The Journal of Rural and Agricultural Research Volume 24 No. 1, 39-41 (2024)
Received March 2024; Acceptance June 2024

Effect of irrigation and fertilizer management on productivity of wheat

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Abstract

An experiment was conducted during 2022-2023 at KVK, Prayagraj-2, UP with three levels of first irrigation at 20, 30 and 40 DAS with five fertility levels. The soil of experimental area is sodic and poor in organic matter, thats result in poor irrigation response. Balance dose of nutrients and irrigation scheduling is important. By obtaining the results of experiment, it was recorded that irrigation applied 20 Day after sowing proved most beneficial. Delay in first irrigation reduced the yield of wheat. Maximum yield of wheat variety KRL-283 was obtained with the application of 180, 90, 40 kg NPK ha¹ (1/2 N, full P_2O_5 and full K, O as basal and 1/2 N top-dressed after first irrigation). Further it was also observed that 7.5 percent higher lodging was observed with application of N_{180} N_{90} N_{40} over the application of NPK @ 120:60:40.

Keywords: Organic matter, nutrients, yield, irrigation, yield

Introduction

India is one of the major wheat producing country occupy third position among the wheat growing countries of the world. In India wheat is cultivated on over 23.61 million hectares with total production of 44.25 millions tonns under different cropping systems. It is mostly grown under irrigated conditions. wheat is one of the major staple food crop in India. The production of wheat is mainly dependent upon whether conditions and nutrient status of the Soil. To sustain the productivity of wheat efficient nutrient management is vital. Balanced fertilization ensures high productivity. Imbalance fertilizer use can lead to a decline of soil productivity. Adequate amount of nutrient use and its application at proper time is the pre-requisite to enhance the yield and to sustain them. Water management also plays an important role in increasing the yield of wheat. Proper time of application particularly Ist irrigation is important, therefore, judicious use of fertilizers and irrigation water have assumed a great importance and vital significance for the maintenance of crop productivity. Keeping this view the present study was aimed to find out the effect of irrigation and fertilizer management on yield of wheat.

Materials and Methods

The experiment was conducted during rabi season of 2022-23 at KVK, Prayagraj-2, UP. The experimental soil was sodic in nature having pH 9.2, EC 4.0 dSM^{-1} organic carbon 0.23% available P_2O_5 and K_2O 40.50 and 270.50 kg ha^{-1}, respectively. Wheat variety grown was KRL-283. The experiment was laid out in split plot design with four replications. The treatment consisted of three levels of first irrigation (20, 30, 40 DAS) as main plots and five levels of fertility i.e. F_1; N_{180} P_{90} K_{40} (1/2N + full P_2O_5 and K_2O applied at sowing 1/2 N at after irrigation), F_2; N_{180} P_{90} K_{40} (1/2 NPK after first irrigation and 1/2 fertilizer (NPK) after II irrigation, F_3; N_{180} P_{90} K_{40} (Full NPK applied after Ist irrigation, F_4 ; N_{180} P_{90} K_{40} (1/3 NPK applied at sowing + 1/3 after irrigation + 1/3 after II irrigation; F_5; N_{120} P_{60} K_{40} (1/2 N + full P and K at sowing + 1/2 N after Ist irrigation) as sub plots.

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Results and Discussion

Effect of irrigation levels

Data on growth, growth attributes and yields of wheat as influenced by different irrigation schedules are presented in Table 1. Data revealed that the first irrigation applied at 20 DAS produced considerably higher shoots per metre row length, height of main shoot and dry matter production per unit area. Irrigation applied 30 and 40 DAS resulted poor growth and this may be due to improper and poor physiological activities in the absence of proper dilution of nutrients in absence of soil moisture form of solution. These finding are in conformity with those of Sharma and Bhardwaj (1988), Bhatia et al., (1983), Hooda and Agrawal (1987), Pandey et al., (1988) and Tomar et al., (1993). The yield data also revealed that the first irrigation at 20 DAS produced considerably higher length and weight of spike and 1000-grain weight CRI (20-25 DAS) was found most sensitive stage for irrigation. Delay in Ist irrigation resulted the poor crop yield due to improper and poor physiological activities performed by the plants in the absence of proper dilution. However, the number of lodged plants were higher in an unit area of first irrigation applied at 20 DAS than that of irrigation applied at 40 DAS. The differences between first irrigation applied at 20 DAS and 30 DAS were not measurable. The delayed maturity was observed with irrigation applied at 20 DAS.

