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Effect of Tillage, Irrigation Schedule and N- Fertilization on Number of Leaves Plant of Barley

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A B S T R A C T

The study was carried out in the Department of Agronomy of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur U.P. India, during rabi season of 2013-14. The flat bed deep tillage level produced highest in respect to growth attributes, yield attributes, grain yield 40.38 q ha^{-1}, harvest index 38.11 per cent, consumptive use 228.30, water use efficiency 17.68 kg grain ha^{-1} mm, N content in grain 1.83 per cent, N content in straw 0.30 per cent, NUE 112.50 per cent, net income 37410 Rs. ha^{-1} and benefit cost ratio 1.25, but reduced in flat bed conventional tillage. The 1.0 IW/CPE ratio irrigation level was produced highest in respect to growth attributes, yield attributes, grain yield 42.67 q ha^{-1}, harvest index 38.73 per cent, consumptive use 240.69 mm, water use efficiency 17.72 kg grain ha^{-1} mm, N content in grain 1.87 per cent, N content in straw 0.33 per cent, NUE 116.13 per cent, net income 40899 Rs. ha^{-1} and benefit cost ratio 1.37, but reduced in 0.75 IW/CPE ratio and 0.5 IW/CPE ratio respectively.

Introduction

Barley (*Hordeum vulgare* L.) is the fourth most important cereal crop of the world after wheat, rice and maize. In India it is popularly called "Jau" Its Sanskrit Name "Yav" is mentioned in Vedas. Its grains contain 8-10 per cent protein and 74 per cent carbohydrates besides minerals and vitamin B-complex, it thus forms a staple food, cattle feed, malt for manufacturing of beer and other liquor products. Tillage, nitrogen levels and irrigation greatly influence the yield and malt quality of barley. Tillage methods have a major influence on aeration, moisture and temperature of soil which in turn affect the yield and quality of crop.

Judicious use of water and fertilizer are important input in crop production. Their input is costly as well as scare. Thus, the problem of shortage of irrigational water is more aggravated under the condition of irregular and insufficient supply of energy. Under such conditions of limited water availability, the efficient use water to get the potential yield of a crop become very essential. Among the major nutrients for the crop productivity, nitrogen has a unique place in production, which is reported to be widely

deficient in our soils. The efficiency of nitrogen fertilizer in increasing the yields depend upon many factors and among these soil moisture is most important, Adequate moisture without fertilizer or adequate fertilizer without sufficient soil moisture may results in very low water and fertilizer use efficiency, respectively.

Nitrogen is a constituent of amino acids, required for proteins synthesis and other related compounds; it plays a role in almost all plant metabolic processes. It is an integral part of chlorophyll responsible for plant food manufacturing through photosynthesis. So it induces rapid growth, increases leaf size and improves quality, promotes fruit and seed development. Among the fertilizer nutrients, nitrogen is the nutrient that is absorbed in largest amount and is the most limiting factor for crop production

Materials and Methods

The present experiment entitled "Effect of Tillage, irrigation schedule and N-Fertilization on Number of Leaves Plant of Barley (*Hordeum vulgare* L.) for central plan Zone of UP" was conducted during *rabi* season of 2013-14. The details about the edaphic and climatic conditions under which the present field experiment was carried out, method followed and agro techniques adopted during the course of investigation are presented below.

The present investigation was conducted in field at Students Instructional Farm (SIF) at Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.) during *rabi* season of 2013-14. The experimental farm falls under the Indo-gangetic alluvial tract of Central Uttar Pradesh. The farm is well laid out and irrigated by tube well.

Geographically, Kanpur is situated in the central part of U.P. and subtropical tract of North India between latitude ranging from 25^0 56' to 28^0 58' North and longitude 79^0 31' to 80^0 34' East and is located on an elevation of about 125.9 meters above mean sea level in gangetic plain. The seasonal rainfall of about 816 mm received mostly from IInd fortnight of June or first Fortnight of July to mid October with a few showers in winter season. The maximum and minimum temperature in the *Rabi* season usually occur 35˚C and 15˚C, respectively. During the experimental period, the crop received total rainfall of 151.20 mm in 2013-14of which 105.80 mm was very concentrated in January (1- 28th January). The mean weather data such as weekly avg. temperature, relative humidity (R.H.), evaporation rate and total rainfall etc. were recorded during crop season from meteorological observation.

The experiment was laid out in a "Split Plot Design" with three replications. The soil of the experimental field was well leveled. The fertility status and textural class of the soil was judged by chemical, physical and mechanical analysis. For purpose, soil samples were taken randomly from 5 places of experimental plot from a depth of 15 cm. just before sowing and fertilizer application.

The soil from these samples was mixed thoroughly and a representative soil sample was drawn. The quantity of soil sample was reduced to about one kg through quartering technique. The soil sample was then subjected to mechanical and chemical analysis in order to determine the textural classes and fertility status. The representative sample so drawn was dried and made free from inert and foreign material by passing through 2 mm standard sieve before analysis.

Crop was fertilized uniformly at a rate of 60 kg N+40 kg P_2O_5+40 kg K_2O. Half dose of

Nitrogen together with full dose of Phosphorus, and Potash were applied as basal at the time of sowing. Remaining half dose of nitrogen was top dressed after first irrigation in each plot individually.

The variety K-560 (Haritma) released from Chandra Shekhar Azad University of Agriculture and Technology Kanpur in 1997.

