EFFECT OF SALINITY ON YIELD PARAMETERS, YIELD AND ECONOMICS OF BARLEY

ABSTARCT

The field experiment was conducted during season of 2017-2018 at Agricultural Research Farm, School of Agriculture, Suresh Gyan Vihar University, Jagatpura, Jaipur. Study entitled "Relative performance of barley (*Hordeum vulgare* L.) cultivars under saline water condition" under Randomized Block Design. To evaluate ten barley cultivars namely RD 2715, RD 2035, RD 2592, RD 2849, RD 2860, RD 2552, RD 2668, RD 2097, BH 946, RD 2052 were grown under field condition for checking individual performance under saline water condition. The results revealed that among ten cultivars RD 2552 cultivar significantly recorded maximum plant population, growth parameters and ultimately increased grain(45.21 q ha^{-1}) as well as straw yield of barley, maximum net realization (41248₹ ha^{-1}) and B: C ratio (1:2.2)

***Key words*:** Cultivars, RD, BH, saline water, growth, yield.

Introduction

Barley (*Hordeum vulgare* L) member of grasses family, it is a self pollinated, diploid species with 14 chromosome number. It is a major cereal grain grown in temperate climates. It was one of the first cultivated grains, particularly in Eurasia as early as 10,000 year ago. Barley has been used as animal fodder, as a source of fermentable material for beer and certain distilled beverages, and as a compound of various health foods. (Malcolmson *et al.,* 2005)

Each 100 g of barley grain comprises 10.6 g protein, 2.1 g fat, 64.0 g carbohydrate, 50.0 mg calcium, 6.0 mg iron, 31 mg vitamin B1, 0.10 mg vitamin B2 and 50 µg folate (Vaughan *et al.,* 2006). High protein barley is suited for animal feed. Malting barley is usually lower protein. Barley is the fourth largest cereal crop after maize, rice and wheat with 132 million tonnes produced annually. In India, barley was cultivated on 0.66 m ha^{-1} area during 2015-16 with 1.62 million tonnes of production at an average productivity status of 24.7q ha^{-1} (FAO, 2017) Rajasthan, it is have the first position with area 0.223 million ha^{-1} and production of 0.620 million tonnes with productivity of 2,774 kg ha^{-1}. This production is far below that of most of the states like Haryana (0.137million tonnes), Punjab (0.047 million

ton) and Jammu and Kashmir (0.008 million ton). The production of barley can be increased either by increasing more area under cultivation or by increasing yield per unit area. (Malcomson *et al.,* 2005).

Barley is tolerant to saline water and sodic soil. Salinity is the concentration of dissolved salts in water or soil and is expressed in terms of concentration (mg L^{-1}) or electrical conductivity (dS m^{-1}). According to Grewal (2010) salinity is one of the major a biotic environmental stresses affecting agricultural productivity. Nearly 7 % of world's total land area is affected by salinity. Salinity affects many morphological, physiological and biochemical processes, including seed germination, plant growth, water and nutrient uptake (Musyimi *et al.,* 2007).Reduced yield and grain quality. However, plant species differ in their sensitivity or tolerance to salts. (Basalah, 2010)

A clear understanding of plant response to salinity and the complex mechanisms of salt stress tolerance will be required for breeding of salt tolerant crop varieties. Germination and seedling growth under saline environment are the screening criteria which are widely used to select the salt tolerance genotype. Increasing the production of these crops under irrigation is an option. However, in a semi-arid country such as India good quality water for agricultural use is rapidly becoming a luxury. During the dryer time (winter months) of the year when these crops are grown water quality in irrigational areas is often not that good and high Electrical Conductivities (EC's) due to salinity may become a problem. (Blumwald, 2002).

MATERIALS AND METHODS

The field experiment was conducted at Agriculture Research farm, School of Agriculture, Suresh Gyan Vihar University, Jagatpura, Jaipur, Rajasthan. Jaipur is situated in the eastern boundary of Thar Desert a semi arid land of Rajasthan at 26.9^0 North latitude and 75.7^0 East longitude at an altitude of 1417 meter from mean sea level. It has subtropical climate characterized by hot dry summer and cool dry winter. Jaipur lies in the "Semi Arid Eastern Plains" agro climatic zone and the traditionally characterized as the wheat, pulse & oil seeds crop zone of Rajasthan. The average maximum temperature during the month of May-June varies between 35.7^0 C to 42.1^0 C, while the average minimum temperature varies between 8.2^0 C to 10.6^0 C during December-January, which is the coldest month of the year. The average annual rainfall of the region is about 500 to 700 mm which is mostly received between July to August and 80 to 100 mm in September.

