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**Muhammad Usman Kasi**

Department of Horticulture,  
Sindh Agriculture University,  
Tandojam, Pakistan

**Abdul Qadir Gola**

Department of Horticulture,  
Sindh Agriculture University,  
Tandojam, Pakistan

**Rayees Ahmad Bhat**

Department of Zoology,  
Kurukshetra University,  
Kurukshetra, India

**Mohammad Alamgeer zimri**

Department of Horticulture,  
Sindh Agriculture University,  
Tandojam, Pakistan

**Safdar Ali Wahocho**

Department of Horticulture,  
Sindh Agriculture University,  
Tandojam, Pakistan

**Abdul Sami khan Durrani**

Department of Horticulture,  
Sindh Agriculture University,  
Tandojam, Pakistan

**Syed Masoom Ahmed Shah**

Department of Horticulture,  
Sindh Agriculture University,  
Tandojam, Pakistan

**Asmat Ullah Mandokhail**

Department of Horticulture,  
Sindh Agriculture University,  
Tandojam, Pakistan

**Correspondence****Abdul Qadir Gola**

Department of Horticulture,  
Sindh Agriculture University,  
Tandojam, Pakistan

## Response of various varieties rate of NPK fertilizer on brinjal (*Solanum melongena* L.)

**Muhammad Usman Kasi, Abdul Qadir Gola, Rayees Ahmad Bhat, Mohammad Alamgeer zimri, Safdar Ali Wahocho, Abdul Sami khan Durrani, Syed Masoom Ahmed Shah and Asmat Ullah Mandokhail**

### Abstract

Nitrogen is an essential nutrients and vegetative growth of plant and levels as well as reproductive growth and yield. Therefore, the experimental design to response of brinjal various varieties rate of NPK fertilizer to the various levels (0, 50, 75 kg ha<sup>-1</sup>). The nitrogen is the successive summer seasons of 2016-17 year at the Sindh Agriculture University TandoJam, Pakistan. The all treatments randomized complete block design (Factorial) RCBD plot with three replication consider the nitrogen levels as the main treatments and brinjal cultivars (Black beauty and Black pearl) nitrogen levels showed the significant various growth are plant height (cm), number of branches plant<sup>-1</sup>, number of fruits plant<sup>-1</sup>, fruit length (cm), weight single fruit (g), weight fruits plant<sup>-1</sup>(g), fruit yield plot<sup>-1</sup> (kg) and fruit yield (m tons) the marketable fruits yield (m tons). However, among the recorded fruits cultivars that the Black pearl with 150 kg ha<sup>-1</sup> showed the better results regarding growth and better yield.

**Keywords:** Brinjal, NPK dose, cultivars, growth and fruits yield

### Introduction

Brinjal is an important vegetable crop and widely grown in Pakistan.

Brinjal (*Solanum melongena* L.) is one of the most important popular vegetable crops and widely grown in Pakistan. Its *Solanaceae* family the cultivars is one of the leading major crop and consider as a national diet in manure other tropical and sub-tropical. Its bear fruits commonly use as vegetable cooking [1]. The plant flourishes in hot climates but cannot tolerate drought [2]. According to USDA (2010) 93% (percent) of output coming from the seven other countries with only china produce 55 percent of the world wide output and India 28% (percent) the brinjal remains field for the long period of time supposed to be heavy feeder so one or two dressing of fertilizer are the necessary [3]. Brinjal production with associated numerous factors including balance application is essential required nutrient elements. The uses of fertilizer is an age long practices in agriculture sectors when it applied NPK could be improve the crop growth and development and fertility as well as quality. The yield depends upon the several production factors among the proper uses and the nutrients play the significant role and nitrogen is consider as one of the essential macronutrients required for their plant growth and developments. The most of crop like eggplant is a heavy feeder and occupied the ground for long period and fertilizer may be necessary for its production. The uses of fertilizer is an age long practices in agriculture when applied with least could improve growth and development as well as crop quality and quantity and enhance soil fertility thereby sustain crop production. Similarly, NPK is an essential nutrient as part of several the key plant and structural components [4]. Plant involves in controlling the key to enzyme reaction and the regulation pathway and potassium is one of the sixteen most essential nutrients and required for plant growth reproduction. It is macronutrients as nitrogen phosphorus and potash is to uses the express contents of various fertilizers the potassium contain it has key role in photosynthesis to control ionic balance protein synthesis plant and increase vegetative growth fruit yield [5].

