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ORIGINAL ARTICLE **OPEN ACCESS**

Ready-Reckoner and STCR Fertilizer Prescribed Equations For Targeted Yield of Groundnut Under Acidic Soil of Jharkhand

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ABSTRACT
Groundnut crop (cultivar AK12-24) was sown to develop fertilizer prescribed equation for targeted yield of crop in acidic soil (pH 5.2) of Ranchi under soil test crop response experiment in experimental area of Soil Science and Agricultural Chemistry, Ranchi, Jharkhand (India). Three soil fertility strips were developed in previous crop using an exhaustive crop (maize). These 3 fertility strips were sub-divided into 72 sub-plots each of 24 sub-plots before groundnut sowing. To reach on fertilizer prescribed equations for targeted yield of groundnut crop, nutrient requirement (NR); percent contribution of soil (Cs) and percent contribution of fertilizer (Cf) for N, P and K was calculated. A ready Reckoner was prepared on the basis of fertilizer prescribed equation for groundnut (AK 12-24) crop. A farmer can get a targeted yield of groundnut (10 q/ha or 15 q/ha) by using Ready-Reckoner table in which NPK fertilizer requirement already calculated and shown in the table.
Key words: *Groundnut, STCR equations, Acid Soil, Ready-Reckoner*

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INTRODUCTION

Farmers are not aware about fertilizer doses for any particular crop. It has been observed that they are applying a blanket dose to the crop or sometime as per availability of fertilizer. In that case, optimum or desired yield could not be harvested. Remote sensing is a current technique for yield forecasting of crop. [1] developed a basis for yield forecasting of wheat in Delhi for different doses of fertilizers They found variation in normalized difference vegetation index of wheat under different dozes of NPK. [2] also worked on Spectral behaviour of rice crop for nitrogen and tillage levels. Effect of water regimes and NPK levels on yield, quality assessment and water-use-efficiency on mid duration rice was studied by [3]. Location 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 [4]. Field specific balanced amounts of N, P, K were prescribed based on crop based estimates of the indigenous supply of N, P and K and by modelling the expected yield response as a function of nutrient interaction was done by many workers [5; 6].

Fertilizers prescribed equations are being developed by Soil Test Crop Response (STCR) centers of India for different locations and for different crops. Targeted yield can be achieved by using these prescribed equations.

MATERIALS AND METHODS

A field experiment was conducted in experimental sites of STCR Project of Birsa Agricultural University, Ranchi on groundnut during Kharif 2015. Entire experimental area was divided into 3 strips, which was further sub-divided into 24 sub-plots in each strip totaling 72 plots. Size of each sub-plot was 6 m X 3 m. Groundnut (cultivar AK 12-24) crop was selected for the experiment which was sown timely i.e. on 4th July, 2015.

3 fertility gradients control, RDF and doubled RDF were developed during previous Rabi (2014-15) crop to see its effect in next Kharif (2015) on groundnut crop. Four levels of each fertilizer nitrogen, phosphorus and potash were applied in groundnut (Table 1) field.

Table1. Fertilizer levels in all the three strips during groundnut crop

Fertilizer Levels	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)
0	0	0	0
1	25	50	25
2	50	100	50
3	75	150	75