The average humidity of the tract is about 65 per cent. The soil at the location is sandy loam, Organic carbon % (0.15), Available Nitrogen (kg ha^{-1}) 250.6, Available P_2O_5 (kg ha^{-1}) 25, Available K_2O (kg ha^{-1}) 162, Electrical Conductivity (dS m^{-1} at 25^0C) 0.24, Soil pH 8.2.

The experiment was laid out in Randomized Block Design with 10 treatments three replicated thrice. The treatments consisted of 30 furrow irrigated raised bed (FIRB) methods. Number of spike meter $^{-1}$ row length, length of spike (cm),number of grain $spike^{-1}$, test weight, grain yield (q ha^{-1}), straw yield (q ha^{-1}), harvest index (%) were recorded at harvest. Economics of barley was also calculated *viz*. gross return, net return and B: C ration to find out the most profitable combination among the 10 combination under study.

Results and discussion

Plant population

The data pertaining to the plant population at 20 DAS and at harvest was influenced by saline water and cultivar are presented in Table 1. The data presented Table 1 showed that saline water did not exert significant effect on plant population at 20 DAS. Whereas, significantly maximum plant population (52.91) was observed under the cultivar RD 2552 at harvest, respectively. Significantly minimum plant population (38.49) was recorded under cultivar RD 2052 being it was at par with RD 2097 cultivar.

The highest plant population at harvesting stage significantly showed in the cultivar RD 2552 whereas significantly lowest plant population at harvest recorded under the cultivar RD 2097. Plant population is directly proportional to yield

Plant height (cm)

The data on plant height were recorded at 30 days interval up to harvesting stage. Observation on plant height as affected by different treatments were recorded at 30, 60 DAS and at harvest. The calculated data with respect to plant height have been summarized and tabulated in Table 2. Among all the treatments significantly maximum plant height on 28.4, 82.9 and 100.37 cm observed under the cultivar RD 2552 at 30, 60 DAS and harvest. It remained at pat with RD 2052 at 30 DAS and at harvest.

Days to 50 per cent heading

The perusal of data in Table 3 Days to 50 percent heading was 4 and 5 days earlier in the cultivar RD 2592 and BH 946 as compared to other cultivars. At the same time days to 50 per cent heading was 19 days late in cultivar RD 2552, followed by other cultivars. Days to 50 per cent heading was 4 and 5 days early in cultivar RD 2592 and BH 946 compared to other cultivars. At the same time days to 50 per cent heading was 19 days late in cultivar RD 2552, respectively.

Days to 50 per cent maturity

The perusal of data in Table 3 Days to 50 per cent maturity was 2 and 4 days earlier in the cultivar RD 2592 and BH 946 as compared to other cultivars. At the same time days to 50 per cent maturity was 18 days late in cultivar RD 2552, respectively. Days to 50 per cent maturity was 2 and 3 days early in cultivar RD 2592 and BH 946 as compared to other cultivars. At the same time days to 50 per cent maturity was 18 days late in cultivar RD 2552, respectively.

Grain and straw yield

Grain yield as influenced by saline water have been presented in Table 4. Revealed that the grain yield was significantly influenced by different cultivars Cultivar RD 2552 was recorded significantly higher grain yield followed by RD 2592 and BH 946 whereas significantly minimum grain yield was observed under cultivar RD 2097 compared to other cultivars. Yield is not an independent character but a product of a number of constellation of yield contributing characters such as tillers per plant, spike length, grain per spike, test weight which form the 'sink' and the harvest index which are considered directly related to yield. In the present study, the higher yield of barley cultivar RD 2552 under salinity may be attributed to its higher number of tillers, long spike length, more number of grains per spike, higher test weight and harvest index. Same is the case with other cultivars RD 2592 and BH 946. These findings are in conformity with the results reported by Sardhana *et al.,* (2002), Jat and Singh (2003), Chakravarty and Kushwah (2007) and Rawat (2011).

The straw yield was significantly influenced by different cultivars. Among the all cultivars maximum straw yield (67.71 q ha^{-1}) was recorded in cultivar RD 2552, being significantly higher than all other cultivars. However, significantly lowest straw yield was obtained in RD 2097 (31.51 q ha^{-1}), respectively. All the barley cultivars under study showed significant variation and thus exerted variable effect on straw yield. This was mainly due to the fact that grain and biological yields increased almost in different pattern during the period of season. Similar results were founded by Chandra and Das (2000) and Cui *et al.,* (2000). Our results are in conformity with Alam (2009) and Kabir (2009).