Nitrogen being key nutrients for improves plants and growth yield. Furthermore plant which to receive the high NPK dose to fastest produce the flower bud earlier had larger number of flowers and increase with 60 kg and total kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> brinjal variety. However the lack of some knowledge about the nutrients required in hybrid culture of brinjal [6]; that recommended

rates of NPK recorded the highest value of the plant height (1060.90 cm) and primary branches (11.66 cm), number of leaves (94.0 plant<sup>-1</sup>) and that 100:50:50 kg NPK plant<sup>-1</sup> results in the greatest number of fruits (26.64) fruits length (10.77 cm), fruits girth (10.03cm), fruit weight (54.11 g) and fruit yield (1.43 kg ha<sup>-1</sup>) in brinjal. The NPK at 75:35:0 kg ha<sup>-1</sup> recorded that the earliest 50% (percent) of flowering in brinjal and plants height fruit seed yield ha<sup>-1</sup> increase with the rate of N the highest seed yield 7.32 ha<sup>-1</sup> the observed following application 200 kg N ha<sup>-1</sup> N ha<sup>-1</sup> splitting the N dose has no beneficial to effects on brinjal fruits. The NPK increase the plant yield and compare the crop weight which was treated the organic fertilizer [7, 8, 9]. The important to enhance production quality of the plants probably the most important that amount applied NPK fertilizer at 75% (percent) the recommended dose N P and 100% (percent) of K and 75 kg N 37.5 kg P 22 Kg ha<sup>-1</sup> favorably the influencing growth and yield [10]. The increase NPK rate and plant height at 200: 100 kg ha<sup>-1</sup> to observed nitrogen at 125 kg phosphorus at 60 kg ha<sup>-1</sup> significant increasing early yield.

However, the nitrogen 187 and phosphorus 60 kg ha<sup>-1</sup> founded to be the most optimum levels for obtaining the highest marketable and fruits yield [11]. The nitrogen levels 50-150 kg ha<sup>-1</sup> significantly increase the fruit yield. The optimum dose of nitrogen, phosphorus and potassium fertilizer levels 150:75:75:25: kg N, P, K ha<sup>-1</sup> the delay flowering plots when the crop on 26 may in brinjal. Moreover, significant improvements and vegetative characters of brinjal such as plant height and number of leaves ha<sup>-1</sup> when N was applied at the rate of 75 kg ha<sup>-1</sup> the observe study and the response of brinjal of varieties and rates of NPK fertilizer, and these having yield and vegetative development flower initiation horticultural crops. Since brinjal is attacked by many insect pest and pesticides are used extensively to reduce economics losses caused by this attack by the number of insect pests from nursery stage till the harvesting, among the resistant to multiple insect of brinjal including orbobalis, spotted leaf beetle, mealybug, aphid, leafhopper and whitefly. This work has it as objectives to response of different varieties rate of NPK fertilizer on brinjal in order to keep the investigate in to the contribution of appropriate fertilizer plants and growth yield.

