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EFFECT OF DIFFERENT DATES OF SOWING ON YIELD AND YIELD ATTRIBUTES OF BARLEY GENOTYPES

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SUMMARY

Field experiments were conducted during *rabi* 1979-80 and 1980-81 to study the effect of sowing dates on yield and yield attributes of barley genotypes. Planting the crop early in season i.e., about a month and half before November was as much productive or even more in comparison to later sowing of until middle of November. Delayed plantings around second week of December reduced the growing season and adversely affected the grain yield. The components of grain yield were affected differently in different sowings and in the early to normal plantings the mutural compensation between these components balanced the effect of sowing dates while at late planting the grain yeild suffered mostly due to drastic reduction in ear number. Further, the short duration varieties yielded as much as the medium late types under early to late plantings. Long duration varieties were not superior to other types under early planting and these invariably yielded less than the other types at late sowing.

INTRODUCTION

Barley (*Hordeum vulgare* L.) is an important cereal and occupies fourth rank among the four principal *rabi* crops in India. The chief reason for the low yields in *rabi* cereals is the limit imposed by shortness of growing season which is largely conditioned by temperature. Planting the crop at different dates may involve various plant environmental interactions and would affect the kernel maturity, grain yield and yield components (Musick and Dusek, 1980). Advancing the sowing date by about a month or so (i.e., second fortnight of September or first week of October) would expose the seedlings not only to higher temperatures but also perhaps to a critical day length for flowering. It was therefore, considered desirable to assess the effects of sowing dates on yield and yield attributes of barley genotypes.

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MATERIALS AND METHODS

A field experiment was carried out during *rabi* 1979-80 and 1980-81 under normal irrigated conditions at IARI, New Delhi. Seven genotypes of barley, differing widely in flowering time (ear emergence) viz., DL 88 (Hulled, early) DL 157 (Hulled, medium late), DL 287 (Naked, medium late), Jyoti (Hulled, medium), Centinella (Hulled, very early), Kailash (Hulled, very late) and Himani (Hulled, late), were studied in 1979-80 (Experiment A). The varietal response to variation in sowing dates was further examined in only four promising strains viz., DL 88, Jyoti, DL 157 and Himani during 1980-81 (Experiment B). The sowing date commenced from around first week of October to the middle of December in the two seasons. The experiments were laid out in a split plot design with sowing dates as main treatment and varieties as sub-plot treatment and replicated four times.

The crop was sown after pre-sowing irrigation under each sowing date. Nitrogen at the rate of 40 kg ha^{-1} through urea, 20 kg each of P_2O_5 through superphosphate and K_2O through muriate of potash were applied. One hand weeding was also given after first irrigation to control the weeds.

RESULTS AND DISCUSSION

Weather data

The weather data during the crop growth period are presented in Table I. During 1979-80, the rainfall was 33.6 mm for the crop growth period and the high maximum temperature at maturity was resulted in lower grain yield of barley. In 1980-81, the rainfall (88.0 mm) mostly received during the months of January and February was accompanied with low maximum temperature at maturity which were conducive for the growth of the crop and for good grain filling.

Yield and yield attributes

The data on yield attributes are given in Table II (experiment A, 1979-80) and Table III (experiment B, 1980-81). The effect of sowing dates on grain yield had a small seasonal fluctuation. In Experiment A, the early plantings (D_1) yielded little higher than the later two plantings (D_2 and D_3), In Experiment B, the first plantings, especially those of DL 157 and Jyoti had slightly lodged which might have caused a small depression in the grain yield under this sowing as compared to normal planting (D_3); the grain yields were. however, similar in D_1 and D_2. It may be admitted that these varieties have been bred and are tailored mostly to the conditions existing in normal planting Despite

Table I : Mean monthly weather data during the crop growing season.

	Temperature (°C)						Average R.H (%)		Rainfall (mm)	
	Maximum		Minimum		Mean					
	1979-80	1980-81	1979-80	1980-81	1979-80	1980-81	1979-80	1980-81	1979-80	1980-81
October	34.5	34.2	17.6	18.1	26.1	26.2	54	62	0.0	8.8
November	29.2	28.4	13.9	10.9	21.6	19.7	61	70	0.0	2.8
December	23.6	22.6	7.6	7.3	15.6	15 0	66	74	0.0	6.2
January	21.2	20.3	5.2	7.7	13.2	14.0	69	81	1.0	38.2
February	25.5	23.9	9.6	9.8	17.6	16.9	61	74	4.2	23.0
March	28.5	27.6	13.0	13.2	20.8	20.4	60	73	28.4	9.0
April	38.5	35.9	20.2	19.8	29.4	28.3	39	49	0.0	0.0

Table II : Effect of sowing dates on yield and yield attributes of barley genotypes (1979-80; experiment 'A').

