

DEVELOPMENT OF INTEGRATED FERTILIZER PRESCRIPTION BASED ON STCR- IPNS FOR BRINJAL THROUGH INDUCTIVE CUM TARGETED YIELD MODEL IN MANNADIPET SOIL SERIES OF PUDUCHERRY.

Abstract

Soil Test Crop Response based on IPNS through Targeted yield concept strikes a balance between “Fertilizing the crop” and “Fertilizing the soil” that is necessary to meet the fertilizer requirements of the crops by enhancing the yield, fertilizer use efficiency, maintaining soil health, quality and profitability to farmers. The inductive cum targeted yield model was used to conduct field trials on Puducherry's Typic ustropept soils. Fertilizer prescription equations (FPE) were developed under IPNS using the basic parameters of nutrient requirement (NR), contribution of nutrients from soil (Cs), fertilizer (Cf), and farmyard manure (Cfym). Nomograms were formulated for the desired yield target (340, 360, and 380 q ha⁻¹) of brinjal for a range of Soil Test Values. The quantity of fertilizers that could be contributed by FYM @ 12.5 t ha⁻¹ were evaluated as 50, 29 and 46 kg fertilizer N, P₂O₅ and K₂O respectively, when applied along with the NPK fertilizers as per soil test and desired yield target.

Keywords: STCR, IPNS, targeted yield model, FPE, soil test value

1.Introduction

Soil testing as a tool for judicious fertilizer use is a well-recognized practice all over the world which takes care of too little, too much or disproportionate applications of nutrients. Balanced nutrition ensures nutrients not only between the nutrients from external sources but application of the nutrients in available forms are in adequate quantity and in required proportion in the soil to meet the requirement of the crops for obtaining the desired levels of yield.

Fertilizer nutrient recommendations are usually given for different crops by taking into consideration the soil available nutrient status, which is being categorised as low, medium and high. Using soil test results and targeted yield equations, the soil test crop response (STCR) strategy is one of the most scientific ways to apply nutrients to crops among the many fertilizer recommendation methods. The development of these equations takes into account the nutrient contributions from fertilizers, manures, and soil. Brinjal (*Solanum melongena* L, 2n = 24) belonging to Solanaceae family is one of the most common and principle vegetable crops in

India and in the world. It is highly productive and usually referred to as the poor man's crop. Brinjal a major fruit vegetable crop, is a moderate source of minerals and vitamins like phosphorus, calcium and iron. The unripe fruit is used as vegetable. India stands as the second largest eggplant producer in the world after China with a share of 26% world eggplant production. While nutrient loss in different vegetable crops is 2.65:1:3.42 NPK, India's general fertilizer recommendation for vegetable crops recommends a 2:1:1 ratio of NPK. This raises the important point that fertilization should be based on the nutrient requirements of different crops. At this point, the Truog (1960) and Ramamoorthy *et al.* (1967) modified prescription technique, known as the Inductive cum Targeted yield model, strikes a compromise between "fertilizing the soil" and "fertilizing the crop."

A scientific foundation for balanced fertilization and a balance between applied and soil-available nutrients is provided by this approach.

2. Materials and Methods

With a view to investigate STCR - IPNS for brinjal, two field experiments were conducted in two phases viz., fertility gradient experiment with Maize hybrid- (Sakthi) (Phase I), followed by test crop experiment with Brinjal variety Palur -2 (Phase II) in Mannadipet soil series of U.T. of Pondicherry. The experiment was conducted at farmer's holding of Kariamianickam village, in Nettapakkam commune of Pondicherry district, U.T. of Puducherry. With an area of 11.01 percent, the region is categorized as a fine, mixed, isohyperthermic, Typic Ustropept under the coastal alluvial plain (PC1) classification. According to agro climatic zonal classification, the study area is located at 11°52' North latitude and 79°36' East longitude.

The characteristics of the analyzed initial soil sample revealed that the soil texture was sandy clay loam with a bulk density of 1.15 Mg m⁻³, particle density of 2.20 Mg m⁻³ and per cent pore space of 47.7. The soil is moderately alkaline (pH - 8.34) and non-saline (0.45 dS m⁻¹) with a CEC of 19.20 Cmol (p+) kg⁻¹. The total N, P and K contents of the soil were 0.216, 0.097 and 0.520 per cent, respectively. The fertility status of the soil is low in KMnO₄-N (202 kg ha⁻¹) and organic carbon (0.41 per cent), high in Olsen-P (60.50 kg ha⁻¹) and medium in NH₄OAc-K (175 kg ha⁻¹).

The aim of the present investigation was to generate wide variation in the experimental field's soil fertility for each controllable variable (fertilizer dosage) at varying levels of the uncontrollable variable (soil fertility), which is not expected to occur at a single location on a regular basis. Therefore, in order to reduce heterogeneity in the soil populations evaluated, the

approaches used, and prevailing climatic circumstances, a gradient crop experiment was carried out prior to the test crop experiment in order to establish fertility changes in the same field.