Haritma (K-560) an lodging and rust resistant variety for NEPZ under rainfed condition. Breeder seed of Barley variety K-560 was sown at row spacing of 20cm. First irrigation applied at 0.5CPE ratio and 2nd irrigation given at 0.75CPE ratio 3rd irrigation given at 1.00CPE ratio, in different plot as Different Treatment combination. And all observations of the number of leafs per plants in running meter^{-1} recorded from each plot at 20, 40, 60, 80 and 100 days after sowing.

All the data recorded were statistically analyzed by split plot design by Standard Method suggested by Panes and Sukhatme (1957). Pair wise treatment comparisons were tested using (t) static by calculating the critical differences (CD) at 5% level of significant.

Results and Discussion

The data pertaining to Number of leaves plant^{-1} at different plant growth stages as influenced by tillage, irrigation scheduling and N- Fertilization have been presented in Table 1. In general, number of leaves increased up to 80 DAS, there after it declined. Perusal of the data (Table 1) indicated that Number of leaves did not influence significantly due to tillage at all plant growth stages. But the maximum number of leaves were recorded in T_1 (flat bed deep tillage) treatment.

Table.1 Effect of tillage, irrigation schedule and n-fertilization on number of leaves plant^{-1} during 2014

Treatment	Number of Leaves per Plant				
	20 days	40 days	60 days	80 days	100 days
Tillage					
T_1	3.732	9.065	17.222	23.94	22.89
T_2	3.677	8.787	16.570	22.56	21.40
SE(d)	0.099	0.279	0.38	0.43	0.43
CD	NS	NS	NS	NS	NS
Irrigation scheduling (IW/CPE ratio)					
IR_1	3.663	8.318	15.500	21.31	20.55
IR_2	3.718	9.190	17.328	23.43	22.28
IR_3	3.733	9.270	17.860	25.01	23.61
SE(d)	0.114	0.314	0.47	0.49	0.53
CD	NS	0.655	0.99	1.02	1.11
N- Fertilization					
F_1	3.512	8.713	16.50	22.78	21.69
F_2	3.897	9.138	17.29	23.71	22.60
SE(d)	0.093	0.256	0.38	0.40	0.43
CD	0.195	NS	NS	0.83	NS
Interaction	NS	NS	NS	NS	NS

Table.2 Effect of tillage, irrigation schedule and N- Fertilization on different leaf area index during 2014

Treatment	Leaf area Index				
	20 days	40 days	60 days	80 days	100 days
Tillage					
T_1	52.50	68.50	97.31	114.82	143.08
T_2	50.90	66.52	94.17	109.81	136.53
SE(d)	0.79	0.70	0.72	1.09	1.43
CD	NS	NS	3.10	4.71	6.15
Irrigation scheduling (IW/CPE ratio)					
IR_1	49.61	64.67	91.26	106.13	131.98
IR_2	51.40	67.18	95.60	113.07	140.90
IR_3	54.09	70.69	100.35	117.74	146.53
SE(d)	0.92	0.82	0.87	1.31	1.73
CD	1.92	1.73	1.83	2.75	3.62
N- Fertilization					
F_1	51.09	66.77	94.35	110.39	137.38
F_2	52.31	68.25	97.12	114.24	142.22
SE(d)	0.75	0.67	0.71	1.07	1.41
CD	NS	1.41	1.49	2.24	2.95
Interaction	NS	NS	NS	NS	NS

Leaf area index could be observed at 60, 80 and 100 DAS, where T_1 was found superior to T_2 in respect of leaf area index (LAI).

The maximum green leaves were recorded under IR_3 (1.00 IW/CPE ratio) at all sampling dates, but the no of leaves did not influence significantly due to different irrigation scheduling at 20 DAS. At later plant growth stages up to 100 DAS it influences significantly. The maximum Number of leaves were recorded under IR_3 which was significantly superior then IR_1 (0.5 IW/CPE ratio) and IR_2 (0.75 IW/CPE ratio) irrigation scheduled.

In respect of N- Fertilization did not influence significantly at 40, 60 and 100 DAS. However, the significant effect of N-Fertilization on Number of Green leaves could be observed at 20 and 80 DAS. Where F_2 (RDF + *Azotobacter*) was significantly superior to that of F_1 (RDF) in N- Fertilization level. The highest Number of leaves was recorded in RDF + *Azotobacter* (F_2) at later plant growth stages.

None of interaction effect was significantly in this respect.

Leaf area index (LAI) influences significantly due to Irrigation scheduling at different IW/CPE ratio at all plant growth stages. The maximum LAI was recorded under IR_3 (1.00 IW/CPE ratio) which was significantly higher than that of IR_1 (0.5 IW/CPE ratio) and IR_2 (0.75IW/CPE ratio) irrigation scheduled. But IR_2 was also significantly influencing from IR_1 irrigation scheduled (Table 2).

Inoculation of the *Azotobacter* improved LAI at all the plant growth stages except 20 DAS. The maximum value of leaf area index was associated with F_2 level (RDF + *Azotobacter*) than F_1 (RDF) level.

Recommendations

Water consumptive use, water use efficiency, N content in grain and straw and N use efficiency also enhanced due to inoculation of Azotobacter with recommended dose of fertilizer (60, 40, 40 kg N, P_2O_5, K_2O + Azotobacter) over RDF(60, 40, 40 kg N, P_2O_5, K_2O) level in all treatments.

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