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Effect of higher levels of fertilizer doses on yield and nutrient uptake of Brinjal in lateritic soils of Konkan region

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Abstract

Application of higher levels of fertilizers generally improve growth, nutrient uptake and yield of crop due to the greater availability of essential nutrients throughout its growth period. The fertilizer should be applied based on soil fertility status and targeted yield requirements for achieving higher productivity while maintaining soil health. A field trial was carried out at the Experimental farm of the Department of Soil Science and Agril. Chemistry, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during *rabi* season of the year 2025 - 2026 to study the effect of higher levels of fertilizer doses on *rabi* brinjal (cv. Konkan Prabha) in the lateritic soils of the Konkan region of Maharashtra. At harvest fruit yield was recorded and nutrient uptake of N, P and K was estimated. The results indicated that the higher nutrient availability increased nutrient uptake by both the plant and fruits showing a positive response of the crop to improved nutrient supply. The highest fruit yields (178, 214 and 226 q ha⁻¹) and increased nutrient uptake were obtained under the higher fertilizer combinations while the lowest values were consistently recorded in the absolute control treatments.

Keywords: Yield, uptake, brinjal, npk, konkan, nutrient and fertilizer

Introduction

Brinjal (*Solanum melongena* L.) from the family *Solanaceae* having highest production potential it is also termed as poor man's vegetable. The British name of brinjal is Aubergine. Brinjal accounts for around 6.62 percent of total vegetable acreage in India and 6.34 percent of total vegetable production Anonymous, (2022a). India is the world's second-largest producer of brinjal after China. In India, the area under brinjal cultivation is 764.55 thousand hectares, with a production of 12607.36 thousand tonnes and a productivity of 16.49 MT ha⁻¹. West Bengal is the leading producer, with 3027.75 tonnes produced and a 23.69% share of total output. Maharashtra, on the other hand, produced 429.91 tonnes, accounting for 3.36% of total production followed by Odisha, Bihar, Karnataka, Andhra Pradesh, Maharashtra and Uttar Pradesh Anonymous, (2018). In Maharashtra, the area under brinjal cultivation is 19.09 thousand hectares, with an annual yield of 320.57 thousand tonnes and a productivity of 16.79 MT ha⁻¹ Anonymous, (2023). Kolhapur, Satara, Sangli, Pune, Ahmednagar, Nashik, Jalgaon, Nagpur, Chandrapur and Amravati are the major brinjal growing districts in Maharashtra. Konkan is the western coastal strip of Maharashtra with an area of 29,79,000 hectares (2.979 M ha⁻¹). It is flanked by the Western Ghats (Sahyadri) on east and Arabian Sea on the west. The region is traditionally famous as homeland for the commercial cultivation of world-famous Alphonso mango. Crops like groundnut, maize, brinjal and watermelon have been undertaken to observe their performance under various cultivation practices in the lateritic soils of Konkan region Syeda, (2022) ^[15]. The soils of Konkan region, particularly in South Konkan are lateritic type of soils which are acidic in nature and medium to low in major nutrient fertility status. In India fertilizer is one of the most vital and expensive agricultural input. Its use rapidly increasing day by day in proportion to food

grain production and it has been and will continue to be a valuable part of attaining the country’s planned food grain production target. However, the imbalanced application and use of fertilizer have affected soil health and fertility. The generic fertilizer recommendation of crops results in under or over fertilization, lowering production and profitability while also polluting the soil and also environment. Therefore, soil testing is necessary for rapid determination of the available nutrient status of soil, interpreting test results and formulating fertilizer recommendations based on crop responses and economic factors Dwivedi *et al.*, (2015) ^[5].

Material and Methods

The experiment was conducted at Department of Soil Science and Agricultural Chemistry farm, Dr. BSKKV., Dapoli. The soil of the experiment site was medium in available nitrogen (312 kg ha⁻¹), low in available phosphorus (22 kg ha⁻¹) and high in available potassium (296 kg ha⁻¹). The brinjal crop used for the trial in *rabi* season of the year 2025-26 in lateritic soils of Konkan region. The research trial was laid out in fractional factorial RBD having three fertility gradient strips (L₀, L₁ and L₂) which was divided into 21 treated plots and 3 control plots. The levels of fertilizers used for brinjal were urea, single superphosphate (SSP) and muriate of potash (MOP) and details regarding it elaborated in Table 1.