Table 2. Fertilizer treatment plan used for groundnut crop during Kharif 2015

Plot	Strip I Treatment code	Strip II Treatment code	Strip III Treatment code
1.	N1P1K1	N2P1K2	N2P1K2
2..	N2P0K2	N2P2K2	N1P2K1
3.	N2P2K3	N1P2K1	N3P1K1
4.	N2P2K0	N3P3K2	N3P3K1
5.	N3P1K1	N3P2K1	N3P3K3
6.	N3P2K2	N2P3K3	N2P2K2
7.	N3P2K3	N0P2K2	N0P0K0
8.	N3P3K1	N0P0K0	N3P2K3
9.	N1P2K1	N2P2K1	N2P3K2
10.	N0P0K0	N2P0K2	N2P1K1
11.	N1P2K2	N1P2K2	N3P2K1
12.	N2P3K3	N3P3K1	N1P1K1
13.	N2P2K1	N2P3K2	N0P0K0
14.	N2P1K1	N0P0K0	N1P1K2
15.	N3P3K2	N2P2K0	N2P2K0
16	N0P0K0	N3P2K3	N2P0K2
17.	N1P1K2	N1P1K1	N3P3K2
18.	N2P2K2	N3P1K1	N0P0K0
19.	N0P0K0	N2P1K1	N1P2K2
20.	N3P2K1	N2P2K3	N3P2K2
21.	N0P2K2	N0P0K0	N2P2K3
22.	N3P3K3	N3P3K3	N2P3K3
23.	N2P3K2 1	N1P1K2	N2P2K1
24.	N2P1K2	N3P2K2	N0P2K2

Each gradient/strip was further sub-divided into 24 sub-plots with different combinations of fertilizers, nitrogen, phosphorus and potash (Table 2). Combinations of fertilizer were in such a way that each strip had 3 absolute control sub-plots.

Available nitrogen was determined by alkaline potassium permanganate method (7). A given weigh of soil was treated with excess of alkaline KMnO4. The organic matter present in the soil was oxidized by nascent oxygen liberated by KMnO4 in present of sodium hydroxide. Ammonium thus released was absorbed in known volume of standard acid, excess of which was titrated with standard alkali using methyl red as indicator. Available phosphorous was determined by (8). Further, the uptake of N was analyzed by the standard procedure as described (9).

RESULTS AND DISCUSSION

Several steps are there to reach on STCR prescribed equations for any crop at any particular soil and location. These equations are variety and area specific.

Maximum value of available N, P and K were recorded in same treatment $N_3P_3K_3$ as 17.3, 28.5 and 160.4 kg/ha respectively in controlled strip. Whereas in RDF strip, maximum value of available nitrogen (240.8 kg/ha) was also recorded in $N_3P_3K_3$ treatment, available phosphorus (31.9 kg/ha) in $N_0P_2K_2$ treatment and available potash (165.0 kg/ha) in $N_1P_2K_2$ treatment.

Total nine absolute control plots were designed, three in each strip. Maximum value of range was recorded in strip III for available phosphorus (23.0) and potash (60.0) whereas strip II for available

nitrogen (58.6). Minimum grain yield (7.20 Q/ha) was recorded in treatment $N_0P_0K_0$ of strip I which is absolute control. Whereas maximum grain yield (16.67 Q/ha) was recorded in treatment $N_2P_3K_3$ in strip III which was created through doubled dose of RDF. The mean value of grain yield was observed maximum in high fertility strip. As and when soil fertility level increased mean yield and range values also increased accordingly.

From the data on yield of groundnut, total uptake of N,P,K by the crop , soil available N,P,K and fertilizer nutrient applied, the basic data on nutrient requirement (NR); percent contribution of soil (Cs) and percent contribution of fertilizer (Cf) for N,P,K was calculated. From the above method the following fertilizer prescription equations (Table 3) were developed for groundnut (cultivar-AK12-24) for Ranchi centre. Soil pH of experimental site was 5.2.

Table 3: Development of fertilizer prescribed equation for groundnut (AK 12-24) during *Kharif,* 2015

Parameters	NR kg/q.	CS %	CF %	Fertilizer Prescription Equations
N	1.28	3.79	31.36	**FN = 4.08 T – 0.12 SN**
P_2O_5	0.31	4.88	6.68	**FP_2O_5 = 4.64 T – 0.73 SP_2O_5**
K_2O	0.84	3.23	16.12	**FK_2O = 5.21 T – 0.20 SK_2O**

A ready Reckoner was prepared on the basis of fertilizer prescribed equation for groundnut (AK 12-24) crop in the Table 4 for grain yield 10 q/ha and 15 q/ha. This table was formed with few assumption of soil test value. For an example, if a soil having available N, P and K value of soil are 150 kg/ha, 10 kg/ha and 90 kg/ha respectively, and targeted grain yield of groundnut crop is 15 q/ha then NPK requirement to be applied in that particular field should be 43.2 kg/ha, 62.3 kg/ha and 57.15 q/ha respectively.

