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Letters to the Editor

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EVAPOTRANSPIRATION AND WATER BALANCE OF *CHICKPEA* AT DHARWAD

1. The measurement of evapotranspiration (ET) of the important crops in the rainy (*kharif*) and winter (*rabi*) seasons, by gravimetric lysimeters at selected stations of the India Meteorological Department, would enable estimates of the water requirement of these crops. The seasonal variation of ET for *kharif* maize at Ludhiana was reported by Venkataraman (1981). Prabhakar *et al.* (1989) have reported a study on weekly ET of *kharif* maize at Dharwad. In the *rabi* season crops are raised at Dharwad with the residual moisture in the soil from the southwest monsoon and a few irrigations. In this paper, we present a study of the ET of *chickpea* (*Cicer arietinum* L.) grown during the *rabi* season at Dharwad.

2. The headquarters of University of Agricultural Sciences is located at Dharwad (Lat. 15° 26′ N, Long. 75° 07′ E and altitude 678m) in north Karnataka. The soil at the lysimeter is black clay loamy with a pH value of 7.5. The physical constants of the soil are shown in Table 1.

2.1. Two gravimetric lysimeters are located at the centre of the field of size 60m × 30m. Daily ET measurements were made during the *rabi* seasons from 1983 to 1986. The mean of the two lysimeters' data was used for this study. The crop was sown at the beginning of the season in the lysimeters and the surrounding field following the same spacing, fertilizer dose and normal culture operations. *Chickpea* was raised only on the stored soil moisture, after the *kharif* maize crop. The soil moisture content of the layer 0-15cm, 15-30 cm and 30-45 cm was measured at the sowing. The dates of various physiological stages were noted. The water balance and irrigation requirement computation was made using the mean of four years. The available soil moistue (ASM) at 50% level was taken as optimum for the computation. The field capacity (FC), wilting point (WP) and 50% ASM was 320 mm, 159 mm and 239 mm respectively for the soil at 75 cm depth.

3. ET was low (0.6 mm/d) in the germination stage (Table 2). It increased rapidly to 2.6 mm/d in the branching stage and the peak (3.2 mm/d) was attained in the flowering stage. It decreased slowly to 3.1 mm/d at the onset of podding and rapidly to 1.6 mm/d in the milk stage. It was low in the later stage with the lowest value of 0.3 mm/d at the end of maturity. The total ET in the life cycle was 173.7mm with a mean daily value of 1.6 mm.

TABLE 1
Physical constants of the soil

Constants	Depth (cm)			
	0-15	15-30	30-60	60-90
Field capacity (%)	32.30	32.42	33.07	34.78
Wilting point (%)	15.80	16.24	16.47	16.75
Bulk density (g/cm^3)	1.25	1.30	1.32	1.30

TABLE 2
Mean ET of *chickpea* (A-1) at Dharwad (1983-86)

Weeks	Mean ET (mm)	Mean daily ET (mm)	Crop stage and days
0-2	8.6	0.6	Germination (11)
2-4	36.3	2.4	First branching (24)
4-6	45.5	3.2	First flowering (39)
6-8	43.2	3.1	First pod (49)
8-10	22.3	1.6	Milk stage (59)
10-12	8.4	0.6	
12-14	5.1	0.4	
14-16	4.5	0.3	
Total/Mean	173.9	1.5	

3.1. The water balance, for two week interval, of *chickpea* is shown in Table 3. The crop was raised mainly on the residual moisture, and 15.9 mm of rainfall received in the first four weeks. The soil moisture change was continuously negative because the rainfall was inadequate to meet the ET requirements in the beginning of the season and later it was nil.

4. Based on ET and soil moisture, irrigation is required to maintain 50% of ASM all through the growing period, a total of two irrigations are required for *chickpea* in the sowing and after 6 weeks. Net irrigation requirement was 102.3 mm given in two irrigations with the quantities shown for the optimum growth and yield. The water use efficiency of *chickpea* was 5.85 kg/ha/mm.

TABLE 3

Water balance of *chickpea* (A-1) at Dharwad (1983-86)

Weeks	Mean rainfall (mm)	Mean ET (mm)	Soil moisture change (mm)	Soil Moisture (mm)	Irrigation need (mm)	Irrigation interval (days)
			ISM 292-2			
0-2	3.2	8.6	-5.4	314.6	27.8	0
2-4	12.7	36.3	-23.6	291.0	-	-
4-6	-	45.5	-45.5	245.5	-	-
6-8	-	43.2	-43.2	277.2	74.5	42
8-10	-	22.3	-22.3	254.9	-	-
10-12	-	8.4	-8.4	246.5	-	-
12-14	-	5.1	-5.1	241.4	-	-
14-16	-	4.5	-4.5	236.9	-	-
Total	15.9	173.9			102.3	42

FC = 320 mm; WP =159 mm; At 50% ASM =239

References

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