Table 1: The treatment levels and doses of nutrients applied

Sr. No.	FYM (t ha ⁻¹)	Nutrient applied (kg ha ¹)					
		N		P ₂ O ₅		K ₂ O	
1.	-	N ₀	00	P ₀	00	K ₀	00
2.	F ₀ - 0	N ₁	75	P ₁	25	K ₁	25
3.	F ₁ - 10	N ₂	150	P ₂	50	K ₂	50
4.	F ₂ - 20	N ₃	225	P ₃	75	K ₃	75

The field layout was prepared having 24 plots and each plot having gross size of 4 x 3.20 m² and net size of 3.70 x 2.80 m². The fertility gradient strips divided into 3 levels of FYM such as F₀(0 t ha⁻¹), F₁(10 t ha⁻¹) and F₂ (20 t ha⁻¹). The brinjal variety Konkan Prabha was used as the main test crop. Healthy seedlings of uniform size were transplanted in each plot at a spacing of 60 cm × 45 cm and recommended cultural packages of practices were followed. After harvest, brinjal fruit yield was recorded and plant samples were collected of all the 24 plots for estimation of total nutrient content and uptake separately for each plot. The nutrient uptake was computed from the total dry matter production and the percentage content of nutrients in the plant and fruits. Fresh plant samples from each plot and a part of the fruit sample were weighed. The samples were air-dried and then oven-dried at 65°C to a constant weight. The samples were analysed by standard methods for the nutrient content at harvest. The total uptake of N, P and K was computed from the nutrient contents and dry weights of plant parts and expressed as kg ha⁻¹. The analytical methods used for measurement of uptake of N by

Micro-Kjeldahl method, P by Vanado-molybdate method and K by Flame photometry method by Tandon (1993) ^[16]. Nutrient uptake for macronutrients (kg ha⁻¹)

Nutrient uptake (kg ha⁻¹)

=
$$\frac{\text{Nutrient content (\%)} \times \text{Yield (kg ha}^{-1}\text{)}}{100}$$

Results and Discussions

Brinjal fruit yield

The yield in the L₀ strip ranged from 113.10 to 202.7 q ha⁻¹ in the treated plots, with a mean of 178 q ha⁻¹, whereas the control plots ranged from 103.5 to 96.6 q ha⁻¹, with a mean of 99 q ha⁻¹. The L₁ strip recorded treated-plot yields from 126.40 to 275.1 q ha⁻¹, with a mean of 214 q ha⁻¹, while the control plots ranged from 112.40 to 114.2 q ha⁻¹, with a mean of 114 q ha⁻¹. The L₂ strip recorded treated-plot yields from 137.3 to 226.9 q ha⁻¹, with a mean of 226 q ha⁻¹, whereas the control plots ranged from 90.5 to 91.8 q ha⁻¹, with a mean of 88 q ha⁻¹ as given in Table 2. The brinjal fruit yield showed strong response to the different nutrient treatment levels. The treatment wise yield data showed a clear advantage of fertilized treatments over the absolute control plots. The yield details are elaborated in the Table 2. The consistent yield advantage of the T₁ and T₂ blocks over T₀ illustrates the well-documented synergism between organic and inorganic sources of nutrients in yield production. The increase in fruit yield might be attributed to improvement in growth of plant which in turn led to higher production. Similar results were obtained by Jilani *et al.* (2009) ^[7], Alvaro *et al.* (2017) and Rangaiah *et al.*, (2024) ^[11]. in brinjal, Singh *et al.* (2025) ^[13]. on for wheat and Deshmukh *et al.*, (2011) ^[6]. in Bt cotton.

Nutrient uptake

The total nutrient uptake computed from nutrient content and dry matter yield. The details regarding the uptake values are demonstrated in Table 3. The applied treatments contents higher doses of nitrogen and other primary nutrients because of which the brinjal responded with higher yield and production and this led to higher uptake of nitrogen at higher level. The build-up in uptake with increasing FYM level recorded in the present lateritic soils corroborates the findings of Sultana *et al.*, (2021) ^[14]. for brinjal grown under a comparably nutrient-enriched organic amendment regime. Similar observations matched with Patil *et al.*, (2026) ^[9]. on *rabi* onion. An increase in nitrogen content and uptake with combined application of FYM and inorganic nitrogen were reported by Murthy *et al.* (2024) ^[8]. The comparatively low but fertilizer responsive phosphorus uptake pattern recorded here is consistent with the high P-fixing capacity of lateritic soils reported by Raut *et al.* (2024) ^[12]. Potassium is one of the dynamic nutrient under soils of Maharashtra. Based on the soil temperature and other factor its availability and uptake vary and the characteristically high potassium uptake by brinjal recorded in the present study is in agreement with Pradeepa *et al.* (2024) ^[10].

