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Studies on effect of different sources of nitrogen on growth and yield of okra [*Abelmoschus esculentus* (L.) Moench]

R.B. SHELAR *, A.S. KADAM, V.K. PATIL AND P.B. NARSUDE
Department of Horticulture, College of Agriculture, Marathwada Agricultural University, Latur, (M.S.) INDIA

ABSTRACT

The growth parameters *viz.,* plant height, number of leaves, leaf area, number of branches, number of nodes and length of internode have been significantly influenced by different treatments. The plant height was maximum in treatment T_9 (50 per cent N through urea + 50 per cent N through neem cake). The growth in terms of number of leaves, leaf area, number of branches, number of nodes was significantly higher in the treatment T_9 (50 per cent N through urea + 50 per cent N through neem cake). Length of internode was found minimum in treatment T_4, while it was maximum in treatment T_8. All yield contributing characters like weight, breadth and length of fruit, number of fruits per plant and yield per hectare were significantly influenced due to different treatments tried. The treatment T_9 recorded significantly maximum weight, breadth and length (10.47 g, 1.50 cm and 9.54, respectively) of okra fruit. The number of fruits per plant was maximum (19.56) with treatment T_9. The highest yield (154.47 q ha^{-1}) was obtained in treatment T_9 (50 per cent N through urea + 50 per cent N through neem cake).

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Key words : Growth, Yield, Vermicompost, Urea neem cake, Okra

INTRODUCTION

Vegetables play an important role in human diet. Okra or bhindi [*Abelmoschus esculentus* (L.) Monech] is mainly cultivated for its immature fruits which are used as vegetable. It is also useful in clarification of juice during jaggery making. Application of higher levels of fertilizer inputs and pesticides could lead to residue in grains, fruits and vegetables. The residual toxicity levels reported to be more in fruits and vegetables as compared to grains. The ill effects of chemicals in agriculture has been documented by Carson (1962). The large scale use of chemical fertilizers cause the problem of environmental pollution and deterioration of soil structure. There are also problems of loss of applied fertilizers through leaching, volatilization and de-nitrification of nitrogen and fixation of phosphorus. Among the different organic manures used, farm yard manure is a commonly used manure, plays an additional role than its capacity to contribute N, P, K. Green manuring also helps in restoring the organic matter content in the soil. Hence, to obtain more production and for balanced nutrient status of soil, proper combination of organic manures and inorganic fertilizers is needed. Therefore, the present studies were undertaken to decide proper combination of organic manure and inorganic fertilizers for better growth, yield and quality of okra variety Parbhani Kranti.

MATERIALS AND METHODS

The experiment was conducted in the plot of Department of Horticulture, College of Agriculture, Latur, Marathwada Agricultural University, Parbhani during *Kharif* season 2006-2007. The experiment consisted of 10 treatments replicated thrice in Randomized Block Design. The different sources of nitrogen *viz.*, urea, FYM, vermicompost, karanj cake were used and neem cake in combinations like T_1) Control, T_2) R.D.F. (N) through Urea (100%), T_3) 75% N through urea + 25% N through vermicompost, T_4) 75% N through urea + 25% N through karanj cake, T_5) 75% N through urea + 25% N through neem cake, T_6) 75% N through urea + 25% N through FYM, T_7) 50%N through urea + 50% N through vermicompost, T_8) 50% N through urea + 50% N through karanj cake, T_9) 50% N through urea + 50% N through neem cake, T_{10}) 50% N through urea + 50% N through FYM. Observations were recorded and statistically analyzed as per method given by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been summarized under following heads:

Effect on growth parameters:

The growth parameters *viz.,* plant height, number

* Author for correspondence.

of leaves, leaf area, number of branches, number of nodes and length of internode have been significantly influenced by different treatments (Table 1).

Plant height:

The increase in plant height due to application of various treatments was most visible plant feature. The treatment T_9 (110.07 cm) recorded significantly more plant height which was at par with the treatments T_8 (110.03 cm), T_7 (102.57 cm), T_{10} (95.40 cm) and T_2 (95.21 cm). The minimum plant height was recorded in T_1 (81.03 cm). Similarly Sonwane (2003) also found maximum plant height from the combined application of 50% RDF with 50% neem cake as compared to control in okra.

Number of leaves and branches per plant:

Maximum number of leaves (15.73) were reported in treatment T_9 (50% N through urea+ 50% N through neem cake), while minimum number of leaves were produced in control. Similarly Maximum number of branches (3.06) were observed in the treatment T_9 (50% N through urea + 50% N through neem cake) at all stages of crop growth. The minimum number of branches were produced in the treatment T_1 (2.53). Similar results were also obtained in tomato by Patil *et al*. (2004) and by Patil (2007) in brinjal.

Leaf area:

The treatment T_9 (293.74 cm^2) recorded maximum leaf area which was significantly superior over rest of all treatments except T_8 (291.11 cm^2), T_7 (271.34 cm^2), T_{10} (269.61 cm^2), T_2 (257.16 cm^2) and T_5 (247.91 cm^2). The lowest leaf area was recorded in the treatment T_1 (219.07 cm^2). Similar trend of results was also obtained in cabbage (Tarata *et al*., 1995) and in brinjal (Subba Rao and Ravi Shankar, 2002).

