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Balanced Nutrient Recommendations for Dry Chilli in an Inceptisol of Tamil Nadu based on a Targeted Yield Model

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ABSTRACT

Background: Considering the high cost of fertilizers and adverse effect of its overuse on environment and soil health, proper organic manure-fertilizer recommendations on the basis of soil test values, residual effect and yield targets of chilli becomes vital.

Methods: Field experiment was carried out on Periyanaickenpalayam soil series of Inceptisol soil order at farmers holding, Dindigul, Tamil Nadu during 2021-2022 after establishment of marked fertility gradient with respect to soil available N, P and K by gradient experiment with fodder sorghum. The test crop experiment with chilli was laid out in a fractional factorial design comprising of 24 treatments with 4 levels of N (0, 50, 100 and 150 kg ha^{-1}), 4 levels for both phosphorus pentoxide (P_2O_5) and potassium dioxide (K_2O). Farmyard manure (FYM) levels were 0, 6.25 and 12.5 kg ha^{-1}.From the field experiment data, the fundamental parameters-nutrient requirement (NR) and nutrients contributions from soil (Cs), fertiliser (Cf) and farmyard manure (Co)-were determined.

Result: The percentage of nutrients estimated from fertiliser (%Cf) that contributed towards the total amount of nutrients taken up by dry chilli was calculated to be 44.09, 39.29 and 76.91 per cent of N, P_2O_5 and K_2O, respectively. K_2O>N>P_2O_5 was seen as the order of the fertiliser nutrient per cent contributions to total nutrient uptake. Incase of nutrient contribution form soil (% Cs) the order is P_2O_5>N> K_2O. FYM contributed (% Co) 29.42, 14.40 and 38.73 per cent of N, P_2O_5 and K_2O. One quintal of dry chilli production was estimated to require (NR) 4.24 kg of nitrogen, 1.91 kg of phosphorus pentoxide (P_2O_5) and 4.80 kg of potassium oxide (K_2O) as nutrients. Fertiliser prescription equations (FPEs) for dry chilli and ready reckoners for the operating range of soil test values for the intended yield target experiment under NPK alone and IPNS were built using basic data.

Key words: Dry chilli, Inceptisol, IPNS.

INTRODUCTION

Chilli (*Capsicum annuum* L.) belongs to Solanaceae family and key member among the spices grown in India. As a result of the Portuguese introducing the crop in the 17th century, it is now produced all across India, with Andhra Pradesh, Karnataka, Tamil Nadu and Maharashtra accounting for 3/4 of the total area, along with Madhya Pradesh, West Bengal, Punjab, Bihar and Rajasthan (Chandramohan *et al*., 2018). The common ingredients in curry paste of chilli fruit and powder of dried fruits are carbohydrates and vitamins A and C. All types of pickles, sauces and paste are made from fresh, ripe and green chilies. Capsanthin, a red pigment, is utilised in premium cosmetic products like lipstick. The food and beverage sectors employ the essential oil oleoresin. The active element "Capsaicin," an alkaloid found in pericarp and placenta that is a digestive stimulant, an essential component of daily diet and a treatment for many rheumatic conditions, is what causes the pungency (Chandini Raj *et al*., 2016).

The global area under chilli cultivation is 1.776 million hectare with a production of 7.182 million tones. India's area under chilli cultivation is 316.47 thousand hectare and total chilli production is 3633.99 thousand MT. India, the world's biggest producer and consumer of red spice, exported 44.90 thousand MT. chilli, worth Rs. 22,074.05 lakhs during the year 2017-18 (Source - Horticulture Statistics-2018). India is the world's top producer, although its average yield is quite low (1.11 t ha^{-1} dried chilli), especially when compared to advanced nations like the USA, China, South Korea, Taiwan, *etc*., where it is between 3 and 4 t ha^{-1}.

Fertilizers are essential to improve agricultural output since they can significantly enhance crop yields when used in the right quantities. Existing practice by farmers is the application of general dose of fertilizers to chilli without consideration of soil type (nutrient status) and crop response. This needs to be given a new dimension. Fertilizer

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recommendations based on soil tests lead to effective fertiliser use and soil fertility management. At this point, the Truog (1960) and Ramamoorthy*et al*. (1967) modified prescription approach, known as the "Inductive-cum-Targeted yield model," offers a scientific foundation for balanced fertilisation and balance between applied nutrients and soil-available nutrients. In accordance with this concept, soil test crop response correlation studies under the integrated plant nutrition system (STCR-IPNS) were carried out in various locations throughout India (Dey and Das, 2014) and Tamil Nadu (Santhi *et al*., 2017) and fertiliser recommendations were made for the desired yield targets of various major field and horticulture crops.