The experimental field was split into three equal strips, and before applying fertilizers and sowing the hybrid maize (Sakthi), pre-sowing surface soil samples (0–15 cm) were collected from each fertility strips. The first strip ($N_0P_0K_0$) received no fertilizer. While the second and third strips received one ($N_1P_1K_1$) and two ($N_2P_2K_2$) times the usual dose of N, P_2O_5 and K_2O , respectively,

The gradient crop Maize hybrid (Sakthi) was sown with a spacing of 45 cm x 60 cm and the crop was grown adopting the usual agronomic practices and harvested and the cob yield was recorded strip wise. Twenty-four cob plant samples, eight from each strip were collected at harvest and processed for the analysis of N, P_2O_5 and K_2O . A total of 24 samples, including pre-sowing and post-harvest soil samples from each fertility strip, were collected and analyzed for alkaline $KMnO_4$ -N, Olsen -P and NH_4OAc -K.

Following the harvest of hybrid maize, each strip was divided into 24 plots. Pre-sowing soil samples were taken from each plot, and their alkaline $KMnO_4$ -N, Olsen -P and NH_4OAc -K contents were examined.

Following the establishment of fertility gradients in the experimental field, the test crop Brinjal (var-Palur 2) was cultivated as per the recommended practices. The treatments consisted of four levels of N (0, 50, 100 and 150 kg ha⁻¹), four levels of P_2O_5 (0, 25, 50 and 75 kg ha⁻¹) and four levels of K_2O (0, 25, 50 and 75 kg ha⁻¹) and three levels of farmyard manure (0, 6.25 and 12.5 t ha⁻¹) (Table 1). The Integrated Plant Nutrition System (IPNS) treatment, which consisted of three treatments: NPK alone (OM I), NPK+ Farm yard manure @ 6.25 t ha⁻¹ (OM II) and NPK + Farm yard manure @12.5 t ha⁻¹ (OM III) were super imposed across the strips following the Fractional Factorial design. This allowed for the randomization of 21 fertilizer treatments and three controls, with each treatment being present in all three strips in either direction (Fig. 1).

After the application of basal dose of fertilizer, the test crop brinjal was planted with a spacing of 60 x 45 cm. The remaining dose of N (50%) was applied as top dressing on 30th day of planting or during earthing up. During the crop growth period, usual agronomic practices were carried out. The brinjal fruit samples were picked at one week interval after fruit set and the total picking of the fruits were recorded. The fruit and plant samples were collected and

analysed for N, P₂O₅ and K₂O contents and uptake values were computed. Post-harvest soil samples collected from all the plots were processed and analysed for available NPK status.

The basic parameters, namely nutrient requirements (NR), contribution of nutrients from soil (Cs), fertilizer (Cf), and farmyard manure (Cfym), were computed using the data on the yield of brinjal, total uptake of N, P₂O₅, and K₂O, initial soil test values for available N, P₂O₅, and K₂O, and doses of fertilizers of N, P₂O₅, and K₂O applied. These computations were made using the methodology of Ramamoorthy et al. (1967)

1. Nutrient requirement (NR) kg q⁻¹

$$\text{kg of N/ P}_2\text{O}_5/\text{ K}_2\text{O required per quintal of fruit production} = \frac{\text{Total uptake of N/ P}_2\text{O}_5/\text{ K}_2\text{O (kg ha}^{-1}\text{)}}{\text{Fruit yield (q ha}^{-1}\text{)}}$$

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

$$\text{Per cent contribution of N/ P}_2\text{O}_5/\text{ K}_2\text{O from soil} = \frac{\text{Total uptake of N/ P}_2\text{O}_5/\text{ K}_2\text{O in control plot (kg ha}^{-1}\text{)}}{\text{STV for available N/ P}_2\text{O}_5/\text{ K}_2\text{O in control plot (kg ha}^{-1}\text{)}} \times 100$$

3. Per cent nutrient contribution of nutrients from fertilizer to total uptake (Cf)

$$\text{Per cent contribution of N/ P}_2\text{O}_5/\text{ K}_2\text{O from fertilizer} = \frac{\text{Total uptake of N/ P}_2\text{O}_5/\text{ K}_2\text{O in treated plot (kg ha}^{-1}\text{)} - \left[\text{Soil test value for available N/ P}_2\text{O}_5/\text{ K}_2\text{O in treated plot (kg ha}^{-1}\text{)} \times \text{Average Cs} \right]}{\text{Fertilizer N/ P}_2\text{O}_5/\text{ K}_2\text{O applied (kg ha}^{-1}\text{)}} \times 100$$

4. Percent nutrient contribution of nutrients from organics to total uptake (Co)

$$\text{Cfym} = \frac{\text{Total uptake of N/ P}_2\text{O}_5/\text{ K}_2\text{O in FYM treated plot (kg ha}^{-1}\text{)} - \left[\text{STV for available N/ P}_2\text{O}_5/\text{ K}_2\text{O in FYM treated plot (kg ha}^{-1}\text{)} \times \text{Average Cs} \right]}{\text{Nutrient N/ P}_2\text{O}_5/\text{ K}_2\text{O added through FYM (kg ha}^{-1}\text{)}} \times 100$$

With the use of these parameters, fertilizer prescription equations were created to determine the fertilizer doses. The soil test-based fertilizer recommendations were provided in the form of a ready table for the intended yield target of brinjal under both IPNS and NPK alone.

