

Research Article

Development of soil test crop response based fertilizer prescriptions through integrated plant nutrition system for aggregatum onion (*Allium cepa* L.) under drip fertigation

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Abstract

An insight into the balanced crop nutrition and efficient irrigation will be rewarding to attain profitable bulb yield of shallow-rooted and high nutrient requiring aggregatum onion. To develop fertilizer prescription equations (FPEs) for aggregatum onion under drip fertigation by encompassing the Soil Test Crop Response approach (STCR), a field experiment was conducted in Palaviduthi soil series with 15 treatments viz., Absolute control (T_1), Blanket recommendation (60:60:30) + Farm Yard Manure (FYM) @ 12.5 t ha⁻¹ (T_2), STCR based NPK fertilizer recommendation (STCR-NPK) for the targeted yield of 14 (T_3), 15 (T_4), 16 t ha⁻¹ (T_5), FYM @ 6.25 (T_6), 12.5 t ha⁻¹ (T_7), STCR-NPK+FYM @ 12.5 t ha⁻¹ for the targeted yield of 14 (T_8), 15 (T_9), 16 t ha⁻¹ (T_{10}), Biocompost @ 2.5 (T_{11}), 5 t ha⁻¹ (T_{12}) and STCR-NPK+Biocompost @ 5 t ha⁻¹ for the targeted yield of 14 (T_{13}), 15 (T_{14}), 16 t ha⁻¹ (T_{15}). The results revealed that T_{10} was more supercilious than others. The basic parameters were deliberated from the experimental data on total nutrient uptake, initial soil fertility status, applied fertilizer doses. The aggregatum onion (variety CO 4) required 0.43, 0.32, 0.45 Kg of N, P₂O₅, K₂O to produce one quintal of bulb yield. The percent contribution of nutrients from soil and fertilizer was 14.01, 54.57 for N, 35.11, 50.50 for P₂O₅ and 12.69, 70.12 for K₂O, respectively. The contribution of N, P₂O₅, K₂O from FYM and biocompost were 41.02, 16.23, 41.53 and 47.98, 15.87, 49.56 percent sequentially. Based on the above parameters, the fertilizer prescription equations were formulated for aggregatum onion under drip fertigation in Palaviduthi soil series.

Keywords: Aggregatum onion, Drip fertigation, Fertilizer prescription equations, STCR – IPNS

INTRODUCTION

Aggregatum onion (*Allium cepa* var. *aggregatum*), belonging to the Alliaceae family portrayed as “Queen of the kitchen” is one of the most important commercial bulb vegetables. India is the second-largest producer next to China with cultivating area, production and productivity of 1.43 million hectares, 26.15 million tonnes and 18.3 MT ha⁻¹, respectively. In Tamil Nadu, it

is cultivated over an area of 0.27 lakh hectares and production of 3.11 lakh tonnes during 2017-2018 (<https://www.indiastat.com/agriculture-data.aspx>). The existence of allyl propyl disulphide makes onion having an idiosyncratic pungent taste.

The foremost things to be appraised for escalating high yield are optimum irrigation and balanced fertilization since it is a shallow-rooted and high nutrient requiring crop. This can be achieved in a better manner by the

adoption of the soil test crop response approach as described by Ramamoorthy *et al.* (1967) and drip fertigation (Solanki *et al.*, 2020). Soil test based fertilizer recommendation harmonizes the much debated approaches namely “Fertilizing the soil” versus “Fertilizing the crop” guaranteeing a real balance between the applied and soil available nutrients (Vijayakumar *et al.*, 2017). It is a demand-driven technology that allows farmers to choose yield targets based on resource endowment capacity and farm typology, thereby using the plant nutrients judiciously.

Although there is a fast retrieval of nutrients from inorganic fertilizers, utilization of organic manures and them that is inorganic manures meet crop nutrient requirements will be an inevitable practice to augment sustainable agriculture consecutively upgrading crop productivity and quality in the near future (Adekiya *et al.*, 2020). So, the integrated plant nutrition system will be a significant option for cost-effective sustainable management of soil fertility. With this view, Fertilizer Prescription Equations (FPEs) were developed for aggregatum onion under soil application by Santhi *et al.* (2002), adopting STCR – IPNS approach.

