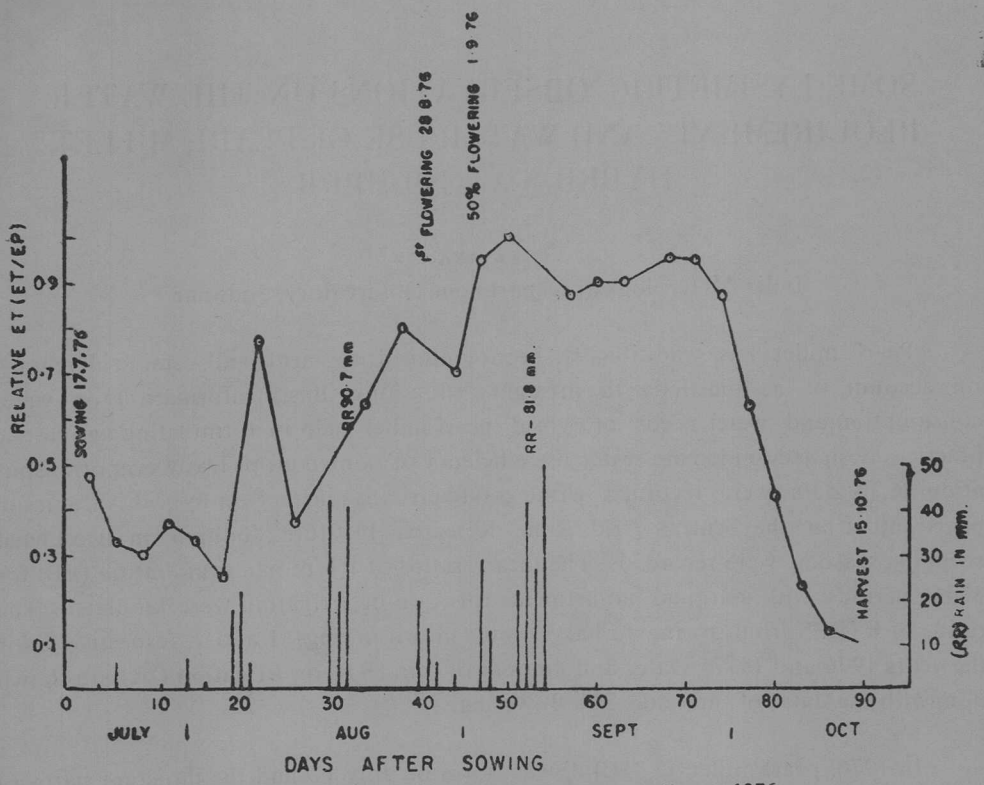

Fig. 1. ET/EP for pearl millet cv HB–3, Jodhpur, 1976

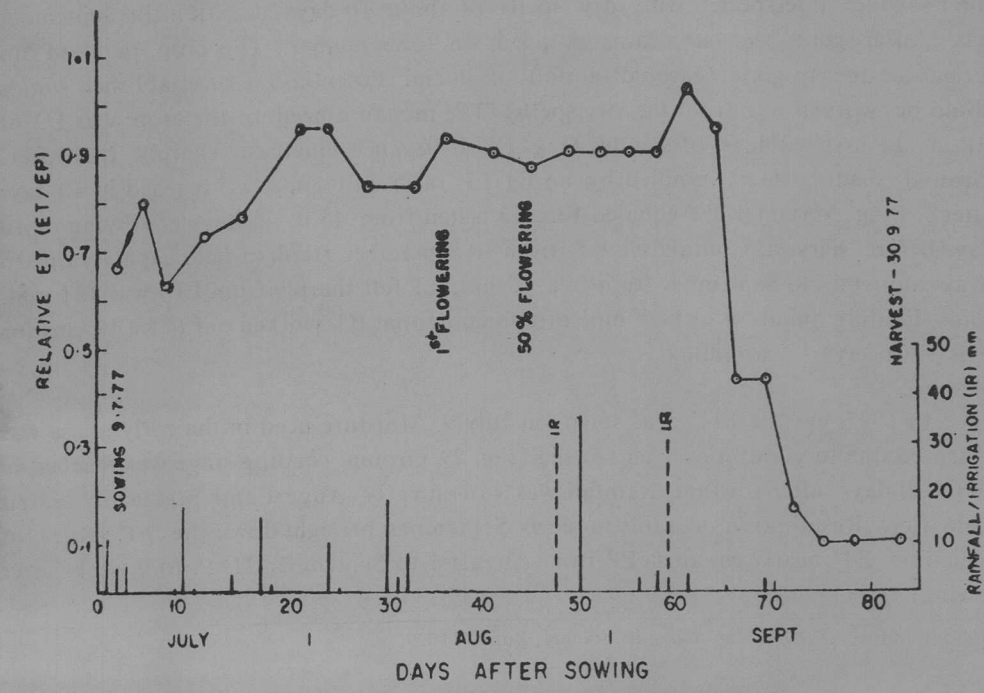

Fig. 2. ET/EP for pearl millet cv BJ 104, Jodhpur, 1977

Irrigation of 30 mm on 25 August left a deficit of 7 cm, as cumulative EP from 10 to 25 August was 10 cm. Rainfall of 35 mm on 28 Aug. and irrigation of 30 mm on 6 September reduced the deficit vis-a-vis cumulative EP to 6 cm. Thus by 12 September. when a sharp drop in ET below that of EP occurred, a deficit of 10 cm was reached. Thus the limiting quantum of field moisture for potential ET was 10 cm for cv BJ-104 of pearl millet.

It is inferred that the moisture requirement of pearl millet crop, irrespective of variety, is equal to 1/3 of pan evaporation and remains static in the first month after sowing.

ET would equal EP 6 weeks after sowing.

Moisture extration of cv HB-3 (13 cm) is better than that of BJ–104 (10 cm).

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