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Effect of Restricted Irrigation on Yield and Yield Attributes of Different Wheat (*Triticum aestivum L.*) Varieties

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A B S T R A C T

The present investigation entitled "Performance of wheat varieties under restricted irrigation" was conducted during Rabi season of 2019-20at university research farm Bihar Agricultural University, Sabour, Bihar, India to find out the effect of restricted irrigation on yield and yield attributes of different wheat varieties. The experiment was laid out in split plot design with three replication. The treatment consisted of three levels of irrigation (I_1 – No irrigation, I_2 – One irrigation at CRI stage, I_3 – Two irrigation at CRI and boot leaf stages) in main plot and six varieties viz.DBW252, HD3171, HI1612, HD2888, HD3293, and K1317 placed in sub plot. Regarding irrigation levels maximum number of earhead/m^2 (312.94), length of ear head (12.25 cm), number of grains/ ear head (44.06) and 1000 grain weight (42.05 g), grain (42.88 q/ha), straw (55.67 q/ha), biological yield (98.56 q/ha) and harvest index (0.44 %) were recorded under two irrigation (I_3) given at CRI and boot leaf stages, which was which was statistically at par with one irrigations (I_2) given at CRI stage. Among the different wheat varieties, HD3171 were recorded with maximum number of earhead/m^2 (312.94), length of ear head(12.25 cm), number of grains/ ear head(44.06) and 1000 grain weight(42.05 g), grain (43.83 q/ha) and (57.18q/ha), biological yield (101.24) and harvest index (0.45) followed by DBW252 and HI1612.

Introduction

Wheat (*Triticum aestivum* L.) is the most important rabi season cereal grown in our country. Wheat is single most important cereal crop that has been considered as integral component of the food security system of several nations. However in India, it is the second most important food crop after rice. Globally, wheat is cultivated over an area of about 215.44 m ha with production of730.90 m ton with a productivity of 3392 kg ha^{-1}.In India, area under wheat cultivation is 29.65 m ha with a production of 99.87 m ton having productivity 3368 kg ha^{-1}. Within the country, U.P ranks first in area and production while Punjab ranks first in productivity. In Bihar, area under wheat cultivation is 2.10 m ha with production of 6.15 m ton having average yield 2922 $kgha^{-1}$ (USDA 2018-19).

Water is essential at every developmental phase starting from seed germination to plant maturation to harvest for the maximum potential yield of wheat. The effect of restricted irrigation on crop yield & WUE

depends on growth stage which is essentially needed irrigation water and the most sensitive growth stage varies from region to region due to regional variability in environment & agronomic practices. Application of restricted irrigation gets maximum yield & save water compare to more irrigation schedules on wheat (Khokhar *et al.*, 2010).

Though, more than 70 % area under wheat cultivation in India is said to have irrigation facility. But, the entire area of the country do not have assured irrigation as most of the canals in India fail to supply irrigation water adequately during winter season. However, even under limited supply of irrigation water or in rainfed condition, farmers have no choice to grow cereal other than wheat in rabi season due to their preference to grow wheat. This make a very large area in India where wheat is cultivated under limited irrigation supply. Thus, timing the length of irrigation interval with the stages of crop growth might bring about a reduction in the number of irrigations and results in an economic crop yield. In principle, irrigation should take place while the soil water potential is still high enough to enable soil to supply water to meet the local atmospheric demands without placing the plants under stress that would reduce yield and quality of crop. In light of these facts the experiment was conducted to find out the suitable variety of wheat under restricted irrigation with maximum yield.

Materials and Methods

The Field experiment was carried out in the experimental farm of Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India in *rabi* season during 2019-20. The experimental plots had uniform topography, sandy loam in texture, slightly alkaline in pH, low in available nitrogen, medium in available phosphate, and medium in available potash. An experiment was conducted with eighteen treatment combinations of three levels of irrigation in main plot and six wheat varieties as sub plot treatment were laid out in a split plot design with three replication. The three levels of irrigation viz. (I_1 – No irrigation, I_2 – One irrigation at CRI stage, I_3 – Two irrigation at CRI and boot leaf stage) in main plot and six varieties viz.DBW252, HD3171, HI1612, HD2888, HD3293, and K1317 as in sub plot. Wheat seed @ 100 kg/ha was sown with spacing of 20 cm apart.

