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Influence of Lower Levels of Irrigation and Fertilization on wheat Production

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The field studies on the effect of irrigation and fertilization on production potential of wheat during 1979-80and80-81 revealed that any reduction in recommended fertilizer and irrigation levels reduced grain yield significantly. Two post-sowing irrigation given at CRI and milky stages increased mean grain yield by 10 q/ha (62.5%) over control. Two more irrigation applied at jointing and flowering stages increased 4 q/ha in mean grain yield. Mean grain yield reduced by 3.7 and 3 q/ha when recommended fertilizer dose (80-60-40) was reduced upto 66·6 and 33.3 percent respectively. Irrigation water use efficiency and nutrient response decreased with increasing levels of irrigation and fertilizer doses.

It has been observed that on cultivators' fields high yielding wheat varieties are not giving expected yields because farmers do not apply recommended levels of irrigation and fertilization. In dwarf wheat, crown root initiation, jointing flowering and milky stage are the critical stages of growth. (Jana and Sen, 1978). The present investigation was therefore, conducted to find out the production potential of wheat at its recommended and lower levels of irrigation and fertilization.

MATERIAL AND METHODS

A field experiment comprising three levels of irrigation control, 2 (C R I and milky stages) and 4 (C R I, jointing, flowering and milky stages) and three levels of fertilization, recommended (80-60-40) 66.6% and 33.3% of recommended dose was conducted during two consecutive rabi seasons of 1979-80 and 1980-81 at Agricultural Research Station, Banswara. The object of the trial was to study the effect of reduced levels of irrigation and fertilization on yield potential of wheat crop. One preplanting irrigation was applied for land preparation and sowing Delta of water 7.5 cm was applied in each irrigation. Wheat variety 'Kalyan sona' was sown on Nov. 30th and 18th and harvested on 20th and 25th March during 1979-80 and 1980-81, respectively. The treatments were replicated three times in a split plot design keeping irrigation levels in main plot and fertilizer levels in sub plot. Urea, single super phosphate and muriate of potash were drilled below the seed as per treatment. Grain and straw yields were recorded and water and fertilizer use efficiencies were calculated to evaluate the treatments.

The soil of exprimental field was clay loam, well-drained having 7.8 pH. The field capacity, permanent wilting point and bulk density of soil were 16.20%, 8.64% and 1.43gm cm^3, respectively. Organic carbon, available phosphorus and potash were 0.45%, 45 and 450 kg/ha, respectively.

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RESULTS AND DISCUSSION

Grain yield:

Two post sowing irrigations applied at crown root initiation and milky stage increased mean grain yield of 10 q/ha (62.5%) over control.

Additional two irrigations significantly increased grain yield when compared with grain yield obtained by two post sowing irrigations. A constraint of over all reduction upto 33.3 percent of recommended fertilizer dose (80-60-40) produced significantly low grain yields of 6.4 and 5.7 q/ha, respectively during 1979-80 and 1980-81 when compared with grain yield obtained by full recommended fertilizer dose. Full recommended fertilizer dose (80-60-40) with 4 post sowing irrigations produced significantly maximum grain yield 34.68 and 33.33 q/ha during 1979-80 and 1980-81, resepctively.

Irrigation water use efficiency (IWUE):

The mean maximum and minimum water use efficiencies (219.40 and 134.84 kg/cm.ha) were observed in control and 4 irrigation (optimum) levels. This was due to proportionately higher increase of water, because crop plants try to economise the water loss under limited supply conditions. With higher delta of irrigation water, there was no proportionate increase in grain yield leading to a reduction in water use efficiency. Rathore and for Singh (1979) and Singh *et al.* (1980) also observed similar results.

Nutrients response:

The mean lowest and highest nutrient response of 15.6 and 35.9 kg grain kg of nutrient were recorded with full and 33.3 percent (1/3 rd) recommended fertilizer dose, respectively. Though maximum irrigation water use efficiency and nutrient response were recorded with control irrigation and lowest fertilizer dose, such higher values are not desirable on economic ground. Irrigation water use efficiency decreased with the reduction in recommended fertilizer dose at the same level of irrigation. However, nutrient response increased with increasing levels of irrigation at same fertilizer dose. This was because of irrigation water makes available more nutrients for plant growth producing healthy plants and more grain yield with an overall the increase in nutrient response.

It may be concluded from foregoing discussions that wheat crop should be irrigated and fertilized with full recommeded does for increased production.

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Table : 1 Grain yield of wheat and irrigation and fertilizer use efficiencies

Treatment	Total Water/ nutrient.	Grain yield (q/ha)			Irrigation water use efficiency (kg/cm/ha)		
		1979-80	1980-81	Mean	1979-80	1980-81	Mean
1.	2.		3.			4.	
A. Irrigation Levels.							
I_1 = Control (PPI)	7.50 cm	17.03	15.88	16.46	227.07	211.73	219.40
I_2 = 2 (CRI & Milky stage)	15.00 cm	28.84	23.66	26.25	192.27	157.73	175.00
I_3 = 4(CRI, Jointing Booting & milky stage)	22.50 cm	30.96	29.72	30.34	137.60	132.09	134.84
C. D. 5%		1.50	4.00	—	—	—	—

B. Fertilizer levels (80-60-40)					Nutrient response (kg grain/ kg of nutrient)		
					1979-80	1980-81	Mean
F_1 = Full recommened	180 kg	28.47	25.75	27.11	15.82	14.31	15.08
F_2 = 66.6% ,,	120 kg	26.27	23.49	24.88	21.89	19.58	20.73
F_3 = 33.3% ,,	60 kg	22.08	20.03	21.06	36.80	33.38	35.09
C. D. 5%		1.36	0.93	—	—	—	—

1	2	3			4			5		
C. Irrigation X Fertilizer (mean values)		F_1	F_2	F_3	F_1	F_2	F_3	F_1	F_2	F_3
I_1	Interactions	17.88	16.61	14.89	238.33	221.40	198.46	9.93	15.86	24.81
I_2	,,	29.44	27.11	22.20	196.26	180.73	147.96	16.35	22.59	36.99
I_3	,,	34.01	30.92	26.09	151.13	137.40	117.32	18.89	25.76	43.48
C. D. 5%			2.04	—	—	—	—	—	—	

PPI = Pre Planting irrigations.