J Krishi Vigyan 2017, 6(1) : 213-216 DOI : 10.5958/2349-4433.2017.00082.4

Use of Soil Test Crop Response Approach in Direct Seeded Rice

Vidyavathi G Yadahalli* and M R Kammar

ICAR-Krishi Vigyan Kendra, Raichur 584 001 (Karnataka)

ABSTRACT

To assess the soil test crop response (STCR) based nutrient management in direct seeded rice (DSR), demonstrations were conducted at five farmer's field during kharif 2015-16 in Tunga Bhadra Command area of Raichur, India. Three technology options (TO) were assessed and were TO1: Farmers' practice (Imbalanced fertilization (250:155:133 kg/ha), TO2: Recommeded package of practices (100:50:50 kg/ha) and TO3: STCR equation based application of fertilizers (targeted yield: 75 q/ha). The grain and straw yield of DSR (variety BPT 5204) was found higher in TO3 (70.70 and 79.94 q/ha, respectively) and increase was to the tune of 21.5 and 21.4 per cent over TO2. The higher B:C ratio was recorded in the TO3 (2.97) and was higher by 14.67 per cent over TO1 (2.59). After harvest of crop, it was observed that there was build up of available N, P2O5 and K2O in plots with TO3 in all the five farmers field. These results clearly indicated that application of fertilizers to crops based on soil test values and target yield approach was effective in getting the higher yield.

Key words: Nutrient management, STCR, Direct seeded rice, Target yield.

INTRODUCTION

Rice (*Oryza sativa*), the staple food of more than half of the population of the world, is an important target to provide food security and livelihoods for millions. Imminent water crisis, water-demanding nature of traditionally cultivated rice and climbing labour costs ramble the search for alternative management methods to increase water productivity, system sustainability and profitability. Direct seeded rice (DSR) technique is becoming popular nowadays because of its low-input demanding nature. It offers a very exciting opportunity to improve water and environmental sustainability. To get more and more yield farmers tend to use excess and heavy doses of fertilizers but on other hand they are neglecting the soil health deterioration. Also in some cases application of fertilizers by the farmers in the field without knowledge on soil fertility status and nutrient requirement by the crop causes adverse effects on soil and crop regarding both nutrient toxicity and deficiency either by over use or inadequate use.

Soiltestcropresponse(STCR)basedNapplication caused significantly higher nutrient uptake over the rest of treatments and was comparable with 150 kg N/ha application in four splits plus green manure 6.25 t/ha (Ramesh *et al*, 2008). Application of N based on STCR enhanced significantly the growth and yield attributing characters viz., plant height, leaf area index (LAI), dry matter production, total tillers/ m2, panicle length, productive tillers, total number of grains per panicle over other nitrogen management practices . The treatment with N application based STCR realized the target yield (Ramesh and Chandrashekaran, 2007). Srinivasan and Angayarkanni (2008b) reported that application of fertilizers based on STCR equation will result in buid up of nutrients in the soil. Hence the present investigation was undertaken where STCR approach of fertilizer application was compared with farmers practise and recommended dose of fertilizers application. In this contest, soil test based application and target yield approach will help to provide the required amount of nutrient to the crop and increases the crop uptake and in turn higher yield can be expected.

MATERIALS AND METHODS

The investigation was conducted at five farmer's field to assess the STCR based nutrient management

*Corresponding Author's Email:vidyavathisac@gmail.com

in DSR during kharif 2015-16 at Manvi taluka of Raichur district of Karnataka (TBP command area). Three technology options (TO) assessed were TO1: Farmers practice (Imbalanced fertilization (250:155:133 kg/ha), TO2: Recommended package of practices (100:50:50 kg/ha) and TO3: STCR equation (targeted yield: 75 q/ha). In each farmers field 0.5 acre plots were made for each technical options. The source for TO2 was University of Agriculture Sciences, Dharwad and Raichur and for TO3 was AICRP STCR, Bengaluru. Initial soil samples from each farmer's field were collected and analyzed for pH, EC, available N, P2O5 and K2O. Based on these soil test values (Table 1) and target yield (75 q/ha) the fertilizers were calculated using STCR equation (Table 2) and added to plot with TO3.

The DSR with variety BPT 5204 (Sona Masuri) was selected for present investigation and seed rate used was 60 kg/ha. Fifty per cent of Nitrogen fertilizer and 100 per cent of phosphorus and potash fertilizers were applied as basal dose and remaining 50 per cent of nitrogen fertilizer was applied in 2 split doses. During the crop growth period, growth and yield parameters were recorded and after harvest of crop soil samples were drawn separately from each TO plots in each farmers filed and analyzed for pH, EC, available N,P2O5 and K2O.