## Materials and methods

The present research was conducted to investigate the response of various varieties of NPK fertilizer on brinjal. The experiment was laid out at the experimental area in the orchard, Department of Horticulture, Sindh Agriculture University Tando Jam during the 2016-17 in a three replicated Randomized Complete Block Design (RCBD). The brinjal varieties (Black beauty and Black pearl) were planted in a plot size 3m x 3.5m (10.50m<sup>2</sup>). The land was prepared by giving 2 dry plowing following by land leveling. The different NPK fertilizer combinations like Control [F1 Untreated] F2 NPK 50-25-0 Kg ha<sup>-1</sup> F3 NPK 100-25-0 Kg ha<sup>-1</sup> F4 NPK 100-50-0 Kg ha<sup>-1</sup> F5 NPK 150-75-0 Kg ha<sup>-1</sup> F6 NPK 150-75-50 Kg ha<sup>-1</sup> were tested and applied at the time of sowing by mixing in the soil, while the remaining NPK dose was applied in first after one month of sowing and second at one month interval. The observation was recorded on the parameters that included. Plant height cm, number of branches plant<sup>-1</sup> number of fruit

plant<sup>-1</sup>, length of fruit cm, weight of single fruit g, weight of fruit plant<sup>-1</sup> kg, fruit yield plot<sup>-1</sup> kg and marketable fruit yield m tons.

## Statistical analysis

Collected data were subjected for statistical analysis using 8.1 Statistix (2006), In order to know the superiority of treatments the least significant different (LSD) test at (0.05) probability level was performed.

## Results and Discussion

### Plant height cm

The plant height is a major growth trait and generally influenced by the genetic makeup parental materials of varieties but the influence of input is pronounced [12]. The brinjal varieties (black beauty and black pearl) as the affected by using various NPK levels in table 1 the analysis various as the described the effect of NPK fertilizer and the plant height significantly highest as (108.23 cm) the brinjal crop fertilizer with the highest NPK levels 150-75-150-0 kg ha<sup>-1</sup> and 100-50-0 kg ha<sup>-1</sup> respectively plant height and further brinjal depreciated to the (77.68cm) and (65.65 cm) the crop was fertilized with the 100-25-0 kg ha<sup>-1</sup> and 50-25-0 kg ha<sup>-1</sup> respectively [13, 14]; reported that the control plots binjal plant height cm the declined sharply to lowest (52.00 cm) the further results showed 84.50 cm) then the black pearl (80.27 cm) the integration both effect on brinjal and NPK levels. That plant height and brinjal varieties to which the effect black beauty was the greater.

**Table 1:** Plant height cm of brinjal varieties under the different NPK levels

Treatments	Varieties		Mean
	Black Beauty	Black Pearl	
F <sub>1</sub> = Control	53.33	50.67	52.00 F
F <sub>2</sub> = NPK 50-25-0 kg ha <sup>-1</sup>	67.33	63.97	65.65 E
F <sub>3</sub> = NPK 100-25-0 kg ha <sup>-1</sup>	79.67	75.68	77.68 D
F <sub>4</sub> = NPK 100-50-0 kg ha <sup>-1</sup>	88.00	83.60	85.80 C
F <sub>5</sub> = NPK 150-75-0 kg ha <sup>-1</sup>	107.67	102.28	104.97 B
F <sub>6</sub> = NPK 150-75-50 kg ha <sup>-1</sup>	111.00	105.45	108.23 A
Mean	84.50 A	80.27 B	

S.E. 0.7912

LSD 0.05 1.6408

### Number of branches plant<sup>-1</sup>

Influence by the genetic of variety in plant is most probably. However, the uses input and proper management these traits positively the results in brinjal variety (black beauty and black pearl) as affected the various NPK levels present in table 2 the results relation in to number of branches plant<sup>-1</sup> in various analysis on NPK levels the number of branches plant<sup>-1</sup> was significant the maximum (7.54) the brinjal plantation with fertilizer highest NPK levels 150-75-50-0 kg ha<sup>-1</sup> by the (6.94) average number of branches plant<sup>-1</sup> the crop with NPK fertilizer with the 100-25-0 kg ha<sup>-1</sup> to (5.66) and (4.77) plant<sup>-1</sup> when the fertilizer with 100-25-0 and 50-25-0 kg ha<sup>-1</sup> respectively [15, 16]. In control plot number of branches reduce markedly (4.29) and the plant results further showed that the number of branches plant<sup>-1</sup> variety of brinjal.