The rising demand for water supply exerts tremendous pressure on agricultural sectors to use available water efficiently to meet future needs. Onion requires frequent but not heavy irrigations as sufficient soil moisture is crucial for bulb development which is greatly influenced by the irrigation system (Bhasker *et al.*, 2018). Drip irrigation is of pressing priority to assure commercial agriculture’s economic and environmental sustainability (Mebrahtu *et al.*, 2019).

By conjoining these as drip fertigation, fertilizers and water can be released directly to the immediate vicinity of the root zone during peak crop demand that can minimize losses and treble the yield of crops (Ramadaas *et al.*, 2017). In this context, this study was contemplated to develop the fertilizer prescription equations for aggregatum onion (*Allium cepa* L.) under drip fertigation for Palaviduthi soil series. This study also ensures as a guideline for achieving desired targeted yield in aggregatum onion.

MATERIALS AND METHODS

Experimental site and initial soil description

The field experiment was conducted in a farmer’s field in Kuppanur village of Thondamuthur, Coimbatore where aggregatum onion (variety CO 4) was sown during rabi (2020). The experimental field’s soil was categorized under Palaviduthi soil series, red, non-calcareous, sandy loam (Typic Rhodustalf) with pH 7.4 and EC 0.15 dSm⁻¹. The initial fertility status was low in organic carbon (0.47%) and available nitrogen (196 Kg ha⁻¹), high in available phosphorus (35 Kg ha⁻¹), medium in available potassium (250 Kg ha⁻¹).

Treatment details

The experiment was laid out in a Randomized Block Design with three replications consisting of 15 treatments viz., T₁ – Absolute control, T₂ – Blanket fertilizer recommendation (60:60:30) + FYM @ 12.5 t ha⁻¹, T₃ – STCR based NPK fertilizer recommendation for the targeted yield of 14 t ha⁻¹, T₄ – STCR based NPK fertilizer recommendation for the targeted yield of 15 t ha⁻¹, T₅ – STCR based NPK fertilizer recommendation for the targeted yield of 16 t ha⁻¹, T₆ – FYM @ 6.25 t ha⁻¹, T₇ – FYM @ 12.5 t ha⁻¹, T₈ – STCR based NPK fertilizer recommendation + FYM @ 12.5 t ha⁻¹ for the targeted yield of 14 t ha⁻¹, T₉ – STCR based NPK fertilizer recommendation + FYM @ 12.5 t ha⁻¹ for the targeted yield of 15 t ha⁻¹, T₁₀ – STCR based NPK fertilizer recommendation + FYM @ 12.5 t ha⁻¹ for the targeted yield of 16 t ha⁻¹, T₁₁ – Biocompost @ 2.5 t ha⁻¹, T₁₂ – Biocompost @ 5 t ha⁻¹, T₁₃ – STCR based NPK fertilizer recommendation + Biocompost @ 5 t ha⁻¹ for the targeted yield of 14 t ha⁻¹, T₁₄ – STCR based NPK fertilizer recommendation + Biocompost @ 5 t ha⁻¹ for the targeted yield of 15 t ha⁻¹, T₁₅ – STCR based NPK fertilizer recommendation + Biocompost @ 5 t ha⁻¹ for the targeted yield of 16 t ha⁻¹.

Experimental methodology

The soil was sampled before initiating the experiment, processed and analyzed for available N, P, K following standard procedures of Subbiah and Asija (1956), Olsen *et al.* (1954), Stanford and English (1949), respectively. The fertilizer doses were calculated for STCR treatments using the existing FPEs developed for surface irrigation and the conventional method of fertilizer application as furnished below:

$$\begin{aligned} \text{FN} &= 0.99 \text{ T} - 0.37 \text{ SN} \\ \text{FP}_2\text{O}_5 &= 0.58 \text{ T} - 1.43 \text{ SP} \\ \text{FK}_2\text{O} &= 0.67 \text{ T} - 0.25 \text{ SK} \end{aligned}$$

For STCR – NPK + FYM @ 12.5 t ha⁻¹ and STCR – NPK + Biocompost @ 5 t ha⁻¹ treatments, FYM @ 12.5 t ha⁻¹ (24% moisture, 0.53, 0.26, 0.42 % N, P, K) and Biocompost @ 5 t ha⁻¹ (33% moisture, 0.98, 0.56, 0.5 % N, P, K) respectively were applied in addition to the calculated fertilizer doses from FPEs. Depending on the treatments, a full dose of phosphorous was applied basally during sowing as SSP. Nitrogen and potassium were applied as urea and MOP respectively through fertigation in splits as per stage wise requirement as mentioned in CPG 2020 (Table 1).