Targeted Yield equations

Making use of the four basic parameters, the fertilizer prescription equations were developed under NPK alone and STCR-IPNS for brinjal as furnished below:

i) Fertilizer nitrogen (FN)

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

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

ii) Fertilizer phosphorus (FP₂O₅)

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

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

iii) Fertilizer potassium (FK₂O)

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

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

where,

T is the yield target in q ha⁻¹, NR is Nutrient requirement of N or P₂O₅ or K₂O (kg ha⁻¹), FN, FP₂O₅ and FK₂O are fertilizer N, P₂O₅ and K₂O (kg ha⁻¹), Cs is Per cent contribution of nutrient from soil, Cf is Per cent contribution of nutrient from fertilizer; ON, OP and OK are the quantities of N, P and K supplied through FYM in kg ha⁻¹ and SN, SP and SK respectively are Soil test value for available alkaline KMnO₄-N, Olsen-P and NH₄OAc-K in kg ha⁻¹ and.

Based on the afore mentioned formulae, fertilizer doses for different soil available nutrient levels can be predicted for particular brinjal yield targets (T).

3. Result and Discussion

The range and mean of soil test values and yield of three strips are presented in table 2. Maximum yield (380.9 q ha^{-1}) was obtained in strip III and the lowest in the strip I (168 q ha^{-1}) (Fig. 2). The data on initial soil test values revealed that the mean value of alkaline $\text{KMnO}_4\text{-N}$ in strip I, II and III were 197.9, 219.0 & 241.6 kg ha^{-1} . The mean Olsen-P value was 54.1, 61.6 and 65.8 kg ha^{-1} in strip I, II and III respectively. The mean of $\text{NH}_4\text{Ac-K}$ was 176.8, 192.2 & 216.4 kg ha^{-1} in strip I, II and III (Fig. 3).

The N uptake in strip I, II and III, ranged respectively from 55.7 to 119.1, 58.6 to 123.3 and 62.7 to 128.1 with the mean values of 93.2, 100.3 and 105.2 kg ha^{-1} . The P uptake ranged from 13.6 to 36.8 kg ha^{-1} with a mean of 30.8 kg ha^{-1} in strip I, from 14.3 to 39.0 kg ha^{-1} with a mean of 32.8 kg ha^{-1} in strip II and from 15.3 to 39.5 kg ha^{-1} with a mean of 34.5 kg ha^{-1} in strip III. The K uptake ranged from 41.8 to 98.2, 45.7 to 107.7 and 49.5 to 108.7 kg ha^{-1} in strip I, II and III, respectively. The mean K uptake values were 73.5, 81.0 and 86.3 kg ha^{-1} respectively in strip I, II and III (Fig. 4). The above mentioned findings demonstrated the significant diversity in the soil test results, fruit production, and nutrient uptake—all of which are necessary to compute the basic parameters and fertilizer prescription equations needed to calibrate fertilizer doses for particular yield targets.

Basic parameters (Table 3)

The three basic parameters—nutrient requirement (NR) in kg per quintal of economic produce, percentage contribution from soil available nutrient (Cs), and fertilizer nutrients (Cf) were calculated using the targeted yield model in order to calibrate soil test results and recommend fertilizer dosages for desired brinjal yield targets (Fig. 5).

Nutrient requirement of brinjal

One quintal of brinjal fruit requires 0.33 kg of N, 0.24 kg of P₂O₅, and 0.32 kg of K₂O, respectively. Among the three nutrients, the requirement of K₂O is the highest followed by N and P₂O₅.

The quantity of N, P₂O₅ and K₂O required to produce one quintal of brinjal fruit were 0.33, 0.24 and 0.32 kg respectively. Among the three nutrients, the requirement of K₂O is the highest followed by N and P₂O₅. Similar trend of nutrient requirement for N, P₂O₅ and K₂O was also reported by Natesan *et al.* (2007), in rice, Coumaravel (2012) for maize-tomato in Palaviduthi soil series in Coimbatore, Muralidharudu *et al.* (2007&2011), Dey and Das (2014), Dhinesh (2015), Kirankumar *et al.* (2019) and Bhatt *et al.* (2021) in brinjal.

