

EVAPOTRANSPIRATION AND WATER BALANCE OF MAIZE

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ABSTRACT

Evapotranspiration studies were made on maize during the kharif season of the years 1980 to 1987 at Dharwad by using gravimetric lysimeters. The seasonal total ET was 339.7 mm with a daily mean of 2.4 mm. Water balance computation indicated that the maize crop can be raised during kharif season without moisture stress and irrigation. The water use efficiency was 17.78 kg/ha/mm.

INTRODUCTION

India Meteorological Department has installed gravimetric lysimeters at selected locations in various agroclimatic zones in India. Prabhakar et al. (1989) have reported the weekly march of evapotranspiration (ET) of maize and the rainfall during the kharif season of the years 1980-1985 at Dharwad. In this paper; (a) the mean ET pattern of maize and the physiological stages of crop growth, (b) the water balance studies to determine net irrigation requirement and the interval of irrigation and (c) the water use efficiency are reported.

MATERIAL AND METHODS

The University of Agricultural Sciences, Dharwad is situated at 15°26' N latitude, 75°07' E longitude and 678 m altitude. Soil of the experimental site is black clay loam with pH of 7.5.

The daily ET was measured from the two gravimetric lysimeters. The ET field had the dimension of 60 m x 30 m with the lysimeters centrally located. The crop sequence during 1980-1982 was maize (cv Deccan 101)-Safflower (cv A-1) while during 1983-1987 the maize was succeeded by chickpea (cv A-1).

During kharif season hybrid maize (cv Deccan 101) was raised under rainfed condition. At the time of sowing the soil samples from 0-15 cm, 15-30 cm and 30-45 cm depth were taken to determine the initial soil moisture status. Observation on the various physiological stage of crop growth and their time of occurrence were taken. For water balance studies 50 percent available soil moisture (ASM) was taken as

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optimum. Soil moisture storage at field capacity, wilting point and 50 per cent ASM at 75 cm depth was estimated to be 320 mm, 159 mm and 239 mm, respectively.

RESULTS AND DISCUSSION

ET pattern of maize

ET increased rapidly from 1.1 mm/d during germination and establishment to 3.2 mm/d during the tasselling and silking stages which coincided during 7-8 weeks after sowing (Table 1). Thereafter ET remained nearly constant. The peak of 3.4mm/d occurred during the milk stage in 11-12 weeks. ET decreased as the crop advanced in maturity and the minimum of 1.0 mm/d was observed at the fag end of maturity in 19-20 weeks. The seasonal total ET for maize was 339.7 mm with the mean daily ET of 2.4 mm.

Table 1. Mean ET of hybrid maize at Dharwad (1980-1987)

Weeks	Mean ET (mm)	Mean daily ET (mm)	Crop stage and days
0-2	15.5	1.1	Germination (7)
2-4	27.6	2.0	
4-6	32.4	2.3	
6-8	45.0	3.2	First Tassel (48), First Silk (54)
8-10	41.7	3.0	First cob (59)
10-12	47.8	3.4	Milk (72)
12-14	45.7	3.3	
14-16	39.4	2.8	
16-18	30.3	2.2	
18-20	14.3	1.0	
Total/mean	339.7	2.4	

Water balance

Water balance (Fig. 1) indicated that the initial soil moisture at the time of sowing was 224.0 mm and the rainfall was in excess of ET from the germination until 10th week and from 13th to 16th week. There was a negative storage change during 11-12, 17-18 and 19-20 weeks where the rainfall was less than ET requirement. Soil moisture storage during the deficit period was well above 50 per cent ASM indicating that maize crop can be grown successfully without any stress under rainfed conditions. Besides, during the crop season there was a water surplus of 69.4 mm that may be harvested and used for rabi crop production.

Water use efficiency

The mean values of the ET, the yield and the water use efficiency of maize were 340 mm, 6046 kg/ha and 17.78 kg/ha/mm.

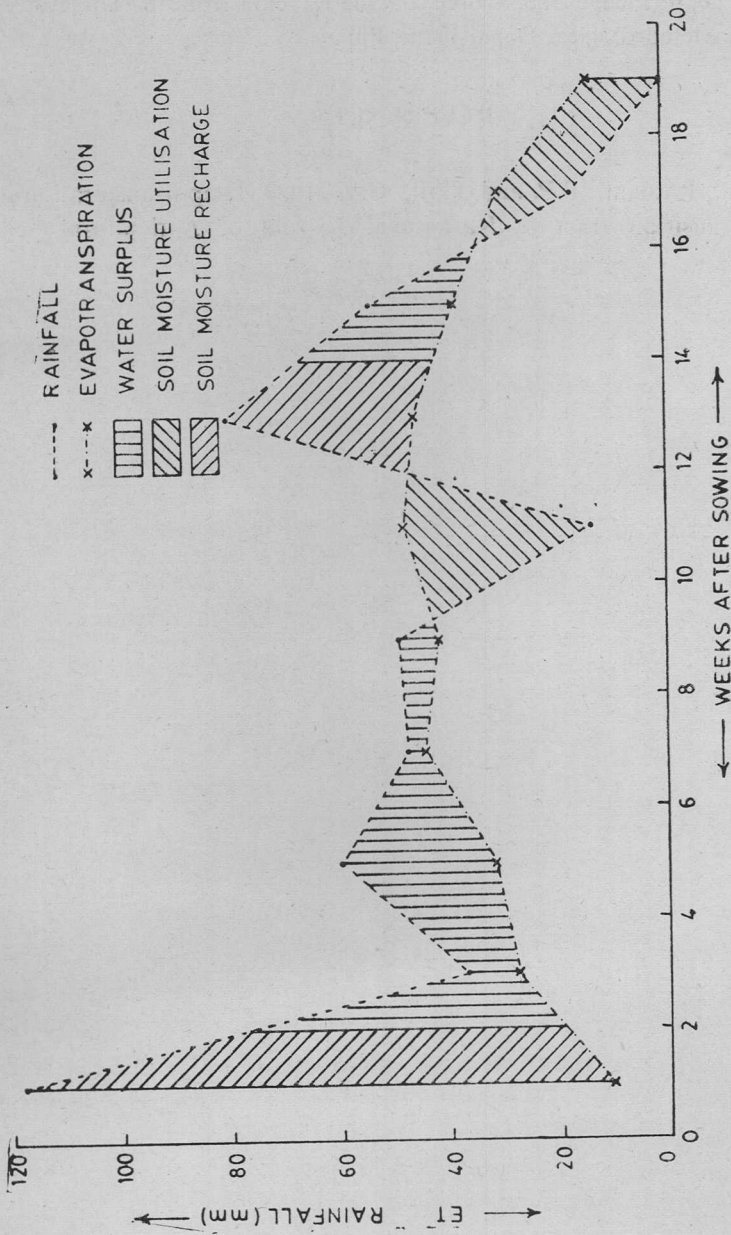


FIG 1 WATER BALANCE OF KHARIF MAIZE AT DHARWAD

ACKNOWLEDGEMENT

Authors acknowledge the source of the ET data from the Director, Agromet Division, India Meteorological Department, Pune.

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