

EFFECT OF IRRIGATION APPLIED AT DIFFERENT GROWTH STAGES ON YIELD CHARACTERS AND YIELD OF HULLED AND HULL-LESS BARLEY*

K WAHAB¹ and K. N. SINGH²

Field experiments conducted at Indian Agricultural Research Institute, New Delhi during the rabi seasons of 1979—80 and 1980—81, with two barley types in combination with ten levels of irrigation, including the control treatment indicated that significant increase in yield characters and yield was observed in hulled barley as compared to hull-less barley. The different levels of irrigation did not influence the ear length. However, 1000-grain weight was significantly influenced by irrigation. Grain yields were favourably influenced by irrigation up to two to three irrigations depending upon the seasonal variations.

The yield of barley is governed by different yield attributing characters namely, the length of ear head, fertile number of spikelets/earhead, number of grains/earhead, weight of grains/earhead, and 1000-grain weight. Solanki and Bakshi (1973) and Park (1975) claimed number of grains and 1000-grain weight to be the real yield attributing characters. Jain (1968) observed positive correlation between 1000-grain weight and grain yields while ear length has not been positively correlated with yield. Ibrahim

et al. (1980) found that irrigation increased 1000-grain weight of barley.

MATERIAL AND METHODS

Experiments were conducted on the farm of Indian Agricultural Research Institute, New Delhi during the *rabi* seasons of 1979-80 and 1980-81 with two barley types (hulled and hull-less) in combination with ten levels of irrigation including the control treatment in a randomised block design with three replications. Treatments were as follows :

- a) Varieties (Two) : DL-85 (hulled) and IB-65 (Hull-less)
- b) Irrigation levels (Ten) :

Treatment symbol	Irrigation given at			
	Active tillering (A)	Flag leaf (F)	Milk (M)	Grain filling (G)
Control	x	x	x	x
A	1	x	x	x
AF	1	1	x	x
AM	1	x	1	x
AG	1	x	x	1
AFM	1	1	1	x
AFG	1	1	x	1
AMG	1	x	1	1
AFMG	1	1	1	1
AFM 50%	1	1	1	1

(at 50% available soil moisture)

NB: 1 = Irrigation; x = No Irrigation

1. Assistant Professor of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641003
2. Senior Scientist (S 3), Division of Agronomy, Indian Agricultural Research Institute, New Delhi-110 012.

The experimental soil was loamy sand in nature having a medium fertility status. The crop was fertilized with 40 kg N/ha and 20 kg/ha each of P₂O₅ and K₂O applied at the time of sowing. Rainfall received during the crop period were 40.2 and 56.6 mm for 1979-80 and 1980-91 respectively. The amount of water to be applied in each irrigation was calculated by estimating the deficit from field capacity in the main root zone.

RESULTS AND DISCUSSION

Yield Characters

The data collected on yield characters viz., ear length and 1000-grain weight are presented in Table 1.

There was differential behaviour of hulled and hull-less barley with respect to yield characters. The yield characters like ear length and 1000-grain weight were more in hulled barley than hull-less barley. The differences in ear length due to different irrigation frequencies showed no significant superiority over control. Application of two to three irrigation, however, significantly increased the 1000-grain weight over one irrigation and control treatments. The beneficial effect of irrigation on this character, may be attributed to the more adequate supply of moisture to the crop with irrigation in comparison to no irrigation control. These findings are in conformity with the findings of Warsi *et al.* (1976).

Grain Yields

The data on grain yields as affected by different treatments are presented in Table 2.

The grain yields data showed that grain yields of barley were significantly higher in hulled than hull-less barley during both the years. Tremendous yield increases in hulled barley over hull-less barley might be due to the full exploitation of the genetic potential of this variety, which resulted in increased growth and yield characters and ultimately the final yield.