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

Making use of the data from the absolute control plots, the per cent contribution of nutrients *viz.*, N, P and K from soil (Cs) to total uptake by brinjal was computed and it is the expression of the ability of brinjal to extract nutrients from the soil. In the present study, it was found that the soil has contributed 27.21 per cent of available N, 32.20 per cent of available P₂O₅ and 24.69 per cent of available K₂O respectively towards the total N, P and K uptake by brinjal. The contribution of nutrients from soil to brinjal was higher for P followed by N and K. The per cent contribution of soil for K was found to be low as the experimental soil is medium in available K, hence, the value for Cs was low. Regarding N and K, comparatively lower Cs was recorded which might be due to the preferential nature of brinjal towards the applied N and K₂O than the native N and K. This is in accordance with the findings of Santhi *et al.* (2011) for beetroot. However, in the case of P, the contribution was more from soil than from fertilizer. Similar trend of contribution of nutrients from soil to the total uptake was reported by Natesan *et al.* (2007) for rice, Coumaravel (2012) for tomato,

Santhi *et al.* (2017), Karuna Prabu (2018) in bhendi, Beena *et al.* (2018) Kirankumar *et al.* (2019) and Bhatt *et al.* (2021) in brinjal.

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

From the NPK applied plots, the per cent contribution of nutrients from fertilizers (Cf) to the total uptake was computed. In the present investigation, the contribution from applied fertilizer was 43.83, 73.79 and 90.31 per cent, respectively for N, P₂O₅ and K₂O and followed the order of K₂O > P₂O₅ > N. The response yardstick recorded was 70.37 kg kg⁻¹. It is revealed that K₂O is 2.06 times greater than N and 1.22 times greater than P₂O₅. With regard to N, P₂O₅ and K₂O, comparatively more contribution was registered with fertilizer source than from the soil source which is in line with results of Natesan *et al.* (2007) and Bagavathi Ammal and Sankar (2012) for rice, Karuna Prabu (2018), Bagavathi Ammal *et al.* (2020) in chilli, Kirankumar *et al.* (2019) in brinjal.

The contribution of K from fertilizer was higher and the high value of K could be due to the interaction effect of higher doses of N and P coupled with priming effect of starter K doses in the treated plots which might have caused the release of soil K, resulting in the higher uptake from the native soil sources by the crop (Ray *et al.*, 2000 and Deshpande *et al.*, 2016).

Contribution of nutrients from FYM for brinjal

The estimated per cent contribution of N, P₂O₅ and K₂O from FYM (Cfym) were 32.58, 22.95 and 36.90 which indicated that relatively higher contribution was recorded for K₂O followed

by N and P₂O₅. Similar computation of Cf_ym was reported by Natesan *et al.* (2007), Bagavathi Ammal and Sankar (2012), Vetrivel (2017) for rice, Coumaravel (2012) for tomato, Karuna Prabu (2018) for bhendi, Kirankumar *et al.* (2019) and Bhatt *et al.* (2020) in brinjal.

Fertilizer prescription equation for brinjal under IPNS

Using the basic parameters computed (NR, Cs, Cf and Cf_ym), fertilizer prescription equations were developed under IPNS and are furnished below.

NPK alone

$$FN = 0.74 T - 0.61 SN$$

$$FP_2O_5 = 0.33 T - 0.97 SP$$

$$FK_2O = 0.35 T - 0.33 SK$$

NPK with FYM

$$FN = 0.74 T - 0.61 SN - 0.74 ON$$

$$FP_2O_5 = 0.33 T - 0.97 SP - 0.71 OP$$

$$FK_2O = 0.35 T - 0.33 SK - 0.49 OK$$

where, T is the yield target in q ha⁻¹; SN, SP and SK respectively are alkaline KMnO₄-N, Olsen-P and NH₄OAc-K in kg ha⁻¹; ON, OP and OK are the quantities of N, P and K supplied through FYM in kg ha⁻¹ and FN, FP₂O₅ and FK₂O are fertilizer N, P₂O₅ and K₂O in kg ha⁻¹ respectively;

Fertilizer prescription under IPNS for desired yield target of brinjal

Ready reckoners (nomograms) were formulated for a range of soil test values and for desired yield targets (Table 4). An average soil available N, P and K of 200, 20 and 200 kg ha⁻¹

respectively was considered to compare the fertilizer recommendation. The results showed that for achieving 360 q ha⁻¹ of brinjal, the doses of fertilizer N, P₂O₅ and K₂O required would be 146.0, 98.0 and 61.0 kg ha⁻¹, respectively for NPK alone, 121.0, 84.0 and 38.0 kg ha⁻¹, respectively for NPK + FYM @ 6.25 t ha⁻¹ and 96.0, 69.0 and 15.0 kg ha⁻¹, respectively for NPK + FYM @ 12.5 t ha⁻¹.

The per cent reduction in NPK fertilizers under IPNS increased with increasing soil fertility levels (i.e. increasing FYM application) with reference to NPK and decreased with increasing yield targets. The results of the above finding are in line with the results of Balamurugan (2009) in wheat, Coumaravel (2012) in maize and tomato and Bagavathi Ammal and Sankar (2012) in rice, Santhi *et al.* (2017), Karuna Prabu (2018) in bhendi, Kirankumar *et al.* (2019) and Bhatt *et al.* (2020) in brinjal.