A package of practices was done since it is used in common by the TNAU CPG (Horticulture), 2020. During harvest, the yield (bulb and straw) was recorded from each plot. Those samples were processed and analyzed for N (Humphries, 1956), P, K content (Jackson, 1973). By multiplying the dry matter yield with its corresponding nutrient content, the nutrient up-

take of bulb and straw was computed and added to determine total uptake.

From the experimental data on bulb yield, nutrient uptake, initial soil available N, P, K and fertilizer doses added (Table 2), fertilizer prescription equations were developed for aggregatum onion under drip fertigation by refinement of existing FPEs by the acquisition of protocol on Soil Test Crop Response Correlation as followed by AICRP – STCR. These data were statistically analyzed using SPSS software to determine the effect of treatments imposed. The data obtained from treatments T₁, T₃ to T₁₅ were utilized for the development of FPEs. To determine the contribution of organics, T₆, T₇ and T₁₁, T₁₂ were considered for STCR – IPNS (FYM) and STCR – IPNS (Biocompost) respectively. The computation of basic parameters was done according to the methodology of Ramamoorthy *et al.* (1967).

1. Nutrient requirement NR (Kg q⁻¹)

Kg of N/P₂O₅/K₂O required per quintal of bulb production = Total nutrient uptake of N/P₂O₅/ K₂O (Kg ha⁻¹) / Bulb yield (q ha⁻¹) Eq. 1

2. Percent contribution of nutrients from soil C_s (%)

Percent contribution of N/P₂O₅/K₂O from soil = Total uptake of N/P₂O₅/K₂O in control plot (Kg ha⁻¹) / Soil test value of N/P₂O₅/K₂O in control plot (Kg ha⁻¹) x 100 Eq. 2

3. Percent contribution of nutrients from fertilizer Cf (%)

Percent contribution of N/P₂O₅/K₂O from fertilizer = Total uptake of N/P₂O₅/K₂O in treated plot (Kg ha⁻¹) - STV of N/P₂O₅/K₂O in treated plot x Average C_s / Nutrient applied through fertilizer (Kg ha⁻¹) x 100 Eq. 3

4. Percent contribution of nutrients from organics Co (%)

Percent contribution of N/P₂O₅/K₂O from organics = [Total nutrient uptake of N/P₂O₅/K₂O in organics treated plot (Kg ha⁻¹)] - [STV of N/P₂O₅/K₂O in treated plot x Average C_s] / Amount of N/P₂O₅/K₂O added through organics (Kg ha⁻¹) x 100 Eq. 4

Fertilizer prescription equations

By utilizing the basic parameters, the Fertilizer Prescription Equations were created for aggregatum onion under drip fertigation which could be used to calculate the required dose of fertilizers for a particular soil test value for the soils belonging to Palaviduthi soil series. The FPEs were developed as follows:

$$FN = \frac{NR}{Cf / 100} T - \frac{Cs}{Cf} SN \quad \dots \text{Eq. 5}$$

$$FN = \frac{NR}{Cf / 100} T - \frac{Cs}{Cf} SN - \frac{Co}{Cf} ON \quad \dots \text{Eq. 6}$$

2. Fertilizer phosphorus

$$FP_2O_5 = \frac{NR}{Cf / 100} T - \frac{Cs}{Cf} \times 2.29 SP \quad \dots \text{Eq. 7}$$

$$FP_2O_5 = \frac{NR}{Cf / 100} T - \frac{Cs}{Cf} \times 2.29 SP - \frac{Co}{Cf} \times 2.29 OP \quad \dots \text{Eq. 8}$$

3. Fertilizer Potassium

$$FK_2O = \frac{NR}{Cf / 100} T - \frac{Cs}{Cf} \times 1.21 SK \quad \dots \text{Eq. 9}$$

$$FK_2O = \frac{NR}{Cf / 100} T - \frac{Cs}{Cf} \times 1.21 SK - \frac{Co}{Cf} \times 1.21 OK \quad \dots \text{Eq. 10}$$

1. Fertilizer nitrogen

where FN, FP₂O₅, FK₂O are fertilizer N, P₂O₅, K₂O (Kg ha⁻¹) respectively. NR is nutrient requirement of N, P₂O₅, K₂O (Kg q⁻¹), Cs is percent contribution of nutrients from soil, Cf is percent contribution of nutrients from fertilizer, Co is percent contribution of nutrients through organics (FYM and Biocompost), T is targeted yield (q ha⁻¹), SN, SP, SK are available N, P, K (Kg ha⁻¹) and ON, OP, OK are quantity of N, P, K supplied through organics (FYM and Biocompost) in Kg ha⁻¹, respectively.

