SHORT COMMUNICATION

SOIL TEST CROP RESPONSE (STCR) CORRELATION STUDIES ON WHEAT

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Abstract: Soil test crop response (STCR) correlation studies on Wheat were carried out in village Chirkoma, district Balrampur (C.G.) during Rabi 2012-13 taking MP-1203 as test crop to quantify Wheat production in the context of the variability of soil properties and use of balanced fertilizers based on targeted yield concept. Soil properties show moderate variation in texture (Sandy to sandy loam), organic carbon content (3.0 to 9.0 g/kg), and pH (4.67 to 7.52). Soil fertility status for N is low to medium (140 to 260 kg/ha), P is low to medium (5.28 to 14.56 kg/ha) and K ranges from medium to high (146 to 387 kg/ha). Database regarding nutrient requirement in kg/t of grain produce (NR), the percent contribution from the soil available nutrients [CS (%)] and the percent contribution from the applied fertilizer nutrients [CF (%)] were computed for calibrating and formulating fertilizer recommendations. The yield target for 30 q/ha was tested in farmers' fields. The percent achievement of targets aimed at different level was more than 90%, indicating soil test based fertilizer recommendation approach was economically viable within the agro-ecological zone with relatively uniform cropping practices and socio-economic conditions.

Keywords: Nutrient requirements, Wheat, Yield target

INTRODUCTION

Wheat is an important crop grown about 50 per cent area during Rabi season in Balrampur district of Chhattisgarh. To get more and more yield farmers inclined to the excess use of chemical fertilizers, but the decision on fertilizer use requires knowledge of the expected crop yield response to nutrient application, which is a function of crop nutrient needs, supply of nutrients from indigenous sources, and the short- and long-term fate of the fertilizer applied (Dobermann *et al*.,). Dumping of fertilizers by the farmers in the fields without information on soil fertility status and nutrient requirement by crop causes adverse effects on soil an crop regarding both nutrient toxicity and deficiency either by overuse or inadequate use (Ray *et al*.,). Managing the location specific variability in nutrient supply is a key strategy to overcome the current mismatch of fertilizer rates and crop nutrient demand in Wheat environments (Dobermann and Cassman).

Soil test based application of plant nutrient helps to realize higher response ratio and benefit:cost ratio as the nutrients are applied in proportion to the magnitude of the deficiency of a particular nutrient and the correction of the nutrients imbalance in soil helps to harness the synergistic effects of balanced fertilization (Rao and Srivastava) cation specific fertilizer recommendations are possible for soils of varying fertility, resource conditions of farmers and levels of targeted yield for similar soil classes and environment (Ahmed *et al.*,). The present investigation aimed to study the relationship between the nutrient supplied by the soil and added fertilizers, their uptake and yield of Wheat and to develop a guideline for judicious application of fertilizer for maximum production of Wheat.

MATERIAL AND METHOD

The study was conducted in two Villages viz. Chirkoma and Sagarrpur in Balrampur district, Chhattisgarh, India for the year 2012-13. The crop was sown at a spacing of 20 cm. Urea has been applied in to three split doses hence divided total urea into three parts. Remaining all sources has been applied at basal dose after mixing uniformly and applied through line behind the plow. Nitrogen was applied through urea, phosphorus through diammonium phosphate (DAP) and potassium through muriate of potash. Twenty soil samples (0-15 cm depth) were collected and sent to Department of Soil Science, IGKV, Raipur (C.G.) for analysis. Samples were dried and passed through 2 mm sieve and analyzed for physicochemical characteristics as described by Jackson. In targeted yield approach for formulating fertilizer recommendations, the basic data viz. nutrient requirement (NR) (kg/t), percent contribution from the soil available nutrients [CS (%)] and the percent contribution from the applied fertilizer nutrients [CF (%)] were transfer into workable adjustment equation (Rao and Srivastava).

Fertilizer dose=[Nutrient requirement (kg/t) of grain]/[CF (%)]×100×*T*(t/ha)−[CS (%)]/[CF (%)]× [Soil test value (kg/ha)],

where *T* is targeted yield (t/ha).

RESULT AND DISCUSSION

Crop trials were done with the basic assumption that fertilizer recommendations typically depend on crop response experiments in which spatial variability has been minimized for every independent variable affecting crop yield except for the nutrient in question, although many non-fertility variables viz. soil texture, soil bulk density, available water content and other fertility variables significantly impact crop yield (Kastens *et al*.,)

Soil characteristics

The soils were acidic to neutral in reaction with pH varying from 4.67 to 7.52 (Table1). The organic carbon content varied from 0.3% to 0.9%. Texture of the surface soil varied from sandy to sandy loam. The soils were low to medium in N (ranging from 140 to 260 kg/ha), low to medium in P (ranging from 5.28 to 14.56 kg/ha) and medium to high in K (from 146 to 387 kg/ha).

