

## Effect of Chemical Fertilizers on Plant Growth and Fruit Productivity of Okra (*Abelmoschus esculentus* L.) cv. Mahi-45.

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### Abstract

This study was conducted to determine the effect of different levels of inorganic fertilizers (NPK) on growth, fruit yield and quality of Okra cv. Mahi-45. Seven treatments were included in the trial. The results showed that inorganic fertilizers treatments had significant effect on all study parameters. The maximum plant height (162.67 cm), number of branches per plant (5.00), number of leaves per plant (37.33), fruit length (14.53 cm), fruit diameter (1.88 cm), number of fruits per plant (35.00), fruit yield per plant (563.88 g), fruit yield per plot (5074.95 g) and fruit yield (50.75 t/ha) were produced by the treatment (T<sub>6</sub>) with (150:125:125 kg/ha of NPK) respectively. While the minimum plant height (60.00 cm), number of branches per plant (1.33), number of leaves per plant (21.00), fruit length (7.87 cm), fruit diameter (1.18 cm), number of fruits per plant (18.00), fruit yield per plant (162.87 g), fruit yield per plot (1465.80 g) and fruit yield (14.66 t/ha) were recorded by the treatment (T<sub>1</sub>) with (control) respectively.

**Key words:** Okra, Inorganic Fertilizers, Growth, Yield and Quality.

### تأثير التسميد الكيميائي على النمو والإنتاجية لمحصول الباميا (*Abelmoschus esculentus* L.) cv. Mahi-45.

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### الخلاصة

أجريت هذه الدراسة لتحديد تأثير مستويات مختلفة من الأسمدة الكيميائية على النمو، الإنتاجية والصفات النوعية لمحصول الباميا. تضمنت الدراسة سبع معاملات. أظهرت الدراسة إن جميع معاملات الأسمدة الغير عضوية تفوقت معنوياً مقارنة بمعاملة المقارنة في جميع الصفات المدروسة. وكانت المعاملة (T<sub>6</sub>) أكثرهم تفوقاً وأعطت أعلى ارتفاع للنبات 162.67 سم، عدد الأفرع 5، عدد الأوراق للنبات الواحد 37.33، طول الثمرة 14.53 سم، قطر الثمرة 1.88 سم، عدد الثمار للنبات الواحد 35، الإنتاجية للنبات الواحد 563.88 غم، الإنتاجية للقطاع الواحد 5074.95 غم والإنتاجية للهكتار 50.75 طن بالترتيب. بينما سجلت معاملة المقارنة (T<sub>1</sub>) 60 سم، 1.33، 21، 7.78 سم، 1.18 سم، 18، 162.87 غم، 1465.8 غم و 14.66 طن على الترتيب.

**الكلمات المفتاحية:** باميا، الأسمدة غير العضوية، نمو، حاصل وصفات نوعية.

## Introduction

Okra (*Abelmoschus esculentus*) is one of the most important pod vegetables in sub-tropical and tropical regions belonging to the family of Malvaceae. Okra is the sixth important vegetable crop having an area, production and productivity viz., 3.26 lakh/ha 33.80 lakh tonnes and 10.4 t/ha, respectively. It contributes 5.50% and 3.86% of total area and production under vegetable crop. Okra is specially valued for its tender fruit and nutritive value. A 100g consumable unripe fruit contain 10.4g Dry matter, 3.1g Caloric energy, 1.8g protein, 90mg Calcium, 1.0mg Iron, 0.1mg Carotene, 6.07mg Thiamin, 0.08mg Riboflavin, 0.08mg Niacin and 18mg Vitamin C (Selvi *et al.*, (1997)... Okra is cultivated for its fibrous fruits or pods containing round, white seeds (Mohammadi, *et al.*, 2011). Okra may be grown in the warmer parts of the world when special efforts are made to provide the proper environmental conditions. Several workers have been reported that increased in yield of okra with the application of N from 56 to 150 kg/ha, P from 120 to 250 kg/ha and 120 to 250 kg/ha of K (Hooda, *et al.*, 1980); (Mani and Ramanathan, 1980); (Majanbu *et al.*, 1985) and (Singh, 1995). Sarfraz *et al.*, (1998) reported significant increase of growth and yield in Carrot, Radish and Tomato with the application of chemical fertilizers. Chemical fertilizers can influence fruiting and fruit development of okra. Keeping the above facts in view the benefits of inorganic fertilizers, the experiment was conducted to find out the suitable inorganic fertilizers for better growth, yield and quality of Okra.

