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Effect of Irrigation Regimes at Different Fertilization Levels on Wheat Varieties.

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Studies conducted at Agricultural College Farm, Pune revealed that the grain yield was significantly increased with 20, 40 and 60 per cent depletion of available soil moisture over 80 per cent depletion of available soil moisture during all the three seasons as well as in pooled analysis. Application of 120 kg N+80 kg P_2O_5/ha gave significantly higher grain yield than 30 kg N/+20 kg P_2O_5/ha during all the three seasons. It was also observed that the variety HD-4502 was superior to variety NI-5643 during all the three seasons. The interaction effects among the different factors were not significant.

Among the various factors affecting the wheat production the role of irrigation and fertilizers assume greater significance. Water and fertilizer resources need judicious use for obtaining maximum output. Gautam *et al.* (1968), Misra *et al.* (1969) and Fischer *et al.* (1977) reported an increase in yield of wheat with an increase in the wetness of regimes and recommended adequate irrigation througout the growing season without subjecting to water stress.

Chowdhary and Pandey (1975) and Shekhawat *et al.* (1975) have reported that the proper integration of soil moisture and fertilization can boost the yields to the levels higher than their singular effects. Bhardwaj and Wright (1967) observed that on many soils deficient in available P, it is impossible to get the potential yield increase from N without adding P.

Prasad and Chowdhary (1977) recommended the variety HD-4502 for cultivation in peninsular India, which is having synchronous tillering, high number of effective tillers and resistance to major rusts of the region.

MATERIAL AND METHODS

The study was conducted at Agricultural College Farm, Pune during three successive years from 1974-75 to 1976-77. An experiment was laid out in sub-sub-split plot design with four replications. Four moisture regimes viz, 20, 40, 60 and 80 per cent depletion of available soil moisture were assigned to main plots. Three fertilizers doses viz. 30 kg N+20 kg P_2O_5, 60 kg N+40 kg P_2O_5 and 120 Kg N+80 kg P_2O_5 / ha to sub plots and HD-4502 and NI-5643 improved varieties of wheat were tried in sub-sub plots. Soil of the experimental plot was medium black with organic C-0.56, total N-0.056. available P_2O_5 - 0 019 and total K_2O-0.025 percent. Soil ph was 7.5. The net plot size was 3.60 X 1.35m². Half of nitrogen and all the

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quantity of P_2O_5 was applied at the time of sowing and the remaining half the quantity of nitrogen 30 days after sowing.

The percentage of moisture retained at 0.33 atmosphere and 15 atmosphere tensions was calculated by subjecting the soil samples to 0.33 and 15 atmosphere pressure in pressureplate and pressure-membrane apparatus respectively. The average field capacity, wilting point and bulk density were 42.35, 26.99 and 1.20 respectively. The available moisture for 0-30 cm depth was calculated as the difference between moisture content at field capacity (0.33 atmosphere) and wilting point (15 atmosphere). Irrigation was given after the calculated amount of depletion was noticed by actual sampling. The soil moisture depletion was determined by thermogravimetric method. Water meter was used to measure the quantity of irrigation water needed to replenish the depleted soil moisture to the field capacity. The total number of irrigations in three years including pre-sowing irrigation were 11, 8, 6 and 4 at 20, 40, 60 and 80 per cent available soil moisture depletion. Year wise grain yields with pooled grain yields are presented in Table-1.