RESULTS AND DISCUSSION

Bulb yield

The present study observed that the bulb yield of aggregatum onion (*Allium cepa* L.) was increased with increasing fertilizer doses of different treatments (Table 2). The remarkably elevated yield was recorded in T₁₀ – STCR – NPK + FYM @ 12.5 t – 16 t ha⁻¹ (17.58 t ha⁻¹) followed by T₁₅ (16.91 t ha⁻¹) which was on par with T₉. Subsequently, the greater yield was acquired in T₁₄. It was statistically collated with T₈ and T₅. The minimal yield was registered in T₁ – Absolute control (6.56 t ha⁻¹). The high targeted yield (16 t ha⁻¹) treatments of STCR – NPK, STCR – NPK + Biocompost @ 5 t ha⁻¹ and STCR – NPK + FYM @ 12.5 t ha⁻¹ exhibited 6, 13, 16 percent increase in yield respectively over T₂ – Blanket recommendation + FYM @ 12.5 t ha⁻¹. It was speculated that the inducement of yield in the STCR approach might be due to the consideration of initial soil fertility levels, crop nutrient removal and efficiency

Table 1. Details of fertigation given as per the stage wise requirement for aggregatum onion following TNAU – CPG (2020)

S.No	Crop stage	Duration (DAS)	Nutrient to be supplied (%)		No. of Fertigations
			N	K	
1	Sowing to establishment	1-10	10	10	2
2	Vegetative	11-35	30	20	3
3	Bulb formation	36-60	30	30	3
4	Bulb development	60- 90	30	40	3

of nutrients both in soil and added fertilizer. This reason was also supported by Satalagaon *et al.* (2014) in their study on STCR based fertilizer recommendation for onion through soil application in deep black soil. The main cause for maximum yield in STCR – IPNS over STCR – NPK alone was the slow and effective release of nutrients through organics compared to readily available fertilizer nutrients. Babu *et al.* (2018) had reported that the escalated yield in drip fertigation than soil application was because of constant nutrient availability during the entire crop growth period. As a whole, the amalgamation of STCR – IPNS approach of fertilizer prescription together with drip fertigation proclaimed the improvement in yield by rising fertilizer use efficiency and timely supply of nutrients than that of adopting the same approach through the conventional method of fertilizer application and surface irrigation even though in similar condition.

Nutrient uptake

There existed a significant influence of treatments on nutrient uptake, having a range of N uptake (27.13 to 85.79 Kg ha⁻¹), P uptake (11.26 to 26.10 Kg ha⁻¹), K uptake (31.47 to 65.11 Kg ha⁻¹). T₁₀ – STCR – NPK + FYM @ 12.5 t ha⁻¹ - 16 t ha⁻¹ exhibited greater N, P, K uptake of 85.79, 26.10 and 65.11 Kg ha⁻¹, respectively. Following T₁₀, T₁₅ revealed high nutrient uptake, which was on par with T₉. The crop had a lesser nutrient uptake in T₁ – Absolute control. Nitrogen uptake manifested a 3.21 and 1.19 fold increase than P and K uptake, respectively. This pattern of nutrient uptake matched homogeneously with the research on STCR – IPNS based fertilizer prescriptions in Cassava (Suganya *et al.*, 2016), Pearl millet (Ravikiran *et al.*, 2018; Sekaran *et al.*, 2019) and in Bhendi (Ammal *et al.*, 2020)

The greater nutrient uptake in STCR – IPNS treatments could be attributed to the capability of FYM and Biocompost, which created a conducive environment for the crop by enhancing soil properties, nutrient retention and water holding capacity. This would mobilize the unavailable nutrients and also had some positive effects on root growth ensuring improved uptake. The increased nutrient uptake in STCR – NPK + FYM treatments than STCR – NPK + Biocompost treatments

might be due to more nutrients from FYM than biocompost thereby minimizing the losses. This might be attributed due to its larger quantity of application. Thangasamy (2016) quantified the nutrient uptake pattern in his study on onion, whose results intimated that basal and soil application of fertilizers was not enough to match the periods of peak nutrient uptake. From the current study, it was pretended to be advantageous to follow STCR – IPNS approach through drip fertigation than through soil application since the nutrients were supplied to the crop at the right time and right method through drip fertigation, the applied nutrients were proficiently taken up by the crop. On the other side, the organics might release the nutrients gradually whose combination had resulted in optimum nutrient uptake.