Treatment	Grain yield ($g\ m^{-2}$)	Ear number (m^{-2})	Grain weight ear^{-1}(g)	Grain number ear^{-1}	1000-grain weight (g)	Total biological yield ($g\ m^{-2}$)	Harvest index (%)
Sowing date							
10.10.1979 (D_1)	624.3	464	1.357	34.9	39.5	1579.4	40.1
29.10.1979 (D_2)	545.7	446	1.250	33.2	38.2	1438.4	38.1
16.11.1979 (D_3)	541.1	437	1.257	34.8	36.2	1405.4	38.5
4.12.1979 (D_4)	453.3	415	1.117	32.7	34.3	1008.6	45.7
L S D (0.05)	73.2	N.S	0.084	N.S	1.1	164.0	1.1
Variety							
DL 88	661.4	452	1.471	36.1	40.8	1358.8	49.2
DL 157	636.3	524	1.237	32.7	37.7	1665.9	39.1
DL 287	493.8	337	1.477	43.0	34.4	1355.9	37.0
Jyoti	578.2	465	1.260	30.9	41.0	1455.7	40.7
Centinella	523.5	467	1.126	27.4	41.6	1120.9	46.9
Kailash	388.1	398	0.989	32.1	30.7	1293.0	30.2
Himani	506.1	440	1.157	35.2	32.9	1265.1	40.9
LSD (0.05)	35.6	37	0.067	1.9	1.2	98.7	1.2

Table III : Effect of sowing dates on yield and yield attributes of barley genotypes (1980-81; experiment 'B').

Treatment	Grain yield (g m^{-2})	Ear number (m^{-2})	Grain weight (ear^{-1}) (g)	Grain number (ear^{-1})	1000-grain weight (g)	Total biological yield m^{-2}	Harvest index (%)
Sowing date							
4.10.1980 (D_1)	594.0	582.4	1.023	22.55	40.0	1209.1	49.24
24.10.1980 (D_2)	624.6	491.7	1.281	30.69	41.6	1467.3	42.49
15.11.1980 (D_3)	679.5	528.4	1.317	32.55	40.3	1452.7	47.19
10.12.1980 (D_4)	475.8	332.7	1.434	33.59	42.7	1097.8	43.60
LSD (0.05)	61.5	53.4	0.118	3.09	1.4	157.4	1.96
Variety							
DL 88	667.0	491.4	1.381	32.94	41.9	1375.5	49.29
DL 157	613.4	474.5	1.300	31.03	41.9	1389.5	43.94
Jyoti	575.9	443.8	1.339	31.18	42.8	1192.6	48.66
Himani	517.7	525.6	1.037	27.23	38.1	1287.3	40 62
LSD (0.05)	67.6	N.S	0.075	1.93	1.2	N.S	1.20

this they perform equally well when grown out of their normal climatic range. Thus, it is reasonable to conclude that planting the crop at first week of October (D_1) would be as much productive or even more (in experiment A) in comparison to plantings sown at later dates, until middle of November (D_2 and D_3). The grain yield under late sowing clearly lagged behind in both the experiments. The lower grain yield with later sowings (D_4) was due to the plants not getting full benefit of soil and water resources because of shorter growing period. Moreover, preflowering phase of the crop was also reduced with delayed sowings. Continuous low temperature during vegetative phase and high temperature at maturity, adversely affected the number of ears and grain weight per ear, which ultimately reduced the grain yields in last sowing (Singh and Tomar, 1970 and Randhawa *et al.*, 1977).

In experiment A, planting dates had major effect on grain weight per ear and/or individual grain size and their decrease contributed to the reduction in the grain yield with the delay in sowings, however, the ear number per unit area was not affected. While in experiment B, the drastic reduction in ear number m^{-2} (or grain number m^{-2}) depressed the grain yield under the last sowing. This was partially and only to a small extent compensated by the increase in grain weight per ear which was increased both by the increase in grain number per ear and individual grain size. Early planting had fewer grains per ear which might be attributed to warm and long days at differentiation and development of inflorescence, but cooler weather prevailing during the subsequent phases of crop development sustained the survival of larger number of ears and compensated for the decreased in grain weight per ear. Thus, the tendency of one of the components of grain yield to compensate for the lack of another is subjected to environmental stress and may not be consistent in different seasons. The total biological yield and harvest index varied unsystematically with variation in sowing dates.

Different varieties responded differently to variation in sowing dates (experiment A). The components of grain yield were also affected differently in different varieties in both the experiments. In some cases mutual compensation between these components balanced the effect of sowing dates. However, in experiment A, DL 88 yielded higher than DL 157, Jyoti and Himani when sown early (D_1) largely by virtue of producing more ears, where as it yielded as much as DL 157 and Jyoti with delay in sowing. The grain yield of Himani was relatively less than the other three varieties at the last two sowings due to greater reduction in grain weight per ear. The grain yields of DL 287 (naked), Centinella and Kailash were inferior only to that of DL 88 and DL 157 under D_1 but they mostly suffered greater than the other varieties at the later plantings.

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