The crop received total rainfall during crop season 54.6 mm. All the agronomic practices and plant protection measures were followed as per the recommendations. The yield attributes were taken at the time of crop maturity before the harvesting of the crop. Wheat crop was harvested in the first fort night of April 2020.

Results and Discussion

Effect of restricted irrigation on yield attributes

The result revealed that levels of irrigations and wheat varieties significantly influenced the number of earhead/m^2 (Table 1). Among different levels of irrigation, maximum number of earhead/m^2 was recorded under two irrigation (I_3) given at CRI and boot leaf stages, which was statistically at par with one irrigations (I_2) at CRI stage and being statistically superior over (I_1) no irrigation. It might be due application of water at critical stages of crop i.e. CRI and boot leaf stage which maintained better soil moisture conditions and hence promoted the vegetative growth and development. Similar findings were reported by Ngwako and Mashiqa (2013) and Aslam *et al.*, (2014). In case of different wheat varieties, it was further observed that varieties differed significantly among themselves in respect of no. of earhead per meter square.

Table.1 Effect of restricted irrigation on yield attributes of wheat varieties

Treatments	No. of Earhead m^{-2}	Earhead length (cm)	No. of grains $Earhead^{-1}$	1000 grain weight (g)
Main plot - Irrigation levels				
I_1- No irrigation	256.67	10.22	40.39	**37.78**
I_2- One irrigation at CRI stage	305.61	11.25	43.17	**39.28**
I_3- Two irrigation at CRI and boot leaf stages	312.94	12.25	44.06	**39.39**
SEm±	**5.97**	**0.27**	**0.41**	**0.57**
CD (P=0.05)	**23.44**	**1.05**	**1.59**	**2.24**
Sub plot – wheat varieties				
V_1- K1317	269.11	10.61	39.89	**38.56**
V_2- HD3171	315.00	12.17	43.11	**40.22**
V_3- DBW252	301.89	11.44	42.44	**38.78**
V_4- HD3293	279.00	10.72	42.78	**38.78**
V_5- HI1612	296.67	11.17	43.67	**38.89**
V_6- HD2888	288.78	11.33	43.33	**37.67**
SEm±	**8.18**	**0.26**	**0.86**	**0.96**
CD (P=0.05)	**23.64**	**0.75**	**2.47**	**2.78**

Table.2 Effect of restricted irrigation on grain, straw, biological yield and harvest index of wheat varieties

Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Biological yield (q ha^{-1})	Harvest index (%)
Main plot - Irrigation level				
I_1- No irrigation at CRI stage	30.33	41.10	71.43	**0.42**
I_2- One irrigation at CRI stage	40.63	52.67	93.19	**0.44**
I_3- Two irrigation at CRI and boot leaf stage	42.88	55.67	98.56	**0.44**
SEm±	1.23	1.78	2.59	**0.02**
CD (P=0.05)	4.84	6.98	10.18	**NS**
Sub plot – wheat varieties				
V_1- K1317	31.24	42.21	73.88	**0.43**
V_2- HD3171	43.83	57.18	101.24	**0.45**
V_3- DBW252	41.13	53.71	94.61	**0.44**
V_4- HD3293	34.70	45.41	79.91	**0.42**
V_5- HI1612	39.81	52.02	91.61	**0.43**
V_6- HD2888	36.98	48.35	85.12	**0.44**
SEm±	**1.55**	**2.00**	**3.18**	**0.02**
CD (P=0.05)	**4.48**	**5.77**	**9.18**	**NS**