Effect of fertility levels

Highest grain yield (38.80 q ha^{-1}) and test weight was obtained with the application of half nitrogen (90 kg ha^{-1}) full phosphorus (90 kg P_2O_5 ha^{-1}) and full potash (40 kg K, O ha^{-1}) applied at sowing and rest ½ nitrogen (90 kg ha^{-1}) after first irrigation. Maximum number of shoots per metre row length, height of main shoots, grain weight, length of spike and dry matter

Table 1: Effect of irrigation and fertility level on growth and yield

Treatments	No. of shoots/m	Plant height of main shoot(cm)	Dry matter accumulation gm/25 cm row length	Days to maturity	Length of spike (cm)	1000 grain weight (g)	Wt. of grain/ soike (gm)	No. of lodged plant (%)	Grain yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)
Irrigation levels											
I_1	97.30	95.88	180.97	135.50	9.78	37.65	1.96	25.62	38.07	64.30	102.37
I_2	83.45	90.30	177.11	131.50	9.46	36.05	1.92	18.15	36.59	59.12	95.71
I_3	66.65	88.00	163.03	122.75	9.10	35.01	1.74	15.52	32.54	56.09	88.63
S EM.±	1.17	1.079	5.218	0.36	0.213	0.496	0.082	0.742	0.495	0.741	0.828
C.D.	5.10	3.127	NS	1.25	NS	1.437	NS	2.152	1.435	2.148	2.399
Fertilizer levels:											
F_1	91.50	95.23	180.24	130.67	10.67	40.75	2.07	32.1	38.8	65.18	103.98
F_2	75.75	90.83	172.38	129.58	9.37	38.08	1.90	18.42	37.48	61.88	99.36
F_3	74.25	89.67	171.33	127.33	8.83	35.75	1.76	8.75	35.58	60.04	95.62
F_4	78.50	88.57	170.17	129.67	8.50	34.08	1.68	15.25	34.40	57.02	91.42
F_5	82.33	92.67	174.38	131.81	9.85	32.62	1.93	24.30	32.40	55.07	87.47
S EM.±	2.09	1.393	0.736	0.43	0.275	0.640	0.106	0.959	0.639	0.957	1.069
C.D.	5.29	4.035	NS	1.19	0.798	1.856	NS	2.778	1.852	2.773	3.097

accumulation also increased considerably with the application of $N_{90}P_{20}K_{40}$ at sowing and rest ½ (90 kg N) after first irrigation followed by application of $N_{60}P_{60}K_{40}$ at basal and rest ½ N (60 kg) after first irrigation. The significantly higher percentage of lodged plant per unit area was noted with the application of $N_{90}P_{90}K_{40}$ at sowing and rest N (90 kg) after first irrigation. Application of $N_{180}P_{90}K_{40}$ also resulted considerably early maturity over application of $N_{120}P_{60}K^{40}$.

Conclusion

In fact on the basis of one season data recommendation may not be made, but even than, with the help of result obtained it may be concluded that first irrigation applied after 20 DAS found most beneficial. Application of 90 kg N, 90 kg P, O, and 40 kg K_2O ha^{-1} as basal and rest ½ (90 kg) after Ist irrigation proved better to harvest a good crop of wheat. Variety KRL-283, in sodic soil.

References

Hooda, I. S. and Agrawal, S .K. (1987). Studies on irrigation, weed control on growth and yield of wheat. Indian J. Agron 32 (3): 361-64.

Kumar, A.; Sharma, D. D. and Sharma, H. C. (1994). Growth, yield and water use efficiency of wheat as influenced by irrigation and nitrogen in sodic soil. Indian J. Agron. 39 (2): 220-24.

Sharma, R. N. and Bhardwaj, R. B. L. (1988). Note on dry matter accumulation of durum and bread wheat under limited and adequate irrigation supply. Indian J. Agric. Sci., 58 (2): 877-79.

Singh, K. M. and Singh, B. P. (1996). Study on irrigation and fertilizer management to reduce lodging in wheat M.Sc.(Ag.) Thesis submitted to Dr. BRA Univ Agra.

Singh, S. K. and Singh, B. P. (1997). Study on irrigation and fertilizer management to reduce lodging in wheat. M.Sc.(Ag.) Thesis submitted to Dr. BRA Univ. Agra.

Tomar, J. S. and Singh, Vinay (1993). Potassium and nitrogen nutrition of wheat. J. Potassium Res. 10 (2): 1984-86.