Table 1. Initial soil available N, P2O5 and K2O

Farmers	Available N (kg/ha)	Available P2O5 (kg/ha)	Available K2O (kg/ha)
F1	165	38	385
F2	212	32	390
F3	245	36	410
F4	178	39	402
F5	158	36	397

STCR based nutrient application

Based on the soil test available N, P2O5 and K2O, the required quantity of fertilizer to attain the target yield of 75 q/ha was calculated (Table 2). The fertilizer prescription to attain specific yield targets based on soil available nutrient levels for the experimental field were as follows:

Target yield equation

FN=3.45T-0.29SN (KMnO4-N)

FP2O5=2.82T-1.70SP2O5 (Olsen's P2O5)

FK2O=2.00T-0.09SK2O (NH4OAC-K2O)

Where,

- SN is soil test Nitrogen
- SP2O5 is soil test P2O5
- SK2O is soil test K2O
- T is Target yield here 75 q/ha is used

Table 2.Calculated FN, FP2O5 and FK2O based on soil test values, using target yield equation.

Farmers	Calculated fertilizers for each farmers		
	Urea (kg)	DAP (kg)	MOP (kg)
F1	334	319	192
F2	295	342	191
F3	280	327	188
F4	327	316	190
F5	335	327	190

RESULTS AND DISCUSSION

The results of the experiment indicated that the number of tillers and panicles per square meter were observed higher in the TO3 (422 and 358, respectively) and was higher by 29 and 19 per cent, respectively over TO1. Similarly, grain and straw yield was found higher in TO3 (70.70 and 79.94 q/ha, respectively) and increase was to the tune of 21.5 and 21.4 per cent over TO2 (Table 3). Singh et al (2014) reported that targeted yield of rice (45 q/ha) and (50 q/ha) was achieved by using the plant nutrients on the basis of targeted yield concept (soil test crop response technology). The present results were in accordance with the study conducted by Singh *et al* (2017) and revealed that among the treatments, STCR-INM recorded relatively higher yield, benefit: cost ratio and per cent achievement than other treatments. The post-harvest soil organic carbon and soil available N, P and K status indicated the build-up and maintenance of soil fertility due to soil test based fertilizer recommendation under INM.

Table 3. Influence of nutrient management on growth and yield of DSR (average of five farmers).

Treatments		No. of tillers/ m^2	No. of panicles / m^2	% BPH incidence	Grain Yield (q/ha)	Straw Yield (q/ha)
T1	Farmers practices (250:155:133 kg/ha)	327	300	14	66.47	75.11
T2	RPP (100:50:50 kg/ha)	375	313	12	58.23	65.80
T3	STCR equation (Targeted yield 75 q/ha)	422	358	12	70.75	79.94

The higher B : C ratio was recorded in the TO3 (2.97) which was higher by 14.67 per cent over TO1 (2.59). The gross and net returns in TO1 were Rs. 1,06,352/- and Rs.65,254/-, respectively (Table 4) where as in TO3 the higher gross and net returns were obtained (Rs.1,13,194/- and Rs.75,064, respectively). Chaubey *et al* (2015) reported that the net returns from the improved practice (STCR technology) were substantially higher than the farmers' practice (GRD) for both the hybrid rice and improved rice. After harvest of crop, soil samples from each TO were collected and subjected to chemical analysis. It was observed that there was buildup of available N, P2O5 and K2O in plots with TO3 in all the farmers filed (Fig 1,2 & 3). These results clearly indicate that application of fertilizers to crops based on soil test values and target yield approach was effective in getting the higher yield, probably due to balanced application of nutrients to the crop. This results were in accordance with study conducted by Srinivasan and Angayarkanni (2008a).The application of fertilizers based on soil test improved the performance of rice crop along with enhanced soil organic carbon, available macronutrients and soil microbial enzyme activities as compared to the application of general recommendation of fertilizers (Rajput et al, 2016).

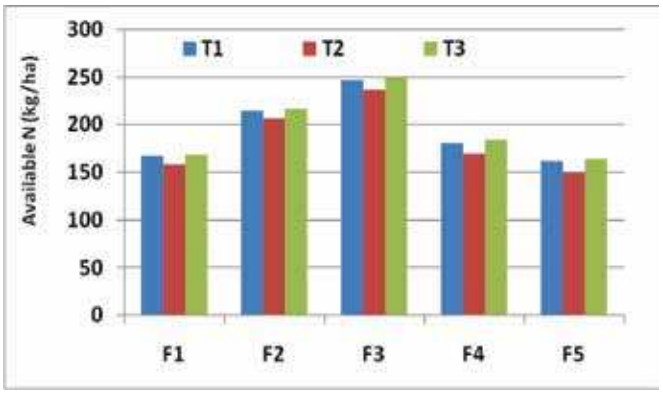

Figure 1: influence of nutrient management on soil available nitrogen status after harvest of crop