**Table 2:** Number of branches plant<sup>-1</sup> brinjal varieties under the different NPK levels

Treatments	Varieties		Mean
	Black Beauty	Black Pearl	
F <sub>1</sub> = Control	4.40	4.18	4.29 F
F <sub>2</sub> = NPK 50-25-0 kg ha <sup>-1</sup>	4.99	4.74	4.87 E
F <sub>3</sub> = NPK 100-25-0 kg ha <sup>-1</sup>	5.81	5.52	5.66 D
F <sub>4</sub> = NPK 100-50-0 kg ha <sup>-1</sup>	6.54	6.21	6.38 C
F <sub>5</sub> = NPK 150-75-0 kg ha <sup>-1</sup>	7.12	6.76	6.94 B
F <sub>6</sub> = NPK 150-75-50 kg ha <sup>-1</sup>	7.74	7.35	7.54 A
Mean	6.10 A	5.79 B	

S.E. 0.0596

LSD 0.05 0.1236

**Number of fruits plant<sup>-1</sup>**

The data regarding number of fruit plant<sup>-1</sup> the fruiting vegetable like brinjal is mainly influence by nutrients available the soil. The varieties (black beauty and black pearl) as effected various NPK levels to indicate the table 3 the analysis as various describe that NPK varieties and the number of fruit plant<sup>-1</sup> was significant the results show that the maximum number of fruits (14.98) plant<sup>-1</sup> was recorded brinjal crop and receiving highest NPK of 150-75-50 kg ha<sup>-1</sup> followed by (13.83) and the average number of fruits receiving the fertilizer with NPK levels 150-75-0 and 100-50-0 kg ha<sup>-1</sup> respectively [17, 18]. the simultaneously reduce the number of fruits i.e (11.03 and 8.01) with decreasing NPK levels up to 100-25-0 and 50-25-0 kg ha<sup>-1</sup> and the least

number of fruits plant<sup>-1</sup> (6.24) was noted in control.

**Table 3:** Number of fruits plant<sup>-1</sup> of brinjal varieties under the different NPK levels

Treatments	Varieties		Mean
	Black Beauty	Black Pearl	
F <sub>1</sub> = Control	6.43	6.05	6.24 F
F <sub>2</sub> = NPK 50-25-0 kg ha <sup>-1</sup>	8.26	7.77	8.01 E
F <sub>3</sub> = NPK 100-25-0 kg ha <sup>-1</sup>	11.37	10.69	11.03 D
F <sub>4</sub> = NPK 100-50-0 kg ha <sup>-1</sup>	13.54	12.73	13.13 C
F <sub>5</sub> = NPK 150-75-0 kg ha <sup>-1</sup>	14.26	13.40	13.83 B
F <sub>6</sub> = NPK 150-75-50 kg ha <sup>-1</sup>	15.44	14.52	14.98 A
Mean	11.55 A	10.86 B	

S.E. 0.1073

LSD 0.05 0.2225

**Fruit length cm**

The fruit length is a trait of great importance to directly proportional for fruit yield. The length of fruit and brinjal varieties (black beauty and black pearl) as the affected by various on NPK levels present in table 4 its analysis of various effect on NPK levels of fruit (11.72 cm), length of fruits was observed in brinjal crop receiving highest NPK levels of 150-75-50 kg ha<sup>-1</sup> the fruit length cm recorded from the crop fertilized with the NPK levels 150-75-0 kg ha<sup>-1</sup> and fruit length of brinjal variety was further recorded (9.77) further more results in (8.92 cm and 7.93) cm also recorded the crop yield [19].