Number of nodes:

Maximum number of nodes (19.73) were recorded in the treatment T_9 (50% N through urea + 50% N through neem cake) which was significantly superior over rest of the treatments except T_8 (19.26), T_7 (18.73), T_4 (17.60) and T_{10} (17.53). The minimum number of nodes were recorded in T_1 (15.60). Similar results were obtained by Naidu *et al*. (1999) in okra.

Length of internode :

The minimum length of internode was recorded in T_4 (5.18 cm) which was significantly superior over all treatments except T_1 (5.19 cm). The maximum length of internode was recorded in T_8 (5.71 cm). Similar results were also obtained in okra by Singh (1979) and Naidu *et al*. (1999).

Table 1: Effect of different sources of nitrogen on growth of okra [*Abelmoschus esculentus* (L.) Monech]

Tr. No.	Treatments	Plant height (cm)	Number of leaves per plant	Leaf area (cm^2)	Number of branches	Number of nodes $plant^{-1}$	Length of internode (cm)
T_1	Control	81.03	11.80	219.07	2.53	15.60	5.19
T_2	R.D.F. through Urea (100%)	95.21	14.40	257.16	2.80	17.06	5.58
T_3	75% N through urea + 25% N through Vermicompost	88.67	13.06	226.73	2.73	16.80	5.27
T_4	75% N through urea + 25% N through Karanj cake	91.27	13.40	243.17	2.80	17.60	5.18
T_5	75% N through urea + 25% N through Neem cake	92.81	13.53	247.91	2.73	16.80	5.52
T_6	75% N through urea + 25% N through FYM	88.03	12.20	224.67	2.66	15.80	5.57
T_7	50%N through urea + 50% N through Vermicompost	102.57	14.53	271.34	2.86	18.73	5.47
T_8	50% N through urea + 50% N through Karanj cake	110.03	15.53	291.11	2.93	19.26	5.71
T_9	50% N through urea + 50% N through Neem cake	110.07	15.73	293.74	3.06	19.73	5.57
T_{10}	50% N through urea + 50% N through FYM	95.40	14.46	269.61	2.80	17.53	5.44
	S.E. $\pm$	5.09	0.54	15.58	0.07	0.60	0.023
	C.D. (P=0.05)	15.10	1.63	46.21	0.23	1.80	0.069

Table 2 : Effect of different sources of nitrogen on yield of okra [*Abelmoschus esculentus* (L.) Monech]

Tr. No.	Treatments	Weight of fruit (g)	Length of fruit (cm)	Breadth of fruit (cm)	Number of fruits per plant	Yield per hectare (q)
T_1	Control	8.30	7.97	1.39	14.40	116.46
T_2	R.D.F. through Urea (100%)	10.04	8.90	1.47	16.46	142.21
T_3	75% N through urea + 25% N through Vermicompost	9.05	8.43	1.43	15.06	132.18
T_4	75% N through urea + 25% N through Karanj cake	9.10	8.74	1.43	15.63	141.63
T_5	75% N through urea + 25% N through Neem cake	9.92	8.85	1.45	16.36	148.72
T_6	75% N through urea + 25% N through FYM	8.63	8.07	1.41	14.96	137.87
T_7	50%N through urea + 50% N through Vermicompost	10.23	9.29	1.49	17.16	138.45
T_8	50% N through urea + 50% N through Karanj cake	10.27	9.49	1.50	17.70	146.99
T_9	50% N through urea + 50% N through Neem cake	10.47	9.54	1.50	19.56	154.47
T_{10}	50% N through urea + 50% N through FYM	10.04	9.26	1.47	16.70	138.71
	S.E. $\pm$	0.22	0.13	0.010	0.56	4.29
	C.D. (P=0.05)	0.65	0.40	0.031	1.66	12.75

Effect on yield parameters:

The various attributes of yield *viz.,* weight, breadth and length of fruit, number of fruits per plant and yield per hectare were significantly influenced due to different treatments tried (Table 2).

Weight and length of fruit:

The treatment T_9 has recorded the maximum weight (10.47 g) and length (9.54 cm) of fruit which was at par with other treatments while minimum weight and length of fruit was recorded in control (8.30 g and 7.97 cm, respectively). These findings are in accordance with the findings of Umap (1998), Bodamwad (2004).

Breadth of fruit:

The treatment T_8 and T_9 recorded the maximum breadth of fruit which was statistically similar with T_7 (1.49 cm). Least breadth of fruit was recorded under treatment T_1 (1.39 cm). Similar results were also observed by Sharma (1995) and Abusaleha and Shanmugavelu (1988).

Number of fruits per plant:

The maximum number of fruits per plant were recorded in the treatment T_9 (19.56) which was significantly superior over remaining all the treatments. The least number of fruits were recorded in T_1 (14.40). This might be due to availability of less nutrients in available form. Similar findings were also reported by Bodamwad (2004).

Yield per hectare:

The treatment T_9 (50% N through urea + 50% N through neem cake) recorded significantly highest yield (154.47 q ha^{-1}) which was statistically at par with T_5 (148.72 q ha^{-1}), T_8 (146.99 q ha^{-1}) and T_2 (142.21 q ha^{-1}). The lowest yield per hectare was recorded in control T_1 (116.46 q ha^{-1}). This might be due to the neem cake which is rich in plant nutrients and in addition to that it contains alkaloids like nimbin and nimbidin, which have nitrification inhibiting properties and releases N slowly. These results are in accordance with Patil *et al*. (2004), Chandra (1998), Jagtap (2007).

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