The data clearly indicated that fertilizers rate decreased with increasing soil test values and FYM alone. This was due to contribution of nutrients from soil as well as FYM to fulfil the nutrient requirement of crops. This fact has also been established by Velayutham *et al.* (1985).

Using the fertilizer prescription equations under IPNS, the magnitude of saving of inorganic fertilizers for brinjal was calculated. Application of FYM @ 6.25 t ha⁻¹ with 30 per cent moisture and 0.56, 0.32 and 0.51 per cent N, P and K, respectively the savings were 25, 15 and 23 kg ha⁻¹ of fertilizer N, P₂O₅ and K₂O, respectively. If FYM @ 12.5 t ha⁻¹ was applied with above quality, the saving of fertilizer N, P₂O₅ and K₂O would be 50, 29 and 46 kg ha⁻¹, respectively.

From above finding, it can be concluded that integrated nutrient application through organic manure and inorganic fertilizer were superior to the sole application of inorganic fertilizer alone in recording both higher yield and nutrient uptake by brinjal. The IPNS

improves the soil fertility which helps to achieve the sustained yield in brinjal with less environment pollution. Moreover, STCR based fertilizer recommendation gives an idea about yield target can be achieved with good agronomic practices and STCR based fertilizer recommendation increases the profit by achieving higher yield and reduce the cost of cultivation by fertilizers savings. Finally, the fertilizer prescription equation developed could be used for making fertilizer recommendation for targeted yields of brinjal in Mannadipet soil series (Inceptisol) of Puducherry.

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Fig 1: Layout of the experimental field

OM III	N ₂ P ₁ K ₂	N ₃ P ₂ K ₂	N ₂ P ₂ K ₂	N ₃ P ₃ K ₃	N ₂ P ₁ K ₁	N ₃ P ₃ K ₂	OUTS
	N ₁ P ₁ K ₁	N ₃ P ₁ K ₁	N ₂ P ₀ K ₂	N ₃ P ₂ K ₃	N ₁ P ₂ K ₂	N ₃ P ₂ K ₁	
	N ₀ P ₂ K ₂	N ₂ P ₃ K ₃	N ₁ P ₂ K ₂	N ₃ P ₃ K ₂	N ₁ P ₁ K ₂	N ₂ P ₃ K ₂	
	N ₀ P ₀ K ₀	N ₂ P ₂ K ₁	N ₀ P ₀ K ₀	N ₂ P ₂ K ₃	N ₀ P ₀ K ₀	N ₂ P ₂ K ₀	
OM II	N ₂ P ₁ K ₁	N ₃ P ₃ K ₂	N ₂ P ₁ K ₂	N ₃ P ₂ K ₂	N ₂ P ₂ K ₂	N ₃ P ₃ K ₃	
	N ₁ P ₂ K ₂	N ₃ P ₂ K ₁	N ₁ P ₁ K ₁	N ₃ P ₂ K ₁	N ₂ P ₀ K ₂	N ₃ P ₂ K ₃	
	N ₁ P ₁ K ₂	N ₂ P ₃ K ₂	N ₀ P ₂ K ₂	N ₂ P ₃ K ₂	N ₁ P ₁ K ₁	N ₃ P ₃ K ₁	
	N ₀ P ₀ K ₀	N ₂ P ₂ K ₀	N ₀ P ₀ K ₀	N ₂ P ₂ K ₁	N ₀ P ₀ K ₀	N ₂ P ₂ K ₃	
OM I	N ₂ P ₂ K ₃	N ₀ P ₀ K ₀	N ₂ P ₂ K ₀	N ₀ P ₀ K ₀	N ₂ P ₂ K ₁	N ₀ P ₀ K ₀	
	N ₂ P ₂ K ₂	N ₃ P ₂ K ₃	N ₂ P ₁ K ₁	N ₃ P ₃ K ₂	N ₂ P ₁ K ₂	N ₃ P ₂ K ₂	
	N ₂ P ₀ K ₀	N ₃ P ₃ K ₁	N ₁ P ₂ K ₂	N ₃ P ₂ K ₃	N ₁ P ₁ K ₁	N ₃ P ₁ K ₁	