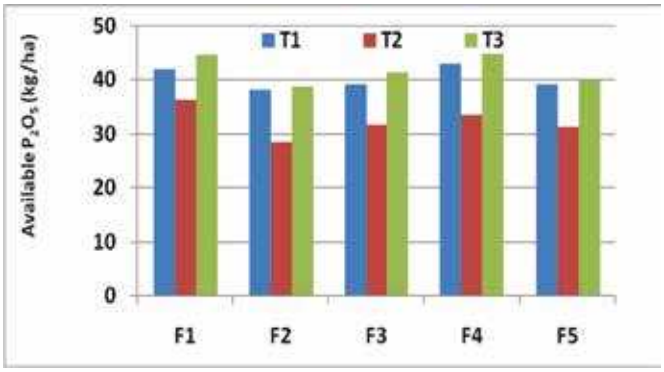

Figure 2: influence of nutrient management on soil available phosphorus status after harvest of crop

Table 4: Influence of nutrient management on economics of DSR (average of five farmers)

Treatments		Grain Yield (q/ ha)	COC (Rs./ ha)	GR (Rs./ ha)	NR(Rs./ha)	BC Ratio
T1	Farmers practices (250:155:133 kg/ha)	66.47	41098	106352	65254	2.59
T2	RPP (100:50:50 kg/ha)	58.23	35325	93162	57837	2.64
T3	STCR equation (Targeted yield 75 q/ha)	70.75	38130	113194	75064	2.97

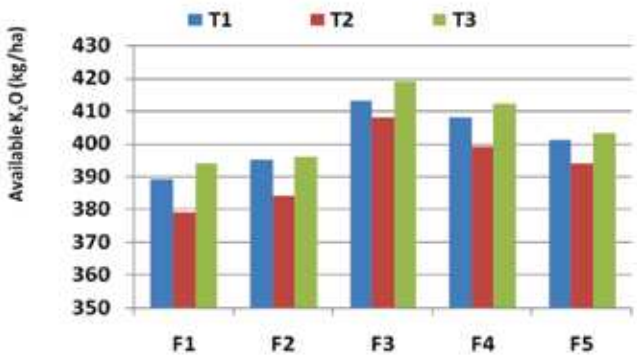

Figure 3: influence of nutrient management on soil available potassium status after harvest of crop

Legend:

T1	Farmers practices (250:155:133 kg/ha)
T2	RPP (100:50:50 kg/ha)
T3	STCR equation (Targeted yield 75 q/ha)
F	Farmer

CONCLUSION

The nutrient requirement by the crop is based on the fact that there is significant linear relationship between nutrient uptake and grain yield. It shows that for required grain yield production, a definite quantity of nutrient must be absorbed by plant. Once the nutrient requirement for a given yield target is known, the fertilizer requirement can be calculated taking in to account the efficiency of soil and fertilizer nutrients. The STCR technology was effective in changing attitude, skill and knowledge of farmers. Further, it can be said that DSR with suitable conservation practices has potential to produce slightly lower or comparable yields as that of transplanted rice (TPR) and appears to be a viable alternative to overcome the problem of labour and water shortage. Despite controversies, if properly managed, comparable yield may be obtained from DSR compared with TPR. It would be good if the capabilities of farmers to manage natural resources in sustainable manner are enhanced and rice productivity is increased through developing knowledge and technology of direct seeding by way of research and extension activities.

REFERENCES

Chaubey A K, Parganiha O P and Paraye P M (2015). Effect of STCR technology for target yield in Rice. *Pl Archives* **15**(1): 267-269.

Rajput P S, Srivastava S, Sharma B L, Sachidanand, Pradip Dey, Aher S B and Yashona D S (2016). Effect of soil-test-based long-term fertilization on soil health and performance of rice crop in Vertisols of central India. *Int J Agric, Environ and Biotech* **9**(5): 801-806.

Ramesh S, Chandrasekaran B and Ravi S (2008). Influence of establishment techniques and nitrogen management on nutrient uptake, soil fertility and economics of rice hybrid CoRH 2. *Int J Plant Sci* **3**(2): 357-365.

Ramesh S and Chendrashekaran B (2007). Evaluation of crop establishment methods and nitrogen management strategies on realizing yield potential of Rice hybrids ADTRHI. *Asian J. Plant Sci* **6**(2):239-251.

Singh M, Singh Y V, Singh S K, Pradip Dey, Jat L K and Ram R L (2017). Validation of Soil Test and Yield Target based Fertilizer Prescription Model for Rice on Inceptisol of Eastern Zone of Uttar Pradesh, India. *Int J Curr Microbiol App Sci* **6**(2): 406-415.

Singh Y V, Sharmaand P K and Meena R (2014). Effect of Soil Test Crop Response Technology on Productivity and Economics of Rice crop of Varanasi district of Uttar Pradesh. *J of Rural Agric Res* **14** (1): 77-80.

Srinivasan S and Angayarkanni S (2008a). Effect of INM on yield and nutrient uptake ny Rice in STCR experiments. *Agric Sci Digest* **28** (2): 130–132.

Srinivasan S and Angayarkanni S (2008b). Fertilizer potassium doses based on STCR for a yield target of 70 qha-1 on rice cv. ADT -36. *Asian J of Soil Sci* **3** (2): 246-248.

Received on 08/05/2017 *Accepted on 05/06/2017*