

EFFECT OF SOIL AMENDMENTS AND SOURCES AND METHODS OF PHOSPHATE FERTILIZATION ON GROWTH AND YIELD OF WHEAT UNDER SALINE-SODIC CONDITIONS

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ABSTRACT

An experiment comprising six soil amendments (Control, FYM at 25 t/ha, Gypsum and Pyrites each at 25 and 50% GR) in combination with two sources of phosphorus (DAP and SSP) with their two methods of application (broadcast and drilling) was carried out on loamy sand saline-sodic soils during 1983-84 and 1984-85. Incorporation of soil amendments significantly increased the growth and biological yield of wheat. The plant height at harvest, number of tillers/m row length and dry matter yield almost at all the growth stages were more under gypsum at 50% GR and the lowest being under control. Similar trend was also observed for the biological yield. Sources of phosphorus as well as their methods of application, however, did not bring any significant impact on growth characters almost at all the growth stages.

Though salt affected soils are highly productive yet without a suitable technology for their amelioration and management, there can not be put to profitable cultivation. Many organic and inorganic amendments have been used for the amelioration of salt affected soils particularly in Kharif seasons (Mehta and Abrol, 1976). Wheat is most important rabi, crop, which can easily be cultivated on salt affected soils if they are reclaimed and managed properly. The phosphate fertilization for a crop grown on saline sodic soils differs remarkably in view of adversely altered physico-chemical nature of the soil. Since no information is available, an experiment was conducted to study the effect of

soil amendments and phosphate fertilization on growth and yield of wheat grown on salt affected soils.

MATERIALS AND METHODS

An experiment was conducted during 1983-84 and 1984-85 on salt affected sandy loam soil (available N 150-156 kg/ha, P₂O₅ 20-22 kg/ha, K₂O 155-170 kg/ha and organic carbon 0.20%) at SKN College of Agriculture, Jobner (Rajasthan). The soil was alkaline in reaction with pH of saturation paste 9.3 and 9.2, EC_e 4.8 and 5.6 mmhos/cm, ESP 33 and 30% and gypsum requirement (GR) 6.02 and 5.02 t/ha during I and II year respectively. The treatments were replicated four times in a split-plot design with six soil amendments (control, FYM

at 25 t/ha, gypsum at 25 and 50% GR; and pyrites at 25 and 50% GR) in main-plots and two each of sources (DAP and SSP) and methods of phosphorus application (broadcast and drilling) in sub-plots. The amendments were applied and mixed in 10 cm furrow slice of experimental plots 35 days before sowing and a heavy irrigation was applied. Nitrogen in form of urea was applied at 100 kg/ha. Half of the N was applied as basal dose and remaining at second irrigation. A common dose of 50 kg P₂O₅/ha (as per sources) and 25 kg K₂O/ha (through muriate of potash) was applied at sowing. Wheat variety Raj 1114 was sown on November 24 and 18 in 1983-84 and 1984-85, respectively at a seed rate of 100 kg/ha and row spacing of 22 cm. The crop was harvested on 1st April, 1984 and 30th March, 1985. Five randomly selected and permanently tagged plants were used to measure plant height at 30, 60, 90 Days after sowing and at harvest. Total number of tillers/m row length (at three marked spots) and dry matter yield/m row length (from 0.22 sq.m area) were also estimated at 30, 60, 90 days and at harvest.

RESULTS AND DISCUSSION

Plant height

The application of soil amendments increased the plant height significantly over that of untreated plots at final stage of observation during both the years except the pyrites at 25 and 50% GR in the year 1984-85 (Table 1). The maximum plant height was attained under

gypsum at 50% GR in both the years. The soil conditions corrected by soil amendments probably led to more plant height. These findings corroborate the results of Yadav and Agarwal (1959). The plant height, however, remained unaffected either by sources of phosphorus or by their methods of application.

Number of tillers

It is evident from Table 2 that incorporation of soil amendments significantly influenced the number of tillers/m row length at 60, 90 DAS and at harvest. Gypsum being the best treatment among the amendments tested, proved to be significantly superior to control and pyrites at 25% GR during both the years, as also reported by Singh and Sharma (1981).

The number of tillers were not affected significantly due to sources of phosphorus, however, among the methods, drilling of phosphorus produced more number of tillers/m over broadcast at 90th day and at harvest during 1984-85. This might be due to more availability of nutrient from the source of fertilizer placed near the roots, thus increasing the absorption and utilization of nutrients by the plants.