	N ₂ P ₂ K ₁	N ₃ P ₂ K ₂		N ₁ P ₂ K ₂	N ₂ P ₃ K ₂		N ₀ P ₂ K ₁	N ₂ P ₃ K ₃	
	STRIP III			STRIP II			STRIP I		

Fig 2: Effect of IPNS on mean fruit yield of brinjal

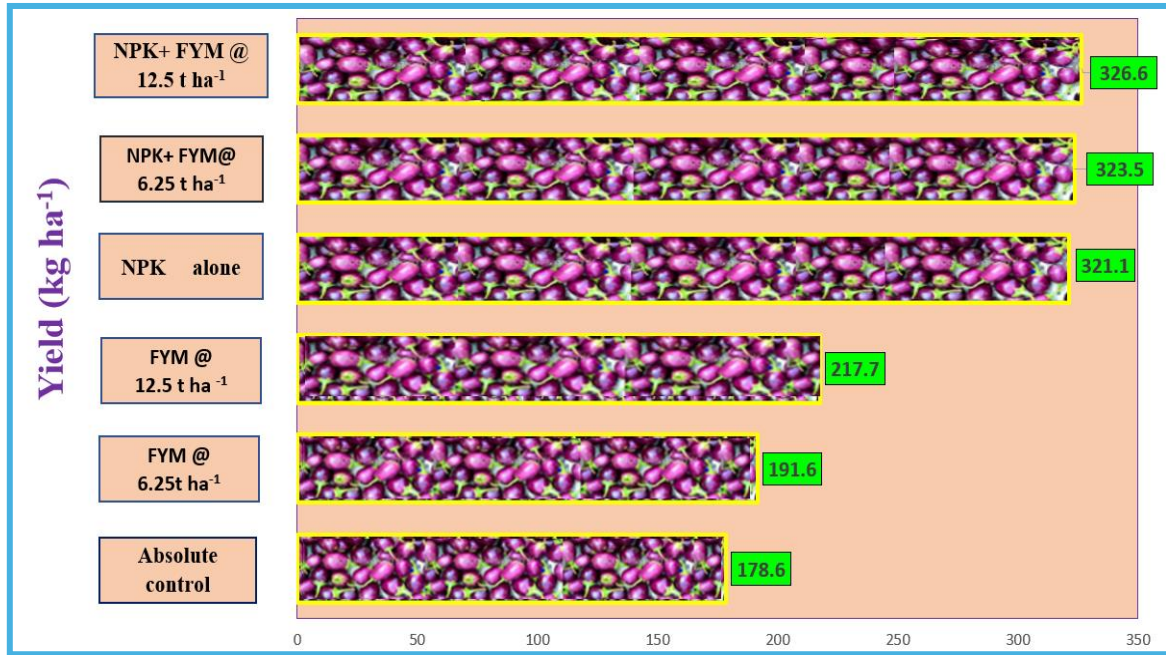


Fig 3: Initial soil fertility in different strips of test crop (Brinjal)