**Table 4:** Length of fruit (cm) of brinjal varieties under the different NPK levels

Treatments	Varieties		Mean
	Black Beauty	Black Pearl	
F <sub>1</sub> = Control	7.20	6.84	7.02 F
F <sub>2</sub> = NPK 50-25-0 kg ha <sup>-1</sup>	8.13	7.72	7.93 E
F <sub>3</sub> = NPK 100-25-0 kg ha <sup>-1</sup>	9.15	8.69	8.92 D
F <sub>4</sub> = NPK 100-50-0 kg ha <sup>-1</sup>	10.02	9.52	9.77 C
F <sub>5</sub> = NPK 150-75-0 kg ha <sup>-1</sup>	10.96	10.41	10.69 B
F <sub>6</sub> = NPK 150-75-50 kg ha <sup>-1</sup>	12.02	11.42	11.72 A
Mean	9.58 A	9.10 B	

S.E. 0.0974

LSD 0.05 0.2019

**Weight of single fruit (g)**

The weight of fruit is directly proportional fruit yield and the higher single fruit weight. The greatest fruit yield subjected to the plant population. The results in relation weight of single fruits of brinjal (black beauty and black pearl) as the influenced by various NPK levels are recorded in table in table 5 the analysis of variance to indicated that the single

fruit weight of brinjal significant affected different NPK levels to recorded [20]. It can be seen from the results that maximum weight fruits (103.37 g) was recorded crop fertilizer with the highest NPK levels 150-75-50-0 kg ha<sup>-1</sup> the following closely single fruit weight (94.23 g and 86.15 g) to be observed crop fertilizer with the NPK levels

**Table 5:** Weight of single fruits g of brinjal varieties under the different NPK levels

Treatments	Varieties		Mean
	Black Beauty	Black Pearl	
F <sub>1</sub> = Control	64.86	59.02	61.94 F
F <sub>2</sub> = NPK 50-25-0 kg ha <sup>-1</sup>	73.20	66.61	69.91 E
F <sub>3</sub> = NPK 100-25-0 kg ha <sup>-1</sup>	82.41	74.99	78.70 D
F <sub>4</sub> = NPK 100-50-0 kg ha <sup>-1</sup>	90.21	82.09	86.15 C
F <sub>5</sub> = NPK 150-75-0 kg ha <sup>-1</sup>	98.67	89.79	94.23 B
F <sub>6</sub> = NPK 150-75-50 kg ha <sup>-1</sup>	108.24	98.50	103.37 A
Mean	86.26 A	78.50 B	

S.E. 0.8621

LSD 0.05 1.7879

**Weight of fruit plant<sup>-1</sup> (g)**

The influence by fruit weight plant subject to the proper plant population. The pertaining data fruit weight plant<sup>-1</sup> the brinjal

varieties (black beauty and black pearl) [21]. As that reported the affected by different NPK levels given in table 6 the analysis various that fruits weight plant<sup>-1</sup> of brinjal was

significant by the various NPK levels and results showed that maximum fruit weight (1552.2 kg) the pots produce by fertilizer with the highest NPK levels 150-75-50-0 kg ha<sup>-1</sup> and closely followed fruit weight (1305.5 kg) there was a considerable reduction in the weight i.e (1133.8 kg, 870.1 and 561.6 kg) to achieve from the plot fertilizer with NPK respectively levels.

**Table 6:** Weight of fruits plant<sup>-1</sup> (g) of brinjal varieties under the different NPK levels

Treatments	Varieties		Mean
	Black Beauty	Black Pearl	
F <sub>1</sub> = Control	417.5	357.2	387.3 F
F <sub>2</sub> = NPK 50-25-0 kg ha <sup>-1</sup>	605.3	517.8	561.6 E
F <sub>3</sub> = NPK 100-25-0 kg ha <sup>-1</sup>	937.9	802.3	870.1 D
F <sub>4</sub> = NPK 100-50-0 kg ha <sup>-1</sup>	1222.1	1045.4	1133.8 C
F <sub>5</sub> = NPK 150-75-0 kg ha <sup>-1</sup>	1407.3	1203.8	1305.5 B
F <sub>6</sub> = NPK 150-75-50 kg ha <sup>-1</sup>	1673.1	1431.2	1552.2 A
Mean	1043.9 A	892.9 B	