Response and percent achievement

By assessing the response, it was obvious that the peak response of 11.02 t ha⁻¹ was attained in T₁₀, followed by T₁₅ with a response of 10.4 t ha⁻¹. It increased with an increase in yield target. Integrated use of inorganic and organic fertilizers exposed a greater response over inorganic fertilizers alone. This was identical with the findings on STCR – IPNS approach through drip fertigation in hybrid maize (Mohanapriya *et al.*, 2020). In the present case, the percent yield achievement was between 97.7 to 114.7.

Basic parameters

The basic parameters viz., nutrient requirement (NR), percent contribution of nutrients from soil (C_s), fertilizers (C_f) and organics (C_o) viz., FYM and Biocompost which were quantified from the experimental data are given in Table 3. It was confessed that the nutrient required to bring about one quintal of bulb yield in aggregatum onion was 0.43, 0.32, 0.45 Kg of N, P₂O₅, K₂O, respectively (Fig. 1). The percent contribution of nutrients from soil and fertilizers was reckoned to be 14.01 and 54.57 for N, 35.11 and 50.50 for P₂O₅, 12.69 and 70.12 for K₂O, respectively. The FYM contributed nutrients of 41.02, 16.23, 41.53 percent of N, P₂O₅, K₂O respectively. Similarly, the contribution of nutrients from biocompost was 47.98, 15.87, 49.56 percent of N, P₂O₅, K₂O sequentially (Fig. 2).

Table 2. Bulb yield, nutrient uptake, initial soil test value, fertilizer doses applied, response, percent yield achievement for aggregatum onion

S. No.	Treatments	t ha ⁻¹													Percent achievement	
		Bulb yield	UN	UP	UK	SN	SP	SK	FN	FP ₂ O ₅	FK ₂ O	FYM	Bio-compost	Response		
1	T ₁	6.56	27.13	11.26	31.47	194	32.2	248	0	0	0	0	0	0	-	-
2	T ₂	14.76	53.63	16.01	46.55	195	33.6	252	60	60	30	12.5	0	0	8.2	-
3	T ₃	14.18	49.09	14.83	45.05	198	34.2	251	66	31	31	0	0	0	7.62	101.3
4	T ₄	14.82	55.83	16.66	46.79	193	33.8	250	76	37	38	0	0	0	8.26	98.8
5	T ₅	15.63	63.24	18.85	50.63	196	34.4	255	86	43	45	0	0	0	9.07	97.7
6	T ₆	8.29	38.78	13.38	39.31	197	35.5	252	0	0	0	6.25	0	0	1.73	-
7	T ₇	8.66	42.55	14.19	42.49	196	34.7	248	0	0	0	12.5	0	0	2.10	-
8	T ₈	16.06	72.17	20.83	54.04	198	35.6	250	66	31	31	12.5	0	0	9.50	114.7
9	T ₉	16.71	78.57	23.39	58.99	196	32.8	248	76	37	38	12.5	0	0	10.15	111.4
10	T ₁₀	17.58	86.46	26.10	65.11	197	32.6	249	86	43	45	12.5	0	0	11.02	109.9
11	T ₁₁	7.86	36.33	12.66	35.86	195	36.3	251	0	0	0	0	2.5	0	1.30	-
12	T ₁₂	8.45	40.49	13.90	40.43	199	37.4	252	0	0	0	0	5	0	1.89	-
13	T ₁₃	15.20	59.74	18.15	48.52	200	35.8	247	66	31	31	0	5	0	8.64	108.6
14	T ₁₄	16.19	73.18	22.00	56.54	196	36.6	250	76	37	38	0	5	0	9.63	107.9
15	T ₁₅	16.91	81.86	25.41	61.57	194	35.9	249	86	43	45	0	5	0	10.35	105.7
	SEd	0.29	0.977	0.302	1.416											
	CD (P = 0.05)	0.60	2.005	0.620	2.906											

