The need for improved irrigation management to attain high yields of wheat in a semi-arid environment

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Irrigated wheat crops in the southern irrigation areas often receive only one or perhaps two spring irrigations. Where only limited water is applied, timing is critical as some phases of growth are more sensitive to moisture stress than others.

Methods

In 1980 a field experiment, designed to examine the effect of moisture stress at defined growth stages was conducted on a red brown earth at the Agricultural Research Centre, Yanco. Six irrigation treatments, replicated four times, were applied to cv. Egret. Each plot was 25 m x 7.2 m. Final grain yield was assessed by harvesting four sections 20 m x 1.2 m with a plot combine (total area 96 m2).

The irrigation treatments were: 1 - control (no irrigation); 2 - first spring irrigation on 22nd August (after tillering and ear initiation); 3 - irrigated only during ear emergence - flowering period (24th September - 19th October); 4 - adequate irrigation through to the end of flowering; 5 - irrigated at the first spring irrigation and again during grain filling; 6 - irrigated through to the end of grain filling.

Irrigation timing was based on a frequency of 65 mm of accumulated E-R (Class A pan evaporation - effective rainfall).

Results and Discussion

Grain yields from treatments 1, 2, 3 and 5 reflect the almost total lack of effective spring rainfall (see table). Adequate irrigation up to the end of flowering (treatment 4) increased yield to 5.5 tonnes ha ^{1}. Additional irrigations during grain filling (12 and 23 days later - treatment 6) raised the yield a further 24% to 6.9 tonnes ha ^{1}. Most of this additional yield obtained from irrigating during grain-filling can be attributed to increased grain weight.

All treatments flowered together but late irrigation delayed physiological maturity thus extending the grain-filling period.

Growers are reluctant to irrigate to crop demand, particularly during grain- filling, because of excessive plant growth, which results in severe lodging and subsequent harvesting difficulties. Failure to realise current potential constitutes an enormous waste of natural resources and lowers the economic viability of the industry in irrigated areas. There is therefore an urgent need for plant breeders to develop a suitable, dwarf variety that is resistant to lodging and would thus encourage growers to irrigate for maximum yield.

Treat-ment	Grain yield	Grain weight	Harvest index	Protein	Plant height	Physiological maturity
	t/ha	g/1000		%	cm	
1	1.0	35.5	n.a.	15.1	47	Oct. 29
2	2.5	29.9	0.24	15.7	79	Nov. 4
3	3.2	31.6	0.25	12.5	83	Nov. 17
4	5.5	33.7	0.29	11.5	103	Nov. 18
5	3.1	34.2	0.26	13.9	79	Nov. 18
6	6.9	40.1	0.33	10.7	101	Nov. 26
lsd(0.05)	0.3	3.5	0.03	0.9	3	