Based on this methodology, quantitative fertiliser requirements have been calculated for specific yield targets of crops like rice, beetroot and SRI rice (Sharma *et al*., 2015; Santhi *et al*., 2011; Maragatham *et al*., 2018). Due to the combined use of soil and plant analysis, recommendations based on soil test crop response correlation (STCR) idea are more quantitative, exact and relevant. It provides a true balance between the nutrients that are applied and those that are already present in the soil and are available. This study was done with the aforementioned parameters in mind as well as the lack of quantitative data on fertiliser doses with organic manures based on desired yield for chilli in Tamil Nadu in an inceptisol.

MATERIALS AND METHODS

The study's location was in Tamil Nadu, India in Farmers Holding, Palaniyur, Dindigul district (10.348°N Latitude, 77.872°E Longitudes), at a height of 282 metres above mean sea level. Experimental soil (0-15 cm deep) was black in colour, sandy clay loam in texture, moderately alkaline (pH = 8.35), non-saline (EC 0.13 dS m^{-1}), with cation exchange capacity of 23.2 Cmol (p^+) kg^{-1} and calcareous in nature. The soil belonged to Periyanaickenpalayam soil series of Inceptisol soil order taxonomically referred as *Vertic Ustropept*. The initial experimental soil had 5.2 g kg^{-1} of organic carbon, 170 kg ha^{-1} available alkaline potassium permanganate ($KMnO_4$) oxidizable nitrogen (N), 17 kg ha^{-1} Olsen phosphorus (P) and 350 kg ha^{-1} neutral normal ammonium acetate (NH_4OAc) exchangeable potassium (K), respectively. The DTPA extractable micronutrients status (*i.e*) zinc (Zn), copper (Cu), manganese (Mn) of experimental soil were in the sufficiency ranges and iron (Fe) was insufficient (Table 1).

During phase-I, gradient experiment was conducted with fodder sorghum (*var*. CO 30) as the sole crop, three strips of fertility gradients, low, medium and high (in terms of accessible nitrogen, phosphorus and potassium), were established. By dividing the field into three equal strips (S1, S2 and S3), which received an application of three graded levels of fertilizers *i.e*., Strip 1-$N_0P_0K_0$ (control), strip 2- $N_1P_1K_1$ (N1- Blanket recommendation of sorghum, P1 and K1- P and K fixing capacities of soil) and strip 3- $N_2P_2K_2$ (double the dose of strip-2), the fertility fluctuation was purposefully produced. At 60 DAS, fodder sorghum was harvested. In order to monitor the emergence of a fertility gradient in the same field, soil samples were taken during sorghum harvest in order to measure the fertility gradient developed and fodder yield was also calculated. By splitting each fertility strip into three FYM blocks across the strip and using different NPK combinations total of 21 NPK combination treatments and 3 controls (Table 2), resulting in a total of 72 plots from the three strips of the field. Initial soil samples (0–15 cm) were taken from each of these plots analyzed for alkaline $KMnO_4$-N (Subbaiah, 1956), Olsen P (Olsen, 1954) and NH_4OAc-K (Stanford and English, 1949).

As a test crop chilli, with four levels of N (0, 50, 100 and 150 kg ha^{-1}), P_2O_5 and K_2O (0, 30, 60 and 90 kg ha^{-1}), along with three levels of FYM (0, 6.25and 12.5 t ha^{-1}) treatments structure was formed as shown in Table 2. The crop was raised as per the standard TNAU CPG-2020. From all of the plots, ripened chilli fruits and biomass yield were recorded and expressed in kg ha^{-1}. Plant and fruit samples were tested for N, P and K contents in accordance with Jackson's (1973) standard protocols for total nutrient uptake. Initial soil data, dry chilli yield, plant biomass yield and nutrient uptake by the chilli crop were used to calculate the four crucial basic parameters *viz*., nutrient required to produce a quintal of dry chilli yield (NR), per cent contribution of nutrients from soil (% Cs), per cent contribution of nutrients from fertilizers (% Cf) and per cent contribution of nutrients from organic matter (% Co) using following formulae. By using the Ramamoorthy *et al*. (1967) technique, these basic components were converted into simplified, practical fertiliser adjustment equations for computing precise yield targets based on soil test data.