Irrigation increased the grain yields of barley significantly over no irrigation control. In the case of hulled barley, application of three irrigations (active tillering, flag leaf and milk stages) increased the grain yields over no irrigation control, one and two irrigations in the first year. In the second year, the grain yields increased upto two irrigations (active tillering and flag leaf). In the case of hull-less barley, application of two irrigations (active tillering and flag leaf stages) was superior over no irrigation control. One and two irrigation treatments in both the years. Thus, it can be generalised that hulled and hull-less barley responded up to two to three irrigations depending upon the seasonal variations particularly rainfall. The critical stage for their application being active tillering, flag leaf and milk stages in case of three irrigations and active tillering and flag leaf stages in case of two irrigations. Application of the fourth irrigation at grain filling stage failed to increase the grain yields of any of the varieties.

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Table 1 Yield characters of barley varieties in relation to irrigation treatments

Treatment	Ear length (cm)						1000-grain weight (g)					
	1979-80			1980-81			1979-80			1980-81		
	Hulled	Hull-less	Mean	Hulled	Hull-less	Mean	Hulled	Hull-less	Mean	Hulled	Hull-less	Mean
Control	5.20	4.50	4.90	7.04	5.84	6.44	35.8	30.7	33.3	33.9	26.6	30.3
A	5.30	4.10	4.70	7.20	5.93	6.57	37.8	31.3	34.6	34.0	27.8	30.9
AF	5.30	4.60	5.00	7.25	5.73	6.49	40.1	32.1	36.1	36.1	28.3	32.2
AM	5.30	4.20	4.80	7.18	5.71	6.45	39.7	32.3	36.0	36.3	27.9	32.1
AG	5.30	3.90	4.60	7.23	5.79	6.51	38.7	30.7	34.7	36.2	27.5	31.9
AFM	5.50	4.60	5.10	7.25	5.74	7.00	40.3	33.2	36.8	36.3	29.7	33.0
AFG	5.20	4.60	4.90	6.97	5.65	6.31	39.6	33.1	36.4	36.2	28.5	32.4
AMG	5.50	4.40	5.00	7.32	5.66	6.34	39.9	32.5	36.2	36.0	29.5	32.8
AFMG	5.40	4.70	5.10	7.05	5.91	6.48	40.3	32.0	36.2	37.2	30.1	33.7
AFM 5%	5.30	4.70	5.00	7.11	5.76	6.44	40.4	31.9	36.2	36.6	29.5	33.1
Mean	5.30	4.40		7.13	5.77		39.3	32.0		35.9	28.5	
S. Em ± (V)		0.10			0.04			0.3			0.3	
C. D. 5%		0.30			0.13			0.9			0.8	
S. Em ± (I)		0.20			0.10			0.7			0.6	
C. D. 5%		NS			NS			2.0			1.7	
S. Em ± (VI)		0.40			0.14			1.0			0.9	
D. D. 5%		NS			NS			NS			NS	

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Table 2 Grain and straw yields of barley varieties in relation to irrigation treatments

Treatment	Grain yield (q/ha)					
	1979-80			1980-81		
	Hulled	Hull-less	Mean	Hulled	Hull-less	Mean
Control	23.46	15.94	19.70	40.16	17.66	28.91
A	31.60	18.63	25.12	44.16	19.60	31.88
AF	34.36	19.25	26.81	48.30	21.11	34.71
AM	33.12	17.94	25.53	47.75	19.46	33.61
AG	31.60	17.60	24.60	47.61	19.32	33.47
AFM	39.33	22.08	30.71	54.79	21.53	38.16
AFM	36.23	20.36	28.30	49.54	21.39	35.47
AMG	31.40	19.87	25.64	47.89	21.94	34.92
AFMG	37.26	21.39	29.33	54.86	22.01	38.44
AFM 50%	36.91	20.56	28.74	54.51	21.80	38.16
Mean	33.53	19.36		8.96	20.58	
S. Em \pm (V)		0.46			0.75	
C. D. 5%		1.33			2.13	
S. Em \pm (I)		0.99			1.70	
C. D. 5%		2.84			4.84	
S. Em \pm (VI)		1.39			2.39	
C. D. 5%		3.97			NS	