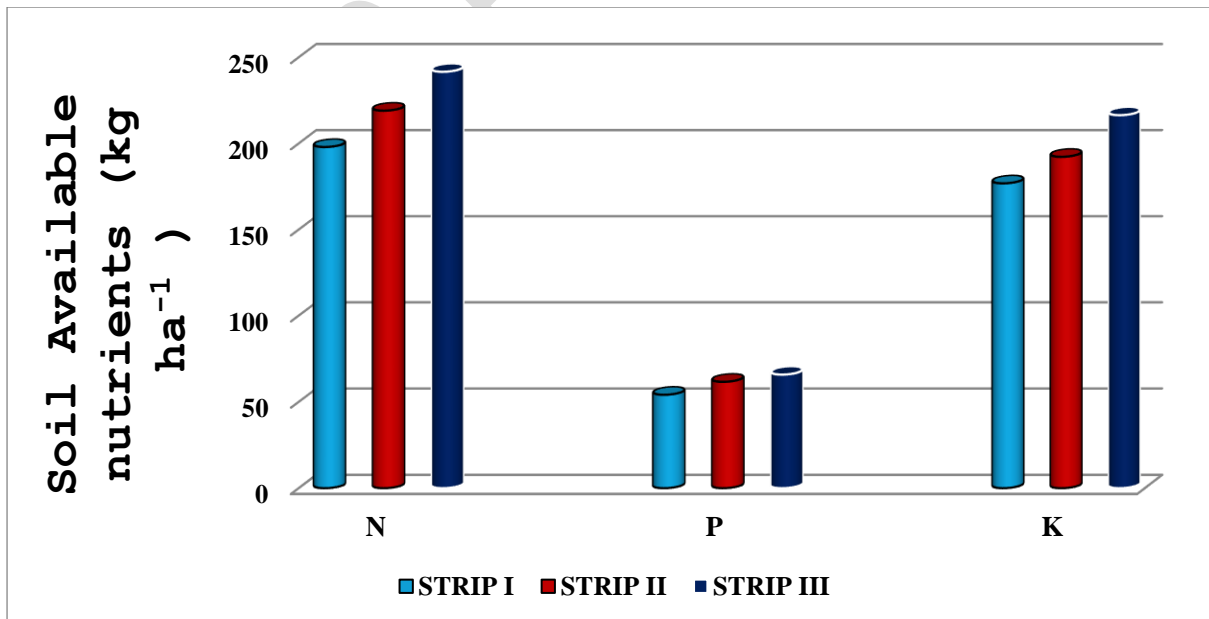


Fig 4: Effect of IPNS on total nutrient uptake by brinjal

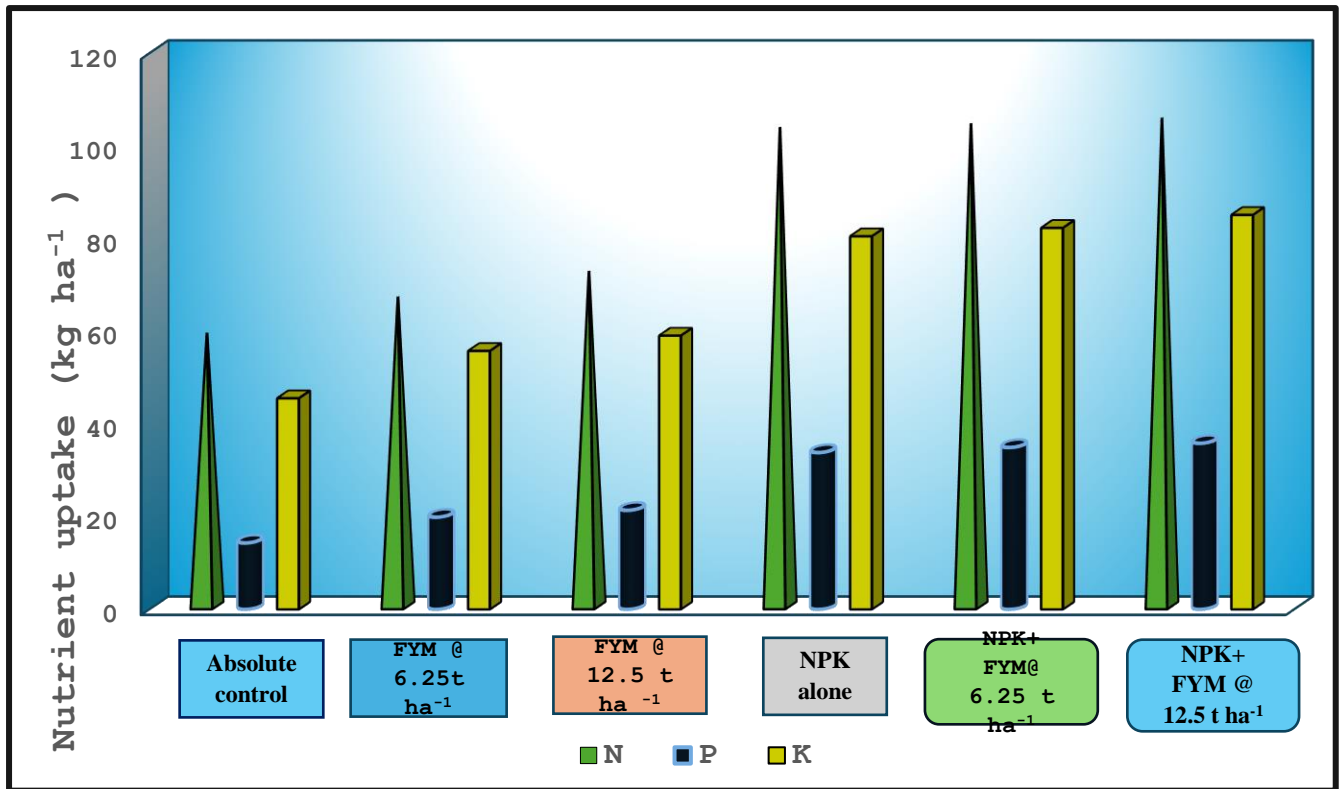


Fig. 5 Per cent contribution of nutrients from soil, fertilizer and FYM

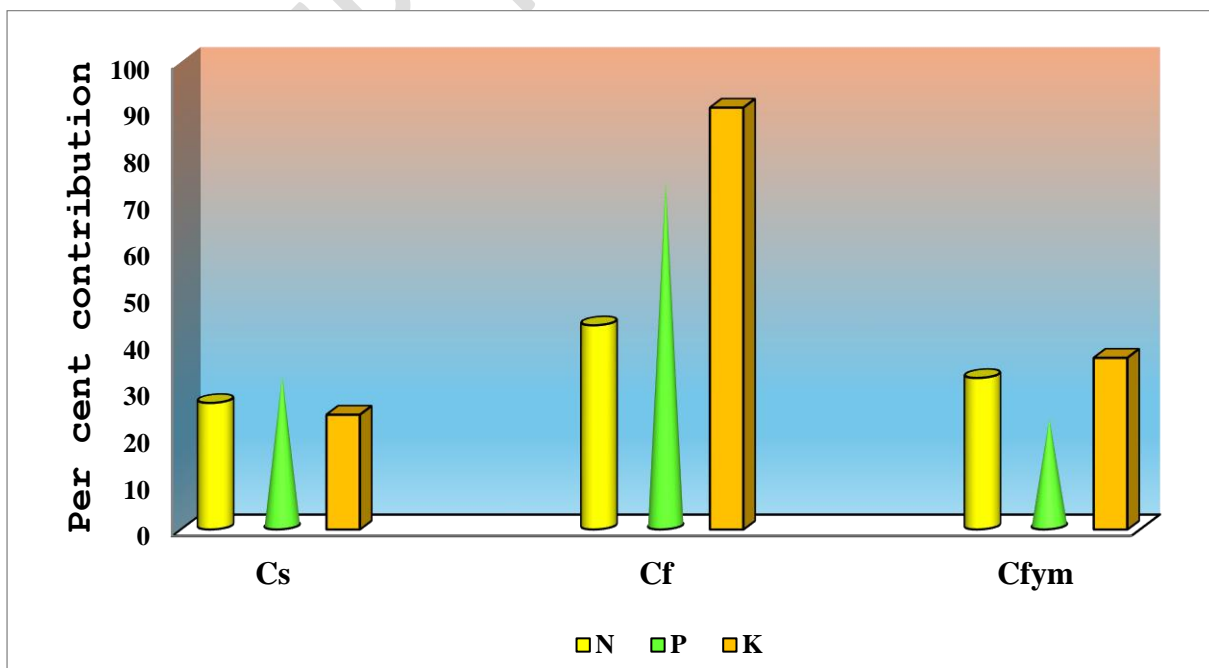


Table 1: Levels of fertilizer nutrients and FYM for brinjal

Level	N (kg ha ⁻¹)	P ₂ O ₅ (kg ha ⁻¹)	K ₂ O (kg ha ⁻¹)	FYM (t ha ⁻¹)
0	0	0	0	0
1	50	25	25	6.25
2	100	50	50	12.5
3	150	75	75	-

Table2. Pre-sowing soil available NPK, yield and NPK uptake by brinjal in various strips (kg ha⁻¹)

Parameters (kg ha ⁻¹)	Strip I		Strip II		Strip III		Overall			
							Treated (NPK)		Control (NPK)	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean

Parameters	Basic Data			Response yard stick (kg kg ⁻¹)
	N	P ₂ O ₅	K ₂ O	
Nutrient requirement (kg q ⁻¹)	0.33	0.24	0.32	70.37
Per cent contribution from soil (Cs)	27.21	32.20	24.69	
Per cent contribution from fertilizers (Cf)	43.83	73.79	90.31	
Per cent contribution from FYM (Cfym)	32.58	22.95	36.90	

KMnO₄-N	193.2–201.6	197.9	215.6–224.0	219.0	234.9–251.7	241.6	193.2–251.7	220.0	196.0–221.2	210.6
Olsen-P	40.2–58.6	54.1	45.7–65.9	61.6	48.6–69.2	65.8	53.2–69.2	62.6	40.2–48.6	44.7
NH₄OAc-K	168.0–189.0	176.8	179.0–214.0	192.2	200.0–232.0	216.4	169.0–232.0	196.6	168.0–196.0	182.8
Fruit yield (q ha⁻¹)	168.4–344.9	288.1	177.2–371.0	309.2	189.5–380.9	324.2	244.8–380.9	326.0	168.4–189.5	178.6