Nutrient requirement (NR) kg q^{-1}

Kg $N/P_2O_5/K_2O$ required per quintal of dry fruit production =

$$\frac{\text{Total uptake of } N/P_2O_5/K_2O \text{ (kg ha}^{-1}\text{)}}{\text{Dry fruit yield (q ha}^{-1}\text{)}}$$

Per cent contribution of nutrients from soil to total nutrient uptake (Cs)

Per cent contribution of $N/P_2O_5/K_2O$ from soil =

$$\frac{\text{Total uptake of } N/P_2O_5/K_2O \text{ in control plot (kg ha}^{-1}\text{)}}{\text{Soil test value for available } N/P_2O_5/K_2O \text{ in control plot (kg ha}^{-1}\text{)}} \times 100$$

Per cent contribution of nutrients from fertilisers to total nutrient uptake (Cf)

Per cent contribution of $N/P_2O_5/K_2O$ from fertiliser =

$$\frac{\text{Total uptake of } N/P_2O_5/K_2O \text{ Oin treated plot (kg ha}^{-1}\text{)} - \left[\text{Soil test value for available } N/P_2O_5/K_2O \text{ Oin treated plot (kg ha}^{-1}\text{)} \times \text{Average Cs}\right]}{\text{Fertiliser N applied (kg ha}^{-1}\text{)}} \times 100$$

Per cent contribution of nutrients from organics to total nutrient uptake (Co)

Per cent contribution of N/P/K from FYM =

$$\frac{\begin{array}{c}\text{Total uptake of}\\ \text{N/P/K in FYM}\\ \text{treated plot}\\ (\text{kg ha}^{-1})\end{array} - \left[\begin{array}{c}\text{Soil test value}\\ \text{for available N/P/K}\\ \text{in FYM treated}\\ \text{plot (kg ha}^{-1})\end{array} \times \begin{array}{c}\text{Average}\\ \text{Cs}\end{array}\right]}{\text{Nutrient N/P/K added through FYM (kg ha}^{-1})} \times 100$$

Fertiliser prescription equations (FPEs)

Fertiliser nitrogen (FN)

$$FN = \frac{NR}{Cf/100}\,T - \frac{Cs}{Cf}\,SN$$

$$FN = \frac{NR}{Cf/100}\,T - \frac{Cs}{Cf}\,SN - \frac{Cfym}{Cf}\,ON$$

Fertiliser phosphorus (FP_2O_5)

$$FP_2O_5 = \frac{NR}{Cf/100}\,T - \frac{Cs}{Cf} \times 2.29 \times SP$$

$$FP_2O_5 = \frac{NR}{Cf/100}\,T - \frac{Cs}{Cf} \times 2.29 \times SP - \frac{Cfym}{Cf} \times 2.29 \times SP$$

Fertiliser potassium (FK_2O)

$$FK_2O = \frac{NR}{Cf/100}\,T - \frac{Cs}{Cf} \times 1.21 \times SK$$

$$FK_2O = \frac{NR}{Cf/100}\,T - \frac{Cs}{Cf} \times 1.21 \times SK - \frac{Cfym}{Cf} \times 1.21 \times SK$$

Where,

FN, FP_2O_5 and FK_2O = Fertilizer N, P_2O_5 and K_2O (kg ha^{-1}) respectively.

NR = Nutrient requirement (kg q^{-1}).

Cs = Percentage contribution from the soil.

Cf = Percentage contribution from fertilizer.

SN, SP and SK = Soil test value for available N, P and K (kg ha^{-1}), respectively.

Co = Percentage contribution from FYM, ON, OP.

OK= Quantity of N, P_2O_5 and K_2O applied through FYM.

RESULTS AND DISCUSSION

From information on the initial nutritional status is showed in Table 3. In strips I, II and III, respectively, the mean values of alkaline $KMnO_4$-N, Bray's P and NH_4OAc-K were 157, 189 and 217 kg ha^{-1} for N; 11.8, 23.8 and 32.2 kg ha^{-1} for P_2O_5 and 335, 367 and 392 kg ha^{-1} for K_2O. The gradient analysis showed that soil NPK levels increased as fertiliser doses increased, indicating the creation of a distinct fertility gradient by the application of graded fertiliser and FYM dosages. Abhishek *et al*. (2022) with hybrid castor in an Alfisol found similar levels of gradient build up.

The range and mean values of dry chilli production and NPK uptake by the chilli crop showed that strip III had the

Table 1: Characteristics of initial surface soil sample of the experimental field.