## Materials and Methods

A field experiment was carried out at Horticultural Experimental Field, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Deemed-to-be University, (formerly known as Allahabad Agricultural Institute-AA-IDU), during summer season of 2013. Seven treatments were included in the trial viz; T<sub>1</sub> control; T<sub>2</sub> (50:25:25 kg/ha of NPK); T<sub>3</sub> (75:50:50 kg/ha of NPK); T<sub>4</sub> (100:75:75 kg/ha of NPK); T<sub>5</sub> (125:100:100 kg/ha of NPK); T<sub>6</sub> (150:125:125 kg/ha of NPK) and T<sub>7</sub> (175:150:150 kg/ha of NPK) were tested in three replication. The experiment of design was randomized complete block design (RCBD). The seeds of Mahi-45 were produced by Mahi Seeds Pvt.Ltd. (Hyderabad). The experimental site is fairly level land with sandy loam soil of uniform fertility status with low clay and high sand percentage. Composition soil sample were collected at random spots from depth of 0-30 cm and the soil was analyzed for pH, electrical conductivity (EC) (dSm<sup>-1</sup> at 25<sup>0</sup> C) , organic carbon%, available nitrogen kg/ha, available phosphorus kg/ha and available potassium kg/ha are 6.87, 0.51, 0.44, 212.56, 37.32 and 210.05 respectively. Fertilizer treatments with half dose of nitrogen and complete dose of phosphorus and potash were applied according to treatments at planting, while the other half dose of nitrogen was applied 30 days after planting. The sources of nitrogen, phosphorus and potash were urea (46 %), single super phosphate (16 % P<sub>2</sub>O<sub>5</sub>) and mutilate of potash (60%

K<sub>2</sub>O) respectively. The size of plot was 1m<sup>2</sup> spacing 30 cm between plant to plant (9 plants/plot) and 30 cm between two rows. The plots were kept free from weeds throughout the growth period by weeding at regular intervals. Immediately after planting a light irrigation was done and later irrigation was done depending upon the moisture requirement of the soil. The crop was attacked by insects like grasshoppers, Jassids and White fly, was controlled by spraying Quinolphas 25 EC and Endosulphos at 1ml/litre of water. Diseases like Yellow Vein Mosaic Virus (YVMS), was controlled by spraying Synthetic Engyme at 5ml/litre of water and by cultural practices. Thinning was done to maintain one plant per hill when it reaches 3-4 leaf stage. Observations were recorded on five randomly selected plants of each treatment to assess the effect of treatments on growth, development and yield of fruit. First picking was done at 50 day after sowing. All the recorded observations were subjected to the statistical analysis. Data were analysed statistically using the method given by (Cochron and Cox, 1992).

### Results and Discussion

The experimental findings of the present investigation. An endeavour has been made to elicit the influence of inorganic fertilizers on growth and fruit yield. The observations recorded at the successive stages of crop growth were analyzed statistically and are presented in the following :-

### Plant Height (cm)

The plant height was influenced by different of inorganic fertilizers and the result was found to be significant. The significantly maximum plant height (162.67 cm) was observed in the treatment (T<sub>6</sub>) followed by the treatment T<sub>7</sub> (160.00 cm). The plant height was found to be minimum (60.00 cm) in the treatment (T<sub>1</sub>). The result of the plant height obtained in present experiment clearly showed that the application of inorganic fertilizers effectively increased the plant height. This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

Various workers have been reported increases in plant height with inorganic fertilizers application (Taya *et al.*, 1994).