ECONOMICS

The economics on different cultivars given in Table 4. It was showed that cultivar RD 2552 gave the highest net return and benefit cost ratio which was found statistically superior

over RD 2592. This might be due to high yielding ability of the cultivar RD 2552 as compared to RD 2592 but similar cost of cultivation, which results in high net return and benefit cost ratio. Cost of cultivation for all cultivars is equal (4160 ₹ ha^{-1}). Gross realization is higher in the cultivar RD 2552 (768130.0 ₹ ha^{-1}) and significantly lowest in RD 2097 (32275.0 ₹ ha^{-1}) cultivar. Net realization is higher under the cultivar RD 2552 (41248.0 ₹ ha^{-1}). Whereas significantly lowest in RD 2097 (3290 ₹ ha^{-1}) cultivar. The cultivar RD 2552 (1:2.2) showed significantly highest B: C ratio and the cultivar RD 2097 (1:1.0) showed significantly lower B: C ratio. Singh *et al.*, (2013) also reported higher net return and benefit cost ratio in cultivar RD 2552. These results are in close conformity with the results of Ram *et al*., (2010) and Ram *et al*., (2012.)

Table: 1 Relative performances of barley cultivars under saline water condition on plant population m^{-2} at 20 DAS and at harvest.

	Plant Population (m^{-2})	
Cultivars	**At 20 DAS**	**At Harvest**
RD2715	43.81	43.14
RD2035	47.88	45.06
RD2592	55.56	49.04
RD2849	53.02	45.01
RD2860	51.28	43.21
RD2552	46.85	52.91
RD2668	37.65	42.50
RD2097	22.94	38.95
BH946	67.33	48.14
RD2052	45.56	38.49
S.Em±	6.96	1.12
CD at 5%	NS	3.34

Table: 2 Relative performance of barley cultivars under saline water condition on plant height at 30, 60 DAS and at harvest

Plant height (cm)			
Cultivars	**At 30 DAS**	**At 60 DAS**	**At Harvest**

RD2715	21.9	72.3	90.61
RD2035	24.2	77.8	94.62
RD2592	22.7	74.7	94.59
RD2849	23.1	75.6	93.57
RD2860	18.6	64.9	84.86
RD2552	28.4	82.9	100.37
RD2668	20.34	70.5	90.18
RD2097	19.6	68.2	87.26
BH946	26.5	79.4	96.48
RD2052	27.4	80.6	98.43
S.Em .±	1.43	0.90	1.59
C.D. at 5 %	4.25	2.68	4.73

Table 3: Relative performance of barley cultivars under saline water condition on days to 50 per cent heading

Cultivars	**Days to 50 per cent heading**	**Days 50 per cent maturity**
RD2715	65.22	98.01
RD2035	76.31	108.32
RD2592	79.33	111.15
RD2849	70.21	102.23
RD2860	72.34	104.05
RD2552	82.33	113.25
RD2668	74.23	106.17
RD2097	63.21	95.03
BH946	78.66	109.11
RD2052	74.66	100.13
S.Em.±	2.59	3.22
C.D. at 5 %	7.70	9.59

Table: 4 Relative performances of barley cultivars under saline water condition on Economics of each treatment

Cultivars	Grain yield ($q\ ha^{-1}$)	Straw yield ($q\ ha^{-1}$)	Net realization (₹ ha^{-1})	B: C Ratio
RD 2715	26.21	45.91	10958.0	1:1.3
RD 2035	39.41	52.61	29468.0	1:1.8
RD 2592	42.41	58.71	34598.0	1:2.0
RD 2849	36.66	41.81	22803.0	1:1.6
RD2860	37.26	45.21	24573.0	1:1.7
RD 2552	45.21	67.71	41248.0	1:2.2
RD 2668	38.81	51.81	2849.0	1:1.8
RD 2097	18.26	31.51	3290.0	1:1.0
BH 946	41.73	64.21	35860.0	1:2.0
RD 2052	28.61	40.81	12428.0	1:1.3
S.Em.±	0.59	0.68		
C.D. at 5%	1.79	2.02		

CONCLUSIONS

Among the 10 promising barley cultivars RD-2552, RD-2592 and BH-946 were quite encouraging under salinity condition in respect to growth, yield and economics. Since RD-2552, RD-2592 and BH-946 cultivars exhibited highest yield among the rest of promising barley cultivars tested under salinity condition. It was showed that cultivar RD 2552 gave the highest net return and benefit cost ratio which was found statistically superior over RD 2592. Thus, it is suggested that these cultivars should be grown and promoted to salinity affected regions of Rajasthan.

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