This Ready-Reckoner is a readymade table for those farmers who know their soil test value of their field. A farmer can get a targeted yield of groundnut (10 q/ha or 15 q/ha) by using Table 4 in which NPK fertilizer requirement already calculated and shown in the table.

Table 4: Ready Reckoner table for different Soil Test Value for targeted yield of 10 q/ha and 15 q/ha of groundnut crop, cv. AK 12-24 in acidic soil of Jharkhand

Fertilizer Recommendation Schedule for Yield Target (10 q/ha & 15 q/ha) at different Soil Test Value								
Soil Available Value			Fertilizer Nutrients Required (Kg/ha) for Yield target of					
Kg/ha			10 q/ha			15 q/ha		
N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
150	10	90	22.8	39.1	32.1	43.2	62.3	57.15
160	12	100	21.6	37.64	30.1	42	60.84	55.15
170	14	110	20.4	36.18	28.1	40.8	59.38	53.15
180	16	120	19.2	34.72	26.1	39.6	57.92	51.15
190	18	130	18	33.26	24.1	38.4	56.46	49.15
200	20	140	16.8	31.8	22.1	37.2	55	47.15
210	22	150	15.6	30.34	20.1	36	53.54	45.15
220	24	160	14.4	28.88	18.1	34.8	52.08	43.15
230	26	170	13.2	27.42	16.1	33.6	50.62	41.15
240	28	180	12	25.96	14.1	32.4	49.16	39.15
250	30	190	10.8	24.5	12.1	31.2	47.7	37.15
260	32	200	9.6	23.04	10.1	30	46.24	35.15
270	34	210	8.4	21.58	8.1	28.8	44.78	33.15
280	36	220	7.2	20.12	6.1	27.6	43.32	31.15
290	38	230	6	18.66	4.1	26.4	41.86	29.15
300	40	240	4.8	17.2	2.1	25.2	40.4	27.15

REFERENCES

1. Kumar, S B and Arora, R P (2003) Variation in normalized difference vegetation index of wheat under different dozes of NPK, *Ann. Agric. Res,* **24** (3): 615-619.
2. Kumar, S. B.; Kumar, A and Brajendra **(**2006) Spectral behaviour of rice crop for nitrogen and tillage levels, *Ind. J. Hill Farming,* **19** (1-2): 98-102.
3. Chaudhary, D K; Kumar, V; Bharti, Vikram and Kumar, S B (2012) Effect of water regimes and NPK levels on yield, quality assessment and water-use-efficiency on mid duration rice, *J. Interacad.,* **16** (3):639-642.
4. Ahmed S, Riazuddin M, Krishna Reddy PV. (2002) Optimizing fertilizer doses for rice in alluvial soils through chemical fertilizers, farm yard manure and green manure using soil test values, *Agropedology*, **12**:133–140.

5. Witt C, Dobermann A, Abdulrachman S, Gines HC, Wang GH, Nagarajan R, Satawathananont S, Son TT, Tan PS, Tiem LV, (1999) Internal nutrient efficiencies of irrigated lowland rice in tropical and subtropical Asia, *Field Crops Res.*, **63** (2):113–138.
6. Dobermann A, White PF. (1998) Strategies for nutrient management in irrigated and rainfed lowland rice systems. Nutrient Cycling, *Agroecosyst,* **53** (1):1–18.
7. Subbiah B V, Asija C L. (1956) A rapid procedure for the estimation of available nitrogen in soils, *Curr. Sci.*, **25**: 328.
8. Olsen S R, Cole C V, Watanabe F S and Dean L A. (1954) Estimation of available phosphorus in soils by extraction with sodium bicarbonate, *U.S. Dep. of Agric. Circ.* 939.
9. Jackson, M.L., (1973) Soil Chemical Analysis, *Prentice Hall of India Private Limited, New Delhi*, p. 187.

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