Yield targeting of Wheat based on soil test

From the field experiment the basic data on nutrient requirements (NR) to produce one quintal of wheat, percent contribution of nutrients from soil [CS (%)] and fertilizer [CF (%)] were evaluated and fertilizer recommendation were made accordingly (Table 2) . Yield target of 30.0 qt/ha has been achieved with comparatively lower application of N and P_2O_5fertilizers but higher application of K_2O, in comparison to doses applied in farmers practice (FP). (Table 3)

However for efficient utilization of applied fertilizer some other parameters like soil pH, organic carbon status, soil texture, bulk density, water holding capacity, soil drainage, etc. should also be considered, since these are the major determining factors of soil nutrient retention. This is for the development of an effective fertilizer schedule as well as nutrient supply source in view of the better nutrient absorption and assimilation by the plants.

Table 1: Physico Chemical properties of the soil

Sample No.	Soil pH	EC dS/m	OC %	Avail N	Av P	Av K
				kg/ha	kg/ha	Kg/ha
1	6.33	0.07	0.37	148	10.48	294
2	5.81	0.07	0.6	240	8.42	174
3	6.56	0.1	0.45	180	7.52	387
4	5.77	0.12	0.52	208	6.72	150
5	6.64	0.08	0.36	144	9.22	363
6	7.53	0.14	0.48	192	13.85	326
7	6.53	0.06	0.75	250	14.25	309
8	5.48	0.07	0.37	148	13.44	254
9	5.00	0.12	0.9	260	6.63	227
10	4.67	0.08	0.3	148	6.36	254
11	5.37	0.07	0.82	250	7.79	188
12	6.00	0.04	0.51	204	6.89	194
13	6.71	0.07	0.28	148	6.09	291
14	6.26	0.08	0.81	260	6	307
15	7.52	0.11	0.35	140	5.28	301
16	5.88	0.09	0.44	176	6.63	146
17	5.51	0.05	0.42	168	6.98	326
18	7.10	0.12	0.48	192	14.56	297
19	5.41	0.06	0.52	208	6.89	244
20	4.77	0.07	0.62	248	6.63	148

Table 2: Soil test based fertilizer recommendation

S.No.	Urea	DAP	MOP	ZnSO4	Bentonite
	per acre	per acre	Per acre	Per acre	per acre
1	90	49	35	8	3
2	53	53	43	8	3
3	79	53	29	8	3
4	64	57	45	8	3
5	90	49	31	8	3
6	76	40	33	8	3
7	56	40	35	8	3
8	93	40	39	8	3
9	47	57	40	8	3
10	86	57	39	8	3

11	49	53	42	8	3
12	69	57	41	8	3
13	86	57	33	8	3
14	47	57	35	8	3
15	91	57	35	8	3
16	78	57	45	8	3
17	82	57	34	8	3
18	80	39	35	8	2
19	64	57	39	8	3
20	51	57	45	8	5

Table 3: Performance of the trial

S.N.	Yield		% increase
	Demonstration Plot (qt/acre)	Control Plot (qt/acre)	
1	10.80	5.60	92
2	10.75	5.85	84
3	11.10	6.20	79
4	10.50	6.50	61
5	11.20	6.30	78
6	11.25	6.10	85
7	10.85	6.45	68
8	10.65	5.80	84
9	11.10	6.50	71
10	11.60	6.30	84
11	10.55	5.40	95
12	10.30	5.65	82
13	11.40	5.85	95
14	10.70	6.25	71
15	11.70	6.30	85
16	11.45	6.10	87
17	10.80	5.70	89
18	10.55	5.45	93
19	11.30	5.60	101
20	10.35	5.35	93

CONCLUSION

Nutrient management for wheat should focus on developing fertilizer recommendations for spatial domains with relatively uniform agro-ecological characteristics, cropping practices and socio-economic conditions. The study will help to make guidelines for the amount of fertilizer used in wheat cultivation. With the variation in conditions like different cultivars, soil conditions, etc. fertilizer requirement will change. However the change will not be significant for cultivars of similar producing capacity. Now with the variation of soil and climate, the contribution from soil varies since the nutrient releasing capacity of soil depends upon its different properties, which are indicated in the assumption.

The specific yield equation based on soil health will not only ensure sustainable crop production but will also steer the farmers towards economic use of costly fertilizer inputs depending on their financial status and prevailing market price of the crop under consideration.

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