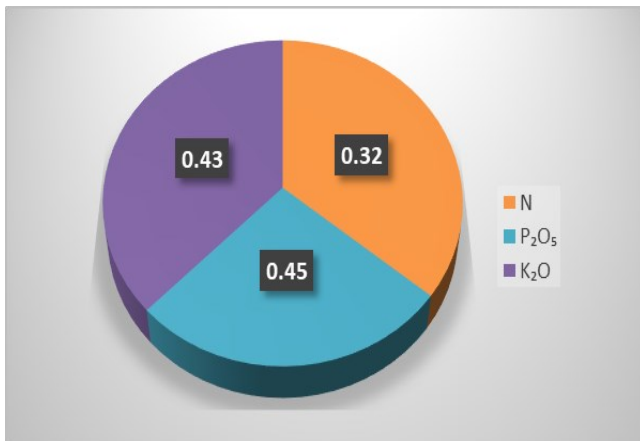


Fig. 1. Nutrient requirement (Kg q⁻¹) of N, P₂O₅, K₂O for aggregatum onion

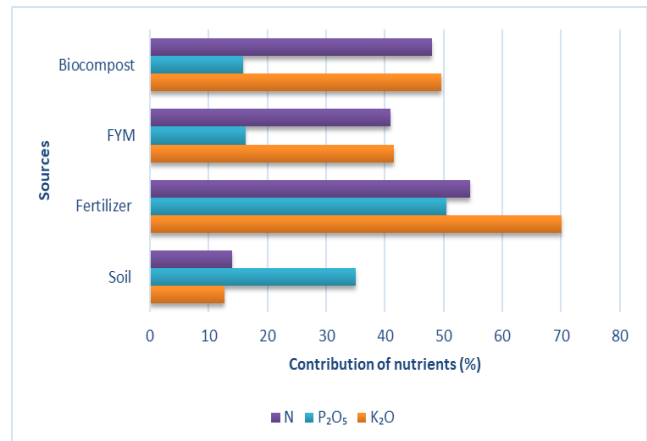


Fig. 2. Contribution of nutrients from soil, fertilizer, FYM, biocompost (%)

It was inferred that the percent contribution of P₂O₅ from soil was higher to the extent of 2.51 times than N and 2.77 times than that of K₂O. The contribution of nutrients from fertilizers was more than its contribution from the soil. The data on C_f showed the order of K₂O > N > P₂O₅. This trend was in synchronous with the results of STCR-IPNS based fertilizer prescriptions for rice in alfisols (Maragatham *et al.*, 2018) and for cauliflower in inceptisols (Thilagam *et al.*, 2009).

Fertilizer prescription equations for aggregatum onion under drip fertigation

Using the calculated basic parameters, FPEs were developed for STCR – NPK alone and STCR – IPNS (FYM and Biocompost) for aggregatum onion under drip fertigation as furnished below:

STCR – NPK + FYM	STCR – NPK + Biocompost
FN = 0.79 T – 0.26 SN – 0.78 ON	FN = 0.79 T – 0.26 SN – 0.88 ON
FP ₂ O ₅ = 0.63 T - 1.59 SP - 0.74 OP	FP ₂ O ₅ = 0.63 T - 1.59 SP - 0.72 OP
FK ₂ O = 0.64 T – 0.22 SK – 0.75 OK	FK ₂ O = 0.64 T – 0.22 SK – 0.86 OK

Soil test based fertilizer prescriptions

The ready reckoner was formulated utilizing the constructed FPEs for a range of soil test values and desired yield target of 17 t ha⁻¹ (Table 4). An estimate from these data showed that when NPK alone was applied with the soil test value of 180:34:250 Kg ha⁻¹ of KMnO₄-N, Olsen P and NH₄OAc-K, respectively, the fertilizer dose required was 88:53:54 Kg ha⁻¹ of N, P₂O₅, K₂O. It was 50:35:25 and 58:39:39 Kg ha⁻¹ of N, P₂O₅, K₂O when FYM @ 12.5 t ha⁻¹ and biocompost @ 5 t ha⁻¹ was applied along with NPK respectively. The extent of fertilizer saved due to FYM and biocompost application was 38, 29 Kg of N, 18, 14 Kg of P₂O₅ and 29, 15 Kg of K₂O, respectively.