Properties	Value
pH	8.35
EC (dS m^{-1})	0.13
CEC (C mol (p^{+}) kg^{-1})	23.2
Bulk density (Mg m^{-3})	1.15
Coarse sand (%)	19.89
Fine sand (%)	33.6
Silt (%)	10.0
Clay (%)	35.42
Texture	Sandy clay loam
Organic carbon (g kg^{-1})	5.2
Free calcium carbonate (%)	9.7
P fixing capacity (kg ha^{-1})	100
K fixing capacity (kg ha^{-1})	80
$KMnO_4$-N (kg ha^{-1})	170
Olsen-P (kg ha^{-1})	17
NH_4OAC-K (kg ha^{-1})	350
DTPA-Zn (mg kg^{-1})	1.27
DTPA-Fe (mg kg^{-1})	5.82
DTPA-Mn (mg kg^{-1})	7.13
DTPA-Cu (mg kg^{-1})	3.06

Table 2: Treatment structure for test crop experiment.

Treatment combination			Levels of nutrients (kg ha^{-1})		
N	P	K	N	P_2O_5	K_2O
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	2	2	0	60	60
1	1	1	50	30	30
1	2	1	50	60	30
1	1	2	50	30	60
1	2	2	50	60	60
2	1	1	100	30	30
2	0	2	100	0	60
2	1	2	100	30	60
2	2	2	100	60	60
2	2	1	100	60	30
2	2	0	100	60	0
2	2	3	100	60	90
2	3	2	100	90	60
2	3	3	100	90	90
3	1	1	150	30	30
3	2	1	150	60	30
3	2	2	150	60	60
3	3	1	150	90	30
3	3	2	150	90	60
3	2	3	150	60	90
3	3	3	150	90	90

Table 3: Presowing soil available NPK, fruit yield and NPK nutrient uptake bydrychilli in various strips.

Parameters	Strip I			Strip II			Strip III		
	Min	Max	Mean±SD (CV)	Min	Max	Mean±SD(CV)	Min	Max	Mean±SD (CV)
.......(kg ha^{-1}).......									
$KMnO_4$-N	152	162	157±3.51 (2.23)	186	194	189±2.82 (1.49)	212	222	217±3.32 (1.53)
Olsen-P	10.1	14.0	11.8±1.41 (12.1)	21.6	26.5	23.8±2.0 (8.4)	30.8	35.6	32.2±1.63 (5.1)
NH_4OAc-K	330	339	335±3.16 (0.9)	362	372	367±3.36 (0.91)	387	397	392±3.16 (0.8)
Fruit Yield	1160	2055	1564±273.6 (17.4)	1340	2667	1964±426.0 (21.6)	1410	3052	2240±530 (23.6)
N uptake	37.6	77.4	65.8±9.67 (14.6)	51.6	110.9	87.5±17.63 (20.1)	54.3	120.1	94.4±20.2 (21.3)
P uptake	8.1	16.9	13.3±2.63 (19.6)	9.2	20.5	16.4±3.15 (19.0)	11.2	22.0	18.4±2.69 (14.6)
K uptake	38.5	74.8	59±10.0(16.9)	46.8	102.5	79.3±15.7 (19.7)	49.1	116.3	90.5±17.7 (19.5)

Table 4: Nutrient requirement and nutrient contributions from soil, fertilizer and farmyard manure for dry chilli.

Parameters	Nutrients		
	N	P_2O_5	K_2O
Nutrient requirement (kg q^{-1})	4.24	1.91	4.80
Per cent contribution from soil (Cs)	23.83	33.54	12.44
Per cent contribution from fertilisers (Cf)	44.09	39.29	76.91
Per cent contribution from FYM (Cfym)	29.42	14.40	38.73

Table 5: Fertilizer prescription equations for dry chilli.

Inorganic fertilizer alone	Inorganic fertilizer with FYM
FN = 9.63 T-0.54 SN	FN = 9.63 T-0.54 SN-0.67 ON
FP_2O_5 = 4.83 T-1.96 SP	FP_2O_5 = 4.83 T-1.96 SP-0.84 OP
FK_2O = 6.24 T-0.19 SK	FK_2O = 6.24 T-0.19 SK-0.61 OK