The variety HD3171 was recorded with maximum number of earhead per meter square, which was statistically at par with varieties DBW252, HI1612 and significantly superior over other varieties. Longest earheads were obtained from the plant supplied with two irrigation (I_3) statistically at par with one irrigations (I_2) and statistically superior with (I_1) no irrigation. Increased length of earheads might be due to constant supply of irrigation water which maintained various metabolic and photosynthetic activities of plants. Similar result also reported by Atikullah *et al.,* (2014) and Ahmad and Kumar (2015). Similar trend was observed with grains/earheads and test weight of wheat. It might be due to the fact that timely irrigation given to wheat plant is helpful to increase grain weight of panicle in comparison to no irrigation. Similar findings were reported by Youssef *et al.,* (2013) and Ahmad and Kumar (2015).

Effect of restricted irrigation on grain yield

Different levels of irrigation and wheat varieties were found to have significant effect on grain yield (Table 2). Maximum grain yield was observed under two irrigation (I_3) given at CRI and boot leaf stages, found at par with one irrigations (I_2) given at CRI stage. Increase in grain yield due to increase in levels of irrigation was reported by Aslam *et al.,* (2014), Meena *et al.,* (2015) and Bedarkar *et al.,* (2017). In case of different wheat varieties, HD3171 was recorded with highest grain yield (43.83 qt/ha), which was statistically at par with varieties DBW252, HI1612 and significantly superior over other varieties. Further maximum straw yield was recorded under two irrigation (I_3) statistically at par with one irrigations (I_2) and superior with (I_1) no irrigation. In case of different wheat varieties, HD 3171 was recorded highest straw yield, which was statistically at par with varieties DBW252, HI1612 only.

Biological yield was increased with irrigation. It found maximum when two irrigation (I_3) given at CRI and boot leaf stages, which was statistically at par with one irrigations (I_2) applied at CRI stage and superior with (I_1) no irrigation. In case of different wheat varieties, HD3171 was recorded highest biological yield, which was statistically at par with varieties DBW252and significantly superior over other varieties. Application of two irrigations at CRI and boot leaf stage recorded maximum harvest index which was statistically at par with irrigation given at CRI stage only.

Therefore, it is concluded that HD 3171 performed better in terms of growth and yield followed by variety DBW252. These varieties can be grown even in limited supply of irrigation water with high yield potential.

References

Agricultural statistics at a glance; Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, New Delhi, 2018.

Ahmad, A and Kumar, R (2015). Effect of irrigation scheduling on the growth and yield of wheat genotypes. *Agric. Sci. Digest*. 35(3):199-202. 3.

Aslam H, Ansari MA, Baloch SK, Baloch SU, Baloch AS (2014). Effect of irrigation scheduling on the growth and harvest index of wheat (*Triticum aestivum* L.) varieties. *Persian Gulf Crop Protection*3(2):15-29.

Atikullah MN, Sikder RK, Asif MI, Mehraj H, Jamaluddin AFM (2014). Effect of Irrigation levels on growth, yield attributes and yield of Wheat. *Journal Bioscience and Agriculture Research* 2(2):83-89.

Bedarkar PB, Sawadhkar SM, Bhale VM, Chore AB (2017). Response of

different genotype to restricted irrigation for increasing yield of wheat. International Journal of Scientific research. 6(1):30-32

Meena, R. K, Parihar S. S, Singh M and Khanna, M (2015) Influence of date of sowing and irrigation regimes on crop growth and yield of wheat (Triticum aestivum) and its relationship with temperature in semi-arid region. Indian Journal of Agronomy60 (1): 92-98.

Ngwako S, Mashiqa PK (2013). The effect of irrigation on the growth and yield of winter wheat (*Triticum aestivum* L.*)* cultivars. Int. J of Agric. and Crop Sci. 5(9):976-982. Research, 23(3-4).

Youssef MA, Sayed MM and Sadek I (2013) Impact of Organic Manure, BioFertilizer and Irrigation Intervals on Wheat Growth and Grain Yield. *American-Eurasian J. Agric. & Environ. Sci.,* 13 (11): 1488-1496.

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