The perusal of nomogram for the targeted yield of 17 t ha⁻¹ and soil test value of 180:34:250 Kg ha⁻¹ of N, P₂O₅, K₂O, sequentially confessed that when FYM and biocompost were applied with NPK, the reduction of fertilizers due to FYM over NPK alone was 43, 35, 54 percent of N, P₂O₅, K₂O, respectively and due to biocompost was 33, 26, 27 percent of N, P₂O₅, K₂O, sequentially. This was concurrent with the findings of Sellamuthu *et al.* (2019) on STCR – IPNS (FYM) based fertilizer prescriptions through soil application in Big onion. The percent fertilizer reduction due to IPNS over NPK alone increases with an increase in soil nutrient status and decreases with an increase in targeted yield. This decrement may be due to the maintenance of soil fertility by supplying nutrients for a long time and creating favorable soil physical, chemical and biological properties as reported by Suresh and Santhi (2018) for Maize in vertisols of the southern region in TamilNadu. Adekiya *et al.* (2020) also had the opinion that organic manures also contain both micro and macronutrients, unlike NPK fertilizer that contains only N, P and K. The quality of vegetables can be provoked by integrated nutrient management.

The additional saving of 8, 4, 14 Kg of N, P₂O₅, K₂O, respectively, was generated when FYM was chosen along with NPK instead of biocompost. This might be owing to the large application of FYM. It was obvious from this current study that the use of both organic ma-

Table 3. Basic parameters calculated for developing FPEs for aggregatum onion under drip fertigation

	N	P ₂ O ₅	K ₂ O
NR (Kg q ⁻¹)	0.43	0.32	0.45
Cs (%)	14.01	35.11	12.69
Cf (%)	54.57	50.50	70.12
Co (%) – FYM	41.02	16.23	41.53
Co (%) – Biocompost	47.98	15.87	49.56

Table 4. STCR based fertilizer recommendation (Kg ha⁻¹) for desired yield target (17 t ha⁻¹) of aggregatum onion under drip fertigation

Soil test value (Kg ha ⁻¹)	STCR Alone	STCR – NPK + FYM @ 12.5 t ha ⁻¹	Percent reduction due to IPNS over NPK alone	STCR- NPK + Biocompost @ 5 t ha ⁻¹	Percent reduction due to IPNS over NPK alone
Available N					
180	88	50	43	58	33
200	82	45	46	53	35
220	77	40	49	48	38
240	72	34	52	43	40
260	67	30*	56	38	44
280	62	30*	61	32	47
Olsen – P					
26	66	47	28	52	21
28	63	44	30	49	22
30	59	41	31	46	23
32	56	38	33	43	24
34	53	35	35	39	26
36	50	31	37	36	27
NH₄OAc – K					
250	54	25	54	39	27
270	49	21	58	35	30
290	45	16	64	30	32
310	41	15*	71	26	36
330	36	15*	80	22	40
350	32	15*	91	17	46

* Maintenance dose (50% of blanket recommendation - 60:60:30)

nures, i.e., FYM & Biocompost would have the highest calibre in benefitting the farming community. The use of FYM was economically feasible than biocompost as it was comparatively expensive. Although the cost of biocompost was comparatively higher, it had the potential to minimize not only the application of inorganic fertilizers but also the other organic manures too. This was also reported in the experimental findings of Rahman *et al.* (2012) in Chilli using biocompost produced from kitchen wastes. So, the biocompost will be the most fitting option to farmers if there is low availability of FYM. Due to the above mentioned benefits of biocompost, the STCR-IPNS based FPEs were also developed for biocompost which could be used by the farmers for aggregatum onion under drip fertigation in Palaviduthi soil series.

Conclusion

The experimental outcomes showed that the refined fertilizer prescription equations could be used for aggregatum onion (*A. cepa* L.) under drip fertigation to prescribe specific fertilizer doses for different soil test values and yield targets for Palaviduthi soil series. It

would set out as a touchstone to the farming community to effectuate momentous yield and pave the way for an ecologically sound environment and assist in fertilizer saving and nutrient availability. The need of the hour in exhilarating water and nutrient requirement of the crop can be made possible by drip fertigation. Biocompost will be a viable replacement for FYM to the farmers if there is low availability of FYM. Thus, drip fertigation and STCR – IPNS approach brings forth efficient irrigation and balanced fertilization, thereby accomplishing optimum yield in aggregatum onion.

Conflict of interest

The authors declare that they have no conflict of interest.

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