Day matter

Gypsum at 50% GR recorded maximum dry matter accumulation which was significantly superior to control at 60th and 90th day; and to control and pyrites 25% GR at harvest during both the years (Table 3). Similarly, incor-

Table 1 : Effect of different treatments on plant height (cm) at different stages

Treatments	30 DAS			60 DAS			90DAS			At harvest	
	1983-84	1984-85	1983-84	1983-84	1984-85	1983-84	1983-84	1984-85	1983-84	1984-85	
Amendments											
Control	2.54	2.67	15.93	16.73	17.93	36.14	36.97	58.74	56.74	58.74	
FYM at 25 t/ha	2.55	2.71	16.94	17.93	17.93	37.20	38.00	61.64	60.21	61.64	
Gypsum at 25%GR	2.58	2.71	17.09	17.84	17.84	38.21	38.03	61.61	60.25	61.61	
Gypsum at 50% GR	2.55	2.76	17.16	18.23	18.23	37.34	38.93	63.04	61.64	63.04	
Pyrites at 25% Gr	2.53	2.72	16.91	17.72	17.72	36.91	37.81	60.80	59.50	60.80	
Pyrites at 50% Gr	2.58	2.73	17.09	18.09	18.09	37.33	37.84	60.81	60.44	60.81	
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	2.38	2.87	2.38	
Source of 'P'											
DAP	2.57	2.72	16.95	17.67	17.67	37.44	38.02	61.16	60.01	61.16	
SSP	2.54	2.71	16.75	17.84	17.84	36.93	37.84	61.05	59.58	61.05	
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
Methods of 'P' application											
Broadcast	2.56	2.70	16.82	17.47	17.47	36.90	37.58	60.68	59.48	60.68	
Drilling	2.55	2.73	16.88	18.04	18.04	37.48	38.28	61.53	60.11	61.53	
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	

NS : Non-significant

DAS : Days after sowing

Table 2 : Effect of different treatments on number of tillers/m row length at different stages

Treatments	30 DAS			60 DAS			90 DAS			At harvest	
	1983-84	1984-85	1983-84	1983-84	1984-85	1983-84	1983-84	1984-85	1983-84	1984-85	
Amendments											
Control	36.6	38.1	58.0	66.7	69.8	74.2	70.1	75.2	75.2	83.0	
FYM at 25 t/ha	37.4	40.3	66.9	73.8	77.0	82.5	77.6	83.0	83.0	82.2	
Gypsum at 25% GR	37.1	38.8	67.1	72.0	76.3	81.0	78.3	82.2	82.2	87.3	
Gypsum at 50% GR	38.9	39.3	69.3	76.1	79.1	86.1	80.0	87.3	87.3	80.7	
Pyrites at 25% GR	37.1	38.7	60.1	71.1	71.2	79.4	72.4	80.7	80.7	83.6	
Pyrites at 50% GR	37.5	40.1	66.1	74.1	78.4	81.8	79.2	83.6	83.6	4.1	
CD at 5%	NS	NS	3.7	3.2	3.2	4.1	4.1	4.1	4.1	4.1	
Sources of 'P'											
DAP	37.6	39.4	64.5	72.5	75.4	88.7	76.6	82.9	82.9	81.1	
SSP	37.3	39.1	64.6	72.3	75.2	80.0	75.9	81.1	81.1	NS	
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
Methods of 'P' application											
Broadcast	37.1	38.9	64.3	71.7	74.5	79.3	75.3	80.5	80.5	83.5	
Drilling	37.8	39.5	64.9	73.1	76.2	82.4	77.2	83.5	83.5	2.8	
CD at 5%	NS	NS	NS	NS	NS	2.6	NS	2.8	NS	2.8	

poration of other soil amendments also produced significantly more dry matter yield as compared to control at later stages of crop growth except the pyrites 25% GR at harvest. The reason for this increase is the beneficial effects of these amendments on soil properties which resulted in more plant height and more number of tillers consequently led to more dry matter accumulation. It is further evident from Table 3 that sources of phosphorus as well as their methods of application did not bring any significant impact on dry matter accumulation.

Yield

It is clear from Table 3 that among the various soil amendments tested,

gypsum at 50% GR attained significantly more yield as compared to rest of the treatments in both the years. Pyrites at 50% GR, gypsum at 25% GR and 25 t FYM, being at per all gave significantly more yield than untreated plots during both the years. Gypsum at 50% GR recorded 28.11 and 22.65% more yield over control during I and II years respectively. The reason for increase in yield is probably more plant height, pre dry matter accumulation and higher number of tillers, as also reported by Yadav and Agarwal (1961) and Bhumbla and Abrol(1975). Sources of phosphorus did not influence the biological yield. But among the methods, drilling of phosphorus attained significantly higher yield over broadcast in 1984-85.

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