N uptake	55.7–119.1	93.2	58.6–123.3	100.3	62.7–128.1	105.2	75.9–128.1	105.0	55.7–62.7	59.1
P uptake	13.6–36.8	30.8	14.3–39.0	32.8	15.3–39.5	34.5	27.1–39.5	35.2	13.6–15.3	14.4
K uptake	41.8–98.2	73.5	45.7–107.7	81.0	49.5–108.7	86.3	57.8–108.7	84.5	41.8–49.5	45.7

Table 3. Nutrient requirement, per cent contribution of nutrients from soil, fertilizer and FYM for brinjal.

Table 4: Soil test-based fertilizer prescription under IPNS for yield target of 360 q ha⁻¹ for brinjal (kg ha⁻¹)

Parameter	IPNS						
	NPK alone (kg ha ⁻¹)	NPK + FYM 6.25 t ha ⁻¹ (kg ha ⁻¹)	Per cent reduction over NPK	Fertilizer saving (kg ha ⁻¹)	NPK + FYM 12.5 t ha ⁻¹ (kg ha ⁻¹)	Per cent reduction over NPK	Fertilizer saving (kg ha ⁻¹)
	KMnO₄-N (kg ha⁻¹)						
200	146	121	17.1	25	96	32.0	50
220	134	109	18.7	25	84	37.3	50
240	122	97	20.5	25	75	38.5	47
260	110	85	22.7	25	75	31.9	35
280	98	75	23.5	23	75	23.5	23
	Olsen – P (kg ha⁻¹)						
10	108	94	13.0	14	79	26.9	29
12	106	92	11.1	14	77	27.4	29
14	104	90	13.5	14	75	27.9	29
16	102	88	13.8	14	73	28.4	29
18	100	86	14.0	14	71	29.0	29
20	98	84	14.3	14	69	29.6	29
22	96	82	14.6	14	68	29.2	28
	NH₄OAc-K (kg ha⁻¹)						
100	93	71	23.7	22	41	55.9	52
120	87	64	26.4	23	34	60.9	53
140	80	57	28.8	23	27	66.3	53
160	74	51	31.0	23	21	71.6	53
180	67	44	34.3	23	15	77.6	52
200	61	38	37.7	23	15	75.4	46

220	54	31	42.6	23	15	72.2	39
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UNDER PEER REVIEW