### Number of Leaves per Plant

The number of leaves per plant was found to be significant among the treatment. The significantly maximum number of leaves per plant (37.33) was observed in the treatment (T<sub>6</sub>) followed by the treatment T<sub>7</sub> (35.00). The number of leaves per plant was found to be minimum (21.00) in the treatment (T<sub>1</sub>). The increase in number of leaves per plant may be due to the maximum growth of plant stimulated through supply of adequate amount of inorganic fertilizers This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

. The results are conformation with the application of inorganic fertilizers by (Alkaff and Hassan, 2003).

**Number of Branches per Plant**

The number of branches per plant was found to be significant among the treatment. The significantly maximum number of branches per plant (5.00) was observed in the treatment (T<sub>6</sub>) followed by the treatment T<sub>7</sub> (4.67). The number of branches per plant was found to be

minimum (1.33) in the treatment (T<sub>1</sub>). This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

The results are conformation with the application of inorganic fertilizers by (Kadlag *et al.*, 2005). Table. (1)

**Table (1)** Effect of Inorganic Fertilizers (NPK) on Plant Growth of Okra cv. Mahi-45.”

Treatments	Plant height(cm)	No.of leaves	No.of branches
T <sub>1</sub> control	60.00	21.00	1.33
T <sub>2</sub> (50:25:25 kg/ha of NPK)	107.67	24.00	3.00
T <sub>3</sub> (75:50:50 kg/ha of NPK)	122.33	25.00	3.33
T <sub>4</sub> (100:75:75 kg/ha of NPK)	132.33	29.00	3.67
T <sub>5</sub> (125:100:100 kg/ha of NPK)	142.33	32.00	4.00
T <sub>6</sub> (150:125:125 kg/ha of NPK)	162.67	37.33	5.00
T <sub>7</sub> (175:150:150 kg/ha of NPK)	160.00	35.00	4.67
F-test	S	S	S
S.Ed	1.90	0.38	0.28
C.D at 5%	4.14	0.82	0.62

**Number of Fruits per Plant**

From data represented it has been observed that different inorganic fertilizers had significant influence on total number of fruits per plant. It is recorded that the treatment (T<sub>6</sub>) have significantly maximum fruits per plant (35.00) followed by the treatment T<sub>7</sub> (34.33). The number of fruits per plant was found to be minimum (18.00) in treatment (T<sub>1</sub>). This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

The result on increase the number of fruits per plant obtained in present

experiment clearly showed that the application of inorganic fertilizers effectively increased the number of fruits per plant. Various workers have been reported increase in number of fruits per plant with inorganic fertilizers application (Alkaff and Hassan, 2003).

**Fruit Length (cm)**

From data represented it has been observed that different inorganic fertilizers had significant influence on fruit length. It is recorded that the treatment (T<sub>6</sub>) have significantly maximum fruit length (14.53 cm)

followed by the treatment T<sub>7</sub> (13.55 cm). The fruit length was found to be minimum (7.87 cm) in treatment (T<sub>1</sub>). The inorganic fertilizers application was found to be very effective to influence the size of fruit. This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

The results are conformation with the application of inorganic fertilizers by (Prabu *et al.*, 2003).

### Fruit Diameter (cm)

From data represented it has been observed that different inorganic fertilizers had significant influence on fruit diameter. It is recorded that the treatment (T<sub>6</sub>) have significantly maximum fruit diameter (1.88 cm) followed by the treatment T<sub>7</sub> (1.82 cm). The fruit diameter was found to be minimum (1.18 cm) in treatment (T<sub>1</sub>). The inorganic fertilizers application was found to be very effective to influence the size of fruit. This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

. The results are conformation with the application of inorganic fertilizers by (Gupta *et al.*, 1981). Table. (2).

