Water-use by serena medic (medicago polymorpha*)* on contrasting soil types in the eastern wheatbelt of Western Australia

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To suggest ways of improving water economy in this region will involve a good understanding of the seasonal pattern of water-use, evapotranspiration (ET), on the two main soil types viz: the light duplex soil (LDS) and heavy land (HL). It is easily assumed that early season ET, often dominated by soil evaporation (Es), is higher on HL, since it has low infiltration rate, but this may not be so. A lysimeter study was undertaken to investigate the seasonal water-use by Serena medic on the two soil types during the winter growing season of 1987.

Methods

The experiment was conducted at Merredin (31? 29'S, 118? 12'E) using 2 hydraulic weighing lysimeters sited on both the LDS and HL. The whole field, including the lysimeters, was sown to pasture seeds on June 11. Periodically, the lysimeters were calibrated, and plant number, fraction of ground cover (FGC) and DM produced were measured. Potential evaporation (Ep) was calculated using the Penman-Monteith equation.

Results and discussion

Almost half of the total ET was in the first 60-day period, when much of the water must have been lost to Es since FGC was below 0.5. At the end of this period water use was just 2.5mm higher on HL than LDS (Table 1). This below expected difference could be attributed to the frequent light rainfall events that often kept the surfaces of the soils moist. Mid-season ET was greater on HL. The low infiltration rate of this soil causes a large amount of water to be held close to the surface, where it is readily available to plants, thereby promoting rapid canopy development and DM production. Although soil moisture supply was depleted, and the pasture hayed off earlier on HL than on LDS, water use efficiency was higher on the HL (9.3kg/ha/mm) than on LDS (5.6kg/ha/mm). Serena appears to be less well adapted on LDS, probably because of low N status and less effective symbiotic nitrogen fixation under low pH than on HL (1).

It is concluded that since half of the total ET occurred on the two soils before full canopy development, water loss due to early season Es could be the same, and so reducing it is equally important, on both soils. Furthermore, it may be possible to improve late season moisture supply on HL by increased infiltration to reduce mid-season ET.

Table 1. Components of water use and pasture growth at Merredin in 1987.

		LDS				HL			
Period (DAS)*	Rain (mm)	ET (mm)	ET/Ep	FGC†	DM (g/ m^2)	ET (mm)	ET/Ep	FGC†	DM (g/m^2)
0-60	60.2	63.3	.36	.39	12.2	65.8	.38	.45	43.5
61-80	30.6	23.9	.50	.63	26.8	26.1	.55	.78	55.8
81-94	o	19.0	.26	.60	20.1	22.2	.31	.95	26.3
95-108	11.4	19.4	.24	.58	14.1	14.8	.18	.77	0
108-122	09.3	09.2	.10	.27	2.2	06.7	.07	.16	0
Total	112.8	134.8	__	__	75.4	135.6	__	__	125.6

*DAS, days after seeding; †FGC, estimated at end of each period.

1. Ewing, M., and C. Revell (undated). Dryland Res. Inst. (WA) bull. 3/88, 1-13.