Table 2: Brinjal fruit yield (q ha⁻¹) as influenced by N, P and K in different fertility gradient strips

Tr.	Treatment			Fruit Yield (q ha ⁻¹)		
No.	N	P ₂ O ₅	K ₂ O	L ₀	L ₁	L ₂
1	0	50	50	113.1	126.4	137.3
2	75	50	50	167.6	170.3	181.8
3	75	25	25	142.8	165.7	187.3
4	75	50	25	153.1	166.9	197.2
5	75	25	50	170.4	193.3	204.5
6	150	50	50	192.6	235.9	266.8
7	150	25	50	168.1	216.6	237.9
8	150	75	50	207.8	240.9	272.4
9	150	50	25	165.6	168.6	219.8
10	150	50	75	168.4	189.01	250.2
11	150	25	25	148.2	151.2	222.4
12	150	75	75	230.1	253.1	297.3
13	150	50	0	152.3	175.3	228.1
14	150	0	50	139.3	142.1	155.1
15	225	50	50	212.6	225.6	299.8
16	225	75	75	259.8	226.2	304.9
17	225	75	50	228.5	298.4	232.2
18	225	50	75	132.8	301.4	217.3
19	225	25	25	177.6	280.1	161.8
20	225	50	25	196.1	298.5	250.3
21	225	75	25	202.7	275.1	226.9
22	0	0	0	103.5	112.4	90.5
23	0	0	0	97.9	115.5	83.1
24	0	0	0	96.6	114.2	91.8
Average of treated plots				178	214	226
Average of control plots				99	114	88

Table 3: Total nutrient uptake (kg ha⁻¹) by brinjal as influenced by available and applied nutrients in FYM blocks

Tr.	Treatment			Nitrogen uptake (kg ha ⁻¹)			Phosphorus uptake (kg ha ⁻¹)			Potassium uptake (kg ha ⁻¹)		
No.	N	P ₂ O ₅	K ₂ O	F ₀	F ₁	F ₂	F ₀	F ₁	F ₂	F ₀	F ₁	F ₂
1	0	50	50	26.16	31.50	46.82	16.04	19.95	22.92	68.45	75.89	93.07
2	75	50	50	37.20	40.53	52.80	18.54	20.44	23.98	66.45	78.62	109.08
3	75	25	25	34.94	52.98	54.02	13.19	14.93	16.83	57.67	69.37	82.18
4	75	50	25	38.98	48.56	51.98	18.90	20.94	22.80	59.45	66.10	78.80
5	75	25	50	39.81	51.92	53.85	11.19	13.59	16.65	58.11	74.06	93.06
6	150	50	50	66.04	73.73	88.53	17.45	18.51	21.98	63.45	78.98	105.40
7	150	25	50	68.59	75.05	87.61	12.69	13.95	17.99	58.96	74.28	85.50
8	150	75	50	69.56	71.84	84.23	19.91	23.47	25.98	71.56	72.53	97.53
9	150	50	25	75.37	79.69	72.98	19.77	23.96	19.50	68.31	85.74	72.33
10	150	50	75	74.12	77.32	71.67	20.85	22.89	19.94	85.67	97.21	86.04
11	150	25	25	72.41	72.60	71.04	14.33	17.38	16.94	67.30	83.30	62.52
12	150	75	75	73.23	79.25	72.29	23.42	25.79	22.11	69.56	119.35	83.63
13	150	50	0	74.67	81.08	75.45	20.69	23.98	20.13	48.19	64.89	48.24
14	150	0	50	72.98	81.98	71.03	13.56	16.56	14.56	76.90	86.27	64.47
15	225	50	50	91.19	83.98	80.06	20.93	23.16	20.94	77.60	91.19	89.18
16	225	75	75	95.72	95.04	92.52	24.76	27.40	23.96	79.23	111.60	88.56
17	225	75	50	89.85	66.87	114.56	26.37	23.90	27.88	74.24	69.69	104.13
18	225	50	75	88.43	74.81	109.02	18.81	16.87	23.94	71.12	93.78	110.73
19	225	25	25	91.84	70.59	113.59	12.85	14.91	17.15	65.45	61.74	75.79
20	225	50	25	79.79	71.75	117.87	18.24	19.19	23.17	68.34	76.09	79.93
21	225	75	25	86.36	73.64	109.89	27.15	26.71	28.99	66.06	72.41	75.78
22	0	0	0	21.97	24.92	29.52	6.48	6.16	9.12	42.54	49.26	52.81
23	0	0	0	22.92	23.07	26.88	6.27	7.61	8.18	41.37	46.98	50.93
24	0	0	0	21.18	23.91	34.97	5.11	6.18	7.07	42.38	52.46	55.94
Average of treated plots				68.92	69.27	80.56	18.55	20.40	21.35	67.72	81.10	85.05
Average of control plots				22.02	23.97	30.46	5.95	6.65	8.12	42.10	49.57	53.23

Conclusion

From the present findings it can be concluded that the levels of fertilizer doses and FYM significantly increased the brinjal fruit yield, effectively achieved the highest productivity and the total nutrient uptake increased in the treated plots as compared to the control plots in the lateritic soils of Konkan region of

Maharashtra.

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