**Table (2)** Effect of Inorganic Fertilizers (NPK) on Fruit Quality of Okra cv. Mahi-45.”

Treatments	No. of fruits	Fruit length (cm)	Fruit diameter (cm)
T <sub>1</sub> control	18.00	7.87	1.18
T <sub>2</sub> (50:25:25 kg/ha of NPK)	29.00	9.75	1.33
T <sub>3</sub> (75:50:50 kg/ha of NPK)	31.00	10.33	1.43
T <sub>4</sub> (100:75:75 kg/ha of NPK)	32.00	11.65	1.55
T <sub>5</sub> (125:100:1 00 kg/ha of NPK)	33.33	12.52	1.77
T <sub>6</sub> (150:125:1 25 kg/ha of NPK)	35.00	14.53	1.88
T <sub>7</sub> (175:150:1 50 kg/ha of NPK)	34.33	13.55	1.82
F-test	S	S	S
S.Ed	0.46	0.05	0.01
C.D at 5%	0.99	0.11	0.03

### Fruit Yield per Plant (g)

The fruit yield per plant was found to be significant among the treatment. The significantly maximum fruit yield per plant (563.88 g) was observed in the treatment (T<sub>6</sub>) followed by the treatment T<sub>7</sub> (506.42 g). The fruit yield per plant was found to be minimum (162.87 g) in the treatment (T<sub>1</sub>). This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

The results are conformation with the application of inorganic fertilizers by (Vimala and Natarajan, 2001) . Increase in yield with the application of inorganic fertilizers was conformation also by (Nuru *et al.*, 2003).

### Fruit Yield per Plot (g)

The fruit yield per plot was found to be significant among the treatment. The significantly maximum fruit yield per plot (5074.95 g) was observed in the treatment (T<sub>6</sub>) followed by the treatment T<sub>7</sub> (4557.75 g). The fruit yield per plot was found to be minimum (1465.80 g) in the treatment (T<sub>1</sub>) . This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

The results are conformation with the application of inorganic fertilizers by

(Vimala and Natarajan, 2001) . Increase in yield with the application of inorganic fertilizers was also conformation by (Nuru, *et al.*, 2003).

### Fruit Yield t/ha

The fruit yield t/ha was found to be significant among the treatment. The significantly maximum fruit yield t/ha (50.75 t/ha) was observed in the treatment (T<sub>6</sub>) followed the treatment T<sub>7</sub> (45.58 t/ha). The fruit yield t/ha was found to be minimum (14.66 t/ha) in the treatment (T<sub>1</sub>). This is probably due to the good treatment combination by which optimum dose of NPK are supplied to the plants.

The results are conformation with the application of inorganic fertilizers by (Vimala and Natarajan, 2001). Increase in yield with the application of inorganic fertilizers was also conformation by (Nuru *et al.*, 2003). Table. (3).

**Table (3)** Effect of Inorganic Fertilizers (NPK) on Fruit Productivity of Okra cv. Mahi-45.’’

Treatments	Fruit yield/plant(g)	Fruit yield/plot (g)	Fruit yield t/ha
T <sub>1</sub> control	162.87	1465.80	14.66
T <sub>2</sub> (50:25:25 kg/ha of NPK)	308.88	2779.95	27.80
T <sub>3</sub> (75:50:50 kg/ha of NPK)	351.32	3161.85	31.62
T <sub>4</sub> (100:75:75 kg/ha of NPK)	408.07	3672.60	36.73
T <sub>5</sub> (125:100:100 kg/ha of NPK)	454.97	4094.70	40.95
T <sub>6</sub> (150:125:125 kg/ha of NPK)	563.88	5074.95	50.75
T <sub>7</sub> (175:150:150 kg/ha of NPK)	506.42	4557.75	45.58
F-test	S	S	S
S.Ed	5.22	47.02	0.47
C.D at 5%	11.38	102.46	1.02

**Conclusion**

On the basis of present investigation, it is concluded that treatment (T<sub>6</sub>) with (150:125:125 kg/ha of NPK) was found to be best treatment in terms of vegetative growth, fruit yield and quality of Okra (*Abelmoschus esculentus*). cv. Mahi-45.

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