RESULTS AND DISCUSSION

Effect of soil moisture regimes:

The data presented in Table-1 reveal that the grain yield was affected significantly by different irrigation frequencies. The crop grown under 20, 40 and 60 per cent depletion of available soil moisture produced significantly higher grain yield than that irrigated at 80 per cent depletion of available soil moisture during all the three seasons. The increase in yield when data were pooled for three years was 61.82, 58.86 and 39.23 per cent with 20, 40 and 60 per cent depletion of available soil moisture as compared to that at 80 per cent available soil moisture depletion These results are collaborative with the findings of Rathore and Singh (1973) Malik (1974), Shrotriya and Misra (1975) and Suraj Bhan (1978). Further, it was also observed that grain yield of wheat at 60 and 80 per cent available soil moisture depletion were significantly lower than 20 per cent available soil moisture depletion during all the three seasons and 40 per cent depletion of available soil moisture during 1974-75, probably because of moisture stress at the time of crown root initiation and other critical stages such as jointing, flowering, dough stage, These results are in conformity with those of Misra *et al.* (1969), Bhardwaj (1978) and Suraj Bhan (1978). who found that crown-root initiation, jointing, flowering, and milk are the critical stages in wheat for water requirement. It was also observed that irrigating wheat at 20 and 40 per cent available soil moisture depletion were found to be at par in all the three seasons and when data were pooled over three years.

EFFECT OF FERTILIZERS

Application of fertilizers significantly affected the grain yield in all the three seasons. Application of 120 kg N+80 kg P_2O / ha gave significantly more grain yield than 30 kg N+20 kg P_2O_5/ ha. Shekhawat *et al.* (1975 recommended 120 kg N and 60 kg P_2O_5/ ha

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for wheat in Rajasthan. Sandhu and Gill (1971) observed that application of nitrogen up to 120 kg/ha in 2 splits gave maximum grain yield. Gupta and Singh (1971) Choudhary and Pandey (1975) Subbiah and Morachan (1977), Agarwal and Yadav (1978) and Bhardwaj (1978) have also reported that the dwarf wheats gave response to nitrogen application, upto 120 kg/ha. An increased yield has also been recorded with 60 kg N+40 kg P_2O_5/ ha as compared to 30 kg N+20 kg P_2O_5/ ha during the year 1975-76. Application of fertilizers did not increase the grain yield significantly when data were pooled over for three seasons.

Effect of varieties

The grain yield of wheat was affected significantly in all the seasons. Variety HD-4502 significantly out yielded the variety NI-5643 during all the three seasons. However, in pooled analysis differences in grain yield due to varieties were found to be non significant. During the year 1976-77 notable reduction in yield (15.24 q/ha) was observed with the variety NI-5643 due to attack of rust.

Effect of interaction

The interaction effects among the different factors were found to be non-significant.

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TABLE 1. Mean grain yield in q/ha as affected by different treatment.

Treatments	1974-75	1975-76	1976-77	Pooled mean
Soil moisture regimes.				
(Percentage available soil moisture depletion)				
20	40.95	39.30	25.59	34.77
40	38.47	36.83	23.84	32.30
60	29.01	34.77	22.13	28.60
80	18.93	25.10	19.21	20.98
S. E. ±	1.03	1.02	0.61	2.51
C. D. at 5%	3.29	2.88	1.79	6.95
Fertilizer levels.				
30kg N + 20kg P_2O_5/ha	30.24	28.29	20.76	25.72
60kg N + 40kg P_2O_5/ha	31.68	34.77	22.20	29.63
120kg N + 30kg P_2O_5/ha	33.53	38.88	24.05	32.10
S. E. ±	0.68	1.54	0.91	1.30
C. D. at 5%	1.96	4.51	2.63	–
Varieties				
H. D. 4502	32.74	36.62	20.44	32.92
NI-5643	30.86	31.27	15.24	25.62
S. E. ±	0.54	1.23	0.49	2.59
C. D. at 5%	1.48	3.41	1.37	–
Irrigation X Fertilizer.				
S. E. ±	3.23	3.06	1.83	–
C. C. at 5%	–	–	–	–
Irrigation X Variety.				
S. E. ±	1.09	7.81	0.91	–
C. D. at 5%	–	–	–	–
Fertilizer X Variety				
S. E. ±	0.95	2.14	0.76	–
C. D. at 5%	–	–	–	–
Irrigation X fertilizer X Variety				
S. E. ±	1.87	4.28	1.48	–
C. D. at 5%	–	–	–	–