highest output and nutrient uptake, followed by strip II and strip I had the lowest. The average dry chilli yield across all plots was 1564, 1964 and 2240 kg ha^{-1} in strips I, II and III, respectively. With mean values of 65.8, 87.5 and 94.4 kg ha^{-1}, the N uptake in strips I, II and III ranged from 37.6 to 77.4, 51.6 to 110.9 and 54.3 to 120.1, respectively. In strips I, II and III, respectively, the P uptake varied from 8.1 to 16.9 kg ha^{-1} with a mean of 13.3 kg ha^{-1}, 9.2 to 20.5 kg ha^{-1} with a mean of 16.4 kg ha^{-1} and 11.2 to 22.0 kg ha^{-1} with a mean of 18.4 kg ha^{-1} respectively. The K uptake ranged from 38.5 to 74.8, 46.8 to 102.5 and 49.1 to 116.3 kg ha^{-1} respectively in strip I, II and III. Similar operational ranges of N, P and K were reported by Durga *et al*. (2017) for marigold grown in Inceptisol. The aforementioned findings demonstrated that there was substantial difference in the soil test results, grain production and nutrient uptake between the strips and treatments, which is necessary to calculate the fundamental parameters and calibrate the equations for fertiliser prescription. Using the basic parameters FPEs were worked and given in Table 4. By using the basic parameters fertilizer prescription equations (FPEs) were developed for inorganic fertilizer alone and inorganic fertilizer with FYM (Table 5).

To fully explore the genetic potential of the crop, which depends on the contribution of applied nutrients and the capacity of the native soil to deliver those nutrients, nutrient optimization is absolutely necessary (Durga *et al*., 2017). One quintal of dry chilli production was found to require 4.24 kg of nitrogen, 1.91 kg of phosphorus pentoxide and 4.80 kg of potassium (Table 4). This study showed that, in comparison to phosphorus, chilli requires 2.2 times more nitrogen and 2.5 times more potassium. The percentage of nutrients estimated from fertiliser that contributed towards the total amount of nutrients taken up by dry chilli was calculated to be 44.09, 39.29 and 76.91 per cent of N, P_2O_5 and K_2O, respectively.K_2O >N>P_2O_5 was seen as the order of the fertiliser nutrients per cent contributions to total nutrient uptake, which is closely in accordance with Udayakumar and Santhi. (2017). These findings show that fertiliser sources contributed more nutrients than soil sources. Santhi *et al*. (2005) reported that the contributions of nutrients from fertiliser sources were greater than those from soil sources and the amounts of fertiliser needed to achieve a desired onion yield target decreased as soil test values rose. The results are in accordance with Selvam *et al*. (2022), regarding higher contribution of N from organic matter (3.40%) and may be attributed to enough carbon from FYM for the building of bacterial population to boost N availability. A substantial contribution of NPK was needed through FYM to meet crop needs, which reduces the amount of nutrients that must be administered through costly fertilisers.

Fertilizer prescription for dry chilli crop

To achieve the intended production target of the dry chilli crop, soil test-based fertiliser prescription equations were created as above by correlating the fundamental parameters gathered from the main experiment (Table 5). Based on the previously mentioned formulae for a certain range of soil test values, a fertiliser prescription table was created for yield targets of 27.5 (Table 6) and 25 q ha^{-1} (Table 7). Table 6 data showed that when the soil test value rises, the amount of required nutrients decreases. *i.e*., in case of nitrogen for

Table 6: Dosages of fertiliser based on soil test for achieving dry chilli target for production (27.5 t ha^{-1}) under NPK alone and NPK + IPNS.

STV $KMnO_4$-N (kg ha^{-1})	Only inorganics F.N required (kg ha^{-1})	With 12.5 t ha^{-1} FYMF.N required (kg ha^{-1})	Per cent reduction over inorganics alone	STV P_2O_5 (kg ha^{-1})	Only inorganics F.P_2O_5 required (kg ha^{-1})	With 12.5 t ha^{-1} FYMF.P_2O_5 (kg ha^{-1})	Per Cent reduction over inorganics alone	STV K_20 (kg ha^{-1})	Only inorganics F.K_20 required (kg ha^{-1})	With 12.5 t ha^{-1} FYMF.K_20 required (kg ha^{-1})	Per Cent reduction over inorganics alone
150	180**	168	7	15	116	90	22	325	120**	91	24
170	180**	157	13	17	112	86	23	335	120**	89	26
190	180**	146	19	19	108	82	24	345	120	87	28
210	175	135	23	21	104	78	25	355	118	85	28
230	164	124	24	23	100	74	26	365	116	83	28
250	154	114	26	25	96	70	27	375	114	81	29

(NB: **maximum dose; If the calculated dose exceeds 150 per cent of the blanket, a maximum dose of 150 per cent of the blanket is recommended). STV- Soil test values.