S.E. 19.958  
LSD 0.05 41.390

### Fruit yield plot<sup>-1</sup> (kg)

The results in relation to fruit yield plot<sup>-1</sup> brinjal varieties (black beauty and black pearl) the influence by various NPK levels presented in table 7 the various analysis results suggested the fruits yield plot<sup>-1</sup> was significant and its evident from the results brinjal fruits yield markedly higher (21.18 kg) when the cop fertilize with highest NPK 150-75-50 kg ha<sup>-1</sup> by fruits yield (17.82 kg) and decreasing (15.47 kg, 11.87 kg and 7.66 kg) the brinjal crop fertilized NPK rate of the 100-50-0 kg and 50-25-0 kg and respectively. However the minimum quality and fruit yield [22].

**Table 7:** Fruit yield plot<sup>-1</sup> (kg) of brinjal varieties under different NPK levels

Treatments	Varieties		Mean
	Black Beauty	Black Pearl	
F <sub>1</sub> = Control	5.70	4.87	5.28 F
F <sub>2</sub> = NPK 50-25-0 kg ha <sup>-1</sup>	8.26	7.06	7.66 E
F <sub>3</sub> = NPK 100-25-0 kg ha <sup>-1</sup>	12.80	10.95	11.87 D
F <sub>4</sub> = NPK 100-50-0 kg ha <sup>-1</sup>	16.68	14.27	15.47 C
F <sub>5</sub> = NPK 150-75-0 kg ha <sup>-1</sup>	19.21	16.43	17.82 B
F <sub>6</sub> = NPK 150-75-50 kg ha <sup>-1</sup>	22.83	19.53	21.18 A
Mean	14.24 A	12.18 B	

S.E. 0.2727  
LSD 0.05 0.5656

### Fruit yield (m tones)

The fruit yield calculate the basis on fruits and yield the results in the relation to yield brinjal varieties (black beauty and black pearl) the both affected by different levels and to indicated that NPK levels on fertilizer and yield varieties. The data show in the table 8 maximum fruits yield m tones achieve the plot fertilizer with highest NPK levels 150-75-50-0 kg ha<sup>-1</sup> the fruits yield followed by (16972 m tones) obtain from the given NPK fertilizer rate of 150-75-0 kg ha<sup>-1</sup> the considerably i. e (14739 m tones and 11311 m tones) when the brinjal crop was minimum fruits yield (5035 m tones) observed in the control where no NPK fertilizer was applied [23, 24].

**Table 8:** Fruit yield (m tons) of brinjal varieties under the different NPK levels

Treatments	Varieties		Mean
	Black Beauty	Black Pearl	
F <sub>1</sub> = Control	5428	4643	5035 F
F <sub>2</sub> = NPK 50-25-0 kg ha <sup>-1</sup>	7869	6731	7300 E
F <sub>3</sub> = NPK 100-25-0 kg ha <sup>-1</sup>	12192	10429	11311 D
F <sub>4</sub> = NPK 100-50-0 kg ha <sup>-1</sup>	15887	13590	14739 C
F <sub>5</sub> = NPK 150-75-0 kg ha <sup>-1</sup>	18295	15649	16972 B
F <sub>6</sub> = NPK 150-75-50 kg ha <sup>-1</sup>	21751	18605	20178 A
Mean	13570 A	11608 B	

S.E. 259.45  
LSD 0.05 538.07

### Conclusion

From the overall results, it was concluded that NPK concentration showed more positive effect on growth related traits of brinjal. The highest levels of NPK 150-75-50 kg ha<sup>-1</sup> produce the maximum better yield and yield component between NPK 150-75-50 and 150-75-0 kg ha<sup>-1</sup>. Hence the considered as optimum levels for economically higher fruits ha<sup>-1</sup> in brinjal it is suggested that rate of NPK fertilizer able to use provide positive results and vegetative reproductive growth and yield.

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