Table 7: Dosages of fertiliser based on soil test for achieving dry chilli target for production (25 t ha^{-1}) under NPK alone and NPK + IPNS.

STV $KMnO_4$-N (kg ha^{-1})	Only inorganics F.N required (kg ha^{-1})	With 12.5 t ha^{-1} FYMF.N required (kg ha^{-1})	Per Cent reduction over inorganics alone	STV P_2O_5 (kg ha^{-1})	Only inorganics F.P_2O_5required (kg ha^{-1})	With 12.5 t ha^{-1} FYMF.P_2O_5 required (kg ha^{-1})	Per Cent reduction over inorganics alone	STV K_20 (kg ha^{-1})	Only inorganics F.K_20 required (kg ha^{-1})	With 12.5 t ha^{-1} FYMF.K_20 required (kg ha^{-1})	Per Cent reduction over inorganics alone
150	180**	144	20	15	104	78	25	325	108	75	31
170	173	133	23	17	100	74	26	335	106	73	31
190	162	122	25	19	96	70	27	345	104	71	32
210	151	111	26	21	92	66	28	355	102	69	32
230	140	100	29	23	88	62	29	365	100	67	33
250	130	90	31	25	84	58	31	375	98	65	34

every 20 kg increase and incase of potassium for every 10 kg increase of soil available nutrient, there was an 11 kg and 2 kg decrease in fertilizer N and K requirement respectively . For every 2 kilogram increase in soil-available phosphorus, there was a 4 kg reduction in phosphatic fertiliser needed. Table 7 data also showed that for the same initial soil nutrient status, extra amounts of fertiliser nitrogen, phosphorus and potassium of 24 kg, 12 kg and 16 kg, respectively, are needed for every 250 kg rise in the desired yield level of chilli.

When no FYM was used, the amount of fertiliser N, P_2O_5 and K_2O needed to achieve a yield target of 27.5 q ha^{-1} of dried chilli with soil test values of 210: 19: 355 kg ha^{-1} of $KMnO_4$- N, Bray's-P and NH_4OAc-K was 175, 108 and 118 kg ha^{-1}, respectively. Nevertheless, 135, 82 and 85 kg ha^{-1} of fertiliser N, P_2O_5 and K_2O, respectively, were needed with 12.5 tonnes FYM ha^{-1} for the same soil test values and yield target (Table 6). Similar to the above, the fertiliser NPK nutrients needed for the target production of 25 q ha^{-1} are 155, 96 and 102 kg ha^{-1} respectively. In case of FYM @ 12.5 t ha^{-1} application along with fertilizer nutrients, the amount of fertiliser N, P_2O_5 and K_2O needed is 111, 70 and 69 kg ha^{-1} respectively for the above mentioned soil test values (210:19:355 kg ha^{-1}). As a result, targeted yield equations produced by STCR-IPNS technology enable both the sustained crop output and the economical use of expensive fertiliser inputs. Due to nutrient availability being increased by FYM through mineralization, the required dose of fertiliser under the IPNS approach is low. According to Santhi *et al*. (2011), an integrated plant nutrient system reduces the amount of fertiliser needed to reach desired yield targets. Both Cheli Lalitha *et al*. (2022) and Ranu *et al*. (2016) reported similar outcomes. These findings unambiguously demonstrated that for the same degree of crop yield, the fertiliser needs changed depending on the soil test results. Soil testing is necessary to provide balanced fertilisation, which is necessary to boost crop output. One quintal (1 q ha^{-1}) of dried chilli production can be increased or decreased by applying different amounts of the nutrients 9.6 kg N, 3.2 kg P_2O_5 and 6.4 kg K_2O, depending on the quantities of the nutrients needed to achieve a particular yield target. Similar variability in nutrient dosages were seen for aggregatum onion and tomato with a projected yield of 17 and 80 t ha^{-1} respectively (Parvathi Sugumari *et al*., 2021; Agila *et al*., 2021).

CONCLUSION

The outcomes of this investigation clearly indicated that Inceptisols in Tamil Nadu may successfully adopt fertiliser prescription equations developed by inorganics or under IPNS to achieve the specified targeted yield of dry chillies. The results of the aforementioned study showed that using STCR-IPNS technology, fertiliser doses are customised to meet the needs of certain chilli yield targets while taking into account the contributions of soil, fertilisers and organic manure. Hence, a balanced supply of nutrients will be present along with the recycling of organic waste, preventing the under-or overuse of fertiliser inputs. Farmers can also determine the desired yield objective for dry chilli according to their resource availability and management conditions.

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